SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

Basic Mathematics

Q1 Evaluate the following:
(-4) +(-16)
(A) -12 (B) -20
(C) 12 (D) 20

Q2 The value of (-5) x (-6) x (-7) is
(A) 1050 (B) -1050
(C) 210 (D) -210

Q3 Divide $\frac{105}{7}$ by 35
(A) $\frac{3}{5}$ (B) $\frac{2}{7}$
(C) $\frac{3}{7}$ (D) None of these

Q4 Which one of the following is not a prime number?
(A) 23 (B) 71
(C) 87 (D) 97

Q5 Which of the following is not a composite number?
(A) 14 (B) 93
(C) 61 (D) 153

Q6 Find the HCF of the following numbers:75 and 135
(A) 15 (B) 75
(C) 135 (D) 675

Q7 The lowest common multiple (L.C.M) of 18 and 24 is
(A) 6 (B) 18
(C) 24 (D) 72

Q8 $\frac{27}{5}$ in the decimal form is
(A) 0.54 (B) 5.4
(C) 54.0 (D) None of these

Q9 $3\frac{4}{5}$ in the improper fraction is
(A) $\frac{12}{5}$ (B) $\frac{19}{5}$
(C) $\frac{19}{4}$ (D) $\frac{5}{19}$

Q10 Add the following. $2\frac{3}{10}\ and\ 1\frac{3}{5}$
(A) $1\frac{9}{10}$ (B) $3\frac{10}{9}$
(C) $9\frac{3}{10}$ (D) $3\frac{9}{10}$

Q11 Compare the following:
$0, -\frac{8}{5}\ and\ -\frac{11}{5}$
(A) $0 > -\frac{8}{5} > -\frac{11}{5}$
(B) $0 < -\frac{8}{5} < -\frac{11}{5}$
(C) $-\frac{8}{5} > 0 > -\frac{11}{5}$
(D) None of these

Q12 $\frac{32}{80}$ in the lowest form is:
(A) $\frac{2}{5}$ (B) $\frac{16}{80}$
(C) $\frac{8}{10}$ (D) None of these

Q13 2 + 22 + 222 + 2.22 = ?
(A) 4.68 (B) 248.22
(C) 2.50 (D) 250.22

Q14 Simplify: $\left(-\frac{3}{10}\right) \times \left(-\frac{5}{12}\right)$
(A) $\frac{1}{8}$
(B) $-\frac{1}{8}$
(C) $\frac{15}{12}$
(D) None of the above

Q15 The lowest common multiple of 8, 48 and 80 is
(A) 8 (B) 48
(C) 80 (D) 480

Q16 The sum of first six prime numbers is
(A) 29 (B) 31
(C) 41 (D) 43

Q17 Evaluate the following:
123+107-{20-(-60)}
(A) 270 (B) 150
(C) 230 (D) None of these

Q18 The HCF of 24, 36 and 84 is
(A) 4 (B) 12

(C) 36 (D) 84

Q19 Find the LCM of 18, 54, 108.

(A) 2 (B) 18

(C) 54 (D) 108

Q20 Which of the following numbers is divisible by each one of 2, 3 and 5?

(A) 66 (B) 80

(C) 105 (D) 210

Answer Key

Q1	(B)	Q11	(A)
Q2	(D)	Q12	(A)
Q3	(C)	Q13	(B)
Q4	(C)	Q14	(A)
Q5	(C)	Q15	(D)
Q6	(A)	Q16	(C)
Q7	(D)	Q17	(B)
Q8	(B)	Q18	(B)
Q9	(B)	Q19	(D)
Q10	(D)	Q20	(D)

Hints & Solutions

Q1 Text Solution:

(-4) +(-16)

= -4-16

= -20

Therefore, (-4) +(-16)= -20

Q2 Text Solution:

(-5) x (-6) x (-7)

=[(-5) x (-6)] x (-7)

=(30) x (-7)

= -210

Therefore, (-5) x (-6) x (-7)= -210

Hence, the correct option is (D) .e., -210.

Q3 Text Solution:

On dividing $\frac{105}{7}$ by 35, we get

$\frac{105}{7} \div 35$

$= \frac{105}{7} \times \frac{1}{35}$

$= \frac{35 \times 3}{7} \times \frac{1}{35}$

$= \frac{3}{7}$

Therefore, the required number is $\frac{3}{7}$.

Hence, the correct option is (C)i.e. $\frac{3}{7}$.

Q4 Text Solution:

We know that,

Prime numbers are those numbers that have exactly two factors i.e. 1 and the number itself.

Thus, 87 is not a prime number since its factors are 1, 3, 29 and 87.

Hence, the correct option is (C)i .e. 87.

Q5 Text Solution:

We know that,

Composite numbers are those numbers that have more than 2 factors.

Here, Factors of

$14 = 1, 2, 7, 14$

$93 = 1, 3, 31, 93$

$61 = 1, 61$

$153 = 1, 3, 9, 17, 51, 153$

Only, 61 has exactly two factors, thus it is not a composite number

Hence, the correct option is (C)i.e. 61.

Q6 Text Solution:

Prime factorisation:

75 = 3 x 5 x 5

135 = 3 x 3 x 3 x 5

The prime factors which are common in both the numbers: 35

Therefore, HCF (75, 135) = 3 x 5 = 15

Hence, the correct option is (A) i.e. 15.

Q7 Text Solution:

Lowest common multiple of 18 and 24:

18 = 2 x 3 x 3

24 = 2 x 2 x 2 x 3

Thus, LCM (18, 24) = 2 x 2 x 2 x 3 x 3

= 72

Hence, the correct option is (D) i.e. 72.

Q8 Text Solution:

Given number: $\frac{27}{5}$

Multiply the numerator and denominator by 2, we get

$\frac{27 \times 2}{5 \times 2} = \frac{54}{10} = 5.4$

Alternate method:

$$
\begin{array}{r|l}
 & 5.4 \\
\hline
5 & 27 \\
 & -25 \\
\hline
 & 20 \\
 & -20 \\
\hline
 & 0
\end{array}
$$

Hence, the correct option is (B)i.e. 5.4

Q9 Text Solution:

$3\frac{4}{5}$ in the improper fraction:

$= \frac{5\times3+4}{5}$

$= \frac{15+4}{5}$

$= \frac{19}{5}$

Therefore, $3\frac{4}{5} = \frac{19}{5}$

Hence, the correct option is (B)i.e. $\frac{19}{5}$

Q10 Text Solution:

Sum of $2\frac{3}{10}\ and\ 1\frac{3}{5}$

$=2\frac{3}{10} + 1\frac{3}{5}$

$=\frac{10\times2+3}{10} + \frac{5\times1+3}{5}$

$=\frac{20+3}{10} + \frac{5+3}{5}$

$= \frac{23}{10} + \frac{8}{5}$

$= \frac{23+16}{10}$

$= \frac{39}{10}$

$= 3\frac{9}{10}$

Hence, the correct option is (D) .e. $3\frac{9}{10}$

Q11 Text Solution:

We know that,

A negative number is always smaller than zero.

Thus,

$0 > -\frac{8}{5}\ and\ 0 > -\frac{11}{5}$

Now, the denominators of $-\frac{8}{5}$ and $-\frac{11}{5}$ are same.

We know -8> -11

$\Rightarrow -\frac{8}{5} > -\frac{11}{5}$

Therefore, $0 > -\frac{8}{5} > -\frac{11}{5}$

Hence, the correct option is (A).

Q12 Text Solution:

Given fraction: $\frac{32}{80}$

Prime factorisation of 32 and 80:

$32 = 2\times2\times2\times2\times2$

$80 = 2\times2\times2\times2\times5$

Thus, HCF of (32, 80) $= 2\times2\times2\times2 = 16$

Dividing the numerator and denominator by 16, we get

$\frac{32\div16}{80\div16} = \frac{2}{5}$

Therefore, $\frac{32}{80}$ in the lowest form is $\frac{2}{5}$.

Hence, the correct option is (A).

Q13 Text Solution:

2 + 22 + 222 + 2.22

=246 + 2.22

246.00

\+ 2.22

_____

248.22

_____

Thus, 2 + 22 + 222 + 2.22 = 248.22

Hence, the correct option is (B)i.e. 248.22.

Q14 Text Solution:

$\left(-\frac{3}{10}\right)\times\left(-\frac{5}{12}\right)$

$= +\frac{3\times5}{10\times12}$

$= \frac{1\times1}{2\times4}$

$= \frac{1}{8}$

Therefore, $\left(-\frac{3}{10}\right)\times\left(-\frac{5}{12}\right) = \frac{1}{8}$

Hence, the correct option is (A)i.e., $\frac{1}{8}$

Q15 Text Solution:

Lowest common multiple of 8, 48 and 80

$8 = 2\times2\times2$

$48 = 2\times2\times2\times2\times3$

$80 = 2\times2\times2\times2\times5$

Thus, LCM (8, 48, 80) = $2\times2\times2\times2\times2\times3\times5$

= 480

Hence, the correct option is (D) i.e. 480.

Q16 Text Solution:

We know that,

Prime numbers are those numbers that have exactly two factors i.e. 1 and the number itself.

Thus, the sum of first six prime numbers:

= 2 + 3 + 5 + 7 + 11 + 13

= 41

Hence, the correct option is (C) i.e. 41

Q17 Text Solution:

On simplification, we get

123+107-{20-(-60)}

=230-{20+60}

=230-(80)

=150

Therefore, 123+107-{20-(-60)}=150

Hence, the correct option is (B) .e. 150.

Q18 Text Solution:

Prime factorisation:

24=2 x 2 x 2 x 3

36=2 x 2 x 3 x 3

84=2 x 2 x 3 x 7

Thus, the prime factors which are common in all the numbers: 2 x 2 x 3

Therefore, HCF (24, 36, 84)=2 x 2 x 3=12

Hence, the correct option is (B)i.e. 12.

Q19 Text Solution:

LCM of 18, 54, 108:

2	$18-54-108$
2	$9-27-54$
3	$9-27-27$
3	$3-9-9$
3	$1-3-3$
	$1-1-1$

Therefore, LCM (18,54, 108)=2 x 2 x 3 x 3 x 3=108.

Hence, the correct option is (D) .e. 108

Q20 Text Solution:

For option (A):

66=2 x 3 x 1 x 1

Clearly, 66 is not divisible by 5.

For option (B):

80=2 x 2 x 2 x 2 x 5

Clearly, 80 is not divisible by 3.

For option (C):

105=3 x 5 x 7

Clearly, 105 is not divisible by 2.

For option (D):

210=2 x 3 x 5 x 7

Clearly, 210 is divisible by each one of 2, 3 and 5.

Hence, the correct option is (D) .e. 210.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

Basic Mathematics

Q1 What is 25% of 640?
(A) 25 (B) 160
(C) 480 (D) 3760

Q2 On subtracting $\frac{2}{3}$ from $\frac{3}{5}$, we get
(A) $\frac{1}{15}$ (B) $-\frac{1}{15}$
(C) $-\frac{1}{2}$ (D) $\frac{1}{2}$

Q3 Simplify: $24 \div 6 + 7^2$
(A) $\frac{1}{4}$ (B) 18
(C) 53 (D) None of these

Q4 On simplification, the value of $64 + 12 \div 3 \times 4 \times 32 \div (-8)$ is
(A) 0 (B) 64
(C) 25 (D) None of these

Q5 $(800 \div 16) \times (216 \div 36) = \ ?$
(A) 300 (B) 800
(C) 1600 (D) 3000

Q6 The factors of $x^2 + 5x + 6$ are
(A) $(x + 1)$ and $(x + 2)$
(B) $(x - 2)$ and $(x + 3)$
(C) $(x + 1)$ and $(x + 5)$
(D) $(x + 2)$ and $(x + 3)$

Q7 Expand:
$(y - 4)^2$
(A) $y^2 - 16$
(B) $y^2 - 8y - 16$
(C) $y^2 - 8y + 16$
(D) $y^2 + 8y + 8$

Q8 Factorize the following:
$2xy - 6y^2$
(A) $2y(x - 3)$
(B) $2(x - 3y^2)$
(C) $2y(x - 3y)$
(D) $-2y(x + 3y)$

Q9 Find the product of the following:
$(3x + 4)(3x - 4)$
(A) $9x - 16$
(B) $9x^2 - 16$
(C) $9x^2 + 16$
(D) $3x^2 - 4$

Q10 Find the product of $(x^2 + 4)$ and $(x^2 + 3)$.
(A) $x^4 + 7x^2 + 12$
(B) $x^2 + 7x + 12$
(C) $x^4 + 12$
(D) None of these

Q11 Multiply $(5x + 3)$ with $(x - 2)$.
(A) $x^2 + 3x - 16$
(B) $5x^2 - 3x - 16$
(C) $5x^2 + 3x - 16$
(D) $5x^2 + 3x + 16$

Q12 Factorize $49p^2 - 25$.
(A) $(7p - 5)(7p - 5)$
(B) $(7p^2 + 5)(7p^2 - 5)$
(C) $(7p + 5)(7p + 5)$
(D) $(7p + 5)(7p - 5)$

Q13 Factorize $14pq + 35pqr$
(A) $7pq(2 + 35r)$
(B) $pq(2 + 5r)$
(C) $-7pq(2 + 5r)$
(D) None of these

Q14 Expand and simplify the expression:
$(g - 9)(g - 2)$
(A) $g^2 - 11g + 18$
(B) $g^2 - 18$
(C) $g^2 + 11g + 18$
(D) $g^2 - 11g - 18$

Q15 Expand $\left(x + \frac{2}{x}\right)^2$

(A) $x^2 + \frac{4}{x^2}$
(B) $x^2 + 4 + \frac{4}{x}$
(C) $x^2 + 4 - \frac{4}{x^2}$
(D) $x^2 + 4 + \frac{4}{x^2}$

Q16 $16p^3 + 4p =$ _____
(A) $16p(p^2 + 4)$
(B) $4p(4p + 1)$
(C) $4p(4p^2 + 1)$
(D) None of these

Q17 $4x^2 - 9 =$ _____
(A) $(4x - 9)(4x + 9)$
(B) $(2x - 9)(2x - 9)$
(C) $(2x + 3)(2x + 3)$
(D) $(2x - 3)(2x + 3)$

Q18 Expansion of $6(a + 2) - 4(a - 1)$ will result in
(A) $2(a + 8)$
(B) $5(a - 1)$
(C) $10(a + 2)$
(D) None of these

Q19 The square of $2p - 9$ is
(A) $4p^2 - 36p + 18$
(B) $2p^2 + 18p + 9$
(C) $4p^2 + 36p + 81$
(D) $4p^2 - 36p + 81$

Q20 Find the product.
$(3p - 2q)(2p - 3q)$
(A) $6p^2 - 6pq$
(B) $6p^2 - 3pq + 4q^2$
(C) $6p^2 + 3pq + 4q^2$
(D) $6p^2 - 6q^2$

Answer Key

Q1	(B)	Q11	(C)
Q2	(B)	Q12	(D)
Q3	(C)	Q13	(D)
Q4	(A)	Q14	(A)
Q5	(A)	Q15	(D)
Q6	(D)	Q16	(C)
Q7	(C)	Q17	(D)
Q8	(C)	Q18	(A)
Q9	(B)	Q19	(D)
Q10	(A)	Q20	(B)

Hints & Solutions

Q1 Text Solution:

25% of 640

$= \frac{25}{100} \times 640$

$= \frac{1}{4} \times 640$

$= 160$

Therefore, the required result is 160.

Hence, the correct option is (B).

Q2 Text Solution:

On subtracting $\frac{2}{3}$ from $\frac{3}{5}$, we get

$\frac{3}{5} - \frac{2}{3}$

Since, LCM (3, 5) = 15

Thus,

$\frac{3\times3}{5\times3} - \frac{2\times5}{3\times5}$

$= \frac{9}{15} - \frac{10}{15}$

$= -\frac{1}{15}$

Hence, the correct option is (B).

Q3 Text Solution:

$24 \div 6 + 7^2$

$= (24 \div 6) + 7 \times 7$

$= 4 + 49$

$= 53$

Therefore, $24 \div 6 + 7^2 = 53$.

Q4 Text Solution:

$64 + 12 \div 3 \times 4 \times 32 \div (-8)$

$= 64 + 4 \times 4 \times (-4)$

$= 64 - 64$

$= 0$

Therefore, the required value is 0.

Hence, the correct option is (A) i.e. 0.

Q5 Text Solution:

$(800 \div 16) \times (216 \div 36)$

$= \frac{800}{16} \times \frac{216}{36}$

$= 50 \times 6$

$= 300$

Thus, the required value is 300.

Hence, the correct option is (A) i.e. 300.

Q6 Text Solution:

Given expression,

$x^2 + 5x + 6$

$= x^2 + 2x + 3x + 6$

$= x(x + 2) + 3(x + 2)$

$= (x + 2)(x + 3)$

Therefore, the factors of $x^2 + 5x + 6$ are $(x + 2)$ and $(x + 3)$.

Hence, the correct option is (D) i.e. $(x + 2)$ and $(x + 3)$.

Q7 Text Solution:

Using, $(a - b)^2 = a^2 - 2ab + b^2$

Thus, $(y - 4)^2$

$= y^2 - 2(y)(4) + 4^2$

$= y^2 - 8y + 16$ ($\because 4^2 = 4 \times 4 = 16$)

Hence, the correct option is (C) i.e. $y^2 - 8y + 16$.

Q8 Text Solution:

Given expression: $2xy - 6y^2$

As, $2xy = 2 \times x \times y$

$6y^2 = 2 \times 3 \times y \times y$

Taking out the common factors i.e. 2 and y, we get

$2xy - 6y^2 = 2y(x - 3y)$

Therefore, $2xy - 6y^2 = 2y(x - 3y)$

Hence, the correct option is (C) i.e. $2y(x - 3y)$.

Q9 Text Solution:

Using, $(a + b)(a - b) = a^2 - b^2$

Thus, $(3x + 4)(3x - 4)$

$= (3x)^2 - 4^2$

$= 9x^2 - 16$ ($\because (3x)^2 = 3x \times 3x = 9x^2$)

Hence, the correct option is (B) i.e. $9x^2 - 16$.

Q10 Text Solution:

The product of $(x^2 + 4)$ and $(x^2 + 3)$ is

$(x^2 + 4)(x^2 + 3)$

$= x^2(x^2+3)+4(x^2+3)$
$= x^4+3x^2+4x^2+12$
$= x^4+7x^2+12$
Hence, the correct option is (A) i.e. x^4+7x^2+12.

Q11 Text Solution:
Multiplication of $(5x+3)$ by $(x-2)$ is given by:
$(5x+3)(x-2)$
$= 5x(x-2)+3(x-2)$
$= 5x^2-10+3x-6$
$= 5x^2+3x-16$
$\therefore (5x+3)(x-2) = 5x^2+3x-16$
Hence, the correct option is (C) i.e. $5x^2+3x-16$.

Q12 Text Solution:
Using, $a^2-b^2=(a+b)(a-b)$
Thus, $49p^2-25$
$=(7p)^2-5^2$
$=(7p+5)(7p-5)$
Therefore, $49p^2-25=(7p+5)(7p-5)$
Hence, the correct option is (D) i.e. $(7p+5)(7p-5)$.

Q13 Text Solution:
Given expression: $14pq+35pqr$
$14pq$ can be written as: $2\times7\times p\times q$
$35pqr$ can be written as: $5\times7\times p\times q\times r$
The common factors are $7\times p\times q$.
Thus, $14pq+35pqr=7pq(2+5r)$
Hence, the correct option is (D) i.e. $7pq(2+5r)$.

Q14 Text Solution:
Given expression: $(g-9)(g-2)$
$= g(g-2)-9(g-2)$
$= g^2-2g-9g+18$
$= g^2-11g+18$
Therefore, $(g-9)(g-2)=g^2-11g+18$
Hence, the correct option is (A) i.e. $g^2-11g+18$.

Q15 Text Solution:
Using, $(a+b)^2=a^2+2ab+b^2$
$\therefore \left(x+\frac{2}{x}\right)^2=x^2+2(x)(\frac{2}{x})+\left(\frac{2}{x}\right)^2$
$=x^2+2(2)+\frac{2^2}{x^2}$
$=x^2+4+\frac{4}{x^2}$
Therefore, $\left(x+\frac{2}{x}\right)^2=x^2+4+\frac{4}{x^2}$
Hence, the correct option is (D) i.e. $x^2+4+\frac{4}{x^2}$.

Q16 Text Solution:
Given: $16p^3+4p$
On taking out the common factors, we get
$16p^3+4p=4p(4p^2+1)$
Hence, the correct option is (C) i.e. $4p(4p^2+1)$.

Q17 Text Solution:
Using $a^2-b^2=(a-b)(a+b)$
Thus, $4x^2-9=(2x)^2-3^2$
$=(2x-3)(2x+3)$
Therefore, $4x^2-9=(2x-3)(2x+3)$
Hence, the correct option is (D) i.e. $(2x-3)(2x+3)$.

Q18 Text Solution:
$6(a+2)-4(a-1)$
$=6a+12-4a+4$
$=6a-4a+12+4$
$=2a+16$
$=2(a+8)$
Therefore, the required result is $2(a+8)$.
Hence, the correct option is (A) i.e. $2(a+8)$.

Q19 Text Solution:
Using, $(a-b)^2=a^2-2ab+b^2$
Thus, $(2p-9)^2$
$=(2p)^2-2(2p)(9)+9^2$
$=4p^2-36p+81$
Therefore, the square of $2p-9$ is $4p^2-36p+81$.
Hence, the correct option is (D) i.e. $4p^2-36p+81$.

Q20 **Text Solution:**

Given: $(3p-2q)(2p-3q)$

$=3p(2p-3q)-2q(2p-3q)$

$=6p^2-9pq+4q^2+6pq$

$=6p^2-3pq+4q^2$

Therefore,

$(3p-2q)(2p-3q)=6p^2-3pq+4q^2$

Hence, the correct option is (A) i.e. $6p^2-3pq+4q^2$.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

RATIO & PROPORTION, INDICES AND LOGARITHM

Q1 The ratio of the quantities is 5 : 7. If the consequent of its inverse ratio is 5, the antecedent is
(A) 5 (B) $\sqrt{7}$
(C) 7 (D) None of these

Q2 If a : b = 3 : 4, the value of 2a + 3b : 3a + 4b is
(A) 54 : 25 (B) 8 : 25
(C) 17 : 24 (D) 18 : 25

Q3 The duplicate ratio of 3 : 4 is
(A) $\sqrt{3} : 2$ (B) 4 : 3
(C) 9 : 16 (D) None of these

Q4 The sub-duplicate ratio of 25 : 36 is
(A) 6 : 5 (B) 36 : 25
(C) 50 : 72 (D) 5 : 6

Q5 The sub-triplicate ratio of 8 : 27 is
(A) 27 : 8 (B) 24 : 81
(C) 2 : 3 (D) None of these

Q6 The ratio compounded of 4 : 9 and the duplicate ratio of 3 : 4 is
(A) 1 : 4 (B) 1 : 3
(C) 3 : 1 (D) None of these

Q7 $\frac{3x-2}{5x+6}$ is the duplicate ratio of $\frac{2}{3}$, then find the value of x.
(A) 6 (B) 2
(C) 5 (D) 9

Q8 If $x : y = 3 : 4$, the value of $x^2y + xy^2 : x^3 + y^3$ is
(A) $13 : 12$ (B) $12 : 13$
(C) $21 : 31$ (D) None of these

Q9 The ratio compounded of $4 : 9$, the duplicate ratio of $3 : 4$, the triplicate ratio of $2 : 3$ and $9 : 7$ is
(A) $2 : 7$ (B) $7 : 2$
(C) $2 : 21$ (D) none of these

Q10 The ratio compounded of duplicate ratio of $4 : 5$, triplicate ratio of $1 : 3$, sub-duplicate ratio of $81 : 256$ and sub-triplicate ratio of $125 : 512$ is
(A) $4 : 512$ (B) $3 : 32$
(C) $1 : 12$ (D) None of these

Answer Key

Q1	(C)	Q6	(A)
Q2	(D)	Q7	(A)
Q3	(C)	Q8	(B)
Q4	(D)	Q9	(C)
Q5	(C)	Q10	(D)

Hints & Solutions

Q1 Text Solution:

For the ratio a : b, a is called antecedent and b is called consequent.

Given, ratio of two quantities = 5 : 7

⇒ Inverse of the ratio = 7 : 5

Let x be the antecedent of the ratio whose consequent is 5.

According to the question,

$\frac{7}{5} = \frac{x}{5}$

$\Rightarrow x = \frac{7\times5}{5}$

$\Rightarrow x = 7$

Therefore, the required antecedent is 7.

Hence, the correct answer is option (C) i.e., 7.

Q2 Text Solution:

Given, a : b = 3 : 4

Let a = 3x and b = 4x

Substituting the values of 'a' and 'b' in 2a + 3b : 3a + 4b, we get

$\frac{2a+3b}{3a+4b}$

$= \frac{2(3x)+3(4x)}{3(3x)+4(4x)}$

$= \frac{6x+12x}{9x+16x}$

$= \frac{18x}{25x}$

$= 18 : 25$

Therefore, the correct answer is option (D) i.e., 18 : 25.

Q3 Text Solution:

We know that,

$a^2 : b^2$ is the duplicate ratio of a : b.

⇒ The duplicate ratio of 3 : 4 is given by $3^2 : 4^2$ = 9 : 16

Therefore, the duplicate ratio of 3 : 4 is 9 : 16.

Hence, the correct answer is option (C) i.e. 9 : 16.

Q4 Text Solution:

We know that, the sub-duplicate ratio of a : b is $\sqrt{a} : \sqrt{b}$.

Thus, the sub-duplicate ratio of 25 : 36 = $\sqrt{25} : \sqrt{36}$ = 5 : 6

Hence, the correct option is (D) i.e., 5 : 6.

Q5 Text Solution:

We know that, the sub-triplicate ratio of a : b is $\sqrt[3]{a} : \sqrt[3]{b}$.

Therefore, the sub-triplicate ratio of 8 : 27 = $\sqrt[3]{8} : \sqrt[3]{27}$

= 2 : 3

Hence, the correct option is (C) i.e., 2 : 3.

Q6 Text Solution:

As we know, $a^2 : b^2$ is the duplicate ratio of a : b.

⇒ The duplicate ratio of 3 : 4 = 9 : 16

Also, the ratio compounded of the two ratios a : b and c : d is ac : bd.

∴ The ratio compounded of 4 : 9 and the duplicate ratio of 3 : 4

i.e., the ratio compounded of 4 : 9 and 9 : 16

= 4(9) : 9(16)

= 4 :16

= 1 : 4

Hence, the correct answer is option (A) i.e., 1 : 4.

Q7 Text Solution:

Given: $\frac{3x-2}{5x+6}$ is the duplicate ratio of $\frac{2}{3}$

We know that, $a^2 : b^2$ is the duplicate ratio of $a : b$.

⇒ The duplicate ratio of $\frac{2}{3} = \frac{(2)^2}{(3)^2} = \frac{4}{9}$

According to the given problem, we have

$\frac{3x-2}{5x+6} = \frac{4}{9}$

On cross multiplication, we get

$9(3x-2) = 4(5x+6)$

$\Rightarrow 27x - 18 = 20x + 24$

$\Rightarrow 27x - 20x = 24 + 18$

$\Rightarrow 7x = 42$

$\Rightarrow x = 6$

Therefore, the value of x is 6.

Hence, the correct option is (A) i.e., 6.

Q8 Text Solution:

Given, $x : y = 3 : 4$

Let $x = 3a$ and $y = 4a$

On substituting the above values of x and y in the given expression, we get

$x^2y + xy^2 : x^3 + y^3$

$= \frac{x^2y + xy^2}{x^3 + y^3}$

$= \frac{(3a)^2(4a) + (3a)(4a)^2}{(3a)^3 + (4a)^3}$

$= \frac{36a^3 + 48a^3}{27a^3 + 64a^3}$

$= \frac{84a^3}{91a^3}$

$= \frac{84}{91}$

$= \frac{12}{13}$

Thus, $x^2y + xy^2 : x^3 + y^3 = 12 : 13$

Hence, the correct answer is option (B) i.e., $12 : 13$.

Q9 Text Solution:

Let us find the individual ratios first.

Duplicate ratio of $3 : 4 \ is \ (3)^2 : (4)^2 = 9 : 16$

Triplicate ratio of $2 : 3 \ is \ (2)^3 : (3)^3 = 8 : 27$

We know that, the ratio compounded of two ratios $a : b$ and $c : d$ is $ac : bd$.

Therefore, the compounded ratio of $4 : 9$, $9 : 16, 8 : 27$ and $9 : 7$

$= \frac{4 \times 9 \times 8 \times 9}{9 \times 16 \times 27 \times 7}$

$= \frac{2}{3 \times 7}$

$= \frac{2}{21}$

$= 2 : 21$

Hence, the correct answer is option (C) i.e., $2 : 21$.

Q10 Text Solution:

Let us find the individual ratios first.

Duplicate ratio of $4 : 5 \ is \ (4)^2 : (5)^2 = 16 : 25$

Triplicate ratio of $1 : 3 \ is \ (1)^3 : (3)^3 = 1 : 27$

Sub-duplicate ratio of $81 : 256 \ is \ : = 9 : 16$

Sub-triplicate ratio of $125 : 512 \ is \ \sqrt[3]{125} : \sqrt[3]{512} = 5 : 8$

We know that,

The ratio compounded of the two ratios $a : b$ and $c : d$ is $ac : bd$.

Therefore, the required compounded ratio

$= \frac{16 \times 1 \times 9 \times 5}{25 \times 27 \times 16 \times 8}$

$= \frac{1}{5 \times 3 \times 8} = \frac{1}{120}$

$= 1 : 120$

Hence, the correct answer is option (D) i.e., none of these.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

RATIO & PROPORTION , INDICES & LOGARITHM

Q1 $4, *, 9, 13\frac{1}{2}$ are in proportion. Then $*$ is
(A) 6 (B) 8
(C) 9 (D) none of these

Q2 The numbers $14, 16, 35, 42$ are not in proportion. The fourth term for which they will be in proportion is
(A) 45 (B) 40
(C) 32 (D) none of these

Q3 The number which has the same ratio to 26 that 6 has to 13 is
(A) 11 (B) 10
(C) 21 (D) None of these

Q4 The mean proportional between $1.4\ gm$ and $5.6\ gm$ is
(A) $28\ gm$ (B) $2.8\ gm$
(C) $3.2\ gm$ (D) none of these

Q5 If $x : y = z : w = 2.5 : 1.5$, the value of $\frac{(x+z)}{(y+w)}$ is
(A) 1
(B) $\frac{3}{5}$
(C) $\frac{5}{3}$
(D) none of these

Q6 If $\frac{u}{v} = \frac{w}{p}$ implies $\frac{(u-v)}{(u+v)} = \frac{(w-p)}{(w+p)}$. The process is called
(A) Invertendo (B) Alternendo
(C) Addendo (D) none of these

Q7 If $A : B = 3 : 2$ and $B : C = 3 : 5$, then $A : B : C$ is
(A) $9 : 6 : 10$
(B) $6 : 9 : 10$
(C) $10 : 9 : 6$
(D) none of these

Q8 The number which when subtracted from each of the terms of the ratio 19 : 31 reducing it to 1 : 4 is
(A) 15 (B) 5
(C) 1 (D) None of these

Q9 Find the ratio of third proportional of 12,30 and mean proportional of $9, 25$.
(A) $7:2$ (B) $5:1$
(C) $9:4$ (D) None of these

Q10 Two numbers are in the ratio 2 : 3. If 4 be subtracted from each, they are in the ratio 3 : 5. The numbers are
(A) $(16, 24)$ (B) $(4, 6)$
(C) $(2, 3)$ (D) none of these

Q11 If a:b = 8:4 then find the value of (a+b):(a-b)
(A) 1 (B) 2
(C) 3 (D) 4

Answer Key

Q1	(A)
Q2	(B)
Q3	(D)
Q4	(B)
Q5	(C)
Q6	(D)
Q7	(A)
Q8	(A)
Q9	(B)
Q10	(A)
Q11	(C)

Hints & Solutions

Q1 Text Solution:

Given: $4, *, 9, 13\frac{1}{2}$ are in proportion

Let $*$ is represented by x

Now, by cross product rule

Product of extremes = Product of means

$\Rightarrow x \times 9 = 4 \times 13\frac{1}{2}$

$\Rightarrow x \times 9 = 4 \times \frac{27}{2}$

$\Rightarrow x = \frac{4\times27}{9\times2} = 6$

Therefore, the value of $*$ is 6.

Hence, the correct answer is option (A) i.e., 6.

Q2 Text Solution:

We know that,

If $a : b = c : d$ then $ad = bc$

Clearly, $\frac{14}{16} \neq \frac{35}{42}$

Let us assume the fourth proportion to be x for which $14, 16, 35, x$ will be in proportion.

i.e., $14 : 16 = 35 : x$

$\Rightarrow \frac{14}{16} = \frac{35}{x}$

$\Rightarrow x = \frac{16}{14} \times 35$

$\Rightarrow x = 8 \times 5$

$\Rightarrow x = 40$

Therefore, the fourth term of proportion should be 40.

Hence, the correct answer is option (B) i.e., 40.

Q3 Text Solution:

Let the number is x which has same ratio to 26 that 6 has to 13.

We can say that $x, 26, 6$ and 13 are in proportion.

$\Rightarrow x : 26 = 6 : 13$

$\Rightarrow \frac{x}{26} = \frac{6}{13}$

$\Rightarrow x = 26 \times \frac{6}{13}$

$\therefore x = 12$

Hence, the correct answer is option D) i.e., none of these.

Q4 Text Solution:

Let the mean proportional between $1.4\ gm$ and $5.6\ gm$ be $\mathrm{b\ gm}$.

We know that, if b is mean proportional between a and c, then $b^2 = ac$

According to the question,

$b^2 = a \times c$

$\Rightarrow b = \sqrt{a \times c}$

$\Rightarrow b = \sqrt{1.4 \times 5.6}$

$\Rightarrow b = \sqrt{1.4 \times 1.4 \times 2 \times 2}$

$\Rightarrow b = 1.4 \times 2 = 2.8$

Therefore, the mean proportional between $1.4\ gm$ and $5.6\ gm$ is$2.8\ gm$.

Hence, the correct answer is option B) i.e., $2.8\ gm$.

Q5 Text Solution:

Given, $x : y = z : w = 2.5 : 1.5$

i.e., $\frac{x}{y} = \frac{z}{w} = \frac{2.5}{1.5}$ .... (1)

We know that,

If $a : b = c : d$, then $a : b = c : d = (a + c) : (b + d)$ (by Addendo)

Applying this concept, we get

$\frac{x}{y} = \frac{z}{w} = \frac{x+z}{y+w}$

$\Rightarrow \frac{x+z}{y+w} = \frac{2.5}{1.5}$ (from eq. 1)

$\Rightarrow \frac{x+z}{y+w} = \frac{25\times10}{15\times10} = \frac{25}{15}$

$\Rightarrow \frac{x+z}{y+w} = \frac{5}{3}$

Therefore, the value of $\frac{x+z}{y+w}$ is $\frac{5}{3}$.

Hence, the correct answer is option (C) i.e., $\frac{5}{3}$.

Q6 Text Solution:

Given: $\frac{u}{v} = \frac{w}{p}$

Applying Componendo to the given equation, we get

$\frac{u+v}{v} = \frac{w+p}{p}$ ..... (1)

Now, applying Dividendo to the given equation, we get

$\frac{u-v}{v} = \frac{w-p}{p}$ ..... (2)

Dividing equation (2) by (1), we get

$\frac{(u-v)}{(u+v)} = \frac{(w-p)}{(w+p)}$

Therefore, the process is called Componendo and Dividendo.

Hence, the correct answer is option D) i.e., none of these.

Q7 Text Solution:

Given, $A : B = 3 : 2$ and $B : C = 3 : 5$

i.e., $\frac{A}{B} = \frac{3}{2}$ and $\frac{B}{C} = \frac{3}{5}$

$\Rightarrow \frac{A}{B} = \frac{3\times 3}{2\times 3}$ and $\frac{B}{C} = \frac{3\times 2}{5\times 2}$

$\Rightarrow \frac{A}{B} = \frac{9}{6}$ and $\frac{B}{C} = \frac{6}{10}$

$\Rightarrow A : B = 9 : 6$ and $B : C = 6 : 10$

$\Rightarrow A : B : C = 9 : 6 : 10$

Hence, the correct answer is option (A) i.e., $9 : 6 : 10$.

Q8 Text Solution:

Let the unknown number be x.

Now, as per the question

$\frac{19-x}{31-x} = \frac{1}{4}$

On cross-multiplying, we get

4(19-x)=1(31-x)

76-4x=31-x

3x=45

$\therefore$ x=15

Hence, the correct option is (A) i.e., 15

Q9 Text Solution:

Let the third proportional of 12,30 be x, then 12,30 and x are in continued proportion

i.e., 12 :30 :: 30 :x

$\Rightarrow \frac{12}{30} = \frac{30}{x}$

$\Rightarrow x = \frac{30\times 30}{12}$

$\Longrightarrow$ x=75

Now, the mean proportional of 9,25 = $\sqrt{9\times 25}$ = 3*5 = 15

Thus, the required ratio is 75 :15

=5 :1

Hence, the correct answer is option (B) i.e., 5 :1.

Q10 Text Solution:

Given: Ratio of the two numbers =2 : 3

Let the two numbers be 2x and 3x.

According to the question,

$\frac{2x-4}{3x-4} = \frac{3}{5}$

$\Rightarrow$ 5(2x-4)=3(3x-4)

$\Rightarrow$ 10x-20=9x-12

$\Rightarrow$ 10x-9x=20-12

$\Rightarrow$ x=8

Thus, the numbers are

2x=2(8)=16

and 3x=3(8)=24

Hence, the correct answer is option A) i.e., (16, 24).

Q11 Text Solution:

Given , a:b = 8:4

Using Componendo and Dividendo

$(a+b) : (a-b) = \frac{8+4}{8-4}$

$= \frac{12}{4} = 3$

Hence, the correct answer is option (C) i.e 3

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

RATIO AND PROPORTION, INDICES AND LOGARITHMS

Q1 An alloy is to contain copper and zinc in ratio 5 : 2. The zinc required to melt with 20 kg of copper is:

(A) 50 kg (B) 8 kg
(C) 10 kg (D) None of these

Q2 P , Q , R are three cities. Ratio of average rainfall between P and Q is 2 : 3 and between P and R is 3 : 4. Find the ratio between Q and R.

(A) 8 : 9 (B) 9 : 8
(C) 3 : 2 (D) 2 : 3

Q3 The number of boys and girls in a class are in ratio 9 : 5. If 4 boys and 4 girls went for a district level competition the ratio becomes 2 : 1. Find the total number of boys and girls in the class.

(A) 36 and 20 (B) 45 and 25
(C) 27 and 15 (D) None of these

Q4 In a company, the bonus amount is 54,000 which is to be distributed among P, Q & R in 9 : 5 : 4. What is the share of R in the bonus?

(A) 27,000 (B) 15,000
(C) 12,000 (D) None of these

Q5 The angles of a triangle are in the ratio $2 : 3 : 5$. The angles are

(A) $(30^\circ, 60^\circ, 90^\circ)$
(B) $(36^\circ, 54^\circ, 80^\circ)$
(C) $(18^\circ, 36^\circ, 126^\circ)$
(D) None of these

Q6 12, 16, *, 20 are in proportion. Then * is

(A) 25 (B) 14
(C) 15 (D) None of these

Q7 If $\frac{x}{2} = \frac{y}{3} = \frac{z}{7}$, then the value of $\frac{(2x - 5y + 4z)}{2y}$ is

(A) $\frac{6}{23}$
(B) $\frac{23}{6}$
(C) $\frac{3}{2}$
(D) $\frac{17}{6}$

Q8 If the ratio of two numbers is 7 : 11. If 7 is added to each number then the new ratio will be 2 : 3. Then the numbers are

(A) 49, 77 (B) 42, 45
(C) 43, 42 (D) 39, 40

Q9 The two numbers are in the ratio $3 : 4$. The difference between their squares is 28. Find the greater number.

(A) 12 (B) 8
(C) 16 (D) 10

Q10 Daily earnings of two persons are in the ratio 4 : 5 and their daily expenses are in the ratio 7 : 9. If each saves ₹50 per day, their daily earnings in ₹ are

(A) 40, 50 (B) 50, 40
(C) 400, 500 (D) None of these

Answer Key

Q1	(B)	Q6	(C)
Q2	(B)	Q7	(D)
Q3	(A)	Q8	(A)
Q4	(C)	Q9	(B)
Q5	(B)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Let the quantity of copper and zinc in an alloy be 5x and 2x

As per the question

Quantity of copper = 20

$\Rightarrow 5x = 20$

$\Rightarrow x = \frac{20}{5} = 4$

Thus, the quantity of zinc = $2x = 2(4)$

= 8 kg

Hence, the correct option is (B) i.e., 8 kg.

Q2 Text Solution:

Given: P : Q = 2 : 3 and P : R = 3 : 4

i.e.,

$\frac{P}{Q} = \frac{2}{3}\ and\ \frac{P}{R} = \frac{3}{4}$

$or\ \frac{Q}{P} = \frac{3}{2}\ and\ \frac{P}{R} = \frac{3}{4}$

$\Rightarrow \frac{Q}{P} = \frac{3\times3}{2\times3} = \frac{9}{6}\ and\ \frac{P}{R} = \frac{3\times2}{4\times2} = \frac{6}{8}$

On multiplying both the ratios, we get

$\frac{Q}{R} = \frac{Q}{P} \times \frac{P}{R} = \frac{9}{6} \times \frac{6}{8} = \frac{9}{8}$

Hence, option (B) is correct i.e., $\frac{9}{8}$

Q3 Text Solution:

Let the original ratio between boys and girls be 9x and 5x

If 4 boys and 4 girls went ratio becomes 2 : 1

$\frac{9x-4}{5x-4} = \frac{2}{1}$

$\Rightarrow 9x - 4 = 2\left(5x - 4\right)$

$\Rightarrow 9x - 4 = 10x - 8$

$\Rightarrow 10x - 9x = -4 + 8$

$\Rightarrow x = 4$

Therefore, number of boys = 9×4 = 36

And the number of girls = 5×4 = 20

Q4 Text Solution:

Given, Amount of Bonus = 54,000

Ratio of bonus of P, Q and R = 9 : 5 : 4

Thus, Sum of the ratio = 9 + 5 + 4 = 18

Therefore, Share of R = $54000 \times \frac{4}{18}$

= 3000×4

= 12000

Q5 Text Solution:

Given: Ratio of angles of triangle $= 2 : 3 : 5$

Let the angles of the triangle be $2x,\ 3x,\ 5x$.

We know that, sum of interior angles of a triangle is 180°.

$\Rightarrow 2x + 3x + 5x = 180^\circ$

$\Rightarrow 10x = 180^\circ$

$\Rightarrow x = \frac{180^\circ}{10}$

$\Rightarrow x = 18^\circ$

Thus, the angles of the triangle is $2 \times 18^\circ, 3 \times 18^\circ, 5 \times 18^\circ$ i.e., $(36^\circ,\ 54^\circ,\ 80^\circ)$.

Q6 Text Solution:

Given: $12, 16, *, 20$ are in proportion

Let * is represented by $x \Rightarrow 12, 16, x, 20$ are in proportion

Now, by cross product rule Product of extremes = Product of means

$$\text{i.e., } 12 \times 20 = 16 \times x$$
$$\Rightarrow x = \frac{12 \times 20}{16}$$
$$\Rightarrow x = 3 \times 5$$
$$\Rightarrow x = 15$$

Therefore, the value of * is 15.

Q7 Text Solution:

Given: $\frac{x}{2} = \frac{y}{3} = \frac{z}{7}$

Consider $\frac{x}{2} = \frac{y}{3} = \frac{z}{7} = k$

$\Rightarrow x = 2k,\ y = 3k,\ z = 7k$

Now, substituting the values of x, y and z in the given expression, we get

$\frac{(2x - 5y + 4z)}{2y}$

$= \frac{2(2k) - 5(3k) + 4(7k)}{2(3k)}$

$= \frac{4k - 15k + 28k}{6k}$

$= \frac{17k}{6k}$

$= \frac{17}{6}$

Therefore, the required value is $\frac{17}{6}$.

Hence, the correct option is (D) i.e., $\frac{17}{6}$.

Q8 Text Solution:

Given: Ratio of two numbers = 7 : 11

Let us assume the two numbers to be 7x and 11x.

According to the question,

$\frac{7x+7}{11x+7} = \frac{2}{7}$

On cross-multiplying, we get

3(7x + 7) = 2(11x + 7)

⇒ 21x + 21 = 22x + 14

⇒ 22x - 21x = 21 - 14

⇒ x = 7

Therefore, the numbers are $7 \times 7 \; and \; 11 \times 7$ i.e., 49 and 77 respectively.

Hence, the correct option is (A) i.e., 49, 77.

Q9 Text Solution:

Given: Ratio of two numbers $= 3 \; : 4$

Let the two numbers be $3x$ and $4x$ respectively.

According to the question,

$(4x)^2 - (3x)^2 = 28$

$\Rightarrow 16x^2 - 9x^2 = 28$

$\Rightarrow 7x^2 = 28$

$\Rightarrow x^2 = 4$

$\Rightarrow x = 2$

Thus, the numbers are 3×2 and 4×2 i.e., 6 and 8.

Therefore, the greater number is 8.

Hence, the correct option is (B) i.e., 8.

Q10 Text Solution:

Given,

Ratio of earnings of two persons = 4 : 5

Ratio of expenses of two persons = 7 : 9

Savings of each person = ₹50 per day

Let the income of two persons be ₹4x and ₹5x.

Since, each saves ₹50 per day, then the expenses of two persons are ₹(4x - 50) and ₹(5x - 50) respectively.

According to the question,

$\frac{4x-50}{5x-50} = \frac{7}{9}$

On cross-multiplying, we get

9(4x - 50) = 7(5x - 50)

⇒ 36x - 450 = 35x - 350

⇒ 36x - 35x = 450 - 350

⇒ x = 100

Therefore, the monthly income of two persons will be ₹4×100 and ₹5×100 i.e.,₹400 and ₹500.

Hence, the correct option is (C) i.e., (400,500)

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

RATIO AND PROPORTION, INDICES AND LOGARITHM

Q1 The value of $\left(\frac{8}{125}\right)^{\frac{1}{3}}$ is
(A) $\frac{2}{5}$
(B) $\frac{5}{2}$
(C) $\frac{2}{25}$
(D) none of these

Q2 The value of $(10)^7 \div (10)^5$ is
(A) 1 (B) 10
(C) 20 (D) 100

Q3 The value of $(125)^{\frac{2}{3}} \times (625)^{\frac{3}{4}}$ is
(A) 150 (B) 625
(C) 3125 (D) none of these

Q4 $2^{\frac{1}{2}} \times 4^{\frac{3}{4}}$ is equal to
(A) a fraction
(B) a positive integer
(C) a negative integer
(D) none of these

Q5 $\frac{a^2 \times a^8 \times a \times b^4}{b^2 \times a^3} = ?$
(A) $a^5 \times b^2$
(B) $a^8 \times b^2$
(C) $\left(a^4 \times b\right)^2$
(D) Both (B) & (C)

Q6 The value of $\left(\frac{2p^2q^3}{3xy}\right)^0$ where p, q, x, y $\neq 0$ is equal to
(A) 0 (B) $\frac{2}{3}$
(C) 1 (D) none of these

Q7 Which is true ?
(A) $2^0 > \left(\frac{1}{2}\right)^0$
(B) $2^0 < \left(\frac{1}{2}\right)^0$
(C) $2^0 = \left(\frac{1}{2}\right)^0$
(D) none of these

Q8 Simplified value of $(125)^{\frac{2}{3}} \times \sqrt{25} \times \sqrt[3]{5^3} \times 5^{\frac{1}{2}}$ is
(A) 5 (B) $\frac{1}{5}$
(C) 1 (D) none of these

Q9 If $(8x)^{10} = 8^{30}$. Find the value of x.
(A) 128 (B) 256
(C) 64 (D) 32

Q10 The value of $\left(\frac{8}{27}\right)^{\frac{-1}{3}} \times \left(\frac{32}{243}\right)^{\frac{-1}{5}}$ *is*
(A) $\frac{9}{4}$ (B) $\frac{4}{9}$
(C) $\frac{2}{3}$ (D) none of these

Answer Key

Q1	(A)	Q6	(C)
Q2	(D)	Q7	(C)
Q3	(C)	Q8	(D)
Q4	(B)	Q9	(C)
Q5	(D)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

We need to simplify $\left(\frac{8}{125}\right)^{\frac{1}{3}}$

$\left(\frac{8}{125}\right)^{\frac{1}{3}} = \left(\frac{2^3}{5^3}\right)^{\frac{1}{3}} = \left(\left(\frac{2}{5}\right)^3\right)^{\frac{1}{3}} \because \left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$

$= \left(\frac{2}{5}\right)^{3\times\frac{1}{3}} \because (x^m)^n = x^{\text{mn}}$

$= \frac{2}{5}$

Therefore, the value of $\left(\frac{8}{125}\right)^{\frac{1}{3}}$ is $\frac{2}{5}$.

Q2 Text Solution:

We know that,

$a^m \div a^n = a^{m-n}$

Thus, $(10)^7 \div (10)^5$

$= (10)^{7-5}$

$= (10)^2$

$= 100$

Therefore, $(10)^7 \div (10)^5 = 100$

Hence, the correct option is (D) i.e., 100.

Q3 Text Solution:

$(125)^{\frac{2}{3}} \times (625)^{\frac{3}{4}}$

$= \left(5^3\right)^{\frac{2}{3}} \times \left(5^4\right)^{\frac{3}{4}}$

$= 5^2 \times 5^3 \ (\because (x^m)^n = x^{\text{mn}})$

$= 25 \times 125$

$= 3125$

Therefore, the required value is 3125.

Hence, the correct option is (C) i.e., 3125.

Q4 Text Solution:

On simplifying the given expression, we get

$2^{\frac{1}{2}} \cdot 4^{\frac{3}{4}}$

$= 2^{\frac{1}{2}} \cdot \left(2^2\right)^{\frac{3}{4}}$

$= 2^{\frac{1}{2}} \cdot 2^{2\times\frac{3}{4}}$

$[\because (x^m)^n = x^{mn}]$

$= 2^{\frac{1}{2}} \cdot 2^{\frac{3}{2}}$

$= 2^{\frac{1}{2}+\frac{3}{2}}$

$= 2^{\frac{4}{2}}$

$= 2^2$

$= 4$

$[\because a^m \times a^n = a^{m+n}]$

Therefore, the value of $2^{\frac{1}{2}} \cdot 4^{\frac{3}{4}}$ is 4, which is a positive integer.

Hence, the correct option is (B) i.e., a positive integer.

Q5 Text Solution:

Given ; $\frac{a^2\times a^8\times a\times b^4}{b^2\times a^3}$

$= a^{2+8+1-3} \times b^{4-2}$

$= a^8 \times b^2$

$= \left(a^4 \times b\right)^2$

Hence, the correct answer is option (D)

Q6 Text Solution:

We know that,

By Law of indices, a^0 = 1 for a $\neq$0

Applying the above concept, we get

$\left(\frac{2p^2q^3}{3xy}\right)^0 = 1$

Therefore, the value of $\left(\frac{2p^2q^3}{3xy}\right)^0 \ is\ 1.$

Hence, the correct option is (C) i.e., 1.

Q7 Text Solution:

We know that,

By Law of indices, a^0 = 1 for a $\neq$ 0

$\therefore$ Applying the above concept, we have

$2^0 = \left(\frac{1}{2}\right)^0 = 1$

Clearly, $2^0 = \left(\frac{1}{2}\right)^0$

Hence, the correct option is (C) i.e., $2^0 = \left(\frac{1}{2}\right)^0$.

Q8 Text Solution:

$(125)^{\frac{2}{3}} \times \sqrt{25} \times \sqrt[3]{5^3} \times 5^{\frac{1}{2}}$

$= \left(5^3\right)^{\frac{2}{3}} \times 5 \times 5 \times 5^{\frac{1}{2}}$

$= 5^{3\times\frac{2}{3}} \times 5 \times 5 \times 5^{\frac{1}{2}}$

$= 5^2 \times 5 \times 5 \times 5^{\frac{1}{2}}$

$= 5^{2+1+1+\frac{1}{2}}$

$= 5^{\frac{9}{2}}$

Hence, the correct answer is option (D) i.e., none of these.

Q9 Text Solution:

Given ;

$(8x)^{10} = 8^{30}$

$\Rightarrow 8^{10} \times x^{10} = 8^{30}$

$\Rightarrow x^{10} = \frac{8^{30}}{8^{10}}$

$\Rightarrow x^{10} = 8^{30-10}$

$\Rightarrow x^{10} = 8^{20}$

$\Rightarrow x^{10} = \left(8^2\right)^{10}$

$\Rightarrow x = 8^2 = 64$

Hence, the correct option is (C).

Q10 Text Solution:

$\left(\frac{8}{27}\right)^{\frac{-1}{3}} \times \left(\frac{32}{243}\right)^{\frac{-1}{5}}$

$= \left(\frac{2^3}{3^3}\right)^{\frac{-1}{3}} \times \left(\frac{2^5}{3^3}\right)^{\frac{-1}{5}}$

$= \left(\frac{2}{3}\right)^{3\times\frac{-1}{3}} \times \left(\frac{2}{3}\right)^{5\times\frac{-1}{5}}$

$= \left(\frac{2}{3}\right)^{-1} \times \left(\frac{2}{3}\right)^{-1}$

$= \frac{3}{2} \times \frac{3}{2}$

$= \frac{9}{4}$

Therefore, the value of $\left(\frac{8}{27}\right)^{\frac{-1}{3}} \times \left(\frac{32}{243}\right)^{\frac{-1}{5}}$ is $\frac{9}{4}$.

Hence, the correct answer is option (A)

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 5

RATIO AND PROPORTION, INDICES AND LOGARITHMS

Q1 The value of $\log_2\ 16$ is
(A) 4
(B) 8
(C) 16
(D) None of the above

Q2 The value of $\log_{60}\ 3 + \log_{60}\ 4 + \log_{60}\ 5$ is
(A) $\log_{60}\ 12$
(B) $\log_{60}\ 30$
(C) 1
(D) 0

Q3 Which of the following statements does not hold?
(A) $\log_{100}\ 1 = 0$
(B) $\log_5\ 5 = 1$
(C) $log(2+3) = log\ (2 \times 3)$
(D) $log(1+2+3) = log\ 1 + log\ 2 + log\ 3$

Q4 Find $\log_4\ 8$.
(A) 1.5 (B) 2
(C) 1 (D) None

Q5 The value of log $\frac{1}{3}$ to the base 9 is
(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$
(C) 1 (D) None of these

Q6 The value of $\log \frac{a^2}{bc} + log\frac{b^2}{ca} + log\frac{c^2}{ab}$ is
(A) 0 (B) 1
(C) -1 (D) None

Q7 If 2 log ***x*** = 4 log 3, then ***x*** is equal to
(A) 3 (B) 9
(C) 2 (D) None of these

Q8 The value of $\log_2\ \log_2\ \log_2 16$
(A) 0 (B) 2
(C) 1 (D) None of these

Q9 $\log_b\ \left(a^{\frac{1}{2}}\right) \log_c\ \left(b^3\right)\ \log_a\ \left(c^{\frac{2}{3}}\right)$ is equal to
(A) 0 (B) 1
(C) -1 (D) None

Q10 Given that $\log_{10} 2 = x\ \&\ \log_{10} 3 = y$, then $\log_{10} 60$ is expressed in terms of x and y as
(A) x - y + 1 (B) x + y + 1
(C) x - y - 1 (D) None of these

Answer Key

Q1	(A)	Q6	(A)
Q2	(C)	Q7	(B)
Q3	(C)	Q8	(C)
Q4	(A)	Q9	(B)
Q5	(A)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

$\log_2\ 16$ can be written as

$\log_2\ 2^4$

$= 4\ \log_2\ 2\ (\because\ log\ m^n = n\ log\ m)$

$= 4 \times 1\ (\because\ log_a\ a = 1)$

$= 4$

Therefore, $\log_2\ 16 = 4$

Hence, the correct option is (A) i.e., 4.

Q2 Text Solution:

$\log_{60}\ 3 + \log_{60}\ 4 + \log_{60}\ 5$

$= \log_{60}\ (3 \times 4 \times 5)$

$(\because\ \log_a m\ + \log_a n\ = \log_a\ (mn))$

$= \log_{60}\ 60$

$= 1$

Hence, the correct option is (C) i.e., 1.

Q3 Text Solution:

For option (A):

Since, $\log_a\ 1 = 0$ thus $\log_{100}\ 1 = 0$ is true.

For option (B):

As $\log_a\ a = 1$ thus $\log_5\ 5 = 1$ is also true.

For option (C):

We know $log(2 + 3) = log\ 5$

whereas $log\ (2 \times 3) = log\ 6 \neq log\ (2 + 3)$

Thus, $log(2 + 3) = log\ (2 \times 3)$ does not hold.

For option (D):

$log(1 + 2 + 3) =\ log\ 6$

Also, $log\ 1 + log\ 2 + log\ 3 = log\ (1 \times 2 \times 3)$

$= log\ 6$

Therefore,

$log(1 + 2 + 3) = log\ 1 + log\ 2 + log\ 3$

Hence, the correct option is (C).

Q4 Text Solution:

As we know ,

$\log_{a^p}\ b\ = \frac{1}{p} \times\ \log_a\ b$

$Also\ \log_a\ b^q\ = q \times\ \log_a\ b$

Using the above two properties

$\log_4\ 8\ =\ \log_{2^2}\ 2^3$

$= \frac{3}{2} \times\ \log_2\ 2$

$= \frac{3}{2} \times\ 1\ = 1.5$

Hence, the correct option is (A).

Q5 Text Solution:

log $\frac{1}{3}$to the base 9 can be written as:

$\log_9\ \frac{1}{3}\ =\ \frac{\log\ \frac{1}{3}}{\log\ 9}$

$= \frac{\log\ 3^{-1}}{\log\ 3^2}$

$= \frac{-\ \log\ 3}{2 \times\ \log\ 3}$

$= -\frac{1}{2}$

Therefore, the value of log $\frac{1}{3}$ to the base 9 is $-\frac{1}{2}$.

Hence, the correct answer is option (A).

Q6 Text Solution:

Simplifying the given expression, we get

$\log \frac{a^2}{\text{bc}} + log\frac{b^2}{\text{ca}} + log\frac{c^2}{\text{ab}}$

$= log\ \left(\frac{a^2}{\text{bc}} \times \frac{b^2}{\text{ca}} \times \frac{c^2}{\text{ab}}\right)$

$(\because\ log\ m + log\ n = log\ mn)$

$= log\ \left(\frac{a^2b^2c^2}{a^2b^2c^2}\right)$

$= log\ 1$

$= 0\ (\because\ log\ 1 = 0)$

Therefore, the value of $\log \frac{a^2}{\text{bc}} + log\frac{b^2}{\text{ca}} + log\frac{c^2}{\text{ab}}$ is 0.

Hence, the correct answer is option (A) i.e., 0.

Q7 Text Solution:

$2\ \log\ x\ =\ 4\ \log\ 3$

$\Rightarrow\ \log\ x\ =\ 2\ \log\ 3$

$\Rightarrow\ \log\ x\ =\ \log\ 3^2$

$\Rightarrow\ \log\ x\ =\ \log\ 9$

$\Rightarrow\ x\ =\ 9$

Therefore, the value of x is 9.

Hence, the correct answer is option (B).

Q8 Text Solution:

On simplifying, we get

$\log_2 \log_2 \log_2 16$
$= \log_2 \log_2 \log_2 (2^4)$
$= \log_2 \log_2(4 \log_2 2)$ ($\because$ $\log_a m^n = n \log_a m$)
$= \log_2 \log_2(4)$ ($\because \log_a a = 1$)
$= \log_2 \log_2(2^2)$
$= \log_2 (2 \log_2 2)$ ($\because \log_a m^n = n \log_a m$)
$= \log_2 2$ ($\because \log_a a = 1$)
$= 1$
Therefore, the value of $\log_2 \log_2 \log_2 16$ is 1.
Hence, the correct answer is option (C) i.e., 1.

Q9 Text Solution:
Simplifying the given expression, we get
$\log_b \left(a^{\frac{1}{2}}\right) \log_c \left(b^3\right) \log_a \left(c^{\frac{2}{3}}\right)$
$= \frac{\log a^{\frac{1}{2}}}{\log b} \cdot \frac{\log b^3}{\log c} \cdot \frac{\log c^{\frac{2}{3}}}{\log a}$ $\left(\because \log_n m = \frac{\log m}{\log n}\right)$
$= \frac{\frac{1}{2} \log a}{\log b} \cdot \frac{3 \log b}{\log c} \cdot \frac{\frac{2}{3} \log c}{\log a}$ ($\because \log m^n = n \log m$)
$= \frac{\log a}{2 \log b} \cdot \frac{3 \log b}{\log c} \cdot \frac{2 \log c}{3 \log a}$
$= 1$
Therefore, $\log_b \left(a^{\frac{1}{2}}\right) \log_c \left(b^3\right) \log_a \left(c^{\frac{2}{3}}\right)$
is equal to 1.
Hence, the correct answer is option (B) i.e., 1.

Q10 Text Solution:
$\log_{10} 60 = \log_{10}(2 \times 3 \times 10)$
$= \log_{10} 2 + \log_{10} 3 + \log_{10} 10$
$= x + y + 1$
Therefore, $\log_{10} 60$ is expressed in terms of x and y as x + y + 1.
Hence, the correct answer is option (B).

SAMPURNA JUNE 2024

Ratio and Proportion, Indices, logarithm

DPP: 6

Q1 The value of $\left(\frac{64}{512}\right)^{\frac{1}{3}}$ is

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{1}{6}$ (D) None of these

Q2 The value of $\log_8 128 \times \log_6 \left(\frac{1}{216}\right)$ is

(A) -7 (B) 7

(C) $\frac{1}{7}$ (D) $-\frac{2}{7}$

Q3 The value of $\frac{1}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{1}{(32)^{-\frac{1}{5}}}$ is

(A) 102 (B) 105

(C) 107 (D) 109

Q4 The value of $\frac{1}{\log_a(ab)} + \frac{1}{\log_b(ab)}$ is

(A) 0 (B) 1

(C) -1 (D) None

Q5 The value of $\frac{1}{1+a^{y-x}} + \frac{1}{1+a^{x-y}}$ is given by

(A) -1 (B) 0

(C) 1 (D) None

Q6 The value of $\log_3 16 \times \log_4 9$ is

(A) 1 (B) 2

(C) 4 (D) None

Q7 If $m = b^x$, $n = b^y$ & $m^y n^x = b^2$ then the value of xy is given by

(A) -1 (B) 0

(C) 1 (D) None

Q8 If log x = m + n & log y = m - n, then find the value of $\log\left(\frac{10x}{y^2}\right)$.

(A) $1 + m - 3n$ (B) $1 - m + 3n$

(C) $1 + 3m - n$ (D) $1 - 3m + n$

Q9 The value of $4\ log\ \frac{8}{25} - 3\ log\ \frac{16}{125} - log\ 5$ is

(A) 0 (B) 1

(C) 2 (D) -1

Q10 If $2^x \times 3^y \times 5^z = 450$, find the value of $x + y + z$.

(A) 6 (B) 5

(C) 7 (D) None

Answer Key

Q1	(A)	Q6	(C)
Q2	(A)	Q7	(C)
Q3	(A)	Q8	(B)
Q4	(B)	Q9	(A)
Q5	(C)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

$\left(\frac{64}{512}\right)^{\frac{1}{3}}$

$= \left(\frac{4^3}{8^3}\right)^{\frac{1}{3}}$

$= \frac{4}{8}$

$= \frac{1}{2}$

Hence, the correct option is (A).

Q2 Text Solution:

$\log_8 128 \times \log_6 \left(\frac{1}{216}\right)$

$= \log_{2^3} 2^7 \times \log_6 6^{-3}$

$= \frac{7}{3} \times \log_2 2 \times -3 \times \log_6 6$

$= -7 \times 1 \times 1 = -7$

Hence, the correct option is (A).

Q3 Text Solution:

We have,

$\frac{1}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{1}{(32)^{-\frac{1}{5}}}$

$= \frac{1}{(6^3)^{-\frac{2}{3}}} + \frac{1}{(2^8)^{-\frac{3}{4}}} + \frac{1}{(2^5)^{-\frac{1}{5}}}$

$= \frac{1}{6^{-2}} + \frac{1}{2^{-6}} + \frac{1}{2^{-1}} \left[\because (a^m)^n = a^{mn}\right]$

$= 6^2 + 2^6 + 2^1 \left[\because a^{-n} = \frac{1}{a^n}\right]$

$= 36 + 64 + 2$

$= 102$

Hence, the correct option is (A) i.e., 102.

Q4 Text Solution:

Simplifying the given expression, we get

$\frac{1}{\log_a(ab)} + \frac{1}{\log_b(ab)}$

$= \frac{1}{\frac{log\,(ab)}{log\,(a)}} + \frac{1}{\frac{log\,(ab)}{log\,(b)}} \left(\because \log_n m = \frac{\log m}{\log n}\right)$

$= \frac{log\,(a)}{log\,(ab)} + \frac{log\,(b)}{log\,(ab)}$

$= \frac{log\,(a) + log\,(b)}{log\,(ab)}$

$= \frac{log\,(ab)}{log\,(ab)} (\because log\,m + log\,n = log\,mn)$

$= 1$

Therefore, the value of $\frac{1}{\log_a(ab)} + \frac{1}{\log_b(ab)}$ is 1.

Hence, the correct answer is option (B) i.e., 1.

Q5 Text Solution:

Simplifying the given expression, we get

$\frac{1}{1+a^{y-x}} + \frac{1}{1+a^{x-y}}$

$= \frac{1}{1+\frac{a^y}{a^x}} + \frac{1}{1+\frac{a^x}{a^y}} \left[\because \frac{x^p}{x^q} = x^{p-q}\right]$

$= \frac{a^x}{a^x+a^y} + \frac{a^y}{a^y+a^x}$

$= \frac{a^x+a^y}{a^x+a^y}$

$= 1$

Therefore, the value of $\frac{1}{1+a^{y-x}} + \frac{1}{1+a^{x-y}}$ is given by 1.

Hence, the correct option is (C) i.e., 1.

Q6 Text Solution:

$\log_3 16 \times \log_4 9 = \frac{\log\,16}{\log\,3} \times \frac{\log\,9}{\log\,4}$

$= \frac{\log\,4^2}{\log\,3} \times \frac{\log\,3^2}{\log\,4}$

$= \frac{2\times\log\,4}{\log\,3} \times \frac{2\times\log\,3}{\log\,4}$

$= 2 \times 2 = 4$

Hence, the correct option is (C).

Q7 Text Solution:

Substituting the values of m and n in $m^y n^x = b^2$

$(b^x)^y \times (b^y)^x = b^2$

$\Rightarrow b^{xy} \times b^{xy} = b^2$

$\Rightarrow b^{2xy} = b^2$

$\Rightarrow 2xy = 2$

$\Rightarrow xy = 1$

Therefore, the value of xy is given by 1.

Hence, the correct answer is option (C).

Q8 Text Solution:

$\log\left(\frac{10x}{y^2}\right) = \log\,10x - \log\,y^2$

$= \log\,10 + \log\,x - 2\times\log y$

$= 1 + \left(m+n\right) - 2\left(m-n\right)$

$= 1 + m + n - 2m + 2n =$

$1 - m + 3n$

Hence , the correct option is (B).

Q9 Text Solution:

On simplifying the given expression, we get

$4\ log\ \frac{8}{25} - 3\ log\ \frac{16}{125} - log\ 5$

$= \log\ \left(\frac{8}{25}\right)^4 - \log\ \left(\frac{16}{125}\right)^3 - log\ 5$

$(\because\ n\ log\ m = log\ m^n)$

$= \log\ \left(\frac{2^3}{5^2}\right)^4 - \log\ \left(\frac{2^4}{5^3}\right)^3 - log\ 5$

$= log \frac{(2^3)^4}{(5^2)^4} - log \frac{(2^4)^3}{(5^3)^3} - log\ 5$

$\left[\because\ \left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}\right]$

$= log\left(\frac{2^{12}}{5^8}\right) - log\left(\frac{2^{12}}{5^9}\right) - log\ 5$

$[\because\ (a^m)^n = a^{\mathrm{mn}}]$

$= log\ \left[\frac{2^{12}}{5^8} \div \frac{2^{12}}{5^9} \div 5\right]$

$(\because\ log\ a - log\ b = log \frac{a}{b})$

$= log\ \left[\frac{2^{12}}{5^8} \times \frac{5^9}{2^{12}} \times \frac{1}{5}\right]$

$= log\ \left(2^{12\ -\ 12} \times 5^{9\ -\ 8\ -1}\right)$

$= log\ \left(2^0 \times 5^0\right)$

$= log\ 1\ (\because\ a^0 = 1\ for\ a \neq 0)$

$= 0\ (\because\ log\ 1 = 0)$

Therefore, the required value is 0.

Hence, the correct answer is option (A) i.e., 0.

Q10 Text Solution:

$2^x \times 3^y \times 5^z\ =\ 450$ .....(i)

Also 450 = $2^1 \times 3^2 \times 5^2$ .....(ii)

Comparing (i) & (ii), we get

x = 1, y = 2 & z = 2

Therefore, the value of x + y + z = 1 + 2 + 2 = 5

Hence, the correct option is (B).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

Mathematics of Finance

Q1 If $P = ₹4,500,\ A = ₹7,200,$ then Simple interest i.e. I will be
(A) ₹2000 (B) ₹3000
(C) ₹2500 (D) ₹2700

Q2 $P = ₹10,000,\ I = ₹2,500,\ R = 12\frac{1}{2}\%\ S.I.$ The numbers of years (T) will be
(A) $1\frac{1}{2}$ years (B) 2 years
(C) 3 years (D) none of these

Q3 The sum required to earn a monthly interest of ₹1,200 at 18% per annum S.I. is
(A) ₹50,000 (B) ₹60,000
(C) ₹80,000 (D) None of these

Q4 A sum of money double itself in 10 years. The number of years it would treble itself is:
(A) 25 years (B) 15 years
(C) 20 years (D) None

Q5 If a simple interest on a sum of money at 6% p.a. for 7 years is equal to twice of simple interest on another sum for 9 years at 5% p.a. The ratio will be:
(A) $2\ :15$ (B) $7\ :15$
(C) $15\ :7$ (D) $1\ :7$

Q6 A man deposited ₹8,000 in a bank for 3 years at 5% per annum at compound interest. After 3 years, he will get
(A) ₹9000 (B) ₹8800
(C) ₹9200 (D) ₹9261

Q7 A sum amount to ₹1331 at a principal of ₹1,000 at 10% compounded annually. Find the time.
(A) 3.31 years (B) 4 years
(C) 3 years (D) 2 years

Q8 Simple interest on ₹2,000 for 5 months at 16% p.a. is _____ .
(A) ₹133.33 (B) ₹133.26
(C) ₹134.00 (D) ₹132.09

Q9 $P = ₹12,000,\ A = ₹16,500\ , T = 2\frac{1}{2}$ years. Rate percent per annum for simple interest will be
(A) 15% (B) 12%
(C) 10% (D) none of these

Q10 ₹100 will becomes after 20 years at 5% p.a compound interest of
(A) ₹250 (B) ₹205
(C) ₹163.33 (D) none of these

Answer Key

Q1	(D)	Q6	(D)
Q2	(B)	Q7	(C)
Q3	(C)	Q8	(A)
Q4	(C)	Q9	(A)
Q5	(C)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Given: P = ₹4,500, A = ₹7,200

We know that,

Amount = Principal + Interest

⇒ Interest = Amount - Principal

= ₹7,200 - ₹4,500

= ₹2,700

Thus, the simple interest (I) is ₹2,700.

Hence, the correct option is (D) i.e., ₹2,700.

Q2 Text Solution:

Given:

$P = ₹10,000,\ I = ₹2,500\ and\ R = 12\frac{1}{2}\%$

$= \frac{25}{2}\%$

We know that,

$I = \frac{P \times R \times T}{100}$ ....(i)

where P = Principal

R = Annual interest rate

T = Time in years

Now, on putting all the values in equation (i), we get

$2500 = \frac{10000 \times 12.5 \times T}{100}$

$\Rightarrow 2500 = 1250T$

$\Rightarrow T = \frac{2500}{1250}$

$\Rightarrow T = 2$

Therefore, the number of years (T) is 2 years.

Hence, the correct answer is option (B) i.e., 2 years.

Q3 Text Solution:

Given that: I = ₹1,200, R = 18% and T = $\frac{1}{12}$years (monthly interest)

We know that,

I = $\frac{P \times R \times T}{100}$

where, R = rate of interest, P = Principal and T = Time

On putting the given values, we get

$1200 = \frac{P \times 18 \times 1}{100 \times 12}$

$\Rightarrow 1200 = \frac{3 \times P}{200}$

$\Rightarrow 1200 \times 200 = P \times 3$

$\Rightarrow P = \frac{1200 \times 200}{3}$

$\Rightarrow P = ₹80,000$

Therefore, the required sum is ₹80,000.

Hence, the correct answer is option (C) i.e., ₹80,000.

Q4 Text Solution:

Let the sum of money be P.

According to the question,

In 10 years, amount will be 2P.

⇒ I = A - P = 2P - P = P

We know that,

I = $\frac{P \times R \times T}{100}$

⇒ P = $\frac{P \times R \times 10}{100}$

⇒ R = 10%

Now, when A = 3P then

I = 3P -P = 2P

$\therefore$ I = $\frac{P \times R \times T}{100}$

⇒ 2P = $\frac{P \times 10 \times T}{100}$

⇒ T = 20 years

Hence, the correct answer is option (C) i.e., 20 years.

Q5 Text Solution:

Let P_1 be the sum of money at 6% interest for 7 years, then

Interest $(I_1) = \frac{P_1 \times 6 \times 7}{100}$

$\Rightarrow\ I_1 = \frac{42P_1}{100}$ ..... (i)

Now, let P_2 be the sum of money at 5% interest for 9 years, then

Interest $(I_2) = \frac{P_2 \times 5 \times 9}{100}$

$\Rightarrow\ I_2 = \frac{45P_2}{100}$ ..... (ii)

According to the question,

$I_1 = 2I_2$

$\Rightarrow \frac{42P_1}{100} = 2 \times \frac{45P_2}{100}$

$\Rightarrow \frac{P_1}{P_2} = \frac{2 \times 45}{42}$

$\Rightarrow \frac{P_1}{P_2} = \frac{15}{7}$

Hence, the correct answer is option (C) i.e., $15 : 7$ years.

Q6 Text Solution:

Given: Principal (P)=₹8,000, Rate of interest (R)=5% and Time (n)=3 years

We know that, $A = P\left[1 + \frac{R}{100}\right]^n$

$\Rightarrow A = 8000\left[1 + \frac{5}{100}\right]^3$

$\Rightarrow A = 8000\left[1 + \frac{1}{20}\right]^3$

$\Rightarrow A = 8000\left[\frac{21}{20}\right]^3$

$\Rightarrow A = 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$

⇒ A = 9261

Thus, the required amount is ₹9261.

Hence, the correct answer is option (D) i.e., ₹9261.

Q7 Text Solution:

Given: Amount =₹1331, Principal =₹1000 and Rate of interest =10%

Let the time be n years.

Since, the interest is compounded annually, thus

$A = P\left[1 + \frac{R}{100}\right]^n$

$\Rightarrow 1331 = 1000\left[1 + \frac{10}{100}\right]^n$

$\Rightarrow \frac{1331}{1000} = \left[\frac{11}{10}\right]^n$

$\Rightarrow \left[\frac{11}{10}\right]^3 = \left[\frac{11}{10}\right]^n$

$\Rightarrow n = 3$

Therefore, the required time period is 3 years.

Hence, the correct answer is option (C) i.e., 3 years

Q8 Text Solution:

Given: P=₹2,000, R=16% and T= 5 months =512 years

We know that,

$S.I. = \frac{P \times R \times T}{100}$

$\Rightarrow S.I = \frac{2000 \times 16 \times 5}{12 \times 100}$

$\Rightarrow S.I = ₹133.33$

Hence, the correct answer is option (A) i.e. ₹133.33

Q9 Text Solution:

Given that: $P = ₹12,000$, $A = ₹16,500$ and $T = 2\frac{1}{2} = \frac{5}{2}$ years

We know that,

$I = A - P$ and $I = \frac{\mathrm{P} \times \mathrm{R} \times \mathrm{T}}{2}$

$A =$ Accumulated amount

$P =$ Principal

$T =$ Time in years

$R =$ Rate of interest per annum

$I = 16,500 - 12,000 = ₹4,500$

We have, $I = \frac{\mathrm{P} \times \mathrm{R} \times \mathrm{T}}{100}$

$\Rightarrow 4500 = \frac{12000 \times \mathrm{R} \times 5}{2 \times 100}$

$\Rightarrow 4500 = 60 \times R \times 5$

$\Rightarrow R = \frac{4500}{5 \times 60} = 15\%$

Therefore, rate percent per annum is 15%.

Hence, option (A) is correct i.e., 15% .

Q10 Text Solution:

It is given that $P = ₹100$, $R = 5\%$ and $n = 20$

We know that,

Compound interest $C.I = P(1 + \frac{R}{100})^n - P$

$P =$ Principal

$R =$ interest rate

$n =$ Time (in years)

$\Rightarrow C.I = 100(1 + \frac{5}{100})^{20} - 100$

$\Rightarrow C.I = 100 \times 2.65329 - 100$

$\Rightarrow C.I = ₹165.33$

Therefore, the required sum of money is $₹165.33$.

Hence, option (C) is correct ,i.e $₹165.33$.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

MATHEMATICS OF FINANCE

Q1 The effective rate of interest corresponding to a nominal rate of 7% p.a convertible quarterly is _____ .

(A) 7% (B) 7.5%
(C) 5% (D) 7.18%

Q2 If the compound interest on a sum for two years at the rate of 5% p.a. is ₹512.50, then the principal is _____ .

(A) ₹$4,000$ (B) ₹$3,000$
(C) ₹$5,000$ (D) None of these

Q3 If in two years, a principal of ₹100 amounts to ₹121 when the interest at the rate of $r\%$ is compounded annually, then the value of r will be

(A) 14 (B) 10.5
(C) 15 (D) 10

Q4 The effective rate equivalent to a nominal rate of 6% compounded monthly is _____ .

(A) 6.05% (B) 6.16%
(C) 6.26% (D) 6.07%

Q5 The $C.I$ on ₹$4,000$ for 6 months at 12% p.a payable quarterly is

(A) ₹243.60 (B) ₹240
(C) ₹243 (D) None of these

Q6 In compound interest, if the amount is 9 times to its principal in two years then the rate of interest is

(A) 300% (B) 200%
(C) 150% (D) 100%

Q7 ₹$16,000$ invested at 10% p.a. compounded semi-annually amounts to ₹$18,522$. Find the time period of investment.

(A) 1 year
(B) $1\frac{1}{2}$ years
(C) 2 years
(D) $1\frac{3}{4}$ years

Q8 Find the effective rate of interest if an amount of ₹$30,000$ deposited in a bank. For 1 year at the rate of 10% p.a. compounded semi-annually.

(A) 10.05% (B) 10.10%
(C) 10.20% (D) 10.25%

Q9 Sania deposited ₹$1,00,000$ in a nationalized bank for three years. If the rate of interest is 7% p.a. compounded annually. Calculate the amount at the end of the third year.

(A) ₹$1,23,000$
(B) ₹$1,22,504.30$
(C) ₹$1,20,550.20$
(D) ₹$1,35,256.40$

Q10 The population of a town increases every year by 2% of the population at the beginning of that year. The number of years by which the total increase of population be 40% is

(A) 7 years
(B) 10 years
(C) 17 years (appx.)
(D) None of these

Answer Key

Q1	(D)	Q6	(B)
Q2	(C)	Q7	(B)
Q3	(D)	Q8	(D)
Q4	(B)	Q9	(B)
Q5	(A)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Given: Rate of interest $= 7\%$,

Number of conversion period $(c) = 4$

(Since the interest is compounded quarterly)

We know that,

Effective interest rate can be calculated as:

$E = \left[\left(1 + \frac{i}{c}\right)^c - 1\right] \times 100,$

Now, $i = 7\% = \frac{7}{100} = 0.07$

∴ Effective Interest Rate (E) is given as,

$E = \left[\left(1 + \frac{0.07}{4}\right)^4 - 1\right] \times 100$

$E = \left[(1.0175)^4 - 1\right] \times 100$

$E = 0.0718 \times 100$

$E = 7.18\%$

Hence, the correct answer is option (D) i.e., 7.18%.

Q2 Text Solution:

Given: $C.I. = ₹512.50$, Rate of interest $(R) = 5\%$ and time $(n) = 2$ years

We know that,

$C.I. = P\left(1 + \frac{R}{100}\right)^n - P$

$\Rightarrow 512.50 = P\left(1 + \frac{5}{100}\right)^2 - P$

$\Rightarrow 512.50 = P\left[\left(1 + \frac{5}{100}\right)^2 - 1\right]$

$\Rightarrow 512.50 = P\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$\Rightarrow 512.50 = P\left(\frac{41}{400}\right)$

$\Rightarrow P = \frac{512.50 \times 400}{41} = 5000$

Therefore, the principal is ₹5000.

Hence, the correct answer is option (C) i.e. ₹5000.

Q3 Text Solution:

Given: P = ₹100, A = ₹121 and Time (n) = 2 years

Since, the interest is compounded annually, thus

$A = P\left[1 + \frac{r}{100}\right]^n$

$\Rightarrow 121 = 100\left[1 + \frac{r}{100}\right]^2$

$\Rightarrow \frac{121}{100} = \left[1 + \frac{r}{100}\right]^2$

$\Rightarrow \frac{11}{10} = 1 + \frac{r}{100}$

$\Rightarrow r = \left(\frac{11}{10} - 1\right) \times 100$

⇒ r = 10

Therefore, the rate of interest is 10%.

Hence, the correct answer is option (D) i.e. 10%.

Q4 Text Solution:

Given: Rate of interest $= 6\%$

We know that,

Effective interest rate can be calculated as:

$E = \left[\left(1 + \frac{i}{n}\right)^n - 1\right] \times 100,$

where, $i =$ actual interest rate in decimal, $n =$ number of conversion period

Now, $i = 6\% = \frac{6}{100} = 0.06$ and

Number of conversion period $(n) = 12$

∴ Effective Interest Rate (E) is given as,

$E = \left[\left(1 + \frac{0.06}{12}\right)^{12} - 1\right] \times 100$

$E = \left[(1.005)^{12} - 1\right] \times 100$

$E = 0.0616 \times 100$

$E = 6.16\%$

Hence, the correct answer is option (B) i.e., 6.16%.

Q5 Text Solution:

Given: Principal $(P) = ₹4,000$

Time $(t) = 6\ months = \frac{6}{12} = \frac{1}{2}$ years

Rate $(R) = 12\%$

$n = 4$ [∵ There are 4 quarters in an year]

Compound Interest is given as,

$C.I = P\left(1 + \frac{R}{\text{n} \times 100}\right)^{\text{nt}} - P$

$= 4000\left(1 + \frac{12}{4 \times 100}\right)^{4 \times \frac{1}{2}} - 4000$

$= \left(4000(1.03)^2 - 4000\right)$

$= 4243.60 - 4000$

$= 243.60$

Hence, the correct answer is option (A) i.e., ₹243.60.

Q6 Text Solution:

Given: Time $(n) = 2$ years

Let P be the Principal, then

According to the question, Amount $= 9P$

We know that,

$\Rightarrow A = P\left(1 + \frac{R}{100}\right)^n$

$\Rightarrow 9P = P\left(1 + \frac{R}{100}\right)^2$

$\Rightarrow \frac{9P}{P} = \left(1 + \frac{R}{100}\right)^2$

$\Rightarrow 9 = \left(1 + \frac{R}{100}\right)^2$

$\Rightarrow \left(1 + \frac{R}{100}\right) = 3$

$\Rightarrow \frac{R}{100} = 2$

$\Rightarrow R = 200\%$

Thus, the rate of interest is 200%.

Hence, the correct answer is option (B) i.e., 200%.

Q7 Text Solution:

Given: $P = ₹16,000$, $A = ₹18,522$, $R = 10\%$ p.a.

Since, the interest is compounded semi-annually, thus

$A = P\left(1 + \frac{R}{2 \times 100}\right)^{2n}$

$\Rightarrow 18,522 = 16000\left(1 + \frac{10}{2 \times 100}\right)^{2n}$

$\Rightarrow \frac{18,522}{16000} = \left(\frac{21}{20}\right)^{2n}$

$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^{2n}$

$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^{2n}$

On comparing, we get

$2n = 3$

$\Rightarrow n = \frac{3}{2} = 1\frac{1}{2}$ years

Hence, the correct answer is option (B) i.e. $1\frac{1}{2}$ years.

Q8 Text Solution:

Given: Amount deposited in bank $= ₹30,000$,

Rate of interest $= 10\%$,

We know that,

Effective interest rate can be calculated as:

$E = \left[\left(1 + \frac{i}{c}\right)^c - 1\right] \times 100$,

where, $i =$ actual interest rate in decimal, $c =$ number of conversion period

Now, $i = 10\% = \frac{10}{100} = 0.10$,

Number of conversion period $(c) = 2$

$\therefore$ Effective Interest Rate (r_e) is given as,

$r_e = \left[\left(1 + \frac{0.10}{2}\right)^2 - 1\right] \times 100$

$r_e = \left[(1.05)^2 - 1\right] \times 100$

$r_e = 0.1025 \times 100$

$r_e = 10.25\%$

Hence, the correct answer is option (D) i.e., 10.25%.

Q9 Text Solution:

Given: $P = ₹1,00,000$, $R = 7\%$, $n = 3$ years

We know that, $A = P\left(1 + \frac{R}{100}\right)^n$

$\Rightarrow A = 100000\left(1 + \frac{7}{100}\right)^3$

$= 100000(1.07)^3$

$= 1,22,504.30$

Therefore, the amount she will receive at the end of the third year will be $₹1,22,504.30$.

Hence, the correct answer is option (B) i.e. $₹1,22,504.30$.

Q10 Text Solution:

Given: Annual increase in population $= 2\%$

Let the initial population be P and at the end of n years, the population increases by 40% i.e.,

$A = P + 40\%\ of\ P = P + \frac{40}{100}P = 1.40P$

We know that,

$A = P\left(1 + \frac{R}{100}\right)^n$

$\Rightarrow 1.40P = P\left(1 + \frac{2}{100}\right)^n$

$\Rightarrow 1.40 = \left(1 + \frac{2}{100}\right)^n$

$\Rightarrow 1.40 = (1.02)^n$

$\Rightarrow n = \frac{log\ 1.4}{log\ 1.02}$

$\Rightarrow n = \frac{0.146}{0.0086}$

$\Rightarrow n = 16.97 = 17$ years (appx.).

Hence, the correct answer is option (C) i.e., 17 years (appx).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

MATHEMATICS OF FINANCE

Q1 The difference between the $\mathrm{S.I.}$ and the $\mathrm{C.I.}$ on ₹$2,400$ for 2 years at 5% p.a is
(A) ₹5 (B) ₹10
(C) ₹16 (D) ₹6

Q2 If $A = ₹1,000,\ n = 2\ years,\ R = 6\%$ p.a compound interest payable half-yearly, then principal (P) is
(A) ₹688.50 (B) ₹885
(C) ₹800 (D) None of these

Q3 How much will ₹$25,000$ amount to in 2 years at compound interest if the rates for the successive years are 4% and 5% per year?
(A) ₹$27,000$ (B) ₹$27,300$
(C) ₹$27,500$ (D) ₹$27,900$

Q4 In how much time would the simple interest on a certain sum be 0.125 times the principal at 10% per annum?
(A) $1\frac{1}{4}$ years
(B) $1\frac{3}{4}$ years
(C) $2\frac{1}{4}$ years
(D) $2\frac{3}{4}$ years

Q5 The effective rate of interest corresponding to a nominal rate of 8% p.a convertible semi-annually is _____ .
(A) 8% (B) 8.16%
(C) 8.5% (D) 8.98%

Q6 A person borrows ₹5000 for 2 years at 4% p.a. simple interest. He immediately lends to another person at $6\frac{1}{4}\%$ p.a. for 2 years. Find his gain in the transaction per year.
(A) ₹112.50 (B) ₹125
(C) ₹225 (D) ₹167.50

Q7 The useful life of a machine is estimated to be 10 years and cost ₹$10,000$. Rate of depreciation is 10% p.a. The scrap value at the end of its life is
(A) ₹$3,486.78$ (B) ₹$4,383$
(C) ₹$3,400$ (D) None of these

Q8 Mary invested ₹2,500 in a fixed deposit that offers a nominal interest rate of 5% per annum, compounded quarterly. What is the effective rate of interest per year?
(A) 5.00% (B) 5.16%
(C) 5.09% (D) 5.90%

Q9 The partners A and B together lent ₹3903 at 4% p.a. interest compounded annually. After a spam of 7 years, A gets the same amount as B gets after 9 years. The share of A in the sum of ₹3903 would have been
(A) ₹1875 (B) ₹2280
(C) ₹2028 (D) ₹2820

Q10 A machine is depreciated at the rate of 20% on reducing balance. The original cost of the machine was ₹$1,00,000$ and its ultimate scrap value was ₹$30,000$. The effective life of the machine is
(A) 4.5 years (appx.)
(B) 5.4 years (appx.)
(C) 5 years (appx.)
(D) None of these

Answer Key

Q1	(D)	Q6	(A)
Q2	(D)	Q7	(A)
Q3	(B)	Q8	(C)
Q4	(A)	Q9	(C)
Q5	(B)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

Given: Principal $(P) = ₹2,400$

Time $(t) = 2$ years

Rate of interest $(R) = 5\%$ p.a

Compound Interest ($C.I) = P\left(1 + \frac{R}{100}\right)^t - P$

Simple Interest $(S.I) = \frac{\text{P}\times\text{R}\times\text{t}}{100}$

According to the question,

$C.I - S.I$

$= \left[P\left(1 + \frac{R}{100}\right)^t - P\right] - \left(\frac{\text{P}\times\text{R}\times\text{t}}{100}\right)$

$= \left[2400\left(1 + \frac{5}{100}\right)^2 - 2400\right]$

$- \left(\frac{2400 \times 5 \times 2}{100}\right)$

$= \left[2400(1 + 0.05)^2 - 2400\right] - 240$

$= [2400(1.1025) - 2400] - 240$

$= 246 - 240$

$= ₹6$

Hence, the correct answer is option (D) i.e., $₹6$.

Q2 Text Solution:

Given: $A = ₹1,000$, $n = 2$ years, $R = 6\%$

Since, the interest is compounded half yearly, thus, $c = 2$

We know, $A = P\left(1 + \frac{R}{2 \times 100}\right)^{2n}$

$\Rightarrow 1000 = P\left(1 + \frac{6}{200}\right)^4$

$\Rightarrow 1000 = P(1 + 0.03)^4$

$\Rightarrow 1000 = P \times 1.1255$

$\Rightarrow P = \frac{1000}{1.1255}$

$\Rightarrow P = ₹888.494 \approx ₹888$

Hence, the correct answer is option (D) i.e., none of these.

Q3 Text Solution:

Given: Principal $(P) = ₹25,000$, Time $(n) = 2$ years

Rate of interests, $(R_1) = 4\%$ and $(R_2) = 5\%$

We know that,

$\Rightarrow A = P\left(1 + \frac{R_1}{100}\right)\left(1 + \frac{R_2}{100}\right)$

$\Rightarrow A = 25000\left(1 + \frac{4}{100}\right)\left(1 + \frac{5}{100}\right)$

$\Rightarrow A = 25000 \times \frac{26}{25} \times \frac{21}{20}$

$\Rightarrow A = 50 \times 26 \times 21$

$\Rightarrow A = 27,300$

Thus, the required amount is $₹27,300$.

Hence, the correct answer is option (B) i.e., $₹27,300$.

Q4 Text Solution:

If P be the principal and S.I. be the simple interest at 10% p.a., then according to the question

$S.I. = 0.125P$

We know that,

$S.I. = \frac{\text{P}\times\text{R}\times\text{T}}{100}$

$\Rightarrow 0.125P = \frac{\text{P}\times 10 \times\text{T}}{100}$

$\Rightarrow T = 0.125 \times 10$

$\Rightarrow T = 1.25$ years $= 1\frac{1}{4}$ years

Hence, the correct answer is option (A) i.e., $1\frac{1}{4}$ years.

Q5 Text Solution:

Given: Rate of interest $= 8\%$,

Number of conversion period $(n) = 2$

Here, $i = 8\% = \frac{8}{100} = 0.08$

We know that,

Effective interest rate can be calculated as:

$E = \left[\left(1 + \frac{i}{n}\right)^n - 1\right] \times 100,$

$E = \left[\left(1 + \frac{0.08}{2}\right)^2 - 1\right] \times 100$

$E = \left[(1.04)^2 - 1\right] \times 100$

$E = 0.0816 \times 100$

$E = 8.16\%$

Hence, the correct option is (B) i.e., 8.16%.

Q6 Text Solution:

Case 1: When $P = ₹5000$, $T = 2$ years and $R = 4\%\ p.a.$

$\therefore$ Interest paid by the person is

$I_1 = \frac{\text{P}\times\text{R}\times\text{T}}{100} = \frac{5000 \times 4 \times 2}{100} = ₹400$

Case 2: When $P = ₹5000$, $T = 2$ years and $R = 6\frac{1}{4}\% = \frac{25}{4}\%$

$\therefore$ Interest received by the person is

$I_2 = \frac{P \times R \times T}{100} = \frac{5000 \times 25 \times 2}{4 \times 100} = ₹625$

Thus, his gain in the transaction in 2 years $= ₹625 - ₹400 = ₹225$

$\Rightarrow$ His gain in the transaction per year $= \frac{225}{2} = ₹112.50$

'OR'

Gain percent in 2 years $= 6\frac{1}{4}\% - 4\% = 2.25\%$

$\Rightarrow$ Interest earned in 2 years $= \frac{P \times R \times T}{100} = \frac{5000 \times 2.25 \times 2}{100} = ₹225$

$\Rightarrow$ Interest earned in 1 year $= \frac{225}{2} = ₹112.50$

Hence, the correct answer is option (A) i.e. $₹112.50$.

Q7 Text Solution:

Given: Time $(n) = 10$ years

Initial cost $= ₹10,000$

Depreciation rate $(R) = 10\%$ p.a.

We know that,

Scrap value $=$ Initial cost $\times \left(1 - \frac{R}{100}\right)^n$

$= 10000 \times \left(1 - \frac{10}{100}\right)^{10}$

$= 10000 \times (1 - 0.1)^{10}$

$= 10000 \times (0.9)^{10}$

$= 10000 \times 0.348678$

$= ₹3486.78$

Hence, the correct answer is option (A) i.e., $₹3486.78$

Q8 Text Solution:

Given: Amount deposited in bank = ₹2,500

Rate of interest = 5%,

Here, $i = 5\% = \frac{5}{100} = 0.05$,

Number of conversion period (n) = 4

We know that,

Effective interest rate can be calculated as:

$E = \left[\left(1 + \frac{i}{n}\right)^n - 1\right] \times 100$

$E = \left[\left(1 + \frac{0.05}{4}\right)^4 - 1\right] \times 100$

$E = \left[(1.0125)^4 - 1\right] \times 100$

$E = 0.0509 \times 100$

$E = 5.09\%$

Hence, the correct option is (C) i.e., 5.09%

Q9 Text Solution:

Let the shares of A and B be $₹x$ and $₹y$ respectively.

It is given that, the amount A gets in 7 years is same as what B gets after 9 years.

$\Rightarrow x\left(1 + \frac{4}{100}\right)^7 = y\left(1 + \frac{4}{100}\right)^9$

$\Rightarrow \frac{x}{y} = \left(1 + \frac{4}{100}\right)^2$

$\Rightarrow \frac{x}{y} = \left(\frac{26}{25}\right)^2$

$\Rightarrow \frac{x}{y} = \frac{676}{625}$

Thus, the ratio of their shares is $676 : 625$.

$\Rightarrow$ Share of $A = x = \frac{676}{676 + 625} \times 3903$

$\Rightarrow x = \frac{676}{1301} \times 3903$

$\Rightarrow x = 676 \times 3 = 2028$

Therefore, the share of A is $₹2028$.

Hence, the correct answer is option (C) i.e., $₹2028$.

Q10 Text Solution:

Given: Depreciation Rate $= 20\%$

Principal (Initial Value) $= ₹1,00,000$

Amount (Net Value) $= ₹30,000$

$\therefore i = \frac{\text{Rate of Depreciation}}{100} = \frac{20}{100} = 0.2$

We know that,

Net value $=$ Initial value $\times (1 - i)^n$

$\Rightarrow 30000 = 100000(1 - 0.2)^n$

$\Rightarrow (0.3) = (0.8)^n$

Taking log on both sides, we get

$log\ 0.3 = log\ (0.8)^n$

$\Rightarrow log\ 0.3 = n\ log\ 0.8\ [\because\ log\ a^m = m\ log\ a]$

$\Rightarrow n = \frac{log\ 0.3}{log\ 0.8}$

$\Rightarrow n = \frac{-0.523}{-0.097}$

$\Rightarrow n = 5.40$ years (appx.)

Hence, the correct answer is option (B) i.e., 5.40 years (appx.).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

MATHEMATICS OF FINANCE

Q1 Future value of an ordinary annuity:

(A) $A(n,i) = A\left[\frac{(1+i)^n - 1}{i}\right]$

(B) $A(n,i) = A\left[\frac{(1+i)^n + 1}{i}\right]$

(C) $A(n,i) = A\left[\frac{1-(1+i)^n}{i}\right]$

(D) $A(n,i) = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$

Q2 $a = ₹100,\ n = 10,\ i = 5\%$, find the FVof annuity.

Using the formula FV= $\frac{a\{(1+i)^n - 1\}}{i}$, FVis equal to

(A) $₹1,258$ (B) $₹2,581$

(C) $₹1,528$ (D) None of these

Q3 The future value of an annuity of $₹5,000$ is made annually for 8 years at interest rate of 9% compounded annually is _____ .

[Given that $(1.09)^8 = 1.99256$]

(A) $₹55,142.22$ (B) $₹65,142.22$

(C) $₹65,532.22$ (D) $₹57,425.22$

Q4 In _____ , first payment/receipt takes place at the end of the first period.

(A) Annuity immediate

(B) Annuity regular

(C) Annuity due

(D) Annuity special

Q5 The future value of an annuity of $₹1500$ made annually for 5 years at an interest rate of 10% compounded annually is _____ .

[Given that $(1.1)^5 = 1.61051$]

(A) $₹9517.56$ (B) $₹9157.65$

(C) $₹9715.56$ (D) $₹9175.65$

Q6 The amount of an annuity $₹150$ for 12 years at 3.5% p.a. C.I. is _____ .

(A) $₹2,190.28$ (B) $₹1,290.28$

(C) $₹2,180.28$ (D) None of these

Q7 $₹800$ is invested at the end of each month in an account paying interest 6% per year compounded monthly. What is the future value of this annually after $10th$ payment?

(A) $₹4,444$ (B) $₹8,756$

(C) $₹3,491$ (D) $₹8,182$

Q8 The future value of annuity of $₹2,000$ for 5 years at 5% compounded annually is given (in nearest ₹) as

(A) ₹51051 (B) ₹21021

(C) ₹11051 (D) ₹61254

Q9 A person invests $₹500$ at the start of each year with a bank which pays interest at 10% p.a. C.I. annually. The amount standing to his credit one year after he has made his yearly investment for the 12^{th} time is

(A) $₹11,761.35$ (B) $₹10,000$

(C) $₹12,000$ (D) None of these

Q10 Z invest $₹10,000$ every year starting from today for next 10 years. Suppose interest rate is 8% p.a. compounded annually. Calculate the future value of the annuity.

Given that $(1 + 0.08)^{10} = 2.15892500$.

(A) $₹1,50,580$

(B) $₹1,56,454.875$

(C) $₹1,58,652.22$

(D) $₹1,56,902.36$

Answer Key

Q1	(A)	Q6	(A)
Q2	(A)	Q7	(D)
Q3	(A)	Q8	(C)
Q4	(B)	Q9	(A)
Q5	(B)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

We know that,

Future value of an ordinary annuity can be calculated as:

$A(n, i) = A\left[\frac{(1+i)^n - 1}{i}\right]$

where, A is the periodic payment, $i =$ rate of interest per conversion period in decimal and $n =$ number of conversion period

Hence, the correct answer is option (A).

Q2 Text Solution:

Given: Annuity amount $(a) = ₹100$

Number of conversion period $(n) = 10$

Rate $(i) = 5\% = \frac{5}{100} = 0.05$

Future value FV is given as,

$FV = \frac{a\{(1+i)^n - 1\}}{i}$

$= \frac{100\{(1+0.05)^{10} - 1\}}{0.05}$

$= \frac{100(0.6288)}{0.05}$

$= \frac{62.88}{0.05}$

$= ₹1258$ (approx.)

Hence, the correct answer is option (A) i.e., ₹1258.

Q3 Text Solution:

Given: $A = ₹5,000$, $n = 8$ and $i = 9\% = \frac{9}{100} = 0.09$

Future value of an ordinary annuity can be calculated as:

$A(n, i) = A\left[\frac{(1+i)^n - 1}{i}\right]$

$\Rightarrow A(8,\ 0.09) = 5000\left[\frac{(1+0.09)^8 - 1}{0.09}\right]$

$= 5000\left[\frac{(1..09)^8 - 1}{0.09}\right]$

$= 5000\left[\frac{1.99256 - 1}{0.09}\right]$

$= 5000\left[\frac{0.99256}{0.09}\right]$

$= ₹55,142.22$

Hence, the correct answer is option (A) i.e. ₹55, 142.22.

Q4 Text Solution:

We know that,

Regular payment/receipts are made at the end of first year or period in annuity regular whereas payments made at the beginning of each period or year is known as annuity immediate or annuity due.

Hence, the correct answer is option (B) i.e. Annuity regular.

Q5 Text Solution:

Given: $A = ₹1500$, $n = 5$ and $i = 10\% = \frac{10}{100} = 0.10$

Future value of an ordinary annuity can be calculated as:

$A(n,\ i) = A\left[\frac{(1+i)^n - 1}{i}\right]$

$\Rightarrow A(5,\ 0.10) = 1500\left[\frac{(1+0.10)^5 - 1}{0.10}\right]$

$= 1500\left[\frac{(1.10)^5 - 1}{0.10}\right]$

$= 1500\left[\frac{1.61051 - 1}{0.10}\right]$

$= 1500\left[\frac{0.61051}{0.10}\right]$

$= ₹9157.65$

Hence, the correct answer is option (B) i.e. ₹9157.65.

Q6 Text Solution:

Given: $A = ₹150, n = 12, i = \frac{3.5}{100} = 0.035$

Future value is given by:

$A(n,\ i) = A\left[\frac{(1+i)^n - 1}{i}\right]$

$\Rightarrow A(12,\ 0.035) = 150\left[\frac{(1+0.035)^{12} - 1}{0.035}\right]$

$= 150\left[\frac{(1.035)^{12} - 1}{0.035}\right]$

$= 150\left[\frac{1.511068 - 1}{0.035}\right]$

$= 150\left[\frac{0.511068}{0.035}\right]$

$= ₹2,190.28$

Hence, the correct answer is option (A) i.e. ₹2, 190.28.

Q7 Text Solution:

Given,

Monthly installment $(A) = ₹800$,

Number of conversion period $(n) = 1 \times 10 = 10$,

Rate of interest per conversion period in decimal$(i) = 6\%\ p.a. = \frac{6\%}{12}$ per month $= \frac{6}{1200} = 0.005$

Future value of an ordinary annuity can be calculated as:

$$A(n,\ i) = A\ \left[\frac{(1+i)^n - 1}{i}\right]$$

$$\Rightarrow\ A(10,\ 0.005) = 800\ \left[\frac{(1+0.005)^{10} - 1}{0.005}\right]$$

$$= 800\ \left[\frac{(1.005)^{10} - 1}{0.005}\right]$$

$$= 800\ \left[\frac{1.051140 - 1}{0.005}\right]$$

$$= 800\ \left[\frac{0.051140}{0.005}\right]$$

$$= ₹8182$$

Hence, the correct answer is option (D) i.e. $₹8182$.

Q8 Text Solution:

Given: $A = ₹2000$, $n = 5$,

$i = 5\% = \frac{5}{100} = 0.05$

Future value of an ordinary annuity can be calculated as:

$$A(n,\ i) = A\ \left[\frac{(1+i)^n - 1}{i}\right]$$

$$\Rightarrow\ A(5,\ 0.05) = 2000\ \left[\frac{(1+0.05)^5 - 1}{0.05}\right]$$

$$= 2000\ \left[\frac{(1.05)^5 - 1}{0.05}\right]$$

$$= 2000\ \left[\frac{1.276281\ - 1}{0.05}\right]$$

$$= 2000\ \left[\frac{0.276281}{0.05}\right]$$

$= ₹11051$ (in nearest ₹)

Hence, the correct answer is option (C) i.e. $₹11051$.

Q9 Text Solution:

Given: $A = ₹500$, $n = 12$,

$i = 10\% = \frac{10}{100} = 0.10$

Since, the payment is made at the start of each year, thus

Future value of annuity immediate can be calculated as:

$$A(n,\ i) = A\ \left[\frac{(1+i)^n - 1}{i}\right] \times (1+i)$$

$$\Rightarrow\ A(12,\ 0.10) = 500\ \left[\frac{(1+0.10)^{12} - 1}{0.10}\right]$$

$$\times (1+0.10)$$

$$= 500\ \left[\frac{(1.10)^{12} - 1}{0.10}\right] \times (1.10)$$

$$= 500\ \left[\frac{3.138428\ - 1}{0.10}\right] \times (1.10)$$

$$= 500\ \left[\frac{2.138428}{0.10}\right] \times (1.10)$$

$$= ₹11,761.35$$

Hence, the correct answer is option (A) i.e. $₹11,761.35$.

Q10 Text Solution:

Given: $A = ₹10,000$, $n = 10$,

$i = 8\% = \frac{8}{100} = 0.08$ p.a.

Since, the investment is starting from that day, thus

Future value can be calculated as:

$$A(n,\ i) = A\ \left[\frac{(1+i)^n - 1}{i}\right] \times (1+i)$$

$$\Rightarrow\ A(10,\ 0.08) = 10,000\ \left[\frac{(1+0.08)^{10} - 1}{0.08}\right]$$

$$\times (1+0.08)$$

$$= 10000\ \left[\frac{(1.08)^{10} - 1}{0.08}\right] \times (1.08)$$

$$= 10000\ \left[\frac{2.15892500\ - 1}{0.08}\right] \times (1.08)$$

$$= 10000\ \left[\frac{1.15892500}{0.08}\right] \times (1.08)$$

$$= ₹1,56,454.875$$

Hence, the correct answer is option (B) i.e. $₹1,56,454.875$.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 5

MATHEMATICS OF FINANCE

Q1 What is the present value of ₹1 to be received after 2 years compounded annually at 10%?
(A) ₹0.83 (B) ₹0.91
(C) ₹0.88 (D) ₹0.79

Q2 $A = ₹1,200, n = 12\ years,\ i = 0.08,\ V = ?$ Using the formula $V = \frac{A}{i}\left[1 - \frac{1}{(1+i)^n}\right]$, the value of V will be
(A) ₹3,039 (B) ₹3,990
(C) ₹9,930 (D) ₹9,043.30

Q3 The present value of an annuity of ₹3,000 for 15 years at 4.5% p.a. C.I is
(A) ₹23,809.41 (B) ₹32,218.63
(C) ₹32,908.41 (D) None of these

Q4 Find the present value of an annuity of ₹1,000 payable at the end of each year for 10 years. If rate of interest is 6% compounding per annum.
(Given $(1.06)^{-10} = 0.5584$)
(A) ₹7,360 (B) ₹8,360
(C) ₹12,000 (D) None of these

Q5 A person invested money in bank paying 6% compounded semi annually. If the person expects to receive ₹8,000 in 6 years, what is the present value of investment?
(A) ₹5,000 (B) ₹4,611.03
(C) ₹5,611.03 (D) None of these

Q6 The present value of annuity of ₹5,000 per annum for 12 years at 4% p.a C.I. annually is
(A) ₹46,000 (B) ₹46,850
(C) ₹15,000 (D) ₹46,925.40

Q7 Mr. Paul borrows ₹20,000 on condition to repay it with C.I. at 5% p.a in annual installments of ₹2000 each. The number of years for the debt to be paid off is
(A) 10 years
(B) 12 years
(C) 11 years
(D) 14.2 years

Q8 Find the present value of an ordinary annuity of 8 quarterly payments of ₹500 each, the rate of interest being 8% p.a. compounded quarterly.
(A) ₹4,292.50 (B) ₹4,725.00
(C) ₹3,662.50 (D) ₹3,266.50

Q9 The present value of an annuity of ₹80 for 20 years at 5% p.a. C.I annually is
(A) ₹997 (approx.)
(B) ₹900
(C) ₹1,000
(D) None of these

Q10 Suppose your mom decides to gift you ₹10,000 every year starting from today for the next sixteen years. You deposit this amount in a bank as and when you receive and get 8.5% per annum interest rate compounded annually. What is the present value of this money?
(A) 83,042 (B) 90,100
(C) 93,042 (D) 10,100

Answer Key

Q1	(A)	Q6	(D)
Q2	(D)	Q7	(D)
Q3	(B)	Q8	(C)
Q4	(A)	Q9	(A)
Q5	(C)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Given: $F.V$ *or* $A(n,\ i) = ₹1$, $n = 2$ years and $i = 10\% = \frac{10}{100} = 0.1$ p.a.

We know that,

$P.V\ (n,\ i) = \frac{\text{F.V}}{(1+i)^n}$

$\Rightarrow P.V\ (2,\ 0.1) = \frac{1}{(1+0.1)^2}$

$= \frac{1}{(1.1)^2}$

$= 0.83$ (approx.)

Therefore, the required present value is ₹0.83.

Hence, the correct answer is option (A) i.e. ₹0.83.

Q2 Text Solution:

Given: Annuity amount $(A) = ₹1200$

Number of years $(n) = 12$

Rate of interest $(i) = 8\% = \frac{8}{100} = 0.08$ p.a.

The formula for present value is given as,

$V = \frac{A}{i}\left(1 - \frac{1}{(1+i)^n}\right)$ [V = Present Value]

$= \frac{1200}{0.08}\left(1 - \frac{1}{(1+0.08)^{12}}\right)$

$= 15000 \times \left(1 - \frac{1}{2.51817}\right)$

$= 15000 \times (1 - 0.397113)$

$= 15000 \times 0.602887$

$= 9043.30$

Hence, the correct answer is option (D) i.e., ₹$9,043.30$.

Q3 Text Solution:

Given: Annuity amount $(A) = ₹3,000$

Number of installments $(n) = 15$

Rate of interest $(i) = 4.5\% = \frac{4.5}{100} = 0.045$ p.a.

The present value is given by:

$P(n,\ i) = A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$

$P(15,\ 0.045) = 3000\left(\frac{(1+0.045)^{15} - 1}{0.045(1+0.045)^{15}}\right)$

$= 3000\left(\frac{(1.045)^{15} - 1}{0.045(1.045)^{15}}\right)$

$= 3000\left(\frac{1.935282 - 1}{0.045(1.935282)}\right)$

$= 32,218.63$

Hence, the correct answer is option (B) i.e., ₹$32,218.63$.

Q4 Text Solution:

Given: Annuity amount $(A) = ₹1,000$

Number of installments $(n) = 10$

Rate of interest $(i) = 6\% = \frac{6}{100} = 0.06$ p.a.

The present value is given by:

$P(n,\ i) = A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$

$P(10,\ 0.06) = 1000\left(\frac{(1+0.06)^{10} - 1}{0.06(1+0.06)^{10}}\right)$

$= 1000\left(\frac{1 - (1+0.06)^{-10}}{0.06}\right)$

$= 1000\left(\frac{1 - 0.5584}{0.06}\right)$

$= 7,360$

Hence, the correct answer is option (A) i.e., ₹$7,360$.

Q5 Text Solution:

Given: $F.V$ *or* $A(n,\ i) = ₹8,000$, Time $= 6$ years, Rate of interest $= 6\%$

Since, the interest is compounded semi-annually, thus

Number of installments $(n) = 6 \times 2 = 12$

Rate of interest per conversion period in decimal$(i) = 6\%\ p.a. = \frac{6\%}{2}$ semi annually

$= \frac{6}{2 \times 100} = 0.03$ semi annually

We know that,

$P.V\ (n,\ i) = \frac{\text{F.V}}{(1+i)^n}$

$\Rightarrow P.V\ (12,\ 0.03) = \frac{8000}{(1+0.03)^{12}}$

$= \frac{8000}{(1.03)^{12}}$

$= 5611.03$ (approx.)

Therefore, the present value of investment is ₹5611.03.

Hence, the correct answer is option (C) i.e. ₹5611.03.

Q6 Text Solution:

Given: Annuity amount $(A) = ₹5,000$

Number of installments $(n) = 12$

Rate of interest $(i) = 4\% = \frac{4}{100} = 0.04$ p.a.

The present value is given by:

$$P(n,\ i) = A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$$P(12,\ 0.04) = 5000\left(\frac{(1+0.04)^{12} - 1}{0.04(1+0.04)^{12}}\right)$$

$$= 5000\left(\frac{1.6010322 - 1}{0.04(1.6010322)}\right)$$

$$= 5000\left(\frac{0.6010322}{0.04(1.6010322)}\right)$$

$$= 46925.40 \text{ (approx.)}$$

Hence, the correct answer is option (D) i.e., $₹46925.40$.

Q7 Text Solution:

Given: Loan amount (L) or $P.V = ₹20,000$

Rate of interest $(i) = 5\% = \frac{5}{100} = 0.05$ p.a

Annual installments $(A) = ₹2000$

Let the time taken for the debt to be paid off be n years, thus

$$P(n,\ i) = A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$$P(n,\ 0.05) = 2000\left(\frac{(1+0.05)^n - 1}{0.05(1+0.05)^n}\right)$$

$$\Rightarrow\ 20000 = 2000\left(\frac{(1.05)^n - 1}{0.05(1.05)^n}\right)$$

$$\Rightarrow\ 20000 = \frac{2000}{0.05}[1 - (1.05)^{-n}]$$

$$\Rightarrow\ 20000 \times \frac{0.05}{2000} = [1 - (1.05)^{-n}]$$

$$\Rightarrow 0.5 = 1 - (1.05)^{-n}$$

$$\Rightarrow (1.05)^{-n} = 0.5$$

$$\Rightarrow\ (1.05)^{n} = 2$$

$$\Rightarrow n\ log\ (1.05) = log\ 2\ [\because \log a^n = n\ log\ a]$$

$$\Rightarrow\ n = \frac{log\ 2}{log\ 1.05}$$

$$\Rightarrow\ n = 14.2 \text{ years}$$

Hence, the correct answer is option (D) i.e., 14.2 years.

Q8 Text Solution:

Given: Annuity payment $(A) = ₹500$, Rate of interest $= 8\%$

Since, the interest is compounded quarterly, thus

Number of installments $(n) = 8$

Rate of interest per conversion period in decimal

$(i) = 8\%\ p.a. = \frac{8\%}{4} per\ quarter = \frac{8}{4 \times 100}$ per quarter $= 0.02$

We know that,

The present value is given by:

$$P(n,\ i) = A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$$P(8,\ 0.02) = 500\left(\frac{(1+0.02)^8 - 1}{0.02(1+0.02)^8}\right)$$

$$= 500\left(\frac{(1.02)^8 - 1}{0.02(1.02)^8}\right)$$

$$= 500\left(\frac{0.17165}{0.02(1.17165)}\right)$$

$$= 3662.50$$

Therefore, the present value of investment is $₹3662.50$.

Hence, the correct answer is option (C) i.e. $₹3662.50$.

Q9 Text Solution:

Given: Annuity amount $(A) = ₹80$

Number of installments $(n) = 20$

Rate of interest $(i) = 5\% = \frac{5}{100} = 0.05$ p.a.

The present value is given by:

$$P(n,\ i) = A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$$P(20,\ 0.05) = 80\left(\frac{(1+0.05)^{20} - 1}{0.05(1+0.05)^{20}}\right)$$

$$= 80\left(\frac{(1.05)^{20} - 1}{0.05(1.05)^{20}}\right)$$

$$= 80\left(\frac{2.65329 - 1}{0.05(2.6532)}\right)$$

$$= 997 \text{ (approx.)}$$

Hence, the correct answer is option (A) i.e., $₹997$.

Q10 Text Solution:

We know that,

The present value of an annuity immediate is the same as annuity regular for $(n-1)$ year plus the initial receipt in the beginning of the period.

Here, $n = 16,\ i = 8.5\% = \frac{8.5}{100} = 0.085$

Thus, $P(n-1,\ i) = A\left(\frac{(1+i)^{n-1} - 1}{i(1+i)^{n-1}}\right)$

$\Rightarrow\ P(16-1,\ 0.085)$

$= 10000\left(\frac{(1+0.085)^{16-1}-1}{0.085(1+0.085)^{16-1}}\right)$

$\Rightarrow\ P(15,\ 0.085) = 10000\left(\frac{(1.085)^{15}-1}{0.085(1.085)^{15}}\right)$

$= 10000\left(\frac{3.39974-1}{0.085(3.39974)}\right)$

$= 83042.33$

Thus, the present value of annuity

$= ₹83,042.33 + ₹10,000$

$= ₹93,042$ (approx.)

Hence, the correct answer is option (C) i.e., $₹93,042$.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 6

MATHEMATICS OF FINANCE

Q1 To accumulate ₹$10,00,000$ over a period of 8 years in a sinking fund, contributions are made at the end of every year. If the interest rate is 7% per annum, what is the amount of each annual deposit required?

(A) ₹$90,000$ (B) ₹$92,000$
(C) ₹$98,000$ (D) ₹$1,00,000$

Q2 An individual is considering the proposal of purchasing a high-end smartphone either by making a full payment of ₹$80,000$ or by leasing it for 4 years at an annual rate of ₹$25,000$. The individual can borrow money at an interest rate of 14% compounded annually. Which course of action is more preferable?

(A) Purchasing high-end smartphone is more preferable.
(B) Leasing the high-end smartphone is more preferable.
(C) The preference depends on additional factors.
(D) Insufficient information to determine the preference.

Q3 Ramesh wants to retire and receive ₹$3,000$ a month. He wants to pass this monthly payment to future generations after his death. He can earn an interest of 8% compounded annually. How much will he need to set aside to achieve his perpetuity goal?

(A) ₹$4,00,000$
(B) ₹$4,49,775$
(C) ₹$5,59,775.25$
(D) None of these

Q4 A company is evaluating the option of purchasing a specialized equipment. The equipment costs ₹$20,00,000$ and has a useful life of 8 years. Alternatively, the company can lease the equipment for 8 years at an annual rate of ₹$350,000$. The company's borrowing cost is 10% compounded annually. Which course of action is more advantageous?

(A) Purchasing the equipment is more advantageous
(B) Leasing the equipment is more advantageous
(C) The advantage depends on additional factors
(D) Insufficient information to determine the advantage

Q5 Sneha is making plans for retirement and seeks a monthly income of ₹$15,500$. She wants to pass on this monthly payment to future generations. Assuming an annual compounding interest rate of 7.1%, how much should Sneha set aside to achieve her perpetuity goal?

(A) ₹$16,19,800$ (B) ₹$25,19,500$
(C) ₹$22,19,700$ (D) ₹$26,19,800$

Q6 An energy-efficient lighting system with a lifespan of 10 years costs ₹$45,000$, while a standard lighting system with a lifespan of 5 years costs ₹$30,000$. The energy-efficient system saves energy costs of ₹$8,000$ annually, while the standard system saves energy costs of ₹$5,000$ annually. Determine the preferred course of action, assuming a cost of borrowing at 12% compounded annually.

(A) Energy-efficient lighting system
(B) Standard lighting system
(C) Both options are equally preferable
(D) Insufficient information to determine the preferred option

Q7 An individual wants to save up for a down payment on a house. They aim to have $₹15,00,000$ in 10 years in a sinking fund by making annual contributions at the end of each year. If the interest rate is 8% per annum, what is the amount of each annual deposit required?

(A) $₹1,80,390$ (B) $₹1,15,200$
(C) $₹1,23,680$ (D) $₹1,03,550$

Q8 An investor is considering purchasing a four-year bond with a face value of $₹10,000$ and a nominal interest rate of 6%. The investor requires a rate of return of 8%. What is the maximum price the investor should be willing to pay for the bond?

(A) ₹9000 (B) ₹9500
(C) $₹10,000$ (D) $₹10,500$

Q9 A company recorded its annual revenues over a five-year period as follows:

Year	2001	2002	2003	2004	2005
Revenue (in thousands ₹)	100	110	121	133	146.41

What is the compound annual growth rate (CAGR) of the company's revenue over this five-year period?

(A) 12 (B) 10
(C) 15 (D) 18

Q10 A company is considering an investment project with the following expected cash flows:

Year	0	1	2	3
Cash flows (in thousand ₹)	50	25	30	40

If the cost of capital is 10% per annum, what is the net present value (NPV) of the project?

(A) $₹1,00,080$ (B) $₹1,15,500$
(C) $₹1,27,580$ (D) $₹1,42,800$

Q11 Assuming that the discount rate is 8% per annum, how much would an investor be willing to pay to receive ₹500 growing at a rate of 4% annually forever?

(A) $₹12,500$ (B) $₹15,000$
(C) $₹10,000$ (D) $₹8,000$

Q12 Determine the present value of perpetuity ₹10 per month for infinite period at an effective rate of interest of 14% p.a.

(A) ₹657 (B) ₹757
(C) ₹857 (D) ₹957

Q13 An investor intends purchasing a three year $₹1,000$ par value bond having nominal interest rate of 10%. At what price the bond may be purchased now if it matures at par and the investor requires a rate of return of 14%?

(A) ₹1000 (B) ₹887.152
(C) ₹907.125 (D) None of these

Q14 If the amount of an annuity after 25 years at 5% p.a C.I. is $₹50,000$ the annuity will be

(A) ₹₹₹ $₹1,406.90$
(B) ₹ $₹1,047.62$
(C) ₹ $₹1,146.90$
(D) None of these

Q15 Find the future value of annuity of $₹1,000$ made annually for 7 years at interest rate of 14% compounded annually. (Given that $(1.14)^7 = 2.5023$)

(A) ₹ $10,730.7$
(B) ₹ $5,365.35$
(C) ₹ $8,756$
(D) ₹ $9,892.34$

Answer Key

Q1	(C)
Q2	(B)
Q3	(B)
Q4	(B)
Q5	(D)
Q6	(A)
Q7	(D)
Q8	(B)
Q9	(B)
Q10	(C)
Q11	(A)
Q12	(C)
Q13	(C)
Q14	(B)
Q15	(A)

Hints & Solutions

Q1 Text Solution:

Given: Future value $(F.V) = ₹10,00,000$

Rate of interest $(i) = 7\% = \frac{7}{100} = 0.07$ p.a.

Time $(n) = 8$ years

Let the required amount of each annual deposit be A.

Future value is given as,

$$F.V = A\left(\frac{(1+i)^n - 1}{i}\right)$$

$$\Rightarrow 10,00,000 = A\left[\frac{(1+0.07)^8 - 1}{0.07}\right]$$

$$\Rightarrow 10,00,000 = A\left[\frac{1.7181861798 - 1}{0.07}\right]$$

$$\Rightarrow 10,00,000 = A\,[10.2598025686]$$

$$\Rightarrow A = ₹97,467.7625 \approx ₹98,000 \text{ (approx)}$$

Hence, the correct answer is option (C) i.e., $₹98,000$.

Q2 Text Solution:

Given: Annuity amount $= ₹25,000$

Rate of interest $(i) = 14\% = \frac{14}{100} = 0.14$ p.a.

Time $(n) = 4$ years

We know that,

If the present value is less than the purchase value, then the leasing is preferable.

Present value $(P.V)$ is given as,

$$P.V = A\left[\frac{(1+i)^n - 1}{i\backslash (1+i)^n}\right]$$

$$= 25,000\left[\frac{(1+0.14)^4 - 1}{0.14\,(1+0.14)^4}\right]$$

$$= 25,000\left[\frac{(1.14)^4 - 1}{0.14\,(1.14)^4}\right]$$

$$= 25,000\left(\frac{1.68896016 - 1}{0.14\,(1.68896016)}\right)$$

$$= 25,000(2.9137123043)$$

$$= ₹72,842.80 \text{ (approx)}$$

We have concluded that leasing is preferable.

Hence, the correct answer is option (B) i.e., Leasing the high-end smartphone is more preferable..

Q3 Text Solution:

Given: $A = ₹3,000$ and $i = 8\%\ p.a.$

Thus, $i = 8\%\ p.a. = \frac{8\%}{12}$ per month

$$= \frac{8}{12 \times 100} = 0.00667 \text{ per month}$$

We know that,

$$PVA = \frac{A}{i}$$

$$= \frac{3000}{0.00667}$$

$$= 4,49,775 \text{ (approx.)}$$

Therefore, he need to set aside the amount of $₹4,49,775$ to achieve his perpetuity goal.

Hence, the correct answer is option (B) i.e. $₹4,49,775$.

Q4 Text Solution:

Given: Annuity amount $= ₹350,000$

Rate of interest $(i) = 10\% = \frac{10}{100} = 0.10$ p.a.

Time $(n) = 8$ years

We know that,

If the present value is less than the purchase value, then the leasing is preferable.

Present value $(P.V)$ is given as,

$$P.V = A\left[\frac{(1+i)^n - 1}{i\backslash (1+i)^n}\right]$$

$$= 350,000\left[\frac{(1+0.10)^8 - 1}{0.10\,(1+0.10)^8}\right]$$

$$= 350,000\left[\frac{(1.10)^8 - 1}{0.10\,(1.10)^8}\right]$$

$$= 350,000\left(\frac{2.1435881 - 1}{0.10\,(2.1435881)}\right)$$

$$= 350,000\left(\frac{1.1435881}{0.10\ (2.1435881)}\right)$$

$= ₹18,67,224.79$

We have concluded that leasing is preferable.

Hence, the correct answer is option (B) i.e., Leasing the equipment is more advantageous.

Q5 Text Solution:

Given: $A = ₹15,500$ and $i = 7.1\%\ p.a.$

Thus, $i = 7.1\%\ p.a. = \frac{7.1\%}{12}$ per month $= \frac{7.1}{12 \times 100}$ per month

We know that,

$PVA = \frac{A}{i}$

$= \frac{15500}{7.1} \times 1200$

$= 26,19,718 = ₹26,19,800$ (approx.)

Therefore, he need to set aside the amount of ₹26, 19, 800 to achieve his perpetuity goal.

Hence, the correct answer is option (D) i.e. ₹26, 19, 800.

Q6 Text Solution:

For energy-efficient lighting system costing ₹30, 000:

Savings $(A) = ₹5,000$, $(i) = 12\% = 0.12$ p.a., $n = 5$ years

Present value $(P.V)$ is given as,

$$P.V = A\left[\frac{(1+i)^n - 1}{i\ (1+i)^n}\right]$$

$$= 5000\left[\frac{(1+0.12)^5 - 1}{0.12\ (1+0.12)^5}\right]$$

$$= 5000\left[\frac{(1.12)^5 - 1}{0.12\ (1.12)^5}\right]$$

$$= 5000\left(\frac{1.7623416832 - 1}{0.12\ (1.7623416832)}\right)$$

$$= 5000\left(\frac{0.76234168321}{0.12\ (2.1435881)}\right)$$

$= ₹18023.88$ (approx)

Thus, the lighting system costing ₹30000 saves ₹18023.88.

Now, for standard lighting system costing ₹45, 000:

Savings $(A) = ₹8,000$, $(i) = 12\% = 0.12$ p.a., $n = 10$ years

Present value $(P.V)$ is given as,

$$P.V = A\left[\frac{(1+i)^n - 1}{i\ (1+i)^n}\right]$$

$$= 8000\left[\frac{(1+0.12)^{10} - 1}{0.12\ (1+0.12)^{10}}\right]$$

$$= 8000\left[\frac{(1.12)^{10} - 1}{0.12\ (1.12)^{10}}\right]$$

$$= 8000\left(\frac{3.1058482083 - 1}{0.12\ (3.1058482083)}\right)$$

$$= 8000\left(\frac{2.1058482083}{0.12\ (3.1058482083)}\right)$$

$= ₹45201.78$ (approx)

Here, this lighting system costing ₹45000 saves ₹45201.78.

Therefore, energy-efficient lighting system with a lifespan of 10 years costs ₹45, 000 is the preferred course of action.

Hence, the correct option is (A).

Q7 Text Solution:

Given: Future value $(F.V) = ₹15,00,000$

Rate of interest $(i) = 8\% = \frac{8}{100} = 0.08$ p.a.

Time $(n) = 10$ years

Let the required amount of each annual deposit be A.

Future value is given as,

$$F.V = A\left(\frac{(1+i)^n - 1}{i}\right)$$

$$\Rightarrow 15,00,000 = A\left[\frac{(1+0.08)^{10} - 1}{0.08}\right]$$

$$\Rightarrow 10,00,000 = A\left[\frac{2.1589249973 - 1}{0.08}\right]$$

$\Rightarrow 10,00,000 = A\ [14.4865624663]$

$\Rightarrow A = ₹103,550$ (approx)

Hence, the correct answer is option (D) i.e., A = ₹103,550.

Q8 Text Solution:

Given: Nominal interest rate $= 6\%$

Rate of interest $= 8\%$

Face value $= ₹10,000$

Thus, $6\%\ of\ ₹10,000 = \frac{6}{100} \times 10000 = ₹600$

∴ Present value of bond

$$= \frac{600}{(1+0.08)^1} + \frac{600}{(1+0.08)^2} + \frac{600}{(1+0.08)^3} + \frac{10000}{(1+0.08)^3}$$

$$= \frac{600}{(1.08)^1} + \frac{600}{(1.08)^2} + \frac{600}{(1.08)^3} + \frac{10000}{(1.08)^3}$$

$$= \frac{600}{(1.08)^1} + \frac{600}{(1.08)^2} + \frac{10600}{(1.08)^3}$$

$$= 555.56 + 514.40 + 8414.62$$

$$= 9484.58 = 9500 \text{ (approx.)}$$

Thus, the purchased value of bond is ₹9500.

Hence, the correct answer is option (B) i.e. ₹9500

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Q9 Text Solution:

We know that,

$$\text{CAGR}\ (t_0,\ t_n) = \left[\left(\frac{V(t_n)}{V(t_0)}\right)^{\frac{1}{t_n - t_0}} - 1\right] \times 100\%,$$

where $V(t_0)$ is beginning period and $V(t_n)$ is end period

According to the question,

Beginning Value $= ₹100,000$

Ending Value $= ₹146,410$

Here, $t_n - t_0 = 2005 - 2001 = 4$

∴ CAGR for year 5 with respect to year 1 is given by:

$$\text{CAGR} = \left[\left(\frac{146410}{100000}\right)^{\frac{1}{4}} - 1\right] \times 100\%$$

$$= (1.1 - 1) \times 100\% = 0.1 \times 100\%$$

$$= 10\%$$

Therefore, the required the compound annual growth rate is 10%.

Hence, the correct option is (B).

Q10 Text Solution:

Given: i = 10% = 0.10 p.a.

We know that,

Discounted cash flows = $\frac{Cash\ flow}{(1+i)^n}$

For year 0:

Discounted cash flows = $\frac{50000}{(1+0.10)^0}$ =50,000

For year 1:

Discounted cash flows = $\frac{25000}{(1+0.10)^1}$ = 22,727.27

For year 2:

Discounted cash flows = $\frac{30000}{(1+0.10)^2}$ = 24,793.39

For year 3:

Discounted cash flows = $\frac{40000}{(1+0.10)^3}$ = 30,052.59

Year	0	1	2	3
Cash flows (in ₹)	50,000	25,000	30,000	40,000
Discounted cash flows	50,000	22,727.27	24,793.39	30,052.59

Thus, Net present value

= 50,000 + 22,727.27 + 24,793.39 + 30,052.59

= 1,27,580 (approx)

Hence, the correct option is (C).

Q11 Text Solution:

Given,

Discount rate $(i) = 8\%\ p.a. = 0.08\ p.a.$

Growing rate $(g) = 4\%\ p.a = 0.04\ p.a.$

Value of each payment received $(A) = ₹500$

Thus, $PVA = \frac{A}{i-g}$

$$= \frac{500}{0.08 - 0.04}$$

$$= \frac{500}{0.04}$$

$$= 500 \times \frac{100}{4}$$

$$= 12,500$$

Therefore, they should pay $₹12,500$ to receive ₹500 growing at 4% annually for ever.

Hence, the correct answer is option (A) i.e. $₹12,500$.

Q12 Text Solution:

Given: $A = ₹10$ and $i = 14\%$ p.a.

Here, $i = 14\%$ p.a. $= \frac{14\%}{12}$ per month $= \frac{14}{1200}$ per month

Therefore, $PVA_{\infty} = \frac{A}{i}$

$= \frac{10}{\frac{14}{1200}}$

$= \frac{10 \times 1200}{14}$

$= 857.14 = ₹857$ (approx.)

Thus, the present value of perpetuity is ₹857.

Henec, the correct answer is option (C) i.e. ₹857.

Q13 Text Solution:

Given: Nominal interest rate $= 10\%$

Rate of interest $= 14\%$

Face value $= ₹1,000$

Thus, $10\%\ of\ ₹1,000 = \frac{10}{100} \times 1000 = ₹100$

∴ Present value of bond

$= \frac{100}{(1+0.14)^1} + \frac{100}{(1+0.14)^2} + \frac{100}{(1+0.14)^3} + \frac{1000}{(1+0.14)^3}$

$= \frac{100}{(1.14)^1} + \frac{100}{(1.14)^2} + \frac{100}{(1.14)^3} + \frac{1000}{(1.14)^3}$

$= 87.71 + 76.946 + 67.497 + 674.971$

$= 907.125$ (approx.)

Thus, the purchased value of bond is ₹907.125.

Hence, the correct answer is option (C) i.e. ₹907.125.

Q14 Text Solution:

Given: Future Value $(FV) = ₹50000$

Time in years $(n) = 25$

Rate $(i) = 5\% = \frac{5}{100} = 0.05$

Future Value FV is given as,

$FV = \frac{a\{(1+i)^n - 1\}}{i}$

$50000 = \frac{a\{(1+0.05)^{25} - 1\}}{0.05}$

$50000 = \frac{a\{2.386\}}{0.05}$

$50000 = \frac{a\{2.386\}}{0.05}$

$a = \frac{50000 \times 0.05}{2.386}$

$a = ₹1047.62$

Hence, the correct answer is option (B) i.e., ₹1047.62.

Q15 Text Solution:

According to the question,

Given: Annuity $(A) = ₹1,000$

Time $(n) = 7$ years

Rate of interest $= 14\%$ p.a.

Effective Rate of interest $(i) = \frac{R}{100} = \frac{14}{100} = 0.14$ p.a.

Future Value $(F.V)$ of ordinary Annuity is given by the formula,

$F.V = A\left(\frac{(1+i)^n - 1}{i}\right)$

$= 1000\left(\frac{(1+0.14)^7 - 1}{0.14}\right)$

$= 1000\left(\frac{1.5022}{0.14}\right)$

$= 1000(10.730)$

$= 10730 \approx 10,730,7$

Hence, the correct answer is option (A) i.e., ₹ 10, 730.7.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 7

MATHEMATICS OF FINANCE

Q1 Compound interest on a certain sum for 2 years is ₹41.60 and the simple interest is ₹40. Find the sum.

(A) ₹500 (B) ₹400

(C) ₹250 (D) ₹300

Q2 If the interest of a money is equal to its one by nine, the rate of interest and time are equal, then the rate of interest is

(A) $3\frac{1}{3}\%$

(B) $4\frac{1}{2}\%$

(C) 3%

(D) 3.5%

Q3 A sinking fund is created for redeeming debentures worth ₹5 lakhs at the end of 25 years. How much provision needs to be made out of profits each year provided sinking funds investments can earn interest at 4% p.a.?

(A) ₹$12,006$ (B) ₹$12,040$

(C) ₹$12,039$ (D) ₹$12,035$

Q4 Rajan is planning for his retirement and desires to receive a monthly payment of ₹$7,500$. He wishes to ensure that this monthly payment continues to be passed on to future generations even after his demise. With an expected interest rate of 5% compounded annually, how much does Rahul need to set aside to achieve his perpetuity goal?

(A) ₹$21,00,000$ (B) ₹$15,00,000$

(C) ₹$24,00,000$ (D) ₹$18,00,000$

Q5 A machine can be purchased for ₹$50,000$. Machine will contribute ₹$12,000$ per year for the next five years. Assume borrowing cost is 10% per annum. Determine whether the machine should be purchased or not.

(A) Should be purchased

(B) Should not be purchased

(C) Can't say about purchase

(D) None of the above

Q6 A person wants to lease out a machine costing ₹$5,00,000$ for a 10 year period. It has fixed a rental of ₹$51,272$ per annum payable annually starting from the end of first year. Suppose rate of interest is 10% per annum, compounded annually on which money can be invested. To whom this agreement is favourable?

(A) Favour for lessee

(B) Favour for lessor

(C) Not for both

(D) Can't be determined

Q7 A company is considering proposal of purchasing a machine either by making full payment of ₹$4,000$ or by leasing it for four years at an annual rate of ₹$1,250$. Which course of action is preferable, if the company can borrow money at 14% compounded annually?

(A) Leasing is preferable

(B) Should be purchased

(C) No difference

(D) None of these

Q8 A person invests ₹500 at the end of each year with a bank which pays interest at 10% p.a. C.I. annually. The amount standing to his credit one year after he has made his yearly investment for the 12th time is

(A) ₹ $11,761.36$

(B) ₹ $10,000$

(C) ₹ $12,000$

(D) None of these

Q9 A machine worth ₹490740 is depreciated at 15% on its opening value each year, find the time when its value would reduce to ₹200000?
(A) 4 years 6 months
(B) 4 years 7 months
(C) 4 years 5 months
(D) 5 years 7 months (approx.)

Q10 How much amount is required to be invested every year as to accumulate ₹ 6,00,000 at the end of $10th$ year, if interest is compounded annually at 10% rate of interest?
(A) ₹ 37,467 (B) ₹ 37,476
(C) ₹ 37,647 (D) ₹ 37,674

Q11 The present value of annuity of ₹80 a year for 20 years at 5% p.a. is
(A) ₹997 (appx).
(B) ₹900
(C) ₹1000
(D) none

Q12 A company establishes a sinking fund to provide for the payment of ₹2,00,000 debt maturing in 20 years. Contributions to the fund are to be made at the end of every year. Find the amount of each annual deposit if interest is 5% per annum.
(A) ₹6,142 (B) ₹6,049
(C) ₹6,052 (D) ₹6,159

Q13 Suppose you deposit ₹900 per month into an account that pays 14.8% interest compounded monthly. How much money will you get after 9 months?
(A) ₹8,511 (B) ₹9,000
(C) ₹9,200 (D) ₹1,000

Q14 Assuming that the discount rate is 7% p.a. How much would they pay to receive ₹200 growing at 5% annually for ever?
(A) ₹2,500 (B) ₹5,000
(C) ₹7,500 (D) ₹10,000

Q15 If a person bought a house by paying ₹45,00,000 down payment and ₹80,000 at the end of each year till the perpetuity, assuming the rate of interest as 16%, the present value of house (in ₹) is given as
(A) ₹47,00,000 (B) ₹45,00,000
(C) ₹57,80,000 (D) ₹50,00,000

Answer Key

Q1	(C)
Q2	(A)
Q3	(A)
Q4	(D)
Q5	(B)
Q6	(A)
Q7	(A)
Q8	(A)
Q9	(D)
Q10	(C)
Q11	(A)
Q12	(B)
Q13	(A)
Q14	(D)
Q15	(D)

Hints & Solutions

Q1 Text Solution:

Given: $S.I. = ₹40$, $C.I. = ₹41.60$ and time $(T) = 2$ years

Let the sum of money be P, then

$S.I. = \frac{\text{P}\times\text{R}\times\text{T}}{100}$

$\Rightarrow 40 = \frac{\text{P}\times\text{R}\times 2}{100}$

$\Rightarrow P \times R = 2000$ ....(i)

Now, $C.I. = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 41.60 = P\left[\left(1+\frac{R}{100}\right)^2 - 1\right]$

$\Rightarrow 41.60 = P\left[1+\frac{R^2}{10000}+\frac{2R}{100} - 1\right]$

$\Rightarrow 41.60 = \left[\frac{\text{PR}^2}{10000}+\frac{2PR}{100}\right]$

$\Rightarrow 41.60 = \left[\frac{2000R}{10000}+\frac{2\times 2000}{100}\right]$ (from i)

$\Rightarrow 41.60 = \left[\frac{R}{5}+40\right]$

$\Rightarrow 1.60 = \frac{R}{5}$

$\Rightarrow R = 8\%$

Since, $P \times R = 2000$

$\Rightarrow P \times 8 = 2000$

$\Rightarrow P = 250$

Therefore, the required sum is $₹250$.

Hence, the correct answer is option (C) i.e. $₹250$.

Q2 Text Solution:

Let P be the principal, R be the rate of interest and T be the time, then

According to the question,

$S.I = \frac{1}{9}P$ and $R = T$ .... (i)

We know that,

$S.I. = \frac{\text{P}\times\text{R}\times\text{T}}{100}$

$\Rightarrow \frac{1}{9}P = \frac{\text{P}\times\text{R}\times\text{R}}{100}$ (from i)

$\Rightarrow \frac{1}{9} = \frac{R^2}{100}$

$\Rightarrow R^2 = \frac{100}{9}$

$\Rightarrow R = \frac{10}{3}$ (since, R cannot be negative)

$\Rightarrow R = 3\frac{1}{3}\%$

Hence, the correct answer is option (A) i.e. $3\frac{1}{3}\%$.

Q3 Text Solution:

Given:

Future value or $A(n,\ i) = 5,00,000$

Time $(n) = 25\ years$

Rate of interest $(i) = 4\%\ p.a. = 0.04\ p.a.$

We know that,

$F.V. = A\left[\frac{(1+i)^n - 1}{i}\right]$

$\Rightarrow 5,00,000 = A\left[\frac{(1+0.04)^{25} - 1}{0.04}\right]$

$\Rightarrow 5,00,000 = A\left[\frac{2.6658363 - 1}{0.04}\right]$

$\Rightarrow 5,00,000 = A(41.645908)$

$\Rightarrow A = \frac{500000}{41.645908}$

$\Rightarrow A = ₹12,006$ (approx.)

Hence, the correct option is (A) i.e. $₹12,006$.

Q4 Text Solution:

Given: $A = ₹7,500$ and $i = 5\%\ p.a.$

Thus, $i = 5\%\ p.a. = \frac{5\%}{12}$ per month $= \frac{5}{12\times 100} = \frac{1}{240}$ per month

We know that,

$PVA = \frac{A}{i}$

$= \frac{7500}{\frac{1}{240}}$

$= 7500 \times 240 = 18,00,000$

Therefore, he need to set aside the amount of $₹18,00,000$ to achieve his perpetuity goal.

Hence, the correct answer is option (D) i.e. $₹18,00,000$.

Q5 Text Solution:

Given: Annuity amount $(A) = ₹12,000$

Number of installments $(n) = 5$

Rate of interest $(i) = 10\% = \frac{10}{100} = 0.10$ p.a.

The present value is given by:

$P(n,\ i) = A\left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$

$P(5,\ 0.10) = 12000\left(\frac{(1+0.10)^5 - 1}{0.10(1+0.10)^5}\right)$

$= 12000\left(\frac{1.61051 - 1}{0.10(1.61051)}\right)$

$= 12000\left(\frac{1 - 0.5584}{0.06}\right)$

$= 45,489.44$

But it costs $₹50,000$ which is more than its present value.

Thus, it should not be purchased.

Hence, the correct answer is option (B) i.e., should not be purchased.

Q6 Text Solution:

Given: Annuity amount $(A) = ₹\ 51,272$

Time $(n) = 10$ years

Rate of Interest $(i) = 10\%\ p.a. = \frac{10}{100} = 0.1\ p.a.$

We know that,

If the present value is less than the purchase/lease value, then the leasing is preferable.

Present value is given by,

$$P.V = A\left[\frac{(1+i)^n - 1}{\mathrm{i}\,(1+i)^n}\right]$$

$$= 51,272\left[\frac{(1+0.1)^{10} - 1}{0.1 \times (1+0.1)^{10}}\right]$$

$$= 51,272\left[\frac{1.5937}{0.1 \times 2.5937}\right]$$

$$= 51272\left(\frac{1.5937}{0.25937}\right)$$

$$= 51272(6.14450)$$

$$= ₹3,15,040.804$$

As, we can see that the calculated present value is less than given present value, therefore it should be leased and it's favour for lessee.

Hence, the correct answer is option (A), i.e., Favour for lessee.

Q7 Text Solution:

Given: Annuity amount $(A) = ₹1,250$

Rate of interest $(i) = 14\% = \frac{14}{100} = 0.14$ p.a.

Time $(n) = 4$ years

We know that,

If the present value is less than the purchase value, then the leasing is preferable.

Present value $(P.V)$ is given as,

$$P.V = A\left[\frac{(1+i)^n - 1}{\mathrm{i}\,(1+i)^n}\right]$$

$$= 1250\left[\frac{(1+0.14)^4 - 1}{0.14\,(1+0.14)^4}\right]$$

$$= 1250\left[\frac{(1.14)^4 - 1}{0.14\,(1.14)^4}\right]$$

$$= 1250\left(\frac{1.68896 - 1}{0.14\,(1.68896)}\right)$$

$$= 1250\left(\frac{0.68896}{0.14\,(1.68896)}\right)$$

$$= ₹3642.15$$

We have concluded that leasing is preferable.

Hence, the correct answer is option (A) i.e., Leasing is preferable.

Q8 Text Solution:

Given: Annuity amount $(a) = ₹500$

Time in years $(n) = 12$

Rate $(i) = 10\% = \frac{10}{100} = 0.1$

Future Value FV is given as,

$$FV = \frac{a\{(1+i)^n - 1\}}{i}$$

$$= \frac{500\{(1+0.1)^{12} - 1\}}{0.1}$$

$$= \frac{500\{2.138\}}{0.1}$$

$$= \frac{1069}{0.1}$$

$$= 10,690$$

Thus, the total amount after 12^{th} month installment,

$$= 10690(1+i)$$

$$= 10690(1 + \tfrac{1}{10})$$

$$= 10690(1.1)$$

= ₹11759 = 11.761.36 (appx.)

Hence, the correct answer is option (A) i.e., $₹11,761.36$.

Q9 Text Solution:

Given,

Initial price = ₹490740

Reduced value = ₹200000

We know that,

Amount $(A) = P\left(1 - \frac{R}{100}\right)^n$

$$\Rightarrow 200000 = 490740\left(1 - \frac{15}{100}\right)^n$$

$$\Rightarrow 200000 = 490740\left(\frac{85}{100}\right)^n$$

$$\Rightarrow 200000 = 490740\left(\frac{17}{20}\right)^n$$

$$\Rightarrow \left(\frac{17}{20}\right)^n = \frac{200000}{490740}$$

$$\Rightarrow (0.85)^n = 0.407$$

Taking log on both sides,

$$\Rightarrow \log(0.85)^n = log(0.407)$$

$$\Rightarrow n\ log(0.85) = log(0.407)$$

$$\Rightarrow n = \frac{log\ (0.407)}{log\ (0.85)}$$

$$\Rightarrow n = 5.531 \text{ years}$$

$\Rightarrow n = 5$ years 7 months (approx.)

Hence, the correct answer is option(D) i.e., 5 years 7 months.

Q10 Text Solution:

Given: Future Value $(F.V) = ₹\,6,00,000$

Time $(n) = 10$ years

Rate of Interest $(i) = 10\% = \frac{10}{100} = 0.1$ p.a.

Let the required amount be A

Future value is given as,

$F.V = A\left(\frac{(1+i)^n - 1}{i}\right)$

$600000 = A\left(\frac{(1+0.1)^{10} - 1}{0.1}\right)$

$600000 = A\left(\frac{2.5937 - 1}{0.1}\right)$

$600000 = A\,(15.937)$

$A = \frac{600000}{15.937}$

$A = ₹\,37648.239 \approx ₹\,37,647$

Hence, the correct answer is option (C) i.e., $₹\,37,647.$

Q11 Text Solution:

The present value is calculated by the given formula:-

$P.V. = A \times \frac{1-(1+i)^{-n}}{i}$, where

$A =$ value of each payment

$i =$ rate of interest per period

$n =$ number of periods

Given,

$P = ₹80,$

$i = 5\%\ p.a. = 0.05\ p.a.$

$n = 20$

Thus,

$P.V. = 80 \times \frac{1-(1+0.05)^{-20}}{0.05}$

$P.V. = 80 \times \left(\frac{1-0.37689}{0.05}\right)$

$P.V. = 1600 \times 0.62311$

$P.V. = 996.97$

Hence, the correct answer is option (A) i.e. $₹997$(appx).

Q12 Text Solution:

Given: Future value $(F.V) = ₹2,00,000$

Rate of interest $(i) = 5\% = \frac{5}{100} = 0.05$ p.a.

Time $(n) = 20$ years

Let the required amount of each annual deposit be $\mathrm{A}.$

Future value is given as,

$F.V = A\left(\frac{(1+i)^n - 1}{i}\right)$

$\Rightarrow 200000 = A\left[\frac{(1+0.05)^{20} - 1}{0.05}\right]$

$\Rightarrow 200000 = A\left[\frac{2.65329771 - 1}{0.05}\right]$

$\Rightarrow 200000 = A\left[\frac{1.65329771}{0.05}\right]$

$\Rightarrow A = \left[\frac{200000}{33.0659542}\right]$

$\Rightarrow A = ₹6,048.517 \approx ₹6049$

Hence, the correct answer is option (B) i.e., $₹6,049.$

Q13 Text Solution:

Given,

Annuity amount $(A) = ₹900$

Rate of interest $(i) = 14.8\% = \frac{14.8}{12}\%$ per month

$= \frac{14.8}{12}\% = \frac{14.8}{1200} = 0.01233$ per month

Time $(n) = 9$ months

We know that,

Future value $= A\left[\frac{(1+i)^n - 1}{i}\right]$

$= 900\left[\frac{(1+0.0123)^9 - 1}{0.0123}\right]$

$= 900\left[\frac{(1.01233)^9 - 1}{0.0123}\right]$

$= 900\left[\frac{1.11663 - 1}{0.0123}\right]$

$= 900\left[\frac{0.11663}{0.0123}\right]$

$= 8511$ (approx.)

Therefore, the amount received is $₹8511.$

Hence, the correct option is (A) i.e. $₹8511.$

Q14 Text Solution:

Given,

Discount rate $(i) = 7\%\ p.a. = \frac{7}{100} = 0.07\ p.a.$

Growing rate $(g) = 5\% p.a. = \frac{5}{100} = 0.05\ p.a.$

Value of each payment received $(A) = ₹200$

Thus, $PVA = \frac{A}{i-g}$

$= \frac{200}{0.07 - 0.05}$
$= \frac{200}{0.02}$
$= 200 \times \frac{100}{2}$
$= 10,000$
Therefore, they should pay ₹$10,000$ to receive ₹200 growing at 5% annually for ever.
Hence, the correct answer is option (D) i.e. ₹$10,000$.

Q15 Text Solution:
Given, ₹$45,00,000$ is paid at the beginning as cash down and the rest ₹$80,000$ is paid at the end of each year till the perpetuity.
Thus, the present value of house is given by
$= ₹45,00,000 + \frac{80,000}{0.16}$
$= ₹45,00,000 + ₹50,000$
$= ₹50,00,000$
Therefore, the present value of house is ₹$50,00,000$.
Henec, the correct option is (D) i.e. ₹$50,00,000$.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

NUMBER SERIES, CODING-DECODING AND ODD MAN OUT

Q1 What comes next in the sequence: $7, 10, 14, 19, 25, ?$
(A) 30 (B) 32
(C) 36 (D) 42

Q2 What number should come next: $58, 52, 46, 40, 34, \ldots ?$
(A) 40 (B) 28
(C) 30 (D) 26

Q3 What number should come next in the following sequence?
$8, 16, 32, 64, \ldots$
(A) 80 (B) 96
(C) 128 (D) 256

Q4 What comes next in the sequence: $16, 8, 4, 2, 1, \ldots$
(A) 0 (B) -2
(C) 0.2 (D) 0.5

Q5 What comes next in the sequence: $7, 10, 8, 11, 9, 12, \ldots ?$
(A) 10
(B) 15
(C) 9
(D) None of the above

Q6 What is the missing term?
$RST, WXY, BCD, \_\_\_\_\_, KLM$
(A) CDE (B) DFE
(C) GIH (D) GHI

Q7 The missing letters in $\_\_\ \_\_\ c\ d\ c\ \_\_\ \_\_\ d\ c\ \_\_\ c\ d$:
(A) c d c c d (B) c d d c d
(C) c c d c d (D) d d d c d

Q8 What number should come next?
$544, 509, 474, 439, \ldots\ldots$
(A) 414 (B) 445
(C) 404 (D) 474

Q9 What number should come next: $3, 8, 27, 112, \ldots . ?$
(A) 256
(B) 408
(C) 565
(D) None of the above

Q10 In the sequence, 80, 10, 70, 15, 60, 20, 50,..... What number should come next?
(A) 25 (B) 30
(C) 40 (D) 55

Q11 The number that comes next in the sequence $5.2, 4.8, 4.4, 4, \ldots\ldots$ is
(A) 3.3 (B) 3.6
(C) 3.8 (D) 4.2

Q12 In the sequence, $8, 6, 9, 23, 87, \ldots$ What number should come next?
(A) 174 (B) 226
(C) 324 (D) 429

Q13 QPO, NML, KJI, _____ , EDC
(A) HGF (B) CAB
(C) JKL (D) GHI

Q14 5, 2, 7, 9, 16, 25, 41, ?
(A) 65 (B) 66
(C) 67 (D) 68

Q15 165, 195, 255, 285, ?, 375
(A) 345 (B) 390
(C) 335 (D) none

Answer Key

Q1	(B)
Q2	(B)
Q3	(C)
Q4	(D)
Q5	(A)
Q6	(D)
Q7	(B)
Q8	(C)
Q9	(C)
Q10	(A)
Q11	(B)
Q12	(D)
Q13	(A)
Q14	(B)
Q15	(A)

Hints & Solutions

Q1 Text Solution:

Given sequence: $7,\ 10,\ 14,\ 19,\ 25,\ ?$

The sequence follows a pattern:

i.e.,

$7 + 3 = 10$

$10 + 4 = 14$

$14 + 5 = 19$

$19 + 6 = 25$

Thus, the missing number is $25 + 7 = 32$

Hence, the correct option is (B) i.e., 32.

Q2 Text Solution:

Given: $58,\ 52,\ 46,\ 40,\ 34,\ \ldots$

The given sequence decreases by 6 each time

i.e.,

$58\ -\ 6\ =\ 52$

$52\ -\ 6\ =\ 46$

$46\ -\ 6\ =\ 40$

$40\ -\ 6\ =\ 34$

Following this pattern, the next number $= 34\ -\ 6\ =\ 28$

Therefore, the next number in the sequence should be 28.

Hence, the correct option is (B) i.e., 28.

Q3 Text Solution:

Given: $8,\ 16,\ 32,\ 64,\ \ldots.$

In this sequence, each term is obtained by multiplying the previous term by 2.

Starting with 8, we multiply it by 2 to get 16.

Then, we multiply 16 by 2 to get 32, and so on.

Continuing the sequence, we get

The missing number $= 64 \times 2 = 128$

Therefore, the missing number is 128.

Hence, the correct option is (C).

Q4 Text Solution:

Given sequence: $16,\ 8,\ 4,\ 2,\ 1,\ \ldots..$

In this sequence, each term is obtained by dividing the previous term by 2 i.e.,

$16 \div 2 = 8$

$8 \div 2 = 4$

$4 \div 2 = 2$

$2 \div 2 = 1$

Thus, the missing term $= 1 \div 2 = \frac{1}{2} = 0.5$

Hence, the correct option is (D) i.e, 0.5.

Q5 Text Solution:

Given sequence: $7,\ 10,\ 8,\ 11,\ 9,\ 12,\ \ldots$

On observing the pattern:

$7 + 3 = 10$

$10 - 2 = 8$

$8 + 3 = 11$

$11 - 2 = 9$

$9 + 3 = 12$

Thus, the pattern is: $+3,\ -2, +3,\ -2,\ \ldots.$

Therefore, the next number is $12 - 2 = 10$

Hence, the correct option is (A) i.e., 10.

Q6 Text Solution:

Given: $RST,\ WXY,\ BCD,\ \_\_\_\_\_,\ KLM$

On observing the pattern, we see that

The letters in each term are in order and the first letter of the next term is three positional ahead of the last letter of preceding term i.e.,

First term $= RST$

First letter of next term $= T + 3 = W$

Thus, second term $= WXY$

First letter of next term $= Y + 3 = B$

Thus, third term $= BCD$

Now, first letter of next term $= D + 3 = G$

Thus, the missing term $= GHI$

Hence, the correct option is (D) i.e., GHI.

Q7 Text Solution:

Given: $\_\_\ \_\_\ c\ d\ c\ \_\_\ \_\_\ d\ c\ \_\_\ c\ d$

The given series is following the pattern:

cd/cd/cd/cd/cd/cd

i.e., the pattern 'cd' is repeated.

Therefore, the pattern will be c d c d c d c d c d c d

Hence, the correct option is (B) i.e. c d d c d.

Q8 Text Solution:

Given: $544,\ 509,\ 474,\ 439,\ .....$

Let's examine the differences between consecutive terms:

$544\ -\ 509\ =\ 35$

$509\ -\ 474\ =\ 35$

$474\ -\ 439\ =\ 35$

We can observe that the differences between consecutive terms are constant and equal to 35.

So, the missing term $=439\ -\ 35\ =\ 404$

Therefore, the next number in the sequence should be 404.

Hence, the correct option is (C) i.e., 404.

Q9 Text Solution:

Given: $3,\ 8,\ 27,\ 112,\ ....$

On observing the pattern, we get

$3 \times 2 + 2 = 8$

$8 \times 3 + 3 = 27$

$27 \times 4 + 4 = 112$

Thus, the next term $= 112 \times 5 + 5 = 565$

Hence, the correct option is (C) i.e., 565.

Q10 Text Solution:

Given sequence:

$80,\ 10,\ 70,\ 15,\ 60,\ 20,\ 50\ ....$

On observing it, we analyze that it consists of alternating addition and subtraction series.

In the first pattern, 10 is subtracted from each number to get the next term

i.e., $80 - 10 = 70$

$70 - 10 = 60$

$60 - 10 = 50$

In the second pattern, 5 is added to each number to get the next number i.e.,

$10 + 5 = 15$

$15 + 5 = 20$

Thus, the missing term $= 20 + 5 = 25$

Hence, the correct option is (A) i.e., 25.

Q11 Text Solution:

Given sequence: $5.2,\ 4.8,\ 4.4,\ 4,\ .....$

On observing the pattern, we get

$5.2 - 0.4 = 4.8$

$4.8 - 0.4 = 4.4$

$4.4 - 0.4 = 4.0$

$4.0 - 0.4 = 3.6$

Thus, the missing number is 3.6.

Hence, the correct option is (B) i.e., 3.6.

Q12 Text Solution:

Given: $8,\ 6,\ 9,\ 23,\ 87\ ,\ .....$

On observing the pattern, we get

$8 \times 1 - 2 = 6$

$6 \times 2 - 3 = 9$

$9 \times 3 - 4\ = 23$

$23 \times 4 - 5\ = 87$

$87 \times 5 - 6\ = 429$

Therefore, the missing term is 429.

Hence, the correct option is (D) i.e., 429.

Q13 Text Solution:

Given: $\mathrm{QPO}, \mathrm{NML}, \mathrm{KJI}, \_\_\_\_\_ , \mathrm{EDC}$

On observing, we can see that all the terms are in reverse order.

Out of the given options, HGF is in the reverse order.

Hence, the correct option is (A) i.e. HGF.

Q14 Text Solution:

Given: 5, 2, 7, 9, 16, 25, 41, ?

The pattern here is, each term in the series, except the first two terms, is the sum of the preceding two terms.

i.e.,

2 + 5 = 7

7 + 2 = 9

9 + 7 = 16

16 + 9 = 25

25 + 16 = 41

Thus, the missing term will be

41 + 25 = 66

Hence, the correct option is (B) i.e., 66.

Q15 Text Solution:

Given: 165, 195, 255, 285, ? , 375

This series follows a pattern of '+30' and then '+60'
i.e.,
165 + 30 = 195
195 + 60 = 255
255 + 30 = 285
Thus, the next term will be:
285 + 60 = 345
Also, 345 + 30 = 375
Hence, the correct option is (A) i.e., 345.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

NUMBER SERIES, CODING-DECODING AND ODD MAN OUT

Q1 Find the odd one out of the following:
1, 5, 7, 11, 14, 17, 21
(A) 5 (B) 11
(C) 14 (D) 21

Q2 Find the odd one out of the following:
10, 15, 20, 25, 45, 54, 60, 75, 80
(A) 80 (B) 75
(C) 45 (D) 54

Q3 Find the odd one out of the following:
8, 27, 64, 81, 125, 216, 343
(A) 27 (B) 81
(C) 216 (D) 343

Q4 **LETTER**: L E A D I N G
CODE DIGIT: 3 6 1 4 2 5 7
Find out the correctly coded alternative from amongst the given four alternatives.
NGADLIA
(A) 5114312
(B) 4716321
(C) 5714321
(D) None of the above

Q5 If EARTH is written as FCUXM in a certain code. How is DELHI written in that code?
(A) EFMIJ (B) EGOLN
(C) EFNJL (D) FGNKM

Q6 In a certain code, NEWYORK is written as 111, how is NEWZEALAND written in that code?
(A) 112 (B) 106
(C) 119 (D) 105

Q7 In a certain code, "TIGER" is written as "74159" and "LION" is written as "6247". How is "GOAT" written in that code?
(A) 1673 (B) 1467
(C) 4178 (D) 1437

Q8 Find odd man out of the following:
4, 9, 256, 529, 573
(A) 529 (B) 9
(C) 573 (D) 256

Q9 Find odd man out of the following:
January, May, July, November
(A) January (B) May
(C) July (D) November

Q10 Find odd man out of the following:
6, 9, 15, 21, 24, 28, 30
(A) 28 (B) 21
(C) 24 (D) 30

Q11 There are four groups of letters in each. Three of these groups are alike in some way while one is different. Find the one which is different.
TRP, YWU, SQO, TVX
(A) TRP (B) YWU
(C) SQO (D) TVX

Q12 Find odd man out of the following:
2, 5, 10, 17, 26, 37, 50, 64
(A) 50 (B) 26
(C) 37 (D) 64

Q13 Find odd man out of the following:
1, 5, 14, 30, 51, 55, 91
(A) 5 (B) 55
(C) 51 (D) 91

Q14 If TAP is coded as SZO, then how is FRIEND coded?
(A) EQJDNC (B) EQHDMC
(C) GSIEND (D) None of above

Q15

If CLOCK is coded 34235 and TIME is 8679. What will be the code of MOTEL?

(A) 72894 (B) 77684
(C) 72964 (D) 27894

Answer Key

Q1	(C)
Q2	(D)
Q3	(B)
Q4	(C)
Q5	(B)
Q6	(D)
Q7	(D)
Q8	(C)
Q9	(D)
Q10	(A)
Q11	(D)
Q12	(D)
Q13	(C)
Q14	(B)
Q15	(A)

Hints & Solutions

Q1 Text Solution:

Given: $1,\ 5,\ 7,\ 11,\ 14,\ 17,\ 21$

All the numbers given are odd numbers expect 14.

Therefore, 14 is odd out of the given numbers.

Hence, the correct option is (C) i.e., 14.

Q2 Text Solution:

Given: $10,\ 15,\ 20,\ 25,\ 45,\ 54,\ 60,\ 75,\ 80$

On observing, we analyze that all the numbers except for 54 are multiples of 5.

Therefore, 54 is odd out of the given numbers.

Hence, the correct option is (D) i.e., 54.

Q3 Text Solution:

Given: $8,\ 27,\ 64,\ 81,\ 125,\ 216,\ 343$

Here, all the numbers are perfect cubes except 81 which is a perfect square i.e.,

$8 = 2^3$

$27 = 3^3$

$64 = 4^3$

$81 = 9^2$

$216 = 6^3$

$343 = 7^3$

Therefore, 81 is odd out of the given numbers.

Hence, the correct option is (B) i.e., 81.

Q4 Text Solution:

Given:

L E A D I N G

3 6 1 4 2 5 7

Therefore, the word NGADLIA can be coded as 5714321.

Hence, the correct option is (C) i.e., 5714321.

Q5 Text Solution:

Given: EARTH is written as FCUXM in a certain code

We know,

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

i.e., E + 1 = F

A + 2 = C

R + 3 = U

T + 4 = X

H + 5 = M

Similarly, for DELHI

D + 1 = E

E + 2 = G

L + 3 = O

H + 4 = L

I + 5 = N

Therefore, DELHI is coded as EGOLN in the given code.

Hence, the correct option is (B) i.e., EGOLN.

Q6 Text Solution:

Given: NEWYORK is written as 111

We know that,

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

Here, NEWYORK = 14 + 5 + 23 + 25 + 15 + 18 + 11 = 111

Similarly, for NEWZEALAND

14 + 5 + 23 + 26 + 5 + 1 + 12 + 1 + 14 + 4 = 105

Therefore, NEWZEALAND is written as 105 in the same code.

Hence, the correct option is (D) i.e., 105.

Q7 Text Solution:

Given: "TIGER" is written as "74159" and "LION" is written as "6247"

T I G E R

7 4 1 5 9

L I O N

6 2 4 7

We observe that, G is coded as 1, O is coded as 4, T is coded as 7.

Thus, the possible codes for letter A are 0, 3, 8.
Out of the given options, the code for 'GOAT' is 1437.
Hence, the correct option is (D) i.e., 1437.

Q8 Text Solution:

On observing the pattern, we get
$2^2 = 4,$
$4^2 = 16,$
$(16)^2 = 256,$
$(23)^2 = 529$
All the numbers except 573 are perfect squares.
Hence, the correct answer is option (C) i.e. 573.

Q9 Text Solution:

Clearly, the months January, May and July are having 31 days whereas November has 30 days.
Hence, the correct answer is option (D) i.e. November.

Q10 Text Solution:

On observing the pattern, we see that
$3 \times 2 = 6,$
$3 \times 3 = 9,$
$3 \times 5 = 15,$
$3 \times 7 = 21,$
$3 \times 8 = 24,$
$3 \times 10 = 30$
All the numbers except 28 are the multiples of 3.
Hence, the correct answer is option (A) i.e. 28.

Q11 Text Solution:

On observing the pattern, we see that
TRP $\rightarrow$ T -2 = R, R -2 = P
YWU $\rightarrow$ Y -2 = W, W -2 = U
SQO $\rightarrow$ S -2 = Q, Q -2 = O
All the words follow a certain pattern except TVX.
Hence, the correct answer is option (D) i.e. TVX.

Q12 Text Solution:

On observing the pattern, we see that
$1^2 + 1 = 2,$
$2^2 + 1 = 5,$
$3^2 + 1 = 10,$
$4^2 + 1 = 17,$
$5^2 + 1 = 25,$
$6^2 + 1 = 37,$
$7^2 + 1 = 50,$
$8^2 + 1 = 65 \neq 64$
Hence, the correct answer is option (D) i.e. 64.

Q13 Text Solution:

Given: $1,\ 5,\ 14,\ 30,\ 51,\ 55,\ 91$
Here, the numbers are of the form:
$1^2 = 1$
$1^2 + 2^2 = 1 + 4 = 5$
$1^2 + 2^2 + 3^2 = 1 + 4 + 9 = 14$
$1^2 + 2^2 + 3^2 + 4^2 = 1 + 4 + 9 + 16 = 30$
$1^2 + 2^2 + 3^2 + 4^2 + 5^2 = 1 + 4 + 9 + 16 + 25 = 55$
$1^2 + 2^2 + 3^2 + 4^2 + 5^2 + 6^2 = 1 + 4 + 9 + 16 + 25 + 36 = 91$
But, 51 is not of the above form.
Hence, the correct option is (C) i.e. 51.

Q14 Text Solution:

Given: TAP is coded as SZO
i.e.,

T	A	P
-1	-1	-1
S	Z	O

Similarly, FRIEND will be coded as EQHDMC.
Hence, the correct option is (B) i.e., EQHDMC

Q15 Text Solution:

We have,
Word CLOCK is coded as 34235

C	L	O	C	K
3	4	2	3	5

Word TIME is coded as 8679

T	I	M	E
8	6	7	9

Therefore, the word MOTEL can be coded as 72894.

Hence, the correct option is (A) i.e., 72894.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

DIRECTION Sense

Q1 Mohan starts from point A and walks $1\ km$ towards south, turns left and walks $1\ km$. Then he turns left again and walks $1\ km$. Now he is facing _____ direction.

(A) East (B) West
(C) North (D) South-West

Q2 Rohit drove towards North for 20 km. Then he turned left and drove another 30 km. After a while, he again turned left and drove 20 km and took some rest. Once more he turned left and drove 30 km to reach to his town. In which direction is he driving now?

(A) West (B) East
(C) North (D) South

Q3 From her home Prerna wishes to go to school. From home she goes towards North and then turns left and then turns right, and finally she turns left and reaches school. In which direction her school is situated with respect to her home?

(A) North-East (B) North-West
(C) South-East (D) South-West

Q4 If a person moves $4\ km$ towards the west, then turns right and moves $3\ km$ and then turns right and moves $6\ km$. What is the direction in which he is now moving ?

(A) East (B) West
(C) North (D) South

Q5 A starts from a point and walks $5\ km$ north, then turns left and walks $3\ km$. Then again turns left and walks $5\ km$. Point out the direction in which he is going now.

(A) North (B) South
(C) East (D) West

Q6 A man is facing East, then he turns left and goes $10\ m$, then turns right and goes $5m$ then goes $5\ m$ to the South and from there $5\ m$ to the West. In which direction is he from his original place?

(A) East (B) West
(C) North (D) South

Q7 A tourist drives $10\ km$ towards west and turns to left and takes a drive of another $4\ km$. He then drives towards east another $4\ km$ and then turns to his right and drives $5\ km$. Afterwards he turns to his left and travels $6\ km$. In which direction is he from the starting point?

(A) North (B) East
(C) West (D) South

Q8 A car traveling from south covers a distance of $8\ km$, then turns right and runs another $9\ km$ and again turns to the right and stops. Which direction does it face now?

(A) South (B) North
(C) West (D) East

Q9 Seeta starts from a point, walks $2\ km$ towards north, turns towards her right and walks $2\ km$, turns right again and walks. What is the direction she is facing now?

(A) North (B) South
(C) West (D) East

Q10 I drove East for 5 miles then drove North 3 miles, then turned to my left and drove for 2 miles and again turned to my left. Which direction am I going now?

(A) South (B) North
(C) West (D) North-west

Answer Key

Q1	(C)	Q6	(C)
Q2	(B)	Q7	(D)
Q3	(B)	Q8	(A)
Q4	(A)	Q9	(B)
Q5	(B)	Q10	(A)

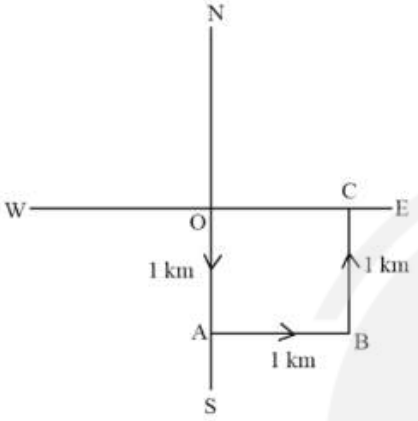
Hints & Solutions

Q1 Text Solution:

Given, A be the initial position of Mohan, then According to the question,

Mohan walks $1\ km$ towards the south and reaches to point B. He turns left, which means he moves towards the east side and reaches to point C. He again turns left and walks $1\ km$ towards the North direction.

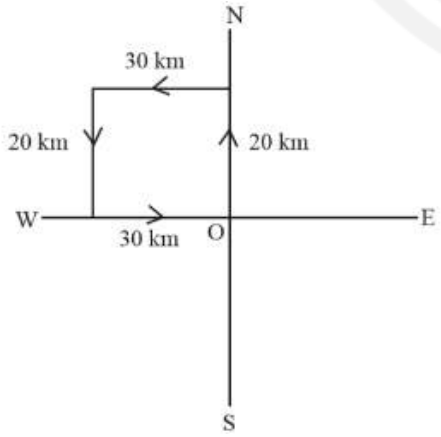
Thus, Mohan is facing the north side.



Hence, the correct answer is option (C) i.e. North.

Q2 Text Solution:

Taking O as the starting point and following the instructions as per the question, we get

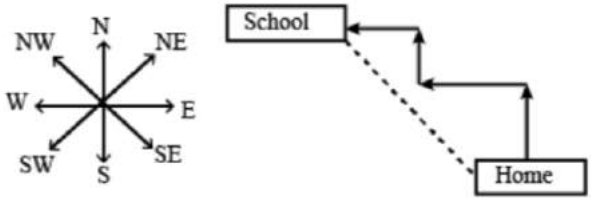


Clearly, he is driving in the east direction.

Hence, the correct answer is option (B) i.e. East.

Q3 Text Solution:

Following the directions given in the question, we get

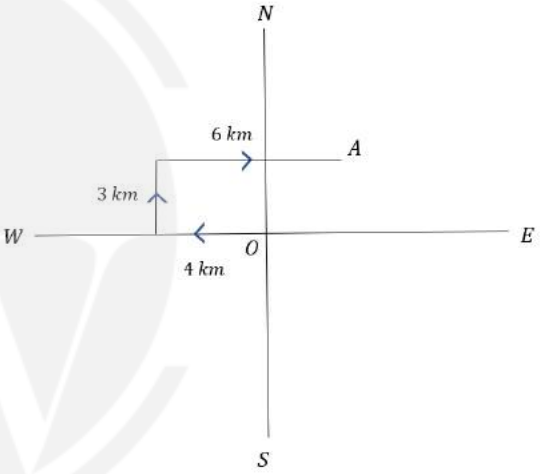


Clearly, her school is situated at the North-West with respect to her home.

Hence, the correct answer is option (B) i.e. North-West.

Q4 Text Solution:

Considering O to be the starting point and then moving along with the data of the question, we get

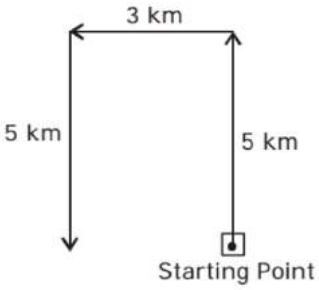


Clearly, his final position is at A, i.e., he is now moving in the east direction.

Hence, the correct answer is option (A) i.e. East.

Q5 Text Solution:

Let us take the starting point at the center and then move along with the data of the question, we get the following diagram.



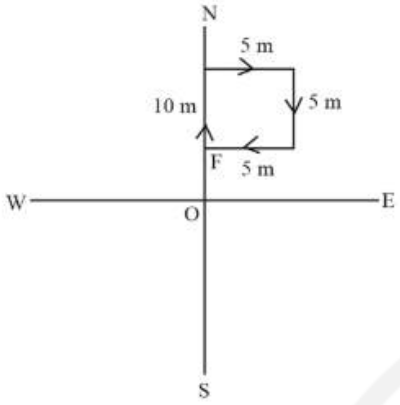
Therefore, he is going towards the south direction.

Hence, the correct option is (B) i.e. South.

Q6 Text Solution:

Let the initial position of the man is O.

Thus, on following the steps and moving along the directions we get the final diagram as:

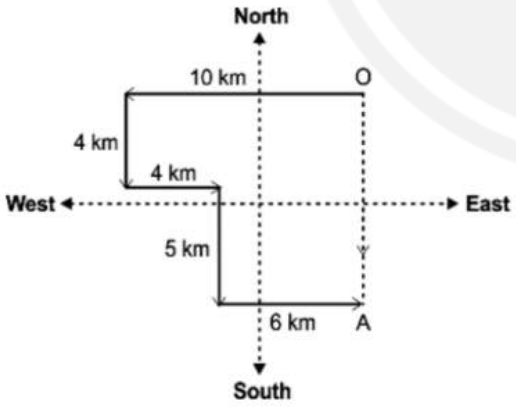


Therefore, his final position is at F which is towards north from his original position.

Hence, the correct answer is option (C) i.e. North.

Q7 Text Solution:

Taking O to be the starting point and following the instructions as per the question, we get

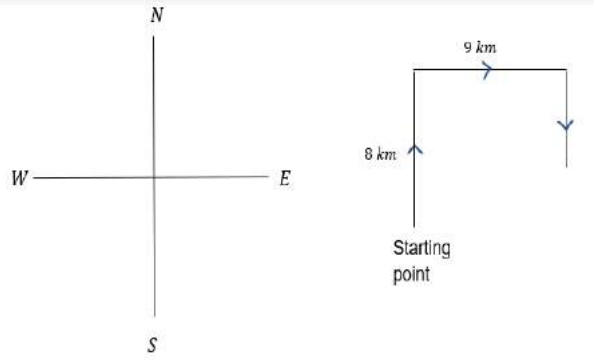


From the above diagram,he is at point A which is the south direction from the starting point.

Hence, the correct option is (D) i.e. South.

Q8 Text Solution:

According to the question, the car is moving from south i.e. it is moving from south to north direction and following the other instructions, we get

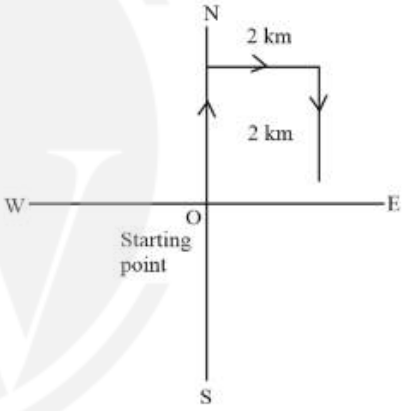


Clearly, the car is facing the South direction.

Hence, the correct answer is option (A) i.e. South.

Q9 Text Solution:

Consider the center to be the starting point and then moving along with the data of the question, we get

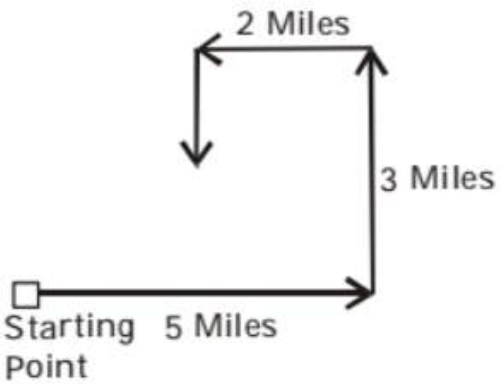


Clearly, she is facing the South direction.

Hence, the correct option is (B) i.e. South.

Q10 Text Solution:

According to the question, we get the following direction:



Clearly, he is facing the South direction.

Hence, the correct answer is option (A) i.e., south.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

DIRECTION Sense

Q1 Suresh starts from a point, walks 2 miles towards south, turns right and walks $1\frac{1}{2}$ miles, turns left and walks $\frac{1}{2}$ miles and then he turns back. What is the direction he is facing now?

(A) East (B) West
(C) South (D) North

Q2 A man starts from a point, walks 2 km towards north, turns towards his right and walks 2 km, turns right again and walks. What is the direction now he is facing?

(A) South (B) East
(C) North (D) West

Q3 Arun started from point A and walked 10 km East to point B, then turned to North and walked 3 km to point C and then turned West and walked 12 km to point D, then again turned South and walked 3 km to point E. In which direction is he from his start point?

(A) East (B) South
(C) West (D) North

Q4 Raju facing North and moves 20 km, then he turned to his right and moves 20 km and then he moves 10 km in North-East, then he turned to his right and moves 20 km and then he turned to his right and moves 20 km and again he turned to his left and moves 20 km. Now in which direction Raju is facing?

(A) South-East (B) North-East
(C) South-West (D) North-West

Q5 A rat runs 20 km towards East and turns to right runs 10 km and turns to right runs 9 km and again turns to left runs 5 km and then turns to left runs 12 km and finally turns to left and runs 6 km. Now what direction is the rat facing?

(A) East (B) North
(C) West (D) South

Q6 K is a place which is located 2 km away in the north-west direction from the capital P. R is another place that is located 2 km away in the south-west direction from K. M is another place and that is located 2 km away in the north-west direction from R. T is yet another place that is located 2 km away in the south-west direction from M. In which direction is T located in relation to P?

(A) South-West (B) North-West
(C) West (D) North

Q7 A man started walking West. He turned right, then right again and finally turned left. Towards which direction was he walking now?

(A) North (B) South
(C) West (D) East

Q8 A man starts from a point, walks 4 miles towards north and turns left and walks 6 miles, turns right and walks for 3 miles and again turns right and walks 4 miles and takes rest for 30 minutes. He gets up and walks straight 2 miles in the same direction and turns right and walks one mile. What is the direction he is facing?

(A) North (B) South
(C) South-East (D) West

Q9 A child walks 25 feet towards North, turns right and walks 40 feet, turns right again and walks 45 feet. He then turns left and walks 20 feet. He turns left again and walks 20 feet. Finally, he turns to his left to walk another 20 feet. In which direction is the child from his starting point?

(A) North (B) South
(C) West (D) East

Q10 A taxi driver commenced his journey from a point and drove 10 km toward north and turned to his left and drove another 5 km. After waiting to meet a friend here, he turned to his right and continued to drive another 10 km. He has covered a distance of 25 km so far, but in which direction would he be now?

(A) South (B) North
(C) East (D) South-East

Q11 Anand walked 20 m towards the north direction. After a while, he turned right and walked 30 m. Again, he turns to his right and walks 35 m. Then he turns left and walks 15 m. At last he turns to his left and walks 15 m. In which direction is Anand from the starting position?

(A) East (B) West
(C) North (D) South

Q12 Ana is facing north direction. She turns 90^o in the clockwise direction, Again after a while she turns 180^o in the anticlockwise direction and then another 90^o in the same direction. Which direction is she facing now?

(A) East (B) West
(C) North (D) South

Q13 Mohit walked 25 m towards the west direction. After a while, he turned to the right and walked 10 m. Again, he then turned to the right and walked 15 m.Now, he turned 135^o and walked 30 m. In which direction is he moving now?

(A) South (B) North-East
(C) South-West (D) West

Q14 Rohan walked 8 km towards the East. Then he turned back and walked 13 km. Again, he turned to his left and walked 4 km. Now, he walked 5 km after turning left. At last, he turned to his left and walked 3 km. How far and in which direction is he from the starting point ?

(A) $3\ km$ West
(B) $1\ km$ North
(C) $1\ km$ South
(D) $4\ km$ South

Q15 Sahil started from his school towards the north. After walking a distance of 18 m, he turned to the left and walked 14 m. He then turned to the left again and walked 30 m. After this, he is to turn left at 180 degrees and to cover 12 m. In which direction is he now as per his initial position?

(A) 14 m East (B) 14 m West
(C) 14 m South (D) 14 m North

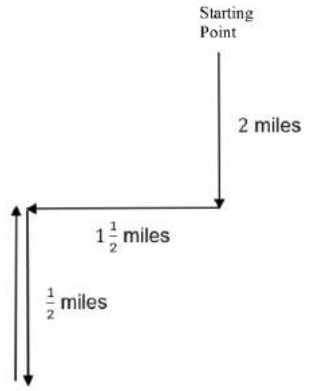
Answer Key

Q1	(D)
Q2	(A)
Q3	(C)
Q4	(A)
Q5	(B)
Q6	(C)
Q7	(A)
Q8	(B)
Q9	(D)
Q10	(B)
Q11	(A)
Q12	(D)
Q13	(C)
Q14	(C)
Q15	(B)

Hints & Solutions

Q1 Text Solution:

According to the question,

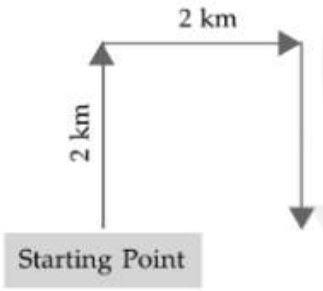


Clearly, Suresh is facing towards the north.

Hence, the correct option is (D) i.e. North.

Q2 Text Solution:

Following the directions as per the question, we get

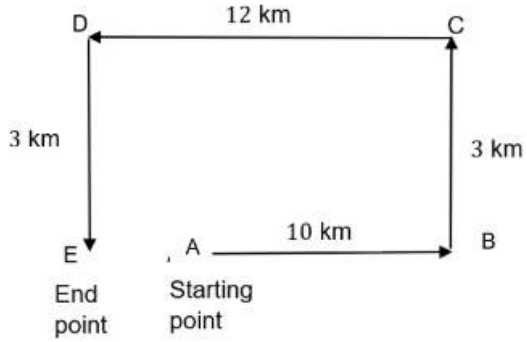


Clearly, he is facing the south direction.

Hence, the correct option is (A) i.e. South.

Q3 Text Solution:

Following the directions as per the question, we get

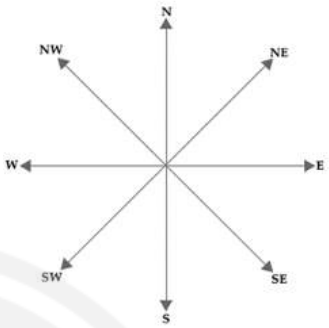


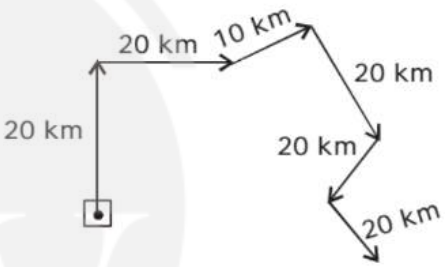
Therefore, Arun is in the west direction from his starting point.

Hence, the correct option is (C) i.e. West.

Q4 Text Solution:

Following the directions as per the question, we get



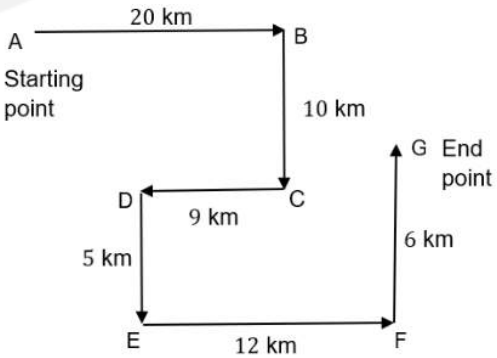


Therefore, Raju is facing South-East direction.

Hence, the correct option is (A) i.e. South-East.

Q5 Text Solution:

Following the direction as per the question, we get

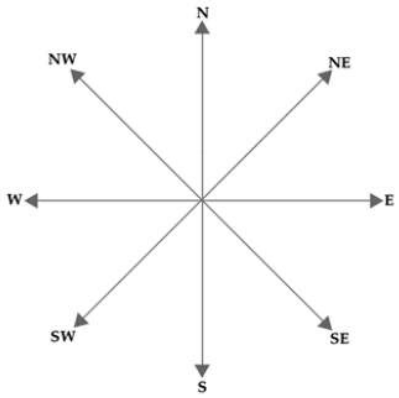


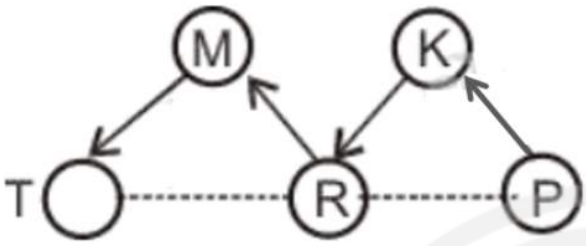
Clearly, the rat is facing the north direction.

Hence, the correct option is (B) i.e. North.

Q6 Text Solution:

Following the directions as per the question, we get



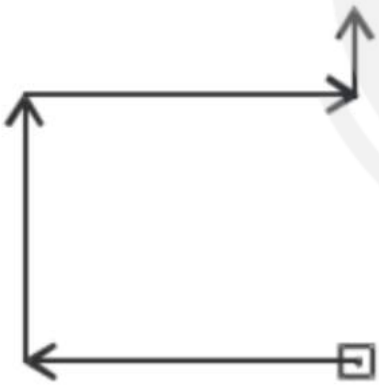


Therefore, T is located in the west direction in relation to P.

Hence, the correct option is (C) i.e. West.

Q7 Text Solution:

Following the directions as per the question, we get

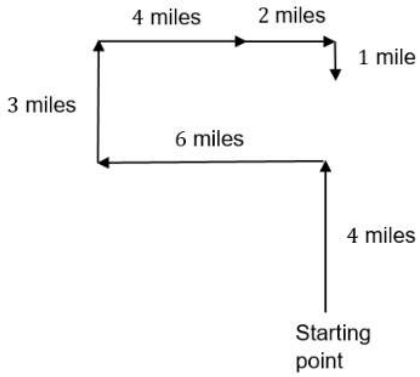


Clearly, the man is walking in the North direction now.

Hence, the correct option is (A) i.e. North.

Q8 Text Solution:

Following the directions as per the question, we get

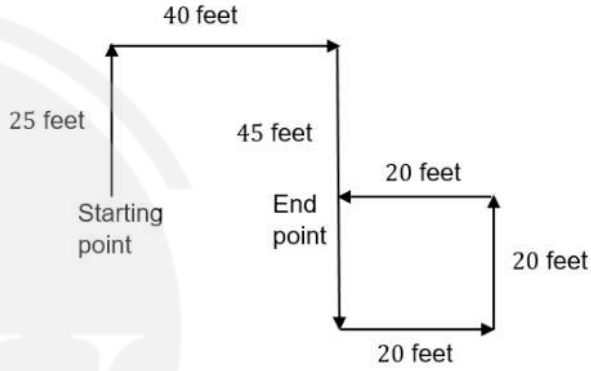


Therefore, he is facing in the South direction.

Hence, the correct option is (B) i.e. South.

Q9 Text Solution:

Following the directions as per the question, we get

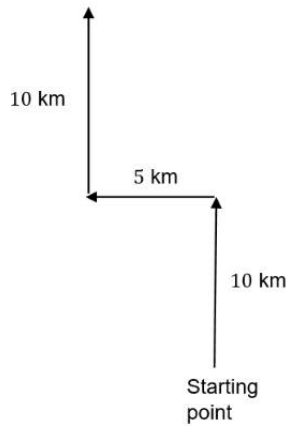


Therefore, the child is in the East direction from his starting point.

Hence, the correct option is (D) i.e. East.

Q10 Text Solution:

Following the directions as per the question, we get

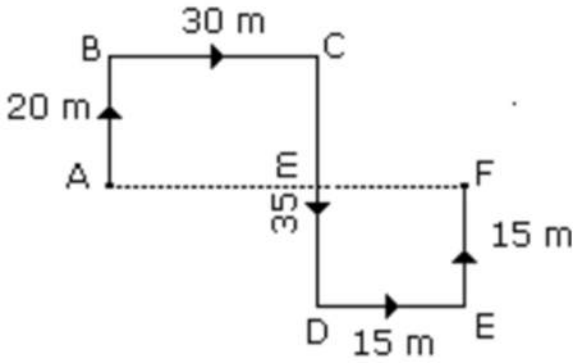


Therefore, he is moving in the North direction.

Hence, the correct option is (B) i.e. North.

Q11 Text Solution:

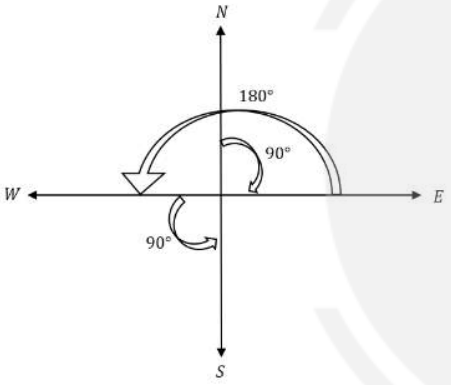
Let the initial position of Anand is at A the following the directions as per the question, we have



Thus, the final position of Anand is at F which is the East direction from the starting point.
Hence, the correct option is (A) i.e., East.

Q12 Text Solution:

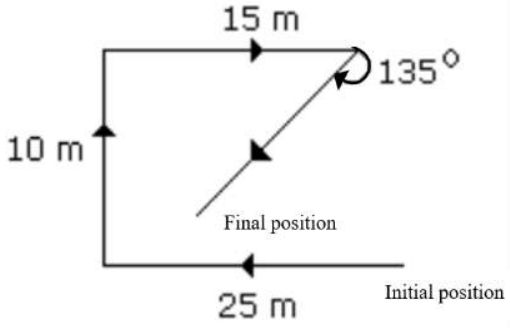
The directions of Ana according to the question is as follow:



Therefore, Ana is facing the South direction now.
Hence, the correct option is (D) i.e., South.

Q13 Text Solution:

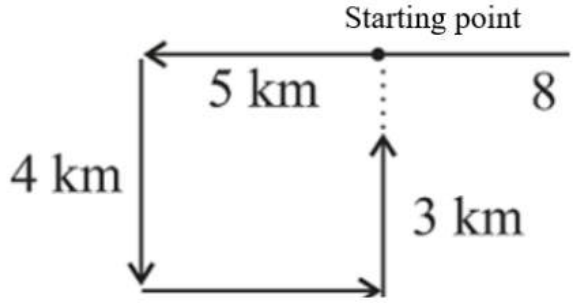
Following the directions as per the question,



Therefore, he is moving in a South-west direction.
Hence, the correct option is (C) i.e., South-West.

Q14 Text Solution:

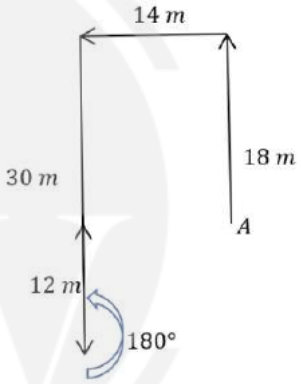
Following the direction as per the question, we have



Therefore, he is at distance of $(4-3)\ km = 1\ km$ in the South.
Hence, the correct option is (C) i.e., $1\ km$ South.

Q15 Text Solution:

Following the directions as per the question, we get



Clearly, Sahil is 14 m West as per his initial position.
Hence, the correct option is (B) i.e., 14 m West.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

SEATING ARRANGEMENT

Q1 In a park, there are five trees labeled A, B, C, D, and E. Tree A is to the right of Tree B. Tree C is to the right of Tree D. Also, Tree D is to the right of Tree E and Tree B is to the right of Tree C.
Which tree is in the middle?
(A) Tree B (B) Tree A
(C) Tree D (D) Tree C

Q2 Five students P, Q, R, S, and T, are positioned in a row facing North. Among them, S is seated between T and Q, and Q is immediately to the left of R. P is immediately to the left of T. Who is positioned at the second right?
(A) S (B) T
(C) R (D) Q

Q3 A, B, C, D, and E are seated on a bench. A is seated adjacent to B, C is seated next to D, D is not seated next to E, who occupies the leftmost position on the bench. C is in the second position from the right. A is to the right of both B and E. A and C are seated together. What is A's position?
(A) Between B and D
(B) Between B and C
(C) Between E and D
(D) Between C and E

Q4 In a classroom, there are six students sitting in a row. The following statements are given:
A is to the left of B.
C is to the right of D.
E is to the left of F and right of C.
D is to the right of A.
Which of the following students is in the middle?
(A) A (B) C
(C) E (D) B

Q5 There are five houses P, Q , R, S, T. P is the immediate right of Q and T is the immediate left of R and immediate right of P. Q is on the right of S. Which house is located at the extreme left end?
(A) P (B) R
(C) S (D) T

Q6 In a row, there are six individuals labeled A, P, R, X, S, and Z. Both S and Z are positioned in the center. A and P occupy the ends of the row. R is seated to the left of A. Who is seated to the immediate right of P?
(A) X (B) A
(C) Z (D) S

Q7 Five boys A_1, A_2, A_3, A_4 and A_5 are sitting in a stair in the following way.
I. A_5 is above A_1
II. A_4 is under A_2
III. A_2 is under A_1
IV. A_4 is between A_2 and A_3
Who is at the lowest position of the stair?
(A) A_1 (B) A_3
(C) A_5 (D) A_2

Q8 In a classroom, five students named Alice, Bob, Charlie, Dave, and Emma are seated in a row facing the front. Here, Charlie is sitting between Dave and Emma, and Dave is to the immediate left of Bob. Alice is to the immediate left of Emma. Who is in the middle?
(A) Charlie (B) Bob
(C) Emma (D) Dave

Q9 In a conference, seven participants labeled A, B, C, D, E, F, and G are seated in a row. The following statements are given:

1. C is seated to the left of B, but on the right of D.
2. A is seated to the right of B.
3. F is seated to the right of E, but to the left of D.
4. H is seated to the left of E.

Which person is seated at the extreme right end?

(A) H (B) D
(C) A (D) None of these

Q10 Five friends are sitting on a bench. A is to the immediate left of B but on the immediate right of C, D is to the immediate right of B but on the immediate left of E. Who are at the extremes?

(A) A, B (B) A, D
(C) C, E (D) B, D

Answer Key

Q1	(D)	Q6	(A)
Q2	(D)	Q7	(B)
Q3	(B)	Q8	(A)
Q4	(B)	Q9	(C)
Q5	(C)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Let's analyze the given information step by step to determine which tree is in the middle:

Tree A is to the right of Tree B i.e., B A

Tree C is to the right of Tree D i.e., D C

Tree D is to the right of Tree E i.e., E D

Tree B is to the right of Tree C i.e., C B

Thus, the final arrangement:

E D C B A

From the arrangement, we can see that Tree C is in the middle position.

Hence, the correct option is (D) i.e.,Tree C.

Q2 Text Solution:

According to the question,

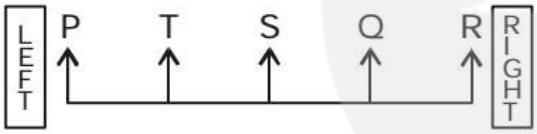
Students are sitting in a row facing North.

S is seated between T and Q i.e. T S Q

Q is seated immediately to the left of R i.e. Q R

P is seated immediately to the left of T i.e. P T

Thus, the final sitting arrangement:-



As shown in figure, Q is seated at second right.

Hence, the correct option is (D) i.e., Q.

Q3 Text Solution:

According to the question,

E occupies the leftmost position on the bench and C is at second position from the right i.e.,

E _ _ C _

Now, A is seated adjacent to B and C is seated next to D.

Also, A and C are seated together thus the possible arrangement is:

E B A C D

Therefore, A is sitting between B and C.

Hence, the correct option is (B) i.e., Between B and C.

Q4 Text Solution:

According to the question,

A is to the left of B i.e., A B

Also, C is to the right of D i.e., D C

Now, E is to the left of F and right of C i.e., C E F

Since, D is to the right of A i.e., A will be at the left of D.

Thus, the possible arrangement is:

A B D C E F

From the arrangement, we can see that C is in the middle position.

Therefore, the student in the middle is C.

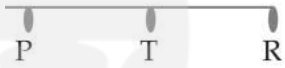
Hence, the correct option is (B) i.e., C.

Q5 Text Solution:

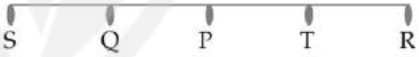
According to the question,

P is immediate right of Q

T is immediate left of R and immediate right of P i.e.,



Now, Q is in the right of S, thus the final arrangement will be:



Therefore, house S is located at the extreme left end.

Hence, the correct option is (C) i.e. S.

Q6 Text Solution:

According to the question,

A and P occupy the ends of the row and R is seated to the left of A,

i.e., P __ __ __ R A

Also, both S and Z are positioned in the center,

P __ S/Z Z/S R A

Thus, the possible position of X is

P X S/Z Z/S R A

Therefore, X is seated to the immediate right of P.

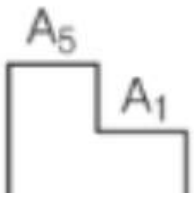
Hence, the correct option is (A) i.e., X.

Q7 Text Solution:

Arrangement according to question,

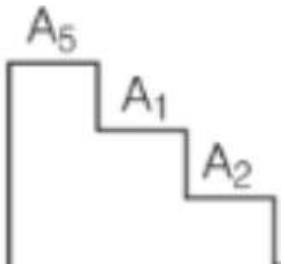
Since, A_5 is above A_1 (from I)

i.e.



Now, A_2 is under A_1 (from III)

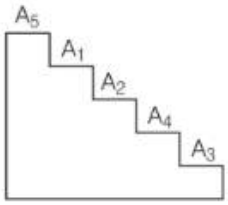
i.e.



Also, A_4 is under A_2

i.e.

Now, A_4 is between A_2 and A_3, thus



Therefore, A_3 is at the lowest position of the stair.

Hence, the correct option is (B).

Q8 Text Solution:

According to the question,

Charlie is sitting between Dave and Emma,

i.e, Dave Charlie Emma 'or' Emma Charlie Dave

Also, Dave is to the immediate left of Bob,

i.e., Dave Bob

Now, Alice is to the immediate left of Emma,

Alice Emma

Considering all the information given, let's arrange the seating positions:

Alice - Emma - Charlie - Dave - Bob

From the arrangement, we can see that Charlie is seated in the middle position.

Hence, the correct option is (A) i.e., Charlie.

Q9 Text Solution:

Considering the seven participants facing in North direction, then

According to the question,

'C' is seated left to 'B' but on the right to 'D' i.e.

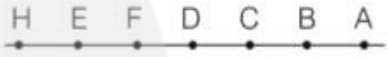
D C B

'A' is seated right to 'B' i.e. D C B A

'F; is seated right to 'E' but left to 'D' i.e.

E F D C B A

'H' is seated to the left to 'E', then the final arrangement of the seven members in row will be:



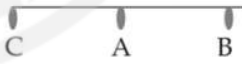
Therefore, A is seated at the extreme right end.

Hence, the correct option is (C) i.e., A.

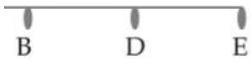
Q10 Text Solution:

According to the question,

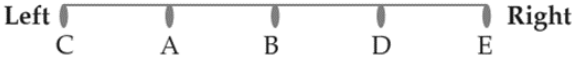
A is to the immediate left of B but on the immediate right of C i.e.



Also, D is to the immediate right of B but on the immediate left of E i.e.



Thus, the final arrangement will be:



Therefore, C and E are at the extremes.

Hence, the correct answer is option (C) i.e. C, E.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

NUMBER SERIES, CODING-DECODING AND ODD MAN OUT

Q1 Find the odd man out of the following:
13, 14, 18, 27, 32, 43, 68.
(A) 27 (B) 43
(C) 32 (D) 68

Q2 What is the next term of the series:
3, 7, 15, 31, ? , 127
(A) 46
(B) 58
(C) 63
(D) None of the above

Q3 What is the next term of the series:
6, 12, 48, 264, 1560, ?
(A) 9432 (B) 9864
(C) 9268 (D) 9336

Q4 What is the next term of the series:
6, 16, 44, 126, 370, ?
(A) 1100
(B) 1250
(C) 1055
(D) None of the above

Q5 Find the odd one out of the following:
4, 9, 16, 25, 36, 48, 64
(A) 25 (B) 16
(C) 48 (D) 9

Q6 If GOLD is written as IQNF, how can WIND be written as code?
(A) YKPF (B) VHCM
(C) XJOE (D) DNIW

Q7 Find the odd one out of the following:
1, 12, 13, 25, 38, 62, 101
(A) 1 (B) 25
(C) 62 (D) 101

Q8 If MEKLF is coded as 91782 and LLLJK as 88867, how can IHJED be coded as?
(A) 97854 (B) 64512
(C) 54610 (D) 75632

Q9 **LETTER**: C Z N V R S W F D
CODE DIGIT: 8 6 4 7 2 9 3 5 1
Find out the correctly coded alternative from amongst the given four alternatives.
WNCSZV
(A) 348267 (B) 318267
(C) 348957 (D) 348967

Q10 If BROTHER is coded 2456784, SISTER coded as 919684, what is coded for BORBERS?
(A) 2542849 (B) 2542898
(C) 2454889 (D) 2524889

Q11 2, 5, 9, 14, ? , 27
(A) 20 (B) 16
(C) 18 (D) 24

Q12 10, 100, 200, 310, 430, ?
(A) 560 (B) 540
(C) 550 (D) 590

Q13 Find the odd one out of the following:
36, 20, 12, 8, 6, 4
(A) 20 (B) 4
(C) 36 (D) 12

Q14 Find the missing number of the sequence:
4, 17, 43, 95, 199, ?
(A) 304 (B) 234
(C) 269 (D) 407

Q15 In certain code 'BILLION' is written as 'I B L L O I N'. How is 'HILTON' written in that code?
(A) I H T L O N (B) I H T L N O
(C) O H T L I N (D) H I T L N O

Answer Key

Q1	(C)
Q2	(C)
Q3	(D)
Q4	(A)
Q5	(C)
Q6	(A)
Q7	(C)
Q8	(C)
Q9	(D)
Q10	(A)
Q11	(A)
Q12	(A)
Q13	(B)
Q14	(D)
Q15	(B)

Hints & Solutions

Q1 Text Solution:

Given: $13,\ 14,\ 18,\ 27,\ 32,\ 43,\ 68$

The pattern in the given numbers is:

13 + 1 = 14

14 + 4 = 18

18 + 9 = 27

27 + 16 = 43

43 + 25 = 68

The number 32 does not follow the pattern.

Therefore, the odd one out is 32.

Hence, the correct option is (C).

Q2 Text Solution:

Given: $3,\ 7,\ 15,\ 31,\ ?\ ,\ 127$

$3\ \times\ 2\ +\ 1 = 7$

$7\ \times\ 2\ +\ 1 = 15$

$15\ \times\ 2\ +\ 1 = 31$

$31\ \times\ 2\ +\ 1 = 63$

$63\ \times\ 2\ +\ 1 = 127$

Therefore, the missing number is 63.

Hence, the correct option is (C) i.e., 63.

Q3 Text Solution:

Given series: $6,\ 12,\ 48,\ 264,\ 1560,\ ?$

On observing the pattern, we see

$6 + 6^1 = 12$

$12 + 6^2 = 12 + 36 = 48$

$48 + 6^3 = 48 + 216 = 264$

$264 + 6^4 = 264 + 1296 = 1560$

$1560 + 6^5 = 1560 + 7776 = 9336$

Therefore, the missing term is 9336.

Hence, the correct option is (D).

Q4 Text Solution:

Given series: $6,\ 16,\ 44,\ 126,\ 370,\ ?$

On observing the series, we get

$6\ \times\ 3 - 2 = 16$

$16\ \times\ 3 - 4 = 44$

$44\ \times\ 3 - 6 = 126$

$126\ \times\ 3 - 8 = 370$

$370\ \times\ 3 - 10 = 1100$

Therefore, the missing term is 1100.

Hence, the correct option is (A) i.e., 1100.

Q5 Text Solution:

Given: $4,\ 9,\ 16,\ 25,\ 36,\ 48,\ 64$

The pattern in the given numbers is:

$2^2 = 4$

$3^2 = 9$

$4^2 = 16$

$5^2 = 25$

$6^2 = 36$

$7^2 = 49$

$8^2 = 64$

The number 48 does not follow the pattern.

Therefore, the odd one out is 48.

Q6 Text Solution:

We know,

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

The pattern followed here is:

Adding 2 to the place values of the letters.

G + 2 = I

O + 2 = Q

L + 2 = N

D + 2 = F

Therefore, WIND can be written as:

W + 2 = Y

I + 2 = K

N + 2 = P

D + 2 = F

Hence, the correct option is (A) i.e., YKPF.

Q7 Text Solution:

Given: $1,\ 12,\ 13,\ 25,\ 38,\ 62,\ 101$

Here, the pattern followed is:

$1\ +\ 12\ =\ 13$

$12\ +\ 13\ =\ 25$

$13\ +\ 25\ =\ 38$

$25\ +\ 38\ =\ 63 \neq 62$

$38\ +\ 63\ =\ 101$

Here, each number is the sum of its preceding two numbers except for first two number.

Therefore, 62 is odd out of the following numbers given.

Hence, the correct option is (C) i.e., 62.

Q8 Text Solution:

We have,

Alphabets	A	B	C	D	E	F	G	H	I	J	K	L	M
Positional value	1	2	3	4	5	6	7	8	9	10	11	12	13
Positional value	26	25	24	23	22	21	20	19	18	17	16	15	14
Alphabets	Z	Y	X	W	V	U	T	S	R	Q	P	O	N

The pattern followed here is:

Subtracting 4 from the place values of the letters.

For MEKLF,

M = 13 - 4 = 9

E = 5 - 4 = 1

K = 11 - 4 = 7

L = 12 - 4 = 8

F = 6 - 4 = 2

For LLLJK,

L = 12 - 4 = 8

L = 12 - 4 = 8

L = 12 - 4 = 8

J = 10 - 4 = 6

K = 11 - 4 = 7

Similarly, for IHJED

I = 9 - 4 = 5

H = 8 - 4 = 4

J = 10 - 4 = 6

E = 5 - 4 = 1

D = 4 - 4 = 0

Hence, the correct option is (C) i.e., 54610.

Q9 Text Solution:

Given:

C	Z	N	V	R	S	W	F	D
8	6	4	7	2	9	3	5	1

Therefore, the word WNCSZV can be coded as 348967.

Hence, the correct option is (D) i.e., 348967.

Q10 Text Solution:

We have,

BROTHER = 2456784 and SISTER = 919684

B	R	O	T	H	E	R
2	4	5	6	7	8	4

S	I	S	T	E	R
9	1	9	6	8	4

Similarly,

B	O	R	B	E	R	S
2	5	4	2	8	4	9

Hence, the correct option is (A) i.e., 2542849.

Q11 Text Solution:

Given sequence: 2, 5, 9, 14, ? , 27

Here,

2 + 3 = 5

5 + 4 = 9

9 + 5 = 14

From the observation, we can say that the next term of the sequence will be 14 + 6 = 20

Therefore, the missing term of the sequence is 20.

Hence, the correct option is (A) i.e., 20.

Q12 Text Solution:

Given: 10, 100, 200, 310, 430, ?

The pattern follows here is:

10 + 90 = 100

100 + 100 = 200

200 + 110 = 310

310 + 120 = 430

Thus, the next term will be:

430 + 130 = 560

Hence, the correct option is (A) i.e., 560.

Q13 Text Solution:

Given: $36,\ 20,\ 12,\ 8,\ 6,\ 4$

On observing the pattern, we have

$36 - 16 = 20$

$20 - 8 = 12$

$12 - 4 = 8$

$8 - 2 = 6$

$6 - 1 = 5 \neq 4$

Therefore, 4 is odd out of the following numbers given.

Hence, the correct option is (B) i.e., 4.

Q14 Text Solution:

Given sequence: $4,\ 17,\ 43,\ 95,\ 199,\ ?$

On observing the pattern, we have

$4\ +\ 13 = 17$

$17\ +\ 26 = 43$

$43\ +\ 52 = 95$

$95\ +\ 104 = 199$

Therefore, the missing number $= 199\ +\ 208 = 407$

Henec, the correct option is (D) i.e., 407.

Q15 Text Solution:

Given: 'BILLION' is coded as 'I B L L O I N'

We observe that the letters are exchanged in pairs

i.e., B I becomes I B, L L becomes L L, I O becomes O I and N remains same since it does not have any pair.

Similarly 'HILTON' can be coded as 'I H T L N O'

Hence, the correct option is (B) i.e., I H T L N O.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

SEATING ARRANGEMENT

Q1 In a residential complex, five families named A, B, C, D, and E are living in a multi-storeyed building. The following statements are given:
Family A lives in a flat above Family B.
Family C lives in a flat below Family D.
Family B lives in a flat above Family D.
Family E lives in a flat below Family C.
Which family lives in the middle?
(A) Family A (B) Family B
(C) Family C (D) Family D

Q2 In a queue, five individuals are standing in a line. One of the two individuals at the extreme ends is a doctor, and the other is an engineer. An artist is standing to the right of the student. An architect is positioned to the left of the engineer. The student is standing between the doctor and the artist. Counting from the left, at which place is the architect?
(A) 2^{nd}
(B) 3^{rd}
(C) 4^{th}
(D) None of these

Q3 Six children named P, Q, R, S, T, and U are standing in a row. The following statements provide their positions:

1. Q is between U and T.
2. R is between P and U.
3. S does not stand next to P.

Between which pairs of children is R standing?
(A) P and Q (B) Q and T
(C) T and U (D) U and P

Q4 Four girls A, B, C, D are sitting around a circle facing the centre. B and C infront of each other, which of the following is definitely true?
(A) A and D infront of each other
(B) A is not between B and C
(C) D is left of C
(D) A is left of C

Q5 Six friends are seated in a circular arrangement, all facing the center. Deepa is positioned between Prakash and Pankaj. Priti is located between Mukesh and Lalit and Mukesh is sitting right to Priti. Prakash and Mukesh are seated opposite each other. Who is sitting immediate left to Prakash ?
(A) Mukesh (B) Deepa
(C) Pankaj (D) Lalit

Q6 Five boys are standing in a row facing East. Pavan is to the left of Tavan, Vipin and Chavan. Tavan, Vipin and Chavan are to the left of Nakul. Chavan is between Tavan and Vipin. If Vipin is fourth from the left, then how far is Tavan from the right ?
(A) First (B) Second
(C) Third (D) Fourth

Q7 Six individuals named A, B, C, D, E, and F are seated in front of one another in two rows. Each row has three people. The following statements provide their seating arrangement:

1. A is seated between D and F and is facing North.
2. B, who is to the immediate left of E, is facing F.
3. C is seated to the immediate right of E.

Who is sitting in front of C?
(A) E (B) B
(C) D (D) C

Q8

In a row facing North, there are seven individuals named A, B, C, D, E, F, and G. The following statements provide their seating arrangement:

1. F is seated immediately to the right of E.
2. E is positioned 4th to the right of G.
3. C is the neighbor of both B and D.
4. The person who is third to the left of D is located at one of the ends.

Who are seated to the left of C?

(A) G and B (B) G, B and D
(C) Only B (D) D, E, F and A

Q9 A to H are seated in a straight line facing North. C sits fourth left of G. D sits second to right of G. Only two people sit between D and A. B and F are immediate neighbours of each other. B is not an immediate neighbour of A. H is not neighbour of D.

How many persons are seated between A and E?

(A) One (B) Two
(C) Three (D) Four

Q10 Six girls, named P, Q, R, S, T, and V, are seated in a circle, all facing the center.
The following statements are given:

1. T is not seated between Q and S but instead, between two other individuals.
2. P is positioned immediately to the left of V.
3. R is located four seats to the right of P.

Which of the following statements is not true?

(A) V is seated just to the right of P.
(B) T is seated just to the right of V.
(C) R is positioned second to the left of T.
(D) P is seated second to the right of R.

Answer Key

Q1	(D)	Q6	(D)
Q2	(C)	Q7	(C)
Q3	(D)	Q8	(A)
Q4	(A)	Q9	(A)
Q5	(B)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

According to the question,

Family A lives in a flat above Family B i.e.,

Family A

Family B

Also, Family C lives in a flat below Family D and Family B lives in a flat above Family D i.e.,

Family B

Family D

Family C

Now, Family E lives in a flat below Family C thus the final arrangement is:

Family A

Family B

Family D

Family C

Family E

Therefore, family D lives in the middle.

Hence, the correct option is (D) i.e., Family D.

Q2 Text Solution:

According to the given statement,

One of the two individuals at the extreme ends is a doctor and the other is an engineer i.e.,

Doctor/Engineer _____ _____ _____ Engineer/Doctor

Also, an artist is standing to the right of the student and the student is standing between the doctor and the artist i.e.,

Doctor Student Artist

Now, an architect is positioned to the left of the engineer i.e.,

Architect Engineer

From the given information, we can deduce the following arrangement:

Doctor - Student - Artist - Architect - Engineer

Counting from the left, we find that the architect is at the 4th place.

Hence, the correct option is (C).

Q3 Text Solution:

According to the given information,,

Q is between U and T and R is between P and U i.e.,

P R U Q T

'or'

T Q U R P

Also, S does not stand next to P i.e.,

P R U Q T S

'or'

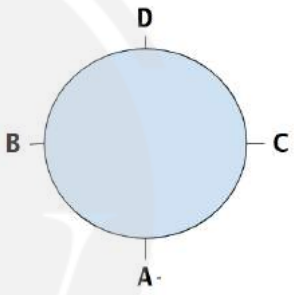
S T Q U R P

From both the arrangement, we can see that R is standing between P and U.

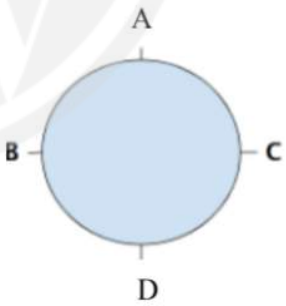
Hence, the correct option is (D) i.e., U and P.

Q4 Text Solution:

According to the given information,



'OR'



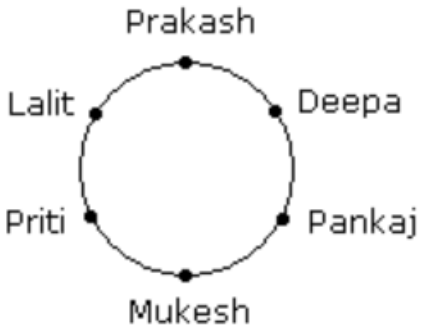
Therefore, A and D are infront of each other is definitely a true statement.

Hence, the correct option is (A) i.e., A and D infront of each other.

Q5 Text Solution:

According to the question,

The arrangement of six friends are as follow:



Therefore, Deepa is sitting immediate left to Prakash.

Hence, the correct option is (B) i.e., Deepa.

Q6 Text Solution:

According to the question, all the five boys are standing in a row facing East.

Since, Vipin is fourth from the left

___ ____ ____ Vipin ____

Now, Chavan is between Tavan and Vipin.

___ Tavan Chavan Vipin ____

Also, Pavan is to the left of Tavan, Vipin and Chavan, and Vipin and Chavan are to the left of Nakul.

Pavan Tavan Chavan Vipin Nakul

which is the required sequence of the five boys.

Clearly, Tavan is fourth from the right.

Hence, the correct option is (D) i.e., Fourth.

Q7 Text Solution:

According to the given information,

A is seated between D and F and is facing North i.e.,

Row : D/F A F/D

Also, B who is to the immediate left of E, is facing F and C is seated to the immediate right of E i.e., the possible arrangement

Row 1: C E B

Row 2: D A F

From the arrangement, we can see that D is sitting in front of C.

Hence, the correct option is (C).

Q8 Text Solution:

According to the given information,

E is positioned 4th to the right of G. This gives us the following arrangement i.e.,

G _ _ _ E

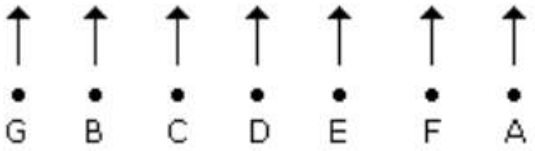
Since F is seated immediately to the right of E, i.e.,

G _ _ _ E F _

Also, C is the neighbor of both B and D and the person who is third to the left of D is located at one of the ends thus

G B C D E F

Thus, the position of A and the final arrangement will be:



Therefore, G and B are seated to the left of C.

Hence, the correct option is (A) i.e., G and B.

Q9 Text Solution:

According to question,

Eight persons from A to H are seated in a straight line facing North.

C sits fourth left of G. D sits second to right of G i.e.

C ____ ___ ___ G ___ D

Only two people sit between D and A i.e.

C ____ ___ A G ___ D

B and F are immediate neighbours of each other and B is not an immediate neighbour of A i.e.

C B F A G ___ D

H is not neighbour of D

H C B F A G E D

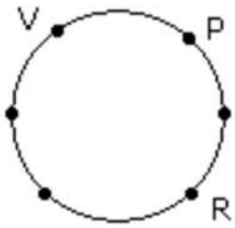
Therefore, 1 person are seated between A and E i.e. G.

Hence, the correct option is (A) i.e., one.

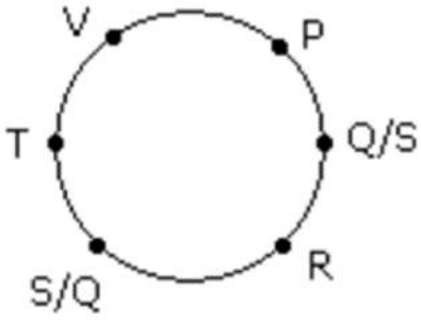
Q10 Text Solution:

According to the question,

P is positioned immediately to the left of V and R is located four seats to the right of P i.e.,



Also, T is not seated between Q and S but instead, between two other individuals thus



Therefore, out of the given options, R is positioned second to the left of T is not true since R is positioned second to the right of T.
Hence, the correct option is (C).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

BLOOD RELATION

Q1 If X is the wife of Y and Z is the father of W and Y. What is Z to X?
(A) Father (B) Brother
(C) Uncle (D) Father-in-law

Q2 A is the father of D. D is the son of E. E is the daughter of F. What is A to F?
(A) Son-in-law (B) Husband
(C) Son (D) None of these

Q3 Ravi is the brother of Anu. Sita is the sister of Mohan. Anu is the daughter of Sita. How is Ravi related to Sita?
(A) Nephew (B) Father
(C) Son (D) Brother

Q4 Maya introduces Rajesh as the son of the only daughter of her mother's brother. How is Maya related to Rajesh?
(A) Cousin (B) Sister
(C) Aunt (D) Niece

Q5 Sanjay's mother said to him, "My brother has a son whose daughter is Tina." How is Tina related to Sanjay?
(A) Cousin (B) Sister
(C) Aunt (D) Niece

Q6 Vinod introduces Vishal as the son of the only brother of his father's wife. How is Vinod related to Vishal ?
(A) Cousin (B) Brother
(C) Son (D) Uncle

Q7 P is Q's brother. Q is R's father. R and S are sisters. How is P related to S?
(A) Son (B) Uncle
(C) Father (D) Grandson

Q8 Aryan is the brother of Bhavana. Deepak is the brother of Chetna. Bhavana is the daughter of Deepak. How is Aryan related to Chetna?
(A) Nephew (B) Father
(C) Son (D) Brother

Q9 A and B are the young ones of C. If C is the mother of B but A is not the daughter of C, then what is the relationship between C and A?
(A) Nephew and Aunty
(B) Brother and Sister
(C) Mother and Son
(D) Niece and Aunty

Q10 A and B are sisters. A is the mother of D. B has a daughter C who is married to F. G is the husband of A. How is C related to D?
(A) Cousin (B) Niece
(C) Aunt (D) Sister-in-law

Q11 A is the mother of D and sister of B. B has a daughter C who is married to F. G is the husband of A. How is G related to D ?
(A) Uncle (B) Husband
(C) Son (D) Father

Q12 M is the son of P. Q is the grand-daughter of O, who is the husband of P. How is M related to O?
(A) Son (B) Daughter
(C) Mother (D) Father

Answer Key

Q1	(D)	Q7	(B)
Q2	(A)	Q8	(A)
Q3	(C)	Q9	(C)
Q4	(C)	Q10	(A)
Q5	(D)	Q11	(D)
Q6	(A)	Q12	(A)

Hints & Solutions

Q1 Text Solution:

In the given scenario, X is the wife of Y and Z is the father of W and Y. This means that Y is the child of Z, and X is married to Y.

Therefore, Z is X's Father-in-law.

Hence, the correct option is (D)

Q2 Text Solution:

Given: A is the father of D and D is the son of E.

This means E is wife of D.

Also, E is the daughter of F i.e., F can be father-in-law or mother-in-law of D.

Therefore, D is F's son-in-law.

Hence, the correct option is (A) i.e., Son-in-law.

Q3 Text Solution:

Given: Ravi is the brother of Anu and Anu is the daughter of Sita.

Since, Ravi and Anu are siblings, and Anu is the daughter of Sita, this means that Ravi is the son of Sita.

Therefore, Ravi is Sita's son.

Hence, the correct option is (C) i.e., Son.

Q4 Text Solution:

In the given scenario, Maya introduces Rajesh as the son of the only daughter of her mother's brother.

i.e., Maya's mother's brother has a daughter, and that daughter is Rajesh's mother. As Maya is the daughter of Rajesh's grandmother, thus Maya is .

Therefore, Maya is Rajesh's aunt.

Hence, the correct option is (C) i.e., Aunt.

Q5 Text Solution:

In the given scenario, Sanjay's mother states that her brother has a son whose daughter is Tina.

This means that Tina is the daughter of Sanjay's cousin.

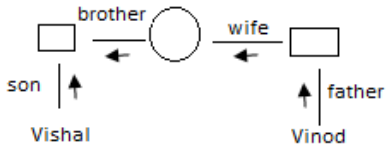
Therefore, Tina is Sanjay's niece.

Hence, the correct option is (D) i.e., Niece.

Q6 Text Solution:

As per the given information,

Wife of Vinod's father is mother of Vinod Only brother of Vinod's mother is maternal uncle of Vinod,



Therefore, Vinod is the cousin of Vishal.

Hence, the correct option is (A) i.e., Cousin.

Q7 Text Solution:

Given: P is Q's brother. Q is R's father. Also, R and S are sisters.

This means that Q is the father of R and S.

Since, P is Q's brother thus P is uncle of R and S.

Therefore, P is the uncle of S.

hence, the correct option is (B) i.e., Uncle.

Q8 Text Solution:

In the given scenario, Aryan is the brother of Bhavana, and Deepak is the brother of Chetna. Bhavana is the daughter of Deepak.

Since Aryan and Bhavana are siblings, and Bhavana is the daughter of Deepak, this means that Aryan is son of Deepak.

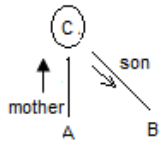
Now, as Chetna is sister of Deepak making Aryan nephew of Chetna.

Therefore, Aryan is Chetna's nephew.

Hence, the correct option is (A) i.e., Nephew.

Q9 Text Solution:

The given information can be depicted as:



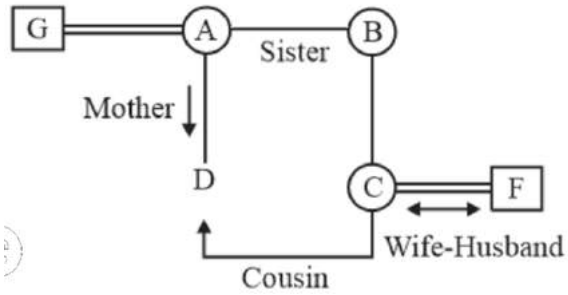
Since, C is the mother of A and B and A is not the daughter of C i.e. A is the son of C.

Therefore, the relationship between C and A is mother and son.

Hence, the correct option is (C) i.e., Mother and Son.

Q10 Text Solution:

The given information can be depicted as:



So, B is the aunt of D and the mother of C.

Therefore, C is the cousin of D.

Hence, the correct option is (A) i.e., Cousin.

Q11 Text Solution:

Since, A is the mother of D and G is the husband of A

Thus, G is the father of D.

Hence, the correct option is (D) i.e., Father.

Q12 Text Solution:

Since, O is the husband of P and Q is the grand-daughter of O.

Thus, O is the grand-father of Q.

Also, M is the son of P.

Therefore, M is the son of O.

Hence, the correct option is (A) i.e., Son.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

BLOOD RELATIONS

Q1 If P is the husband of Q and R is the mother of S and Q. What is R to P?
(A) Mother (B) Sister
(C) Aunt (D) Mother-in-law

Q2 A is B's brother. C is A's mother. D is C's father. F is A's son. How is B related to F's child?
(A) Aunt (B) Cousin
(C) Nephew (D) Grandfather

Q3 P is the father of T. T is the daughter of M. M is the daughter of K. What is P to K ?
(A) Father (B) Father-in-law
(C) Brother (D) Son-in-law

Q4 Based on the statements given below, find out who is the uncle of P ?
(i) K is the brother of J.
(ii) M is the sister of K.
(iii) P is the brother of N.
(iv) N is the daughter of J.
(A) K (B) J
(C) N (D) M

Q5 X is the husband of Y. W is the daughter of X. Z is husband of W. N is the daughter of Z. What is the relationship of N to Y?
(A) Cousin (B) Niece
(C) Daughter (D) Grand-daughter

Q6 Pointing towards A, B said "Your mother is the younger sister of my mother". How is A related to B?
(A) Uncle (B) Cousin
(C) Nephew (D) Father

Q7 Ramu's mother said to Ramu,"My mother has a son whose son is Achyut". How is Achyut relation to Ramu?
(A) Uncle (B) Cousin
(C) Brother (D) Nephew

Q8 A's mother is sister of B and has a daughter C. How can A be related to B from among the following?
(A) Niece (B) Uncle
(C) Daughter (D) Father

Q9 M and F are a married couple. A and B are sisters. F is the sister of A. Who is B to M ?
(A) Sister (B) Sister-in-law
(C) Niece (D) Daughter

Q10 Rajiv is the brother of Atul. Sonia is the sister of Sunil. Atul is the son of Sonia. How is Rajiv related to Sonia?
(A) Nephew (B) Son
(C) Brother (D) Father

Q11 A and B are brother and sister respectively. C is A's father. D is C's sister and E is D's mother. How is B related to E?
(A) Grand-daughter
(B) Great grand-daughter
(C) Aunt
(D) Daughter

Q12 A and B are brothers. C and D are sisters. A's son is D's brother. How is B related to C ?
(A) Father (B) Brother
(C) Uncle (D) Son

Q13 Suresh introduces a man as "He is the son of the woman who is the mother of the husband of my mother". How is Suresh related to the man?
(A) Uncle (B) Son
(C) Cousin (D) Grandson

Q14 Rahul and Robin are brothers. Promod is Robin's father. Sheela is Pramod's sister. Prema is Promod's niece. Shubha is Sheela's grand-daughter. How is Rahul related to Shubha?

(A) Brother (B) Cousin

(C) Uncle (D) Nephew

Q15 Pointing to a photograph Vikas said "She is the daughter of my grandfather's only son". How is the lady in the photograph related to Vikas in the photograph?

(A) Father (B) Brother

(C) Sister (D) Mother

Answer Key

Q1	(D)
Q2	(D)
Q3	(D)
Q4	(A)
Q5	(D)
Q6	(B)
Q7	(B)
Q8	(A)
Q9	(B)
Q10	(B)
Q11	(A)
Q12	(C)
Q13	(B)
Q14	(C)
Q15	(C)

Hints & Solutions

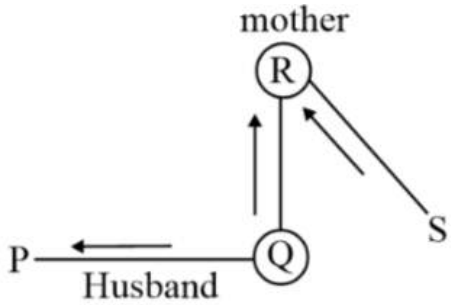
Q1 Text Solution:

Given,

P is the husband of Q

R is the mother of S and Q

The above situation can be represented as:



where the circle around the alphabet indicates that person is a lady.

Therefore, P is the son-in-law of R or R is the mother-in-law of P.

Hence, the correct option is (D) i.e., Mother-in-law.

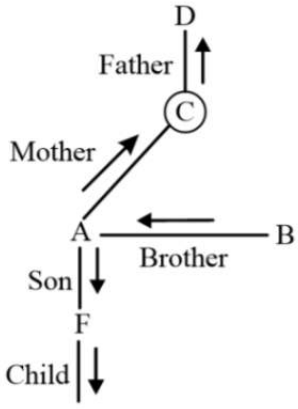
Q2 Text Solution:

A is B's brother i.e. A and B are siblings and A is male.

C is A's mother i.e. C is the mother of A and B.

D is C's father and F is A's son.

It can be represented as:



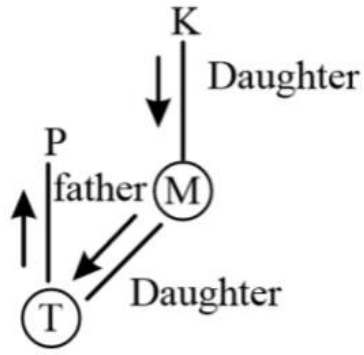
where the circle around the alphabet indicates that person is a lady.

Therefore, B will be the grandfather of F's child.

Hence, the correct option is (D) i.e., Grandfather.

Q3 Text Solution:

The given information can be represented as:



where the circle around the alphabet indicates that person is a lady.

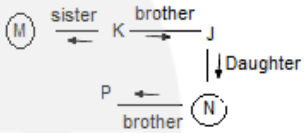
Thus, M is the mother of T and wife of P.

Therefore, P is the son-in-law of K.

Hence, the correct option is (D) i.e., Son-in-law.

Q4 Text Solution:

The given information can be represented as:



where the circle around the alphabet indicates that person is a lady.

Therefore, K is the uncle of P.

Hence, the correct option is (A) i.e., K.

Q5 Text Solution:

Given,

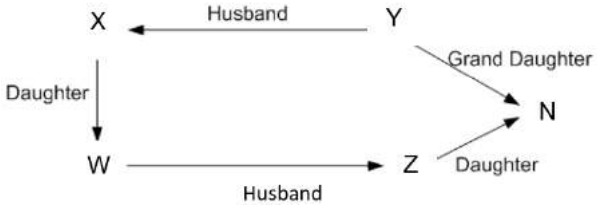
X is the husband of Y.

W is the daughter of X i.e. W is the daughter of X and Y.

Z is husband of W i.e. X and Y are parents-in-law of Z.

N is the daughter of Z i.e. Y is the grand-mother of N.

It can be represented as:



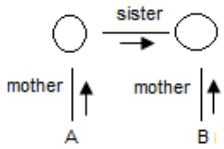
Therefore,

N is the grand-daughter of Y.

Hence, the correct answer is option (D) i.e., Grand-daughter.

Q6 Text Solution:

As per the given information,



Therefore, A is a cousin of B.

Hence, the correct option is (B) i.e., Cousin.

Q7 Text Solution:

As per the given information,

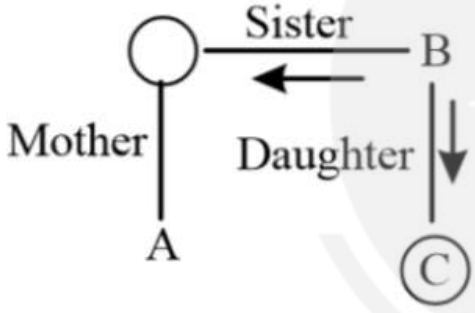
Achyut is nephew of Ramu's mother.

Therefore, Achyut is the cousin of Ramu.

Hence, the correct option is (B) i.e., Cousin.

Q8 Text Solution:

The given information can be represented as,



where the circle around the alphabet represents the person is female.

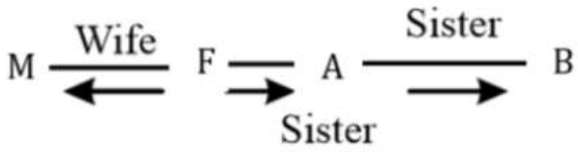
Here, 'A' can be Niece or Nephew of 'B'.

Therefore, out of the given options, 'A' is niece of 'B'.

Hence, the correct option is (A) i.e., Niece.

Q9 Text Solution:

The given information can be represented as:

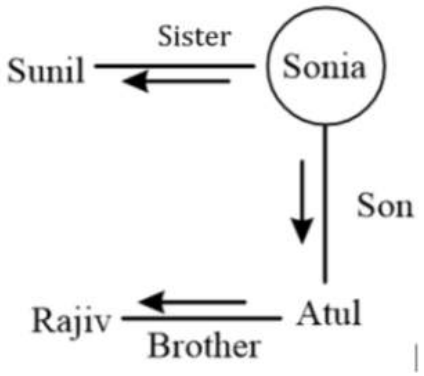


As it can be seen that 'B' is the Sister-in-law of 'M'.

Hence, the correct option is (B) i.e., Sister-in-law.

Q10 Text Solution:

The given information can be depicted as:

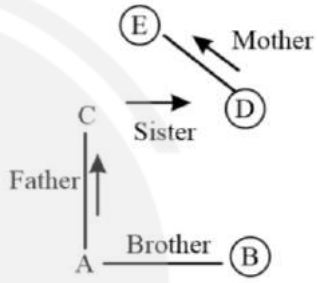


Therefore, Sonia is the mother of Rajiv.

Hence, the correct option is (B) i.e., son.

Q11 Text Solution:

As per the given information,



As it can be seen that 'B' is the Grand-daughter of 'E'.

Hence, the correct option is (A) i.e., Grand-daughter.

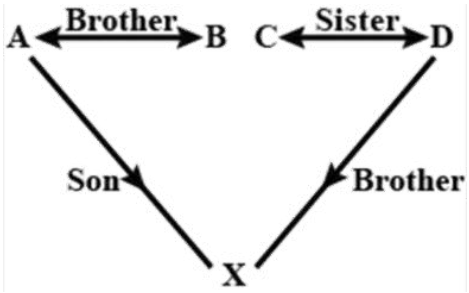
Q12 Text Solution:

Given,

A and B are brothers and C and D are sisters.

A's son is the brother of D. So, D is the daughter of A.

Since, C and D are sisters. Therefore, C is also the daughter of A.



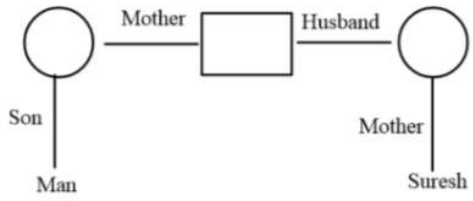
Thus, B is the uncle of C.

Hence, the correct option is (C) i.e., Uncle.

Q13 Text Solution:

According to the question,

The husband of my mother is my father (Suresh) and the mother of my father is the mother of the man, so the man is the brother of the father of Suresh.



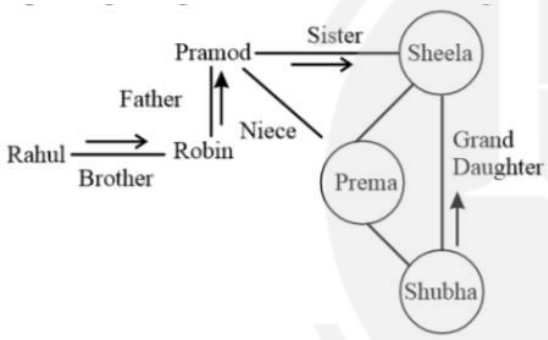
Thus, out of the given options, the man is the father of Suresh.

Therefore, Suresh is the son of the man.

Hence, the correct option is (B) i.e., Son

Q14 Text Solution:

Depicting the given information, we get



Rahul and Robin are brothers and Pramod is Robin's father which implies that Rahul is also the son of Pramod.

Also, Sheela is Pramod's sister and Prema is Pramod's niece which implies that Prema is the daughter of Sheela.

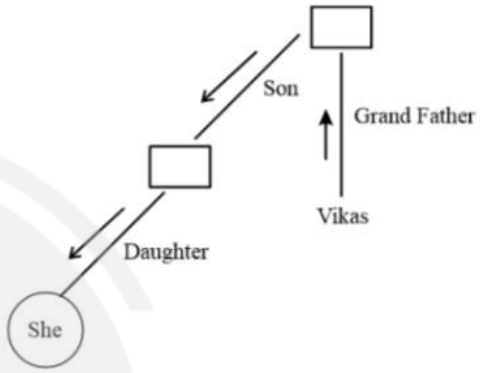
Since, Shubha is Sheela's grand-daughter.

Thus, Rahul is the uncle of Shubha.

Hence, the correct option is (C) i.e., Uncle.

Q15 Text Solution:

Depicting the given information, we get



Vikas's grandfather's only son is Vikas's father.

So, the daughter of Vikas's father is Vikas's sister.

Thus, the lady is the sister of Vikas.

Hence, the correct option is (C) i.e., Sister.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

BLOOD RELATIONS

Q1 If P is the husband of Q and R is the mother of S and Q. What is R to P?
(A) Mother (B) Sister
(C) Aunt (D) Mother-in-law

Q2 A is B's brother. C is A's mother. D is C's father. F is A's son. How is B related to F's child?
(A) Aunt (B) Cousin
(C) Nephew (D) Grandfather

Q3 P is the father of T. T is the daughter of M. M is the daughter of K. What is P to K ?
(A) Father (B) Father-in-law
(C) Brother (D) Son-in-law

Q4 Based on the statements given below, find out who is the uncle of P ?
(i) K is the brother of J.
(ii) M is the sister of K.
(iii) P is the brother of N.
(iv) N is the daughter of J.
(A) K (B) J
(C) N (D) M

Q5 X is the husband of Y. W is the daughter of X. Z is husband of W. N is the daughter of Z. What is the relationship of N to Y?
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(C) Daughter (D) Grand-daughter

Q6 Pointing towards A, B said "Your mother is the younger sister of my mother". How is A related to B?
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Q7 Ramu's mother said to Ramu,"My mother has a son whose son is Achyut". How is Achyut relation to Ramu?
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Q8 A's mother is sister of B and has a daughter C. How can A be related to B from among the following?
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(C) Daughter (D) Father

Q9 M and F are a married couple. A and B are sisters. F is the sister of A. Who is B to M ?
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(C) Niece (D) Daughter

Q10 Rajiv is the brother of Atul. Sonia is the sister of Sunil. Atul is the son of Sonia. How is Rajiv related to Sonia?
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Q11 A and B are brother and sister respectively. C is A's father. D is C's sister and E is D's mother. How is B related to E?
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(B) Great grand-daughter
(C) Aunt
(D) Daughter

Q12 A and B are brothers. C and D are sisters. A's son is D's brother. How is B related to C ?
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(C) Uncle (D) Son

Q13 Suresh introduces a man as "He is the son of the woman who is the mother of the husband of my mother". How is Suresh related to the man?
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Q14 Rahul and Robin are brothers. Promod is Robin's father. Sheela is Pramod's sister. Prema is Promod's niece. Shubha is Sheela's grand-daughter. How is Rahul related to Shubha?

(A) Brother (B) Cousin

(C) Uncle (D) Nephew

Q15 Pointing to a photograph Vikas said "She is the daughter of my grandfather's only son". How is the lady in the photograph related to Vikas in the photograph?

(A) Father (B) Brother

(C) Sister (D) Mother

Answer Key

Q1	(D)
Q2	(D)
Q3	(D)
Q4	(A)
Q5	(D)
Q6	(B)
Q7	(B)
Q8	(A)
Q9	(B)
Q10	(B)
Q11	(A)
Q12	(C)
Q13	(B)
Q14	(C)
Q15	(C)

Hints & Solutions

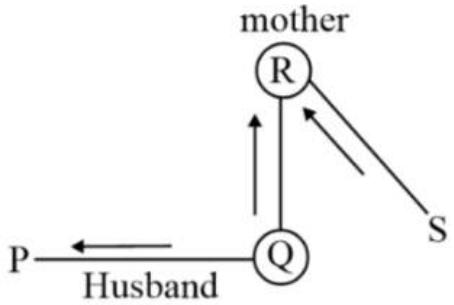
Q1 Text Solution:

Given,

P is the husband of Q

R is the mother of S and Q

The above situation can be represented as:



where the circle around the alphabet indicates that person is a lady.

Therefore, P is the son-in-law of R or R is the mother-in-law of P.

Hence, the correct option is (D) i.e., Mother-in-law.

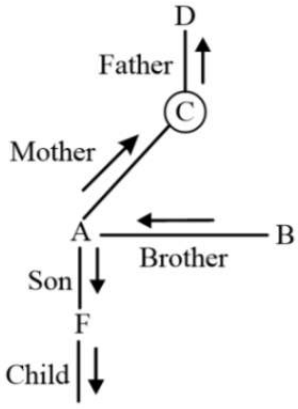
Q2 Text Solution:

A is B's brother i.e. A and B are siblings and A is male.

C is A's mother i.e. C is the mother of A and B.

D is C's father and F is A's son.

It can be represented as:



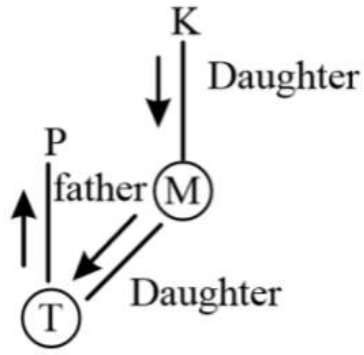
where the circle around the alphabet indicates that person is a lady.

Therefore, B will be the grandfather of F's child.

Hence, the correct option is (D) i.e., Grandfather.

Q3 Text Solution:

The given information can be represented as:



where the circle around the alphabet indicates that person is a lady.

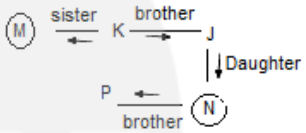
Thus, M is the mother of T and wife of P.

Therefore, P is the son-in-law of K.

Hence, the correct option is (D) i.e., Son-in-law.

Q4 Text Solution:

The given information can be represented as:



where the circle around the alphabet indicates that person is a lady.

Therefore, K is the uncle of P.

Hence, the correct option is (A) i.e., K.

Q5 Text Solution:

Given,

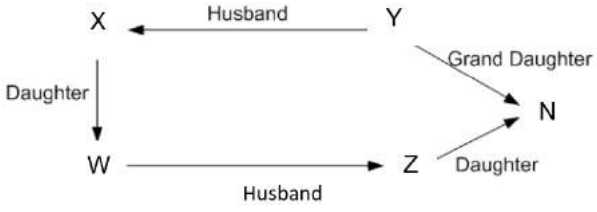
X is the husband of Y.

W is the daughter of X i.e. W is the daughter of X and Y.

Z is husband of W i.e. X and Y are parents-in-law of Z.

N is the daughter of Z i.e. Y is the grand-mother of N.

It can be represented as:



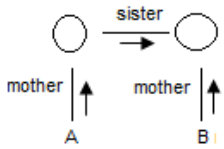
Therefore,

N is the grand-daughter of Y.

Hence, the correct answer is option (D) i.e., Grand-daughter.

Q6 Text Solution:

As per the given information,



Therefore, A is a cousin of B.

Hence, the correct option is (B) i.e., Cousin.

Q7 Text Solution:

As per the given information,

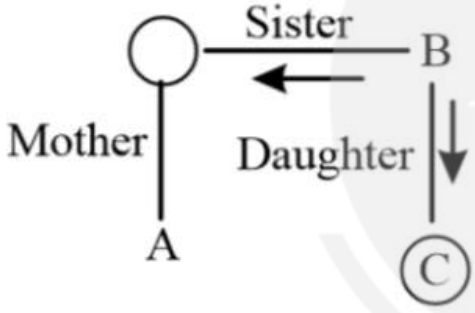
Achyut is nephew of Ramu's mother.

Therefore, Achyut is the cousin of Ramu.

Hence, the correct option is (B) i.e., Cousin.

Q8 Text Solution:

The given information can be represented as,



where the circle around the alphabet represents the person is female.

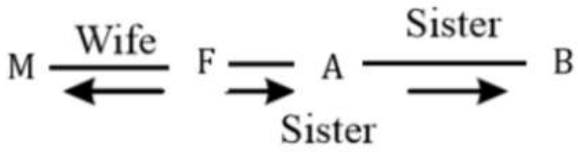
Here, 'A' can be Niece or Nephew of 'B'.

Therefore, out of the given options, 'A' is niece of 'B'.

Hence, the correct option is (A) i.e., Niece.

Q9 Text Solution:

The given information can be represented as:

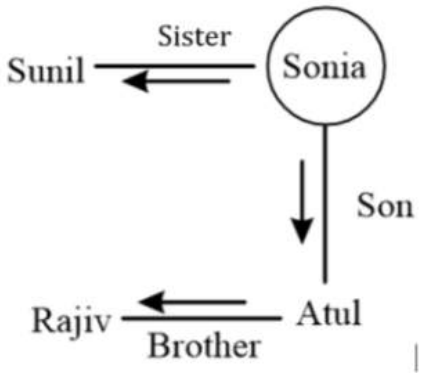


As it can be seen that 'B' is the Sister-in-law of 'M'.

Hence, the correct option is (B) i.e., Sister-in-law.

Q10 Text Solution:

The given information can be depicted as:

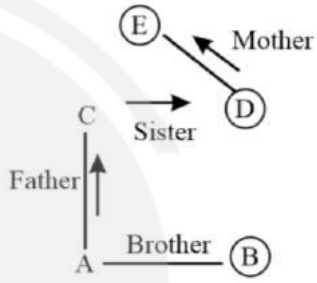


Therefore, Sonia is the mother of Rajiv.

Hence, the correct option is (B) i.e., son.

Q11 Text Solution:

As per the given information,



As it can be seen that 'B' is the Grand-daughter of 'E'.

Hence, the correct option is (A) i.e., Grand-daughter.

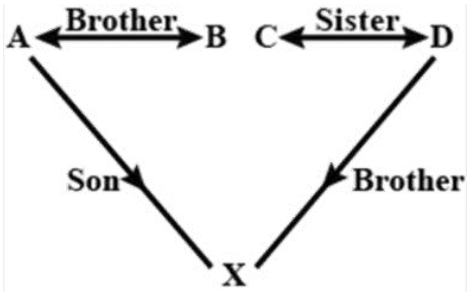
Q12 Text Solution:

Given,

A and B are brothers and C and D are sisters.

A's son is the brother of D. So, D is the daughter of A.

Since, C and D are sisters. Therefore, C is also the daughter of A.



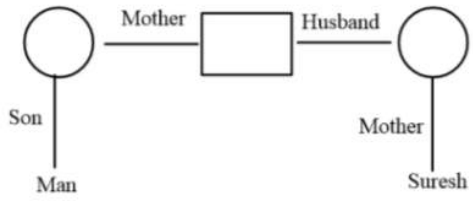
Thus, B is the uncle of C.

Hence, the correct option is (C) i.e., Uncle.

Q13 Text Solution:

According to the question,

The husband of my mother is my father (Suresh) and the mother of my father is the mother of the man, so the man is the brother of the father of Suresh.



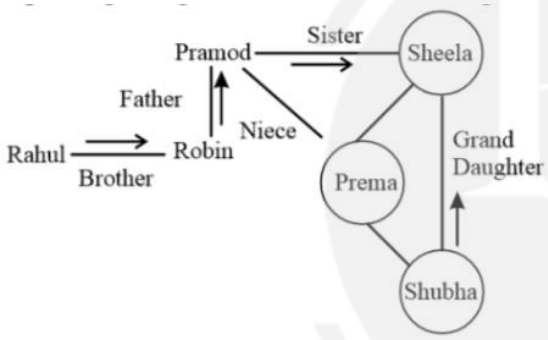
Thus, out of the given options, the man is the father of Suresh.

Therefore, Suresh is the son of the man.

Hence, the correct option is (B) i.e., Son

Q14 Text Solution:

Depicting the given information, we get



Rahul and Robin are brothers and Pramod is Robin's father which implies that Rahul is also the son of Pramod.

Also, Sheela is Pramod's sister and Prema is Pramod's niece which implies that Prema is the daughter of Sheela.

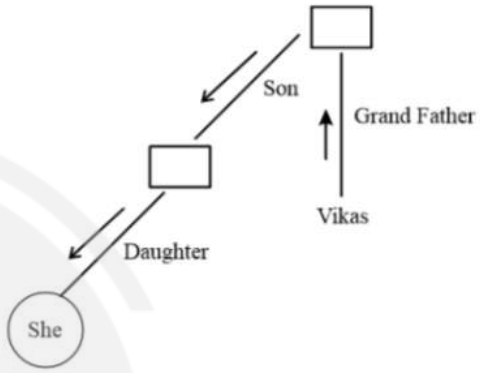
Since, Shubha is Sheela's grand-daughter.

Thus, Rahul is the uncle of Shubha.

Hence, the correct option is (C) i.e., Uncle.

Q15 Text Solution:

Depicting the given information, we get



Vikas's grandfather's only son is Vikas's father.

So, the daughter of Vikas's father is Vikas's sister.

Thus, the lady is the sister of Vikas.

Hence, the correct option is (C) i.e., Sister.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

STATISTICAL DESCRIPTION OF DATA

Q1 An attribute is
(A) A qualitative characteristic
(B) A quantitative characteristic
(C) A measurable characteristic
(D) All of these

Q2 Annual income of a person is
(A) An attribute
(B) A discrete variable
(C) A continuous variable
(D) (B) or (C)

Q3 Which method of data collection is best suited for collecting data during a natural calamity or epidemic?
(A) Personal interview method
(B) Mailed questionnaire method
(C) Indirect interview method
(D) Observation method

Q4 Which of the following is NOT a potential source of secondary data?
(A) Government reports and publications.
(B) Research articles published in academic journals.
(C) Social media posts and online forums.
(D) Surveys conducted by an investigator.

Q5 Which of the following is an example of an attribute?
(A) Number of misprints in a book
(B) Height of a person
(C) Color of a flower
(D) Profit

Q6 Which method of data collection involves the investigator meeting the respondents directly?
(A) Mailed questionnaire method
(B) Observation method
(C) Personal interview method
(D) Indirect interview method

Q7 If Prof. Das collects data on the height of every student in his class, what type of data is it for him?
(A) Secondary data collected by an investigator
(B) Secondary data used by a different person
(C) Primary data collected by an investigator
(D) Primary data used by a different person

Q8 What are the sources of secondary data?
(A) International sources
(B) Government sources
(C) Private and quasi-government sources
(D) All of the above

Q9 Which data collection method has the potential for a high amount of non-responses?
(A) Personal interview method
(B) Mailed questionnaire method
(C) Indirect interview method
(D) Observation method

Q10 The accuracy and consistency of data can be verified by
(A) Internal checking
(B) External checking
(C) Scrutiny
(D) Both (A) and (B)

Q11 The mode of presentation of data are
(A) Textual, tabulation and diagrammatic
(B) Tabular, internal and external
(C) Textual, tabular and internal
(D) Tabular, textual and external

Q12 The best method of presentation of data is
(A) Textual (B) Tabular

(C) Diagrammatic (D) (B) and (C)

Q13 The most attractive method of data presentation is
(A) Textual (B) Tabular
(C) Diagrammatic (D) (A) and (B)

Q14 Divided bar chart is considered for
(A) Comparing different components of a variable.
(B) The relation of different components to the table.
(C) (A) or (B)
(D) (A) and (B)

Q15 Multiple line chart is applied for
(A) Showing multiple charts
(B) Two or more related time series when the variables are expressed in the same unit
(C) Two or more related time series when the variables are expressed in different unit
(D) Multiple variations in the time series.

Q16 'Stub' of a table is the
(A) Left part of the table describing the columns
(B) Right part of the table describing the columns
(C) Right part of the table describing the rows
(D) Left part of the table describing the rows.

Q17 Pie-diagram is used for
(A) Comparing different components and their relation to the total
(B) Representing qualitative data in a circle
(C) Representing quantitative data in circle
(D) (B) or (C)

Q18 The most accurate mode of data presentation is
(A) Diagrammatic method
(B) Tabulation
(C) Textual presentation
(D) None of these

Q19 Which of the following statements is **untrue** for tabulation?
(A) Statistical analysis of data requires tabulation
(B) It facilitates comparison between rows and not columns
(C) Complicated data can be presented
(D) Diagrammatic representation of data requires tabulation

Q20 For tabulation, 'caption' is
(A) The upper part of the table
(B) The lower part of the table
(C) The main part of the table
(D) The upper part of a table that describes the column and sub-column.

Answer Key

Q1	(A)	Q11	(A)
Q2	(B)	Q12	(B)
Q3	(A)	Q13	(C)
Q4	(D)	Q14	(D)
Q5	(C)	Q15	(B)
Q6	(C)	Q16	(D)
Q7	(C)	Q17	(A)
Q8	(D)	Q18	(B)
Q9	(B)	Q19	(B)
Q10	(C)	Q20	(D)

Hints & Solutions

Q1 Text Solution:

We know that,

A qualitative characteristic is known as an attribute.

For example: Gender of baby, nationality of a person etc.

Hence, the correct option is (A).

Q2 Text Solution:

We know that,

When a variable assumes a finite or a countably infinite number of isolated values, it is known as a discrete variable.

Thus, Annual income of a person is a discrete variable.

Hence, option (B) is the correct answer

Q3 Text Solution:

The best method of data collection for collecting data during a natural calamity or epidemic is the personal interview method. In this method, the investigator meets the respondents directly and collects the required information on the spot. During a natural calamity or epidemic, it is crucial to gather data quickly and accurately to assess the impact and make informed decisions. The personal interview method allows the investigator to interact directly with the affected individuals, gather real-time information, and clarify any doubts or uncertainties. This method ensures a higher level of accuracy and reliability compared to other methods like mailed questionnaires or indirect interviews, which may have delays in response or potential misinterpretation of information. Therefore, the personal interview method is the most suitable for collecting data during such situations.

Hence, the correct option is (A).

Q4 Text Solution:

Surveys conducted by an investigator are not considered a potential source of secondary data. Secondary data refers to data that has already been collected by someone else for a different purpose. Government reports and publications, research articles in academic journals, and social media posts and online forums are all examples of potential sources of secondary data. Surveys conducted by an investigator, on the other hand, are a primary data collection method.

Hence, the correct option is (D).

Q5 Text Solution:

We know that,

A qualitative characteristic is known as an attribute.

Therefore, Color of a flower is an example of an attribute.

Hence, the correct option is (C).

Q6 Text Solution:

We know that,

The personal interview method is a data collection technique where the investigator directly interacts with the respondents to gather the required information. In this method, the investigator conducts face-to-face interviews with the respondents and asks them specific questions to collect data on the variables of interest.

Hence, the correct option is (C).

Q7 Text Solution:

In the given scenario, since Prof. Das is the one directly collecting the data for his own research purposes, it falls under the category of primary data. The data collected on the height of every student in his class is specific to his research project and has not been previously collected or used by anyone else.

Therefore, it is Primary data collected by an investigator.

Hence, the correct option is (C).

Q8 Text Solution:

The sources of secondary data include international sources, government sources, and private and quasi-government sources. International sources refer to organizations like the World Health Organization (WHO), International Monetary Fund (IMF), World Bank, etc., which provide data on various global aspects. Government sources include statistical abstracts published by the Central Statistical Organization (CSO), agricultural statistics published by the Ministry of Food and Agriculture, and other government agencies that collect and publish data. Private and quasi-government sources include organizations like the Indian Statistical Institute (ISI), Indian Council of Agricultural Research (ICAR), National Council of Educational Research and Training (NCERT), and various research institutes and researchers who generate data for their studies.

Therefore, all of these options are valid sources of secondary data.

Hence, the correct option is (D).

Q9 Text Solution:

The mailed questionnaire method involves sending questionnaires to the respondents through the mail, along with a pre-paid stamp for their convenience in returning the filled questionnaire. The respondents are expected to complete the questionnaire and send it back by mail.

One of the main challenges associated with the mailed questionnaire method is the potential for a high amount of non-responses. Non-response occurs when the respondents do not complete or return the questionnaire.

Hence, the correct option is (B).

Q10 Text Solution:

Since the statistical analyses are made only on the basis of data, it is necessary to check whether the data under consideration are **accurate as well as consistence**. No hard and fast rules can be recommended for the **scrutiny** of data. One must apply his intelligence, patience and experience while scrutinising the given information.

By conducting a careful scrutiny of the data, researchers can have confidence in the accuracy and reliability of their findings and draw meaningful conclusions from the analysis. It helps in minimizing the potential for biased or misleading results that may arise from erroneous or inconsistent data. Overall, scrutiny is an essential step in the statistical analysis process to ensure the quality and integrity of the data and the validity of the subsequent analysis and conclusions.

Hence, option (C) is the correct answer.

Q11 Text Solution:

We know that,

Mode of Presentation of Data:

(a) Textual presentation

(b) Tabular presentation or Tabulation

(c) Diagrammatic representation

Hence, the correct option is (A).

Q12 Text Solution:

The tabular method is preferred because:

- It makes it easier to compare between rows and columns.
- With tabulation, complicated data can also be represented.
- It is required for the diagrammatic representation as well.
- Statistical analysis of data is impossible without tabulation.

Thus, tabular form is the best method of presentation of data.

Hence, the correct answer is option (B) i.e. Tabular.

Q13 Text Solution:

We know that,

Diagrammatic representation like charts, diagrams and pictures make statistical data more attractive. Moreover, it can be used for

both the educated section and uneducated section of the society. Furthermore, any hidden trend present in the given data can be noticed only in this mode of representation.

Thus, the most attractive method of data presentation is Diagrammatic.

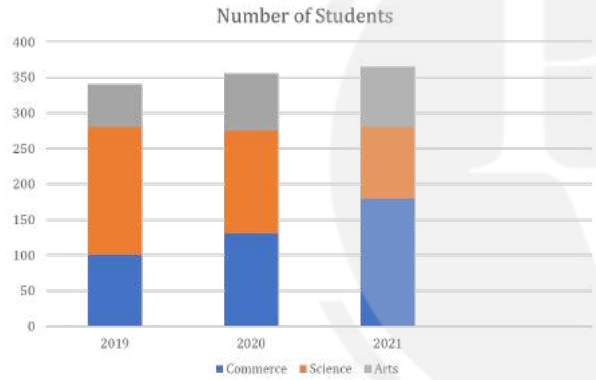
Hence, the correct answer is option (C) i.e. Diagrammatic.

Q14 Text Solution:

We know that,

Divided bar chart is used to present the data which have more than 1 component. Since, the total magnitude is divided into different components, thus it helps to compare different components of a variable. Also, we get to know the relation of different components to the table.

For example:

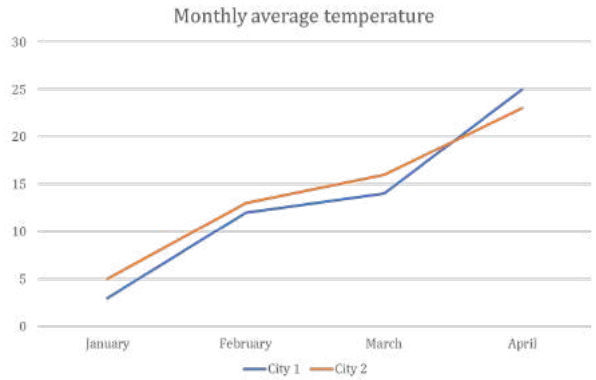


Hence, the correct option is (D).

Q15 Text Solution:

We know that, a multiple line graph is a line graph having two or more lines. It is used to represent two or more variables which changes over the corresponding time period.

For example:



Thus, multiple line chart is applied for two or more related time series when the variables are expressed in the same unit.

Hence, option (B) is the correct answer.

Q16 Text Solution:

We know that,

Stub of a table is the left part of the table providing the description of the rows.

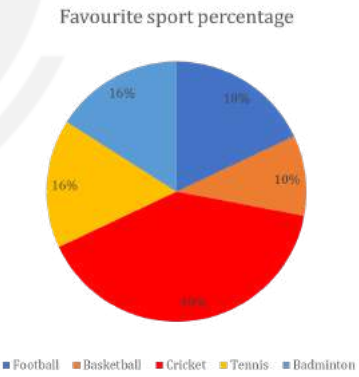
Hence, the correct answer is option (D).

Q17 Text Solution:

We know that,

Pie-diagram is used for comparing different components and their relation to the total.

For example:



Hence, the correct option is (A).

Q18 Text Solution:

The most accurate mode of data presentation is tabulation since it is presented systematically in the form of rows and columns.

Hence, the correct option is (B) i.e. Tabulation.

Q19 Text Solution:

We know that,

Tabulation facilitates comparison between both rows as well as columns.

Hence, the correct option is (B).

Q20 **Text Solution:**

The table under consideration should be divided into caption, Box-head, Stub and Body where

- Caption is the upper part of the table, describing the columns and sub-columns, if any.
- Box-head is the entire upper part of the table which includes columns and sub-column numbers, unit(s) of measurement along with caption.
- Stub is the left part of the table providing the description of the rows.
- The body is the main part of the table that contains the numerical figures.

Hence, the correct answer is option (D).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

STATISTICAL DESCRIPTION OF DATA

Q1 The number of observations falling within a class is called
(A) Density (B) Frequency
(C) Both (D) None

Q2 Difference between the lower and the upper class boundaries is
(A) Width (B) Size
(C) Both (D) None

Q3 Classes with zero frequencies are called
(A) Nill Class (B) Empty Class
(C) Class (D) None

Q4 Which of the following best defines the range in a frequency distribution?
(A) The number of classes in the distribution
(B) The difference between the largest and smallest values in the distribution
(C) The average value of the data in the distribution
(D) The sum of the frequencies in the distribution

Q5 The heights (in centimeters) of a group of students are recorded. The maximum height is 180 cm, and the minimum height is 150 cm. What is the range of the heights?
(A) 20 cm (B) 30 cm
(C) 150 cm (D) 180 cm

Q6 The number of types of cumulative frequency is
(A) One (B) Two
(C) Three (D) Four

Q7 The number of accidents for seven days in a locality are given below:

No. of accidents :	0	1	2	3	4	5	6
Frequency :	15	19	22	31	9	3	2

What is the number of cases when 3 or less accidents occurred?
(A) 56 (B) 6
(C) 68 (D) 87

Q8 The value exactly at the middle of a class interval is called
(A) Class mark (B) Mid value
(C) Both (D) None

Q9 The heights (in inches) of 50 students are recorded. The maximum height is 72 inches, and the minimum height is 54 inches. If we want to construct a frequency distribution with 6 class intervals, what should be the class length?
(A) 2 inches (B) 3 inches
(C) 4 inches (D) 5 inches

Q10 In the distribution of heights of athletes, if the width of a class interval is 8 inches and the lower class boundary is 65 inches, what is the upper class boundary?
(A) 65 inches (B) 73 inches
(C) 57 inches (D) None of these

Q11 Consider the following class interval: 20 - 30. What is the midpoint or class mark for this interval?
(A) 20.5 (B) 25
(C) 30 (D) 35

Q12 The following data relate to the marks of a group of students:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
No. of students	15	38	65	84	100

How many students got marks more than 30?

(A) 65 (B) 50

(C) 35 (D) 43

Q13 The following data relate to the incomes of persons :

Income in Rs.	500 – 999	1000 – 1499	1500 – 1999	2000 – 2499
No. of persons	15	28	36	7

What is the percentage of persons earning more than Rs. 1500?

(A) 50% (B) 4%

(C) 40% (D) 60%

Q14 Find the number of observations between 250 and 300 from the following data:

Value	More than 200	More than 250	More than 300	More than 350
No. of observations	56	38	15	0

(A) 56 (B) 23

(C) 15 (D) 8

Q15 From the following data, find the number of class intervals if class length is given as 5.

73, 72, 65, 41, 54, 80, 50, 46, 49, 53

(A) 6 (B) 5

(C) 7 (D) 8

Answer Key

Q1	(B)
Q2	(C)
Q3	(B)
Q4	(B)
Q5	(B)
Q6	(B)
Q7	(D)
Q8	(C)
Q9	(B)
Q10	(B)
Q11	(B)
Q12	(C)
Q13	(A)
Q14	(B)
Q15	(D)

Hints & Solutions

Q1 Text Solution:

We know that,

The number of observations falling within a class is called Frequency.

Frequency is defined as the number of times an event or observation happened in an experiment.

Example: Let's consider a dataset of students' test scores. We have the following scores:

85, 92, 78, 88, 90, 82, 88, 85, 92, 78

To determine the frequency of each score, we count how many times each score appears in the dataset:

Score 78: Frequency = 2

Score 82: Frequency = 1

Score 85: Frequency = 2

Score 88: Frequency = 2

Score 90: Frequency = 1

Score 92: Frequency = 2

Hence, the correct answer is option (B) i.e., Frequency.

Q2 Text Solution:

We know that,

Width or Size is defined as the difference between the upper-class limit and the lower-class limit.

For example:

For a class interval 33 – 55,

Class Width/Size = 55 – 33 = 22

Hence, the answer is option (C) i.e., Both.

Q3 Text Solution:

We know that,

Empty Class is defined as a class that does not contain any data members.

Thus, the classes with zero frequencies are called Empty classes.

Hence, the answer is option (B) i.e., Empty Class.

Q4 Text Solution:

We know that,

The range in a frequency distribution refers to the numerical difference between the largest value (maximum) and the smallest value (minimum) in the dataset. It provides a measure of the spread or variability of the data.

Hence, the correct option is (B).

Q5 Text Solution:

Given,

Maximum height = 180 cm

Minimum height = 150 cm

We know that,

Range = Maximum height - minimum height

= 180 - 150

= 30 cm

Therefore, the range of the heights is 30 cm.

Hence, the correct option is (B) i.e., 30 cm.

Q6 Text Solution:

We know that,

There are two types of cumulative frequency which are enlisted below:

- Less than cumulative frequency
- More than cumulative frequency

Cumulative frequency is defined as the total of frequencies.

Hence, the correct answer is option (B) i.e., Two.

Q7 Text Solution:

Given,

No. of accidents	0	1	2	3	4	5	6
Frequency	15	19	22	31	9	3	2

∴ Number of cases when or less accidents occurred

= Sum of frequencies of 0, 1, 2 and 3 accidents

$= 15 + 19 + 22 + 31$

$= 87$

Hence, the correct answer is option (D).

Q8 Text Solution:

We know that,

Class mark is defined as the average of the upper limit and the lower limit of a class in a

frequency distribution.

Mid value is defined as mid-points of class intervals of various class groups.

They are formulated as: $(x_n, y_n) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Thus, the value exactly at the middle of a class interval is called class mark or mid value.

Hence, the correct answer is option (C) i.e., Both.

Q9 Text Solution:

We know that,

Number of class intervals $= \frac{Range}{Class\ length}$

Now, Range = Maximum value - Minimum value

= 72 - 54 = 18 inches

Also, number of class intervals = 6

Thus, Class length $= \frac{18}{6} = 3$

Hence, the correct option is (B) i.e., 3.

Q10 Text Solution:

We know that,

Width or Size is defined as the difference between the upper-class boundary and the lower-class boundary.

According to the given information,

Width = UCB - LCB

8 = UCB - 65

UCB = 65 + 8

UCB = 73 inches

Therefore, the upper class boundary is 73 inches.

Hence, the correct option is (B).

Q11 Text Solution:

Given,

Lower class limit = 20

Upper class limit = 30

Midpoint = $\frac{Lower\ class\ limit + Upper\ class\ limit}{2}$

= $\frac{20+30}{2}$

= $\frac{50}{2}$

= 25

Therefore, the midpoint or class mark for the interval 20 - 30 is 25.

Hence, the correct option is (B).

Q12 Text Solution:

According to the question,

Students who got more than 30 marks

= Number of students who got below 50 - Number of students who got below 30

= (100 - 65)

= 35

Hence, the correct answer is option (C) i.e., 35

Q13 Text Solution:

Given: Total people = 86

Income in Rs.	500 – 999	1000 – 1499	1500 – 1999	2000 – 2499
No. of persons	15	28	36	7

As we see the data table,

People earning more than Rs. 1500

= 36 + 7

= 43

Percentage of persons earning more than Rs. 1500

$= \frac{Persons\ earning\ more\ than\ Rs\ 1500}{Total\ people} \times 100$

$= \frac{43}{86} \times 100 = 50\%$

Hence, the correct option is (A) i.e., 50%.

Q14 Text Solution:

Given,

Value	More than 200	More than 250	More than 300	More than 350
No. of observations	56	38	15	0

According to the question,

Number of observations between 250 and 300 will be given by,

= (Observations more than 250) - (Observations more than 300)

= 38 - 15

= 23

Hence, the correct answer is option (B) i.e., 23.

Q15 Text Solution:

We know that,

Number of class intervals $= \frac{Range}{i}$

Now, Range = Maximum value - Minimum value

= 80 - 41 = 39

Also, class length (i) = 5

Thus, number of class intervals $= \frac{Range}{i} = \frac{39}{5} = 7.8 \approx 8$

(We take the next integer as the number of class intervals so as to include both the minimum and maximum values).

Hence, the correct option is (D) i.e. 8.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

STATISTICAL DESCRIPTION OF DATA

Q1 Mode of a distribution can be obtained from
(A) Histogram
(B) Less than type ogives
(C) More than type ogives
(D) Frequency polygon

Q2 The most appropriate diagram to represent the data relating to the monthly expenditure on different items by a family is
(A) Histogram
(B) Pie-diagram
(C) Frequency polygon
(D) Line graph

Q3 To draw Histogram the frequency distribution should be
(A) Inclusive type
(B) Exclusive type
(C) Inclusive and Exclusive type
(D) None

Q4 What is a exclusive series ?
(A) In which both upper and lower limit are not included in class frequency.
(B) In which lower limit is not included in class frequency.
(C) In which upper limit is not included in class frequency
(D) None of the above

Q5 If the class intervals are $10-14, 15-19, 20-24, \ldots\ldots\ldots$ then the first class boundary is:
(A) 9.5 - 14.5 (B) 10 - 15
(C) 9 - 15 (D) 10.5 - 15.5

Q6 The frequency of class $20-30$ in the following data is:

Class	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$
Cumulative Frequency	5	13	28	34	38

(A) 5 (B) 28
(C) 15 (D) 13

Q7 For the overlapping classes $0-10, 10-20, 20-30$ etc. the class mark of the class $0-10$ is
(A) 5 (B) 0
(C) 10 (D) None

Q8

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	8	15	6	4

For the class 20–30, cumulative frequency is
(A) 20 (B) 13
(C) 15 (D) 28

Q9 Tally marks determines
(A) Class width
(B) Class boundary
(C) Class limit
(D) Class frequency

Q10 What should be shown at the bottom part of a statistical table to provide additional information or clarity?
(A) Caption (B) Box-head
(C) Stub (D) Footnotes

Q11 When all classes have equal width, the heights of the rectangles in Histogram will be numerically equal to the
(A) class frequencies
(B) class boundaries
(C) both
(D) none

Q12 Class

$0-5$ $5-10$ $10-15$ $15-20$ $20-25$

Frequency

8 12 5 15 20

For the class 10-15, the cumulative frequency is:

(A) 5 (B) 12

(C) 25 (D) 29

Q13 The following data relates to the number of books sold in a bookstore:

Number of Books Sold:	0-99	100-199	200-299	300-399
Number of Days:	10	18	12	5

What is the percentage of days with book sales exceeding 200?

(A) 50.65% (B) 37.78%

(C) 40.50% (D) 100%

Q14 Which method of data collection covers the widest area?

(A) Telephone interview method

(B) Mailed questionnaire method

(C) Direct interview method

(D) All of these

Q15 Details are shown by

(A) Charts

(B) Tabular presentation

(C) both

(D) none

Q16 In indirect oral investigation:

(A) Data is not capable of numerical expression

(B) Not possible or desirable to approach informant directly

(C) Data is collected from the books

(D) None of these

Q17 The following data related to the marks of group of students

Marks	No. of Students
More than 70%	7
More than 60%	18
More than 50%	40
More than 40%	60
More than 30%	75
More than 20%	100

How many students have got marks less than 50% ?

(A) 60 (B) 82

(C) 40 (D) 53

Q18 The quickest method to colléct primary data is:

(A) Personal Interview

(B) Indirect Interview

(C) Mailed Questionnaire Method

(D) Telephonic Interview

Q19 Data are said to be _____ if the investigator himself is responsible for the collection of the data.

(A) Primary data

(B) Secondary Data

(C) Mixed of primary and secondary data

(D) None

Q20 The distribution of shares is an example of the frequency distribution of

(A) A discrete variable

(B) A continuous variable

(C) An attribute

(D) (A) or (C).

Q21 The following data relates to the heights of a group of students:

Heights (in inches):	Below 50	Below 60	Below 70	Below 80	Below 90
No. of students	10	25	45	60	80

How many students have heights greater than 70 inches?

(A) 60 (B) 35

(C) 80 (D) 140

Q22 Consecutive rectangles in a Histogram have no space in between

(A) True (B) False

(C) Both (D) None

Q23 Using Ogive curve, we can determine:

(A) Median
(B) Quartile
(C) Both (A) and (B)
(D) None

Q24 A pie diagram is used to represent the following data.

Source	Customers	Excise	Income Tax	Wealth Tax
Revenue in Millions	120	180	240	180

The central angles corresponding to Income Tax and Wealth Tax are
(A) $90^\circ, 120^\circ$
(B) $120^\circ, 90^\circ$
(C) $60^\circ, 120^\circ$
(D) $90^\circ, 60^\circ$

Q25 Out of 1000 persons, 25 percent were industrial workers and the rest were agricultural workers. 300 persons enjoyed world cup matches on T.V. 30 percent of the people who had not watched world cup matches were industrial workers. What is the number of agricultural workers who had enjoyed world cup matches on TV ?
(A) 230 (B) 250
(C) 240 (D) 260

Answer Key

Q1	(A)
Q2	(B)
Q3	(B)
Q4	(C)
Q5	(A)
Q6	(C)
Q7	(A)
Q8	(D)
Q9	(D)
Q10	(D)
Q11	(A)
Q12	(C)
Q13	(B)
Q14	(B)
Q15	(B)
Q16	(B)
Q17	(A)
Q18	(D)
Q19	(A)
Q20	(A)
Q21	(B)
Q22	(A)
Q23	(C)
Q24	(B)
Q25	(D)

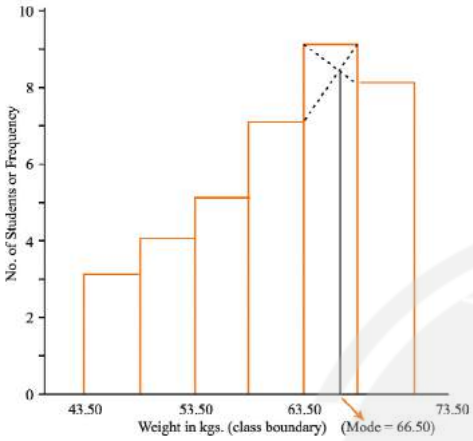
Hints & Solutions

Q1 Text Solution:

We know that,

The mode is the value that occurs most in a given data set.

The highest peak or the longest bar of the histogram represents the location of the mode of the given data set. For example:



Thus, Mode of a distribution can be obtained from histogram.

Hence, the correct option is (A) i.e. Histogram.

Q2 Text Solution:

Pie Diagram is the most appropriate diagram to represent the data' relating to the monthly expenditure on the different items by the family.

For example:

It is divided into the different sectors which helps us to understand the numerical proportion of each item.

Hence, the correct option is (B) i.e. Pie-diagram.

Q3 Text Solution:

According to the question,

Exclusive class is the class in which the upper limit is not included in that class but is included in the next class.

For instance, 0 - 100, 100 - 110, 110 - 120 etc.

Inclusive class is the class in which the upper limit of the class is included in that class itself.

For instance, 1 - 10, 11 - 20, 21 - 30 etc.

Thus, in order to draw a histogram the frequency distribution should be of exclusive type.

Hence, the correct answer is option (B) i.e., Exclusive type.

Q4 Text Solution:

According to the question,

Exclusive series are those series in which the upper limit is not included in that class but is included in the next class.

For instance, $0 - 100, 100 - 110, 110 - 120, 120 - 130$

From the above instance, the upper limit of the class is included in the next class interval.

Hence, the correct answer is option (C).

Q5 Text Solution:

According to the question,

Class Intervals: $10 - 14, 15 - 19, 20 - 24$

Class size is given by the difference of upper limit and lower limit of the class interval.

$\therefore$ Class size $= 14 - 10 = 4$

Now, Diagonal difference (D) between upper class limit and lower class limit will be,

$D = 15 - 14 = 1$

So, Lower class boundary (LCB) will be given by,

$LCB =$ Lower class limit $- \left(\frac{1}{2}\right) D$

$= 10 - \left(\frac{1}{2}\right) 1 = 9.5$

and, Upper class boundary (UCB) will be given by,

$UCB =$ Upper class limit $+ \left(\frac{1}{2}\right) D$

$= 14 + \left(\frac{1}{2}\right) 1 = 14.5$

So, the first class boundary is $9.5 - 14.5$

Hence, the correct answer is option (A) i.e., $9.5 - 14.5$.

Q6 Text Solution:

According to the question,

Make a data table according to the data given

Class Interval	Cumulative Frequency	Frequency
0 – 10	5	5
10 – 20	13	8
20 – 30	28	15
30 – 40	34	6
40 – 50	38	4

So in order to calculate the value of frequency, subtract the successive cumulative frequency and preceding cumulative frequency.

i.e., 28 - 13 = 15

Thus, for the class interval 20-30, the frequency is 15.

Hence, the correct answer is option (C) i.e., 15.

Q7 Text Solution:

Class mark:

Corresponding to a class interval, this may be defined as the sum of the lower class limit and upper class limit divided by 2.

Thus, the class mark of the class $0 - 10$ is:

Class mark $= \frac{LCL+UCL}{2}$

$= \frac{0+10}{2}$

$= 5$

Hence, the correct option is (A).

Q8 Text Solution:

Given,

Class	0-10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	5	8	15	6	4
Cumulative frequency	5	13	28	34	38

Thus, for the class 20–30, cumulative frequency is 28.

Hence, the correct option is (D) i.e. 28.

Q9 Text Solution:

Class frequency is defined as the number of times the items corresponding to a class interval repeat in the series or it's the frequency of the class.

Therefore, tally marks determine class frequency.

Hence, the correct answer is option (D) i.e., Class Frequency.

Q10 Text Solution:

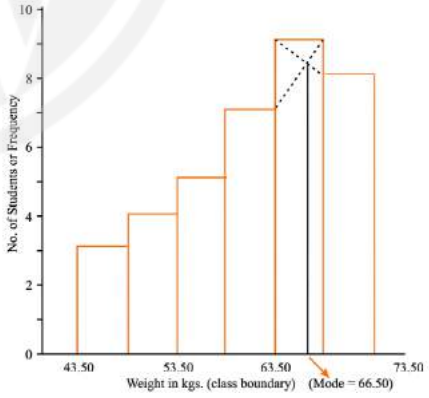
We know that,

Footnotes are shown at the bottom part of a statistical table to provide additional information or clarity about certain aspects of the data presented in the table. They are used to explain the source of the data, define terms or abbreviations used in the table, highlight any specific conditions or exceptions, or provide any other relevant notes that enhance the understanding of the data. Footnotes help in avoiding confusion or ambiguity and provide important contextual details that cannot be included directly in the table itself.

Hence, the correct option is (D).

Q11 Text Solution:

When all classes have equal width, the heights of the rectangles in Histogram will be numerically equal to the **class frequencies.**



Hence, option (A) is the correct answer.

Q12 Text Solution:

According to the question,

Make a data table in order to calculate cumulative frequency.

Class	Frequency	Cumulative Frequency
0-5	8	8

5-10	12	8 + 12 = 20
10-15	5	20 + 5 = 25
15-20	15	25 + 15 = 40
20-25	20	40 + 20 = 60

As we can see, cumulative frequency corresponding to the class 10 - 15 is 25.
Hence, the correct option is (C) i.e., 25.

Q13 Text Solution:

Given: Total books = 10 + 18 + 12 + 5 = 45

Number of Books Sold:	0-99	100-199	200-299	300-399
Number of Days:	10	18	12	5

As we see the data table,
Total number of days with book sales exceeding 200
= 12 + 5
= 17
Percentage of days with book sales exceeding 200

$$= \frac{Total\ number\ of\ days\ with\ book\ sales\ exceeding\ 200}{Total\ days} \times 100\%$$

$$= \frac{17}{45} \times 100 = 37.78\%$$

Hence, the correct option is (B) i.e., 37.78%

Q14 Text Solution:

Mailed questionnaire method is a well-drafted questionnaire which can cover all the important aspects of the problem under consideration. It can be sent to the respondents after providing all the necessary guidelines for filling up the questionnaire. Thus, a wide range of people can be linked by this method.
Hence, the correct option is (B) i.e. Mailed questionnaire method.

Q15 Text Solution:

We know that,
Tabular presentation is depicted in a table that helps to represent even a large amount of data in an engaging, easy to read, and coordinated manner.
It shows the details and helps the analyst/ reader to easily read or analyse the data.

Hence, the correct answer is option (B) i.e., Tabular presentation

Q16 Text Solution:

Indirect Oral Investigation: It is the method by which the data is collected by the investigator from the third parties who are in the possession of required information about the required subject of enquiry. It is done when the original person is not available or reluctant to provide the information.
Hence, the correct option is (B) i.e. Not possible or desirable to approach informant directly.

Q17 Text Solution:

According to the question,
As we see the data table,
There are a total of 100 students and 40 students have got more than 50%.
Thus, students who got less than 50% marks will be given as,
= Total students − Students who got more than 50%
$= 100 - 40$
$= 60$ students
Hence, the correct answer is option (A) i.e., 60.

Q18 Text Solution:

The methods for the collection of data are:
1) Personal interview
2) Indirect interview
3) Mailed questionnaire method
4) Telephonic Interview
Out of the all above mentioned methods, telephonic interview is the fastest method to collect primary data as it does not require anybody to travel or spend some money. The interviews or surveys are conducted over a phone call. This method does not work in some areas because of the lack of telephones. However, it is a good method to collect information especially on some sensitive issues

as the interrogator and the person cannot see each other.

Therefore, telephonic interview is the fastest method to collect primary data.

Hence, the correct option is (D) i.e. Telephonic Interview.

Q19 Text Solution:

As we know, a sort of data known as primary data is gathered by researchers directly from primary sources via interviews, questionnaires, trials, etc.

Additionally, primary data is gathered directly from the source.

Thus, data is said to be primary if the investigator himself is responsible for the collection of the data.

Hence, the correct answer is option (A) i.e., Primary data.

Q20 Text Solution:

When a variable assumes a finite or a countably infinite number of isolated values, it is known as a **discrete variable**. Examples of discrete variables may be found in the number of petals in a flower, the number of misprints a book contains, **the distribution of shares** and so on.

Hence, option (A) is the correct answer.

Q21 Text Solution:

According to the question,

Students having heights greater than 70 inches

= Number of students in the category below 90

- Number of students in the category below 70

= (80 - 45)

= 35

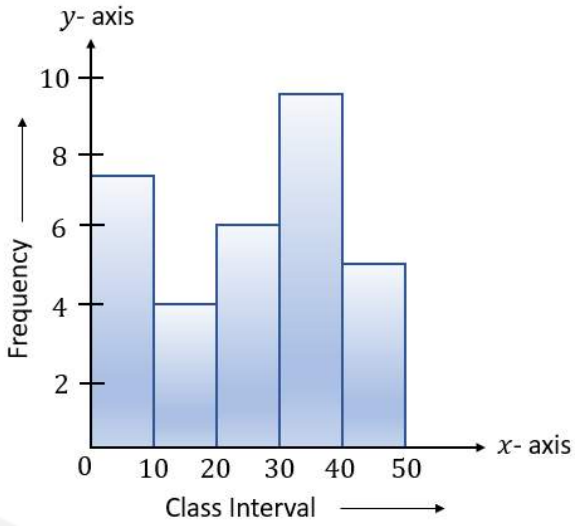
Hence, the correct option is (B) i.e., 35.

Q22 Text Solution:

We know that,

Histogram is a graphical representation of frequency distribution having the continuous classes.The histogram is represented by a set of rectangles, which are adjacent to each other having no space in between them, where each bar represents data.

For example:



Thus, the given statement is True.

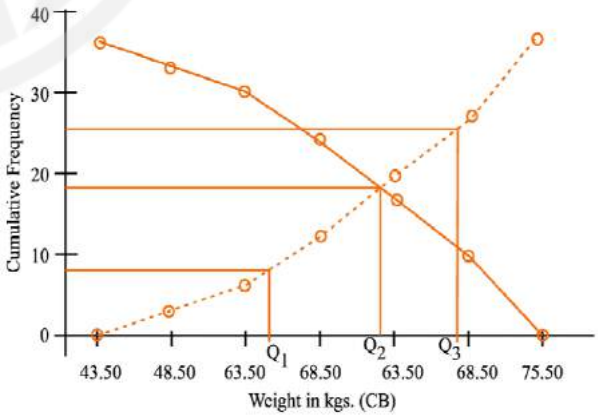
Hence, the correct option is (A) i.e. True.

Q23 Text Solution:

The point of intersection of more than ogive and less than ogive gives the "median" of distribution.

Also, the first quartile can be obtained by cutting off the curve into four parts and then the data lying in the first quadrant is called the first quartile.

For example:



where, Q_1 is lower quartile, Q_2 is 2nd quartile or median and Q_3 is upper quartile.

Thus, with the help of ogive, we can find the median and quartiles.

Therefore, the correct option is (C).

Q24 Text Solution:

According to the question,

Total Revenue = 120 + 180 + 240 + 180

= 720

Central Angle will be given by the formula,

$= \frac{Revenue\ of\ the\ class}{Total\ Revenue} \times 360^{\circ}$

Thus, Central Angle corresponding to Income Tax

$= \frac{240}{720} \times 360^{\circ}$

$= 120^{\circ}$

Central Angle corresponding to Wealth Tax

$= \frac{180}{720} \times 360^{\circ}$

$= 90^{\circ}$

Hence, the correct answer is option (B).

Q25 Text Solution:

According to the question,

Number of industrial workers = 25% of 1000 = 250

⇒ Number of agricultural workers = 1000 - 250 = 750

Thus, the complete data can be listed as:

Category	Watch world cup	Didn't watch world cup	Total
Agricultural workers	260	490	750
Industrial workers	40	210	250
Total	300	700	1000

Therefore, total number of agricultural workers who enjoyed world cup on T.V

= 260

Hence, the correct option is (D) i.e. 260.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 A.M of $8, 1, 6$ is

(A) 5 (B) 6

(C) 4 (D) none

Q2 The weights of a group of individuals are recorded in kilograms: $65, 70, 75, 80, 85, 90, 95$. Compute the mean weight.

(A) 75 kg (B) 80 kg

(C) 85 kg (D) 90 kg

Q3 The A.M of $1, 3, 5, 6, x, 10$ is 6. The value of x is

(A) 10 (B) 11

(C) 12 (D) none

Q4 Following are the daily wages in thousands of a sample of 9 workers: ₹58, ₹62, ₹48, ₹53, ₹70, ₹52, ₹60, ₹84, ₹75. Compute the mean wage.

(A) ₹60,000 (B) ₹61,740

(C) ₹62,440 (D) None of these

Q5 Find the mean salary of 60 workers in a factory from the following table.

Salary in ₹	Number of workers
3000	16
4000	12
5000	10
6000	8
7000	6
8000	4
9000	3
10000	1

(A) ₹5065.50

(B) ₹6000

(C) ₹5083.33

(D) None of the above

Q6 If the mean of the following distribution is 6, then the value of P is

X:	2	4	6	10	$P+5$
f:	3	2	3	1	2

(A) 7 (B) 5

(C) 11 (D) 8

Q7 What is the value of mean for the following data?

Marks	5 – 14	15 – 24	25 – 34	35 – 44	45 – 54	55 – 64
Number of students	10	18	32	26	14	10

(A) 30 (B) 29

(C) 33.68 (D) 34.21

Q8 The mean of 6, 4, 1, 5, 6, 10 and 3 is 5. If each number is added with 2, then the new mean is _____.

(A) 7 (B) 5

(C) 6 (D) 10

Q9 If x and y are related as 2x + 5y = 30 and the mean of x is 10, then the mean of y is:

(A) 2 (B) 4

(C) 6 (D) None

Q10 The mean of a set of numbers is 8. If each number is multiplied by 3, then the new mean is _____.

(A) 24 (B) 8

(C) 3 (D) 12

Q11 The means of 25 items of a data is 12 and if each item is divided by 3, then the new mean will be:

(A) 48 (B) 9

(C) 4 (D) 15

Q12 If mean weight of 50 boys is 70 kg and the mean weight of 100 girls is 55 kg then find the combined mean weight.

(A) 40 kg
(B) 50 kg
(C) 60 kg
(D) 70 kg

Answer Key

Q1	(A)	Q7	(C)
Q2	(B)	Q8	(A)
Q3	(B)	Q9	(A)
Q4	(C)	Q10	(A)
Q5	(C)	Q11	(C)
Q6	(A)	Q12	(C)

Hints & Solutions

Q1 Text Solution:

Given observations: $8,\ 1,\ 6$

We know that,

Arithmetic mean $= \frac{x_1 + x_2 + x_3}{3}$

A.M $= \frac{8+1+6}{3}$

A.M $= \frac{15}{3}$

A.M $= 5$

Therefore, A.M of $8,\ 1,\ 6$ is 5.

Hence, the correct option is (A) i.e., 5.

Q2 Text Solution:

Given, Weights in kilograms: $65,\ 70,\ 75,\ 80,\ 85,\ 90,\ 95$

We know that,

Mean weight $= \frac{x_1 + x_2 + x_3 + x_4 + \ldots\ldots + x_n}{n}$

$= \frac{65+70+75+80+85+90+95}{7}$

$= \frac{560}{7}$

$= 80$

Therefore, the mean weight is 80 kilograms.

Hence, the correct option is (B) i.e., 80 kg.

Q3 Text Solution:

We know that,

Arithmetic mean is defined as the ratio of sum of all observations to the number of observations.

According to the question,

$\frac{(1+3+5+6+x+10)}{6} = 6$

$\Rightarrow \frac{(25+x)}{6} = 6$

$\Rightarrow x = 36 - 25$

$\Rightarrow x = 11$

Therefore, the value of x is 11.

Hence, the correct answer is option (B) i.e. 11.

Q4 Text Solution:

We know that,

Mean is defined as the sum of all the observations divided by the number of observations.

Thus, the mean wage $(\bar{x})$ will be:

$\bar{x} = \frac{58+62+48+53+70+52+60+84+75}{9}$

$= \frac{562}{9}$

$= 62.44 \quad (in\ thousands)$

$= 62,440$

Therefore, the mean wage is ₹62,440.

Q5 Text Solution:

According to the question,

Salary (x_i)	Number of workers (f_i)	$x_i f_i$
3000	16	48000
4000	12	48000
5000	10	50000
6000	8	48000
7000	6	42000
8000	4	32000
9000	3	27000
10000	1	10000
Total	$\Sigma f_i = 60$	$\Sigma f_i x_i = 305000$

We know that,

Mean $= \frac{x_i\ f_i}{f_i}$

$= \frac{305000}{60}$

$= 5083.33$

Therefore, the mean salary is ₹5083.33.

Hence, the correct option is (C) i.e., ₹5083.33.

Q6 Text Solution:

Given: Mean x = 6

According to the question,

Make a data table for the question,

x_i	f_i	$x_i f_i$
2	3	6
4	2	8
6	3	18
10	1	10
$P + 5$	2	$2P + 10$
Total	$\Sigma f_i = 11$	$\Sigma x_i f_i = 2p + 52$

As we know,

$$Mean = \frac{\sum xifi}{\sum fi}$$

$\Rightarrow 6 = \frac{2p+52}{11}$

$\Rightarrow$ 66 = 2P + 52

$\Rightarrow$ 2P = 14

$\Rightarrow$ P = 7

Hence, the correct option is (A) i.e., 7

Q7 Text Solution:

According to given data, we have

Class	Class-boundaries	Frequency (f)	Mid value (x)	$d = \frac{x-A}{h} = \frac{x-39.5}{10}$, $A = 39.5$, $h = 10$	$f \times d$
5 – 14	4.5 – 14.5	10	9.5	– 3	– 30
15 – 24	14.5 – 24.5	18	19.5	– 2	– 36
25 – 34	24.5 – 34.5	32	29.9	– 1	– 32
35 – 44	34.5 – 44.5	26	39.5 = A	0	0
45 – 54	44.5 – 54.5	14	49.5	1	14
55 – 64	54.5 – 64.5	10	59.5	2	20
		n = 110			$\Sigma f.d$ = – 64

Mean = $A + \frac{\sum f.d}{n} \times h$

$= 39.5 - \frac{64}{110} \times 10 = 33.68$

Hence, the correct option is (C) i.e., 33.68.

Q8 Text Solution:

We know that,

If each observation is added with 2, then the new mean will also increase by 2.

Thus, the new mean = 5 + 2 = 7

Alternate method:

Given observations: 6, 4, 1, 5, 6, 10 and 3

Since, each observation is increased by 2, thus the new observations will be 8, 6, 3, 7, 8, 12 and 5

∴ New mean $= \frac{8+6+3+7+8+12+5}{7} = \frac{49}{7} = 7$

Therefore, the new mean is 7.

Q9 Text Solution:

Given relation: $2x + 5y = 30$

Also, mean of $x = 10$

Thus, $5y = 30 - 2x$

$\Rightarrow 5\bar{y} = 30 - 2\overline{x}$

$\Rightarrow 5\bar{y} = 30 - 2(10)$

$\Rightarrow 5\bar{y} = 10$

$\Rightarrow \bar{y} = 2$

Q10 Text Solution:

We know that,

If each observation is multiplied by 3, then the new mean will also multiplied by 3.

Thus, the new mean $= 8 \times 3 = 24$

Therefore, the new mean is 24.

Q11 Text Solution:

As we know,

The Mean is given by the formula,

Mean $= \frac{Sum\ of\ Observations}{Number\ of\ Observations}$

Given in the question,

Mean of 25 items of data = 12

i.e., $12 = \frac{Sum\ of\ Observations}{25}$

Sum of observations $= 300$

Now, if each item is divided by 3, then

New sum of observations $= \frac{300}{3} = 100$

So, New mean $= \frac{100}{25} = 4$

Trick:

Since, Mean of 25 items of data is 12, thus on dividing each observation by 3 then the mean will also be divided by 3.

i.e., New mean $= \frac{12}{3} = 4$

Hence, the correct option is (C) i.e., 4.

Q12 Text Solution:

According to the question, we have

$n_1 = 50,\ \overline{X_1} = 70,\ n_2 = 100\ \&\ \overline{X_2} = 55$

Therefore, the combined mean weight is given by:

$\overline{X} = \frac{n_1\overline{X_1} + n_2\overline{X_2}}{n_1+n_2}$

$= \frac{50(70)+100(55)}{50+100}$

$= \frac{3500+5500}{150}$

$= \frac{9000}{150}$

$= 60$

Hence, the combined mean weight is 60 kg.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 What is the median for the following observations?

$10,\ 2,\ 7,\ 9,\ 13$

(A) 5 (B) 9

(C) 6 (D) 11

Q2 The following number of goals were scored by a team in a series of 10 matches:

$2,\ 3,\ 4,\ 5,\ 0,\ 1,\ 3,\ 3,\ 4,\ 3$

Find the median of these scores.

(A) 5

(B) 6

(C) 3

(D) None of the above

Q3 For the distribution

X:	1	2	3	4	5	6
f:	6	9	10	14	12	8

The value of median is

(A) 3.5 (B) 3

(C) 4 (D) 5

Q4 The median of x, $\frac{x}{2}$, $\frac{x}{3}$, $\frac{x}{5}$ is 10. Find x, where x > 0.

(A) 24 (B) 32

(C) 8 (D) 16

Q5 What is the value of median for the following data?

Marks	5 – 14	15 – 24	25 – 34	35 – 44	45 – 54	55 – 64
Number of students	10	18	32	26	14	10

(A) 28 (B) 30

(C) 32.94 (D) 33.18

Q6 Consider two variables, x and y, related by the equation $y = 3x + 5$. If the median of x is 10, what is the median of y?

(A) 20 (B) 40

(C) 37 (D) 35

Q7 Consider the following set of observations: $19,\ 12,\ 27,\ 14,\ 21,\ 18,\ 9,\ 15$. What is the value of the first quartile?

(A) 11.5 (B) 12

(C) 12.5 (D) 13

Q8 Consider the set of numbers: $14,\ 8,\ 19,\ 22,\ 17,\ 9,\ 13,\ 16$. What is the value of the third decile?

(A) 11.8 (B) 13.4

(C) 13.5 (D) 14

Q9 The third quartile and 65th percentile for the following data are:

Profit in '000₹	less than 10	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59
No.of firms	5	18	38	20	9	2

(A) ₹33,500 and ₹29,184

(B) ₹33,000 and ₹28,680

(C) ₹33,600 and ₹29,000

(D) ₹33,250 and ₹29,250

Q10 20^{th} percentile is equal to

(A) 19^{th} decile

(B) 20^{th} decile

(C) 2^{nd} decile

(D) None

Answer Key

Q1	(B)	Q6	(D)
Q2	(C)	Q7	(C)
Q3	(C)	Q8	(A)
Q4	(A)	Q9	(A)
Q5	(C)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Given data: $10,\ 2,\ 7,\ 9,\ 13$

Arranging the data in increasing order, we get

$2,\ 7,\ 9,\ 10,\ 13$

Clearly, the number of observations is 5 i.e. odd

$\therefore$ Median $= \left(\frac{n+1}{2}\right)^{\text{th}}\ \text{term}$

$= \left(\frac{5+1}{2}\right)^{\text{th}}\ \text{term}$

$= 3rd\ term$

$=\ 9$

Therefore, the median is 9.

Q2 Text Solution:

Arranging the given data in ascending order:

0, 1, 2, 3, 3, 3, 3, 4, 4, 5

Here, number of observations (n) = 10, which is even

Thus, median $= \frac{\frac{n}{2}^{th} + \left(\frac{n}{2}+1\right)^{\text{th}}\ \text{term}}{2}$

$= \frac{\frac{10}{2}^{th} + \left(\frac{10}{2}+1\right)^{\text{th}}\ \text{term}}{2}$

$= \frac{5th\ term + 6th\ term}{2}$

$= \frac{3+3}{2}$

$= \frac{6}{2}$

$= 3$

Therefore, the median of given observations is 3.

Q3 Text Solution:

Given data,

X:	1	2	3	4	5	6
f:	6	9	10	14	12	8
cf:	6	15	25	39	51	59

Here, N = 59

We know that, median will be the observation having cumulative frequency just equal or greater than (N + 12)th term.

Thus, $median\ =\ \frac{59+1}{2}\ th\ term$

$= 30th\ term$

Thus, the cumulative frequency just greater than 30 is 39 which corresponds to 4.

Therefore, the median is 4.

Q4 Text Solution:

Given, Median $= 10$

Clearly, the given observations $x,\ \frac{x}{2},\ \frac{x}{3},\ \frac{x}{5}$ are even in number and in decreasing order, thus

Median $= \frac{\frac{n}{2}^{th}\ term + \left(\frac{n}{2}+1\right)^{th}\ \text{term}}{2}$

$\Rightarrow$ Median $= \frac{2nd\ term + 3rd\ term}{2}$

$\Rightarrow 10 = \frac{1}{2}\left(\frac{x}{2} + \frac{x}{3}\right)$

$\Rightarrow 20 = \frac{5x}{6}$

$\Rightarrow 5x = 120$

$\Rightarrow x = 24$

Therefore, the value of x is 24.

Q5 Text Solution:

According to the given data,

Class	Frequency (f)	Class-boundaries	Mid value (x)	$c.f$
5 – 14	10	4.5 – 14.5	9.5	10
15 – 24	18	14.5 – 24.5	19.5	28
25 – 34	32	24.5 – 34.5	29.9	60
35 – 44	26	34.5 – 44.5	39.5 = A	86
45 – 54	14	44.5 – 54.5	49.5	100
55 – 64	10	54.5 – 64.5	59.5	110
	n = 110			

Here, $n = 110$

$\therefore$

$Value\ of\ \frac{n}{2}th\ observation\ =\ \frac{110}{2}th$

$observation\ =\ value\ of\ 55th\ observation$

$\Rightarrow$ Median class $= 24.5 - 34.5$

Now

$l =$ Lower boundary point of the median class = 24.5

$n =$ Total frequency = 110

$cf =$ Cumulative frequency of the class preceding the median class = 28

$f =$ Frequency of the median class = 32

$c =$ Class length of the median class = 10

$$Thus,\ Median\ = l + \frac{\frac{n}{2} - cf}{f}c$$
$$= 24.5 + \frac{55 - 28}{32} \times 10$$
$$= 32.94$$

Q6 Text Solution:

Given, $y = 3x + 5$ and the median of x is 10.

To find median of y, put $x = 10$ in the given equation

$\Rightarrow y = 3 \times 10 + 5$
$\Rightarrow y = 30 + 5$
$\Rightarrow y = 35$

Thus, the median of y is 35.

Q7 Text Solution:

Given observations:

$19,\ 12,\ 27,\ 14,\ 21,\ 18,\ 9,\ 15$

Arranging the observations in increasing order, we get

$9,\ 12,\ 14,\ 15,\ 18,\ 19,\ 21,\ 27$

We know that,

First quartile

$Q_1 = \left(\frac{n+1}{4}\right)^{th}\ value$
$= \left(\frac{8+1}{4}\right)^{th}\ value$
$= \left(\frac{9}{4}\right)^{th}\ value$
$= (2.25)^{th}\ value$
$= 2^{nd}\ value\ + 0.25 \times Difference\ between\ 3rd\ and\ 2nd\ values$
$= 12 + 0.25\left(14 - 12\right)$
$= 12 + 0.25\left(2\right)$
$= 12 + 0.50$
$= 12.50$

Therefore, the value of the first quartile is 12.50.

Q8 Text Solution:

Given observations:

$14,\ 8,\ 19,\ 22,\ 17,\ 9,\ 13,\ 16$

Arranging the observations in ascending order, we get $8,\ 9,\ 13,\ 14,\ 16,\ 17,\ 19,\ 22$

We know that,

Third quartile is given by:

$D_3 = \frac{3}{10} \times (n+1)^{th}\ term$
$= \frac{3}{10} \times (8+1)^{th}\ term$
$= \frac{3}{10} \times 9^{th}\ term$
$= 2.7^{th}\ term$
$= 2^{nd}\ term\ +\ Difference\ between\ 3^{rd}\ term\ and\ 2^{nd}\ term$
$= 9 + 0.70\left(13 - 9\right)$
$= 9 + 2.8$
$= 11.8$

Hence, the correct option is (A).

Q9 Text Solution:

According to the given data,

Class interval	Class-boundaries	Frequency (f)	Cumulative frequency (cf)
less than 10	less than 9.5	5	5
10 – 19	9.5 – 19.5	18	23
20 – 29	19.5 – 29.5	38	61
30 – 39	29.5 – 39.5	20	81
40 – 49	39.5 – 49.5	9	90
50 – 59	49.5 – 59.5	2	92
		$n = \Sigma f_i = 92$	

$Third\ quartile\ Q_3 =\ Value\ of\ \left(\frac{3n}{4}\right)^{th}\ observation$
$= \left(\frac{3 \times 92}{4}\right)^{th} = 69^{th}\ observation$

69th observation lies in the class interval $29.5 - 39.5$, so it is a quartile class.

Here,

$l = 29.5,\ cf = 61,\ f = 20,\ c = 39.5 - 29.5 = 10$

We know that,

$\Rightarrow Q_3 = l + \frac{\frac{3n}{4} - cf}{f} \times c$
$\Rightarrow Q_3 = 29.5 + \frac{69 - 61}{20} \times 10 = 33.5$
$\Rightarrow Q_3 = 33.5 \times 1000$
$\left(\because\ Profits\ is\ given\ in\ thousands\right)$
$\Rightarrow Q_3 = 33500$

$Now,\ 65th\ percentile\ P_{65} =\ Value\ of$
$\left(\frac{65n}{100}\right)^{th}\ observation$

$= \left(\frac{65\times92}{100}\right)^{th}$

$= Value\ of\ 59.8^{th}\ observation$

Since, 59.8th observation lies in a class 19.5 - 29.5. So, it is 65th percentile class .

Here, $l = 19.5,\ cf = 23,\ f = 38,\ c = 10$

We know that,

$P_{65} = l + \frac{\frac{65n}{100} - cf}{f} \times c$

$\Rightarrow P_{65} = 19.5 + \frac{59.8 - 23}{38} \times 10 = 29.184$

$\Rightarrow P_{65} = 29.184 \times 1000$

$\left(\because\ Profits\ is\ given\ in\ thousands\right)$

$\Rightarrow P_{65} = ₹29184$

Q10 Text Solution:

We know that,

Percentile divides the data into 100 equal parts and Decile divides the data into 10 equal parts.

$\therefore 20^{\text{th}}$ percentile $= P_{20} = \left(\frac{20N}{100}\right)^{\text{th}}$

$= \left(\frac{2N}{10}\right)^{\text{th}} = D_2 = 2^{\text{nd}}$ decile

Therefore, 20^{th} percentile is equal to 2^{nd} decile.

Hence, the correct option is (C) i.e. 2^{nd} decile.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 What is the modal value for the numbers: $5, 8, 6, 4, 10, 15, 18, 10$?

(A) 18 (B) 10

(C) 14 (D) None of these

Q2 The heights (in centimeters) of a group of students in a class were recorded. The data set is as follows:

$141, 150, 154, 152, 162, 142, 155, 160, 167, 147, 152, 160$

What is the mode(s) of the heights in the data set?

(A) 142 (B) 165

(C) 152 and 160 (D) No mode

Q3 What is the mode for the following set of numbers?

$7, 9, 12, 15, 18, 21, 24, 27$

(A) 7 (B) 27

(C) 15, 18 (D) No mode

Q4

Height in cms:	61 – 63	63 – 65	65 – 67	67 – 69	69 – 71
No.of students:	15	118	142	127	18

Modal group is

(A) 65 - 67 (B) 69 - 71

(C) 63 - 65 (D) none

Q5 For moderately skewed distribution, if the mean and median are 22.33 and 22 respectively, then what will be its mode?

(A) 44.33 (B) 0.33

(C) 21.34 (D) None

Q6 If x and y are related by $x - y - 10 = 0$ and mode of x is known to be 23, then the mode of y is

(A) 10 (B) 13

(C) 3 (D) None

Q7 What is the geometric mean (GM) for the numbers 2, 8 and 32?

(A) 4 (B) 6

(C) 8 (D) 12

Q8 The harmonic mean for the numbers $2, 3, 5$ is

(A) 2.00 (B) 3.33

(C) 2.90 (D) 3.30

Q9 If GM of x is 10 and GM of y is 15, then GM of xy is

(A) 150

(B) $\log\ 10 \times \log\ 15$

(C) $\log\ 150$

(D) None of these

Q10 The mode for the following frequency distribution:

Class interval :	350 – 369	370 – 389	390 – 409	410 – 429	430 – 449	450 – 469
Frequency	15	27	31	19	13	6

(A) 390 (B) 390.50

(C) 394.50 (D) 394

Q11 If the difference between Mean and Mode is 69, then the difference between Mean and Median will be

(A) 63 (B) 31.5

(C) 23 (D) None

Q12 The geometric mean of three numbers 40, 50 and x is 10, the value of x is

(A) 5 (B) 4

(C) 2 (D) $\frac{1}{2}$

Answer Key

Q1	(B)	Q7	(C)
Q2	(C)	Q8	(C)
Q3	(D)	Q9	(A)
Q4	(A)	Q10	(C)
Q5	(C)	Q11	(C)
Q6	(B)	Q12	(D)

Hints & Solutions

Q1 Text Solution:

Given data: $5,\ 8,\ 6,\ 4,\ 10,\ 15,\ 18,\ 10$

We know that,

For a given set of observations, mode may be defined as the value that occurs the maximum number of times.

Here, 10 occurs maximum number of times (2 times).

Therefore, the modal value is 10.

Q2 Text Solution:

Given data: $141,\ 150,\ 154,\ 152,\ 162,\ 142,\ 155,\ 160,\ 167,\ 147,\ 152,\ 160$

We know that,

For a given set of observations, mode may be defined as the value that occurs the maximum number of times.

Here, we can see that the heights 152 and 160 both appear two times, which is more frequent than any other height in the data set.

Therefore, the modes of the heights in the data set are 152 and 160.

Q3 Text Solution:

We know that,

The mode represents the value(s) that occur most frequently in a set of numbers. In the given set, each number appears only once, and there are no repeated values. Therefore, there is no value that occurs more frequently than others, resulting in no mode for this set of numbers.

Hence, the correct option is (D).

Q4 Text Solution:

We know that,

For a given set of observations, mode may be defined as the value that occurs the maximum number of times.

Clearly, the highest frequency is 142 which lies in the class 65 - 67.

Therefore, the modal class is 65 - 67.

Q5 Text Solution:

Given,

Mean $= 22.33$

Median $= 22$

We know that,

Mode = 3 Median - 2 Mean

$\Rightarrow$ Mode $= 3(22) - 2(22.33)$

$\Rightarrow$ Mode $= 66 - 44.66$

$\Rightarrow$ Mode $= 21.34$

Therefore, the mode is 21.34.

Q6 Text Solution:

Given, $x - y - 10 = 0$

To find the mode of y, put $x = 23$ in the given equation.

$23 - y - 10 = 0$

$\Rightarrow 13 - y = 0$

$\Rightarrow y = 13$

Therefore, mode of y is 13.

Q7 Text Solution:

Given: $x_1 = 2,\ x_2 = 8,\ x_3 = 32$ and $n = 3$

We know that,

GM$= (x_1\ x_2\ x_3\ \ldots\ldots x_n)^{\frac{1}{n}}$

$= (2 \times 8 \times 32)^{\frac{1}{3}}$

$= (2 \times 2 \times 4 \times 4 \times 4 \times 2)^{\frac{1}{3}}$

$= 2 \times 4$

$= 8$

Therefore, the required geometric mean is 8.

Q8 Text Solution:

Given: $x_1 = 2,\ x_2 = 3,\ x_3 = 5$ & $n = 3$

We know that,

HM $= \frac{n}{\frac{1}{x_i}}$

$= \frac{3}{\frac{1}{2}+\frac{1}{3}+\frac{1}{5}}$

$= \frac{3\times 30}{15+10+6}$

$= \frac{90}{31}$

$= 2.90$

Therefore, the harmonic mean of the given numbers is 2.90.

Q9 Text Solution:

Given: GM of x = 10 and GM of y = 15

We know that,

GM of the product of two variables is the product of their GM's.

Thus, GM of xy = GM of x $\times$ GM of y

= 10$\times$15 = 150

Therefore, GM of xy is 150.

Hence, the correct option is (A) i.e. 150.

Q10 Text Solution:

According to the question,

Class	Frequency (f)	Class-boundaries
350 – 369	15	349.5 – 369.5
370 – 389	27	369.5 – 389.5
390 – 409	31	389.5 – 409.5
410 – 429	19	409.5 – 429.5
430 – 449	13	429.5 – 449.5
450 – 469	6	449.5 – 469.5

Clearly, the maximum frequency is 31.

∴ The modal class is 389.5 - 409.5.

Here,

l = lower frequency point of modal class = 389.5

f_1 = frequency of the modal class = 31

f_0 = frequency of the preceding class = 27

f_2 = frequency of the succeeding class = 19

c = class length of the modal class = 20

$$\therefore \ Mode = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times c$$

$$= 389.5 + \frac{31 - 27}{2(31) - 27 - 19} \times 20$$

$$= 394.50$$

Q11 Text Solution:

We know that,

Mean - Mode = 3(Mean - Median)

$$\Rightarrow 69 = 3(mean - median)$$

$$\Rightarrow \frac{69}{3} = Mean - Median$$

$$\Rightarrow Mean - Median = 23$$

Q12 Text Solution:

Given, Geometric mean of three numbers 40, 50 and x = 10

i.e., $(40 \times 50 \times x)^{\frac{1}{3}} = 10$

Taking cube on both sides, we get

$2000x = 10^3$

$\Rightarrow 2000x = 1000$

$\Rightarrow x = \frac{1}{2}$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 The mode of the numbers $7, 7, 7, 9, 10, 11, 11, 11, 12$ is
(A) 10 (B) 11
(C) 7 (D) 7&11

Q2 $\frac{n+1}{2}$th term is median if n is
(A) odd (B) even
(C) both (D) none

Q3 If each item is reduced by 15, A.M is
(A) reduced by 15
(B) increased by 15
(C) reduced by 10
(D) None

Q4 When mean is 3.57 and mode is 2.13, then the value of median is _____ .
(A) 3.09 (B) 5.01
(C) 4.01 (D) None of these

Q5

Variable:	2	3	4	5	6	7
No. of men:	5	6	8	13	7	4

Mode is
(A) 6 (B) 5
(C) 4 (D) None

Q6 Mean of $7, 9, 12, x, 4, 11$ & 5 is 9. Find the missing observation.
(A) 13 (B) 15
(C) 12 (D) None of these

Q7 If there are 3 observations $15, 20, 25$, then the sum of deviation of the observations from their AM is
(A) 0 (B) 5
(C) - 5 (D) None of these

Q8 25th percentile is equal to
(A) 1st quartile (B) 2nd quartile
(C) 3rd quartile (D) None

Q9 The median of following numbers, which are given in ascending order is 25. Find the value of x if data is $11, 13, 15, 19, (x+2), (x+4), 30, 35, 39, 46$
(A) 22 (B) 20
(C) 15 (D) 30

Q10 If the AM and HM for two numbers are 5 and 3.2 respectively, then the GM will be
(A) 16 (B) 4.10
(C) 4.05 (D) 4

Q11 The fourth decile for the numbers $12, 15, 18, 20, 22, 25, 28, 30$ is
(A) 12.50 (B) 19.20
(C) 28.0 (D) 30.0

Q12 If $y = 3x - 100$ and $\bar{x}$ = 50, then the value of $\bar{y}$ is
(A) 60 (B) 30
(C) 100 (D) 50

Q13 The average of 5 quantities is 6 and the average of 3 is 8. What is the average of the remaining two?
(A) 4 (B) 5
(C) 3 (D) 3.5

Q14 A survey was conducted by a group of students as a part of their environmental awareness program, in which they collected the following data regarding the number of plants in 200 houses in a locality. Find the mean number of plants per house.

Number of plants	0 – 2	2 – 4	4 – 6	6 – 8	8 – 10	10 – 12	12 – 14
Number of houses	1	2	1	5	6	2	3

(A) 162 (B) 20
(C) 15.5 (D) 8.1

Q15 Following is an incomplete distribution having modal mark as 44.

Marks :	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of students	5	18	?	12	5

What would be the mean marks?
(A) 45 (B) 46
(C) 47 (D) 48

Q16 If Arithmetic mean between two numbers is 5 and Geometric mean is 4, then what is the value of Harmonic mean?
(A) 3.2 (B) 3.4
(C) 3.5 (D) 3.6

Q17 A train covered the first 5 km of its journey at a speed of 30 km/hr and next 15 km at a speed of 45 km/hr. The average spped of the train was
(A) 38 km/hr (B) 40 km/hr
(C) 36 km/hr (D) 42 km/hr

Q18 The geometric mean of three numbers is 12 and two of the numbers are 4 and 16. What is the third number?
(A) 12 (B) 32
(C) 27 (D) 48

Answer Key

Q1	(D)	Q10	(D)
Q2	(A)	Q11	(B)
Q3	(A)	Q12	(D)
Q4	(A)	Q13	(C)
Q5	(B)	Q14	(D)
Q6	(B)	Q15	(D)
Q7	(A)	Q16	(A)
Q8	(A)	Q17	(B)
Q9	(A)	Q18	(C)

Hints & Solutions

Q1 Text Solution:

Given data: 7, 7, 7, 9, 10, 11, 11, 11, 12

The mode is the value that appears the most often in a data set.

According to this question, 7 and 11 both appear thrice.

Hence, the correct answer is option (D) i.e., 7 & 11

Q2 Text Solution:

To find median:

First of all, we will arrange the given numbers in ascending order.

We know that,

If n is odd: Median $= \left(\frac{n+1}{2}\right)^{\text{th}} \text{term}$

If n is even: Median $= \frac{\left(\frac{n}{2}\right)^{\text{th}} term + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}}{2}$

Q3 Text Solution:

As we know, Arithmetic Mean $\left(A.M\right) = \frac{\text{Sum of observations}}{\text{Number of observations}}$

Let us assume the observations to be $20,\ 21$ and 22, then

Arithmetic mean $= \frac{20+21+22}{3} = \frac{63}{3} = 21$

Now, when each observation is reduced by 15, then the new observations will be, $(20-15),\ (21-15),\ (22-15)$ i.e. $5,\ 6,\ 7$

Now, new Arithmetic Mean,

$\left(A.M\right)' = \frac{5+6+7}{3}$

$\left(A.M\right)' = \frac{18}{3} = 6$

Thus, the new Arithmetic mean is also reduced by 15.

Alternate method:

If each observation is reduced with 15, then the new mean will also reduce by 15.

Q4 Text Solution:

Given: Mode $= 2.13$, Mean $= 3.57$

We know that, the empirical formula of mean, mode and median is as follows;

3 Median $= 2$ mean $+$ Mode

$\Rightarrow$ 3 Median $= 2(3.57) + 2.13$

$\Rightarrow$ 3 Median $= 9.27$

$\Rightarrow$ Median $= \frac{9.27}{3}$

$\Rightarrow$ Median $= 3.09$

Q5 Text Solution:

By observing the table,

We can infer that maximum number of people i.e. 15 are there corresponding to variable 5.

Therefore, the mode is 5.

Q6 Text Solution:

Given data: $7,\ 9,\ 12,\ x,\ 4,\ 11,\ 5$

Mean of the data $= 9$

As we know, Mean $= \frac{\text{Sum of the observations}}{\text{Number of the observations}}$

So, Mean $= \frac{7+9+12+x+4+11+5}{7} = 9$

$\Rightarrow \frac{48+x}{7} = 9$

$\Rightarrow 48 + x = 63$

$\Rightarrow x = 63 - 48$

$\Rightarrow x = 15$

Q7 Text Solution:

Given observations: $15,\ 20,\ 25$

Firstly, we will find AM of the given data

$AM = \frac{15+20+25}{3}$

$AM = \frac{60}{3}$

$AM = 20$

Thus, the deviation of the observations from their AM is

$15-20,\ 20-20,\ 25-20$ i.e. $-5,\ 0,\ 5$

Therefore, the sum of deviation $= -5+0+5 = 0$

Q8 Text Solution:

25th percentile is equal to $\frac{25N}{100}th\ value = \frac{N}{4}th\ value = 1st\ quartile$

Hence, the correct option is (A) i.e 1st quartile

Q9 Text Solution:

Given: Median of the numbers $= 25$

Total number of observations , $n = 10$ (even)

We know that,

If $\mathbf{n}$ is even, then Median $= \frac{\left(\frac{n}{2}\right)^{\text{th}} term + \left(\frac{n}{2}+1\right)^{\text{th}} \text{term}}{2}$

Since, the data is arranged in ascending order

$11,\ 13,\ 15,\ 19,\ (x+2),\ (x+4),\ 30,\ 35,\ 39,\ 46$

$\Rightarrow$ Median $= \frac{\left(\frac{10}{2}\right)^{\text{th}} term\ + \left(\frac{10}{2}+1\right)^{\text{th}} \text{term}}{2}$

$\Rightarrow$ Median $= \frac{5^{\text{th}}\ term\ + 6^{\text{th}}\ \text{term}}{2}$

$\Rightarrow 25 = \frac{(x+2)+(x+4)}{2} = \frac{2x+6}{2}$

$\Rightarrow 25 = x + 3$

$\Rightarrow x = 22$

Q10 Text Solution:

Given: AM = 5 and GM = 3.2

We know that,

$AM \times HM = GM^2$

$\Rightarrow GM^2 = 5 \times 3.2$

$\Rightarrow GM^2 = 16$

$\Rightarrow GM = 4$

Therefore, GM will be 4.

Q11 Text Solution:

Given data: $12,\ 15,\ 18,\ 20,\ 22,\ 25,\ 28,\ 30$

The given data is already in ascending order.

We know that,

Fourth decile, $D_4 = \frac{3}{10} \times (n+1)^{\text{th}}$ value

$= \frac{4}{10} \times (8+1)^{\text{th}}$ value

$= \frac{4}{10} \times 9^{\text{th}}$ value

$= 3.6^{\text{th}}$ value

$= 3^{\text{rd}}$ value $+0.6 \times$ Difference between 4^{th} and 3^{rd} values

$= 18 + 0.70(20-18)$

$= 18 + 1.2$

$= 19.20$

Q12 Text Solution:

Given: $\bar{x}$ = 50 , $y = 3x - 100$

$\bar{y}$ can be written as, $\bar{y} = 3\bar{x}$ - 100

Put the value of $\bar{x}$ = 50 in the above equation,

$\bar{y} = 3(50) - 100$

$\Rightarrow \bar{y} = 150 - 100$

$\Rightarrow \bar{y} = 50$

Q13 Text Solution:

Average of 5 quantities $= 6$

$\Rightarrow \frac{Sum\ of\ 5\ quantities}{5} = 6$

$\Rightarrow Sum\ of\ 5\ quantities = 30$

Also, average of 3 quantities $=\ 8$

$\Rightarrow \frac{Sum\ of\ 3\ quantities}{3} = 8$

$\Rightarrow Sum\ of\ 3\ quantities = 24$

So, sum of remaining two numbers,

$= (5 \times 6) - (3 \times 8)$

$= 6$

Since, Mean $= \frac{Sum\ of\ the\ terms}{Number\ of\ terms}$

Average of remaining two $= \frac{6}{2} = 3$

Hence, the correct option is (C) i.e. 3.

Q14 Text Solution:

We know that,

$Class\ marks = x_i$

$= \frac{Upper\ class\ limit + Lower\ class\ limit}{2}$

Thus, according to the data given

Number of plants	Number of houses (f_i)	x_i	$x_i f_i$
0 - 2	1	1	1
2 - 4	2	3	6
4 - 6	1	5	5
6 - 8	5	7	35
8 - 10	6	9	54
10 - 12	2	11	22
12 - 14	3	13	39
		$\Sigma x_i = 20$	$\Sigma x_i f_i = 162$

Thus, $mean = \frac{\sum xi\ fi}{\sum xi} = \frac{162}{20} = 8.1$

Therefore, the mean number of plants per house is 8.1.

Q15 Text Solution:

Let us assume that ? = x

Given, mode is 44.

$\Rightarrow$Modal class is 40 - 60.

Thus, $l = 40,\ f_1 = x,\ f_0 = 18,\ f_2 = 12$ and $c = 20$

We know that,

$\text{Mode } Z = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times c$

$\Rightarrow 44 = 40 + \frac{x-18}{2x-18-12} \times 20$

$\Rightarrow 44 - 40 = \frac{x-18}{2x-30} \times 20$

$\Rightarrow \frac{1}{5} = \frac{x-18}{2x-30}$

On cross multiplication, we get

$2x - 30 = 5(x - 18)$

$\Rightarrow 2x - 30 = 5x - 90$

$\Rightarrow 3x = 60$

$\Rightarrow x = \frac{60}{3}$

$\Rightarrow x = 20$

$\Rightarrow ? = 20$

Now, to find mean:

Class	Frequency (f)	Mid value (x)	$d = \frac{x-A}{h} = \frac{x-50}{20}$, $A = 50, h = 20$	$f \times d$
0 – 20	5	10	– 2	– 10
20 – 40	18	30	– 1	– 18
40 – 60	20	50 = A	0	0
60 – 80	12	70	1	12
80 – 100	5	90	2	10
	n = 60			$\Sigma f.d$ =– 6

$\text{Mean } \overline{X} = A + \frac{\sum f \cdot d}{n} \times h = 50 - \frac{6}{60} \times 20$

$= 48$

Therefore, the mean marks is 48 .

Hence, the correct option is (D) i.e. 48.

Q16 Text Solution:

Given, A.M = 5 and G.M = 4

We know that,

$G.M^2 = A.M \times H.M$

$\Rightarrow 4^2 = 5 \times H.M$

$\Rightarrow 16 = 5 \times H.M$

$\Rightarrow H.M = 3.2$

Q17 Text Solution:

We know that,

$Speed = \frac{Dis\tan ce}{Time}$

Thus, average speed = $\frac{Total\ dis\tan ce}{Total\ time}$

$\Rightarrow \frac{5+15}{\frac{5}{30} + \frac{15}{45}}$

$\Rightarrow \frac{20}{\frac{1}{6} + \frac{1}{3}}$

$\Rightarrow \frac{20 \times 6}{3}$

$\Rightarrow 40\ km/hr$

Q18 Text Solution:

Let the third number be x.

We know that,

$\text{G. M.} = \sqrt[n]{a_1 \times a_2 \times a_3 \times \ldots\ldots\ldots\ldots\ldots \times a_n}$

Since, Geometric mean of 4, 16 and x = 12

$\Rightarrow G \cdot M \cdot = \sqrt[3]{4 \times 16 \times x}$

$\Rightarrow 12 = \sqrt[3]{64 \times x}$

On cubing both the sides,

$\Rightarrow \left(12\right)^3 = 64 \times x$

$\Rightarrow x = \frac{(12)^3}{64}$

$\Rightarrow x = 27$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 5

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 Following are the wages of 8 workers expressed in Rupees:

$82,\ 96,\ 52,\ 75,\ 70,\ 65,\ 50,\ 70$

Find the range.

(A) ₹10 (B) ₹34

(C) ₹46 (D) None of these

Q2 The following data represents the heights (in centimeters) of a group of students in a class:

Height (cm)	Frequency
100 - 120	5
120 - 140	8
140 - 160	12
160 - 180	10
180 - 200	6

What is the range of heights for the given grouped frequency data?

(A) 100 cm (B) 120 cm

(C) 160 cm (D) 200 cm

Q3 What is the coefficient of range for the following wages of 8 workers ?

₹80, ₹65, ₹90, ₹60, ₹75, ₹70, ₹72, ₹85

(A) ₹30 (B) ₹20

(C) 30 (D) 20

Q4 The following data represents the weights (in kilograms) of a group of individuals in a gym:

Weight (kg)	Frequency
41 - 50	6
51 - 60	12
61 - 70	15
71 - 80	8
81 - 90	5

Find the coefficient of range for the given grouped frequency data

(A) 1.13% (B) 3.82%

(C) 4.29% (D) None of these

Q5 The range of x is 2, what would be the range of $-3x + 50$?

(A) 2 (B) 6

(C) -6 (D) 44

Q6 Given the observations: $4, 9, 11, 14, 37$. The mean deviation about the median is

(A) 11 (B) 8.5

(C) 7.6 (D) 7.45

Q7 The mean deviation about mode for the numbers $\frac{4}{11}, \frac{6}{11}, \frac{8}{11}, \frac{9}{11}, \frac{12}{11}, \frac{8}{11}$

(A) $\frac{1}{6}$

(B) $\frac{1}{11}$

(C) $\frac{6}{11}$

(D) $\frac{5}{11}$

Q8 If the relation between x and y in $5y - 3x = 10$ and the mean deviations about mean for x is 12, then the mean deviation of y about mean is

(A) 7.20 (B) 6.80

(C) 20 (D) 18.80

Q9

If two variables x and y are related by the equation $2x - 3y + 4 = 0$ and the mean and mean deviation about mean of x are 4 and 0.6 respectively, then the coefficient of mean deviation of y about its mean is

(A) 5 (B) 8

(C) 10 (D) None of these

Q10 What is the coefficient of mean deviation for the following distribution of heights? Take deviation from AM.

Height in inches:	$60-62$	$63-65$	$66-68$	$69-71$	$72-74$
No. of students:	5	22	28	17	3

(A) 2.30 inches (B) 3.45 inches

(C) 3.82 inches (D) 2.48 inches

Answer Key

Q1	(C)	Q6	(C)
Q2	(A)	Q7	(A)
Q3	(D)	Q8	(A)
Q4	(B)	Q9	(C)
Q5	(B)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

Given wages in rupees:
$82,\ 96,\ 52,\ 75,\ 70,\ 65,\ 50,\ 70$
Maximum wage $=$ ₹96
Minimum wage $=$ ₹50
$\therefore$ Range $=$ Maximum wage $-$ Minimum wage
$=$ ₹96 $-$ ₹50 $=$ ₹46

Q2 Text Solution:

We know that,
Range = Highest class boundary - Smallest class boundary
According to the data given,
Minimum height $= 100\ cm$
Maximum height $= 200\ cm$
Therefore, the range of heights
$= 200\ cm\ -\ 100\ cm$
$= 100\ cm$

Q3 Text Solution:

Given: The wages of 8 workers in ₹ are
₹80, ₹65, ₹90, ₹60, ₹75, ₹70, ₹72, ₹85
Maximum wage (H) = ₹90
Minimum wage (L) = ₹60
So, the range = H - L = ₹90 - ₹60 = ₹30
Coefficient of the range
$= \frac{H-L}{H+L} \times 100$
$= \frac{₹90-₹60}{₹90+₹60} \times 100$
$= \frac{₹30}{₹150} \times 100$
$= \frac{1}{5} \times 100$
$= 20$
Hence, the correct answer is option (D).

Q4 Text Solution:

According to the data given,
S $= 41 - 0.5 = 40.5$
L $= 90 + 0.5 = 90.5$
Thus, Coefficient of range $= \frac{L-S}{L+S} \times 100$
$= \frac{90.5-40.5}{90.5+40.5} \times 100$
$= \frac{50}{131} \times 100$
$= 3.82\%$

Q5 Text Solution:

Given: Range of $x = 2$
$\therefore$ Range of $(-3x\ +\ 50)\ =\ |-3|\times$ Range of x
$=\ 3 \times 2\ =\ 6$

Q6 Text Solution:

Given observations, $X_i : 4, 9, 11, 14, 37$
Here, $n = 5$
Since, n is odd
Thus, median of observation $= \frac{n+1}{2} = \frac{5+1}{2} = \frac{6}{2} = 3^{\text{rd}}$ observation $= 11$

$$\therefore |d| = |X_i - \text{Median}| = |X_i - 11|$$

X_i	$\lvert d\rvert = \lvert X_i - 11\rvert$
4	7
9	2
11	0
14	3
37	26
	$\sum \lvert d\rvert = 38$

Mean deviation about the median

$$= \frac{\sum (X_i - \text{Median})}{n} = \frac{\sum |d|}{n} = \frac{38}{5}$$
$$= 7.6$$

Q7 Text Solution:

Given data (X_i): $\frac{4}{11}$, $\frac{6}{11}$, $\frac{8}{11}$, $\frac{9}{11}$, $\frac{12}{11}$, $\frac{8}{11}$

Since, $\frac{8}{11}$ is occurring most frequent (2 times), thus

Mode of the data $= \frac{8}{11}$

Now, the deviation from mode

$= |X_i - Mode| = |X_i - \frac{8}{11}|$

$= \frac{4}{11}, \frac{2}{11}, 0, \frac{1}{11}, \frac{4}{11}, 0$

$\therefore$ Mean deviation about mode $= \frac{(X_i - Mode)}{n}$

$= \frac{\frac{4}{11} + \frac{2}{11} + 0 + \frac{1}{11} + \frac{4}{11} + 0}{6}$

$= \frac{\frac{11}{11}}{6}$

$= \frac{1}{6}$

Q8 Text Solution:

Given,

The relation is $5y - 3x = 10$

$\Rightarrow y = \frac{(10 + 3x)}{5}$

$\Rightarrow y = \frac{3}{5}x + 2$

Mean deviation about mean of $y = |\frac{3}{5}| \times$ mean deviation about

mean of x

$= |\frac{3}{5}| \times 12$

$= \frac{3}{5} \times 12$

$= 7.2$

Q9 Text Solution:

Given,

The relation is $2x - 3y + 4 = 0$

$\Rightarrow 3y = 2x + 4$

$\Rightarrow y = \frac{2}{3}x + \frac{4}{3}$

Thus, the mean of $y = \frac{2}{3}(mean\ of\ x) + \frac{4}{3}$

$\Rightarrow y = \frac{2}{3}(4) + \frac{4}{3}$

$\Rightarrow y = 4$

Mean deviation of $y = |\frac{2}{3}| \times$ mean deviation of x

$\Rightarrow y = \frac{2}{3}(0.6)$

$\Rightarrow y = 0.4$

Thus, Coefficient of mean deviation

$= \frac{\text{mean deviation}}{\text{mean}} \times 100$

$= \frac{0.4}{4} \times 100$

$= 10$

Q10 Text Solution:

According to the given data,

C.I.	Class boundary	Frequency (f_i)	x_i	$u_i = \frac{x_i - A}{h}$, $A = 67, h = 3$	$f_i u_i$
60 – 62	59.5 – 62.5	5	61	– 2	– 10
63 – 65	62.5 – 65.5	22	64	– 1	– 22
66 – 68	65.5 – 68.5	28	67 = A	0	0
69 – 71	68.5 – 71.5	17	70	1	17
72 – 74	71.5 – 74.5	3	73	2	6
		75			

$Thus,\ Mean = A + \frac{\sum f_i u_i}{n} \times h$

$= 67 + \frac{-9}{75} \times 3$

$= 67 - 0.36$

$= 66.64$

Now,

$d = \lvert x_i - mean \rvert$	$f_i . d$
5.64	28.20
2.64	58.08
0.36	10.08
3.36	57.12
6.36	19.08
	172.56

$Mean\ Deviation\ about\ mean$

$= \frac{fi\ |(xi - x)|}{n}$

$= \frac{172.56}{75} = 2.3008$

Therefore,

$Coefficient\ of\ Mean\ Deviation$

$= \frac{Mean\ Deviation}{Mean} \times 100$

$= \frac{2.3008}{66.64} \times 100 \approx 3.45\ inches$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 6

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 Quartile deviation is called
(A) Semi interquartile range
(B) Quartile range
(C) Both
(D) None

Q2 When 1^{st} quartile $= 20$, 3^{rd} quartile $= 30$, the value of quartile deviation is
(A) 7 (B) 4
(C) -5 (D) 5

Q3 The first quartile of a dataset is 25 and the third quartile is 75. What is the interquartile range of the dataset?
(A) 25 (B) 50
(C) 75 (D) 100

Q4 Quartile Deviation for the data 1, 3, 4, 5, 6, 6, 10 is
(A) 3 (B) 1
(C) 6 (D) 1.5

Q5 Find the interquartile range for the following dataset representing the scores of 10 students in a mathematics test:
$35,\ 42,\ 48,\ 55,\ 60,\ 63,\ 68,\ 70,\ 72,\ 78$
(A) 12 (B) 24
(C) 46.5 (D) None of these

Q6 The quartiles of a variable are 45, 52 and 65 respectively. Its quartile deviation is
(A) 10 (B) 20
(C) 25 (D) 8.30

Q7 If x and y are related as $2x + 5y = 30$ and the quartile deviation of x is 10, then the quartile deviation of y is:
(A) 2 (B) 4
(C) 5 (D) 6

Q8 If median $= 5$, Quartile deviation $= 1.5$, then the coefficient of quartile deviation is
(A) 33 (B) 35
(C) 30 (D) 20

Q9 Following are the marks of the 10 students: $56,\ 48,\ 65,\ 35,\ 42,\ 75,\ 82,\ 60,\ 55,\ 50$. Find the coefficient of quartile deviation.
(A) 16.50 (B) 18
(C) 18.42 (D) None of these

Q10 The quartile deviation for the data is:

x	2	3	4	5	6
f	3	4	8	4	1

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$
(C) 1 (D) 0

Answer Key

Q1	(A)	Q6	(A)
Q2	(D)	Q7	(A)
Q3	(B)	Q8	(C)
Q4	(D)	Q9	(C)
Q5	(B)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

We know that,

The interquartile range is defined as the difference between the third and the first quartile and Semi interquartile range refers to the interquartile difference divided by two. i.e.

Semi Interquartile Range $= \frac{(Q_3 - Q_1)}{2}$

where, Q_3 is third quartile and Q_1 is first quartile which is the same as Quartile Deviation.

Thus, Quartile Deviation is also known as semi interquartile range.

Q2 Text Solution:

Given: $Q_1 = 20$ and $Q_3 = 30$

We know that,

Quartile deviation $= \frac{Q_3 - Q_1}{2}$

$= \frac{30 - 20}{2}$

$= \frac{10}{2}$

$= 5$

Therefore, the value of quartile deviation is 5.

Q3 Text Solution:

To find the interquartile range, we need to calculate the difference between the third quartile and the first quartile.

Given:

Q_1 = 25

Q_3 = 75

Therefore, Interquartile range $= Q_3 - Q_1$

= 75 - 25

= 50

Therefore, the interquartile range of the dataset is 50.

Q4 Text Solution:

As we know that,

Quartile Deviation is given by $\frac{Q_3 - Q_1}{2}$

where, Q_3 is third quartile and Q_1 is first quartile

We have, 1, 3, 4, 5, 6, 6, 10

Given series of numbers is already arranged in ascending order and the number of observations is odd i.e. n = 7

First Quartile $= Q_1 = \left(\frac{n+1}{4}\right)^{th} observations$

$= \left(\frac{7+1}{4}\right)^{th} observations = 2^{nd}\ observation$

$= 3$

Third Quartile, $Q_3 = 3\left(\frac{n+1}{4}\right)^{th} observation$

$= \left(\frac{24}{4}\right)^{th} observation$

$= 6^{th}\ observation = 6$

Therefore, Quartile Deviation $= \frac{6-3}{2} = 1.5$

Hence, the correct option is (D).

Q5 Text Solution:

Given dataset:

$35,\ 42,\ 48,\ 55,\ 60,\ 63,\ 68,\ 70,\ 72,\ 78$

The dataset is already in ascending order.

Now,

First Quartile $Q_1 = \left(\frac{n+1}{4}\right)^{\text{th}}$ observations

$= \left(\frac{10+1}{4}\right)^{\text{th}}$ observations $= 2.75^{\text{nd}}$ observation

$= 2^{\text{nd}}$ observation $+0.75\times$ Difference between 3rd and 2nd observations

$= 42 + 0.75(48 - 42)$

$= 42 + 4.5 = 46.5$

Third Quartile $Q_3 = \frac{3(n+1)}{4}^{\text{th}}$ observations

$= \left(\frac{3(11)}{4}\right)^{\text{th}}$ observations $= 8.25^{\text{nd}}$ observation

$= 8^{\text{th}}$ observation $+0.25\times$ Difference between 9th and 8th observations

$= 70 + 0.25(72 - 70)$

$= 70 + 0.50 = 70.50$

Therefore, Interquartile range $= Q_3 - Q_1$

$= 70.50 - 46.50$

$= 24$

Q6 Text Solution:

Given: Quartiles of a variable are $45, 52$ and 65

i.e. $Q_1 = 45,\ Q_2 = 52$ and $Q_3 = 65$

Thus, Quartile deviation $= \frac{Q_3 - Q_1}{2}$
$= \frac{65 - 45}{2}$
$= \frac{20}{2}$
$= 10$
Therefore, the quartile deviation is 10.

Q7 Text Solution:
Given relation: $2x + 5y = 30$
Also, quartile deviation of $x = 10$
Thus, $5y = 30 - 2x$
$y = 6 - \frac{2}{5}x$
Put the value of quartile deviation of x to find quartile deviation of y i.e.,
$y = \frac{2}{5}(10)$
$y = 2$
Therefore, the quartile deviation of y is 2.

Q8 Text Solution:
Given: Median $= 5$, Quartile deviation $= 1.5$
We know that,
Coefficient of Quartile Deviation
$= \frac{\text{Quartile deviation}}{\text{median}} \times 100$
$= \frac{1.5 \times 100}{5}$
$= 30$
Therefore, the coefficient of quartile deviation is 30.

Q9 Text Solution:
On arranging the marks in ascending order, we get
$35,\ 42,\ 48,\ 50,\ 55,\ 56,\ 60,\ 65,\ 75,\ 82$
Now,
First Quartile $Q_1 = \left(\frac{10+1}{4}\right)^{\text{th}}$ observations
$= \left(\frac{11}{4}\right)^{\text{th}}$ observations $= 2.75^{\text{nd}}$ observation
$= 2^{\text{nd}}$ observation $+0.75\times$ difference between 3^{rd} and 2^{nd} observation
$= 42 + 0.75(48 - 42) = 46.50$
Third Quartile $Q_3 = \frac{3(n+1)}{4}^{\text{th}}$ observations
$= \left(\frac{33}{4}\right)^{\text{th}}$ observations $= 8.25^{\text{th}}$ observation
$= 8^{\text{th}}$ observation $+0.25\times$ difference between 9^{th} and 8^{th} observation
$= 65 + 0.25(75 - 65) = 67.50$
Thus, the coefficient of quartile deviation is given by $\frac{(Q_3 - Q_1)}{(Q_3 + Q_1)} \times 100$
$= \frac{67.50 - 46.50}{67.50 + 46.50} \times 100$
$= \frac{21}{114} \times 100 = 18.42$

Q10 Text Solution:
We know that,
Quartile deviation is given by $Q.D. = \frac{1}{2} \times (Q_3 - Q_1)$, where
$Q_1 = \left(\frac{N+1}{4}\right)th\ \ observation,$
$Q_3 = 3 \times \left(\frac{N+1}{4}\right)th\ observation$
Calculating cumulative frequency, we get

x	2	3	4	5	6
f	3	4	8	4	1
cf	3	7	15	19	20

$Here,\ N = \sum x_i = 20$
$So,\ Q_1 = \left(\frac{20+1}{4}\right)th = 5.25th\ observation$
$= 3$
Similarly, $Q_3 = \left[\frac{3(20+1)}{4}\right]th$
$= 15.75th\ observation = 5$
Therefore, $Q.D. = \frac{1}{2} \times (5 - 3) = 1$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 7

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 What is the standard deviation of $5,\ 5,\ 9,\ 9,\ 9,\ 10,\ 5,\ 10,\ 10$?

(A) $\sqrt{14}$ (B) $\frac{\sqrt{42}}{3}$

(C) 4.50 (D) 8

Q2 The heights (in centimeters) of a group of students are as follows:

$150,\ 160,\ 165,\ 155,\ 170,\ 155,\ 160,\ 155.$

What is the standard deviation of the heights?

(A) 4.16 (B) 5.20

(C) 6.62 (D) 7.07

Q3 If Mean $= 5$, Standard deviation $= 2.6$, then the coefficient of variation is

(A) 49 (B) 51

(C) 50 (D) 52

Q4 What is the coefficient of variation of the following numbers?

$53,\ 52,\ 61,\ 60,\ 64$

(A) 8.09 (B) 18.08

(C) 20.23 (D) 20.45

Q5 If the SD of the $1st$ n natural numbers is 2, then the value of n must be

(A) 2 (B) 7

(C) 6 (D) 5

Q6 The sum of squares of deviation from mean of 10 observations is 250. Mean of the data is 10. Find the co-efficient of variation.

(A) 10% (B) 25%

(C) 50% (D) 0%

Q7 $\sum x^2 = 3390, n = 30, \sigma = 7,$ then $\overline{X} =$

(A) 113 (B) 210

(C) 8 (D) None

Q8 If the profits of a company remain the same for the last ten months then the standard deviation of profits for these ten months would be?

(A) Positive (B) Negative

(C) Zero (D) (A) or (C)

Q9 Mean of a series is equal to 100 , coefficient of variation is 45% then the S.D. is

(A) 45 (B) 0.45

(C) 4.5 (D) 4.05

Q10 If the standard deviation for the marks obtained by a student in monthly test is 36, then the variance is

(A) 36

(B) 6

(C) 1296

(D) None of the above

Answer Key

Q1	(B)	Q6	(C)
Q2	(D)	Q7	(C)
Q3	(D)	Q8	(C)
Q4	(A)	Q9	(A)
Q5	(B)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Given observations:

$5, 5, 9, 9, 9, 10, 5, 10, 10$

$\therefore$ Sum of the observations

$= 5 + 5 + 5 + 10 + 10 + 10 + 9 + 9 + 9$

$= 72$

Now, mean of the data $= \frac{72}{9} = 8$

Thus, the sum of squares of the deviation from mean

$(x_i - x)^2 = 3^2 + 3^2 + 3^2 + 2^2 + 2^2 + 2^2 + 1^2 + 1^2 + 1^2$

$= 9 + 9 + 9 + 1 + 1 + 1 + 4 + 4 + 4$

$= 42$

Therefore,

$$S.D = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$$

$$= \sqrt{\frac{42}{9}}$$

$$= \frac{\sqrt{42}}{3}$$

Q2 Text Solution:

Given observations:

$150, 160, 165, 155, 170, 155, 170, 155$

$\therefore$ Sum of the observations

$= 150 + 160 + 165 + 155 + 170 + 155 + 170 + 155$

$= 1280$

Now, mean of the data $= \frac{1280}{8} = 160$

Thus, the sum of squares of the deviation from mean

$(x_i - x)^2 = 10^2 + 0^2 + 5^2 + 5^2 + 10^2 + 5^2 + 10^2 + 5^2$

$= 100 + 0 + 25 + 25 + 100 + 25 + 100 + 25$

$= 400$

Therefore,

$$S.D = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$$

$$= \sqrt{\frac{400}{8}}$$

$$= \sqrt{50} = 7.07$$

Q3 Text Solution:

We have,

Mean = 5 and Standard deviation = 2.6

We know that,

Coefficient of variation $= \frac{\text{Standard deviation} \times 100}{\text{mean}}$

$= \frac{2.6 \times 100}{5}$

$= 52$

Q4 Text Solution:

Given observations: $53, 52, 61, 60, 64$

$\therefore$ Mean of the data

$= \frac{(53 + 52 + 60 + 61 + 64)}{5} = \frac{290}{5} = 58$

The sum of the squares of deviation from mean

$= (x_i - x)^2 = 5^2 + 6^2 + 3^2 + 2^2 + 6^2$

$= 25 + 36 + 9 + 4 + 36$

$= 110$

We know that,

$$S.D = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$$

$$= \sqrt{\frac{110}{5}}$$

$$= \sqrt{22}$$

Thus, Coefficient of variation $= \frac{S.D}{Mean} \times 100$

$= \frac{\sqrt{22}}{58} \times 100 = 8.09$

Q5 Text Solution:

Given: SD of the $1st$ n natural numbers $= 2$

Thus, SD of the 1st n natural numbers

$= \frac{\sqrt{n^2 - 1}}{12}$

$\Rightarrow 2 = \frac{\sqrt{n^2 - 1}}{12}$

Squaring both the sides, we get

$4 = \frac{n^2 - 1}{12}$

$\Rightarrow 48 = n^2 - 1$

$\Rightarrow 49 = n^2$

$\Rightarrow n = 7$

Q6 Text Solution:

Given, $n = 10,\ \sum (x - \bar{x})^2 = 250$ and Mean = 10

We know that,

$S.D = \sqrt{\frac{\sum (x_I - \bar{x})^2}{n}}$

$\Rightarrow \sqrt{\frac{250}{10}}$

$\Rightarrow 5$

Therefore, Coefficient of variance

$= \frac{S.D.}{N} \times 100$

$= \frac{50}{100} \times 100 = 50\%$

Q7 Text Solution:

We know that,

$\sigma^2 = \frac{\sum x^2}{N} - \left(\overline{X}\right)^2$

Given that, $\sum x^2 = 3390, n = 30, \sigma = 7$

Putting the values, we get

$$\sigma^2 = \frac{3390}{30} - (\bar{X})^2$$
$$\Rightarrow 49 = 113 - (\bar{X})^2$$
$$\Rightarrow (\bar{X})^2 = 64$$
$$\Rightarrow \bar{X} = 8$$

Q8 Text Solution:

We know that,

If all the observations are equal, then the SD is zero.

Since, the profit of the company remains the same for the last ten months, thus deviation will be zero.

Hence, the correct option is (C) i.e., Zero.

Q9 Text Solution:

We know that,

Coefficient of variance $\left(C.V\right) =. \frac{\sigma}{\overline{X}} \times 100$

Given that $\overline{X} = 100,\ C.V = 45$

Now, $45 = \frac{\sigma}{100} \times 100 \Rightarrow \sigma = 45$

Q10 Text Solution:

We know that,

Variance is square of standard deviation.

Since, $SD\ (\sigma) = 36,$

thus Variance $= \sigma^2 = (36)^2 = 1296$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 8

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 If all the observations are increased by 10, then
(A) SD would be increased by 10
(B) Mean deviation would be increased by 10
(C) Quartile deviation would be increased by 10
(D) All these three remains unchanged

Q2 If same amount is added to or subtracted from all the values of the individual series, then the standard deviation and variance both shall be
(A) Changed (B) Unchanged
(C) Same (D) None of these

Q3 For any two numbers, SD is always
(A) Twice the range
(B) Half of the range
(C) Square of the range
(D) None of these

Q4 The probable value of mean deviation when $Q_3 = 50$ and $Q_1 = 20$ is _____ .
(A) 15 (B) 18
(C) 17 (D) 10

Q5 If AM and C.V of a random variable X are 10 and 40 respectively, then the variance of $\left(-15 + \frac{3X}{2}\right)$:
(A) 64 (B) 81
(C) 49 (D) 36

Q6 If the mean and S.D. of x are a & b respectively, then the S.D. of $\frac{x-a}{b}$ is
(A) $\frac{a}{b}$ (B) -1
(C) 1 (D) ab

Q7 If V(x) = 23, find variance of (2x + 10).
(A) 104 (B) 110
(C) 92 (D) 85

Q8 If all the observations are multiplied by 2, then
(A) New SD would also be multiplied by 2
(B) New SD would be half of the previous SD
(C) New SD would be increased by 2
(D) New SD would be decreased by 2

Q9 If every observation is increased by 5, then
(A) SD increases by 5
(B) MD increases by 5
(C) QD increases by 5
(D) None affected

Q10 For Normal distribution, the relation between quartile deviation (Q.D.) and standard deviation (S.D.) is
(A) Q.D > S.D
(B) Q.D < SD
(C) Q.D = S.D
(D) None of the above

Q11 If the SD of x is 3, what is the variance of (5 – 2x)?
(A) 36 (B) 6
(C) 1 (D) 9

Q12 If two samples of sizes 30 and 20 have means as 55 and 60 and variances as 16 and 25 respectively, then what would be the SD of the combined sample of size 50 ?
(A) 5.00 (B) 5.06
(C) 5.23 (D) 5.35

Q13 If x and y are related by $2x + 3y + 4 = 0$ and SD of x is 6, then SD of y is
(A) 22 (B) 4
(C) 5 (D) 9

Q14 Which of the following companies A or B is more consistent so far as the payment of dividend is concerned?

Dividend paid by A	5	9	6	12	15	10	8	10
Dividend paid by B	4	8	7	15	18	9	6	6

(A) A
(B) B
(C) Both A & B
(D) Neither A nor B

Q15 What is the coefficient of variation for the following distribution of wages?

Daily Wages (₹)	30–40	40–50	50–60	60–70	70–80	80–90
No. of workers	17	28	21	15	13	6

(A) ₹ 14.73
(B) 14.73
(C) 26.93
(D) 20.82

Answer Key

Q1	(D)
Q2	(B)
Q3	(B)
Q4	(B)
Q5	(D)
Q6	(C)
Q7	(C)
Q8	(A)
Q9	(D)
Q10	(B)
Q11	(A)
Q12	(B)
Q13	(B)
Q14	(A)
Q15	(C)

Q1 Text Solution:

If all the observations are increased by a certain constant, then standard deviation, mean deviation, quartile deviation remains same

Hence, the correct option is (D) i.e., All these three remain unchanged.

Q2 Text Solution:

We know that,

Standard deviation does not change with respect to the change of origin.

Since, variance $= \sqrt{S.D}$

Thus, variance will also remain unchanged.

Q3 Text Solution:

For any two numbers,

Standard deviation is half of the range.

For example:

Let us consider two numbers as 1 and 2.

We know that,

Standard deviation

$$\left(S.D\right) = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

$$= \sqrt{\frac{1^2+2^2}{2} - \left(\frac{1+2}{2}\right)^2}$$

$$= \sqrt{\frac{5}{2} - \frac{9}{4}}$$

$$= \sqrt{\frac{10-9}{4}}$$

$$= \sqrt{\frac{1}{4}}$$

$$= \frac{1}{2}$$

Now, Range = Maximum value - Minimum value

$$= 2 - 1 = 1$$

$\therefore$ S.D. $= \frac{Range}{2}$

Hence, the correct option is (B) i.e., half of the range.

Q4 Text Solution:

Given: $Q_3 = 50$ and $Q_1 = 20$

We know that,

$QD = \frac{1}{2}\ (Q_3 - Q_1) = \frac{1}{2}\ (50 - 20)$

$= \frac{30}{2} = 15$

The relationship between MD & QD is given by:

6QD = 5MD

$\Rightarrow MD = \frac{6}{5}\ \text{QD}$

$\Rightarrow MD = \frac{6}{5}\ (15)$

$\Rightarrow\ MD\ = 18$

Therefore, the probable value of mean deviation is 18.

Q5 Text Solution:

We know that,

Coefficient of variance (C.V. $) = \frac{\sigma}{\bar{X}} \times 100$

Given, $C.V = 40, \bar{X} = 10$

then, $40 = \frac{\sigma}{10} \times 100$

$\Rightarrow \sigma = \frac{400}{100} = 4$

Thus, $S \cdot D\left(-15 + \frac{3X}{2}\right) = \frac{3}{2} \times SD(X)$

$\Rightarrow S \cdot D\left(-15 + \frac{3X}{2}\right) = \frac{3}{2} \times 4 = 6$

Therefore, variance of $\left(-15 + \frac{3X}{2}\right) = 6^2 = 36$

Q6 Text Solution:

We know that, SD remains unaffected due to a change of origin but is affected in the same ratio due to a change of scale.

Thus, S.D $\left(\frac{x-a}{b}\right) = \left|\frac{1}{b}\right| \times \sigma_x$

$\Rightarrow$ S.D $\left(\frac{x-a}{b}\right) = \frac{1}{b} \times b = 1$ (Given, $\sigma_x = b$)

Hence, option (C) is correct i.e. 1.

Q7 Text Solution:

We know that, standard deviation (σ) remains unaffected due to a change of origin but is affected in the same ratio due to a change of scale.

Given, $V(x) = 23 \Rightarrow \sigma = \sqrt{23}$

Now, S.D. of $(2x + 10) = 2\sigma = 2\sqrt{23}$

Thus, $V(2x + 10) = \left(2\sqrt{23}\right)^2 = 92$

Q8 Text Solution:

If the observations are multiplied by constant K, then SD of new observations will be K times of the origin SD.

Thus, as the observations are multiplied by 2, SD will be doubled.

Hence, the correct answer is option (A) i.e., New SD would also be multiplied by 2

Q9 Text Solution:

We know that,

Value of QD, MD, SD, range remains unaffected after the change of origin.

Thus, if every observation is increased by 5, none will be affected.

Q10 Text Solution:

We know that, the relation between quartile deviation and standard deviation is as follow:

Quartile deviation (Q.D.) $= \frac{2}{3} \times$ Standard Deviation (S.D.)

Clearly, Q.D < S.D

Hence, the correct option is (B).

Q11 Text Solution:

Given relation: $y = 5 - 2x$ and S.D. of $x = 3$

So, variance of y = $4 \times variance\ of\ x$

$= 4 \times (SD\ of\ x)^2$

$= 4 \times 9$

$= 36$

Q12 Text Solution:

According to the question,

Variances, ${\sigma_1}^2 = 16$ and ${\sigma_2}^2 = 25$

$n_1 = 30$ and $n_2 = 20$

$\overline{x_1} = 55$ & $\overline{x_2} = 60$

Thus, combined mean $= \frac{\overline{x_1} n_1 + \overline{x_2}\, n_2}{n_1 + n_2}$

$= \frac{30(55) + 20(60)}{30 + 20}$

$= \frac{1650 + 1200}{50}$

$= \frac{2850}{50} = 57$

Thus, $d_1 = \overline{x_1} - \bar{x} = 55 - 57 = -2$

$d_2 = \overline{x_2} - \bar{x} = 60 - 57 = 3$

We know that,

Combined SD,

$\sigma = \sqrt{\frac{n_1{\sigma_1}^2 + n_2{\sigma_2}^2 + n_1{d_1}^2 + n_2{d_2}^2}{n_1 + n_2}}$

$= \sqrt{\frac{(30)(16) + (20)(25) + (30)(4) + (20)(9)}{50}}$

$= \sqrt{\frac{480 + 500 + 120 + 180}{50}}$

$= \sqrt{\frac{1280}{50}}$

$= 5.06$

Q13 Text Solution:

Given relation, $2x + 3y + 4 = 0$ and S.D. of $x = 6$

$\Rightarrow 3y = -2x - 4$

$\Rightarrow y = \frac{-2x - 4}{3}$

$\Rightarrow y = \frac{-2x}{3} - \frac{4}{3}$

Thus, SD of y $= \left|\frac{-2}{3}\right| \times$ SD of x

$= \frac{2}{3} \times 6 = 4$

Q14 Text Solution:

We are given that

Dividend paid by A	5	9	6	12	15	10	8	10
Dividend paid by B	4	8	7	15	18	9	6	6

To check the consistency for the payment of dividend by A and B; we will find the coefficient of variation of A & B.

Let dividend paid by A be X, dividend paid by B be Y

$Then, \sum X = 5 + 9 + 6 + 12 + 15 + 10 + 8 + 10 = 75$

$\Rightarrow \overline{X} = \frac{75}{8} = 9.375$

$Also, \sum X^2 = 5^2 + 9^2 + 6^2 + 12^2 + 15^2 + 10^2 + 8^2 + 10^2 = 775$

Now, S.D is given by:

$S.D. = \sqrt{\frac{\sum X^2}{N} - \left(\frac{\sum X}{N}\right)^2}$

$= \sqrt{\frac{775}{8} - \left(\frac{75}{8}\right)^2}$

$= 2.99 \approx 3$

Thus, $C.V._A = \frac{\sigma_A}{\overline{X}} \times 100$

$= \frac{3}{9.375} \times 100 = 32$

Similarly,

$\sum Y = 73\ ;\ \overline{Y} = \frac{73}{8} = 9.125$

$\sum Y^2 = 831$

$\Rightarrow {\sigma^2}_B = \frac{831}{8} - \left(\frac{73}{8}\right)^2$

$= 20.61$

$\Rightarrow \sigma = 4.54$

$Now, C.V_B = \frac{4.54}{9.125} \times 100 = 49.75$

Since, $C.V_A < C.V_B$

Therefore, company A is more consistent than company B.

Q15 Text Solution:

To find out the mean and S.D, we have to prepare a table as follows.

Class	Frequency	x_i	u_i	f_iu_i	$f_iu_i^2$
30 – 40	17	35	– 3	– 51	153
40 – 50	28	45	– 2	– 56	112
50 – 60	21	55	– 1	– 21	21
60 – 70	15	65	0	0	0
70 – 80	13	75	1	13	13
80 – 90	6	85	2	12	24
Total:	100			– 103	323

We know that,

$$Mean = A + \frac{\sum fu}{n} \times h$$
$$= 65 + \frac{(-103)}{100} \times 10$$
$$= 54.7$$

Now, standard deviation

$$= \sqrt{\frac{\sum f_i u_i^2}{n} - \left(\frac{\sum f_i\, u_i}{n}\right)^2} \times c$$
$$= \sqrt{\frac{323}{100} - \left(\frac{-103}{100}\right)^2} \times 10$$
$$= \sqrt{\frac{32300-10609}{10000}} \times 10$$
$$= \frac{\sqrt{21691}}{10}$$
$$= 14.73$$

Therefore, coefficient of variation

$$= \frac{S.D.}{Mean} \times 100$$
$$= \frac{14.73}{54.7} \times 100$$
$$\approx 26.93$$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 9

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Q1 Find the range of $6,\ 5,\ 4,\ 3,\ 1,\ 3,\ 6,\ 10,\ 8$.
(A) 6 (B) 3
(C) 9 (D) 10

Q2 If the difference between mean and mode is 63, then the difference between mean and median will be_____
(A) 63
(B) 31.5
(C) 21
(D) None of the above

Q3 If the Arithmetic mean between two numbers is 64 and the Geometric mean between them is 16. The Harmonic Mean between them is _____ .
(A) 64 (B) 4
(C) 16 (D) 40

Q4 If Arithmetic Mean $= \frac{8+4}{2}$, then variance is
(A) 2 (B) 6
(C) 1 (D) 4

Q5 Coefficient of variation is a relative measure of
(A) Range
(B) Central Tendency
(C) Dispersion
(D) Q.D.

Q6 For the following incomplete distribution of marks of 100 marks, median marks is known to be 32.

Marks :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No.of students	10	–	25	30	–	10

What is the mean mark?
(A) 32 (B) 31
(C) 31.30 (D) 31.50

Q7 The rates of returns from three different shares are $100\ \%,\ 200\%$ and 400% respectively, the average rate of return will be_____.
(A) 350% (B) 233.33%
(C) 200% (D) 300%

Q8 The average of 2 numbers is 20 and their standard deviation 5 . Find the two numbers.
(A) $15, 25$ (B) $30, 40$
(C) $10, 15$ (D) None of these

Q9 Q.D is
(A) $\frac{2}{3}SD$ (B) $\frac{4}{5}SD$
(C) $\frac{5}{6}SD$ (D) None

Q10 $1st$ quartile is 142, Semi-inter quartile range is 18. Then median is
(A) 151 (B) 160
(C) 178 (D) None

Q11 The median of the data $5,\ 6,\ 7,\ 7,\ 8,\ 9,\ 10,\ 11,\ 11,\ 12,\ 15,\ 18,\ 18$ and 19 is
(A) 10 (B) 10.5
(C) 11.5 (D) 11

Q12 Let the mean of the variable 'x' be 50, then the mean of $u = 10 + 5x$ will be:
(A) 250 (B) 260
(C) 265 (D) 273

Q13 If the S.D. of the 1 st n natural numbers is $\sqrt{30}$, then the value of n is
(A) 19 (B) 20
(C) 21 (D) None

Q14 The geometric mean of $3, 6, 24$ and 48 is
(A) 6 (B) 8
(C) 12 (D) 24

Q15 _____ is used for ordering the size of designed cloths.

(A) Mean (B) Median
(C) Mode (D) None

Q16 _____ deviation is called semi-interquartile range.
(A) Percentile (B) Standard
(C) Quartile (D) none

Q17 A.M of $2, 6, 4, 1, 8, 5, 2$ is
(A) 2 (B) 3
(C) 4 (D) none

Q18 If the A.M. and H.M. for two numbers are 5 and 3.2 respectively then the G.M. will be
(A) 4.05 (B) 16
(C) 4 (D) 4.10

Q19 The mean of first three terms is 14 and mean of next two terms is 18. The mean of all five terms is:
(A) 14.5 (B) 15
(C) 14 (D) 15.6

Q20 The mean and SD for a, b and 2 are 3 and $\frac{2}{\sqrt{3}}$ respectively, The value of ab would be
(A) 5 (B) 6
(C) 11 (D) 3

Q21 The median of $27, 30, 26, 44, 42, 51, 37$ is
(A) 30 (B) 42
(C) 44 (D) 37

Q22 The G.M. of $4, 6$ and 8 is :
(A) 4.77 (B) 4.32
(C) 6.14 (D) 5.77

Q23 Find the mean deviation about mean of $5, 6, 7, 4, 8$.
(A) 7.0 (B) 5.2
(C) 1.2 (D) 3.1

Q24 Find the mode from the following data:

Class:	$3-6$	$6-9$	$9-12$	$12-15$	$15-18$	$18-21$	$21-24$
Frequency	2	5	10	23	21	12	3

(A) 23 (B) 13.3
(C) 12.6 (D) 14.6

Q25 If X and Y are related by $X - Y - 10 = 0$ and mode of X is known to be 23, then the mode of Y is :
(A) 20 (B) 13
(C) 3 (D) 23

Answer Key

Q1	(C)	Q14	(C)
Q2	(C)	Q15	(C)
Q3	(B)	Q16	(C)
Q4	(D)	Q17	(C)
Q5	(C)	Q18	(C)
Q6	(C)	Q19	(D)
Q7	(C)	Q20	(C)
Q8	(A)	Q21	(D)
Q9	(A)	Q22	(D)
Q10	(B)	Q23	(C)
Q11	(B)	Q24	(D)
Q12	(B)	Q25	(B)
Q13	(A)		

Hints & Solutions

Q1 Text Solution:

We know that, range is difference between maximum and minimum data value.

Here,

Maximum value $= 10$

Minimum value $= 1$

Therefore, Range $= 10 - 1 = 9$

Q2 Text Solution:

Given that, the difference between mean and mode is 63

$\Rightarrow mean - mode = 63$

We know that,

Empirical relationship between mean, mode and median is given by:

$(mean - mode) = 3(mean - median)$

$\Rightarrow \frac{(mean-mode)}{3} = \left(mean - median\right)$

Therefore, $mean - median = \frac{63}{3} = 21$

Q3 Text Solution:

Given, A.M. = 64 and G.M. = 16

We know that,

$(G.M.)^2 = A.M. \times H.M.$

Substituting the values into the equation;

$\Rightarrow (16)^2 = 64 \times \text{H.M.}$

$\Rightarrow 256 = 64 \times \text{H.M.}$

$\Rightarrow H.M = \frac{256}{64}$

$\Rightarrow H.M. = 4$

Therefore, the harmonic mean between the two numbers is 4.

Q4 Text Solution:

Given that,

Arithmetic Mean $= \frac{8+4}{2}$

$\Rightarrow$ Observations$(x_i) = 8, 4$

Now, S.D. of any two numbers a and b is given by $\frac{1}{2}|a - b|$

Thus, S.D. of 8 & 4 $= \frac{1}{2}|8 - 4| = 2$

Variance $= S.D^2 = 4$

Q5 Text Solution:

We know that, Coefficient of variance C.V.= $\frac{\sigma}{\bar{x}} \times 100$

It represents the ratio of standard deviation to the mean, i.e. it gives the relative dispersion of data around mean.

Therefore, the coefficient of variation is a relative measure of dispersion.

Q6 Text Solution:

Given: Median = 32

Since, it lies in the class interval 30-40.

$l = 30,\ c = 10,\ n = 100$

Let the first and second missing frequency be x and y, then

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of students	10	x	25	30	y	10
C.F	10	$10 + x$	$35 + x$	$65 + x$	$65 + x + y$	$75 + x + y$

$\therefore\ x + y + 75 = 100$

$x + y = 25$

Now, for class interval 30-40,

$f = 30$ and cf preceding the class $= 35 + x$

Now, let's find the value of x and y

We know that,

Median $M = l + \frac{\frac{n}{2} - cf}{f} \times c$

$\Rightarrow 32 = 30 + \frac{50-(35+x)}{30} \times 10$

$\Rightarrow 2 = \frac{15-x}{3}$

$\Rightarrow 2 \times 3 = 15 - x$

$\Rightarrow x = 15 - 6$

$\Rightarrow x = 9$

$\because x + y = 25$

Now, put $x = 9$ in above equation, we get

$\Rightarrow 9 + y = 25$

$\Rightarrow y = 25 - 9$

$\Rightarrow y = 16$

Class	Frequency (f)	Mid value	$d = \frac{x-A}{h} = \frac{x-35}{10}$, $A = 35, h = 10$	$f \times d$
0 – 10	10	5	−3	−30
10 – 20	9	15	−2	−18
20 – 30	25	25	−1	−25
30 – 40	30	35 = A	0	0
40 – 50	16	45	1	16
50 – 60	10	55	2	20
	$n = 100$			$\sum f.d = -37$

$\text{Mean } \overline{X} = A + \frac{\Sigma f.d}{n} \times h = 35 - \frac{37}{100} \times 10$
$= 31.30$
So, the mean marks is 31.30.

Q7 Text Solution:

Given: Rate of returns are 100%, 200% and 400%
According to the question, the average rate of return will be given by Geometric mean.
As we know,
The Geometric Mean is given by:
Geometric Mean $= [100 \times 200 \times 400]^{\frac{1}{3}}$
$= (100 \times 2 \times 100 \times 2 \times 2 \times 100)^{\frac{1}{3}}$
$= 100 \times 2$
$= 200$
Therefore, the average rate of return will be 200%.

Q8 Text Solution:

Let the numbers be x, y such that $x > y$
Given mean of x, y is 20 , i.e

$$\bar{x} = \frac{x+y}{2} = 20$$
$$\Rightarrow x + y = 40 \ldots\ldots (i)$$

Also, S.D. $= \frac{1}{2}|x - y| = 5$ i.e.

$$\Rightarrow x - y = 10 \text{ (since, } x > y \text{)} \ldots\ldots (ii)$$

Adding (i) and (ii), we get

$$2x = 50$$
$$\Rightarrow x = 25$$

Thus, $y = 40 - 25 = 15$
Therefore, the numbers are 25 and 15.
Hence, option (A) is correct i.e., 15, 25 .

Q9 Text Solution:

We know that, $6\ Q.D = 5\ M.D = 4\ S.D$
Now, $Q \cdot D. = \frac{5}{6} MD = \frac{4}{6} SD$
Therefore, we get
$Q \cdot D \cdot = \frac{2}{3} S \cdot D$

Q10 Text Solution:

Let us assume that data is symmetrical then
$\text{Median } = \frac{Q_3 + Q_1}{2}$
Also, we know that semi- inter quartile range is given by
$Q.D. = \frac{Q_3 - Q_1}{2}$
Given, $Q_1 = 142,\ Q.D. = 18$
$\Rightarrow Q_3 - Q_1 = 36$
$\Rightarrow Q_3 = 36 + Q_1 = 36 + 142 = 178$
Also, median is given by:
$M = \frac{Q_3 + Q_1}{2} = \frac{178 + 142}{2} = 160$

Q11 Text Solution:

According to the question,
Align the data in the ascending order, we get
$5,\ 6,\ 7,\ 7,\ 8,\ 9,\ 10,\ 11,\ 11,\ 12,\ 15,\ 18,\ 18,\ 19$
Here, $N = 14$
For even observations,

$$\text{Median } = \left[\frac{\left(\frac{N}{2}\right)^{\text{th}} + \left(\frac{N}{2}+1\right)^{\text{th}}}{2}\right] \text{ observation,}$$

where
N is the number of observations

$$\text{So, Median } = \left[\frac{\left(\frac{14}{2}\right)^{\text{th}} term + \left(\frac{14}{2}+1\right)^{\text{th}} \text{term}}{2}\right]$$
$$= \frac{7^{\text{th}}\ term + 8^{\text{th}}\ \text{term}}{2}$$
$$= \frac{10 + 11}{2}$$
$$= \frac{21}{2}$$
$$= 10.5$$

Q12 Text Solution:

Given: Mean of the variable 'x' $= 50$
As we know that,
Mean changes with change in origin and scale.
Thus, to find mean of u, put the value of mean of x in given equation
$\Rightarrow u = 10 + 5x$
$\Rightarrow u = 10 + (5 \times 50)$
$\Rightarrow u = 10 + 250 = 260$
Therefore, the mean of $u = 260$.

Q13 Text Solution:

We know that, SD for first n natural numbers is given by

$$SD = \sqrt{\frac{n^2-1}{12}} = \sqrt{30}$$
$$\Rightarrow \frac{n^2-1}{12} = 30$$
$$\Rightarrow n^2 = 360 + 1$$
$$\Rightarrow n^2 = 361$$
$$\Rightarrow n = 19$$

Therefore, the value of n is 19 .

Q14 Text Solution:

As we know,

The Geometric Mean is given by:

Geometric Mean

$= \left[(3 \times 6 \times 24 \times 48)^{\frac{1}{4}}\right]$

$= \left[(3 \times 3 \times 2 \times 2 \times 2 \times 2 \times 3 \times 2 \times 2 \times 2 \times 2 \times 3)^{\frac{1}{4}}\right]$

$= 2 \times 2 \times 3 = 12$

Q15 Text Solution:

In statistics, the mode is the value that is repeatedly occurring in a given set. We can also say that the value or number in a data set, which has a high frequency or appears more frequently, is called mode or modal value.

Mode is used for ordering the size of designed clothes because mode gives an idea about which size of designed clothes are sold more.

Therefore, mode is used for ordering the size of designed clothes.

Q16 Text Solution:

We know that,

Quartile deviation is also referred to the semi interquartile range and is half of the difference between the third quartile and the first quartile value.

The formula for quartile deviation of the data $= \frac{Q_3 - Q_1}{2}$

Q17 Text Solution:

As we know that,

Mean $= \frac{Sum\ of\ observations}{Total\ number\ of\ observations}$

We have, $2,\ 6,\ 4,\ 1,\ 8,\ 5,\ 2$

So, Mean $= \frac{2+6+4+1+8+5+2}{7} = \frac{28}{7} = 4$

Q18 Text Solution:

Given: $A.M = 5$ and $H.M = 3.2$

We know that,

$\mathrm{G.M}^2 = A.M \times \mathrm{H.M}$

$\Rightarrow \mathrm{G.M}^2 = 5 \times 3.2$

$\Rightarrow \mathrm{G.M}^2 = 16$

$\Rightarrow \mathrm{G.M} = 4$

Therefore, the $\mathrm{G.M}$ will be 4.

Q19 Text Solution:

Given: Mean of first three terms $= 14$

Mean of next two terms $= 18$

We know that,

Mean $= \frac{\text{Sum of observations}}{\text{Number of observations}}$

Thus, sum of first 3 numbers

$=$ Mean of three terms $\times 3$

$= 14 \times 3 = 42$

Sum of next 2 numbers $= 2 \times 18 = 36$

now, sum of all these 5 numbers

$= 42 + 36 = 78$

Average of these 5 numbers $= \frac{78}{5} = 15.6$

Therefore, the mean of all five terms is 15.6.

Q20 Text Solution:

Given: Mean of a, b and 2 is 3.

Thus, $\frac{a+b+2}{3} = 3$

$\Rightarrow a + b + 2 = 9$

$\Rightarrow a + b = 7$

Also, S.D $= \frac{2}{\sqrt{3}}$

$\Rightarrow \mathrm{Variance} = \frac{4}{3}$

We know that,

Variance (V(x)) $= \frac{\sum_{i=1}^{n} x_i^2}{n} - \left(\frac{\sum_{i=1}^{n} x_i}{n}\right)^2$

$\Rightarrow \frac{4}{3}=\frac{\sum_{i=1}^{n} x_i^2}{n}-\left(\frac{\sum_{i=1}^{n} x_i}{n}\right)^2$

$\Rightarrow \frac{4}{3}=\frac{a^2+b^2+4}{3}-9$

$\Rightarrow \frac{4}{3}=\frac{a^2+b^2+4-27}{3}$

$\Rightarrow 4=a^2+b^2-23$

$\Rightarrow a^2+b^2=27$

$\Rightarrow \left(a+b\right)^2-2ab=27$

$\left[\because a^2+b^2-2ab=(a+b)^2\right]$

$\Rightarrow \left(7\right)^2-2ab=27\ [\because \text{From}(i)]$

$\Rightarrow 49-27=2ab$

$\Rightarrow 2ab=22$

$\Rightarrow ab=11$

Hence, the correct answer is option (C).

Q21 Text Solution:

Arrange the given numbers in ascending order i.e.

26, 27, 30, 37, 42, 44, 51

Here, the number of observations $(n)=7$

For odd number of observations, we have

Median = $\left(\frac{n+1}{2}\right)th$ observation

= $\left(\frac{7+1}{2}\right)th$ observation

= 4th observation = 37

Therefore, the median is 37.

Q22 Text Solution:

We know that,

$G.M.=\sqrt[n]{a_1\times a_2\times a_3\times \ldots\ldots\ldots\ldots\times a_n}$

Thus, $G.M=(4\times 6\times 8)^{\frac{1}{3}}$

$=(192)^{\frac{1}{3}}=5.77$

Therefore, the $\mathrm{G.M}$ of $4,\ 6$ and 8 is 5.77.

Q23 Text Solution:

We know that,

M.D about mean is given by:

$MD=\frac{\sum|X-\overline{X}|}{N}$

For the given data: 5, 6, 7, 4, 8

$\overline{X}=\frac{5+6+7+4+8}{5}=6$

X	$\lvert X-\overline{X}\rvert$
5	1
6	0
7	1
4	2
8	2

$\sum\left|X-\overline{X}\right|=6$

$Therefore,\ M.D.\ =\frac{6}{5}=1.2$

Q24 Text Solution:

According to the question,

According to the question,

As we know modal class is given by the highest frequency class.

Here, the highest frequency is 23 which belongs to class $12-15$.

So, Modal class $=12-15$

Mode is given by the formula,

$\text{Mode}\ =l+\left[\frac{f_1-f_0}{2f_1-f_0-f_2}\right]\times h$

where, [l is lower limit of modal class, f_1 is frequency of modal class, f_0 is frequency of preceding modal class, f_2 is frequency of succeeding modal class, h is class size

Therefore, put the respective values, we get

$\text{Mode}\ =12+\left[\frac{23-10}{2(23)-10-21}\right]\times 3$

$=12+\left(\frac{13}{15}\right)\times 3$

$=14.6$

Q25 Text Solution:

Given: $X-Y-10=0$, Mode of $X=23$

To find the value of mode of Y, put the value of mode of X in given equation

$\Rightarrow 23-\ Y-10=0$

$\Rightarrow Y=23-10$

$\Rightarrow Y=13$

Thus, mode of Y is 13.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

SAMPLING

Q1 Which of the following is a subset of population?
(A) Distribution (B) Sample
(C) Data (D) Set

Q2 What is complete enumeration?
(A) Study of all elements of a Data
(B) Study of selected elements of a Data
(C) When data is is collected on the choice of investigator
(D) None of these

Q3 Which of the following cases is considered as ideal for Sampling ?
(A) When data is heterogeneous and very large number of elements are to be studied
(B) When data is homogeneous and very large number of elements are to be studied
(C) When data is heterogeneous and small number of elements are to be studied
(D) When data is homogeneous and very large number of elements are to be studied

Q4 Which of the folowing is not an advantage of sampling?
(A) Economical
(B) Time Consuming
(C) Suitable for Homogeneous Data
(D) Both (A) & (C)

Q5 Which one of the following is a disadvantage of complete enumeration ?
(A) Reliable
(B) More expert`s opinion
(C) Free from Biasness
(D) Costly

Q6 Which principal of sampling helps in maintaining consistency and comparability in survey results over time ?
(A) Law of Statistical Regularity
(B) Principle of Inertia
(C) Principle of Optimization
(D) Principle of Validity

Q7 A sample size is considered large in which of the following cases?
(A) $n \geq 30$ (B) $n \geq 50$
(C) $n \leq 30$ (D) $n \leq 50$

Q8 How many errors are there in sampling ?
(A) One (B) Two
(C) Three (D) Four

Q9 Sampling error increase as we increase the sampling size.
(A) True
(B) False
(C) Cannot be determined
(D) None of these

Q10 Which of the following is a branch of statistics?
(A) Descriptive statistics
(B) Inferential statistics
(C) Industry statistics
(D) Both (A) and (B)

Answer Key

Q1	(B)	Q6	(B)
Q2	(A)	Q7	(A)
Q3	(D)	Q8	(B)
Q4	(B)	Q9	(B)
Q5	(D)	Q10	(D)

Hints & Solutions

Q1 Text Solution:
In sampling distribution we take a subset of population which is called as a sample. The main advantage of this sample is to reduce the variability present in the statistics.

Q2 Text Solution:
When complete information is collected for all the units belonging to a population, it is defned as complete enumeration or census.

Q3 Text Solution:
Homogeneous data is a type where all the elements have similar characteristics and behaviour.
Since, Sampling should be used for large number of elements and having similar characteristics.
Therefore, option (D) is the answer.

Q4 Text Solution:
As compared to census, a sample survey could be conducted, much more quickly because in sample survey, only a part of the vast population is enumerated.
Hence, it is not time consuming.

Q5 Text Solution:
The complete enumeration process is very costly as all the elements of data are to be studied for which many enumerators are required which leads to increment in cost

Q6 Text Solution:
The principle of inertia suggests that, unless there's a good reason to the contrary, researchers often prefer not to change their methods or sample size. It helps in maintaining consistency and comparability in survey results over time.

Q7 Text Solution:
Generally, a sample having 30 or more sample values is called a large sample.

Q8 Text Solution:
There are two types of errors in sampling namely **Sampling error & Non-Sampling Error**

Q9 Text Solution:
Sampling error is inversely proportional to the sampling size.
Hence, when the sampling size increases the sampling error decreases.

Q10 Text Solution:
There are two branches of statistics :
a) Descriptive statistics
b) Inferential statistics

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QUANTITATIVE APTITUDE

DPP: 2

SAMPLING

Q1 What is the characteristic of Population ?
(A) Parameter
(B) Statistic
(C) Random Variable
(D) None of these

Q2 If the population contains an uncountable number of units, then it is known as _____
(A) Finite population
(B) Infinite population
(C) Countable population
(D) None of these

Q3 Which of the following is a Parameter ?
(A) Population Mean
(B) Population S.D.
(C) Population Proportion
(D) All of the above

Q4 Population of number of occurence of digit 6 when a dice is rolled infinite times is an example of _____
(A) Hypothetical Population
(B) Existent Population
(C) Statistic
(D) Parameter

Q5 Number of students giving the examination of CA Foundation is an example of _____
(A) Hypothetical Population
(B) Existent Population
(C) Statistic
(D) Parameter

Q6 The standard deviation of the statistic is called _____
(A) Standard Error (B) Expectation
(C) Estimate (D) None of these

Q7 _____ is a detailed and complete list of all the sampling units
(A) Sampling Frame (B) Sample Set
(C) Universal Set (D) None of these

Q8 The variation in the values of a statistic is termed as
(A) Estimate
(B) Population
(C) Sampling Fluctuations
(D) Sampling Errors

Q9 If $n = 16$ and standard deviation is 5, then find the value of Standard Error.
(A) 1.50 (B) 0.80
(C) 1.25 (D) 2

Q10 If there are 10 students of class XII of a school is preparing for CA Foundation exam, then find the population proportion of CA Aspirants if there are 80 students in the class.
(A) 8 (B) 0.125
(C) 0.25 (D) None of these

Answer Key

Q1	(A)	Q6	(A)
Q2	(B)	Q7	(A)
Q3	(D)	Q8	(C)
Q4	(A)	Q9	(C)
Q5	(B)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

A parameter is a characteristic of a population, determined by considering all units within that population.

Q2 Text Solution:

If the population contains an infinite or uncountable number of units, then it is known as an infinite population

Q3 Text Solution:

A parameter is a characteristic of a population, determined by considering all units within that population.

All the given terms are derived from all the elements / units of popuation .

Hence , Option (D) is correct answer

Q4 Text Solution:

A population that exists just hypothetically is known as a hypothetical or an imaginary population.

In the given case, the rolling of a dice infinite times is an imaginary event.

Hence, the population of number of occurence of digit 6 when a dice is rolled infinite times is an example of hypothetical or imaginary population.

Q5 Text Solution:

A population consisting of real elements or units is known as an existent population.

In the instant case, the students appearing for CA Foundation exams are real elements of the population

Hence, the case is an example of Existent Population.

Q6 Text Solution:

Standard Error is the standard deviation of the statistic

Q7 Text Solution:

A detailed and complete list of all the sampling units is known as a "Sampling Frame".

Q8 Text Solution:

The variation in the values of a statistic is termed as **"Sampling Fluctuations".**

Q9 Text Solution:

$$S.E. = \frac{\sigma}{\sqrt{n}}$$

$$\Rightarrow S.E. = \frac{5}{\sqrt{16}}$$

$$\Rightarrow S.E. = \frac{5}{4} = 1.25$$

Q10 Text Solution:

Here, X = 10 & N = 80

$$So,\ Population\ Proportion\ (P) = \frac{X}{N}$$

$$\Rightarrow P = \frac{10}{80} = 0.125$$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

SAMPLING

Q1 Which of the following is an example of Non-probability Sampling ?
(A) Simple Random Sampling
(B) Systematic Sampling
(C) Judgement Sampling
(D) Stratified Sampling

Q2 Which of the following is not the purpose of Stratified Sampling ??
(A) To make representation of all the sub populations
(B) To provide an estimate of parameter not only for all the sample but also for overall estimate
(C) Reduction of variability in data
(D) To check internal consistency of data

Q3 If a sample of 7 employees is to be taken from a department of 20 employees without replacement .
How many such samples can be taken ?
(A) 155040 (B) 77520
(C) 38760 (D) None of these

Q4 If a sample of 3 bulbs is to be taken from a box consisting 8 bulbs without replacement. How many such samples can be taken ?
(A) 6561 (B) 8
(C) 336 (D) 56

Q5 If a sample of 3 bulbs is to be taken from a box consisting 8 bulbs with replacement .
How many such samples can be taken ?
(A) 512 (B) 8
(C) 336 (D) 56

Q6 A person wants to taste 2 different ice-creams out of 5 options available for the research of his new start-up.
In how many waays he can do so?
(A) 25 (B) 15
(C) 10 (D) None of these

Q7 What are the possible samples if a sample is taken of 2 elements without replacement out of 4 elements namely A, B, C & D ?
(A) (A,B) ; (B,C)
(B) (A,B) ; (B,C) ; (C,D) ; (A,D)
(C) (A,B) ; (B,C) ; (C,D) ; (A,D) ; (B,D) ; (A,C)
(D) None of these

Q8 Which sampling method is considered completely free from Sampler's biases?
(A) Judgement Sampling
(B) Stratified Sampling
(C) Systematic Sampling
(D) None of these

Q9 Mr. Virat wants to select a sample of 2 T-Shirts of different colours out of 4 T-shirts of following colours :
(a) Yellow[Y] (b) Blue[B]
(c) Grey[G] (d) White[W]
What are possible samples ?
(A) (Y,B) ; (B;Y)
(B) (Y,B) ; (Y,G) ; (Y,W) ; (B,G) ; (B,W) ; (G,W)
(C) (Y,B) ; (Y,G) ; (Y,W) ; (Y,Y)
(D) None of these

Answer Key

Q1	(C)
Q2	(D)
Q3	(B)
Q4	(D)
Q5	(A)
Q6	(B)
Q7	(C)
Q8	(D)
Q9	(B)

Hints & Solutions

Q1 Text Solution:

In Judgement Sampling, the selection of sample size and sample elements completely depends on the judgement of the sampler.

Q2 Text Solution:

There are three objectives of stratified sampling :

(i) To make representation of all the sub populations

(ii) To provide an estimate of parameter not only for all the sample but also for overall estimate

(iii) To reduce of variability in data

Checking internal consistency of data is the objective of Scrutiny.

Q3 Text Solution:

Total employees = 20

No. of employees in sample = 7

$So\ ,\ the\ total\ no.\ of\ such\ samples\ = {}^{20}C_7$

$= \frac{20!}{(20-7)!\times 7!}$

$= \frac{20!}{13!\times 7!} = 77520$

Q4 Text Solution:

Total bulbs = 8

No. of bulbs in sample = 3

$So\ ,\ the\ total\ no.\ of\ such\ samples\ = {}^{8}C_3$

$= \frac{8!}{(8-3)!\times 3!}$

$= \frac{8!}{3!\times 5!} = 56$

Q5 Text Solution:

Total bulbs (n) = 8

No. of bulbs in sample (k) = 3

$So\ ,\ the\ total\ no.\ of\ such\ samples\ = n^k$

$= 8^3$

$= 512$

Q6 Text Solution:

The person wants to taste 2 different ice-creams .

It means if he has taken an ice-cream once , he will not take it again.

Therefore , he will taste the ice-cream without replacement

$So\ ,\ the\ total\ no.\ of\ such\ samples\ = {}^{5}C_2$

$= \frac{5!}{(5-2)!\times 2!}$

$= \frac{5!}{3!\times 2!} = 10$

Q7 Text Solution:

$Total\ no.\ of\ samples\ without\ replacement\ = {}^{4}C_2$

$= \frac{4!}{(4-2)!\times 2!}$

$= \frac{4!}{2!\times 2!} = 6$

which are $(A,B)\ ;\ (B,C)\ ;\ (C,D)\ ;\ (A,D)\ ;\ (B,D)\ ;\ (A,C)$

Q8 Text Solution:

Simple Random Sampling is considered completely free from Sampler's biases

Q9 Text Solution:

$Total\ no.\ of\ samples\ without\ replacement\ = {}^{4}C_2$

$= \frac{4!}{(4-2)!\times 2!}$

$= \frac{4!}{2!\times 2!} = 6$

which are (Y,B) ; (Y,G) ; (Y,W) ; (B,G) ; (B,W) ; (G,W)

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

INDEX NUMBER

Q1 Price Relative is equal to

(A) $\frac{Price\ in\ the\ given\ year \times 100}{Price\ in\ the\ base\ year}$

(B) $\frac{Price\ in\ the\ base\ year \times 100}{Price\ in\ the\ given\ year}$

(C) $Price\ in\ the\ given\ year \times 100$

(D) $Price\ in\ the\ base\ year \times 100$

Q2 The prices of a commodity in the years 1975 and 1980 were 25 and 30 respectively , Price relative of 1975 on 1980 is:

(A) 113.25 (B) 83.33

(C) 109.78 (D) None

Q3 From the following data:

Commodity	Base Price	Current Price
Rice	35	42
Wheat	30	35
Pulse	40	38
Fish	107	120

The simple Aggregative Index is

(A) 115.8 (B) 110.8

(C) 112.5 (D) 113.4

Q4 If $\sum P_0Q_0 = 1360, \quad \sum P_nQ_0 = 1900, \sum P_0Q_n = 1344, \sum P_nQ_n = 1880$ then the Laspeyre's Index number is

(A) 0.71 (B) 1.39

(C) 1.75 (D) None of these

Q5 If $\sum P_0Q_0 = 116, \quad \sum P_0Q_1 = 140, \sum P_1Q_0 = 97, \quad \sum P_1Q_1 = 117$ then Fisher's ideal index number is

(A) 184 (B) 83.59

(C) 119.66 (D) 120

Q6 The simple index number for the current year using simple aggressive method for the following data:

Commodity base	Base year Price (P_0)	Current Year Price (P_1)
Wheat	80	100
Rice	100	150
Gram	120	250
Pulses	200	300

(A) 200 (B) 150

(C) 240 (D) 160

Q7 From the following data constructed the index number by Laspeyre's method:

$\Sigma P_1Q_1 = 100, \ \Sigma P_0Q_1 = 86, \ \Sigma P_0Q_0 = 83, \ \Sigma P_1Q_0 = 106$

(A) 130.36 (B) 131.51

(C) 130.59 (D) 127.71

Q8 If Fisher's index = 150 and Paasche's Index = 144, then Laspeyre's index is

(A) 147 (B) 156.25

(C) 104.17 (D) 138

Q9 Fisher index number is _____ of Laspyres and Paasches Index Number.

(A) A.M (B) G.M

(C) H.M (D) None of these

Q10 Find the Paasche's index number for prices from the following data taking 1970 as the base year.

Commodity	1970		1975	
	Price	Quantity	Price	Quantity
A	1	6	3	5
B	3	5	8	5
C	4	8	10	6

(A) 261.36 (B) 265.48

(C) 274.32 (D) 282

Q11 The prices and quantities of commodities in base and current years are as follows:

P_0	P_1	Q_0	Q_1
12	14	10	20
10	8	20	30
8	10	30	10

The Laspeyre's Price Index Number is

(A) 118.13 (B) 107.14

(C) 120.10 (D) None

Q12 From the following data base year :

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	4	3	6	2
B	5	4	6	4
C	7	2	9	2
D	2	3	1	5

Fisher's Ideal index is

(A) 117.3 (B) 115.43

(C) 118.35 (D) 116.48

Answer Key

Q1	(A)	Q7	(D)
Q2	(B)	Q8	(B)
Q3	(B)	Q9	(B)
Q4	(B)	Q10	(A)
Q5	(B)	Q11	(B)
Q6	(D)	Q12	(A)

Hints & Solutions

Q1 Text Solution:

As we know,

Price relative is the ratio of the price of a single commodity in a given period to its price in another period called the base period.

The approach uses the current-year price of each commodity as a percentage of the base-year price.

Thus, it is formulated as $\frac{Price\ in\ the\ given\ year \times 100}{Price\ in\ the\ base\ year}$ i.e., $\frac{P_n}{P_0} \times 100$

Hence, the correct answer is option (A).

Q2 Text Solution:

Given: Current Base Year's Price = 25

Base Year's Price = 30

As we know,

Price Relative is given by the formula,

Price Relative $= \frac{Current\ Base\ Year's\ Price}{Base\ Year's\ Price} \times 100$

Put the values and compute,

Price Relative$= \frac{25}{30} \times 100$

$= 83.33$

Hence, the correct option is (B).

Q3 Text Solution:

Make a data table according to the question,

Commodity	Base Price (P_0)	Current Price (P_1)
Rice	35	42
Wheat	30	35
Pulse	40	38
Fish	107	120
Total	$\sum P_0 = 212$	$\sum P_1 = 235$

The simple Aggregative Index is given by the formula,

$$\text{Simple Aggregative Index} = \frac{\sum P_1}{\sum P_0} \times 100$$

$= \frac{235}{212} \times 100$

$= 110.8$

Hence, the correct option is (B).

Q4 Text Solution:

As we know, Laspeyre's Index number is formulated as,

$$\text{Laspeyre's Index number} = \frac{\sum P_n Q_0}{\sum P_0 Q_0}$$

$$= \frac{1900}{1360}$$

$$= 1.3970 \approx 1.39$$

Hence, the correct answer is option (B).

Q5 Text Solution:

Given:

$\sum P_0 Q_0 = 116, \sum P_0 Q_1 = 140, \sum P_1 Q_0 = 97, \sum P_1 Q_1 = 117$

As we know, Fisher's Ideal index is given by the formula,

$$\text{Fisher's Index Number} = \sqrt{\frac{\sum p_1 q_0 \times \sum p_1 q_1}{\sum p_0 q_0 \times \sum p_0 q_1}} \times 100$$

Put the values and compute,

$$= \sqrt{\frac{97 \times 117}{116 \times 140}} \times 100$$

$$= \sqrt{\frac{11349}{16240}} \times 100$$

$$= \sqrt{0.698} \times 100$$

$$= 83.546 \approx 83.59$$

Hence, the correct option is (B).

Q6 Text Solution:

The simple Aggregative Index is given by the formula,

$\frac{\sum P_1}{\sum P_0} \times 100$

$= \frac{100+150+250+300}{80+100+120+200} \times 100$

$= \frac{800}{500} \times 100$

$= 160$

Q7 Text Solution:

Given,

$\Sigma P_1 Q_1 = 100,\ \Sigma P_0 Q_1 = 86,\ \Sigma P_0 Q_0 = 83,\ \Sigma P_1 Q_0 = 106$

We know,

Laspeyre's index is given by $\frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100$

$= \frac{106}{83} \times 100$

$= 127.71$

Q8 Text Solution:

We know,

$Fisher's\ index$

$= \sqrt{Laspeyre's \times Paasche's}$

$\Rightarrow 150 = \sqrt{Laspeyre's \times 144}$

$\Rightarrow (150)^2 = Laspeyre's \times 144$

$\Rightarrow Laspeyre's = \frac{(150)^2}{144}$

$\Rightarrow Laspeyre's = 156.25$

Q9 Text Solution:

We know,

$Fisher's\ index$

$= \sqrt{Laspeyre's\ Index \times Paasche's\ index}$

Therefore, Fisher index number is geometric mean of Laspyres and Paasches Index Number.

Q10 Text Solution:

Make a data table according to the question,

Commodity	p_0	q_0	p_1	q_1	p_1q_1	p_0q_1
A	1	6	3	5	15	5
B	3	5	8	5	40	15
C	4	8	10	6	60	24
					$\Sigma p_1q_1 = 115$	$\Sigma p_0q_1 = 44$

Paasche's index number is given by the formula,

$= \frac{\sum P_1Q_1}{\sum P_0Q_1} \times 100$

$= \frac{115}{44} \times 100$

$= 261.36$

Q11 Text Solution:

Given that,

P_0	P_1	Q_0	Q_1	P_0Q_0	P_1Q_0
12	14	10	20	120	140
10	8	20	30	200	160
8	10	30	10	240	300
				$\Sigma P_0Q_0 = 560$	$\Sigma P_1Q_0 = 600$

Now, using the formula of Laspeyre's Price Index Number i.e.,

$P_{01} = \frac{\sum P_1Q_0}{\sum P_0Q_0} \times 100$

$\Rightarrow P_{01} = \frac{600}{560} \times 100$

$\Rightarrow P_{01} = 107.14$

Thus, the Laspeyre's price index number is 107.14.

Hence, option (B) is the correct answer.

Q12 Text Solution:

According to the question,

Make a data table according to the question,

Commodity	P_0	Q_0	P_1	Q_1	P_0Q_0	P_1Q_0	P_0Q_1	P_1Q_1
A	4	3	6	2	12	18	8	12
B	5	4	6	4	20	24	20	24
C	7	2	9	2	14	18	14	18
D	2	3	1	5	6	3	10	5
					$\Sigma P_0Q_0 = 52$	$\Sigma P_1Q_0 = 63$	$\Sigma P_0Q_1 = 52$	$\Sigma P_1Q_1 = 59$

Fisher's Ideal index is given by the formula,

Fisher's Index Number

$= \sqrt{\frac{\sum P_1Q_0 \times \sum P_1Q_1}{\sum P_0Q_0 \times \sum P_0Q_1}} \times 100$

$= \sqrt{\frac{63 \times 59}{52 \times 52}} \times 100$

$= 117.244 = 117.3\ (approx.)$

Hence, the correct answer is option (A).

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QUANTITATIVE APTITUDE

DPP: 2

INDEX NUMBER

Q1 Index number for the base period is always taken as
(A) 200 (B) 50
(C) 1 (D) 100

Q2 P_{10} is the index for time.
(A) 1 on 0 (B) 0 on 1
(C) 1 on 1 (D) 0 on 0

Q3 If the index number of prices at a place in 1994 is 250 with 1984 as base year, then the prices have increased on average by
(A) 250% (B) 150%
(C) 350% (D) None of these

Q4 If Laspeyre's index number is 90 and Paasche's index number is 160 then Fisher's index number will _____.
(A) 144 (B) 120
(C) 125 (D) None of these

Q5 The index number of prices at a place in the year 2008 is 225 with 2004 as the base year then there is :
(A) average 125% increase in prices
(B) average 225% increase in prices
(C) average 100% increase in prices
(D) None of the above

Q6 If the prices of all commodities in a place have decreased 35% over the base period prices, then the index number of prices of that place now is
(A) 35 (B) 135
(C) 65 (D) None of these

Q7 If Laspeyre's Index number is 250 and Paasche's Index number is 160, then Fisher's Index number is
(A) 200 (B) 400
(C) 250 (D) 196

Q8 If $\sum p_1 q_1 = 249$, $\sum p_0 q_0 = 150$, Paasche's Index Number $= 150$ and Dorbish and Bowely's Index number $= 145$, then the Fisher's Ideal Index Number is
(A) 175 (B) 144.91
(C) 145.97 (D) None

Q9 Consumer Price index number for the year 1957 was 313 with 1940 as the base year. The Average Monthly wages in 1957 of the workers in to factory be ₹ $160/-$ their real wages is :
(A) ₹ 48.40 (B) ₹ 51.12
(C) ₹ 40.30 (D) None of these

Q10 If the price of all commodities in a place have increased times in comparison to the base period prices, then the index number of prices for the place is now
(A) 100
(B) 125
(C) 225
(D) None of the above

Q11 From the following data

Group	Weight	Index Number Base = 100
Food	50	241
Clothing	2	21
Fuel and Light	3	204
Rent	16	256
Miscellaneous	29	179

The cost of living index number is:
(A) 224.5 (B) 223.91
(C) 225.32 (D) None of these

Q12 The index number for the year 2012 taking 2011 as base using simple average of price relatives method from data given below is:

Commodity	A	B	C	D	E
Price in 2011 (P_0)	115	108	95	80	90
Price in 2012 (P_1)	125	117	108	95	95

(A) 112 (B) 117
(C) 120 (D) 111

Q13 From the following data

Commodities		A	B	C	D
1992 Base Year	Price	3	5	4	1
	Quantity	18	6	20	14
1993 Current Year	Price	4	5	6	3
	Quantity	15	9	26	15

The Paasche's price index number is
(A) 146.41 (B) 148.25
(C) 144.25 (D) None of these

Q14 From the following data:

Commodity	P_0	Q_0	P_1	Q_1
A	3	18	4	15
B	5	6	5	9
C	4	20	6	26
D	1	14	3	15

The Marshall Edge Worth Index number is :
(A) 148.25 (B) 144.19
(C) 147.25 (D) 143.78

Q15 The cost-of-living index number in year 2015 and 2018 were 97.5 and 115 respectively. The salary of CA Jitendra in 2015 was 195000. How much additional salary was required for him in 2018 to maintain the same standard of living as in 2015 ?
(A) 30,000 (B) 40,000
(C) 35,000 (D) 45,000

Answer Key

Q1	(D)
Q2	(B)
Q3	(B)
Q4	(B)
Q5	(A)
Q6	(C)
Q7	(A)
Q8	(B)
Q9	(B)
Q10	(C)
Q11	(D)
Q12	(D)
Q13	(A)
Q14	(C)
Q15	(C)

Hints & Solutions

Q1 Text Solution:

As we know, an index number is a ratio of two or more time periods are involved, one of which is the base time period. The value at the base time period serves as the standard point of comparison.

By the fact we know that Index number for the base period is always taken as 100.

Hence, the correct answer is option (D).

Q2 Text Solution:

As we know,

P_{10} is the index for time 0 on 1.

Hence, the correct answer is option (B).

Q3 Text Solution:

Given: Index number of prices in 1994 is 250

We know that,

The base index number in 1984 will be 100.

Thus, percentage increase = 250 - 100 = 150%

Therefore, the prices have increased on average by 150%.

Hence, the correct option is (B).

Q4 Text Solution:

As we know,

Fisher's index number is given by the formula,

Fisher's index number

$= \sqrt{Laspeyre's\ Index \times Paasche's\ Index}$

$= \sqrt{90 \times 160}$

$= 120$

Hence, the correct answer is option (B) i.e., 120.

Q5 Text Solution:

Let the price of the base year (2004) be 100.

Given as per the question,

Price of the current year $(2008) = 225$

Then, the percentage increase $= 225 - 100$

$= 125\%$

Hence, the correct answer is option (A) i.e., average 125% increase in prices.

Q6 Text Solution:

As the base year price is 100.

Since, Price has decreased by 35%.

So, the new price $= 100 - 35 = 65$

We know that,

Index Number $= \frac{Current\ year\ price}{Base\ year\ price} \times 100$

$= \frac{65}{100} \times 100$

$= 65$

Hence, the correct option is (C).

Q7 Text Solution:

Given, Laspeyre's Index number = 250 and Paasche's Index number = 160

We know,

$Fisher's\ Index = \sqrt{250 \times 160}$

$\Rightarrow Fisher's\ Index = 5 \times 4 \times 10$

$\Rightarrow Fisher's\ Index = 200$

Q8 Text Solution:

We know,

Dorbish and Bowely's Index number $= \frac{Laspeyre's\ in dex + Paasche's\ index}{2}$

$\Rightarrow 145 = \frac{L+150}{2}$

$\Rightarrow 290 = L + 150$

$\Rightarrow L = 140$

Also,

$Fisher's\ index$

$= \sqrt{Laspeyre's\ index \times Paasche's\ index}$

$\Rightarrow Fisher's\ index = \sqrt{140 \times 150}$

$\Rightarrow Fisher's\ index = 144.91$

Q9 Text Solution:

Given,

Consumer Price index number, $CPI = 313$

Average Monthly wages in $1957 =$ ₹ 160

We know that,

$CPI = \frac{\text{Current year price}}{\text{Base year price}} \times 100$

$\Rightarrow 313 = \frac{160}{P_0} \times 100$

$\Rightarrow P_0 = \frac{160}{313} \times 100$

$\Rightarrow P_0 = 51.12$

Therefore, Real Wages = ₹ 51.12

Hence, the correct option is (B) i.e., ₹ 51.12 .

Q10 Text Solution:

We know that, the base year number be 100.

Since, Current price is increased by 1.25 times, thus

Current Price index number

$= 1.25(100) + 100 = 225$

Hence, the correct option is (C) i.e., 225.

Q11 Text Solution:

Make a data table table according to the question,

Group	Weight (w)	Index Number Base = 100 (i)	$i.w$
Food	50	241	12050
Clothing	2	21	42
Fuel and Light	3	204	612
Rent	16	256	4096
Miscellaneous	29	179	5191
	$\sum w = 100$		$\sum i.w = 21991$

As we know, cost of living index number is given by the formula,

$$\text{Cost of living index number} = \frac{\sum i.w}{\sum w}$$
$$= \frac{21991}{100}$$
$$= 219.91$$

Hence, the correct answer is option (D).

Q12 Text Solution:

According to the question,

Commodity	A	B	C	D	E	
Price in 2011 (P_0)	115	108	95	80	90	$\Sigma P_0 = 488$
Price in 2012 (P_1)	125	117	108	95	95	$\Sigma P_1 = 540$

As we know,

Price relative is formulated as,

$$\text{Price Relative } = P_{01} = \frac{\Sigma P_1}{\sum P_0} \times 100$$
$$= \frac{540}{488} \times 100$$
$$= 110.655 \approx 111$$

Hence, the correct option is (D).

Q13 Text Solution:

Make a data table according to the question,

Commodity	P_0	Q_0	P_1	Q_1	P_0Q_0	P_1Q_0	P_0Q_1	P_1Q_1
A	3	18	4	15	54	72	45	60
B	5	6	5	9	30	30	45	45
C	4	20	6	26	80	120	104	156
D	1	14	3	15	14	42	15	45
					$\Sigma P_0Q_0 = 178$	$\Sigma P_1Q_0 = 264$	$\Sigma P_0Q_1 = 209$	$\Sigma P_1Q_1 = 306$

Paasche's Index number is given by the formula,

$$\text{Paasche's Index number} = \frac{\sum P_1Q_1}{\sum P_0Q_1} \times 100$$
$$= \frac{306}{209} \times 100$$
$$= 146.411$$

Hence, the correct answer is option (A) i..e, 146.41.

Q14 Text Solution:

Make a data table according to the question,

Commodity	P_0	Q_0	P_1	Q_1	P_0Q_0	P_1Q_0	P_0Q_1	P_1Q_1
A	3	18	4	15	54	72	45	60
B	5	6	5	9	30	30	45	45
C	4	20	6	26	80	120	104	156
D	1	14	3	15	14	42	15	45
					$\Sigma P_0Q_0 = 178$	$\Sigma P_1Q_0 = 264$	$\Sigma P_0Q_1 = 209$	$\Sigma P_1Q_1 = 306$

Marshall Edgeworth index number

$$= \frac{\sum P_1Q_0 + \sum P_1Q_1}{\sum P_0Q_0 + \sum P_0Q_1} \times 100$$
$$= \frac{264+306}{178+209} \times 100$$
$$= 147.25$$

Hence, the correct option is (C).

Q15 Text Solution:

Let the salary of CA Jitendra in 2018 be x, then

According to the question

Year	Cost of living Index	Income
2015	97.5	1,95,000
2018	115	x

Thus,

$$\frac{97.5}{115} = \frac{195000}{x}$$
$$\Rightarrow x = \frac{195000 \times 115}{97.5}$$
$$\Rightarrow x = 2,30,000$$

Therefore, the additional salary required = 2,30,000 - 1,95,000 = 35,000

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

INDEX NUMBER

Q1 Shifted Price Index $= \frac{Original\ Price \times 100}{Price\ Index\ of\ the\ year\ on\ which\ it\ has\ to\ be\ shifted}$

(A) True (B) False

(C) both (D) none

Q2 In price index, when a new commodity is required to be added, which of the following index is used?

(A) Shifted price index

(B) Splicing price index

(C) Deflating price index

(D) Value price index

Q3 The number of test of Adequacy is

(A) 2 (B) 5

(C) 3 (D) 4

Q4 Time reversal and factor reversal are:

(A) Quantity Index

(B) Ideal index

(C) Price Index

(D) Test of Consistency

Q5 The Circular Test is known as :

(A) $P_{01} \times P_{12} \times P_{20} = 1$

(B) $P_{12} \times P_{01} \times P_{20} = 1$

(C) $P_{20} \times P_{12} \times P_{01} = 1$

(D) $P_{02} \times P_{21} \times P_{12} = 1$

Q6 Circular test is not met by

(A) The simple geometric mean of price relatives

(B) The weighted aggregative with fixed weights

(C) Laspeyre's or Paasche's or the fisher's ideal index

(D) None of these

Q7 Laspeyre's and Paasche's method _____ time reversal test.

(A) satisfy (B) do not satisfy

(C) are (D) are not

Q8 The test of shifting the base is called

(A) Unit Test

(B) Time Reversal Test

(C) Circular Test

(D) none

Q9 _____ is concerned with the measurement of price changes over a period of years when it is desirable to shift the base.

(A) Unit Test

(B) Circular Test

(C) Time Reversal Test

(D) none

Q10 Laspeyre's or Paasche's or the Fisher's ideal index do not satisfy

(A) Time Reversal Test

(B) Unit Test

(C) Circular Test

(D) none

Q11 Which one is called an Ideal index number?

(A) Laspeyre's index number

(B) Paasche's index number

(C) Fisher's index number

(D) Masrshall Edgeworth index number

Q12 Factor Reversal test is satisfied by

(A) Fisher's Ideal Index

(B) Laspeyre's Index

(C) Paasche's Index

(D) none

Q13 Weighted G.M. of relative formula satisfy _____ test.

(A) Time Reversal Test

(B) Circular test
(C) Factor Reversal Test
(D) none

Q14 Fisher's Ideal Formula for calculating index numbers satisfies the _____ tests.
(A) Unit Test
(B) Factor Reversal Test
(C) both
(D) none

Q15 Paasche index is based on
(A) Base year quantities
(B) Current year's quantities
(C) Average of current and base year
(D) None of these

Answer Key

Q1	(A)
Q2	(B)
Q3	(D)
Q4	(D)
Q5	(A)
Q6	(C)
Q7	(B)
Q8	(C)
Q9	(B)
Q10	(C)
Q11	(C)
Q12	(A)
Q13	(A)
Q14	(C)
Q15	(B)

Hints & Solutions

Q1 Text Solution:

The ratio of the original price and the price index of the year on which it must be shifted full, multiplied by 100, is the formula for the "Shifted Price Index."

It is formulated as,

$$\text{Shifted Price Index} = \frac{Original\ price \times 100}{Price\ Index\ of\ the\ year\ on\ which\ it\ has\ to\ be\ shifted}$$

Hence, the correct option is (A) i.e., True.

Q2 Text Solution:

We know,

In price index, when a new commodity is required to be added, Splicing price index is used.

Q3 Text Solution:

We know, Test of Adequacy are as follow:

1. Unit Test
2. Time Reversal Test
3. Factor Reversal Test
4. Circular Test

Thus, there are 4 test of Adequacy.

Hence, the correct answer is option (D) i.e., 4.

Q4 Text Solution:

As we know, an evaluation of a method's ability to work both forward and backward in time is known as a time reversal test.

A price index multiplied by a volume index of the same type must match the proportionate change in the present values in order to pass the factor reversal test.

Thus, Time reversal and factor reversal are test of Consistency.

Hence, the correct option is (D) i.e., Test of Consistency.

Q5 Text Solution:

As we know, The "circular test" is another evaluation of the index number formula's suitability.

If there is interest in measuring price changes over a number of years rather than just comparing prices over two years when index numbers are used. Shifting the basis is frequently desirable.

The circular test is satisfied if $P_{01} \times P_{12} \times P_{20} = 1$

Hence, the correct answer is option (A) i.e., $P_{01} \times P_{12} \times P_{20} = 1$.

Q6 Text Solution:

The circular test is not met by the ideal index or by any of weighted aggregative with changing weights.

This test is met by simple geometric mean of price relatives and the weighted aggregative fixed weights.

Thus, circular test is not met by Laspeyre's or Paasche's or the fisher's ideal index.

Hence, the correct answer is option (C).

Q7 Text Solution:

According to the time-reversal test, the index for the later period based on the earlier period should be equal to the earlier period based on the later period's index.

i.e., $P_{01} \times P_{10} = 1$

As a result, the time-reversal test using Laspeyres and Paasche's technique is not satisfied.

Hence, the correct answer is option (B).

Q8 Text Solution:

When we need to shift the base, we can measure price changes across a number of years using the circular test.

Additionally, if there is interest in measuring price changes over a number of years rather than just comparing prices over two years when index numbers are used. Shifting the basis is frequently desirable.

Thus, the test of shifting the base is called the Circular test.

Hence, the correct option is (C) i.e., Circular test.

Q9 Text Solution:

When we need to shift the base, we can measure price changes across a number of years using the circular test.

Thus, Circular test is concerned with the measurement of price changes over a period of years when it is desirable to shift the base.

Hence, the correct option is (B) i.e., Circular test.

Q10 Text Solution:

The Laspeyre's, Paasche's, or Fisher's ideal index does not satisfy the circular test.

The circular test is not met by Fisher's ideal index.

Hence, the correct option is (C) i.e., Circular test.

Q11 Text Solution:

As we know, The Paasche and Laspeyre's index numbers are combined to create the Fisher index, which is the square root of that product.

Fisher's ideal index number $= \sqrt{\text{Paasche index number} \times \text{Laspeyre's index number}}$

Thus, Fisher's Index number is an Ideal Index Number.

Hence, the correct option is (C) i.e., Fisher's index number.

Q12 Text Solution:

As we know, Factor reversal test holds when the product of price index and the quantity index should be equal to the corresponding value index.

i.e., $P_{01} \times Q_{01} = V_{01}$

Out of the given options, only Fisher's Ideal index satisfy Factor reversal test.

Hence, the correct option is (A) i.e., Fisher's Ideal Index.

Q13 Text Solution:

As we know,

Time reversal test is based on the property of time reversibility, it means if periods are reversed and indices are multiplied it should result into unity.

Thus, Weighted G.M. of relative formula satisfies the time reversal testsince it is insensitive to the direction of time.

Hence, the correct answer is option (A) i.e., Time Reversal Test.

Q14 Text Solution:

As we know, Laspeyre's and Paasche's Price indices are geometrically averaged to produce the Fisher Price Index. It is also known as Ideal index formula.

Thus, Fisher's Ideal formula for calculating index numbers satisfies both Unit test and Factor reversal test.

Hence, the correct option is (C) i.e., both.

Q15 Text Solution:

As we know, Paasche's index is a price composite index produced using the weighted sum method.

This index number represents the ratio between the total price for the actual period and the total price for the reference period, with the actual period's real relative quantities used to weight the sums.

Hence, the correct answer is option (B) i.e., Current year's quantities.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

EQUATIONS

Q1 The solution to the linear equation $4x + 6 = 2x - 10$ is:
(A) $x = -4$
(B) $x = 4$
(C) $x = -8$
(D) $x = 8$

Q2 The solution of the equation $\frac{x+24}{5} = 4 + \frac{x}{4}$ is
(A) 6 (B) 10
(C) 16 (D) None of these

Q3 For what value of x the following equation satisfies:
$\frac{5x}{8} = \frac{25}{4}$
(A) 2 (B) 20
(C) 5 (D) 10

Q4 The root of the equation $\frac{x+4}{4} + \frac{x-5}{3} = 11$ is
(A) 20 (B) 10
(C) 2 (D) none of these

Q5 If $\frac{2x+5}{10} + \frac{3x+10}{15} = 5$, then the value of x is
(A) 10.58 (B) 9.58
(C) 9.5 (D) None of these

Q6 The second part of a number is 10 more than the fourth part. What is the number?
(A) 20 (B) 40
(C) 60 (D) 80

Q7 If thrice of A's age 6 years ago be subtracted from twice his present age, the result would be equal to his present age. Find A's present age.
(A) 7 (B) 8
(C) 9 (D) 6

Q8 The cost of 5 apples and 3 mangoes is ₹90, the situation can be represented as:
(If the cost of one apple and one mango is ₹x and ₹y respectively)
(A) $5x - 3y = 90$
(B) $x + y = 90$
(C) $5x + 3y = 90$
(D) None of the above

Q9 The solution to the system of linear equations $x + y = 7$ and $x - y = 3$ is:
(A) $(2, 5)$ (B) $(5, 2)$
(C) $(4, 3)$ (D) $(3, 4)$

Q10 The solution of the set of equations $3x + 4y = 7, 4x - y = 3$ is
(A) $(1, -1)$ (B) $(1, 1)$
(C) $(2, 1)$ (D) $(1, -2)$

Q11 The sum of two numbers is 52 and their difference is 2. The numbers are
(A) 17 and 25 (B) 12 and 10
(C) 27 and 25 (D) None of these

Q12 Of two numbers, $\frac{1}{5}^{th}$ of the greater is equal to $\frac{1}{3}^{rd}$ of the smaller and their sum is 16. The numbers are:
(A) (6, 10) (B) (9, 7)
(C) (12, 4) (D) (11, 5)

Answer Key

Q1	(C)	Q7	(C)
Q2	(C)	Q8	(C)
Q3	(D)	Q9	(B)
Q4	(A)	Q10	(B)
Q5	(B)	Q11	(C)
Q6	(B)	Q12	(A)

Hints & Solutions

Q1 Text Solution:

Given equation:

$4x + 6 = 2x - 10$

$\Rightarrow 4x - 2x = -10 - 6$

$\Rightarrow 2x = -16$

$\Rightarrow x = \frac{-16}{2}$

$\Rightarrow x = -8$

Therefore, the value of x is -8.

Hence, the correct option is (C).

Q2 Text Solution:

Given equation,

$\frac{x+24}{5} = 4 + \frac{x}{4}$

$\Rightarrow \frac{x}{5} + \frac{24}{5} = 4 + \frac{x}{4}$

$\Rightarrow \frac{x}{5} - \frac{x}{4} = \frac{4}{1} - \frac{24}{5}$

$\Rightarrow \frac{4\times x - 5\times x}{20} = \frac{4\times 5 - 24}{5}$

$\Rightarrow \frac{4x-5x}{20} = \frac{20-24}{5}$

$\Rightarrow \frac{-x}{20} = \frac{-4}{5}$

$\Rightarrow x = \frac{4}{5} \times 20$

$\Rightarrow x = 16$

Therefore, the solution of the given equation is 16.

Hence, the correct option is (C).

Q3 Text Solution:

Given equation: $\frac{5x}{8} = \frac{25}{4}$

$\Rightarrow x = \frac{25}{4} \times \frac{8}{5}$

$\Rightarrow x = 5 \times 2$

$\Rightarrow x = 10$

Therefore, the required value of x is 10.

Hence, the correct option is (D) i.e., 10.

Q4 Text Solution:

Given equation: $\frac{x+4}{4} + \frac{x-5}{3} = 11$

We know that,

L.C.M of 4 and 3 = 12

So, equation will become

$\frac{3(x+4)+4(x-5)}{12} = 11$

$\Rightarrow 3\left(x+4\right) + 4\left(x-5\right) = 12 \times 11$

$\Rightarrow 3x + 12 + 4x - 20 = 132$

$\Rightarrow 7x - 8 = 132$

$\Rightarrow 7x = 140$

$\Rightarrow x = 20$

Therefore, the root of the given equation is 20.

Hence, the correct option is (A).

Q5 Text Solution:

Given, $\frac{2x+5}{10} + \frac{3x+10}{15} = 5$

$\Rightarrow \frac{3(2x+5)+2(3x+10)}{30} = 5$

$\Rightarrow 6x + 15 + 6x + 20 = 150$

$\Rightarrow 12x = 150 - 35$

$\Rightarrow 12x = 115$

$\Rightarrow x = 9.58$

Q6 Text Solution:

Let the required number be a.

So, the second part of the number will be $\frac{a}{2}$.

Also, fourth part of the number will be $\frac{a}{4}$.

According to the question,

$\frac{a}{2} = \frac{a}{4} + 10$

$\Rightarrow \frac{a}{2} - \frac{a}{4} = 10$

$\Rightarrow \frac{2a-a}{4} = 10$

$\Rightarrow \frac{a}{4} = 10$

$\Rightarrow a = 40$

Trick: Check with the options:

For option (A): 20

Its second part $= \frac{1}{2} \times 20 = 10$

Its fourth part $= \frac{1}{4} \times 20 = 5$

Clearly, the second part of a number is not 10 more than the fourth part.

For option (B): 40

Its second part $= \frac{1}{2} \times 40 = 20$

Its fourth part $= \frac{1}{4} \times 40 = 10$

Here, the second part of a number is 10 more than the fourth part.

Therefore, the required number is 40.

Hence, the correct option is (B) i.e 40.

Q7 Text Solution:

Let the present age of A be x years.
Thus, A's age 6 years ago = 'x - 6' years
According to the question,
$2x - 3(x - 6) = x$
$\Rightarrow 2x - 3x + 18 = x$
$\Rightarrow -x + 18 = x$
$\Rightarrow 2x = 18$
$\Rightarrow x = 9$
Therefore, the present age of A is 9 years.

Q8 Text Solution:
Given: Cost of one apple and one mango is ₹x and ₹y respectively
Then, cost of 5 apples $= ₹5x$
Cost of 3 mangoes $= ₹3y$
According to the question,
$₹5x + ₹3y = ₹90$
or $5x + 3y = 90$
Hence, the correct option is (C).

Q9 Text Solution:
Given equations: $x + y = 7$ and
$x - y = 3$
$x + y = 7 \quad ....(i)$
$x - y = 3 \quad ...(ii)$
Adding (i) and (ii), we get
$(x + y) + (x - y) = 7 + 3$
$\Rightarrow 2x = 10$
$\Rightarrow x = 5$
Put the value of x in eq (i), we get
$5 + y = 7$
$\Rightarrow y = 2$
Therefore, the required solution is (5, 2).
Hence, the correct option is (B) i.e., (5, 2).

Q10 Text Solution:
Given equations: $3x + 4y = 7,\ 4x - y = 3$
We need to find the value $(x,\ y)$ so that both the equations are satisfied.
$3x + 4y = 7 \quad ....(i)$
$4x - y = 3 \quad ....(ii)$
Multiplying equation (ii) by 4, we get
$16x - 4y = 12 \quad ....(iii)$
On adding equations (i) and (iii), we get
$(3x + 4y) + (16x - 4y) = 7 + 12$
$\Rightarrow 19x = 19$
$\Rightarrow x = 1$
Now, putting the value of $x = 1$ in equation (i), we have

$31 + 4y = 7$
$\Rightarrow 3 + 4y = 7$
$\Rightarrow 4y = 7 - 3$
$\Rightarrow 4y = 4$
$\Rightarrow y = 1$

Therefore, the solution is (1,1) for the given equations.
Hence, the correct option is (B) i.e., (1, 1).

Q11 Text Solution:
Let the two numbers be x and y, such that $x > y$.
According to the question,
$x + y = 52 \quad .....(i)$
$x - y = 2 \quad .....(ii)$
On adding (i) and (ii) ,we get
$(x + y) + (x - y) = 52 + 2$
$\Rightarrow 2x = 54$
$\Rightarrow x = \frac{54}{2}$
$\Rightarrow x = 27$
Now, put $x = 27$ in eq (i) ,we have
$27 + y = 52$
$\Rightarrow y = 52 - 27$
$\Rightarrow y = 25$
Therefore, the first number is 27 and second number is 25.
Hence, the correct option is (C) i.e., 27 and 25.

Q12 Text Solution:
Let the greater number be x and the smaller number be y.
According to the question,
$\frac{1}{5}x = \frac{1}{3}y$
$\Rightarrow 3x = 5y$
$\Rightarrow 3x - 5y = 0 \quad .... \quad (i)$
Also,
$x + y = 16$
$\Rightarrow \ 3x + 3y = 48 \quad .... \quad (ii)$ (on multiplying each term by 3)
Now, subtracting eq (i) from eq (ii), we get

$3x + 3y - (3x - 5y) = 48 - 0$

$\Rightarrow 8y = 48$

$\Rightarrow y = 6$

Put the value of y in eq (i), we get

$3x - 5(6) = 0$

$\Rightarrow 3x = 30$

$\Rightarrow x = 10$

Therefore, the numbers are 6 and 10.

Hence, the correct option is (A) i.e., (6, 10).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

EQUATIONS

Q1 The value of y that satisfy the equation $\frac{y+11}{6} - \frac{y+1}{9} = \frac{y+7}{4}$ is

(A) -1 (B) 10

(C) 1 (D) $-\frac{1}{7}$

Q2 Pick up the correct value x for which $\frac{x}{0.5} - \frac{1}{0.05} + \frac{x}{0.005} - \frac{1}{0.0005} = 0.$

(A) $x = 0$ (B) $x = 1$

(C) $x = 10$ (D) none of these

Q3 Three persons Mr. Roy, Mr. Paul and Mr. Singh together have ₹51. Mr. Paul has ₹4 less than Mr. Roy and Mr. Singh has got ₹5 less than Mr. Roy. They have the money as

(A) $(₹20,\ ₹16,\ ₹15)$

(B) $(₹15,\ ₹20,\ ₹16)$

(C) $(₹25,\ ₹11,\ ₹15)$

(D) None of these

Q4 If $4x + 5y = 83$ and $\frac{3x}{2y} = \frac{21}{22}$ then $y - x =$?

(A) 3 (B) 4

(C) 7 (D) 1

Q5 Choose the most appropriate option (A), (B), (C) or (D) as the solution to the given set of equations:

$1.5x + 3.6y = 2.1,\ \ 2.5(x + 1) = 6y$

(A) $(0.2,\ 0.5)$

(B) $(0.5,\ 0.2)$

(C) $(2,\ 5)$

(D) $(-2, -5)$

Q6 A man wants to cut three lengths from a single piece of board of length 91 cm. The second length is to be 3 cm longer than the shortest and third length is to be twice as the shortest. What is the possible length for the shortest piece?

(A) 22 cm (B) 20 cm

(C) 15 cm (D) 18 cm

Q7 The cost prices of 3 pens and 4 bags is ₹324. and 4 pens and 3 bags is ₹257, then cost price of 1 bag is equal to

(A) ₹16 (B) ₹18

(C) ₹50 (D) ₹75

Q8 The values of x and y satisfying the following equations are given by

$\frac{3}{x+y} + \frac{2}{x-y} = 3,\ \frac{2}{x+y} + \frac{3}{x-y} = 3\frac{2}{3}$

(A) $(1,\ 2)$ (B) $(-1, -2)$

(C) $\left(1,\ \frac{1}{2}\right)$ (D) $(2,\ 1)$

Q9 Two numbers are such that twice the greater number exceeds twice the smaller one by 18 and $\frac{1}{3}^{rd}$ of the smaller and $\frac{1}{5}^{th}$ of the greater number are together 21. The numbers are:

(A) (36, 45) (B) (45, 36)

(C) (50, 41) (D) (55, 46)

Q10 Solve for x, y and z:

$2x + 3y + 4z = 0,\ \ x + 27y - 5z = 0,\ \ 10x + 16y - 6z = 0$

(A) (0, 0, 0) (B) (1, -1,1)

(C) (3, 2, -1) (D) (1, 0, 2)

Q11 Divide 56 into two parts such that three times of first part exceeds one third of the second by 48. The parts are

(A) (20, 36) (B) (25, 31)

(C) (24, 32) (D) None of these

Q12 The point of intersection between the lines 3x + 4y = 7 and 4x - y = 3 lie in the

(A) 1st quadrant (B) 2nd quadrant

(C) 3rd quadrant (D) 4th quadrant

Q13 The value of y of fraction $\frac{x}{y}$ exceeds with x by 5 and if 3 be added to both numerator and denominator of the fraction it becomes $\frac{3}{4}$. Find the fraction.

(A) $\frac{12}{17}$ (B) $\frac{13}{17}$

(C) $-\frac{1}{3}$ (D) None of these

Q14 Ten years ago, the age of father was four times of his son. Ten years hence, the age of the father will be twice that of his son. The present ages of the father and the son are

(A) (50, 20) (B) (60, 20)

(C) (55, 25) (D) None of these

Q15 If $2^{x+y} = 2^{2x-y} = \sqrt{8}$ then the respective values of x and y are

(A) $1, \frac{1}{2}$

(B) $\frac{1}{2}, 1$

(C) $\frac{1}{2}, \frac{1}{2}$

(D) None of these

Answer Key

Q1	(D)
Q2	(C)
Q3	(A)
Q4	(B)
Q5	(A)
Q6	(A)
Q7	(D)
Q8	(D)
Q9	(B)
Q10	(A)
Q11	(A)
Q12	(A)
Q13	(A)
Q14	(A)
Q15	(A)

Hints & Solutions

Q1 Text Solution:

Given: $\frac{y+11}{6} - \frac{y+1}{9} = \frac{y+7}{4}$

$\therefore$ L.C.M of 6 and 9 = 18

$\Rightarrow \frac{3(y+11)-2(y+1)}{18} = \frac{y+7}{4}$

$\Rightarrow \frac{3y+33-2y-2}{18} = \frac{y+7}{4}$

$\Rightarrow \frac{y+31}{18} = \frac{y+7}{4}$

On cross multiplication, we get

$4(y+31) = 18(y+7)$

$\Rightarrow 4y + 124 = 18y + 126$

$\Rightarrow 18y - 4y = 124 - 126$

$\Rightarrow 14y = -2$

$\Rightarrow y = -\frac{1}{7}$

Therefore, the required value of y is $-\frac{1}{7}$.

Hence, the correct option is (D).

Q2 Text Solution:

Given equation:

$\frac{x}{0.5} - \frac{1}{0.05} + \frac{x}{0.005} - \frac{1}{0.0005} = 0$

On multiplying both sides by 0.5, we get

$0.5 \times \left(\frac{x}{0.5} - \frac{1}{0.05} + \frac{x}{0.005} - \frac{1}{0.0005}\right) = 0.5 \times 0$

$\Rightarrow \frac{0.5\times x}{0.5} - \frac{0.5\times 1}{0.05} + \frac{0.5\times x}{0.005} - \frac{0.5\times 1}{0.0005} = 0$

$\Rightarrow x - 10 + 100x - 1000 = 0$

$\Rightarrow 101x - 1010 = 0$

$\Rightarrow 101x = 1010$

$\Rightarrow x = 10$

Trick:

Go by choices:

Clearly, for option (C): x = 10

LHS $= \frac{x}{0.5} - \frac{1}{0.05} + \frac{x}{0.005} - \frac{1}{0.0005}$

$= \frac{10}{0.5} - \frac{1}{0.05} + \frac{10}{0.005} - \frac{1}{0.0005}$

$= 20 - 20 + 2000 - 2000 = 0 =$ RHS

Hence, the correct option is (C).

Q3 Text Solution:

Let us suppose that Mr. Roy has x rupees.

Now, according to the question

Mr. Paul has ₹(x - 4) and Mr. Singh has ₹(x - 5).

Since, they have ₹51 in total.

$x + (x-4) + (x-5) = 51$

$\Rightarrow 3x - 9 = 51$

$\Rightarrow 3x = 9 + 51$

$\Rightarrow 3x = 60$

$\Rightarrow x = 20$

Thus, Mr. Roy has ₹20.

Now, Mr. Paul has ₹$(x-4) =$ ₹$(20-4) =$ ₹16

and

Mr. Singh has ₹$(x-5) =$ ₹$(20-5) =$ ₹15

Trick:

Go by choices:

For option (A), (₹20, ₹16, ₹15)

Clearly,

Mr. Roy has ₹20.

Mr. Paul has ₹16, which is ₹4 less than Mr. Roy.

and Mr. Singh has ₹15, which is ₹5 less than Mr. Roy.

Hence, the correct option is (A).

Q4 Text Solution:

Given: $4x + 5y = 83 \quad \ldots.(i)$

$\frac{3x}{2y} = \frac{21}{22} \quad \ldots.(ii)$

Cross multiply (ii), we get

$66x = 42y$

$\Rightarrow 11x = 7y$

$\Rightarrow y = \frac{11x}{7}$

Put the value of y in (i),

$\Rightarrow 4x + 5\left(\frac{11x}{7}\right) = 83$

$\Rightarrow \frac{28x+55x}{7} = 83$

$\Rightarrow \frac{83x}{7} = 83$

$\Rightarrow x = 7$

Put the value of x = 7 in (i),

$\Rightarrow 4(7) + 5y = 83$

$\Rightarrow 28 + 5y = 83$

$\Rightarrow 5y = 83 - 28$

$\Rightarrow 5y = 55$

$\Rightarrow y = 11$

Thus, $y - x = 11 - 7 = 4$

Hence, the correct option is (B).

Q5 Text Solution:

Given, $1.5x + 3.6y = 2.1$

$\Rightarrow\ 15x + 36y = 21$

$\Rightarrow\ 5x + 12y = 7 \quad \ldots\ldots\ldots (i)$

Also, $2.5(x + 1) = 6y$

$\Rightarrow 2.5x + 2.5 = 6y$

$\Rightarrow 25x + 25 = 60y$

$\Rightarrow\ 5x + 5 = 12y$

(on dividing both the sides by 5)

$\Rightarrow 5x - 12y = \ -5 \quad \ldots\ldots\ldots (ii)$

Now, adding eq (i) and eq (ii), we get

$(5x + 12y) + (5x - 12y) = \ 7 + (-5)$

$\Rightarrow 10x = 2$

$\Rightarrow x = 0.2$

Now, putting the value of $x\ =\ 0.2$ in equation (i), we get

$5(0.2) + 12y = 7$

$\Rightarrow 1 + 12y = 7$

$\Rightarrow 12y = 7 - 1$

$\Rightarrow 12y = 6$

$\Rightarrow y = 0.5$

Thus, the required solution set is x = 0.2 and y = 0.5.

Hence, the correct answer is option (A).

Q6 Text Solution:

Let the shortest piece be of x cm.

According to the question,

Second length = 'x + 3' cm and Third length = '2x' cm

Thus,

$x + x + 3 + 2x = 91$

$\Rightarrow 4x = 91 - 3$

$\Rightarrow 4x = 88$

$\Rightarrow x = 22$

Therefore, the length of shortest piece of board is 22 cm.

Q7 Text Solution:

Let the cost price of 1 pen be ₹x and of bag be ₹y.

According to the question,

$3x + 4y = 324\ \&\ 4x + 3y = 257$

On adding the equations, we get

$7x + 7y = 581$

$\Rightarrow x + y = 83\ \ldots.(i)$

On subtracting, we get

$-x + y = 67 \ldots (ii)$

From (i) and (ii), we have

$2y = 150$

$\Rightarrow y = 75$

Therefore, the price of 1 bag is ₹75.

Q8 Text Solution:

Given,

$\frac{3}{x+y} + \frac{2}{x-y} = 3$ .....(i)

$\frac{2}{x+y} + \frac{3}{x-y} = 3\frac{2}{3} = \frac{11}{3}$ .....(ii)

Let us assume $\frac{1}{x+y} = a$ and $\frac{1}{x-y} = b$

Multiply (i) by 2 and (ii) by 3 and then subtract (i) and (ii), we get

$6a\ +\ 4b\ =\ 6$

$6a\ +\ 9b\ =\ 11$

$(-) \quad (-) \quad (-)$

$-\ 5b\ =\ -\ 5$

$\Rightarrow b\ =\ 1$

Put b = 1 in (i),

$\Rightarrow 3a\ +\ 2(1)\ =\ 3$

$\Rightarrow 3a = 1$

$\Rightarrow a = \frac{1}{3}$

So, $a = \frac{1}{3}$ and $b = 1$

Thus, $\frac{1}{x+y} = a$ and $\frac{1}{x-y} = b$

$\Rightarrow \frac{1}{x+y} = \frac{1}{3}$

$\Rightarrow x + y = 3\ \ldots.(iii)$

Also,

$\frac{1}{x-y} = 1$

$\Rightarrow x - y = 1\ \ldots.(iv)$

Add (iii) and (iv), we get

$(x + y) + (x - y) = 3 + 1$

$\Rightarrow 2x\ =\ 4$

$\Rightarrow x = 2$

Put x = 2 in (iii), we get

$2\ +\ y\ =\ 3$

$\Rightarrow y\ =\ 3\ -\ 2$

$\Rightarrow y\ =\ 1$

So, x = 2 and y = 1

Hence, the correct option is (D).

Q9 Text Solution:

Let the two numbers be x and y such that $x > y$.

Now, according to the question,

$2x = 2y + 18$

$\Rightarrow x = y + 9 \quad ....(i)$

Also, $\frac{1}{3}y + \frac{1}{5}x = 21$

$\Rightarrow 5y + 3x = 315 \quad ....(ii)$

Put the value of x from eq (i) in eq (ii), we get

$5y + 3(y + 9) = 315$

$\Rightarrow 5y + 3y + 27 = 315$

$\Rightarrow 8y = 288$

$\Rightarrow y = 36$

Put the value of y in eq (i), we get

$x = 36 + 9$

$\Rightarrow x = 45$

Therefore, $x = 45$ and $y = 36$

Hence, the correct answer is option (B).

Q10 Text Solution:

Trick: Go by options

Only (0, 0, 0) is satisfying all the three given equations

i.e., $2x + 3y + 4z = 0 \Rightarrow 2(0) + 3(0) + 4(0) = 0$

$x + 27y - 5z = 0 \Rightarrow (0) + 27(0) - 5(0) = 0$

$10x + 16y - 6z = 0 \Rightarrow 10(0) + 16(0) - 6(0) = 0$

So, $x = 0, y = 0, z = 0$

But (1, -1,1), (3, 2, -1) and (1, 0, 2) does not satisfy all the given equations.

Hence, the correct option is (A) i.e., (0, 0, 0).

Q11 Text Solution:

Let the first part be x and second part be (56 - x).

According to the question,

$3x = \frac{56-x}{3} + 48$

$\Rightarrow 3x = \frac{56-x}{3} + \frac{48}{1}$

L.C.M of 3 and 1 is 3.

$\Rightarrow 3x = \frac{56-x}{3} + \frac{48\times3}{1\times3}$

$\Rightarrow 3x = \frac{56-x+144}{3}$

$\Rightarrow 9x = 200 - x$

$\Rightarrow 10x = 200$

$\Rightarrow x = 20$

So, the first part is $x = 20$.

And the second part is $(56 - x) = 56 - 20 = 36$.

Therefore, the required parts are (20, 36).

Trick:

Go by choices:

Clearly, for option (A): (20, 36)

Three times of first part $= 3(20) = 60$

One third of the second part $= \frac{36}{3} = 12$

Thus, $60 = 12 + 48$

The given condition does not hold for the other options.

Hence, the correct option is (A) i.e., (20, 36).

Q12 Text Solution:

Given,

$3x + 4y = 7 \quad ....(i)$

$4x - y = 3 \quad ....(ii)$

Multiplying eq (ii) by 4 and then adding with eq (i), we get

$3x + 4y = 7$

$16x - 4y = 12$

$19x = 19$

$\Rightarrow x = 1$

Put the value of x in eq (ii), we get

$4 - y = 3$

$\Rightarrow y = 4 - 3$

$\Rightarrow y = 1$

Therefore, x = 1 and y = 1 i.e., (1, 1) lies in 1st quadrant.

Q13 Text Solution:

According to the question, we have

$y - x = 5 \quad ...(i)$

$\frac{x+3}{y+3} = \frac{3}{4}$

$\Rightarrow 4(x + 3) = 3(y + 3)$

$\Rightarrow 4x + 12 = 3y + 9$

$\Rightarrow 4x - 3y = -3 \quad ....(ii)$

Multiplying eq (i) with 4 and adding with eq (i), we get

$4y - 4x = 20$
$4x - 3y = -3$
$\_\_\_\_\_$
$4y - 3y = 17$
$\Rightarrow y = 17$
Thus, $x = 17 - 5 = 12$
Therefore, the fraction is $\frac{12}{17}$.

Q14 Text Solution:
Let the ages of son and father be x years and y years respectively.
Ten years ago,
Age of son $= (x - 10)$ years
Age of father $= (y - 10)$ years
According to the first condition of their ages, we have
$(y - 10) = 4(x - 10)$
$\Rightarrow y - 10 = 4x - 40$
$\Rightarrow 4x - y = 40 - 10$
$\Rightarrow 4x - y = 30 \quad \ldots . (i)$
Ten years hence,
Age of son $= (x + 10)$ years
Age of father $= (y + 10)$ years
Now, according to the second condition of their ages, we have

$(y + 10) = 2(x + 10)$
$\Rightarrow y + 10 = 2x + 20$
$\Rightarrow y = 2x + 10 \quad \ldots . (ii)$
Substituting $y = 2x + 10$ in equation (i), we get

$4x - (2x + 10) = 30$
$\Rightarrow 4x - 2x - 10 = 30$
$\Rightarrow 2x = 30 + 10$
$\Rightarrow 2x = 40$
$\Rightarrow x = 20$

Now, put $x = 20$ in equation (ii), we get
$y = 2(20) + 10$
$\Rightarrow y = 40 + 10$
$\Rightarrow y = 50$
Therefore, the present age of son is 20 years and his father is 50 years .

Hence, the correct option is (A) i.e., (50, 20).

Q15 Text Solution:
We have, $2^{x+y} = 2^{2x-y} = \sqrt{8}$
$\Rightarrow 2^{x+y} = 2^{2x-y} = (2^3)^{\frac{1}{2}}$
$\Rightarrow 2^{x+y} = 2^{2x-y} = 2^{\frac{3}{2}}$
$\Rightarrow x + y = \frac{3}{2} \& \; 2x - y = \frac{3}{2}$
On adding both the equations, we get
$(x + y) + (2x - y) = \frac{3}{2} + \frac{3}{2}$
$\Rightarrow 3x = 3$
$\Rightarrow x = 1$
$\Rightarrow y = \frac{3}{2} - x = \frac{3}{2} - 1 = \frac{1}{2}$
Therefore, the values of x and y are $1 \; and \; \frac{1}{2}$ respectively.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

EQUATIONS

Q1 The values of x for the equation $x^2 + 9x + 18 = 6 - 4x$ are
(A) $(1,\ 12)$ (B) $(-1, -12)$
(C) $(1, -12)$ (D) $(-1, 12)$

Q2 If $x = m$ is one of the solution of the equation $2x^2 + 5x - m = 0$, the possible values of m are
(A) $(0,\ 2)$ (B) $(0,\ -2)$
(C) $(0,\ 1)$ (D) $(1,\ -1)$

Q3 The equation $x^2 - (p+4)x + 2p + 5 = 0$ has equal roots, the value of p will be
(A) ± 1 (B) 2
(C) ± 2 (D) -2

Q4 The roots of the equation $x^2 + (2p-1)x + p^2 = 0$ are real if
(A) $p \geq 1$ (B) $p \leq 4$
(C) $p \geq \frac{1}{4}$ (D) $p \leq \frac{1}{4}$

Q5 If one root of $5z^2 + 13z + y = 0$ is reciprocal of the other, then the value of y is
(A) $\frac{1}{5}$ (B) $-\frac{1}{5}$
(C) 5 (D) -5

Q6 If the ratio of the roots of the equation $4x^2 - 6x + p = 0$ is $1\ :\ 2$, then the value of p is
(A) 1 (B) 2
(C) -2 (D) -1

Q7 If one root of $5x^2 + 13x + p = 0$ be reciprocal of the other then the value of p is
(A) -5 (B) 5
(C) $\frac{1}{5}$ (D) $-\frac{1}{5}$

Q8 If α, β be the roots of the equation $2x^2 - 4x - 3 = 0$, then the value of $\alpha^2 + \beta^2$ is
(A) 5 (B) 7
(C) 3 (D) -4

Q9 The satisfying values of $x^3 + x^2 - 20x = 0$ are
(A) $(1,\ 4,\ -5)$
(B) $(2,\ 4,\ -5)$
(C) $(0,\ -4,\ 5)$
(D) $(0,\ 4,\ -5)$

Q10 Solving $x^3 + 9x^2 - x - 9 = 0$, we get the following roots
(A) $\pm 1,\ -9$
(B) $\pm 1,\ \pm 9$
(C) $\pm 1,\ 9$
(D) None

Answer Key

Q1	(B)	Q6	(B)
Q2	(B)	Q7	(B)
Q3	(C)	Q8	(B)
Q4	(D)	Q9	(D)
Q5	(C)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

Given quadratic equation:

$x^2 + 9x + 18 = 6 - 4x$

$\Rightarrow x^2 + 9x + 4x + 18 - 6 = 0$

$\Rightarrow x^2 + 13x + 12 = 0$

By splitting the middle term, we get

$x^2 + 12x + x + 12 = 0$

$\Rightarrow x(x + 12) + 1(x + 12) = 0$

$\Rightarrow (x + 12)(x + 1) = 0$

$\Rightarrow x + 12 = 0$ or $x + 1 = 0$

$\Rightarrow x = -12$ or $x = -1$

Therefore, $x = -12, -1$ are the roots of the given equation.

Hence, the correct answer is option (B).

Q2 Text Solution:

We know that,

If $x = \alpha$ is a solution of the $ax^2 + bx + c = 0$, then $x = \alpha$ will satisfy the equation.

Since, $x = m$ is the solution of the equation

$2x^2 + 5x - m = 0$

$\Rightarrow 2m^2 + 5m - m = 0$

$\Rightarrow 2m^2 + 4m = 0$

$\Rightarrow 2m(m + 2) = 0$

$\Rightarrow 2m = 0,\ m + 2 = 0$

$\Rightarrow m = 0,\ m = -2$

So, the values of m are 0 and -2 .

Hence, the correct option is (B).

Q3 Text Solution:

Given: $x^2 - (p + 4)x + 2p + 5 = 0$

We know that, If the quadratic equation $ax^2 + bx + c = 0$ has equal roots then

$D = b^2 - 4ac = 0$

On comparing, we get

$a = 1,\ b = -(p + 4),\ c = 2p + 5$

Since, the roots are equal

$\Rightarrow [-(p + 4)]^2 - 4(1)(2p + 5) = 0$

$\Rightarrow (p + 4)^2 - 8p - 20 = 0$

$\Rightarrow p^2 + 16 + 8p - 8p - 20 = 0$

$\Rightarrow p^2 - 4 = 0$

$\Rightarrow p^2 = 4$

$\Rightarrow p = \pm 2$

Thus, the values of p are ± 2.

Hence, the correct option is (C).

Q4 Text Solution:

Given: $x^2 + (2p - 1)x + p^2 = 0$ has real roots

We know that, if $ax^2 + bx + c = 0$ has real roots then

$D = b^2 - 4ac \geq 0$

On comparing the given equation with standard equation, we get

$a = 1,\ b = (2p - 1),\ c = p^2$

Since,

$D \geq 0$

$\Rightarrow (2p - 1)^2 - 4(1)(p^2) \geq 0$

$\Rightarrow 4p^2 + 1 - 4p - 4p^2 \geq 0$

$\Rightarrow 1 - 4p \geq 0$

$\Rightarrow 1 \leq 4p$

$\Rightarrow 4p \leq 1$

Now, divide the above inequality by 4, we get

$\frac{4p}{4} \leq \frac{1}{4}$

$\Rightarrow p \leq \frac{1}{4}$

So, the given equation will have real roots when $p \leq \frac{1}{4}$.

Hence, the correct answer is option (D).

Q5 Text Solution:

Given equation, $5z^2 + 13z + y = 0$

Let one root of the equation be α, then the other root will be $\frac{1}{\alpha}$.

Comparing the given equation with standard equation $az^2 + bz + c = 0$, we get

$a = 5,\ b = 13\ and\ c = y$

Now, product of roots $= \frac{c}{a}$

$\Rightarrow \alpha \cdot \frac{1}{\alpha} = \frac{y}{5}$

$\Rightarrow 1 = \frac{y}{5}$

$\Rightarrow y = 5$

Q6 Text Solution:

Given equation, $4x^2 - 6x + p = 0$

Let the roots of the equation is α & β, then

$\frac{\alpha}{\beta} = \frac{1}{2}$

$\Rightarrow 2\alpha = \beta$

Now, sum of roots $= \alpha + \beta = -\frac{b}{a}$

$\Rightarrow \alpha + 2\alpha = \frac{-(-6)}{4}$

$\Rightarrow 3\alpha = \frac{3}{2}$

$\Rightarrow \alpha = \frac{1}{2}$

$\Rightarrow \beta = 2\alpha = 2 \times \frac{1}{2} = 1$

Now, Product of roots $= \alpha\beta$

$\Rightarrow \alpha\beta = \frac{c}{a}$

$\Rightarrow \frac{1}{2} \times 1 = \frac{p}{4}$

$\Rightarrow p = 2$

Q7 Text Solution:

We know that,

If α and β are the roots of the quadratic equation $ax^2 + bx + c = 0$, then the product of roots $= \alpha\beta = \frac{c}{a}$

Comparing $5x^2 + 13x + p = 0$ with $ax^2 + bx + c = 0$, we get

$a = 5,\ b = 13$ and $c = p$

Now, let α and β are the roots of the given equation, then

According to the question,

$\alpha = \frac{1}{\beta}$

$\Rightarrow \alpha\beta = 1$

$\Rightarrow \frac{p}{5} = 1 \quad \left(\because \alpha\beta = \frac{c}{a}\right)$

$\Rightarrow p = 5 \times 1$

$\Rightarrow p = 5$

Therefore, the required value of p is 5 .

Hence, the correct option is (B) i.e., 5 .

Q8 Text Solution:

Given: $\alpha,\ \beta$ is the roots of the equation $2x^2 - 4x - 3 = 0$

We know that, If $\alpha,\ \beta$ are the roots of the quadratic equation $ax^2 + bx + c = 0$ then $\alpha + \beta = \frac{-b}{a}$ and $\alpha\beta = \frac{c}{a}$

On comparing with the given equation, we get

$a = 2,\ b = -4$and $c = -3$

$\Rightarrow \alpha + \beta = \frac{-(-4)}{2} = 2$

$\Rightarrow \alpha\beta = \frac{-3}{2}$

Since, $(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta$

$\Rightarrow \alpha^2 + \beta^2 = \left(\alpha + \beta\right)^2 - 2\alpha\beta$

$\Rightarrow \alpha^2 + \beta^2 = \left(2\right)^2 - 2 \times \left(\frac{-3}{2}\right)$

$\Rightarrow \alpha^2 + \beta^2 = 4 + 3$

$\Rightarrow \alpha^2 + \beta^2 = 7$

Therefore, the value of $\alpha^2 + \beta^2$ is 7 .

Hence, the correct option is (B) i.e., 7.

Q9 Text Solution:

Given cubic equation: $x^3 + x^2 - 20x = 0$

$\Rightarrow x\left(x^2 + x - 20\right) = 0$

$\Rightarrow x\left(x^2 + 5x - 4x - 20\right) = 0$

$\Rightarrow x\left[x\left(x + 5\right) - 4\left(x + 5\right)\right] = 0$

$\Rightarrow x\left(x + 5\right)\left(x - 4\right) = 0$

$\Rightarrow x = 0, x + 5 = 0, x - 4 = 0$

$\Rightarrow x = 0, -5, 4$

Thus, the required values are $0,\ 4, -5$.

Hence, the correct answer is option (D).

Q10 Text Solution:

Given: $x^3 + 9x^2 - x - 9 = 0$

$\Rightarrow x^2\left(x + 9\right) - 1\left(x + 9\right) = 0$

$\Rightarrow \left(x^2 - 1\right)\left(x + 9\right) = 0$

$\Rightarrow \left(x + 1\right)\left(x - 1\right)\left(x + 9\right) = 0$

$\Rightarrow \left(x - 1\right) = 0, \left(x - 1\right) = 0, \left(x + 9\right) = 0$

$\Rightarrow x = 1, -1, -9$

$\Rightarrow x = \pm 1, -9$

Hence, the correct option is (A).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

EQUATIONS

Q1 Solving equation $3x^2 - 14x + 8 = 0$, we get roots

(A) ± 4 (B) ± 2

(C) $4, \frac{2}{3}$ (D) None

Q2 If p and q are the roots of $x^2 + 2x + 1 = 0$ then the values of $p^3 + q^3$ becomes

(A) 2 (B) -2

(C) 4 (D) -4

Q3 Product of the digits of a two-digit number is 20. If we add 9 to the number, the digits get reversed. Then the original two-digit number is

(A) 54 (B) 45

(C) 20 (D) 63

Q4 If the roots of $(k-4)x^2 - 2kx + (k+5) = 0$ are coincident, then the value of k is

(A) 14 (B) 20

(C) 18 (D) 22

Q5 If $4x^3 + 8x^2 - x - 2 = 0$ then the value of $(2x + 3)$ is given by

(A) $4, -1, 2$

(B) $-4, 2, 1$

(C) $2, -4, -1$

(D) none of these

Q6 If roots of equation $x^2 + x + r = 0$ are α and β and $\alpha^3 + \beta^3 = -6$. Find the value of 'r'.

(A) $-\frac{5}{3}$ (B) $\frac{7}{3}$

(C) $-\frac{4}{3}$ (D) 1

Q7 If the roots of the equation $x^2 - 8x + m = 0$ exceeds the other by 4, then the value of m is

(A) $m = 10$ (B) $m = 11$

(C) $m = 9$ (D) $m = 12$

Q8 The sum of the two numbers is 8 and the sum of their squares is 34. Taking one number as x form an equation in x and hence find the numbers. The numbers are

(A) (7, 10) (B) (4, 4)

(C) (3, 5) (D) (2, 6)

Q9 Solve $x^3 - 6x^2 + 5x + 12 = 0$.

(A) $1, 3, 4$

(B) $-1, 3, 4$

(C) $1, 6, 2$

(D) $1, -6, -2$

Q10 The rational root of the equation $2x^3 - x^2 - 4x + 2 = 0$ is

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$

(C) 2 (D) -2

Answer Key

Q1	(C)	Q6	(A)
Q2	(B)	Q7	(D)
Q3	(B)	Q8	(C)
Q4	(B)	Q9	(B)
Q5	(A)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

Given quadratic equation, $3x^2 - 14x + 8 = 0$

$\Rightarrow 3x^2 - 12x - 2x + 8 = 0$
$\Rightarrow 3x(x-4) - 2(x-4) = 0$
$\Rightarrow (x-4)(3x-2) = 0$
$\Rightarrow x - 4 = 0 \; or \; 3x - 2 = 0$
$\Rightarrow x = 4 \; or \; x = \frac{2}{3}$

Therefore, the roots are 4 and $\frac{2}{3}$.

Hence, option (C) is correct.

Q2 Text Solution:

Given: p and q are the roots of $x^2 + 2x + 1 = 0$

Now, $x^2 + 2x + 1 = 0$
$\Rightarrow x^2 + x + x + 1 = 0$
$\Rightarrow x(x+1) + 1(x+1) = 0$
$\Rightarrow (x+1)(x+1) = 0$
$\Rightarrow x + 1 = 0, \; x + 1 = 0$
$\Rightarrow x = -1, \; x = -1$

Thus, the roots are equal.

$\Rightarrow p = q = -1$
$\Rightarrow p^3 + q^3 = (-1)^3 + (-1)^3$
$\Rightarrow p^3 + q^3 = -1 - 1$
$\Rightarrow p^3 + q^3 = -2$

Hence, the correct option is (B).

Q3 Text Solution:

Let the tens digit be 'x' and the units digit be 'y'.

Then the number is 10x + y.

When 9 is added to the number, the new number is 10x + y + 9.

If the digits are reversed, the new number is 10y + x.

Thus we have

$10x + y + 9$
$\Rightarrow 10y + x$

Simplifying this equation, we get

$9y - 9x = 9$
$\Rightarrow y - x = 1 \; \ldots . (i)$

Also, $xy = 20 \; \ldots . (ii)$

From (i) and (ii), we have

$\frac{20}{x} - x = 1$
$\Rightarrow x^2 + x - 20 = 0$
$\Rightarrow x^2 + 5x - 4x - 20 = 0$
$\Rightarrow (x+5)(x-4) = 0$
$\Rightarrow x = 4 \; (x \text{ cannot be negative})$

Thus, y = 5

Therefore, the required number $xy = 45$

Trick: Go by options

For option (B): 45

Product of the digits of a two-digit number $= 4 \times 5 = 20$

If we add 9 to the number, we get $45 + 9 = 54$

Clearly, the digits got reversed.

Hence, the correct option is (B) i.e. 45.

Q4 Text Solution:

Given, the roots of $(k-4)x^2 - 2kx + (k+5) = 0$ are coincident i.e., the root are equal.

Thus, if the roots are equal then $b^2 - 4ac = 0$

Here, $a = k - 4, \; b = -2k \; and \; c = k + 5$

$\Rightarrow (-2k)^2 - 4(k-4)(k+5) = 0$
$\Rightarrow 4k^2 - 4(k^2 + 5k - 4k - 20) = 0$
$\Rightarrow 4k^2 - 4k^2 - 20k + 16k + 80 = 0$
$\Rightarrow -4k + 80 = 0$
$\Rightarrow k = 20$

Q5 Text Solution:

Given cubic equation, $4x^3 + 8x^2 - x - 2 = 0$

$\Rightarrow 4x^2\left(x+2\right)-1\left(x+2\right)=0$

$\Rightarrow \left(x+2\right)\left(4x^2-1\right)=0$

$\Rightarrow \left(x+2\right)\left[\left(2x\right)^2-1^2\right]=0$

$\Rightarrow \left(x+2\right)\left(2x+1\right)\left(2x-1\right)=0$

$\left[\because a^2-b^2=\left(a-b\right)\left(a+b\right)\right]$

$\Rightarrow \left(x+2\right)=0\ or\ 2x+1=0\ or\ 2x-1=0$

$\Rightarrow x=\ -2\ or\ 2x=\ -1\ or\ 2x=1$

$\Rightarrow x=\ -2\ or\ x=-\frac{1}{2}\ or\ x=\frac{1}{2}$

(i) When $x=-2$, then

$(2x+3)=2(-2)+3=\ -4+3\ =\ -1$

(ii) When $x=-\frac{1}{2}$, then

$\left(2x+3\right)=2\times\left(\frac{-1}{2}\right)+3=-1+3=2$

(iii) When $x=\frac{1}{2}$, then

$\left(2x+3\right)=2\times\frac{1}{2}+3=1+3=4$

Therefore, the required values are $-1,\ 2,\ 4$.

Hence, the correct option is (A).

Q6 Text Solution:

Given, $x^2+x+r=0$

Thus, Sum of roots $=\alpha+\beta=-1$

Product of roots $=\alpha\beta=r$

Also,

$\alpha^3+\beta^3=-6$

$\Rightarrow (\alpha+\beta)^3-3\alpha\beta\left(\alpha+\beta\right)=-6$

$\Rightarrow (-1)^3-3r\left(-1\right)=-6$

$\Rightarrow (-1)+3r=-6$

$\Rightarrow 3r=-5$

$\Rightarrow r=-\frac{5}{3}$

Q7 Text Solution:

Given equation, $x^2-8x+m=0$

We know that, if α and β are the roots of the quadratic equation $ax^2+bx+c=0$, then

Sum of roots $=\alpha+\beta=-\frac{b}{a}$

Product of roots $=\alpha\beta=\frac{c}{a}$

Now, compare the given equation with $ax^2+bx+c=0$, we get

$a=1,\ b=-8\ \ and\ c=m$

According to the question,

If α be the root of the equation $x^2-8x+m=0$, then the other root will be $\alpha+4$.

$\Rightarrow \alpha+\alpha+4=-(-8)$

$\Rightarrow 2\alpha+4=8$

$\Rightarrow 2\alpha=4$

$\Rightarrow \alpha=2$

Also, for product of roots

$\Rightarrow \alpha(\alpha+4)=m$

$\Rightarrow m=2(2+4)$

$\Rightarrow m=12$

Therefore, the value of m is 12.

Hence, the correct option is (D).

Q8 Text Solution:

Let the numbers be x and '8 - x'.

Then, according to the question, we have

$x^2+(8-x)^2=34$

$\Rightarrow x^2+64+x^2-16x=34$

$\Rightarrow 2x^2-16x+30=0$

$\Rightarrow x^2-8x+15=0$

$\Rightarrow x^2-3x-5x+15=0$

$\Rightarrow x\left(x-3\right)-5\left(x-3\right)=0$

$\Rightarrow \left(x-3\right)\left(x-5\right)=0$

$\Rightarrow x=3,\ x=5$

Q9 Text Solution:

Given equation: $x^3\ -\ 6x^2\ +\ 5x\ +\ 12\ =\ 0$

We know that, for cubic equation $\mathrm{ax}^3\ +bx^2\ +c+d=0$

Sum of roots $=\ -\frac{b}{a}$

Thus, for $x^3\ -\ 6x^2\ +\ 5x\ +\ 12\ =\ 0$

Sum of roots $=\ -\frac{b}{a}=\ -\frac{-6}{1}=6$

For option (A): $1,\ 3,\ 4$

Sum of roots $=1+3+4=7$ which is not true

For option (B): $-1,\ 3,\ 4$

Sum of roots $=\ -1+3+4=6$ which is true

Also, for other options, it does not hold.

Therefore, $x\ =\ -1,\ 3,\ 4$

Hence, the correct option is (B) i.e., $-1,\ 3,\ 4$.

Q10 Text Solution:

Given, $2x^3-x^2-4x+2=0$

$\Rightarrow x^2\left(2x-1\right)-2\left(2x-1\right)=0$

$\Rightarrow \left(x^2-2\right)\left(2x-1\right)=0$

$\Rightarrow \left[\left(x\right)^2-\left(\sqrt{2}\right)^2\right]\left(2x-1\right)=0$

$\left(\because \sqrt{2}\times\sqrt{2}=2\right)$

$\Rightarrow \left(x+\sqrt{2}\right)\left(x-\sqrt{2}\right)\left(2x-1\right)=0$

$\Rightarrow \left(x+\sqrt{2}\right)=0 \text{ or } \left(x-\sqrt{2}\right)=0 \text{ or } 2x-1=0$

$\Rightarrow x=-\sqrt{2} \text{ or } x=\sqrt{2} \text{ or } 2x=1$

$\Rightarrow x=-\sqrt{2},\ x=\sqrt{2},\ x=\frac{1}{2}$

Clearly, $\sqrt{2}$ and $-\sqrt{2}$ are irrational roots.

Therefore, the rational root of given equation is $\frac{1}{2}$.

Trick: Go by options

For option (A): $\frac{1}{2}$

LHS: $2x^3-x^2-4x+2$

$=2\left(\frac{1}{2}\right)^3-\left(\frac{1}{2}\right)^2-4\left(\frac{1}{2}\right)+2$

$=\frac{1}{4}-\frac{1}{4}-2+2=0=RHS$

whereas other given values of x does not satisfy the given equation.

Hence, the correct option is (A).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

LINEAR INEQUALITIES

Q1 $-6x < -18$ implies
(A) $x < 3$ (B) $x > 3$
(C) $x = 0$ (D) $x = 3$

Q2 In a class of boys (x) and girls (y), the maximum seating capacity is 360. This can be shown as:
(A) $x + y \leq 360$ (B) $x + y \geq 360$
(C) $x + y \neq 360$ (D) None of these

Q3 Find the range of real of x satisfying the inequalities $3x - 2 > 7$ and $4x - 13 > 15$.
(A) x > 3 (B) x > 7
(C) x < 7 (D) x < 3

Q4 The solution of the inequality $8x + 6 < 12x + 14$ is
(A) $(-2,\ 2)$
(B) $(-2,\ 0)$
(C) $(2,\ \infty)$
(D) $(-2,\ \infty)$

Q5 An employer recruits experienced (x) and fresh workmen (y) for his under the condition that he can not employ more than 11 people and y can be related by the inequality.
(A) $x + y \neq 11$
(B) $x + y \leq 11,\ x \geq 0,\ y \geq 0$
(C) $x + y \geq 11,\ x \geq 0,\ y \geq 0$
(D) None of these

Q6 A company is planning to launch a new product and decides to hire marketing executives and sales executives for the project. If the company cannot employ more than 12 executives, which of the following inequalities correctly relates the number of marketing executives (x) and sales executives (y) that the company can hire?
(A) $x + y \leq 12$
(B) $2x + 3y \leq 12$
(C) $3x + 2y \leq 12$
(D) $4x + 4y \leq 12$

Q7 Solve the inequality: $\frac{(3x-1)}{2} \leq \frac{(x+2)}{4}$.
(A) $x \leq 2$
(B) $x \leq 0.8$
(C) $x \geq 1.5$
(D) $x \geq 2$

Q8 Solve for real 'x' if $5x - 2 \geq 2x + 1$ and $2x + 3 < 18 - 3x$.
(A) $-1 > x > -3$
(B) $-1 > x > -3$
(C) $1 \leq x < 3$
(D) $x = 3$

Q9 The rules and regulations demand that the employer should employ not more than 5 experienced hands to 1 fresh one and this fact can be expressed as:
(Taking experienced person as x and fresh person as y)
(A) $y \geq 5x$ (B) $5y \leq x$
(C) $5y \geq x$ (D) none of these

Q10 A dietitian wishes to mix together two kinds of food so that the vitamin content of the mixture is at least 9 units of vitamin A, 7 units of vitamin B, 10 units of vitamin C and 12 units of vitamin D. The vitamin content per kg of each food is shown below:

	A	B	C	D
Food I:	2	1	1	2
Food II:	1	1	2	3

Assuming x units of food I is to be mixed with y units of food II, the situation can be expressed as
(A)

$2x + y \leq 9,\ x + y \leq 7,\ x + 2y \leq 10,\ 2x + 3y \leq 12,\ x > 0,\ y > 0$

(B) $2x + y \geq 30,\ x + y \leq 7,\ x + 2y \geq 10,\ x + 3y \geq 12$

(C) $2x + y \geq 9,\ x + y \geq 7,\ x + y \leq 10,\ x + 3y \geq 12$

(D) $2x + y \geq 9,\ x + y \geq 7,\ x + 2y \geq 10,\ 2x + 3y \geq 12,\ x \geq 0, y \geq 0$

Answer Key

Q1	(B)	Q6	(B)
Q2	(A)	Q7	(B)
Q3	(B)	Q8	(C)
Q4	(D)	Q9	(C)
Q5	(B)	Q10	(D)

Hints & Solutions

Q1 Text Solution:

Given,

$-6x < -18$

$\Rightarrow x > \frac{-18}{-6}$

$\Rightarrow x > 3$

Hence, the correct option is (B).

Q2 Text Solution:

Given: Number of boys = x

Number of girls = y

Since, the maximum seating capacity is 360.

$\Rightarrow x + y \leq 360$

Hence, the correct option is (A).

Q3 Text Solution:

Given,

$3x - 2 > 7$

$\Rightarrow 3x > 7 + 2$

$\Rightarrow 3x > 9$

$\Rightarrow x > 3 \quad \ldots\ldots (i)$

Also,

$4x - 13 > 15$

$\Rightarrow 4x > 15 + 13$

$\Rightarrow 4x > 28$

$\Rightarrow x > 7 \quad \ldots\ldots (ii)$

From (i) and (ii), we get

$x > 7$

Hence, the correct answer is option (B).

Q4 Text Solution:

Given,

$8x + 6 < 12x + 14$

$\Rightarrow 6 - 14 < 12x - 8x$

$\Rightarrow -8 < 4x$

$\Rightarrow 4x > -8$

$\Rightarrow x > -2$

Therefore, the solution of given inequality is $(-2, \infty)$.

Hence, the correct option is (D).

Q5 Text Solution:

Given,

Number of experienced workmen = x

Number of fresh workmen = y

Since, the employer cannot employ more than 11 people, thus the required inequality will be:

$x + y \leq 11$

Also, number of workmen cannot be less than 0 i.e.,

$x \geq 0,\ y \geq 0$

Q6 Text Solution:

Given: Number of marketing executives and sales executives the company can hire are x and y respectively.

Since, the company cannot employ more than 12 executives, i.e., total number of marketing executives (x) and sales executives (y) that the company hires cannot exceed 12.

This situation can be represented as:

$x + y \leq 12$

Hence, the correct option is (A) i.e., $x + y \leq 12$.

Q7 Text Solution:

Given: $\frac{(3x-1)}{2} \leq \frac{(x+2)}{4}$

$\Rightarrow \frac{(3x-1)}{1} \leq \frac{(x+2)}{2}$

$\Rightarrow 2(3x-1) \leq (x+2)$

$\Rightarrow 6x - 2 \leq x + 2$

$\Rightarrow 6x - x \leq 2 + 2$

$\Rightarrow 5x \leq 4$

$\Rightarrow x \leq \frac{4}{5}$

$\Rightarrow x \leq 0.8$

Hence, the correct option is (B) i.e., $x \leq 0.8$.

Q8 Text Solution:

Given inequalities: $5x - 2 \geq 2x + 1$ and $2x + 3 < 18 - 3x$

Since, $5x - 2 \geq 2x + 1$

$\Rightarrow 5x - 2x \geq 1 + 2$

$\Rightarrow 3x \geq 3$

$\Rightarrow x \geq 1$

Also, $2x + 3 < 18 - 3x$

$\Rightarrow 2x + 3x < 18 - 3$

$\Rightarrow 5x < 15$

$\Rightarrow x < 3$

From (i) and (ii), we get

$1 \leq x < 3$

Hence, the correct option is (C) i.e, $1 \leq x < 3$.

Q9 Text Solution:

Since, x and y are the number of experienced and fresh hands respectively.

According to the question,

With 1 fresh, the maximum experienced employees can be 5

⇒ With y fresh, the maximum experienced employees can be 5y

But, the number of experienced employees are x.

$\Rightarrow x \leq 5y$

$\Rightarrow 5y \geq x$

Hence, the correct option is (C).

Q10 Text Solution:

Given: Quantity of food I = x units

Quantity of food II = y units

Since, the content should be atleast 9 units of vitamin A, 7 units of vitamin B, 10 units of vitamin C and 12 units of vitamin D.

$2x + y \geq 9,\ x + y \geq 7,\ x + 2y \geq 10,\ 2x + 3y \geq 12$

Also, the quantity of food cannot be negative.

$\Rightarrow x \geq 0,\ y \geq 0$

Hence, the correct option is (D).

SAMPURNA JUNE 2024

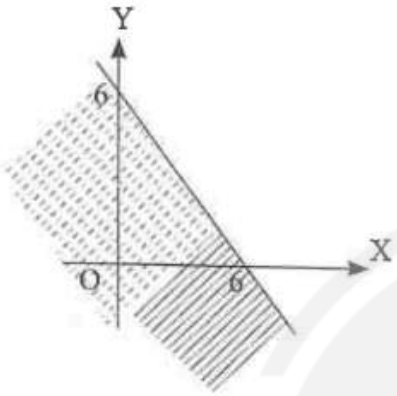
QUANTITATIVE APTITUDE

DPP: 2

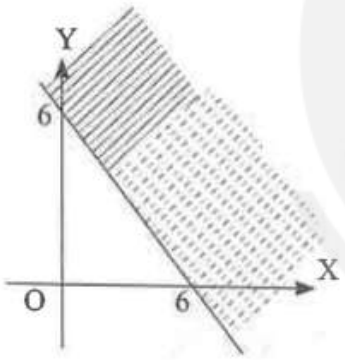
LINEAR INEQUALITIES

Q1 Which of the following graph represented the inequality $x + y \leq 6$?

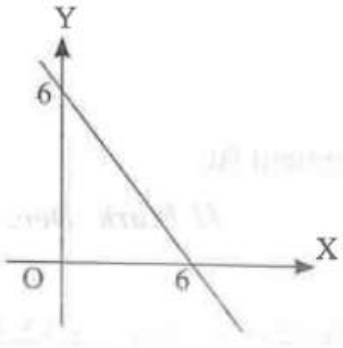
(A)



(B)



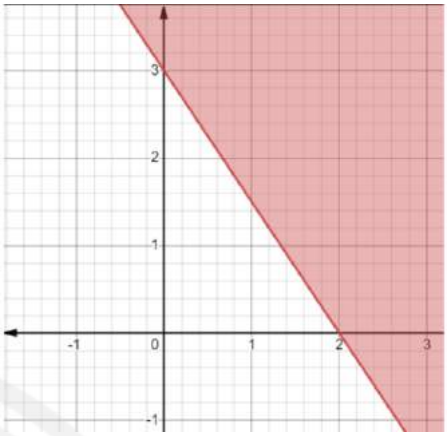
(C)



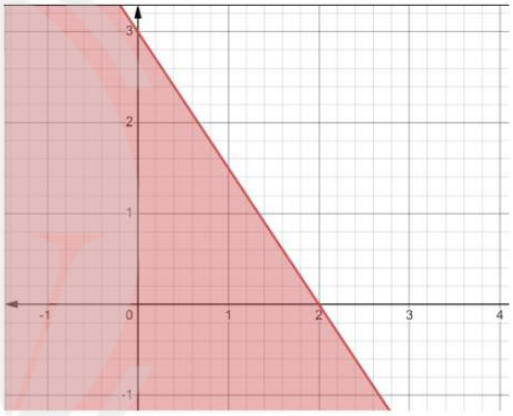
(D) None of these

Q2 The graph to express the inequality $3x + 2y \leq 6$ is

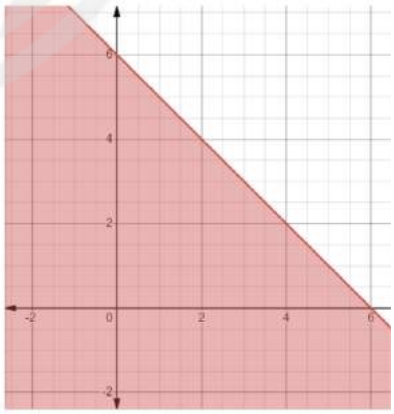
(A)



(B)



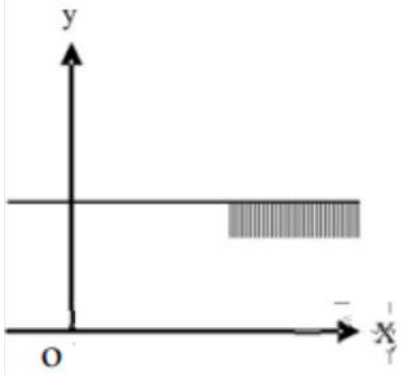
(C)



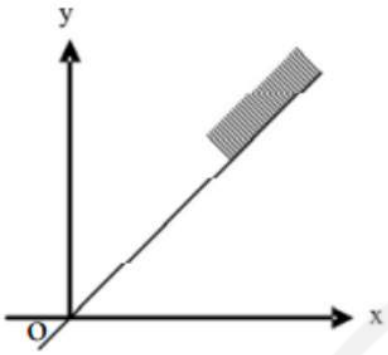
(D) None of the above

Q3 The graph to express the inequality $y \leq \left(\frac{1}{2}\right)x$ is indicated by

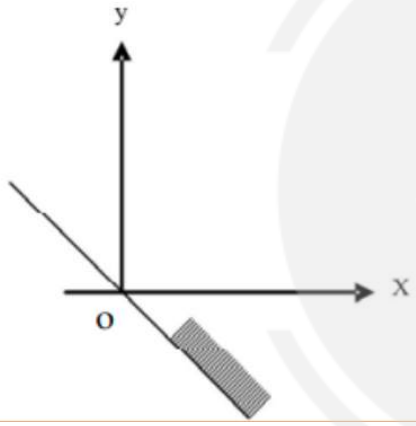
(A)



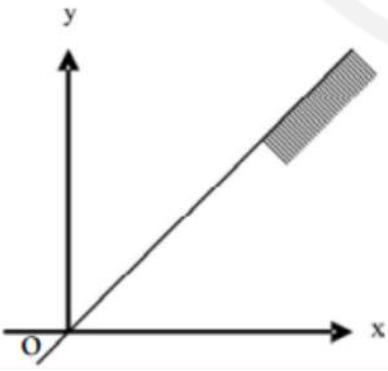
(B)



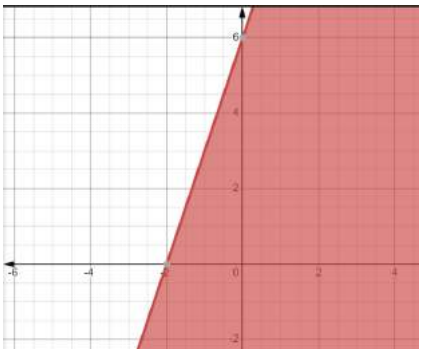
(C)



(D)



Q4 The graph represents which of the following inequality ?



(A) $6x - 2y \geq -12$

(B) $6x - 2y \leq -12$

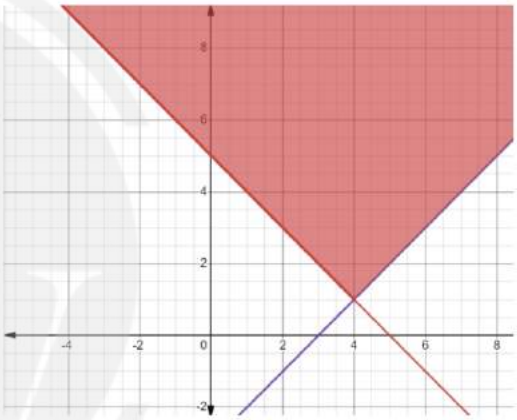
(C) $x + 2y \geq -12$

(D) $x + 2y \leq -6$

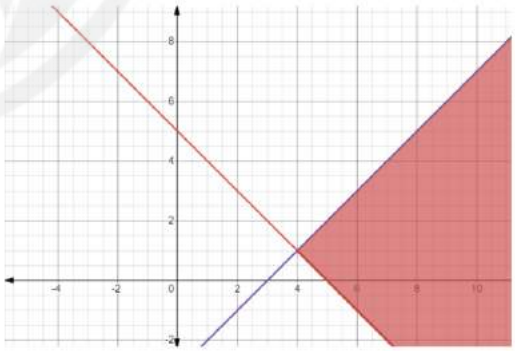
Q5 Which of the following graph represents the inequalities:

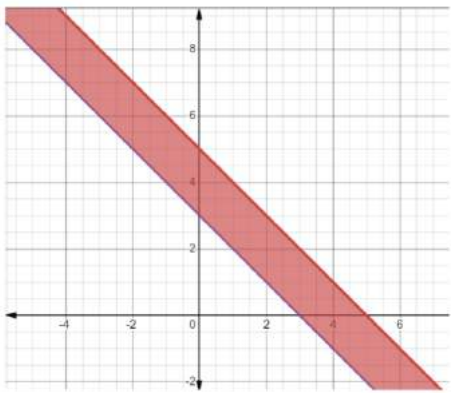
$x + y \geq 5$ and $x - y \leq 3$?

(A)



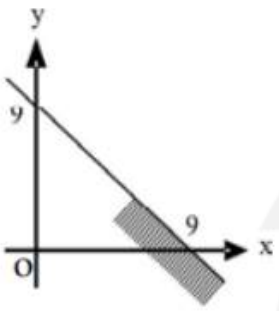
(B)

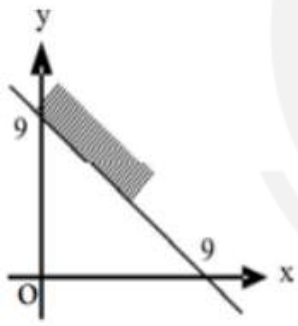


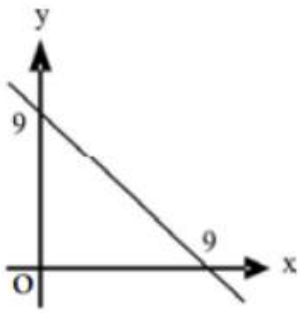
(C) 

(D) None of the above

Q6 The graph to express the inequality $x + y \leq 9$ is

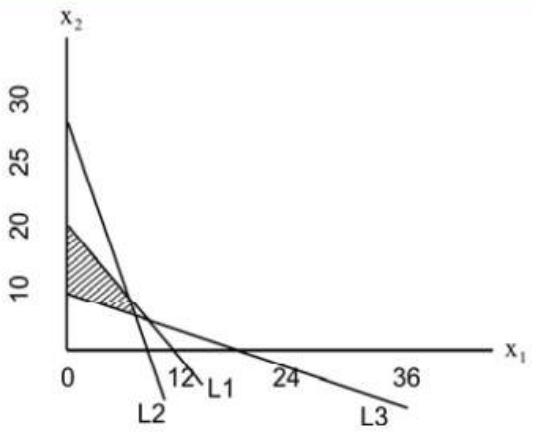
(A) 

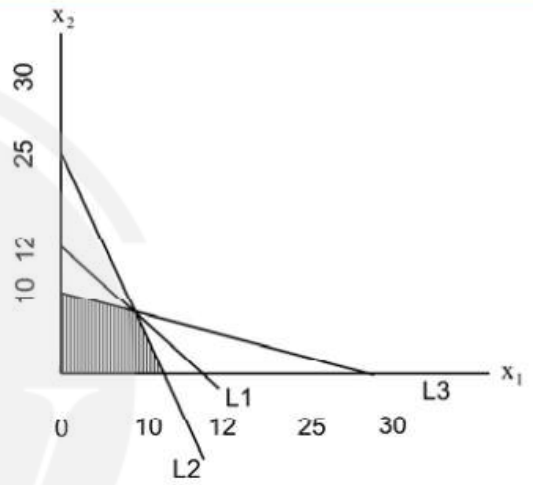
(B) 

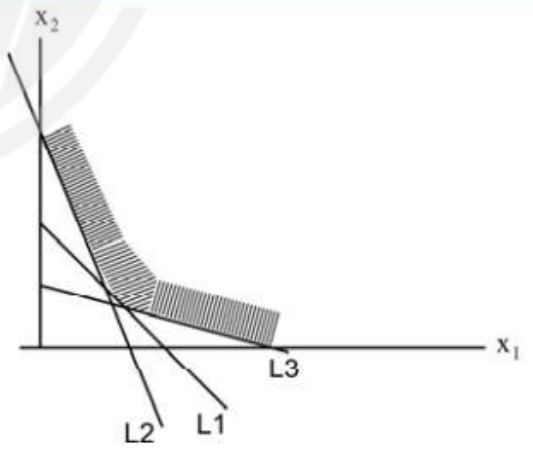
(C) 

(D) none of these

Q7 The set of inequalities $L1 : x_1 + x_2 \leq 12,\ L2 :\ 5x_1 + 2x_2 \leq 50,$ $L3 :\ x_1 + 3x_2 \leq 30,\ x_1 \geq 0$ and $x_2 \geq 0$ is represented by

(A) 

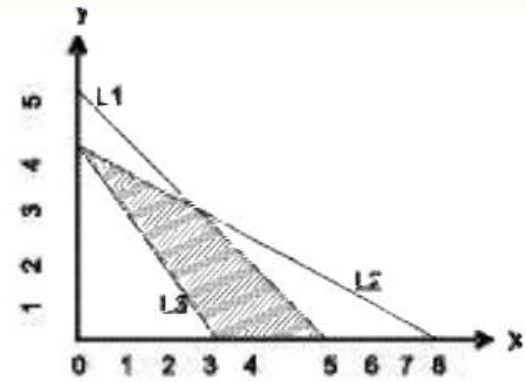
(B) 

(C) 

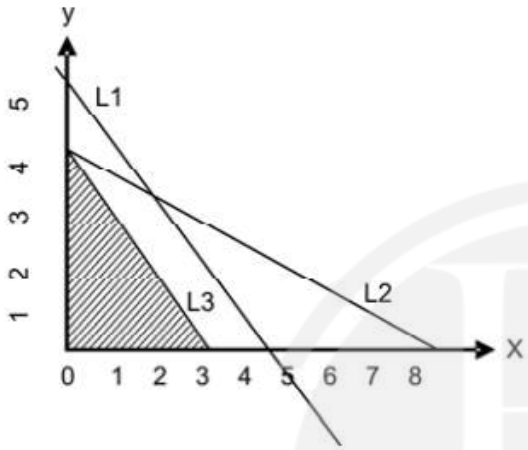
(D) None of these

Q8 The common region satisfying the set of inequalities $x \geq 0,\ y \geq 0,\ L1 :\ x + y \leq 5,\ L2 :\ x + 2y \leq 8,\ L3 :\ 4x + 3y \geq 12$ indicated by

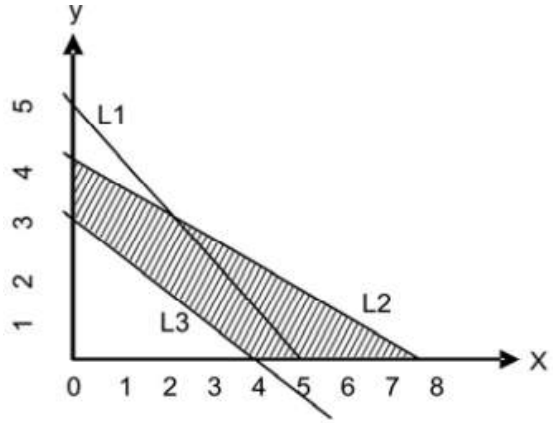
(A)



(B)



(C)



(D) None of these

Answer Key

Q1	(A)	Q5	(A)
Q2	(B)	Q6	(A)
Q3	(D)	Q7	(B)
Q4	(B)	Q8	(A)

Hints & Solutions

Q1 Text Solution:

Given inequality: $x + y \leq 6$

The line of equation corresponding to the given inequality:

$x + y = 6$

When $x = 0$ then $y = 6$

When $y = 0$ then $x = 6$

Also, on putting $x = 0$ and $y = 0$ in the given inequality, we get

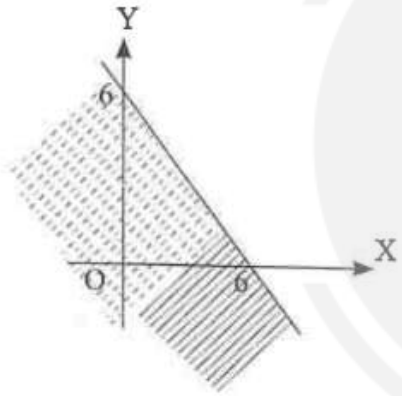
$0 + 0 \leq 6$

$0 \leq 6$

which is true

Thus, the shaded region will be towards the origin.

The required graph will be



Hence, the correct option is (A).

Q2 Text Solution:

Given inequality: $3x + 2y \leq 6$

For line of equation of above inequality: $3x + 2y = 6$

When $x = 0$ then $y = 3$

When $y = 0$ then $x = 2$

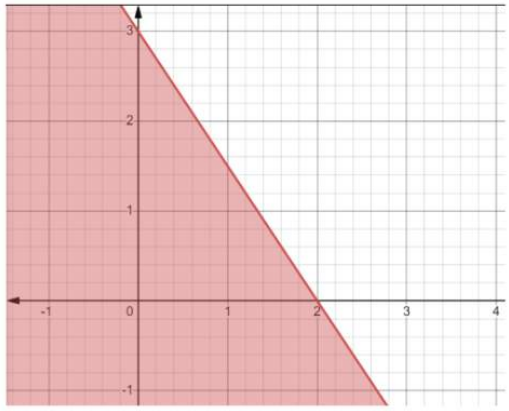
Thus, the coordinates satisfying the equation is (0, 3) and (2, 0).

Now, on putting $x = 0$ and $y = 0$ in the above inequality, we get

$3x + 2y = 3(0) + 2(0) = 0 \leq 6$, which is true

So, the shaded region will be towards the origin.

Thus, the required graph is:



Hence, the correct option is (B).

Q3 Text Solution:

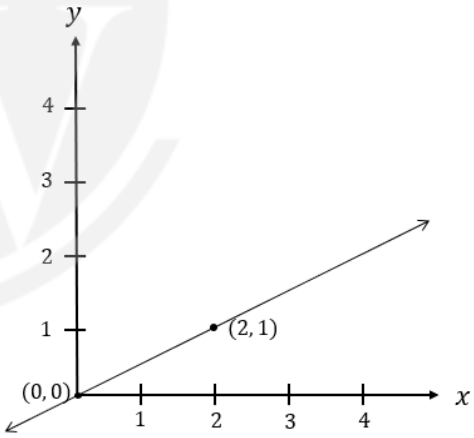
Given inequality: $y \leq \left(\frac{1}{2}\right)x$

The line of equation corresponding to given inequality: $y = \frac{1}{2}x$

When $x = 0$ then $y = 0$

When $x = 2$ then $y = 1$

Thus, the graph of the line of equation passing through (0, 0) and (2, 1):



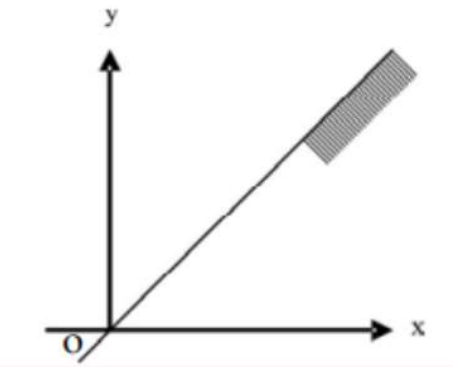
Now, put the point $(4, 0)$ in the given inequality, we get

$\therefore 0 \leq \left(\frac{1}{2}\right)(4)$

$\Rightarrow 0 \leq 2$, which is true.

Since, the point is satisfying the inequality, thus the shading will be done towards this point of the region.

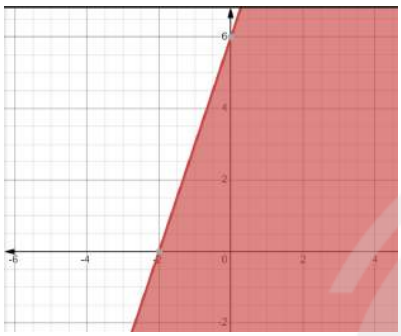
Therefore, the shaded region of the graph:



Henc, the correct option is (D).

Q4 Text Solution:

Given:



Here, the given graph is satisfying $(0,\ 0)$

Clearly, eq (A): $6x - 2y \geq -12$ and eq (3): $x + 2y \geq -12$ does not satisfy the point $(0,\ 0)$

Since, $6(0) - 2(0) = 0$ which is not greater or equal to -12.

Also, $(0) + 2(0) = 0$ which is not greater or equal to -12.

Now, for eq (D): $x + 2y \leq -6$

Let's check for points $(-2,\ 0)$, $(0,\ 6)$ and $(0,\ 0)$

At $(-2,\ 0)$: $(-2) + 2(0) = -2$ which is greater than -6.

Therefore, $x + 2y \leq -6$ does not satisfy the conditions.

Now, for eq (B): $6x - 2y \leq -12$

Let's check for points $(-2,\ 0)$, $(0,\ 6)$ and $(0,\ 0)$

At $(-2,\ 0)$: LHS = $6(-2) - 2(0) = -12 \leq -12$, which is true

At $(0,\ 6)$: LHS = $6x - 2y = 6(0) - 2(6) = -12 \leq -12$, which is also true

At $(0,\ 0)$: LHS = $6x - 2y = 6(0) - 2(0) = 0 \leq -12$, which is also true

Therefore, the given graph represents the inequality $6x - 2y \leq -12$.

Hence, the correct option is (B).

Q5 Text Solution:

Given: $x + y \geq 5$ and $x - y \leq 3$

For line of equation: $x + y = 5$

When $x = 0$ then $y = 5$

When $y = 0$ then $x = 5$

Thus, the coordinates satisfying the equation is $(0,\ 5)$ and $(5,\ 0)$.

Now, on putting $x = 0$ and $y = 0$ in inequality $x + y \geq 5$, we get

$x + y = 0 + 0 = 0 \geq 5$ which is false

So, the shaded region will be away from the origin.

For line of equation: $x - y = 3$

When $x = 0$ then $y = -3$

When $y = 0$ then $x = 3$

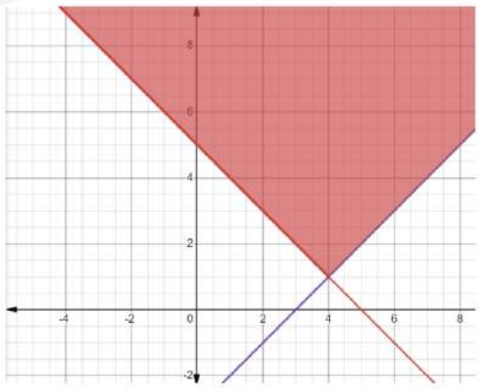
Thus, the coordinates satisfying the equation is $(0,\ -3)$ and $(3,\ 0)$.

Now, on putting $x = 0$ and $y = 0$ in inequality $x - y \leq 3$, we get

$x - y = 0 - 0 = 0 \leq 3$ which is true

So, the shaded region will be towards the origin.

Thus, the required graph of both the inequalities is:



Hence, the correct option is (A).

Q6 Text Solution:

Given inequality: $x + y \leq 9$

The line of equation corresponding to given inequality: $x + y = 9$

When $x = 0$, then $y = 9$

When $y = 0$, then $x = 9$

Thus, the coordinates satisfying the equation is $(0,\ 9)$ and $(9,\ 0)$.

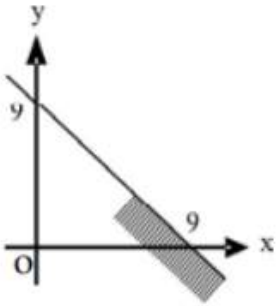
Now, on putting $x = 0$ and $y = 0$ in the above inequality, we get

$0 + 0 \leq 9$

$\Rightarrow 0 \leq 9$, which is true.

So, the shaded region will be towards the origin.

Thus, the required graph is:



Hence, the correct answer is option (A).

Q7 Text Solution:

Given,

$L1:\ x_1 + x_2 \leq 12$

For line of equation: $x_1 + x_2 = 12$

When $x_1 = 0$ then $x_2 = 12$

When $x_2 = 12$ then $x_1 = 0$

On putting $x_1 = 0$ and $x_2 = 0$ in L1, we get

$0 + 0 \leq 12 \Rightarrow 0 \leq 12$, which is true

Also, $L2:\ 5x_1 + 2x_2 \leq 50$

For line of equation: $5x_1 + 2x_2 = 50$

When $x_1 = 0$ then $x_2 = 25$

When $x_2 = 0$ then $x_1 = 10$

On putting $x_1 = 0$ and $x_2 = 0$ in L2, we get

$0 + 0 \leq 50 \Rightarrow 0 \leq 50$ which is true

Now, $L3: x_1 + 3x_2 \leq 30$

For line of equation: $x_1 + 3x_2 = 30$

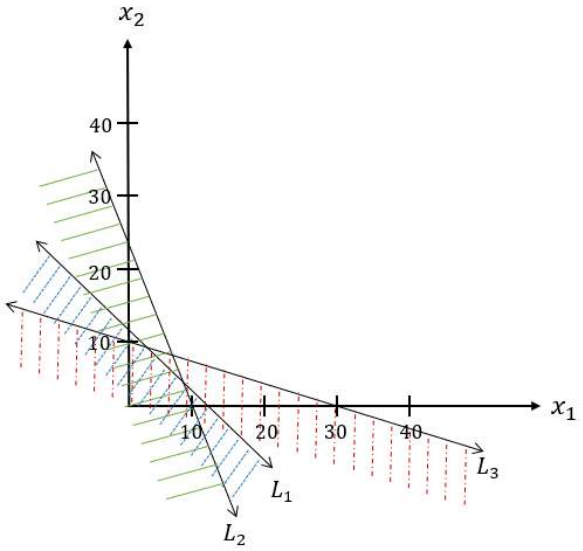
When $x_1 = 0$ then $x_2 = 10$

When $x_2 = 0$ then $x_1 = 30$

On putting $x_1 = 0$ and $x_2 = 0$ in $L3$, we get

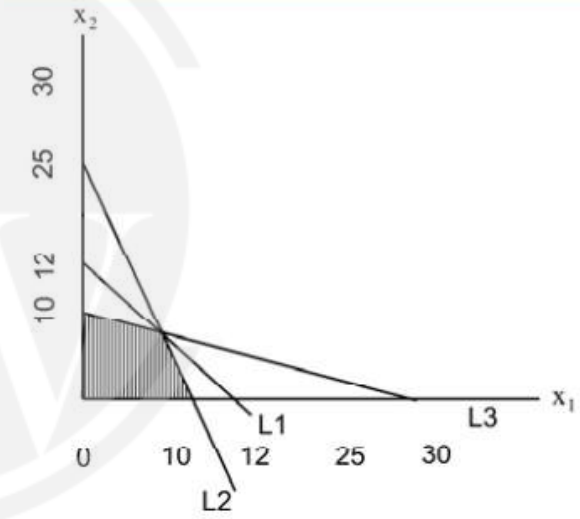
$0 + 0 \leq 30 \Rightarrow 0 \leq 30$, which is true

Thus, the graph for all the inequalities can be represented as:



Since, $x_1 \geq 0$ and $x_2 \geq 0$

Thus, the common region can be represented as:



Hence, the correct answer is option (B).

Q8 Text Solution:

Given,

$L1:\ x + y \leq 5$

For line of equation: x + y = 5

When x = 0 then y = 5

When y = 0 then x = 5

On putting x = 0 and y = 0 in L1, we get

$0 + 0 \leq 5 \Rightarrow 0 \leq 5$, which is true

Also, $L2:\ x + 2y \leq 8$

For line of equation: x + 2y = 8

When x = 0 then y = 4

When y = 0 then x = 8

On putting x = 0 and y = 0 in L2, we get

$0 + 0 \leq 8 \Rightarrow 0 \leq 8$, which is true

Now, $L3: \ 4x + 3y \geq 12$

For line of equation: $4x + 3y = 12$

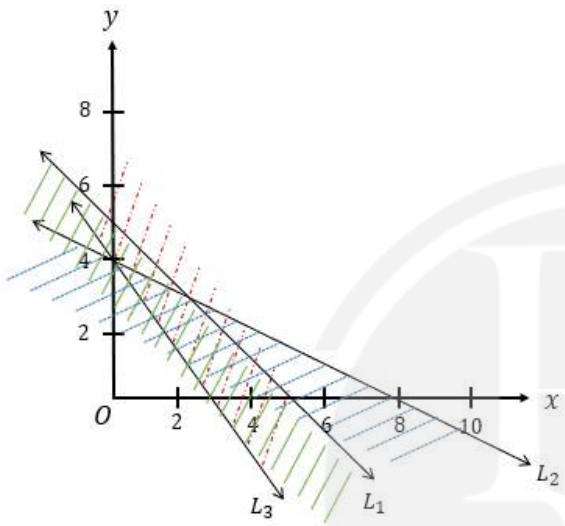
When x = 0 then y = 4

When y = 0 then x = 3

On putting x = 0 and y = 0 in L3, we get

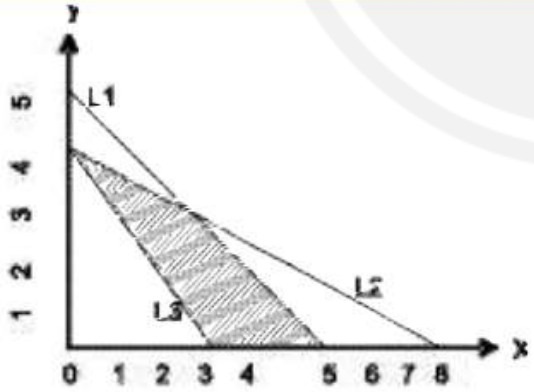
$0 + 0 \geq 12 \Rightarrow 0 \geq 12$ which is true

Thus, the graph for all the inequalities can be represented as:



Since, $x \geq 0 \text{ and } y \geq 0$

The common region can be represented as



Hence, the correct answer is option (A).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

LINEAR INEQUALITIES

Q1 Solve the inequality: $\frac{5x}{2} + \frac{3x}{4} \geq \frac{39}{4}$.

(A) $[3, \infty)$

(B) $(3, \infty)$

(C) $(-\infty, 3)$

(D) None of these

Q2 Solve for real 'x' if $2x + 6 \geq 0$ and $4x - 8 < 0$.

(A) $-3 \leq x \leq 2$

(B) $-6 \leq x < 8$

(C) $-3 \leq x < 2$

(D) None of these

Q3 In a theater, the number of adults (x) and children (y) attending a show should not exceed 500. This can be shown as:

(A) $x + y \leq 500$ (B) $x + y \geq 500$

(C) $x + y \neq 500$ (D) None of these

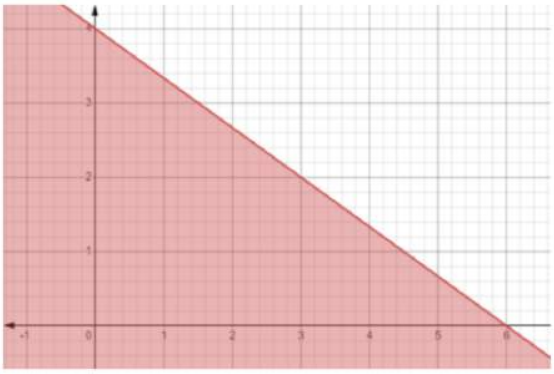
Q4 Solve for real 'x' if $2x - 7 > 5 - x$ and $11 - 5x \leq 1$.

(A) $x > 2$ (B) $x > 4$

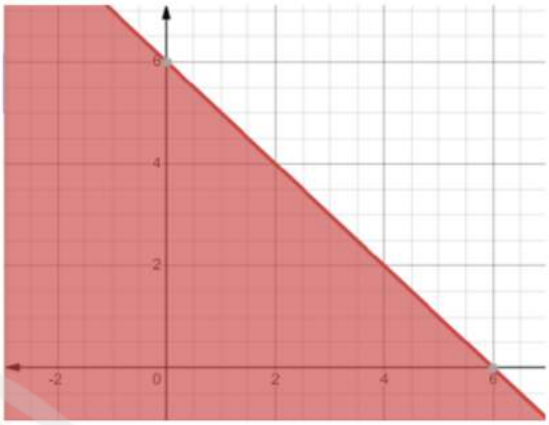
(C) $2 < x < 4$ (D) $x < 4$

Q5 Which of the following graphs represents the inequality $2x + 3y \leq 12$?

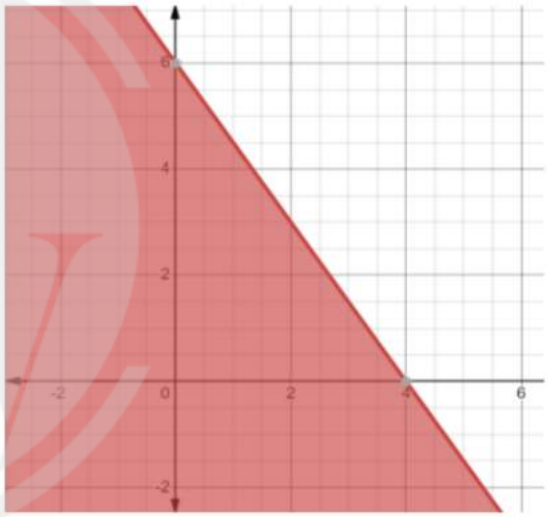
(A)



(B)



(C)



(D) None of these

Q6 A dealer has ₹5760 to invest in fans (x) and sewing machines (y). The cost per unit of fan and sewing machine is ₹360 and ₹240 respectively. This can be shown by

(A) $360x + 240y \geq 5760$

(B) $360x + 240y \leq 5760$

(C) $360x + 240y = 5760$

(D) None of these

Q7 Solution set of inequalities $2x + y \leq 10$ and $x - y \leq 5$:

(i) includes the origin.

(ii) includes the point (4,3).

Which one is correct?
(A) Only (i)
(B) Only (ii)
(C) Both (i) and (ii)
(D) None of the above

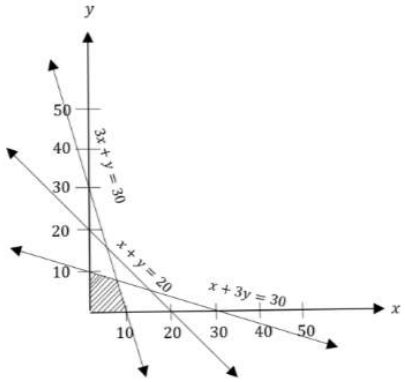
Q8 A bakery produces two types of cakes: chocolate cakes and vanilla cakes. The bakery has two ovens, Oven A and Oven B. The time required for baking each type of cake in minutes and the total available baking time per day on each oven are as follows:

Oven	Chocolate Cake	Vanilla Cake	Available Time
A	20	30	240
B	25	35	300

Constraints can be formulated by taking x = number of chocolate cakes, y = number of vanilla cakes produced as:
(A) $20x + 30y \leq 240,\ 25x + 35y \leq 300,\ x \geq 0$ and $y \geq 0$
(B) $20x + 30y \geq 240,\ 25x + 35y \leq 300,\ x \geq 0$ and $y \geq 0$
(C) $20x + 30y = 240,\ 25x + 35y = 300$
(D) None of the above

Q9 A fertilizer company produces two types of fertilizers called grade I (x) and grade II (y). Each of these types is processed through two critical chemical plant units. Plant A has maximum of 120 hours available in a week and plant B has maximum of 180 hours available in a week. Manufacturing one bag of grade I fertilizer requires 6 hours in plant A and 4 hours in plant B. Manufacturing one bag of grade II fertilizer requires 3 hours in plant A and 10 hours in plant B. Express this using linear inequalities.
(A) $6x + 3y \leq 120,\ 4x + 10 = 180$
(B) $6x + 3y = 120,\ 4x + 10y > 180$
(C) $6x + 3y \leq 120,\ 4x + 10y \leq 180$
(D) $6x + 3y < 120,\ 4x + 10y < 180$

Q10 The shaded region represents:



(A) $3x - y \leq 30,\quad x + y \leq 20,\quad x + 3y \leq 30,\ x \geq 0$ and $y \geq 0$
(B) $3x - y \geq 30,\quad x + y \geq 20,\quad x + 3y \leq 30,\ x \geq 0$ and $y \geq 0$
(C) 3x − y ≤ 30, x + y ≤ 20, x + 3y ≤ 30
(D) None of these

Answer Key

Q1	(A)	Q6	(B)
Q2	(C)	Q7	(A)
Q3	(A)	Q8	(A)
Q4	(B)	Q9	(C)
Q5	(A)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

Given: $\frac{5x}{2} + \frac{3x}{4} \geq \frac{39}{4}$

$\Rightarrow \frac{10x+3x}{4} \geq \frac{39}{4}$

$\Rightarrow \frac{13x}{4} \geq \frac{39}{4}$

$\Rightarrow 13x \geq 39$

$\Rightarrow x \geq 3$

Therefore, the solution set is $[3, \infty)$

Hence, the correct option is (A).

Q2 Text Solution:

Given: $2x + 6 \geq 0$

$2x \geq -6$

$x \geq -3$

Also, $4x - 8 < 0$

$\Rightarrow 4x < 8$

$\Rightarrow x < 2$

Thus, $-3 \leq x < 2$

Hence, the correct option is (C).

Q3 Text Solution:

Given: Number of adults $= x$

Number of children $= y$

As the total attendance does not exceed the maximum capacity of 500.

This can be shown as $x + y \leq 500$

Hence, the correct option is (A) i.e., $x + y \leq 500$.

Q4 Text Solution:

Given: $2x - 7 > 5 - x$

$\Rightarrow 2x + x > 7 + 5$

$\Rightarrow 3x > 12$

$\Rightarrow x > 4 \quad \ldots . (i)$

Also, $11 - 5x \leq 1$

$\Rightarrow -5x \leq 1 - 11$

$\Rightarrow -5x \leq -10$

$\Rightarrow x \geq 2 \quad \ldots . . (ii)$

From (i) and (ii), we get

$x > 4$

Hence, the correct option is (B).

Q5 Text Solution:

Given inequality: $2x + 3y \leq 12$

For line of equation of above inequality: $2x + 3y = 12$

When $x = 0$ then $y = 4$

When $y = 0$ then $x = 6$

Thus, the coordinates satisfying the equation is $(0, 4)$ and $(6, 0)$.

Now, on putting $x = 0$ and $y = 0$ in the above inequality, we get

$2x + 3y = 2(0) + 3(0) = 0 \leq 12$ which is true

So, the shaded region will be towards the origin.

Thus, the required graph is:

Hence, the correct option is (A).

Q6 Text Solution:

Given: x and y is respectively the number of fans and sewing machines bought by dealer

Since, the cost of fan per unit is ₹360 and the cost of sewing machine per unit is ₹240.

Therefore, the total cost will be $360x + 240y$.

Also, the dealer has only ₹5760 to invest.

Thus, $360x + 240y \leq 5760$

Hence, the correct answer is option (B) i.e., $360x + 240y \leq 5760$.

Q7 Text Solution:

Given inequalities: $2x + y \leq 10$ and $x - y \leq 5$

(i) For the origin (0,0) :

$2x + y \leq 10$

$0 + 0 \leq 10$ or $0 \leq 10$, which is true

$x - y \leq 5$

$0 - 0 \leq 5$ or $0 \leq 5$, which is also true

(ii) For the point (4,3) :

$2x + y \leq 10$

$2(4) + 3 \leq 10$

$8 + 3 \leq 10$

$11 \leq 10$, which is false

Clearly, (0,0) satisfies both the inequations.

Hence, the correct answer is option (A) i.e., Only (i).

Q8 Text Solution:

Given: x = number of chocolate cakes, y = number of vanilla cakes produced

Clearly, x ≥ 0, y ≥ 0

According to the given data,

The constraints can be formulated as:

20x + 30y ≤ 240

25x + 35y ≤ 300

Hence, the correct answer is option (A).

Q9 Text Solution:

Since, the number of bags of grade I is x and number of bags of grade II is y.

Also, for grade I fertilizer requires 6 hours in plant A, for grade II fertilizer requires 3 hours in plant A and the maximum number of hours available in a week for plant A is 120 hours.

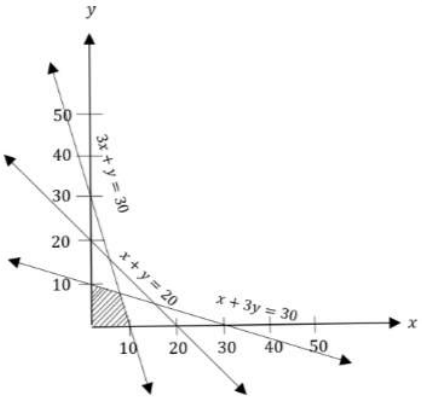
$\Rightarrow 6x + 3y \leq 120$

Now, for grade I fertilizer requires 4 hours in plant B, for grade II fertilizer requires 10 hours in plant B and the maximum number of hours available in a week for plant B is 180 hours.

$\Rightarrow 4x + 10y \leq 180$

Hence, the correct option is (C).

Q10 Text Solution:



Checking the options:

Option (A):

$3x - y \leq 30, x + y \leq 20, x + 3y \leq 30$

At origin: $(0,\ 0)$

LHS: $3x - y = 3(0) - (0) = 0 \leq 30$, true

LHS: $x + y = 0 + 0 = 0 \leq 20$, true

LHS: $x + 3y = 0 + 3(0) = 0 \leq 30$, true

Only equations in option (A) are satisfying the conditions, however in other options all the equations are not satisfying it.

Also, from graph $x \geq 0$ and $y \geq 0$.

Hence, the correct option is (A).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

Basic Concepts of Permutation and Combination

Q1 If you have 4 pairs of shoes and 2 pairs of socks, then in how many ways can you wear them?
(A) 2 (B) 4
(C) 8 (D) 16

Q2 There are 15 boys and 13 girls in a class. The teacher wants to select 1 boy and 1 girl for class representative. In how many ways can the teacher make the selection?
(A) 28 (B) 150
(C) 195 (D) None of these

Q3 Riya wanted to buy one ball pen, one pencil and one eraser. If a shopkeeper has 10 varieties of ball pens, 6 varieties of pencils and 3 varieties of erasers, then in how many ways can she select these items?
(A) 100 (B) 180
(C) 240 (D) None of these

Q4 There are 4 routes for journey from station X to station Y. In how many different ways can a man go from X to Y and return if for returning any of the route is taken?
(A) 4 (B) 8
(C) 16 (D) 24

Q5 $7!$ is equal to
(A) 5040 (B) 4050
(C) 5050 (D) none of these

Q6 Evaluate $\frac{10!}{7!}$
(A) 120 (B) 360
(C) 720 (D) None of these

Q7 Evaluate $5! - 4!$
(A) 24 (B) 96
(C) 120 (D) None of these

Q8 $0!$ is equal to
(A) 0
(B) 1
(C) infinity
(D) none of these

Q9 Compute $\frac{7!}{5! \times 2!}$
(A) 21 (B) 60
(C) 120 (D) 5040

Q10 $\frac{0! \times 5!}{2!}$ is equal to
(A) 0 (B) 60
(C) 120 (D) None of these

Q11 In how many ways can 6 letters be posted in 5 letter boxes?
(A) 6 (B) 30
(C) 5^6 (D) 6^6

Q12 Find the value of x for which $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$.
(A) 4 (B) 8
(C) 16 (D) 64

Q13 There are two tasks such that it can be completed independently in 4 and 6 ways respectively, then in how many ways either of the two tasks can be completed?
(A) 10 ways (B) 24 ways
(C) 36 ways (D) None of these

Q14 Mr. X and Mr. Y enters into a railway compartment having 6 vacant seats. The number of ways in which then can occupy the seats is
(A) 25 (B) 31
(C) 32 (D) 30

Q15 4 digit number to be formed out of the figures $0, 1, 2, 3, 4$ (no digit is repeated), then number of such number is
(A) 120 (B) 20

(C) 96 (D) none of these

Answer Key

Q1	(C)
Q2	(C)
Q3	(B)
Q4	(C)
Q5	(A)
Q6	(C)
Q7	(B)
Q8	(B)
Q9	(A)
Q10	(B)
Q11	(C)
Q12	(D)
Q13	(A)
Q14	(D)
Q15	(C)

Hints & Solutions

Q1 Text Solution:

Given: Pairs of shoes $= 4$ and pairs of socks $= 2$

By Fundamental Principle counting of multiplication,

Required number of ways $= 4 \times 2 = 8$

Hence, the correct option is (C) i.e. 8.

Q2 Text Solution:

Given,

Number of boys $= 15$

Number of girls $= 13$

Since, the teacher has to choose 1 boy and 1 girl for class representative, thus

Number of ways the selection can be made $= 15 \times 13 = 195$

Hence, the correct option is (C) i.e. 195.

Q3 Text Solution:

Given,

Number of ball pen $= 10$

Number of pencils $= 6$

Number of erasers $= 3$

Thus, by Fundamental Principle counting of multiplication,

Number of ways of selection of these items $= 10 \times 6 \times 3 = 180$

Hence, the correct option is (B) i.e. 180.

Q4 Text Solution:

Given: Number of routes from station X to station Y $= 4$

Number of ways a man can go from station X to station Y $= 4$

Number of ways a man can return from station Y to station X $= 4$

Thus, by Fundamental Principle counting of multiplication,

Total number of ways from station X to Y and returning back to station X $= 4 \times 4 = 16$

Hence, the correct option is (C) i.e. 16.

Q5 Text Solution:

We know that,

$n! = n \times (n-1) \times (n-2) \times \ldots . . 3 \times 2 \times 1$

Thus, $7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$

Hence, option (A) is correct.

Q6 Text Solution:

$\frac{10!}{7!}$ can be written as

$\frac{10 \times 9 \times 8 \times 7!}{7!}$

$= 10 \times 9 \times 8$

$= 720$

Hence, the correct option is (C) i.e. 720.

Q7 Text Solution:

To evaluate: $5! - 4!$

$5!$ can be written as $5 \times 4!$

Thus, $5! - 4! = 5 \times 4! - 4!$

$= 4!(5-1)$

$= 4! \times 4$

$= 4 \times 3 \times 2 \times 1 \times 4$

$= 96$

Hence, the correct option is (B) i.e. 96.

Q8 Text Solution:

We know that,

The value of $0!$.

Hence, option (B) is correct.

Q9 Text Solution:

$\frac{7!}{5! \times 2!}$

$= \frac{7 \times 6 \times 5!}{5! \times 2!}$

$= \frac{7 \times 6}{2!}$

$= \frac{7 \times 6}{2 \times 1}$

$= 7 \times 3$

$= 21$

Therefore, $\frac{7!}{5! \times 2!} = 21$

Hence, the correct option is (A) i.e. 21.

Q10 Text Solution:

To find: $\frac{0! \times 5!}{2!}$

We know that,

$0! = 1$

Thus, $\frac{0! \times 5!}{2!}$

$= \frac{1 \times 5 \times 4 \times 3 \times 2!}{2!}$

$= 1 \times 5 \times 4 \times 3$

$= 60$

Hence, the correct option is (B) i.e. 60.

Q11 Text Solution:

Given,

Number of letters $= 6$

Number of letter boxes $= 5$

Since, each of the letter can be posted in any one of the 5 letter boxes.

Thus, total number of ways in which all the 6 letters can be posted $= 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 5^6$

Hence, the correct option is (C) i.e. 5^6.

Q12 Text Solution:

Given: $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$

$\Rightarrow x = \frac{8!}{6!} + \frac{8!}{7!}$

$\Rightarrow x = \frac{8 \times 7 \times 6!}{6!} + \frac{8 \times 7!}{7!}$

$\Rightarrow x = 8 \times 7 + 8$

$\Rightarrow x = 56 + 8 = 64$

Therefore, the value of x is 64.

Hence, the correct option is (D) i.e. 64.

Q13 Text Solution:

Given: First task can be completed in 4 ways and second tasks can be completed in 6 ways

Thus, by Fundamental Principle counting of addition,

Either of the tasks can be completed in 4 ways or 6 ways

Therefore, total number of ways $= 4 + 6 = 10$

Hence, the correct option is (A) i.e. 10 ways.

Q14 Text Solution:

Given: Number of seats in the compartment $= 6$

Thus,

Mr. X can take seats in 6 ways.

Now, Mr. Y can take seats in 5 ways.

So, total number of ways in which then can occupy the seats$= 6 \times 5 = 30$

Hence, option (D) is correct.

Q15 Text Solution:

Given digits: $0, 1, 2, 3, 4$

We can't use 0 for the first place, so there are 4 ways to fill the first place .

Now, second place can be filled be in 4 ways since at second place 0 can be filled.

Now, for third place there are 3 ways to fill it and for the fourth place there are 2 ways to fill.

Thus, there are $4 \times 4 \times 3 \times 2 = 96$ ways to form a 4 digit number using the given digits.

Hence, the correct option is (C) i.e 96.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

Basic Concepts of Permutation and Combination

Q1 ${}^4P_3$ is evaluated as
(A) 43 (B) 34
(C) 24 (D) None of these

Q2 ${}^6P_r = 30$, then the value of r is
(A) 3
(B) 2
(C) 4
(D) none of these

Q3 If ${}^nP_3 : {}^nP_2 = 3 : 1$, then n is equal to
(A) 7 (B) 4
(C) 5 (D) none of these

Q4 Find how many five-letters words can be formed out of the word 'LOGARITHMS' (the word may not convey the meaning)
(A) ${}^{10}P_5$ (B) ${}^{10}C_5$
(C) ${}^9C_5$ (D) None

Q5 If 12 schools teams are participating in a quiz contest, then the number of ways first, second and third position may be won is
(A) 1,230 (B) 3,210
(C) 1,320 (D) none of these

Q6 The number of arrangement in which the letters of the word 'MONDAY' be arranged so that the word thus formed begin with 'M' and do not ends with 'N' is
(A) 720 (B) 120
(C) 96 (D) none of these

Q7 The number of 4 digit number greater than 5000 can be formed out of the digits 3, 4, 5, 6 and 7 (no digit is repeated). The number of such is
(A) 72 (B) 27
(C) 70 (D) none of these

Q8 In how many ways can the letters of the word 'STRANGE' be arranged so that the vowels come together?
(A) 120 (B) 720
(C) 1440 (D) none of these

Q9 The number of ways in which 7 girls form a ring is
(A) 700 (B) 710
(C) 720 (D) none of these

Q10 In how many ways 5 sanskrit, 3 English and 3 Hindi books be arranged keeping the books of the same language together?
(A) $5! \times 3! \times 3! \times 3!$
(B) $5! \times 3! \times 3!$
(C) ${}^5P_3$
(D) None

Q11 The number of permutation of the word 'ACCOUNTANT' is
(A) $10! \div (2!)^4$ (B) $10! \div (2!)^3$
(C) $10!$ (D) None

Q12 If 50 different jewels can be set to form a necklace then the number of ways is
(A) $\frac{50!}{2}$ (B) $\frac{49!}{2}$
(C) $49!$ (D) none of these

Answer Key

Q1	(C)	Q7	(A)
Q2	(B)	Q8	(C)
Q3	(C)	Q9	(C)
Q4	(A)	Q10	(A)
Q5	(C)	Q11	(A)
Q6	(C)	Q12	(B)

Hints & Solutions

Q1 Text Solution:

We know that,

$^nP_r = \frac{n!}{(n-r)!}$

Thus,

$^4P_3 = \frac{4!}{(4-3)!}$

$\Rightarrow {}^4P_3 = \frac{4!}{1!}$

$\Rightarrow {}^4P_3 = 24$

Hence, option (C) is correct.

Q2 Text Solution:

Given, $^6P_r = 30$

$\Rightarrow \frac{6!}{(6-r)!} = 30$

$\Rightarrow \frac{720}{(6-r)!} = 30$

$\Rightarrow \frac{720}{30} = \left(6-r\right)!$

$\Rightarrow \left(6-r\right)! = 24$

It is possible only when $r = 2$ since $(6-r)\,! = (6-2)\,! = 4! = 24$

Hence, option (B) is correct.

Q3 Text Solution:

Given: $^nP_3 \ : {}^nP_2 = 3 \ : 1$

$\Rightarrow \frac{n_{P_3}}{n_{P_2}} = \frac{3}{1}$

$\Rightarrow \frac{\frac{n!}{(n-3)!}}{\frac{n!}{(n-2)!}} = 3$

$\Rightarrow \frac{(n-2)!}{(n-3)!} = 3$

$\Rightarrow \frac{(n-2)\times(n-3)!}{(n-3)!} = 3$

$\Rightarrow n-2 = 3$

$\Rightarrow n = 2+3$

$\Rightarrow n = 5$

Thus, the value of n is 5.

Hence, option (C) is correct i.e., 5.

Q4 Text Solution:

Since, 'LOGARITHMS' contains 10 letters.

Thus, the number of arrangements of 10 letters taking 5 letters at a time $= {}^{10}P_5$

Hence, option (A) is correct.

Q5 Text Solution:

Given: Total number of schools = 12

Since, order matters thus by using permutation

Total number of ways first, second and third position may be won

$= {}^{12}P_3$

$= \frac{12!}{(12-3)!} \quad \left(\because {}^nP_r = \frac{n!}{(n-r)!}\right)$

$= \frac{12!}{9!}$

$= \frac{12\times11\times10\times9!}{9!}$

$= 1320$

Hence, option (C) is correct.

Q6 Text Solution:

Total words in 'MONDAY' $= 6$

Number of choice for first letter $= 1$

Number of choices for last letter $= 4$

For 2^{nd}, 3^{rd}, 4^{th} and 5^{th} position, number of choices $= 4,\ 3,\ 2,\ 1$

Therefore, number of possible arrangement

$= 1\times4\times4\times3\times2 = 96$

Hence, option (C) is correct.

Q7 Text Solution:

Since, 4 digit number should be greater than 5000 thus the number should start with 5 or 6 or 7.

Thus, the thousands place can be done in 3 ways.

Now, as the repetition of numbers is not allowed, thus the hundreds place can be filled with 4 ways.

Similarly, the tens place and the ones place can be filled with 3 and 2 ways respectively.

Therefore, total number of ways

$= 3\times4\times3\times2 = 72$

Hence, option (A) is correct.

Q8 Text Solution:

Given word: STRANGE

Since, all vowels should be coming together thus we will assume these 2 vowels as one letter i.e. letters would be S, T, R, N, G and AE

Now, the possible arrangement of above 6 letters $= 6!$

But vowels can also rearrange their positions (AE, EA)

Total possible arrangement of vowels $= 2$

Therefore, total arrangements will be $6! \times 2 = 720 \times 2 = 1440$

Hence, option (C) is correct i.e., 1440.

Q9 Text Solution:

We know that,

The number of circular permutation of n different things chosen at a time $(n-1)!$

Thus, the number of ways in which 7 girls from a ring is $(7-1)! = 720$

Hence, option (C) is correct i.e., 720.

Q10 Text Solution:

Given, there are books of three different languages thus it can be considered as a 3 different groups.

So, the total number of ways of arranging these groups is 3! ways.

Also, five books of sanskrit can be arranged in 5! ways .

Similarly, 3 Hindi and 3 English books can be arranged in 3! and 3! ways respectively.

Thus, the total number of ways these books can be arranged $= 3! \times 5! \times 3! \times 3!$

Hence, option (A) is correct.

Q11 Text Solution:

The word 'ACCOUNTANT' consists of 10 letters.

Number of 'C'$= 2$

Number of 'A'$= 2$

Number of 'N' $= 2$

Number of 'T'$= 2$

So, arrangements of the word 'ACCOUNTANT' $= \frac{10!}{2! \times 2! \times 2! \times 2!} = \frac{10!}{(2!)^4}$

Hence, option (A) is correct.

Q12 Text Solution:

We know that,

Since, in forming a necklace or a garland there is no difference between a clockwise and anti clockwise direction because we can simply turn it over so that clockwise becomes anti clockwise and vice versa.

Thus, number of necklace that can be formed with n beads of different colours is $\frac{(n-1)!}{2}$

So, if 50 different jewels can be set to form a necklace then the number of ways is $\frac{(50-1)!}{2} = \frac{49!}{2}$

Hence, option (B) is correct.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

Basic Concepts of Permutation and Combination

Q1 How many four digit number can be formed by using 1, 2, ... 7?
(A) ${}^7P_4$ (B) ${}^7P_3$
(C) ${}^7C_4$ (D) None

Q2 The number of diagonals in a decagon is
(A) 30 (B) 35
(C) 45 (D) none of these

Q3 In how many ways can the letters of the word 'VIOLENT' be arranged so that the vowels occupy even places only?
(A) 1440 (B) 240
(C) 480 (D) 144

Q4 The number of ways in which 8 different beads be strung on a necklace is
(A) 2500 (B) 2520
(C) 2250 (D) none of these

Q5 How many four digits numbers greater than 7000 can be formed out of the digits 3, 5, 7, 8, 9?
(A) 24 (B) 48
(C) 72 (D) 50

Q6 In how many ways it is possible to write the word 'ZENITH' in a dictionary?
(A) ${}^6P_6$ (B) ${}^6C_6$
(C) ${}^6P_0$ (D) None

Q7 In how many ways can the word 'STRANGE' be arranged so that the vowels occupy only the odd places ?
(A) ${}^5P_5$ (B) ${}^5P_5 \times {}^5P_5$
(C) ${}^5P_5 \times {}^4P_2$ (D) None

Q8 If $4.\ {}^nP_3 = 5 \times {}^{n-1}P_3$ then the value of n is
(A) 12 (B) 13
(C) 14 (D) 15

Q9 In a group of boys the number of arrangements of 4 boys in 12 times the number of arrangements of 2 boys. The number of boys in the group is
(A) 10 (B) 8
(C) 6 (D) none of these

Q10 The number of ways in which the letter of the word 'MOBILE' be arranged so that consonants always occupy the odd places is
(A) 36 (B) 63
(C) 30 (D) none of these

Answer Key

Q1	(A)	Q6	(A)
Q2	(B)	Q7	(C)
Q3	(D)	Q8	(D)
Q4	(B)	Q9	(C)
Q5	(C)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

To form 4 digit numbers using the digits 1, 2, 3 .....7.

Since, the order of digits matters.

Thus, the number of four digit numbers ${}^{7}P_{4}$

Hence, option (A) is correct.

Q2 Text Solution:

We know that decagon have 10 sides.

The number of diagonal in a polygon having n sides is ${}^{n}C_{2} - n$ or $\frac{1}{2}n(n-3)$

Here, $n = 10$

Thus, number of diagonals

$= \frac{1}{2} \times 10 \times (10-3)$

$= 5 \times 7 = 35$

Therefore, the number of diagonals in decagon are 35.

Hence, option (B) is correct i.e., 35.

Q3 Text Solution:

Number of letters in the word 'VIOLENT' $= 7$

Number of consonants $= 4$

Number of vowels $= 3$

Since, there are 3 even places that should be occupied by 3 vowels can be done in 3! ways.

Now, remaining 4 consonants can be done in 4! ways.

Therefore, the required number of ways $= 3! \times 4! = 144$

Hence, option (D) is correct i.e., 144.

Q4 Text Solution:

We know that,

Number of necklace with n beads of different color $= \frac{(n-1)!}{2}$

Here, $n = 8$

Therefore, the number of ways in which 8 different beads be strung on a necklace

$= \frac{(8-1)!}{2}$

$= \frac{7!}{2}$

$= \frac{5040}{2}$

$= 2520$

Hence, option (B) is correct i.e., 2520.

Q5 Text Solution:

For the number to be greater than 7000 , the digits at the thousands place should be either 7,8 or 9

Thus, for thousands place, there are 3 possibilities.

Now, for the remaining three digits, the possible arrangements can be done in ${}^{4}P_{3}$ different ways.

Therefore, number of numbers formed greater than 7000

$= 3 \times {}^{4}P_{3}$

$= 3 \times \frac{4!}{(4-3)!}$

$= 3 \times 4!$

$= 72$

Hence, option (C) is correct i.e., 72.

Q6 Text Solution:

Total letters in word 'ZENITH' $= 6$

Since, in the arrangement of letters the order matters. Thus, the number of possible arrangements of the letters in the word 'ZENITH' in a dictionary $= {}^{6}P_{6}$

Hence, option (A) is correct i.e., ${}^{6}P_{6}$.

Q7 Text Solution:

In the word 'STRANGE':

Total number of letters $= 7$

Number of vowels $= 2$

Since, vowels have to occupy odd positions.

There are 4 odd positions that has to occupy by vowels which can be done in ${}^{4}P_{2}$ ways.

Now, the arrangements of remaining 5 letters can be done in ${}^{5}P_{5}$ ways.

Therefore, total number of arrangements $= {}^{5}P_{5} \times {}^{4}P_{2}$

Hence, option (C) is correct i.e., ${}^{5}P_{5} \times {}^{4}P_{2}$

Q8 Text Solution:

Given: $4.{}^{n}P_3 = 5 \times {}^{n-1}P_3$

$\Rightarrow 4 \times \frac{n!}{(n-3)!} = 5 \times \frac{(n-1)!}{(n-1-3)!}$

$\Rightarrow 4 \times \frac{n(n-1)(n-2)(n-3)!}{(n-3)!} = 5$

$\times \frac{(n-1)(n-2)(n-3)(n-4)!}{(n-4)!}$

$\Rightarrow 4n\left(n-1\right)\left(n-2\right) = 5$

$\times \left(n-1\right)\left(n-2\right)\left(n-3\right)$

$\Rightarrow 4n = 5\left(n-3\right)$

$\Rightarrow 4n = 5n - 15$

$\Rightarrow 5n - 4n = 15$

$\Rightarrow n = 15$

Hence, option (D) is correct i.e., 15.

Q9 Text Solution:

Assume that number of boys in the group be n.

Now, arrangements of 4 boys can be done in $4! \times {}^{n}C_4$ ways

Arrangements of 2 boys can be done in $2! \times {}^{n}C_2$ ways

Now, according to the question

$\Rightarrow 4! \times {}^{n}C_4 = 12 \times 2! \times {}^{n}C_2$

$\Rightarrow {}^{n}C_4 = {}^{n}C_2$

We know that, if ${}^{n}C_x = {}^{n}C_y \Rightarrow x = y$ or $n = x + y$

Thus, $n = 4 + 2 = 6$

$\Rightarrow n = 6$

Therefore, the number of boys in a group are 6 .

Hence, option (C) is correct i.e., 6.

Q10 Text Solution:

In the word 'MOBILE' there are total 3 odd and 3 even places.

Now, for the consonants to occupy the odd places, the possible arrangements are ${}^{3}P_3$.

For the remaining three vowels the possible arrangements are ${}^{3}P_3$.

Thus, total number of ways $= {}^{3}P_3 \times {}^{3}P_3$

$= \frac{3!}{(3-3)!} \times \frac{3!}{(3-3)!}$

$= 3! \times 3!$

$= 36$

Hence, option (A) is correct i.e., 36 .

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

Basic Concepts of Permutation and Combination

Q1 ${}^{12}C_8 =$
(A) 215 (B) 495
(C) 745 (D) none of these

Q2 The value of ${}^{12}C_4 + {}^{12}C_3$ is
(A) 715 (B) 710
(C) 716 (D) none of these

Q3 If ${}^{18}C_r = {}^{18}C_{r+2}$, then the value ${}^{r}C_5$ is
(A) 55 (B) 50
(C) 56 (D) none of these

Q4 8 points marked on the circumference of a circle. The number of chords obtained by joining these in pairs is
(A) 25 (B) 27
(C) 28 (D) none of these

Q5 In forming a committee of 5, out of 5 males and 6 females how many choices you have to make if there are 2 males ?
(A) 150 (B) 200
(C) 1 (D) 461

Q6 Every two person shakes hands with each other in a party and total number of hand shakes is 66. The number of guests in the party is
(A) 11 (B) 12
(C) 13 (D) 14

Q7 If you have to make a choice of 7 questions out of 10 questions set, you can do it in _____ number of ways.
(A) ${}^{10}C_7$ (B) ${}^{10}P_7$
(C) ${}^{10}C_7 \times 7!$ (D) None

Q8 Out of 10 consonants and 4 vowels, how many words can be formed each containing 6 consonants and 3 vowels?
(A) ${}^{10}C_6 \times {}^{4}C_3$
(B) ${}^{10}C_6 \times {}^{4}C_3 \times 9!$
(C) ${}^{10}C_6 \times {}^{4}C_3 \times 10!$
(D) None

Q9 If ${}^{n}C_6 \div {}^{n-2}C_3 = \frac{91}{4}$, then the value of n is _____ .
(A) 15 (B) 14
(C) 13 (D) None

Q10 From 6 boys and 4 girls, 5 are to be seated, if there must be exactly 2 girls then the number of ways of selection is _____ .
(A) 240 (B) 120
(C) 60 (D) None

Q11 You have to make a choice of 4 balls out of one red, one blue and ten white balls. The number of ways this can be done to always include the red ball is _____ .
(A) ${}^{11}C_3$ (B) ${}^{10}C_3$
(C) ${}^{10}C_4$ (D) None

Q12 The way of selecting 4 letters of the word 'EXAMINATION' is
(A) 136 (B) 130
(C) 125 (D) none of these

Answer Key

Q1	(B)	Q7	(A)
Q2	(A)	Q8	(B)
Q3	(C)	Q9	(D)
Q4	(C)	Q10	(B)
Q5	(B)	Q11	(A)
Q6	(B)	Q12	(A)

Hints & Solutions

Q1 Text Solution:

We know that,

$^{n}C_r = \frac{n!}{r! \times (n-r)!}$

Thus, $^{12}C_8 = \frac{12!}{8! \times (12-8)!}$

$= \frac{12 \times 11 \times 10 \times 9 \times 8!}{4 \times 3 \times 2 \times 1 \times 8!}$

$= \frac{12 \times 11 \times 10 \times 9}{4 \times 3 \times 2 \times 1} = 495$

So, the value of $^{12}C_8$ is 495.

Hence, option (B) is correct i.e., 495.

Q2 Text Solution:

We know that,

$^{n+1}C_r = {}^{n}C_r + {}^{n}C_{r-1}$

Thus, $^{12}C_4 + {}^{12}C_3 = {}^{13}C_4$

$= \frac{13!}{4! \times (13-4)!}$

$= \frac{13 \times 12 \times 11 \times 10 \times 9!}{4 \times 3 \times 2 \times 1 \times 9!}$

$= \frac{13 \times 12 \times 11 \times 10}{4 \times 3 \times 2 \times 1}$

$= 715$

So, the required value is 715.

Hence, option (A) is correct.

Q3 Text Solution:

Given: $^{18}C_r = {}^{18}C_{r+2}$

We know that, $^{n}C_x = {}^{n}C_y \Rightarrow x = y$ or $x + y = n$

Since, $^{18}C_r = {}^{18}C_{r+2}$

$\Rightarrow r + r + 2 = 18$

$\Rightarrow 2r + 2 = 18$

$\Rightarrow 2r = 18 - 2$

$\Rightarrow r = \frac{16}{2}$

$\Rightarrow r = 8$

Thus, $^{r}C_5 = {}^{8}C_5 = \frac{8!}{5! \times (8-5)!} = \frac{8!}{5! \times 3!} = 56$

Therefore, the value of $^{r}C_5$ is 56 .

Hence, option (C) is correct i.e., 56.

Q4 Text Solution:

Given, Number of points on the circle = 8

To draw the chord we need 2 points on the circumference of the circle.

So, the number of chords obtained by joining these in pairs is

$= {}^{8}C_2$

$= \frac{8!}{2! \times (8-2)!}$

$= \frac{8!}{2 \times 6!}$

$= \frac{8 \times 7 \times 6!}{2 \times 6!} = 28$

Hence, option (C) is correct.

Q5 Text Solution:

Given,

Number of males = 5

Number of females = 6

Since, there should be 2 males thus number of females should be 3.

Therefore, number of selections to be made is

$^{5}C_2 + {}^{6}C_3$

$= \frac{5!}{2! \times 3!} \times \frac{6!}{3! \times 3!}$

$= 5 \times 2 \times 5 \times 4$

$= 200 \text{ ways}$

Hence, option (B) is correct.

Q6 Text Solution:

Let the number of guests be n.

Now, we need 2 people for hand shakes, so selecting 2 persons from n persons can be done in $^{n}C_2$ ways

According to the question,

$^{n}C_2 = 66$

$\Rightarrow \frac{n!}{(n-2)! \times 2!} = 66$

$\Rightarrow \frac{n \times (n-1) \times (n-2)!}{2 \times (n-2)!} = 66$

$\Rightarrow \frac{n^2 - n}{2} = 66$

$\Rightarrow n^2 - n = 132$

$\Rightarrow n^2 - n - 132 = 0$

$\Rightarrow n^2 + 11n - 12n - 132 = 0$

$\Rightarrow n\left(n + 11\right) - 12\left(n + 11\right) = 0$

$\Rightarrow \left(n + 11\right)\left(n - 12\right) = 0$

$\Rightarrow n + 11 = 0 \text{ or } n - 12 = 0$

$\Rightarrow n = -11 \text{ or } 12$

$\Rightarrow n = 12$

(Since number of guest can't be negative)

Therefore, the number of guests in the party is 12.

Hence, option (B) is correct.

Q7 Text Solution:

Total number of questions = 10

Questions to be selected = 7

Thus, to choose 7 questions out of 10 questions, it can be done in ${}^{10}C_7$ different ways.

Hence, option (A) is correct.

Q8 Text Solution:

Given,

Number of consonants = 10

Number of vowels = 4

Thus, selection of 6 consonants out of 10 can be done in ${}^{10}C_6$ ways.

Now, selection 3 vowels out of 4 vowels can be done in ${}^{4}C_3$ ways. Since, there are 9 letters which can be arranged in 9 ! ways to form a word.

Therefore, the total number of words formed $= {}^{10}C_6 \times {}^{4}C_3 \times 9!$

Hence, option (B) is correct i.e., ${}^{10}C_6 \times {}^{4}C_3 \times 9!$.

Q9 Text Solution:

Given: ${}^{n}C_6 \div {}^{n-2}C_3 = \frac{91}{4}$

$\Rightarrow \frac{n!}{6! \times (n-6)!} \div \frac{(n-2)!}{3! \times ((n-2)-3))!} = \frac{91}{4}$

$\Rightarrow \frac{n!}{6! \times (n-6)!} \div \frac{(n-2)!}{3! \times (n-5)!} = \frac{91}{4}$

$\Rightarrow \frac{n!}{6! \times (n-6)!} \times \frac{3! \times (n-5)!}{(n-2)!} = \frac{91}{4}$

$\Rightarrow \frac{n(n-1)(n-2)!}{6 \times 5 \times 4 \times 3! \times (n-6)!} \times \frac{3! \times (n-5) \times (n-6)!}{(n-2)!} = \frac{91}{4}$

$\Rightarrow \frac{n(n-1)(n-5)}{30} = \frac{91}{1}$

$\Rightarrow n\left(n-1\right)\left(n-5\right) = 2730$

Since, $n = 15, 14, 13$ are not satisfying the above equation.

Hence, option (D) is correct i.e., None.

Q10 Text Solution:

Given: There are 6 boys and 4 girls

Since, there must be exactly 2 girls thus the selection can be done in ${}^{4}C_2$ ways.

Now, out of 5 seats 2 are occupied by girls so remaining 3 will be occupied by boys.

Thus, the selection of 3 boys out of 6 can be done in ${}^{6}C_3$ ways.

Total number of selection $= {}^{4}C_2 \times {}^{6}C_3$

$= \frac{4!}{2! \times 2!} \times \frac{6!}{3! \times 3!}$

$= \frac{4 \times 3}{2 \times 1} \times \frac{6 \times 5 \times 4}{3 \times 2 \times 1}$

$= 120$

Hence, option (B) is correct.

Q11 Text Solution:

Given,

Total red balls = 1

Total blue balls = 1

Total white balls = 10

As, the number of balls to be selected is 4 out of which 1 red ball should always be included, thus the selection of remaining 3 balls can be done in ${}^{11}C_3$ ways.

Therefore, total number of choices $= 1 \times {}^{11}C_3 = {}^{11}C_3$

Hence, option (A) is correct.

Q12 Text Solution:

In the word 'EXAMINATION',

Total letters = 11

Number of 'A' = 2

Number of 'I' = 2

Number of 'N' = 2

Thus, we have E, X, M, T, O, (AA), (II), (NN) i.e. 8 distinct letters.

Case I: When all are distinct

${}^{8}C_4$ ways = 70 ways

Case II: 2 letters alike and 2 distinct (e.g: MTNN, EOII etc)

${}^{3}C_1 \times {}^{7}C_2$ ways = 63 ways

Case III: 2 letters alike and 2 letters alike (e.g: IINN, IAIA etc)

${}^{3}C_2$ ways = 3 ways

Total way of selecting 4 letters of the word 'EXAMINATION' is

$= 70 + 63 + 3 = 136$

Hence, option (A) is correct

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 5

Basic Concepts of Permutation and Combination

Q1 ${}^{51}C_{31}$ is equals to
(A) ${}^{51}C_{20}$ (B) $2 \times {}^{50}C_{20}$
(C) $2 \times {}^{45}C_{15}$ (D) none of these

Q2 If ${}^{18}C_n = {}^{18}C_{n+2}$, then the value of n is _____ .
(A) 0 (B) -2
(C) 8 (D) None

Q3 Out of 8 different balls taken three at a time without taking the same three together more than once, for how many times you can select any ball?
(A) ${}^{7}C_2$ (B) ${}^{8}C_3$
(C) ${}^{7}P_2$ (D) ${}^{8}P_3$

Q4 The number of ways in which a person can choose one or more of the four electrical appliances: TV, Refrigerator, Washing Machine and cooler is
(A) 15 (B) 25
(C) 24 (D) none of these

Q5 Out of 6 members belonging to a party 'A' and 4 to party 'B' in how many ways a committee of 5 can be selected so that members of party 'A' are in majority ?
(A) 180 (B) 186
(C) 185 (D) 184

Q6 In your College Union Election you have to choose candidates. Out of 5 candidates 3 are to be elected and you are entitled to vote for any number of candidates but not exceeding the number to be elected. You can do it in _____ ways.
(A) 25 (B) 5
(C) 10 (D) None

Q7 Five bulbs of which three are defective are to be tried in two bulbs points in a dark room. Number of trials the room shall be lighted is
(A) 6 (B) 8
(C) 5 (D) 7

Q8 You are selecting a cricket team of first 11 players out of 16 including 4 bowlers and 2 wicket-keeper. In how many ways you can do it so that the team contains exactly 3 bowlers and 1 wicket -keeper ?
(A) 960 (B) 840
(C) 420 (D) 252

Q9 From 7 men and 4 women, a committee of 5 is to be formed. In how many ways can this be done to include at least one woman ?
(A) 441 (B) 440
(C) 420 (D) None

Q10 How many combinations can be formed of 8 counters marked 1, 2 ..... , 8 taking 4 at a time there being at least one odd and even numbered counter in each combination?
(A) 68 (B) 66
(C) 64 (D) 62

Answer Key

Q1	(A)	Q6	(A)
Q2	(C)	Q7	(D)
Q3	(B)	Q8	(A)
Q4	(A)	Q9	(A)
Q5	(B)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

We know that, ${}^{n}C_{r} = {}^{n}C_{n-r}$

Thus, ${}^{51}C_{31} = {}^{51}C_{51-31} = {}^{51}C_{20}$

Hence, option (A) is correct.

Q2 Text Solution:

We know that,

If ${}^{n}C_{x} = {}^{n}C_{y} \Rightarrow x = y \text{ or } x + y = n$

Since, ${}^{18}C_{n} = {}^{18}C_{n+2}$

$\Rightarrow n + n + 2 = 18$

$\Rightarrow 2n + 2 = 18$

$\Rightarrow 2n = 18 - 2$

$\Rightarrow 2n = 16$

$\Rightarrow n = \frac{16}{2}$

$\Rightarrow n = 8$

Hence, option (C) is correct.

Q3 Text Solution:

Given: Number of different balls = 8

We need to select three balls at a time.

Thus, the selection can be done in ${}^{8}C_{3}$ ways.

So, the number of times you can select any ball = ${}^{8}C_{3}$

Hence, option (B) is correct i.e., ${}^{8}C_{3}$.

Q4 Text Solution:

Given: Four electrical appliances: TV, Refrigerator, Washing Machine and cooler

As, the person can choose either one or more electrical appliances out of 4 .

So, the number of ways the selection can be done

$= {}^{4}C_{1} + {}^{4}C_{2} + {}^{4}C_{3} + {}^{4}C_{4}$

$= 4 + 6 + 4 + 1$

$= 15$

Therefore, the required number of ways is 15 .

Hence, option (A) is correct i.e., 15.

Q5 Text Solution:

Out of 6 members belonging to a party 'A' and 4 members to a party ' B ' we need to find the number of ways a committee of 5 can be selected so that members of party 'A' are in majority.

So, there are 3 possibilities.

(i) A committee consist of 3 members from party ' A ' and 2 are from party 'B'

So selection of 3 members out of 6 members of party 'A' can be done in ${}^{6}C_{3} = 20$ ways.

Selection of 2 members out of 4 members of party ' B ' is done in ${}^{4}C_{2} = 6$ ways.

So, the number of selection of 3 members from ' A ' and 2 from ' B '

$= 20 \times 6 = 120$

(ii) A committee consist of 4 members from party 'A' and 1 are from party 'B'

So selection of 4 members out of 6 members of party 'A' can be done in ${}^{6}C_{4} = 15$ ways.

Selection of 1 members out of 4 members of party ' B ' is done in ${}^{4}C_{1} = 4$ ways.

So, the number of selection of 4 members from ' A ' and 1 from ' B '

$= 15 \times 4 = 60$

(iii) A committee consist of 5 members from party 'A' and 0 are from party ' B '

So selection of 5 members out of 6 members of party ' A ' can be done in ${}^{6}C_{5} = 6$ ways.

Selection of 0 members out of 4 members of party ' B ' is done in

${}^{4}C_{0} = 1$ ways.

So, the number of selection of 5 members from ' A ' and 0 from ' B '

$= 6 \times 1 = 6$

So,the total number of committee in which member of ' A ' are in majority

$= 120 + 60 + 6 = 186$

Hence, option (B) is correct i.e., 186.

Q6 Text Solution:

Total candidates = 5

Candidates to be selected = 3

SInce, we are entitled to vote for any number of candidates but not exceeding the number to be elected i.e., we can vote for one candidate or two candidates or three candidates.

Thus, the number of ways it can be done

$= {}^5C_1 + {}^5C_2 + {}^5C_3$

$= \frac{5!}{4! \times 1!} \times \frac{5!}{2! \times 3!} \times \frac{5!}{3! \times 2!}$

$= 5 + 10 + 10$

$= 25 \text{ ways}$

Hence, option (A) is correct i.e., 25.

Q7 Text Solution:

Given,

Total number of bulbs = 5

Number of defective bulbs = 3

Since, to lighten up the room at least one good bulb should be there.

Thus, number of selecting 2 bulbs out of 5 is

${}^5C_2 = 10 \text{ ways}$

Now, number of ways of selecting 2 defective bulbs out of 3 is

${}^3C_2 = 3 \text{ ways}$

Therefore, the number of trials where the room shall be lighted

= Total number of selections - Number of selections where the room will not be lighted

$= 10 - 3$

$= 7$

Hence, option (D) is correct i.e., 7.

Q8 Text Solution:

Given,

Total number of players = 16

Number of bowlers = 4

Number of wicket-keeper = 2

Thus, the selection of 3 bowlers out of 4 bowlers can be done in ${}^4C_3$ ways.

Also, the selection of 1 wicket-keeper out of 2 wicket-keeper cane be done in ${}^2C_1$ ways.

Now, the remaining players is 10 and players to be selected is 7 which can be done in ${}^{10}\mathrm{C}_7$ ways.

Therefore, the total number of ways

$= {}^4C_3 \times {}^2C_1 \times {}^{10}C_7$

$= \frac{4!}{3! \times 1!} \times \frac{2!}{1! \times 1!} \times \frac{10!}{7! \times 3!}$

$= 4 \times 2 \times 10 \times 3 \times 4$

$= 960$

Hence, option (A) is correct i.e., 960.

Q9 Text Solution:

Total number of men $= 7$

Total number of women$= 4$

Since, at least one woman should be there, thus the possibilities are 1 woman and 4 men or 2 women and 3 men or 3 women and 2 men or 4 women and 1 men

Therefore, total ways

$= {}^4C_1 \times {}^7C_4 + {}^4C_2 \times {}^7C_3 + {}^4C_3 \times {}^7C_2 + {}^4C_4 \times {}^7C_1$

$= \frac{4!}{3! \times 1!} \times \frac{7!}{4! \times 3!} + \frac{4!}{2! \times 2!} \times \frac{7!}{3! \times 4!} + \frac{4!}{3! \times 1!} \times \frac{7!}{2! \times 5!} + \frac{4!}{0! \times 4!} \times \frac{7!}{6! \times 1!}$

$= 4 \times 35 + 6 \times 35 + 4 \times 21 + 1 \times 7$

$= 140 + 210 + 84 + 7$

$= 441$

Hence, option (A) is correct i.e., 441.

Q10 Text Solution:

Here,

Number of even numbered counter $= 4$

Number of odd numbered counter $= 4$

There are 3 possibilities for it as it should have at least one even and one odd counter.

Possibility (1): 1 odd and 3 even counters.

Out of 4 odd, selection of 1 odd can be done in ${}^4C_1 = 4$ ways

Out of 4 even, selection of 3 even counters can be done in ${}^4C_3 = 4$ ways.

Number of combinations $= 4 \times 4 = 16$

Possibility (2): 2 odd and 2 even counters.

Out of 4 odd, selection of 2 odd can be done in ${}^4C_2 = 6$ ways.

Out of 4 even, selection of 2 even can be done in ${}^4C_2 = 6$ ways.

Number of combinations $= 6 \times 6 = 36$

Possibility (3): 3 odd and 1 even counters.

Out of 4 odd, selection of 3 odd can be done in ${}^4C_3 = 4$ ways.

Out of 4 even, selection of 1 even can be done in ${}^4C_3 = 6$ ways.

Number of combinations $= 6 \times 6 = 36$.

Therefore, total number of combination $= 16 + 36 + 16 = 68$.

Hence, option (A) is correct i.e., 68.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 6

Basic Concepts of Permutation and Combination

Q1 ${}^4P_4$ is evaluated as
(A) 1 (B) 24
(C) 0 (D) None of these

Q2 The number of permutations of the word 'ALLAHABAD' is
(A) $9! \div (4! \times 2!)$
(B) $9! \div 4!$
(C) $9!$
(D) None

Q3 The number of ways the letters of the word 'TRIANGLE' to be arranged so that word 'ANGLE' will be always present in
(A) 20 (B) 60
(C) 24 (D) 32

Q4 The number of ways in which 6 men can be arranged in a row so that the particular 3 men sit together is
(A) ${}^4P_4$ (B) ${}^4P_4 \times {}^3P_3$
(C) $(3!)^2$ (D) none of these

Q5 In forming a committee of 5, out of 5 males and 6 females how many choices you have to make if there is no females ?
(A) 150 (B) 200
(C) 1 (D) 461

Q6 The number of ways in which the letters the word 'DOGMATIC' can be arranged is
(A) 40,319 (B) 40,320
(C) 40,321 (D) none of these

Q7 How many 6 digit numbers can be formed with the digits $9, 5, 3, 1, 7, 0$?
(A) 600 (B) 720
(C) 120 (D) None of these

Q8 The letters of the word 'CALCUTTA' and 'AMERICA' are arranged in all possible ways. The ratio of the numbers of there arrangements is
(A) 1 : 2 (B) 2 : 1
(C) 2 : 2 (D) none of these

Q9 The total number of sitting arrangements of 7 persons in a row if one person occupies the middle seat is _____ .
(A) $5!$ (B) $6!$
(C) $2! \times 5!$ (D) None

Q10 ${}^nP_r \div {}^{n-1}P_{r-1}$ is
(A) n (B) $n!$
(C) $(n-1)!$ (D) ${}^nC_n$

Q11 How many different arrangements can be made beginning with 'N' and ending in 'A' with the letters of the word 'ORIENTAL'?
(A) 6! (B) 8!
(C) 4! (D) None

Q12 In how many the word 'ARRANGE' be arranged such that the 2'R's come together ?
(A) 400 (B) 440
(C) 360 (D) None

Q13 The number of arrangements that can be made with the word 'ASSASSINATION' is
(A) $13! \div \left[3! \times 4! \times (2!)^2\right]$
(B) $13! \div [3! \times 4! \times (2!)]$
(C) $13!$
(D) None

Q14 In how many ways does the word 'MATHEMATICS' be arranged so that the vowels occur together?
(A) $11! \div (2!)^3$
(B) $(8! \times 4!) \div (2!)^3$

(C) $12! \div (2!)^3$
(D) None

Q15 If ${}^nP_r = 336$ and ${}^nC_r = 56$ then n and r will be
(A) (3, 2) (B) (8, 3)
(C) (7, 4) (D) none of these

Q16 The number of ways the letters of the word 'SIGNAL' can be arranged such that the vowels occupy only odd positions is _____ .
(A) 1440 (B) 240
(C) 480 (D) 144

Q17 The total number of sitting arrangements of 7 persons in a row if two persons occupy the end seats is _____ .
(A) 5! (B) 6!
(C) $2! \times 5!$ (D) None

Q18 How many different words can be formed beginning with 'E' of the letters the word 'TRIANGLE'?
(A) 8!
(B) 7!
(C) 6!
(D) $2! \times 6!$

Q19 The chief minister of 17 states meet to discuss the hike in oil price at a round table. In how many ways do they sit themselves if Kerala and Bengal chief ministers choose to sit together?
(A) $15! \times 2!$ (B) $17! \times 2!$
(C) $16! \times 2!$ (D) None

Q20 There are 12 points in the plane of which 5 are collinear. The number of triangles is
(A) 200 (B) 211
(C) 210 (D) none of these

Answer Key

Q1	(B)	Q11	(A)
Q2	(A)	Q12	(C)
Q3	(C)	Q13	(A)
Q4	(B)	Q14	(B)
Q5	(C)	Q15	(B)
Q6	(B)	Q16	(D)
Q7	(A)	Q17	(C)
Q8	(B)	Q18	(B)
Q9	(B)	Q19	(A)
Q10	(A)	Q20	(C)

Hints & Solutions

Q1 Text Solution:

We know that,

${}^{n}P_{r} = \frac{n!}{(n-r)!}$

Thus, ${}^{4}P_{4} = \frac{4!}{(4-4)!}$

$= \frac{4!}{0!}$

$= \frac{4!}{1}$

$= 4 \times 3 \times 2 \times 1$

$= 24$

Hence, option (B) is correct.

Q2 Text Solution:

The word 'ALLAHABAD' is consist of 9 alphabets.

Number of 'L' = 2

Number of 'A' = 4

So, arrangements of the word 'ALLAHABAD' $= \frac{9!}{2! \times 4!}$

Hence, option (A) is correct.

Q3 Text Solution:

Given: In the word 'TRIANGLE' the word 'ANGLE' should always be present.

Thus, consider 'ANGLE' as one letter so the letters will be T, R, I and 'ANGLE'.

Therefore, there are 4 letters which can be arranged in 4! i.e. 24 ways.

Hence, option (C) is correct i.e., 24.

Q4 Text Solution:

Since, 3 men sit together thus considering them as a single unit. But these 3 men can arranged themselves in ${}^{3}P_{3}$ ways.

Along with this group and remaining 3 mens i.e. total of 4 can arranged themselves in ${}^{4}P_{4}$ ways.

Therefore, the number of ways in which 6 men can be arranged in a row so that particular men sit together is ${}^{4}P_{4} \times {}^{3}P_{3}$ ways.

Hence, option (B) is correct, i.e ${}^{4}P_{4} \times {}^{3}P_{3}$.

Q5 Text Solution:

Given,

Number of males $= 5$

Number of females $= 6$

Since, to form a committee with no females thus all 5 members will be males.

Therefore, selection of 5 males is done in ${}^{5}C_{5}$ i.e. 1 way.

Hence, option (C) is correct i.e. 1.

Q6 Text Solution:

Number of letters in word 'DOGMATIC' = 8

Thus, the letters in word 'DOGMATIC' can be arranged in 8! ways

$= 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$

$= 40320$

Hence, option (B) is correct i.e., 40,320 .

Q7 Text Solution:

Given digits: $9,\ 5,\ 3,\ 1,\ 7,\ 0$

Since, 0 cannot be placed at the first position, otherwise the number will be of 5 digits.

Thus, the first place can be filled in 5 ways (9, 5, 3, 1 or 7).

Now, the arrangement of remaining 5 digits and 5 places can be done in 5! ways.

Therefore, the required number of ways $= 5 \times 5$!

$= 5 \times 5 \times 4 \times 3 \times 2 \times 1$

$= 600$

Hence, option (A) is correct i.e., 600.

Q8 Text Solution:

Number of letters in the word 'CALCUTTA' $= 8$

Number of $C = 2$

Number of $A = 2$

Number of $T = 2$

Number of arrangements in the word 'CALCUTTA'$= \frac{8!}{2! \times 2! \times 2!} = 7!$

Number of letters in the word 'AMERICA' $= 7$

Number of $A = 2$

Number of arrangements of for the word 'AMERICA' $= \frac{7!}{2!}$

Thus, the ratio of arrangements $= 7!\ :\ \frac{7!}{2!} = 2!\ :\ 1 = 2\ :\ 1$

Hence, option (B) is correct.

Q9 Text Solution:

Number of persons $= 7$

Since, 4^{th} seat is occupied by a particular person thus remaining 6 seats by the 6 persons can be arranged in 6! ways.

Therefore, the total number of sitting arrangements $= 6!$

Hence, option (B) is correct i.e, 6!.

Q10 Text Solution:

$${}^{n}P_{r} \div {}^{n-1}P_{r-1}$$

$$= \frac{n!}{(n-r)!} \div \frac{(n-1)!}{((n-1)-(r-1))!}$$

$$= \frac{n!}{(n-r)!} \div \frac{(n-1)!}{(n-1-r+1)!}$$

$$= \frac{n!}{(n-r)!} \div \frac{(n-1)!}{(n-r)!}$$

$$= \frac{n!}{(n-r)!} \times \frac{(n-r)!}{(n-1)!}$$

$$= \frac{n!}{(n-1)!}$$

$$= \frac{n(n-1)!}{(n-1)!}$$

$$= n$$

Hence, option (A) is correct.

Q11 Text Solution:

Number of letters in word 'ORIENTAL' = 8

Since, the first letter should start with 'N' and end with 'A' thus, remaining 6 letters can be arranged in 6! ways.

Hence, option (A) is correct i.e., 6!.

Q12 Text Solution:

Number of letters in word 'ARRANGE' = 7

Number of 'R' = 2

Number of 'A' = 2

Since, 2'R's should come together thus we will considered it as single letter and now we have 6 letters to arrange which can be done in 6! ways.

Now, as the letter 'A' occurs 2 times thus, the number of ways the word 'ARRANGE' be arranged such that the 2'R's come together $= \frac{6!}{2!} = \frac{720}{2} = 360$

Hence, option (C) is correct.

Q13 Text Solution:

The word 'ASSASSINATION' consists of 13 letters.

Number of 'S' = 4

Number of 'A' = 3

Number of 'N' = 2

Number of 'I' = 2

Thus, the arrangements of the word 'ASSASSINATION' $= \frac{13!}{3! \times 4! \times 2! \times 2!}$

Hence, option (A) is correct.

Q14 Text Solution:

Total letters in word 'MATHEMATICS' = 11

Number of 'A' = 2

Number of 'T' = 2

Number of 'M' = 2

Since, the vowels have to occur together thus considering them as one letter i.e. (AAEI)

Thus 8 letters where T and M are repeating twice can be arranged in $\frac{8!}{2! \times 2!}$ ways.

Also, 4 vowels where A is repeating twice can be arranged in $\frac{4!}{2!}$ ways.

So, number of ways $= \frac{8!}{2! \times 2!} \times \frac{4!}{2!} = \frac{8! \times 4!}{(2!)^3}$

Hence, option (B) is correct.

Q15 Text Solution:

Given: ${}^{n}P_{r} = 336$ and ${}^{n}C_{r} = 56$

We know that,

$$r! \times {}^{n}C_{r} = {}^{n}P_{r}$$

$$\Rightarrow r! \times 56 = 336$$

$$\Rightarrow r! = \frac{336}{56}$$

$$\Rightarrow r! = 6$$

$$\Rightarrow r! = 3!$$

$$\Rightarrow r = 3$$

Now, put $r = 3$ in ${}^{n}C_{r} = 56$

$$\Rightarrow {}^{n}C_{3} = 56$$

$$\Rightarrow \frac{n!}{3! \times (n-3)!} = 56$$

$$\Rightarrow \frac{n \times (n-1) \times (n-2) \times (n-3)!}{6 \times (n-3)!} = 56$$

$$\Rightarrow n\left(n-1\right)\left(n-2\right) = 8 \times 7 \times 6$$

$$\Rightarrow n\left(n-1\right)\left(n-2\right) = 8\left(8-1\right)\left(8-2\right)$$

$$\Rightarrow n = 8$$

Therefore, the value of $n = 8$ and $r = 3$.

Hence, option (B) is correct.

Q16 Text Solution:

Total letters in the word 'SIGNAL' = 6

Number of consonants = 4

Number of vowels = 2

Since, there are 3 odd places places which can be occupied by 2 vowels can be done in ${}^3P_2$ ways.

$= \frac{3!}{(3-2)!} = 6$ ways

Now the remaining 4 places can be filled by 4 consonants in 4! ways.

Therefore, the required number of ways $= 6 \times 24 = 144$

Hence, option (D) is correct.

Q17 Text Solution:

Total persons = 7

Since, two particular persons occupy the end seats thus it can be done in 2! ways.

Now, remaining 5 seats can be occupied by 5 persons in 5! ways.

Therefore, the required number of sitting arrangements $= 2! \times 5!$

Hence, option (C) is correct.

Q18 Text Solution:

Given: Total letters in the word 'TRIANGLE' = 8

Since, the word has to begin with the letter 'E' thus fixing the letter 'E' at first position.

Now, remaining 7 letters can be arranged in 7! ways.

Therefore, the number of possible different words = 7!

Hence, option (B) is correct i.e 7!.

Q19 Text Solution:

Since, Kerala and Bengal chief ministers choose to sit together thus the remaining 15 chief ministers can arranged themselves in 15! ways.

Now, Kerala and Bengal chief ministers can also rearranged their positions in 2! ways.

Therefore, the possible number of arrangements $= 15! \times 2!$

Hence, option (A) is correct.

Q20 Text Solution:

Given,

Total points = 12

Number of collinear points = 3

The total number of ways to form a triangle by 12 points are given by ${}^{12}C_3$, but 5 points are collinear thus no triangles can be formed using these points.

Therefore, the possible number of triangles

$= {}^{12}C_3 - {}^5C_3$

$= \frac{12!}{9! \times 3!} - \frac{5!}{3! \times 2!}$

$= \frac{12 \times 11 \times 10}{3 \times 2 \times 1} - \frac{5 \times 4}{2 \times 1}$

$= 220 - 10$

$= 210$

Hence, option (C) is correct.

SAMPURNA JUNE 2024

Lecture No. - 07

Quantitative Aptitude

Basic Concept of Permutation and Combination

By- Rahul Bhutani Sir

RECAP OF PREVIOUS LECTURE

(i) Practice Questions

(ii) PYQs

TOPICS TO BE COVERED

(i) Doubt Session

Question

M A R K E T S

#Q.1 How many words can be formed the letter of words 'MARKETS' provided at least three letter

Sir, Samaj nahi aa raha hai kaise banna hai. Please Explain.

All words

(1) _ _ _ $^7P_3$

(2) _ _ _ _ $^7P_4$

(3) _ _ _ _ _ $^7P_5$

(4) _ _ _ _ _ _ $^7P_6$

(5) _ _ _ _ _ _ _ $^7P_7$

$* \; {}^7P_3 + {}^7P_4 + {}^7P_5 + {}^7P_6 + {}^7P_7$

Question

CA

#Q.2 The number of 4 digit numbers formed with the digits 1,1,2,2,3,4 is

Sir ye question ka answer kya aayega ye samaj nahi aa raha hai

A. 100

B. 101

C. 201

D. None of these

(1) 4 digit are distinct $= {}^4C_4 \times {}^4P_4 = 1 \times 4! = 24$

or

(2) 1 pair & 2 distinct $= {}^2C_1 \times {}^3C_2 \times \frac{{}^4P_4}{2!} = 2 \times \frac{3 \times 2 \times 4!}{2 \times 1 \times 2} = 3 \times 24 = 72$

or

(3) 2 pair $= {}^2C_2 \times \frac{{}^4P_4}{2!2!} = 1 \times \frac{4!}{2 \times 2} = \frac{24}{2 \times 2} = 6$

1 1 2 2

$\Rightarrow$ Total $= 24 + 72 + 6 = 102$

B H A V Y A

$\Rightarrow \frac{{}^{6}P_{6}}{2!}$

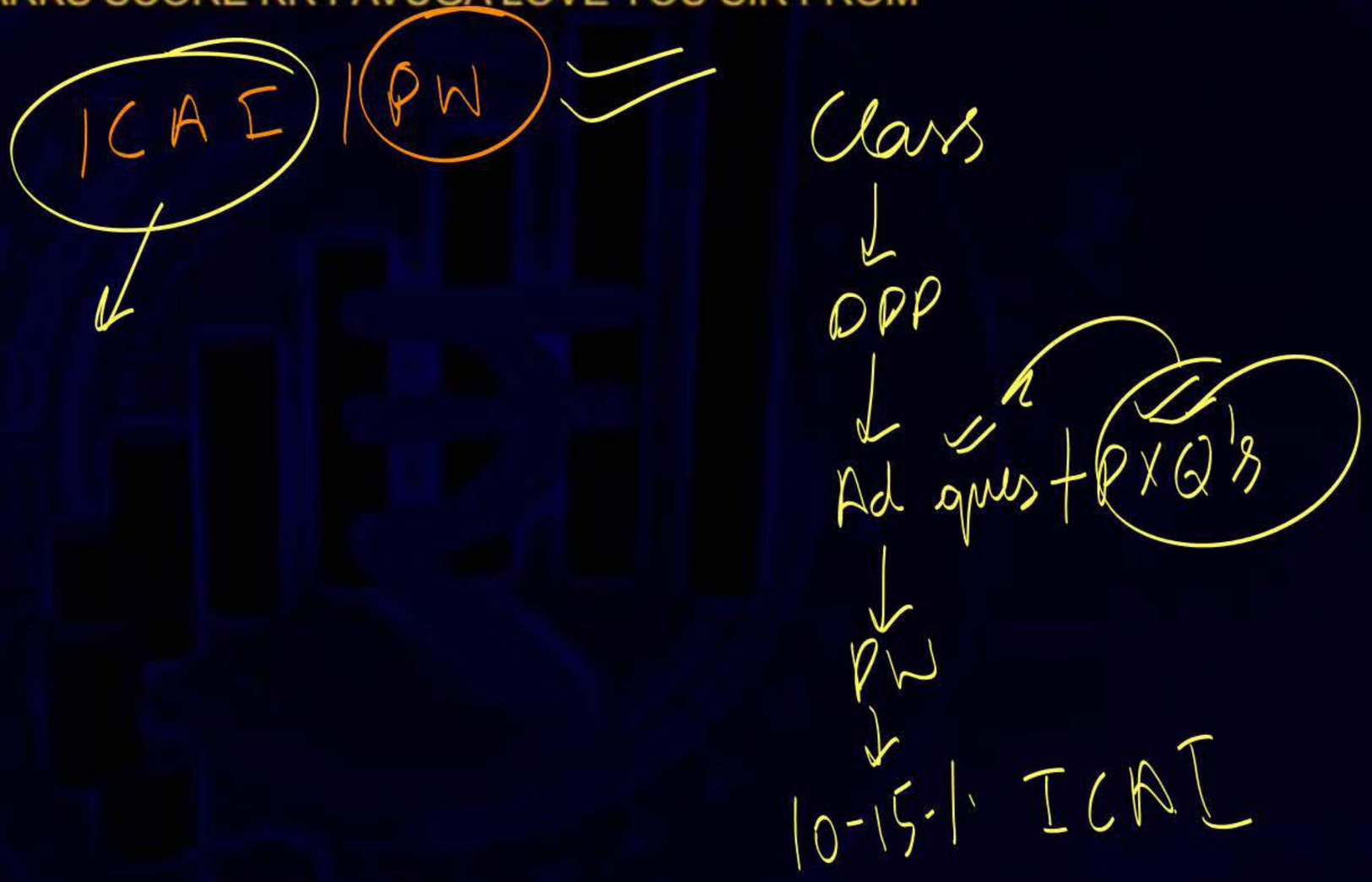
$\frac{n!}{n_1! \, n_2! \, n_3!}$

6 digit → 4 digit

→ 4 choose & 4 arrange

6 choose → 4 arrange → 4

SIR AGAR MAI KHALI AP K BOOK SAI PADUGA. ICAI MODULE SAI NHI PADUGA TOH MAI KITNAI MARKS SCORE KR PAVUGA LOVE YOU SIR FROM KASHMIR



Question

#Q.3 Find the number of ways of selecting 4 letters from the word 'CLASSROOM'.

sir ye question me divide 2! 2! kyu nhi hoga

4 letter select

Arrangement

Question

CA

#Q.4 The number of different words that can be formed with 12 consonants and 5 vowels by taking 4 consonants and 3 vowels in each word is

A. ${}^{12}C_4 \times {}^{5}C_3$

B. ${}^{17}C_7$

C. $4950 \times |7!$

D. None of these

Sir ye question ka answer A ana chahiye but answer me C aa raha hai

arrange

12-C → choose 4

5-V → choose 3

$(4+3)$ arrange

${}^{12}C_4 \times {}^{5}C_3 \times {}^{7}P_7$

$= \frac{12 \times 11 \times 10 \times 9}{4 \times 3 \times 2 \times 1} \times \frac{5 \times 4 \times 3}{3 \times 2 \times 1} \times 7! = 4950 \times 7!$

Question

#Q.5 The number of even numbers greater than 300 can be formed with the digits 1,2,3,4,5 without repletion is

Sir ye question ka answer samaj nahi aa raha hai

A. 110

B. 112

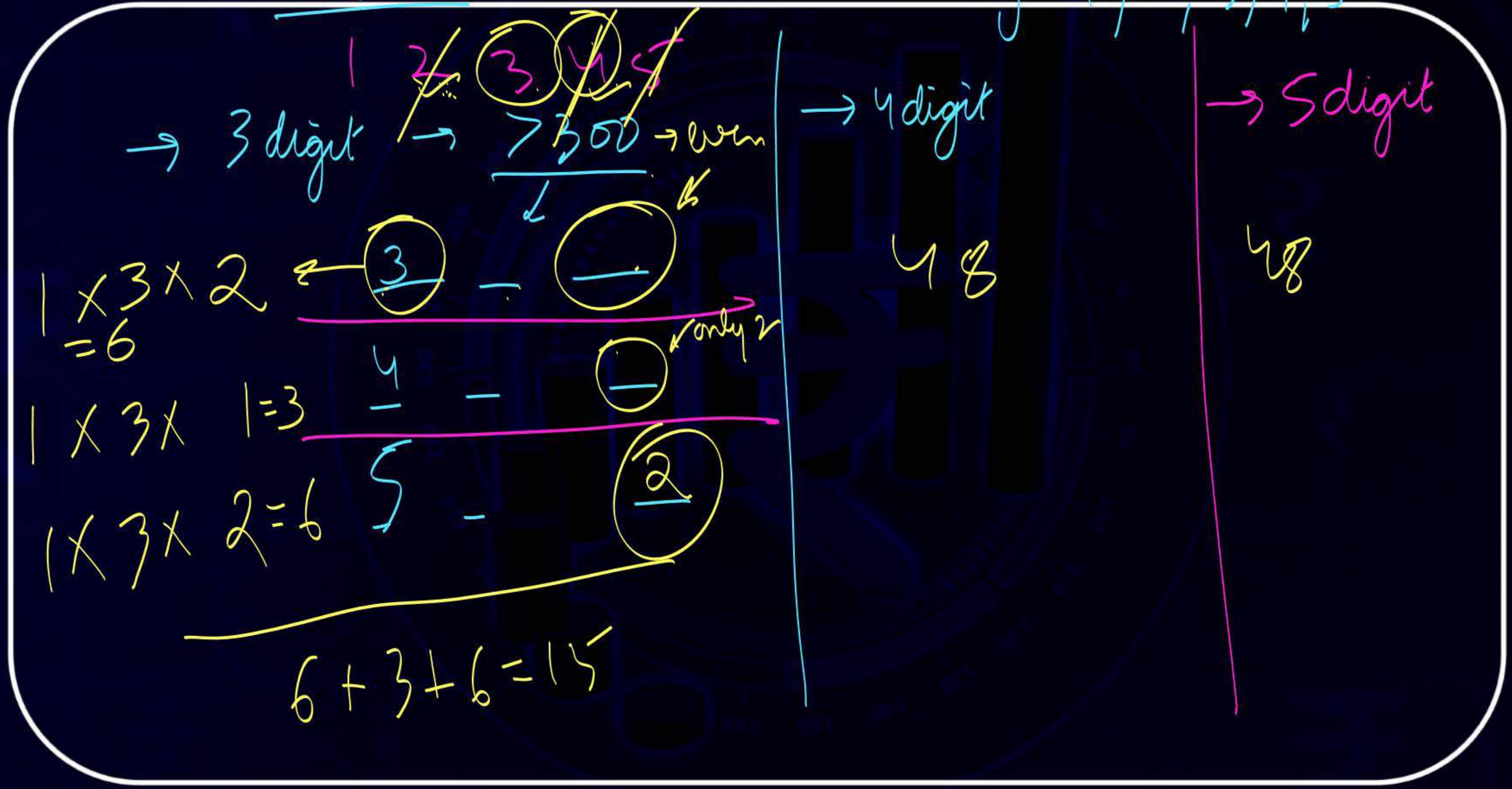
C. 111

D. None of these

3 digit :- 6+6+3 = 15
4 digit ⇒ 48
5 digit ⇒ 48
Total 15+48+48 = 111

(1) 3 digit → >300 & even
(4) 4 digit → even 4×3×2×2 = 48
(5) 5 digit → even 4×3×2×1×2 = 48

> 300 & even using 1, 2, 3, 4, 5



Question

#Q.6 The number of numbers lying between 10 and 1000 can be formed with the digits 2,3,4,0,8,9 is

Sir isko solve kar raha hu to answer 100 ana chahiye lekin 125 answer module me Diya hai . Please explain sir

A. 124

B. 120

C. 125

D. None of these

11 to 999 ✗, 3, 0, 4, 8, 9

2 digit → $\underline{5} \times \underline{5} = 25$

3 digit → $\underline{5} \times \underline{5} \times \underline{4} = 100$

$100 + 25 = 125$

Question

CA

#Q.7 Eight Chairs are numbered from 1 to 8. Two women and three men are to be seated by allowing one Chair for each. First, the women choose the chairs from the chairs numbered 1 to 4 and then men select the chairs from the remaining. The number of possible arrangement is

A. 120

B. 288

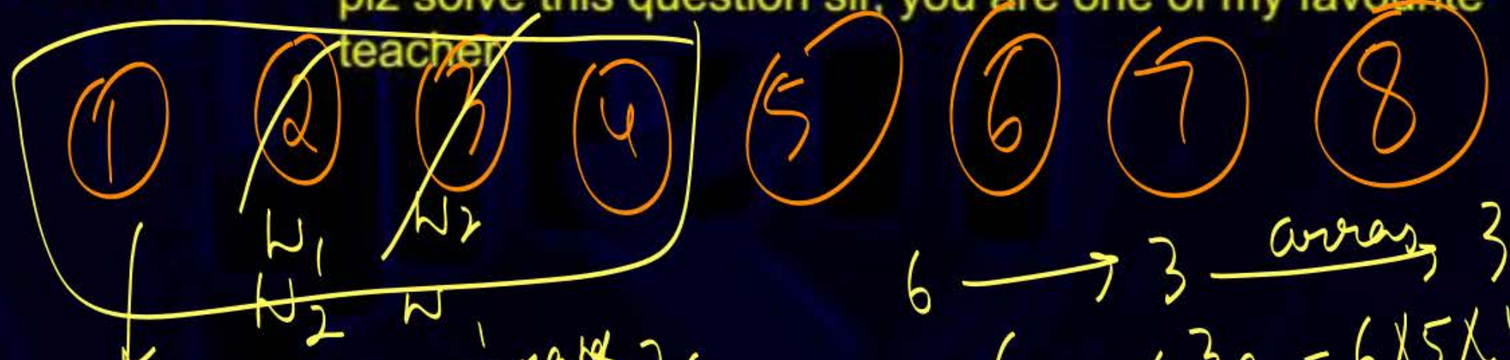
C. 32

D. 1440

plz solve this question sir, you are one of my favourite teacher

W - 2

M - 3



$^4C_2$ choose $^2C_2$ arrange $^2C_2$

$^4C_2 \times {}^2P_2 = \frac{4\times3}{2\times1} \times 2\times1 = 12$

6 → 3 arrange 3

$^6C_3 \times {}^3P_3 = \frac{6\times5\times4}{3\times2\times1} \times 3\times2\times1 = 120$

$12 \times 120 = 1440$

Question

$n-1-1=n-2$

and → done kam karna → ×
or → done me se ek → +

#Q.8

3. Find the value of n if ${}^{n-1}P_3 : {}^{n}P_4 = 1 : 9$.
(a) 3 (b) 9 (c) 10 (d) None of these

Sir questions samjh nhi aa rha h iska ratio and questions bhi nhi samjh rha h . Please bta dijiye sir

A. 30

B. 60

C. 120

D. None of these

n =-
3 ×
9
10

$${}^{n-1}P_3 : {}^{n}P_4 = 1:9$$

$$\Rightarrow \frac{(n-1)(n-2)(n-3)}{n(n-1)(n-2)(n-3)} = \frac{1}{9}$$

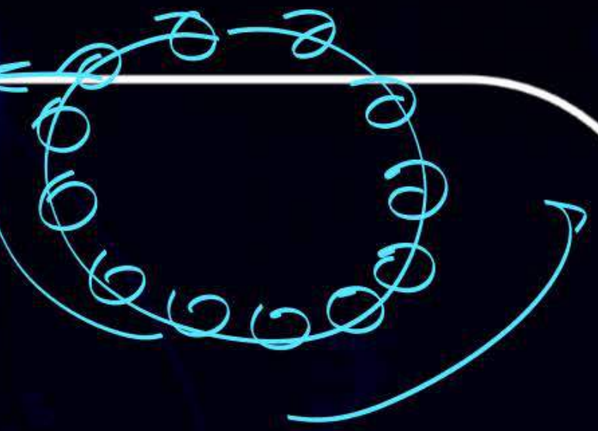
$$\frac{1}{n} = \frac{1}{9} \Rightarrow n = 9$$

ARRANGE

$\Rightarrow \frac{6P_6}{2!} \times \frac{2P_2}{2!}$

So fuel

$\Rightarrow \frac{(So-1)1}{2}$



- - - → no three on same line all are non colinear

$^{16}C_2 \times 1 = \frac{16 \times 15}{2 \times 1} = 120$

$$\_\,0\,\_\,0\,\_\,0\,\_\,0\,\_\,0\,\_\,0\,\_\,0\,\_$$

$$\Rightarrow {}^{6}P_{6} \times {}^{7}P_{4}$$

$$\frac{}{6!} \qquad \frac{}{4!}$$

Logical Org

$\frac{12}{3} = 4$

12 student

$^{12}C_4 \times {}^{8}C_4 \times {}^{4}C_4$

CALCUTTA AMERICA

$\rightarrow \frac{{}^{8}P_8}{2! \cdot 2! \cdot 2!} \Big/ {}^{7}P_7$

$\frac{{}^{n}P_3}{{}^{n}P_2} = \frac{3}{1} \Rightarrow \frac{n(n-1)(n-2)}{n(n-1)} = 3 \Rightarrow n-2 = 3$

$n = 5$

12 → 4 equal arrange

$^{12}P_4 \times {}^{8}P_4 \times {}^{4}P_4 \times {}^{3}P_3$

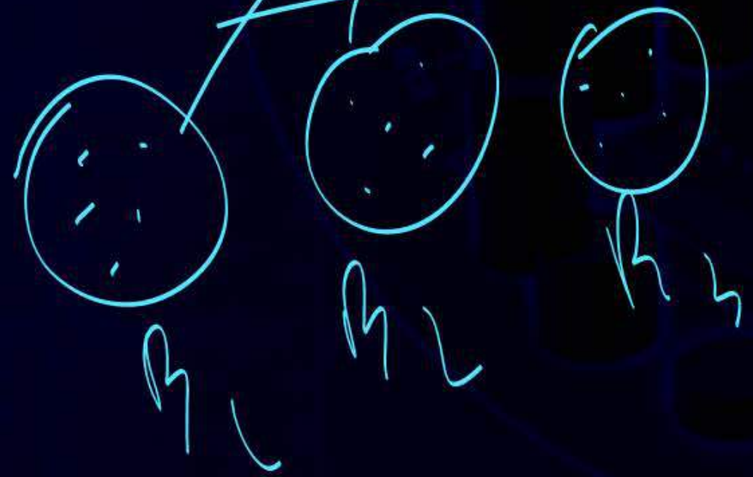
CA

12 Student
↓
3 group

$$\frac{{}^{12}C_4 \times {}^{8}C_4 \times {}^{4}C_4}{3!}$$

15 mangoes
↓
3 bacho

$$\rightarrow \frac{{}^{15}C_5 \times {}^{10}C_5 \times {}^{5}C_5}{}$$



$10 - 1 = 9$ $\quad$ $^{9}P_{4}$

1, 2

→ 6Q ≤ 4

→ 6Q ≤ 4

6 ques

600 → 2, 2, 2, 3, 5, 5

2	600
2	300
2	150
3	75
5	25
5	5
	1

	6 ≤ 4	6 ≤ 4	Total → 6
(1)	4	2	$^6C_4 \times {}^6C_2$ +
(2)	2	4	$^6C_2 \times {}^6C_4$
(3)	3	3	$+ {}^6C_3 \times {}^6C_3$

$S_1 S_3$ $S_2 S_3$ $S_1 S_2$

$B_1\ B_2\ B_3\ B_4$ $S_1\ S_2\ S_3$

$^{28}C_{2r}$ $= \frac{255}{11}$

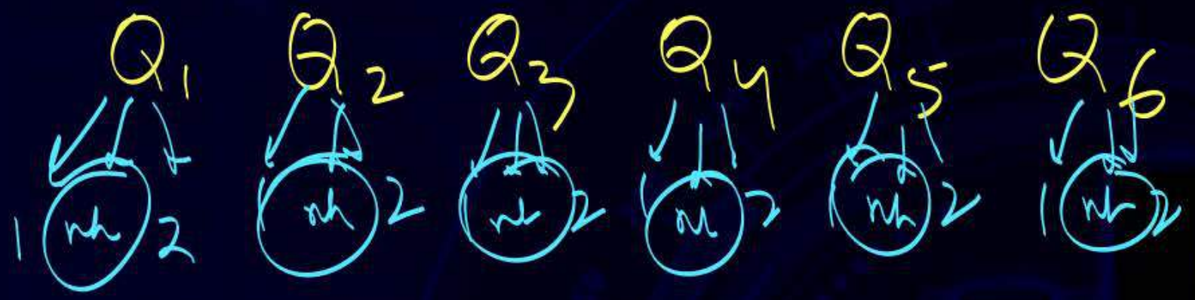
$^{24}C_{2r-4}$ GBL

(1) $\Rightarrow$ $^5P_5 \times {}^3P_3$

---

(2) $B_1\ B_2\ B_3\ B_4\ B_1$

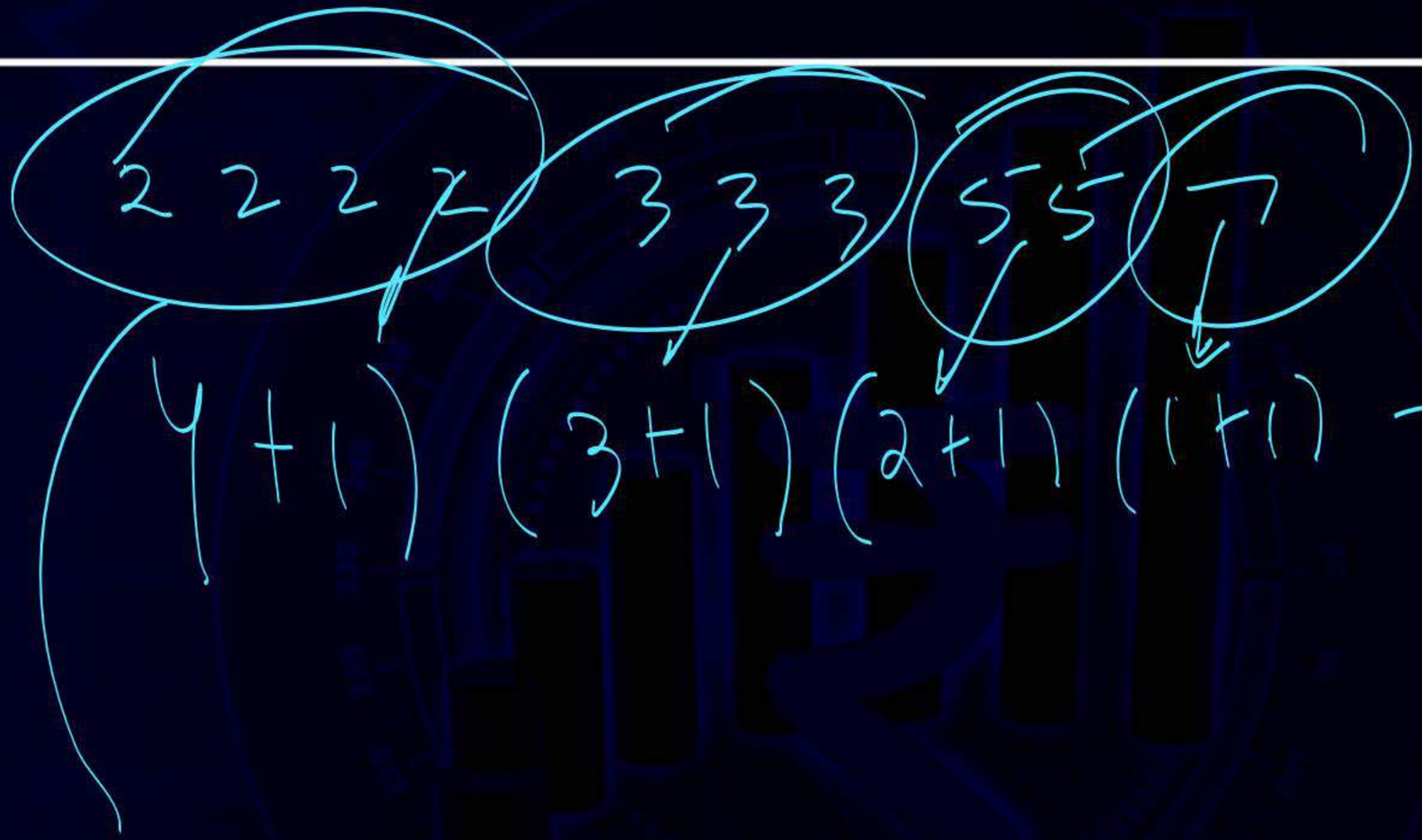
$^5P_5 \times {}^6P_3$



$\Rightarrow 3 \times 3 \times 3 \times 3 \times 3 \times 3 - 1$

$n_{C_2} = {}^{n+2}C_3$

$\Rightarrow \frac{n \times n-1}{2 \times 1} = \frac{(n+2)(n+1)n}{3 \times 2 \times 1}$


2 2 2 2
3 3 3
5 5
7
(4+1)(3+1)(2+1)(1+1) - 1

Homework

Practice

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Summary of the lecture

$75600 = 2^4 \cdot 3^3 \cdot 5^2 \cdot 7^1$

$(4+1)\times(3+1)\times(2+1)\times(1+1)$

$= 5\times4\times3\times2 = 120$

(i) Doubt Session

(1) one digit → 2, 3, 5, 7 → 4

(2) _ _ = $^3C_1 \times \frac{^2P_2}{2!} + {}^4P_2$

2	75600
2	37800
2	18900
2	9450
5	4725
5	945
3	189
3	63
3	21
7	7
	1

(3) 3 _ _ _


Thank You
MARKET
PROFIT
SERVICE

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

SEQUENCE AND SERIES

Q1 The first three terms of a sequence when n^{th} term (t_n) is $n^3 - n$ are:
(A) $6,\ 24,\ 25$
(B) $0,\ 6,\ 24$
(C) $1,\ 2,\ 5$
(D) None of these

Q2 $\sum_{i=1}^{4} \sqrt{5-i}$ can be written as
(A) $2+\sqrt{2}+\sqrt{3}$ (B) $3+\sqrt{2}+\sqrt{3}$
(C) $\sqrt{2}+\sqrt{3}+\sqrt{5}+1$ (D) None of these

Q3 The 20th term of the progression 1, 4, 7, 10 ..... is
(A) 58 (B) 52
(C) 50 (D) None of these

Q4 The nth term of the sequence 1, 3, 5, 7,..... is
(A) n (B) 2n - 1
(C) 2n + 1 (D) None of these

Q5 Divide 24 into three parts which are in arithmetic progression (A.P.) and such that the product of the first two parts is 48. Find the three parts.
(A) $4,\ 8,\ 12$
(B) $6,\ 12,\ 18$
(C) $3,\ 6,\ 9$
(D) $6,\ 8,\ 10$

Q6 The sum of the series 9, 5, 1,.... to 100 terms is
(A) –18,900 (B) 18,900
(C) 19,900 (D) None of these

Q7 The first and the last term of an AP are –4 and 146 respectively. The sum of the terms is 7171. The number of terms is
(A) 101 (B) 100
(C) 99 (D) None of these

Q8 The last term of the A.P. 0.6, 1.2, 1.8,... to 13 terms is
(A) 8.7 (B) 7.8
(C) 7.7 (D) None of these

Q9 The arithmetic mean between 33 and 77 is
(A) 50 (B) 45
(C) 55 (D) None of these

Q10 The sum of all odd numbers between 200 and 300 is
(A) 11,600 (B) 12,490
(C) 12,500 (D) 24,750

Q11 The value of x such that 8x + 4, 6x – 2, 2x + 7 will form an A.P. is
(A) 15 (B) 2
(C) $\frac{15}{2}$ (D) None of these

Q12 The sum of three integers in AP is 15 and their product is 80. The integers are
(A) 2, 8, 5 (B) 8, 2, 5
(C) 2, 5, 8 (D) None of these

Answer Key

Q1	(B)	Q7	(A)
Q2	(B)	Q8	(B)
Q3	(A)	Q9	(C)
Q4	(B)	Q10	(C)
Q5	(D)	Q11	(C)
Q6	(A)	Q12	(C)

Hints & Solutions

Q1 Text Solution:

Given: n^{th} term of the sequence, $t_n = n^3 - n$

For $n = 1$, we get

$t_1 = 1^3 - 1 = 0$

For $n = 2$, we get

$t_2 = 2^3 - 2 = 8 - 2 = 6$

For $n = 3$, we get

$t_3 = 3^3 - 3 = 27 - 3 = 24$

Therefore, the first three terms of sequence are $0,\ 6,\ 24$.

Hence, the correct option is (B).

Q2 Text Solution:

We have,

$\sum_{i=1}^{4} \sqrt{5-i}$

On expanding,

$\Rightarrow \sum_{i=1}^{4} \sqrt{5-i} = \sqrt{5-1} + \sqrt{5-2}$

$+ \sqrt{5-3} + \sqrt{5-4}$

$\Rightarrow \sum_{i=1}^{4} \sqrt{5-i} = \sqrt{4} + \sqrt{3} + \sqrt{2} + \sqrt{1}$

$\Rightarrow \sum_{i=4}^{7} \sqrt{2i-1} = 2 + \sqrt{3} + \sqrt{2} + 1 = 3$

$+ \sqrt{2} + \sqrt{3}$

Hence, the correct option is (B).

Q3 Text Solution:

Given: $1,\ 4,\ 7,\ 10$

Here, the common difference is the same. So, given progression is in A.P.

We know that,

n^{th} term of an A.P. is given by $a_n = a + (n-1)d$ where, a = first term and d = common difference

Here, $a = 1,\ d = 3$ and $n = 20$

Thus, $a_{20} = 1 + (20-1) \times 3$

$\Rightarrow a_{20} = 58$

Therefore, the correct option is (A) i.e., 58.

Q4 Text Solution:

Given sequence: $1,\ 3,\ 5,\ 7,\ .....$

We know that, n^{th} term of an A.P. is given by $a_n = a + (n-1)d$ where, a = first term, d = common difference

Here, $a = 1$ and $d = 3 - 1 = 2$

Thus, $a_n = a + (n-1)d$

$\Rightarrow a_n = 1 + (n-1)2$

$\Rightarrow a_n = 1 + 2n - 2$

$\therefore a_n = 2n - 1$

Hence, the correct option is (B).

Q5 Text Solution:

Let the three parts of A.P. be $a - d$, a and $a + d$.

Given that the product of the first two parts is 48, we have:

$(a-d) \times a = 48$

$a^2 - da = 48$ ---- (1)

Also, the sum of the three parts is 24

(a - d) + a + (a + d) = 24

3a = 24

a = 8

Substituting the value of 'a' in equation (1), we get:

8^2 - 8d = 48

64 - 8d = 48

8d = 16

d = 2

So, the three parts are:

$a - d = 8 - 2 = 6,$

$a = 8,$

$a + d = 8 + 2 = 10$

Hence, the correct option is (D) i.e., $6,\ 8,\ 10$.

Q6 Text Solution:

Given series,

$9,\ 5,\ 1,\ \ldots..\ 100$ terms

Since, the common difference is same. So, the given series is in A.P.

We know that,

Sum of first n terms of an A.P. is given by,

$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

Substituting $a = 9,\ d = 5 - 9 = -4,\ n = 100$

$\Rightarrow S_{100} = \frac{100}{2}\left[2 \times 9 + (100-1) \times (-4)\right]$

$\Rightarrow S_{100} = \frac{100}{2}\left[18 - 396\right]$

$\therefore S_{100} = -18,900$

Thus, the correct option is (A).

Q7 Text Solution:

We know that, Sum of first n terms of an A.P. is given by,

$S_n = \frac{n}{2}[a + l]$

where, a = first term and l = last term

Given that,

$a = -4$

$l = 146$

$S_n = 7171$

Now, substituting the given values

$\Rightarrow 7171 = \frac{n}{2}\left[-4 + 146\right]$

$\Rightarrow 7171 = \frac{n(142)}{2}$

$\therefore n = 101$

Therefore, the correct option is (A) i.e., 101.

Q8 Text Solution:

We have,

0.6, 1.2, 1.8,... to 13 terms

Here,

First term (a) = 0.6

Common difference (d) = 1.2 - 0.6 = 0.6

Number of terms (n) = 13

We know that,

n^{th} term of an A.P. is given by

$a_n = a + (n-1)d$

Since, the number of terms are 13 , thus the last term is given by

$a_n = a + (n-1)d$

$\Rightarrow a_{13} = 0.6 + (13-1) \times 0.6$

$\Rightarrow a_{13} = 0.6 + 7.2$

$\therefore a_{13} = 7.8$

Therefore, the correct option is (B) i.e., 7.8.

Q9 Text Solution:

We know that,

A.M. of a & b $= \frac{a+b}{2}$

Thus, A.M. between 33 and 77 is given by,

$A.M = \frac{33+77}{2}$

$\Rightarrow A.M = \frac{110}{2}$

$\Rightarrow A.M = 55$

Therefore, the arithmetic mean between 33 and 77 is 55.

Hence, the correct option is (C).

Q10 Text Solution:

We know that,

The odd numbers between 200 and 300 are 201, 203, 205 .....,299

Clearly, it is an A.P with first term as 201 & common difference as 2.

Now, nth term of an A.P. is given by

$a_n = a + (n-1)d$

$299 = 201 + (n-1)2$

$\Rightarrow (n-1)2 = 98$

$\Rightarrow (n-1) = 49$

$\Rightarrow n = 50$

Now, the sum of first n terms of an A.P. is given by,

$S_n = \frac{n}{2}[a + l]$

where, a = first term, l = last term and n be the number of terms

$\Rightarrow S_n = \frac{50}{2}[201 + 299]$

$\Rightarrow S_n = 25 \times 500$

$\therefore S_n = 12500$

Hence, the correct option is (C) i.e., 12500.

Q11 Text Solution:

Given three terms:

First term, $a_1 = 8x + 4$

Second term, $a_2 = 6x - 2$

Third term, $a_3 = 2x + 7$

We know that,

In an A.P., the common difference between two adjacent terms is always constant.

Thus, we get

$d = a_2 - a_1 = a_3 - a_2$

$\Rightarrow (6x - 2) - (8x + 4) = (2x + 7) - (6x - 2)$

$\Rightarrow 6x - 2 - 8x - 4 = 2x + 7 - 6x + 2$

$\Rightarrow -2x - 6 = -4x + 9$

$\Rightarrow 2x = 15$

$\therefore x = \frac{15}{2}$

Thus, the correct option is (C).

Q12 Text Solution:

Let the first term be a and common difference be d.$= 80$

Let the three terms of AP are $a - d, a, a + d.$

According to question,

Sum of three terms =15, then

$a - d + a + a + d = 15$

$\Rightarrow 3a = 15$

$\Rightarrow a = 5 \quad \ldots . (i)$

Also, product of three terms $= 80$

$(a - d)(a)(a + d) = 80$

$\Rightarrow (5 - d)(5)(5 + d) = 80 \quad (from\ i)$

$\Rightarrow 5(25 - d^2) = 80$

$\Rightarrow 25 - d^2 = \frac{80}{5}$

$\Rightarrow 25 - d^2 = 16$

$\Rightarrow d^2 = 9$

$\Rightarrow d = \pm 3$

Thus, the numbers are 2, 5, 8 or 8, 5, 2.

Hence, out of the given options, the correct option is (C) i.e., 2, 5, 8.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

SEQUENCE AND SERIES

Q1 Find the $6th$ term and the common ratio of the geometric progression (G.P.):
$3,\ 9,\ 27,\ 81,\ \ldots\ldots\ldots$
(A) $255,\ 9$ (B) $343,\ 3$
(C) $729,\ 3$ (D) $2187,\ 9$

Q2 The 7th term of the series 6, 12, 24,..... is
(A) 384 (B) 834
(C) 438 (D) None of these

Q3 Which term of the geometric progression (G.P.) $2,\ 6,\ 18,\ \ldots\ldots\ldots$ is 1458?
(A) 6^{th}
(B) 7^{th}
(C) 8^{th}
(D) 9^{th}

Q4 The G.P whose 3rd and 6th terms are $1, -\frac{1}{8}$ respectively is
(A) $4,\ -2,\ 1\ldots\ldots$
(B) $4,\ 2,\ 1\ldots\ldots\ldots$
(C) $4,\ -1,\ \frac{1}{4}\ldots\ldots\ldots$
(D) None

Q5 The sum of the series –2, 6, –18, ... to 7 terms is
(A) –1094 (B) 1094
(C) –1049 (D) None of these

Q6 Sum of the series 1 + 3 + 9 + 27 + ... is 364. The number of terms is
(A) 5 (B) 6
(C) 11 (D) None of these

Q7 Find the sum of the infinite geometric progression $3,\ 1.5,\ 0.75,\ \ldots\ldots$
(A) 4
(B) 6
(C) 8
(D) Cannot be determined

Q8 The sum of n terms of the G.P. $3,\ 6,\ 12,\ \ldots$ is 381. Find the value of n.
(A) 3 (B) 12
(C) 5 (D) 7

Q9 If x, y, z are in G.P., then
(A) $y^2 = xz$ (B) $y\left(z^2 + x^2\right) = x\left(z^2 + y^2\right)$
(C) $2y = x + z$ (D) none of these

Q10 The second term of a G.P. is 24 and the fifth term is 81. The series is
(A) $16,\ 36,\ 24,\ 54,\ \ldots\ldots$
(B) $24,\ 36,\ 53,\ \ldots\ldots$
(C) $16,\ 24,\ 36,\ 54,\ \ldots\ldots$
(D) None of these

Q11 Which term of the G.P. $\sqrt{3},\ 3,\ 3\sqrt{3},\ \ldots\ldots\ldots$ is 729?
(A) 9th
(B) 10th
(C) 12th
(D) None of the above

Q12 The common ratio of a G.P. is 3, and the last term is 486. If the sum of these terms is 728, find the first term.
(A) 2 (B) 5
(C) 6 (D) 3

Answer Key

Q1	(C)	Q7	(B)
Q2	(A)	Q8	(D)
Q3	(A)	Q9	(A)
Q4	(A)	Q10	(C)
Q5	(A)	Q11	(C)
Q6	(B)	Q12	(A)

Hints & Solutions

Q1 Text Solution:

Given G.P.,

$3,\ 9,\ 27,\ 81,\ \ldots\ldots\ldots$

Here, the common ratio $r = \frac{t_2}{t_1} = \frac{9}{3} = 3$

Thus, $6th$ term of G.P. $= t_6 = ar^{6-1}$

$\Rightarrow t_6 = 3(3)^5$

$\Rightarrow t_6 = 3^6 = 729$

Therefore, 6th term of G.P. is 729 and the common ratio is 3.

Hence, the correct option is (C).

Q2 Text Solution:

Given series: $6,\ 12,\ 24, \ldots\ldots$

Here, $a = 2$ and $r = \frac{12}{6} = 2$

General term of G.P. is given by,

$t_n = ar^{n-1}$

Thus, the 7th term of series is,

$t_7 = ar^{7-1}$

$\Rightarrow t_7 = 6(2)^6$

$\Rightarrow t_7 = 384$

Therefore, the correct option is (A).

Q3 Text Solution:

Given: $2,\ 6,\ 18,\ \ldots\ldots\ldots,\ 1458$

Here, $a = 2, r = 3$

Let 1458 be n^{th} term of G.P., then

$t_n = 1458$

i.e., $ar^{n-1} = 1458$

$\Rightarrow 2(3)^{n-1} = 1458$

$\Rightarrow (3)^{n-1} = 729$

$\Rightarrow (3)^{n-1} = 3^5$

On comparing, we get

$n - 1 = 5$

$\Rightarrow n = 5 + 1$

$\Rightarrow n = 6$

Hence, the correct option is (A).

Q4 Text Solution:

Given: 3^{rd} and 6^{th} terms of G.P are $1, \frac{-1}{8}$ respectively.

Let n^{th} term of a G.P. be ar^{n-1}, where a is first term and r is a common ratio.

According to the question,

$\Rightarrow ar^{3-1} = 1$

$\Rightarrow ar^2 = 1 \ \ldots\ (i)$

Also, $ar^{6-1} = \frac{-1}{8}$

$\Rightarrow ar^5 = \frac{-1}{8}$

$\Rightarrow ar^2 \times r^3 = \frac{-1}{8}$

$\Rightarrow ar^2 \times r^3 = \frac{-1}{8}$

$\Rightarrow 1 \times r^3 = \frac{-1}{8}\ (\text{from eq i})$

$\Rightarrow r^3 = \left(\frac{-1}{2}\right)^3$

$\Rightarrow r = \frac{-1}{2}$

Put $r = \frac{-1}{2}$ in eq (i), we get

$\Rightarrow a \times \left(\frac{-1}{2}\right)^2 = 1$

$\Rightarrow a = 4$

So, the terms of the G.P are $4,\ 4 \times \left(\frac{-1}{2}\right),\ 4 \times \left(\frac{-1}{2}\right)^2, \ldots = 4,\ -2,\ 1, \ldots$

Hence, option (A) is correct.

Q5 Text Solution:

As we know that, Sum of first n terms of a G.P.

$S_n = \frac{a(1-r^n)}{(1-r)}$

We have,

$-2, 6, -18, \ldots\ldots$ to 7 terms

Here, $a = -2,\ r = -3,\ n = 7$

So, $S_n = \frac{a(1-r^n)}{(1-r)}$

$\Rightarrow S_7 = \frac{\left(-2\right)\left(1-(-3)^7\right)}{(1-(-3))}$

$\Rightarrow S_7 = \frac{-2\times 2188}{4}$

$\therefore S_7 = -1094$

Hence, the correct option is (A) i.e., -1094 .

Q6 Text Solution:

We have,

$1 + 3 + 9 + 27 + \ldots\ldots = 364$

We know that, Sum of first n terms of a G.P. is given by

$S_n = \frac{a(r^n-1)}{(r-1)}$

Here, $a = 1,\ r = 3,\ S_n = 364$

So, $S_n = \frac{a(r^n-1)}{(r-1)}$

$\Rightarrow S_n = \frac{(1)(3^n-1)}{(3-1)}$

$\Rightarrow \frac{(3^n-1)}{2} = 364$

$\Rightarrow 3^n - 1 = 728$

$\Rightarrow 3^n = 729$

$\Rightarrow 3^n = 3^6$

On comparing, we get

$n = 6$

Hence, the correct option is (B) i.e., 6.

Q7 Text Solution:

Given: $3,\ 1.5,\ 0.75,\ .....$

Here, $a = 3, r = \frac{1.5}{3} = \frac{15}{30} = \frac{1}{2} = 0.5$

We know,

Sum of infinite geometric progression $= \frac{a}{1-r}$

$= \frac{3}{1-0.5}$

$= \frac{3}{0.5}$

$= \frac{30}{5}$

$= 6$

Therefore, the required sum is 6.

Hence, the correct option is (B) i.e., 6.

Q8 Text Solution:

Given G.P., $3 + 6 + 12 + ... = 381$

Here, $a = 3, r = \frac{6}{3} = 2$ and $S_n = 381$

We know that,

$S_n = \frac{a(r^n - 1)}{r - 1}$

$\Rightarrow 381 = \frac{3[(2)^n - 1]}{2 - 1}$

$\Rightarrow 381 = \frac{3[(2)^n - 1]}{1}$

$\Rightarrow \frac{381}{3} = (2)^n - 1$

$\Rightarrow 127 = (2)^n - 1$

$\Rightarrow 128 = (2)^n$

$\Rightarrow 2^7 = (2)^n$

On comparing, we get

$n = 7$

Hence, the correct option is (D).

Q9 Text Solution:

As we know that,

A geometric progression is a special type of progression where the successive terms bear a constant ratio known as a common ratio.

If $x,\ y,\ z$ are in G.P., then

$\Rightarrow \frac{y}{x} = \frac{z}{y} = r$, where r is some constant

Since, $\frac{y}{x} = \frac{z}{y}$

On cross-multiplying,

$\Rightarrow y^2 = xz$

Hence, the correct option is (A).

Q10 Text Solution:

We know that, n^{th} term of an G.P. is given by $a_n = ar^{n-1}$ where, $a =$ first term and $r =$ common ratio

As per the question,

$a_2 = 24$

$\Rightarrow ar^{2-1} = 24$

$\Rightarrow ar = 24 \ ..... \ (i)$

Also, $a_5 = 81$

$\Rightarrow ar^{5-1} = 81$

$\Rightarrow ar^4 = 81 ..... (ii)$

Dividing eq (ii) by eq (i),

$\Rightarrow \frac{ar^4}{ar} = \frac{81}{24}$

$\Rightarrow r^3 = \frac{27}{8}$

$\Rightarrow r^3 = \left(\frac{3}{2}\right)^3$

$\Rightarrow r = \frac{3}{2}$

From eq (i),

$\Rightarrow a\left(\frac{3}{2}\right) = 24$

$\Rightarrow a = 16$

Thus, the series is

$16, 16 \times \frac{3}{2}, 16 \times \left(\frac{3}{2}\right)^2, 16 \times \left(\frac{3}{2}\right)^3, ...$

$= 16,\ 24,\ 36,\ 54 .....$

Hence, the correct option is (C).

Q11 Text Solution:

Given: $\sqrt{3},\ 3,\ 3\sqrt{3},\ ..... \ 729$

Here, $a = \sqrt{3}$ and $r = \frac{3}{\sqrt{3}} = \frac{\sqrt{3} \times \sqrt{3}}{\sqrt{3}} = \sqrt{3}$

Let 729 be nth term of G.P., then

$t_n = ar^{n-1}$

$\Rightarrow 729 = \sqrt{3}\left(\sqrt{3}\right)^{n-1}$

$\Rightarrow 729 = \left(\sqrt{3}\right)^n$

$\Rightarrow 3^6 = \left(\sqrt{3}\right)^n$

$\Rightarrow \left(\sqrt{3}\right)^{12} = \left(\sqrt{3}\right)^n$

On comparing, we get

$n = 12$

Therefore, 729 is 12th term of G.P.

Q12 **Text Solution:**

Given: $r = 3,\ t_n = 486$ and $S_n = 728$

We know that,

n^{th} term of G.P, $t_n = ar^{n-1}$

$\Rightarrow 486 = a(3)^{n-1}$

$\Rightarrow 486 = a(3)^n.3^{-1}$

$\Rightarrow 486 = \frac{a(3)^n}{3}$

$\Rightarrow 1458 = a(3)^n$ ..... (1)

Also, Sum of terms of G.P., $S_n = \frac{a(1-r^n)}{1-r}$

$\Rightarrow 728 = \frac{a(1-(3)^n)}{1-3}$

$\Rightarrow 728 = \frac{a(1-(3)^n)}{-2}$

$\Rightarrow -1456 = a(1 - (3)^n)$

$\Rightarrow -1456 = a - a(3)^n$

$\Rightarrow -1456 = a - 1458$ (from 1)

$\Rightarrow 1458 - 1456 = a$

$\Rightarrow a = 2$

Therefore, the first term is 2.

Hence, the correct option is (A).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

SEQUENCE AND SERIES

Q1 The product of the first three terms of a G.P. is -1. Find the middle term.

(A) -1 (B) 0

(C) 1 (D) 3

Q2 How many terms of the G.P. $3, \frac{3}{2}, \frac{3}{4}, \ldots\ldots$ be taken together to make $\frac{3069}{512}$?

(A) 7

(B) 8

(C) 10

(D) Cannot be determined

Q3 The first term of an A.P. is 5, the common difference is 3, and the last term is 80; find the number of terms.

(A) 78 (B) 26

(C) 15 (D) None of these

Q4 The sum of a series in A.P. is 72, the first term is 17 and the common difference –2. The number of terms is _____.

(A) 6 (B) 12

(C) 6 or 12 (D) None

Q5 The sum of n terms of an A.P. is $2n^2 + 3n$. Find the nth term.

(A) 4n + 1 (B) 4n - 1

(C) 2n + 1 (D) 2n - 1

Q6 If the sum of n terms of a G.P. with last term 128 and common ratio 2 is 255, the value of n is _____.

(A) 8 (B) 5

(C) 3 (D) None

Q7 A man saved ₹16500 in ten years. In each year after the first, he saved ₹100 more than he did in the preceding year. How much did he save in the first year?

(A) ₹1000 (B) ₹1100

(C) ₹1200 (D) ₹1500

Q8 The sum of the first two terms of a G.P. is $\frac{5}{3}$ and the sum to infinity of the series is 3. The common ratio is

(A) $\frac{1}{3}$ (B) $\frac{2}{3}$

(C) $\frac{4}{3}$ (D) $\frac{5}{3}$

Q9 If the third term of G.P is the square of first term and the fifth term is 64, the series would be _____ .

(A) $4 + 8 + 16 + 32 + \ldots\ldots$

(B) $4 - 8 + 16 - 32 + \ldots\ldots$

(C) both

(D) None

Q10 If the sum of three numbers in G.P is 35 and their product is 1000

then the numbers are _____ .

(A) $20, 10, 5$ (B) $5, 10, 20$

(C) both (D) None

Q11 Find the sum of the following arithmetic progression:

$3, \frac{9}{2}, 6, \frac{15}{2}, \ldots$ to 25 terms

(A) 450 (B) 500

(C) 525 (D) 800

Q12 Find the sum of the following series:

$0.5 + 0.55 + 0.555 + \ldots.$ to n terms

(A) $\frac{5}{81}\left[n - \frac{(1-0.1^n)}{9}\right]$

(B) $\frac{5}{9}\left[n - \frac{(1-0.1^n)}{9}\right]$

(C) $\frac{1}{9}\left[n - \frac{(1+0.1^n)}{9}\right]$

(D) None of the above

Answer Key

Q1	(A)	Q7	(C)
Q2	(C)	Q8	(B)
Q3	(B)	Q9	(C)
Q4	(C)	Q10	(C)
Q5	(A)	Q11	(C)
Q6	(A)	Q12	(B)

Hints & Solutions

Q1 Text Solution:

Let the three terms of G.P. be $\frac{a}{r},\ a,\ ar$

According to the question,

Product of the first three terms of a G.P. $= \ -1$

$\Rightarrow \frac{a}{r} \times a \times ar = \ -1$

$\Rightarrow a^3 = \ -1$

$\Rightarrow a^3 = (-1)^3$

$\Rightarrow a = \ -1$

Therefore, the middle term is -1.

Hence, the correct option is (A).

Q2 Text Solution:

Given, $3 + \frac{3}{2} + \frac{3}{4} + \ \ldots\ldots\ldots \ = \frac{3069}{512}$

Here, $a = 3, r = \frac{\frac{3}{2}}{3} = \frac{1}{2} = 0.5$ and $S_n = \frac{3069}{512}$

We know that,

$S_n = \frac{a(1-r^n)}{1-r}$

$\Rightarrow \frac{3069}{512} = \frac{3(1-(0.5)^n)}{1-0.5}$

$\Rightarrow \frac{3069}{512} = \frac{3(1-(0.5)^n)}{0.5}$

$\Rightarrow \frac{3069}{512} \times \frac{0.5}{3} = 1 \ - \ (0.5)^n$

$\Rightarrow \frac{1023}{512} \times \frac{1}{2} = 1 \ - \ (0.5)^n$

$\Rightarrow \frac{1023}{1024} = 1 \ - \ (0.5)^n$

$\Rightarrow 1 - \frac{1023}{1024} = (\frac{5}{10})^n$

$\Rightarrow \frac{1}{1024} = \left(\frac{1}{2}\right)^n$

$\Rightarrow \left(\frac{1}{2}\right)^{10} = \left(\frac{1}{2}\right)^n$

$\Rightarrow n = 10$

Therefore, the number of terms is 10.

Hence, the correct option is (C).

Q3 Text Solution:

Given: $a = 5,\ d = 3$ and a_n or $l = 80$

We know that,

$a_n = a + (n-1)d$

$\Rightarrow \ 80 = 5 + (n-1)3$

$\Rightarrow \ 80 = 5 + 3n - 3$

$\Rightarrow \ 80 = 2 + 3n$

$\Rightarrow \ 78 = 3n$

$\Rightarrow \ n = 26$

Therefore, the number of terms is 26.

Hence, the correct option is (B).

Q4 Text Solution:

Sum of first n term of an A.P. is given by,

$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

Here, $S_n = 72,\ a = 17,\ d = -2$

$\Rightarrow 72 = \frac{n}{2}\left[2 \times 17 + (n-1) \times (-2)\right]$

$\Rightarrow 72 = n\left(17 - (n-1)\right)$

$\Rightarrow 72 = n\left(17 - n + 1\right)$

$\Rightarrow 72 = n\left(18 - n\right)$

$\Rightarrow 72 = 18n - n^2$

$\Rightarrow n^2 - 18n + 72 = 0$

$\Rightarrow n^2 - 12n - 6n + 72 = 0$

$\Rightarrow n(n-12) - 6(n-12) = 0$

$\Rightarrow (n-12)(n-6) = 0$

$\Rightarrow n = 12 \text{ or } 6$

Hence, the correct option is (C) i.e., 6 or 12 .

Q5 Text Solution:

We have,

$S_n = 2n^2 + 3n$

So,

$S_1 = 2 + 3 = 5 = a_1$

$S_2 = a_1 + a_2 = 2 \times (2^2) + 3 \times 2 = 14$

Thus, $a_2 = S_2 - S_1 = 14 - 5 = 9$

Now, common difference of A.P. is given by

$d = a_2 - a_1 = 9 - 5 = 4$

Thus, n^{th} term of an A.P. is given by,

$a_n = a + (n-1)d$

$\Rightarrow a_n = 5 + (n-1)4$

$\Rightarrow a_n = 5 + 4n - 4$

$\Rightarrow a_n = 4n + 1$

Hence, the correct option is (A) i.e., $4n + 1$.

Q6 Text Solution:

Given: First Term $(a) = ?$

Common ratio $(r) = 2$

Last term $(t_n) = 128$

Sum of n terms i.e. $S_n = 255$

Last term (l) is given as, $t_n = ar^{n-1}$

Sum of n terms of G.P is given by, $S_n = \frac{a(1-r^n)}{1-r}$

Using, $t_n = ar^{n-1} = 128$ and $S_n = \frac{a(r^n-1)}{r-1}$

$255 = \frac{ar^{n-1} \times r - a}{r-1}$

$\Rightarrow 255 = \frac{128 \times 2 - a}{2-1}$

$\Rightarrow 255 = 256 - a$

$\Rightarrow a = 1$

Since, $S_n = \frac{a(r^n-1)}{r-1}$

$\Rightarrow 255 = \frac{1(2^n-1)}{2-1}$

$\Rightarrow 255 = 2^n - 1$

$\Rightarrow 2^n = 256$

$\Rightarrow 2^n = 2^8$

$\Rightarrow n = 8$

Hence, the correct answer is option (A).

Q7 Text Solution:

Let the amount saved in the first year be ₹ x.

According to the question,

In the second year, he saves '$x + 100$'

In the third year, he saves $x + 100 + 100 = x + 200$

And so on.

Thus, $a = x,\ d = 100,\ n = 10$ and $S_n = 16,500$

We know that,

$S_n = \frac{n}{2}[2a + (n-1)d]$

$\Rightarrow 16500 = \frac{10}{2}[2x + (10-1)100]$

$\Rightarrow 16500 = 5\ (2x + 900)$

$\Rightarrow 3300 = 2x + 900$

$\Rightarrow 2400 = 2x$

$\Rightarrow x = 1200$

Therefore, the man saved ₹1200 in the first year.

Hence, the correct option is (C).

Q8 Text Solution:

Given,

Sum of the first two terms $= \frac{5}{3}$

Sum to infinity of the series $= 3$

We know that,

Sum of first n terms of a G.P. is given by

$S_n = \frac{a(1-r^n)}{(1-r)}$

Sum of infinite geometric series,

$S_\infty = \frac{a}{1-r}$

Now, as per question

Sum of the first two terms $= \frac{5}{3}$

i.e., $S_2 = \frac{5}{3}$

$\Rightarrow \frac{a(1-r^2)}{(1-r)} = \frac{5}{3} \ldots\ldots \left(i\right)$

Also, sum to infinity of the series = 3

i.e., $S_\infty = 3$

$\Rightarrow \frac{a}{1-r} = 3$

Putting above value in eq (i),

$\Rightarrow 3 \times \left(1 - r^2\right) = \frac{5}{3}$

$\Rightarrow 1 - r^2 = \frac{5}{9}$

$\Rightarrow r^2 = 1 - \frac{5}{9}$

$\Rightarrow r^2 = \frac{4}{9}$

$\Rightarrow r = \pm\frac{2}{3}$

Hence, out of the given option, the correct option is (B).

Q9 Text Solution:

Let the first five terms of G.P is $a,\ ar,\ ar^2,\ ar^3,\ ar^4$.

where, first term is a and common ratio is r.

Now, according to the question,

$ar^2 = a^2$

$\Rightarrow r^2 = a \quad \ldots(i)$

According to the second condition, we have

$ar^4 = 64$

$\Rightarrow a\left(r^2\right)^2 = 64$

$\Rightarrow a \times a^2 = 64 \quad \left(\because r^2 = a\right)$

$\Rightarrow a^3 = 4^3$

$\Rightarrow a = 4$

Put $a = 4$ in equation (i), we get

$\Rightarrow r^2 = 4$

$\Rightarrow r = \pm 2$

If $r = 2$

So, terms of series will be $4,\ 4 \times 2,\ 4 \times 2^2,\ 4 \times 2^3,\ 4 \times 2^4$

$= 4,\ 8,\ 16,\ 32,\ 64$

If $r = -2$

So, terms of series will be $4, 4 \times (-2) 2, 4 \times (-2)^2, 4 \times (-2)^3, 4 \times (-2)^4$

$= 4, -8, 16, -32, 64$

Therefore, the series are $4 + 8 + 16 + 32 + \ldots\ldots$ and $4 - 8 + 16 - 32 + \ldots\ldots$.

Hence, option (C) is correct i.e., both.

Q10 Text Solution:

Given that the sum of three number in G.P is 35 and their product is 1000.

Let three terms of G.P is $\frac{a}{r}, a, ar$

According to the question

$\frac{a}{r} \times a \times ar = 1000$

$\frac{a}{r} \times a \times ar = 1000$

$\Rightarrow a^3 = 1000$

$\Rightarrow a^3 = 10^3$

$\Rightarrow a = 10$

Also, $\frac{a}{r} + a + ar = 35$

$\Rightarrow \frac{10}{r} + 10 + 10r = 35$

$\Rightarrow \frac{10 + 10r + 10r^2}{r} = 35$

$\Rightarrow 10 + 10r + 10r^2 = 35r$

$\Rightarrow 10r^2 + 10r - 35r + 10 = 0$

$\Rightarrow 10r^2 - 25r + 10 = 0$

$\Rightarrow 5(2r^2 - 5r + 2) = 0$

$\Rightarrow 2r^2 - 5r + 2 = 0$

$\Rightarrow 2r^2 - 4r - r + 2 = 0$

$\Rightarrow 2r(r - 2) - (r - 2) = 0$

$\Rightarrow (2r - 1)(r - 2) = 0$

$\Rightarrow (2r - 1) = 0$ or $r - 2 = 0$

$\Rightarrow r = \frac{1}{2}$ or 2

If $r = 2$

Terms will be $\frac{10}{2}, 10, 10 \times 2 = 5, 10, 20$

If $r = \frac{1}{2}$

Terms of G.P will be $\frac{10}{\frac{1}{2}}, 10, 10 \times \frac{1}{2} = 20, 10, 5$

Hence, option (C) is correct i.e., both.

Q11 Text Solution:

According to the question,

$a = 3,$

$d = \frac{9}{2} - 3 = \frac{9-6}{2} = \frac{3}{2}$

$n = 25$

We know that,

Sum of an A.P., $S_n = \frac{n}{2}[2a + (n-1)d]$

$= \frac{25}{2}\left[6 + (25-1)\frac{3}{2}\right]$

$= \frac{25}{2}\left[6 + (24)\frac{3}{2}\right]$

$= \frac{25}{2}\left[6 + 36\right]$

$= \frac{25}{2}\left[42\right]$

$= 525$

Hence, the correct option is (C).

Q12 Text Solution:

Given series: $0.5 + 0.55 + 0.555 + \ldots.$

Taking 5 as a common term, we get

$5(0.1 + 0.11 + 0.111 + \ldots\ldots\ldots)$

Dividing and multiplying the above series by 9, we get

$= \frac{5}{9}(0.9 + 0.99 + 0.999 + \ldots\ldots\ldots$ upto n terms)

$= \frac{5}{9}[(1 - 0.1) + (1 - 0.1^2) + (1 - 0.1^3) + \ldots\ldots\ldots$

upto n terms]

$= \frac{5}{9}\left[(1 + 1 + 1 + \ldots.. + n)\right.$

$\left. - (0.1 + 0.1^2 + 0.1^3 + \ldots\ldots + 0.1^n)\right]$

The terms $0.1 + 0.1^2 + 0.1^3 + \ldots.$ are in geometric progression (G.P.) with $a = 0.1,\ r = 0.1$, using the formula of sum of n terms of G.P.

$S_n = \frac{a(1 - r^n)}{(1 - r)}$ when $r < 1$

So,

$= \frac{5}{9}\left[n - \frac{0.1(1 - 0.1^n)}{(1 - 0.1)}\right]$

$= \frac{5}{9}\left[n - \frac{0.1(1 - 0.1^n)}{0.9}\right]$

$= \frac{5}{9}\left[n - \frac{(1 - 0.1^n)}{9}\right]$

Therefore, $0.5 + 0.55 + 0.555 + \ldots.$ to n terms $= \frac{5}{9}\left[n - \frac{(1 - 0.1^n)}{9}\right]$

Hence, the correct option is (B).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

SEQUENCE AND SERIES

Q1 The 4th term of the series $0.04,\ 0.2,\ 1,\ \ldots$ is
(A) 0.05 (B) $\frac{1}{2}$
(C) 5 (D) None of these

Q2 The last term of the series 5, 7, 9,..... to 21 terms is
(A) 44 (B) 43
(C) 45 (D) None of these

Q3 The number of numbers between 74 and 25,556 divisible by 5 is
(A) 5,090 (B) 5,097
(C) 5,095 (D) None of these

Q4 If you save 1 paise today, 2 paise the next day, 4 paise the succeeding day and so on, then your total savings in two weeks will be
(A) ₹ 163 (B) ₹ 183
(C) ₹ 163.83 (D) None of these

Q5 The number of terms to be taken so that $1 + 2 + 4 + 8 + \ldots\ldots$ will be 8191 is
(A) 10 (B) 13
(C) 12 (D) None of these

Q6 If the terms $2x,\ (x + 10)$ and $(3x + 2)$ be in A.P., the value of x is
(A) 7 (B) 10
(C) 6 (D) None of these

Q7 The sum of a certain number of terms of an A.P. $-8,\ -6,\ -4,\ \ldots\ldots$ is 52. The number of terms is
(A) 12 (B) 13
(C) 11 (D) None of these

Q8 The sum of the infinite series $1 + \frac{2}{3} + \frac{4}{9} + \ldots\ldots$ is
(A) $\frac{1}{3}$ (B) 3
(C) $\frac{2}{3}$ (D) None of these

Q9 A sum of ₹6240 is paid off in 30 installments such that each installment is ₹10 more than the proceeding installment. The value of the 1st installment is
(A) ₹36 (B) ₹30
(C) ₹60 (D) ₹63

Q10 The sum of the series $3\frac{1}{2} + 7 + 10\frac{1}{2} + 14 + \ldots.$ to 17 terms is
(A) 530 (B) 535
(C) $535\frac{1}{2}$ (D) None of these

Q11 A person saved ₹16,500 in ten years. In each year after the first year he saved ₹100 more than he did in the preceding year. The amount of money he saved in the 1st year was
(A) ₹1000 (B) ₹1500
(C) ₹1200 (D) none of these

Q12 The sum of the infinite G.P., $14, -2, +\frac{2}{7}, -\frac{2}{49}, + \ldots.$ is
(A) $4\frac{1}{12}$ (B) $12\frac{1}{4}$
(C) 12 (D) None of these

Q13 The last term of the series $1,\ 2,\ 4,\ \ldots.$ to 10 terms is
(A) 512 (B) 256
(C) 1024 (D) None of these

Q14 The sum of n terms of the series $1 + 3 + 5 + \ldots\ldots\ldots$ is
(A) n^2 (B) $2n^2$
(C) $\frac{n^2}{2}$ (D) None

Q15 The sum of the series $1 + 2 + 4 + 8 + \ldots.$ to n terms is
(A) $2^n - 1$ (B) $2n - 1$
(C) $2n + 1$ (D) None of these

Q16 The sum of first n natural numbers is

(A) $\frac{n}{2}(n+1)$ (B) $\frac{n}{6}(n+1)(2n+1)$

(C) $\left[\frac{n}{2}(n+1)\right]^2$ (D) None

Q17 How many terms of the G.P. $1, 4, 16 \ldots.$ are to be taken to have their sum 341?

(A) 8 (B) 5

(C) 3 (D) None

Q18 The sum of all natural numbers between 500 and 1000 which are divisible by 13, is

(A) 28405 (B) 24805

(C) 28540 (D) none of these

Q19 The sum of 3 numbers of a G P is 39 and their product is 729. The numbers are

(A) 3, 27, 9 (B) 9, 3, 27

(C) 3, 9, 27 (D) None of these

Q20 The number of the terms of the series $10 + 9\frac{2}{3} + 9\frac{1}{3} + 9 + \ldots\ldots\ldots\ldots$ will amount to 155 is

(A) 30 (B) 31

(C) 32 (D) Both A and B

Answer Key

Q1	(C)	Q11	(C)
Q2	(C)	Q12	(B)
Q3	(B)	Q13	(A)
Q4	(C)	Q14	(A)
Q5	(B)	Q15	(A)
Q6	(C)	Q16	(A)
Q7	(B)	Q17	(B)
Q8	(B)	Q18	(A)
Q9	(D)	Q19	(C)
Q10	(C)	Q20	(D)

Hints & Solutions

Q1 Text Solution:

General term of G.P. is given by,

$t_n = ar^{n-1}$

where,

$a =$ first term $= 0.04$

$r =$ common ratio $= \frac{0.2}{0.04} = 5$

So, the 4^{th} term of series is,

$t_4 = ar^{4-1}$

$\Rightarrow t_4 = (0.04) \times (5)^3$

$\Rightarrow t_4 = \frac{4}{100} \times 125$

$\Rightarrow t_4 = \frac{500}{100}$

$\Rightarrow t_4 = 5$

Therefore, the correct option is (C) i.e., 5 .

Q2 Text Solution:

We have,

$5,\ 7,\ 9,\ \ldots\ldots$ to 21 terms

Since, the common difference is same, thus the given sequence is an A.P.

Here,

First term $(a) = 5$

Common difference $(d) = 7 - 5 = 2$

Number of terms $(n) = 21$

We know that,

n^{th} term of an A.P. is given by,

$a_n = a + (n-1)d$

$\Rightarrow a_{21} = 5 + (21-1)2$

$\Rightarrow a_{21} = 5 + 40$

$\therefore a_{21} = 45$

Therefore, the correct option is (C) i.e., 45 .

Q3 Text Solution:

We know that,

The numbers between 74 and 25,556 divisible by 5 is given by:

$75,\ 80,\ 85,\ 90,\ \ldots\ldots\ 25,555$

First term, $a = 75$

Common difference, $d = 5$

Last term, $a_n = 25555$

We know that,

n^{th} term of an A.P. is given by,

$a_n = a + (n-1)d$

$\Rightarrow 25555 = 75 + (n-1) \times 5$

$\Rightarrow 25555 = 75 + 5n - 5$

$\Rightarrow 25555 = 70 + 5n$

$\Rightarrow 25485 = 5n$

$\therefore n = 5097$

Thus, the correct option is (B) i.e., 5097.

Q4 Text Solution:

According to the question,

First day saving = 1 paise

Second day saving = 2 paise

Third day saving = 4 paise

That means every next day saving double from the previous day.

i.e., $1, 2, 4, 8, 16, \ldots\ldots\ldots\ to\ 14$ terms (Since, 2 weeks $= 14$ days)

Here, the common ratio is the same so it is in G.P.

As we know that,

Sum of first n terms of a G.P.

$S_n = \frac{a(r^n - 1)}{(r-1)}$

$\Rightarrow S_{14} = \frac{1 \times (2^{14} - 1)}{(2-1)}$

$\Rightarrow S_{14} = 16,383\ paise$ or ₹163.83

Thus, the saving in two weeks is ₹163.83

Hence, the correct option is (C) i.e., ₹163.83.

Q5 Text Solution:

We have,

$1 + 2 + 4 + 8 + \ldots. = 8191$

We know that,

Sum of first n terms of a G.P.

$S_n = \frac{a(r^n - 1)}{(r-1)}$

Here, $a = 1,\ r = 2,\ S_n = 8191$

So,

$S_n = \frac{a(r^n-1)}{(r-1)}$

$\Rightarrow S_n = \frac{(1)(2^n-1)}{(2-1)}$

$\Rightarrow \frac{(2^n-1)}{(2-1)} = 8191$

$\Rightarrow 2^n - 1 = 8191$

$\Rightarrow 2^n = 8192$

$\Rightarrow 2^n = 2^{13}$

On comparing, we get

$n = 13$

Hence, the correct option is (B) i.e., 13.

Q6 Text Solution:

We know that, If $a, b \& c$ are in A.P., then $b = \frac{a+c}{2}$

We have given, $2x, (x+10)$ and $(3x+2)$ are in A.P.

$\Rightarrow \left(x+10\right) = \frac{2x+(3x+2)}{2}$

$\Rightarrow 2x + 20 = 5x + 2$

$\Rightarrow 2x - 5x = -20 + 2$

$\Rightarrow -3x = -18$

$\therefore x = 6$

Hence, the correct option is (C) i.e., 6 .

Q7 Text Solution:

As we know that,

Sum of first n terms of an A.P. is given by,

$S_n = \frac{n}{2}[2a + (n-1)d]$

We have given A.P. as, $-8, -6, -4, \ldots\ldots$

Here, $a = -8, d = 2, S_n = 52$

Substituting values in above formula,

$\Rightarrow 52 = \frac{n}{2}[2 \times (-8) + (n-1)(2)]$

$\Rightarrow 52 = n(-8 + n - 1)$

$\Rightarrow 52 = -9n + n^2$

$\Rightarrow n^2 - 9n - 52 = 0$

$\Rightarrow n^2 - 13n + 4n - 52 = 0$

$\Rightarrow n(n-13) + 4(n-13) = 0$

$\Rightarrow (n-13)(n+4) = 0$

$\Rightarrow n = 13 \; or \; n = -4 \; (not \; possible)$

$\therefore n = 13$

Therefore, the correct option is (B) i.e., 13.

Q8 Text Solution:

We know that, Sum of infinite geometric series,

$S_\infty = \frac{a}{1-r}$ when $-1 < r < 1$

Given G.P. series is $1 + \frac{2}{3} + \frac{4}{9} + \ldots\ldots$

Here, $a = 1, r = \frac{2}{3}$

So,

$S_\infty = \frac{1}{1-\frac{2}{3}}$

$\Rightarrow S_\infty = \frac{1}{\frac{1}{3}}$

$\Rightarrow S_\infty = 3$

Thus, the correct option is (B) i.e., 3 .

Q9 Text Solution:

Let, the first installment be x

It is given that, each installment is ₹10 more than the proceeding installment

i.e., second installment $= x + 10$

Third installment $= x + 20$

.

.

30th installment $= x + 290$

This forms an A.P. with common difference is 10.

We know that, sum of first n terms of an A.P. is given by,

$S_n = \frac{n}{2}[a + l]$

where, $a =$ first term and $l =$ last term

$\Rightarrow 6240 = \frac{30}{2}[x + x + 290]$

$\Rightarrow 2x + 290 = 416$

$\Rightarrow 2x = 126$

$\therefore x =$ ₹63

Hence, the correct option is (D) i.e., ₹63.

Q10 Text Solution:

Sum of first n term of an A.P. is given by,

$S_n = \frac{n}{2}[2a + (n-1)d]$

Given that,

$a = 3\frac{1}{2} = \frac{7}{2},$

$n = 17$

$d = 7 - 3\frac{1}{2} = \frac{7}{2}$

Now, substituting given values,

$\Rightarrow S_n = \frac{17}{2}\left[2 \times \frac{7}{2} + (17-1) \times \frac{7}{2}\right]$

$\Rightarrow S_n = \frac{17}{2}(7 + 56)$

$\Rightarrow S_n = \frac{1071}{2}$

$\therefore S_n = 535\frac{1}{2}$

Therefore, the correct option is (C).

Q11 Text Solution:

It is given that a person saved a total of ₹$16,500$ in ten years.

Also, it is given that a person uniformly increases his savings by ₹100 after every year.

So, let us take the first installment as x, then

Second installment $= x + 100$

Third installment $= x + 200$

So, we can say that these installments will form Arithmetic Progression with a common difference $(d) = 100$

$S_{10} = 16500,\ n = 10,\ d = 100$

We know that, sum to n terms of an AP is given by

$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

$\Rightarrow S_{10} = \frac{10}{2}\left[2x + (10-1)(100)\right]$

$\Rightarrow 16500 = 5\left[2x + 900\right]$

$\Rightarrow 2x + 900 = \frac{16500}{5}$

$\Rightarrow 2x + 900 = 3300$

$\Rightarrow 2x = 2400$

$\Rightarrow x = 1200$

So, the savings of the man in the first year is $Rs\ 1,200.$

Hence, the correct option is (C) i.e., ₹1200.

Q12 Text Solution:

We know that, Sum of infinite geometric series,

$S_\infty = \frac{a}{1-r}$

Given G.P. series is $14,\ -2,\ +\frac{2}{7},\ -\frac{2}{49},\ \ldots.$

Here, we have $a = 14,\ r = -\frac{2}{14} = -\frac{1}{7}$

So,

$S_\infty = \frac{14}{1-\left(-\frac{1}{7}\right)}$

$\Rightarrow S_\infty = \frac{14}{1+\frac{1}{7}}$

$\Rightarrow S_\infty = \frac{14\times 7}{8}$

$\Rightarrow S_\infty = \frac{98}{8} = \frac{49}{4}$

$\therefore S_\infty = 12\frac{1}{4}$

Thus, the correct option is (B).

Q13 Text Solution:

We know that,

General term of G.P. is given by,

$t_n = ar^{n-1}$

where,

$a =$ first term

$r =$ common ratio

Here, $a = 1,\ r = 2,\ n = 10$

So,

$t_{10} = ar^{10-1}$

$\Rightarrow t_{10} = (1) \times (2)^9$

$\therefore t_{10} = 512$

Therefore, the correct option is (A) i.e., 512 .

Q14 Text Solution:

We know that, Sum of first n term of an A.P. is given by,

$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

We have,

$1 + 3 + 5 + \ldots.$

This series is in A.P. with $a = 1\ \&\ d = 2$

So,

$\Rightarrow S_n = \frac{n}{2}\left[2 \times 1 + (n-1) \times 2\right]$

$\Rightarrow S_n = \frac{n}{2}\left[2 + 2n - 2\right]$

$\Rightarrow S_n = n^2$

Hence, the correct option is (A).

Q15 Text Solution:

We know that, Sum of first n terms of a G.P.

$S_n = \frac{a(r^n-1)}{(r-1)}$

We have,

$1\ +\ 2\ +\ 4\ +\ 8\ +\ \ldots.$ to n terms

Here, $a = 1,\ r = 2$

So, $S_n = \frac{a(r^n-1)}{(r-1)}$

$\Rightarrow S_n = \frac{1(2^n-1)}{(2-1)}$

$\therefore S_n = 2^n - 1$

Thus, the correct option is (A).

Q16 Text Solution:

The first n natural numbers are $1,\ 2,\ 3,\ 4,\ 5,\ \ldots\ldots\ldots,\ n$

The natural numbers form an A.P. with first term is 1 & common difference is 1

As we know that, Sum of first n terms of an A.P. is given by,

$S_n = \frac{n}{2}\left[2a + \left(n-1\right)d\right]$

$\Rightarrow S_n = \frac{n}{2}\left[2 \times 1 + \left(n-1\right) \times 1\right]$

$\Rightarrow S_n = \frac{n}{2}\left[2 + n - 1\right]$

$\therefore S_n = \frac{n(n+1)}{2}$

Hence, the correct option is (A).

Q17 Text Solution:

Given: First term $(a) = 1$

Common ratio $(r) = \frac{4}{1} = 4$

$S_n = 341$

Sum of n terms of G.P is given by, $S_n = \frac{a(1-r^n)}{1-r}$

$341 = \frac{1(1-4^n)}{1-4}$

$\Rightarrow 341 \times -3 = 1 - 4^n$

$\Rightarrow -1023 = 1 - 4^n$

$\Rightarrow -1023 - 1 = -4^n$

$\Rightarrow -1024 = -4^n$

$\Rightarrow 4^5 = 4^n$

$\Rightarrow n = 5$

Hence, the correct option is (B) i.e., 5.

Q18 Text Solution:

First number after 500 and divisible by 13 is 507 and number just less than 1000 and divisible by $13 = 998$

Thus, the sequence is $507,\ 520,\ \ldots\ldots\ldots,\ 988$ (n terms)

This is an A.P with first term of A.P. is 507 & common difference 13

We know that, n^{th} term of an A.P. is given by,

$a_n = a + \left(n-1\right)d$

$\Rightarrow 988 = 507 + \left(n-1\right) \times 13$

$\Rightarrow \left(n-1\right) \times 13 = 988 - 507$

$\Rightarrow \left(n-1\right) \times 13 = 481$

$\Rightarrow n - 1 = \frac{481}{13}$

$\Rightarrow n - 1 = 37$

$\therefore n = 38$

Now, Sum of first n term of an A.P. is given by,

$S_n = \frac{n}{2}\left[a + l\right]$

where, a = first term and l = last term

$\Rightarrow S_n = \frac{38}{2}\left[507 + 988\right]$

$\Rightarrow S_n = 19 \times 1495$

$\therefore S_n = 28405$

Hence, the correct option is (A) i.e., 28405.

Q19 Text Solution:

Given the sum of 3 numbers of a G P is 39 & their product is 729 .

Let the three numbers are $\frac{a}{r},\ a,\ ar$

As the product of three numbers is 729, thus

$\frac{a}{r} \times a \times ar = 729$

$\Rightarrow a^3 = 729$

Taking cube root on both sides, we get

$\Rightarrow a = 9$

As the sum of three numbers is 39 , thus

$\frac{a}{r} + a + ar = 39$

$\Rightarrow ar^2 + ar + a = 39r$

$\Rightarrow 9r^2 + 9r + 9 = 39r$

$\Rightarrow 9r^2 - 30r + 9 = 0$

$\Rightarrow 9r^2 - 27r - 3r + 9 = 0$

$\Rightarrow 9r\left(r-3\right) - 3\left(r-3\right) = 0$

$\Rightarrow \left(9r-3\right)\left(r-3\right) = 0$

$\Rightarrow r = \frac{1}{3},\ r = 3$

When $r = \frac{1}{3}$, then the numbers are 27, 9, 3.

When $r = 3$, then the numbers are 3, 9, 27.

Therefore, the correct option is (C).

Q20 Text Solution:

We have,

$10 + 9\frac{2}{3} + 9\frac{1}{3} + 9 + \ \ldots\ldots\ n$ terms

Here, $a = 10\ \&\ d = -\frac{1}{3}$

We know that, Sum of first n terms of an A.P. is given by,

$S_n = \frac{n}{2}\left[2a + \left(n-1\right)d\right]$

Given that, $S_n = 155$

$\Rightarrow \frac{n}{2}\left[2a + \left(n-1\right)d\right] = 155$

$\Rightarrow \frac{n}{2}\left[20 + \left(n-1\right)\left(-\frac{1}{3}\right)\right] = 155$

$\Rightarrow \frac{n}{2}\left(20 - \frac{1}{3}n + \frac{1}{3}\right) = 155$

$\Rightarrow \frac{n}{2}\left(\frac{61}{3} - \frac{1}{3}n\right) = 155$

$\Rightarrow \frac{n}{2}\left(\frac{61-n}{3}\right) = 155$

$\Rightarrow 61n - n^2 = 930$

$\Rightarrow n^2 - 61n + 930 = 0$

$\Rightarrow n^2 - 30n - 31n + 930 = 0$

$\Rightarrow n\left(n-30\right) - 31\left(n-30\right) = 0$

$\Rightarrow \left(n-30\right)\left(n-31\right) = 0$

$\Rightarrow n - 30 = 0 \ \& \ n - 31 = 0$

$\Rightarrow n = 30,\ 31$

Hence, the correct option is (D).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

SETS, RELATION AND FUNCTION

Q1 Write the following set in Roster form.
$A = \{x : x \text{ is an integer and } -4 \leq x < 2\}$
(A) $\{-3, -2, -1, 0, 1\}$
(B) $\{-4, -3, -2, -1, 0, 1\}$
(C) $\{0, 1\}$
(D) None

Q2 Write the following set in set-builder form.
$\{1, 4, 9, \ldots\ldots 121\}$
(A) $\{x : x = 2n, n \in N \text{ and } 1 \leq x \leq 11\}$
(B) $\{x : x = n^2, n \in N \text{ and } 1 < x < 11\}$
(C) $\{x : x = n^2, n \in N \text{and } 1 \leq x \leq 11\}$
(D) None of the above

Q3 Which of the following sets is finite?
(A) The set of months of a year.
(B) $\{1, 2, 3, \ldots\ldots\}$
(C) The set of positive integers greater than 100.
(D) None

Q4 The null set is represented by
(A) $(\emptyset)$ (B) (0)
(C) $\emptyset$ (D) none of these

Q5 Write down all the subsets of the following set?
$\{1, 2, 3\}$
(A) {1}, {2}, {3}
(B) {1}, {2}, {3}, {1, 2}, {2, 3}, {2, 3}, {1, 3}
(C) $\emptyset$, {1}, {2}, {3}, {1, 2}, {2, 3}, {1, 3}
(D) $\emptyset$, {1}, {2}, {3}, {1, 2}, {2, 3}, {1, 3}, {1, 2, 3}

Q6 The number of proper subsets of the set $\{3, 4, 5, 6, 7\}$ is
(A) 32 (B) 31
(C) 30 (D) 25

Q7 The number of subsets of the set {1, 2, 3, 5} is
(A) 4 (B) 6
(C) 8 (D) 16

Q8 If A = {a, b, c, d}, which of the following can be the element of power set P(A)?
(A) $\emptyset$, {a}, {b},{c}, {d}, {a, b}, {a, c}, {a, d}, {b, c}, {b, d}, {c, d}, {a, b, c}, {a, b, d}, {a, c, d}, {b, c, d}, {a, b, c, d}
(B) {a, b, c}, {a, b, d}, {a, c, d}, {b, c, d}
(C) {a}, {b}, {c}, {d}
(D) All the above elements are in P(A)

Q9 Which of the following pair of sets is equal?
(A) A = {1, 2, 3, 4} and B = {d, c, a, b}
(B) A = {1, 4, 9, 16} and B = {16, 1, 9, 4}
(C) A = {x: x is multiple of 10} and B = {10, 20, 25, 30, 40, ...}
(D) None

Q10 If $A = \{0, 1\}$ state which of the following statements are true:
(i) $\{1\} \subset A$ (ii) $\{1\} \in A$ (iii) $\phi \in A$ (iv) $0 \in A$ (v) $1 \subset A$ (vi) $\{0\} \in A$ (vii) $\phi \subset A$
(A) (i), (iv) and (vii) only are true
(B) (i), (iv) and (vi) only are true
(C) (ii), (iii) and (vi) only are true
(D) None

Answer Key

Q1	(B)	Q6	(B)
Q2	(C)	Q7	(D)
Q3	(A)	Q8	(D)
Q4	(C)	Q9	(B)
Q5	(D)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

Given set:

$A = \{x : x \text{ is an integer and } -4 \leq x < 2\}$

Since, x is an integer such that $-4 \leq x < 2$, thus x can be $\{-4, -3, -2, -1, 0, 1\}$

Thus, the given set can be written in roster form as:

$A = \{-4, -3, -2, -1, 0, 1\}$

Hence, the correct option is (B).

Q2 Text Solution:

Given set:

$\{1, 4, 9, \ldots . 121\}$

Clearly,

$1^2 = 1, 2^2 = 4, 3^2 = 9, \ldots . . , 11^2 = 121$

Therefore, the given set in set-builder form can be written as:

$\{x : x = n^2, n \in N \text{ and } 1 \leq x \leq 11\}$

Hence, the correct option is (C).

Q3 Text Solution:

We know that,

The set of months of a year is a finite set as it contains 12 elements in it.

Whereas the set {1, 2, 3, ... } and set of positive integers greater than 100 has an infinite number of elements.

Hence, the correct option is (A) i.e. the set of months of a year.

Q4 Text Solution:

Null set is a set which does not contain any element.

It is either represented by $\emptyset$ or { }.

Hence, the correct option is (C) i.e. $\emptyset$.

Q5 Text Solution:

Given set: {1, 2, 3}

The subsets of the given set are:

$\emptyset$, {1}, {2}, {3}, {1, 2}, {2, 3}, {1, 3}, {1, 2, 3}

Hence, the correct option is (D).

Q6 Text Solution:

Given set: $\{3, 4, 5, 6, 7\}$

We know that,

The number of proper subsets of the set is given by $2^n - 1$, where n is the number of elements in the set.

Here, the number of elements $(n) = 5$

Thus, the required number of proper subsets

$= 2^5 - 1$

$= 32 - 1$

$= 31$

Hence, the correct option is (B) i.e. 31 .

Q7 Text Solution:

Given set: $\{1, 2, 3, 5\}$

We know that,

The number of subsets of the set is given by 2^n where n is the number of elements in the set.

Here, $n = 4$

Thus, the number of subsets of the given set $= 2^4 = 16$

Hence, the correct option is (D) i.e. 16.

Q8 Text Solution:

Power Set: A power set is the collection of all the subsets.

Given, $A = \{a, b, c, d\}$

Number of Power sets is given by 2^n, where n is number of elements

Here, $n = 4$

Thus, $n[P(A)] = 2^4$

$\Rightarrow n\ [P(A)] = 16$

$P(A) = \phi, \{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\},$
$\{a, d\}, \{b, c\}, \{b, d\}, \{c, d\},$
$\{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\},$
$\{a, b, c, d\}$

Hence, the correct answer is option (D) i.e, All the above elements are in P(A).

Q9 Text Solution:

For option (A):

A = {1, 2, 3, 4} and B = {d, c, a, b}

Clearly, the elements in both the sets are not same but the number of elements are equal.

Thus, it is an equivalent set but not an equal set.

For option (B):

A = {1, 4, 9, 16} and B = {16, 1, 9, 4}

Since, the order in which the elements are listed does not matter and all the elements in A and B are same, thus it is an equal set.

For option (C):

A = {x: x is multiple of 10} and B = {10, 20, 25, 30, 40, ...}

Here, 25∈ B but 25 ∉ A

Thus, these are not equal sets.

Therefore, the sets A = {1, 4, 9, 16} and B = {16, 1, 9, 4} are equal.

Hence, the correct option is (B).

Q10 Text Solution:

Given that,

$A = \{0, 1\}$

(i) $\{1\} \subset A$ is correct since $\{1\}$ is a subset of A.

(ii) $\{1\} \in A$ is incorrect $(1 \in A \; but \; \{1\} \notin A)$

(iii) $\phi \in A$ is incorrect since ϕ is not the element of A.

(iv) $0 \in A$ is correct since 0 is the element of A.

(v) $1 \subset A$ is incorrect $(1 \in A \; and \; \{1\} \subset A)$

(vi) $\{0\} \in A$ is incorrect $(0 \in A \; but \; \{0\} \notin A)$

but $\{0\} \notin A)$

(vii) $\phi \subset A$ is correct $(\emptyset$ is a subset of every set)

Hence, option (A) is the correct answer i.e., (i), (iv) and (vii) only are true.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

SETS, RELATION AND FUNCTION

Q1 Given the sets A = {1, 3, 5}, B = {2, 4, 6} and C = {0, 2, 4, 6, 8}, which of the following may be considered as universal set for all the three sets A, B and C?
(A) {0, 1, 2, 3, 4, 5, 6}
(B) $\emptyset$
(C) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
(D) {1, 2, 3, 4, 5, 6, 7, 8}

Q2 If A = {3, 4, 5, 6}, B = {3, 7, 9, 5} and C = {6, 8, 10, 12, 7}, then A' is
(Given that the universal set is U = {3, 4, ..., 11, 12, 13})
(A) {7, 8, ...12, 13}
(B) {4, 6, 8, 10, ...13}
(C) {3, 4, 5, 9, 11, 13}
(D) None

Q3 If $U = \{1, 2, \ldots . 9\}$ be the universal set, $A = \{1, 2, 3, 4\}$ and $B = \{2, 4, 6, 8\}$, then set $A \cup B$ is
(A) $\{1, 2, 3, 4, 6, 8\}$
(B) $\{2, 4\}$
(C) $\{5, 6, 7, 8, 9\}$

(D) $\{5, 7, 9\}$

Q4 If A = {a, b, c, d, e, f}, B = {a, e, i, o, u} and C = {m, n, o, p, q, r, s, t, u}, then A ∪ (B - C) is
(A) {a, b, c, d, e, f, i}
(B) {a, b, c, d, e, f, o}
(C) {a, b, c, d, e, f, u}
(D) None

Q5 Which of the following pairs of sets is disjoint?
(A) {1, 2, 3, 4} and {x: x is a natural numbers such that $4 \leq x \leq 6$}
(B) {a, e, i, o, u} and {c, d, e, f}
(C) {x: x is an even integer} and {x: x is an odd integer}
(D) None

Q6 In a group of 20 children, 8 drink tea but not coffee and 13 like tea. The number of children drinking coffee but not tea is
(A) 6 (B) 7
(C) 1 (D) none of these

Q7 If
$P = \{1, 2, 3, 5, 7\}$, $Q = \{1, 3, 6, 10, 15\}$,
Universal set
$S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$
The cardinal number of $P \cap Q$ is
(A) 3 (B) 2
(C) 1 (D) none of these

Q8 If A has 32 elements, B has 42 elements and $A \cup B$ has 62 elements. Find the number of elements in $A \cap B$.
(A) 74 (B) 62
(C) 12 (D) None

Q9 Out of a total population of $50,000$, only $28,000$ read Telegraph and $23,000$ read Times of India while $4,000$ read both. How many do not read any paper?
(A) $3,000$ (B) $2,000$
(C) $4,000$ (D) None

Q10 Out of 2000 staff, 48% preferred coffee, 54% tea and 64% cocoa. Of the total, 28% used coffee and tea, 32% tea and cocoa and 30% coffee and cocoa. Only 6% did none of these. Find the number having all the three.
(A) 360 (B) 280
(C) 160 (D) None

Answer Key

Q1	(C)	Q6	(B)
Q2	(A)	Q7	(B)
Q3	(A)	Q8	(C)
Q4	(A)	Q9	(A)
Q5	(C)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

Given sets:

A = {1, 3, 5}, B = {2, 4, 6} and C = {0, 2, 4, 6, 8}

For option (A):

Here, C = {0, 2, 4, 6, 8} $\not\subset$ {0, 1, 2, 3, 4, 5, 6}

Thus, it cannot be the universal set of the given sets.

For option (B):

Here, A $\not\subset \emptyset$, B $\not\subset \emptyset$ and C $\not\subset \emptyset$

Thus, $\emptyset$ cannot be the universal set of the given sets.

For option (C):

Clearly,

A = {1, 3, 5} $\subset$ {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

B = {2, 4, 6} $\subset$ {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

C = {0, 2, 4, 6, 8} $\subset$ {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

For option (D):

C = {0, 2, 4, 6, 8} $\not\subset$ {1, 2, 3, 4, 5, 6, 7, 8}

Hence, the correct option is (C).

Q2 Text Solution:

Given: A = {3, 4, 5, 6} and U = {3, 4, ..., 11, 12, 13}

We know that,

Complement of a set is the difference between the universal set and the set itself.

Here,

$A' = U - A$

$\Rightarrow A' = \{3, 4, \ldots\ldots, 11, 12, 13\} - \{3, 4, 5, 6\}$

$\Rightarrow A' = \{7, 8, 9, 10, 11, 12, 13\}$

Hence, the correct answer is option (A).

Q3 Text Solution:

Given,

$A = \{1, 2, 3, 4\}$ and $B = \{2, 4, 6, 8\}$

Therefore,

$A \cup B = \{1, 2, 3, 4\} \cup \{2, 4, 6, 8\}$

$= \{1, 2, 3, 4, 6, 8\}$

Hence the correct option is (A).

Q4 Text Solution:

Given: A = {a, b, c, d, e, f}

B = {a, e, i, o, u}

C = {m, n, o, p, q, r, s, t, u}

We know that,

The difference of the sets B and C in this order is the set of elements which belong to B but not to C.

Thus, B - C = {a, e, i, o, u} - {m, n, o, p, q, r, s, t, u}

= {a, e, i}

Now, A $\cup$ (B - C) = {a, b, c, d, e, f} $\cup$ {a, e, i}

= {a, b, c, d, e, f, i}

Hence, the correct option is (A) i.e., {a, b, c, d, e, f, i}.

Q5 Text Solution:

For option (A):

{1, 2, 3, 4} and {x: x is a natural numbers such that 4x6}

i.e. {1, 2, 3, 4} and {4, 5, 6}

Clearly, 4 belongs to both the sets, thus it is not disjoint sets.

For option (B):

{a, e, i, o, u} and {c, d, e, f}

Here, e belongs to both the sets, thus these are not disjoint sets.

For option (C):

Clearly, {x: x is an even integer} $\cap$ {x: x is an odd integer} = $\emptyset$

Thus, these are disjoint sets.

Hence, the correct option is (C).

Q6 Text Solution:

Let T represents people drinking tea and C represents people drinking coffee.

According to question,

$n(T \cup C) = 20$

Number of people who drink tea but not coffee $= n(T \cap \overline{C}) = 8$, Number of people who drink tea $= n(T) = 13$

We know that,

$n(\overline{T} \cap C) = n(T \cup C) - n(T)$

Thus, the number of people who drink coffee but not tea

$= n(\overline{T} \cap C)$
$= n(T \cup C) - n(T)$
$= 20 - 13 = 7$
Therefore, the number of children drinking coffee but not tea is 7 .
Hence, option (B) is correct i.e. 7.

Q7 Text Solution:
Given: $P = \{1,\ 2,\ 3,\ 5,\ 7\}$
$Q = \{1,\ 3,\ 6,\ 10,\ 15\}$
Universal set S = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10,11, 12, 13, 14, 15}
We know that,
The cardinality of a set is the number of elements in the set.
Now, $P \cap Q = \{1,\ 3\}$
Thus, the cardinality of $P \cap Q$ is 2.
Hence, the correct option is (B) i.e. 2.

Q8 Text Solution:
Given,
$n(A) = 32$
$n(B) = 42$
$n(A \cup B) = 62$
$n(A \cap B) = ?$
We know that,
$n(A \cap B) = n(A) + n(B) - n(A \cup B)$
$\Rightarrow n(A \cap B) = n(A) + n(B) - n(A \cup B)$
$\Rightarrow n(A \cap B) = 32 + 42 - 62$
$\Rightarrow n(A \cap B) = 12$
Hence the correct answer is option (C) i.e, 12 .

Q9 Text Solution:
Let A : Reads Telegraph, B : reads Times of India
Given,
Total population $n(U) = 50,000$,
$n(A) = 28,000,\ n(B) = 23,000$ and
$n(A \cap B) = 4000$
We know that,
$n(A \cup B) = n(A) + n(B) - n(A \cap B)$
$\Rightarrow n(A \cup B) = 28,000 + 23,000 - 4000$
$\Rightarrow n(A \cup B) = 47,000$
Thus, the number of people who do not read any newspaper
$= n(A \cup B)'$
$= n(U) - n(A \cup B)$
$= 50,000 - 47,000$
$= 3,000$
Therefore, $3,000$ people do not read any newspaper.
Hence, the correct answer is option (A) i.e, $3000.$

Q10 Text Solution:
Given,
Total number of employees $= 2,000$
People who like coffee $= n(C) = 48\% = \frac{48}{100} \times 2000 = 960$
People who like tea $= n(T)$
$= 54\% = \frac{54}{100} \times 2000 = 1080$
People liking cocoa $= n(O)$
$= 64\% = \frac{64}{100} \times 2000 = 1280$
Also,
$n(C \cap T) = 28\% = 560$
$n(T \cap O) = 32\% = 640$
$n(C \cap O) = 30\% = 600$
Percentage of employees who liked neither of it i.e.
$n(C \cup T \cup O)' = 6\% = 120$
Thus, the number of employees who like all the three
i.e. $n(C \cup T \cup O)$
$=$ Total number of employees $-$ Number of employees who liked none
$= 2000 - 120$
$= 1880$
We know,
$\Rightarrow n(C \cup T \cup O) = n(C) + n(T) + n(O)$
$- n(C \cap T)$
$-n(T \cap O) - n(C \cap O)$
$+ n(C \cap T \cap O)$
$\Rightarrow 1880 = 960 + 1080 + 1280 - 560 - 640$
$- 600$
$+ n(C \cap T \cap O)$
$\Rightarrow 1880 = 1520 + n(C \cap T \cap O)$
$\Rightarrow n(C \cap T \cap O) = 1880 - 1520$
$\Rightarrow n(C \cap T \cap O) = 360$

Therefore, the number of employees liking all the three $= 360$.

Hence, the correct answer is option (A) i.e., 360.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

SETS, RELATION AND FUNCTION

Q1 If P and Q are two sets such that P has 50 elements, $P \cup Q$ has 70 elements, and $P \cap Q$ has 20 elements, how many elements does Q have?

(A) 20 (B) 40
(C) 60 (D) None

Q2 In a survey of 100 students, 70 enjoy playing football, 60 enjoy playing basketball, and at least 50 students enjoy both sports. How many students enjoy both football and basketball?

(A) 70 (B) 30
(C) 50 (D) 80

Q3 In a classroom, there are 35 students who study French or Spanish. Of these, 20 study French, and 5 study both French and Spanish. How many students study Spanish?

(A) 20 (B) 40
(C) 50 (D) 65

Q4 In a survey, it was revealed that 90% of participants enjoy traveling, while 85% of participants enjoy photography. What percentage of participants enjoy both traveling and photography?

(A) 50% (B) 75%
(C) 90% (D) None of these

Q5 In a conference with 400 attendees, 300 attendees are from the finance industry and 200 attendees are from the marketing industry. How many attendees are from the finance industry only?

(A) 70 (B) 150
(C) 200 (D) None of these

Q6 In a survey of 500 people, it was found that 350 people enjoy reading books and 250 people enjoy watching movies. How many people enjoy watching movies only?

(A) 70 (B) 80
(C) 150 (D) 170

Q7 In a class of 50 students, 30 students play the guitar, 25 students play the piano, and 10 students play both instruments. How many students play either the guitar or the piano?

(A) 30 (B) 45
(C) 55 (D) None of these

Q8 In a survey of 100 people, 40 like chocolate ice cream, 30 like vanilla ice cream, and 20 like both chocolate and vanilla ice cream. How many people like neither chocolate nor vanilla ice cream?

(A) 20 (B) 30
(C) 40 (D) 50

Q9 In a town, 70% of the population owns a car, 60% of the population owns a bike, and 40% of the population owns both a car and a bike. What percentage of the population owns either a car or a bike?

(A) 70% (B) 90%
(C) 50% (D) 100%

Q10 In a group of 100 students, 60 students play football, 50 students play basketball, and 40 students play cricket. Out of these, 15 students play both football and basketball, 10 students play both basketball and cricket, 8 students play both football and cricket and 5 students play all three sports. How many students play cricket only?

(A) 14 (B) 29
(C) 34 (D) None of these

Answer Key

Q1	(B)	Q6	(C)
Q2	(D)	Q7	(B)
Q3	(A)	Q8	(D)
Q4	(B)	Q9	(B)
Q5	(C)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

Given:

$n(P) = 50$

$n(P \cup Q) = 70$

$n(P \cap Q) = 20$

We know,

$n(P \cup Q) = n(P) + n(Q) - n(P \cap Q)$

Substituting the values in the above formula, we get

$70 = 50 + n(Q) - 20$

$\Rightarrow 70 = 30 + n(Q)$

$\Rightarrow n(Q) = 40$

Therefore, set Q has 40 elements.

Hence, the correct option is (B).

Q2 Text Solution:

Given:

Total number of people $= 100$

Number of people who like football $= n(F) = 70$

Number of people who like basketball $= n(B) = 60$

Number of students who likes atleast one of both sports

We know that,

$n(F \cap B) = n(F) + n(B) - n(F \cup B)$

$\Rightarrow n(F \cap B) = 70 + 60 - 50$

$\Rightarrow n(F \cap B) = 80$

Therefore, 80 students enjoy both football and basketball.

Hence, the correct option is (D).

Q3 Text Solution:

Given:

Total number of students $n(F \cup S) = 35$

Number of people who study French $= n(F) = 20$

Number of students who study both $= n(F \cap S) = 5$

We know that,

$n(F \cup S) = n(F) + n(S) - n(F \cap S)$

$\Rightarrow 35 = 20 + n(S) - 5$

$\Rightarrow n(S) = 35 - 15 = 20$

Therefore, 20 students study Spanish.

Hence, the correct option is (A).

Q4 Text Solution:

Given:

Participants enjoy traveling, $n(T) = 90\%$

Participants enjoy photography $n(P) = 85\%$

Participants who enjoy both traveling and photography$= n(T \cap P) = \ ?$

We know that,

$n(T \cup P) = n(T) + n(P) - n(T \cap P)$

Substituting the value, we get

$100 = 90 + 85 - n(T \cap P)$

$\Rightarrow n(T \cap P) = 175 - 100$

$\Rightarrow n(T \cap P) = 75$

Therefore, 75% participants enjoy both traveling and photography.

Hence, the correct option is (B).

Q5 Text Solution:

Given:

Attendees from the finance industry $n(F) = 300$

Attendees from the marketing industry $n(M) = 200$

Total attendees $= n(F \cup M) = 400$

We know that,

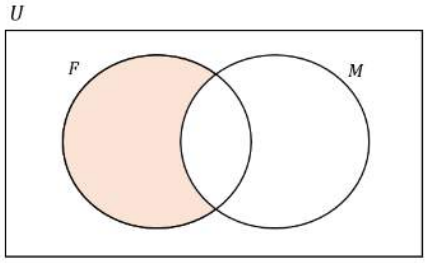
$n(F \cap M) = n(F) + n(M) - n(F \cup M)$

$\Rightarrow n(F \cap M) = 300 + 200 - 400$

$\Rightarrow n(F \cap M) = 500 - 400$

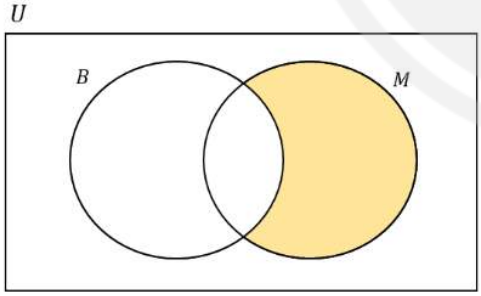
$\Rightarrow n(F \cap M) = 100$

Now, attendees are from the finance industry only can be calculated by



$= n(F) - n(F \cap M)$
$= 300 - 100$
$= 200$
Therefore, 200 attendees are from the finance industry only.
Hence, the correct option is (C).

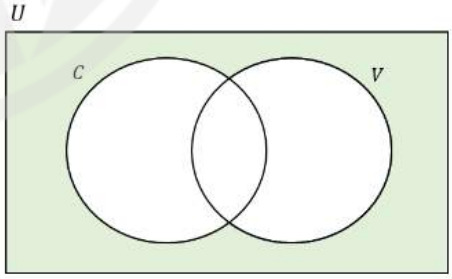
Q6 Text Solution:
Given:
People who enjoy reading books $n(B) = 350$
People who enjoy watching movies $n(M) = 250$
Total people in a survey $= n(B \cup M) = 500$
We know that,
$n(B \cap M) = n(B) + n(M) - n(B \cup M)$
$\Rightarrow n(B \cap M) = 350 + 250 - 500$
$\Rightarrow n(B \cap M) = 600 - 500$
$\Rightarrow n(B \cap M) = 100$
Now, people enjoy watching movies only can be calculated by



$= n(M) - n(B \cap M)$
$= 250 - 100$
$= 150$
$\therefore 150$ people enjoy watching movies only.
Hence, the correct option is (C).

Q7 Text Solution:
Given:
Total students in a class, $n(U) = 50$
Students who play guitar, $n(G) = 30$
Students who play piano, $n(P) = 25$
Students who play both $= n(G \cap P) = 10$
Students play either the guitar or the piano ie given by $n(G \cup P)$
We know,
$n(G \cup P) = n(G) + n(P) - n(G \cap P)$
$\Rightarrow n(G \cup P) = 30 + 25 - 10$
$\Rightarrow n(G \cup P) = 55 - 10$
$\Rightarrow n(G \cup P) = 45$
Therefore, 45 students play either the guitar or the piano.
Hence, the correct option is (B).

Q8 Text Solution:
Given:
People who like chocolate ice cream, $n(C) = 40$
People who like vanilla ice cream, $n(V) = 30$
People who like both, $n(C \cap V) = 20$
Total people in a survey $= n(U) = 100$
We know that,
$n(C \cup V) = n(C) + n(V) - n(C \cap V)$
$\Rightarrow n(C \cup V) = 40 + 30 - 20$
$\Rightarrow n(C \cup V) = 70 - 20$
$\Rightarrow n(C \cup V) = 50$
Now, people like neither chocolate nor vanilla ice cream, $n(C' \cap V')$ is represented by shaded portion:



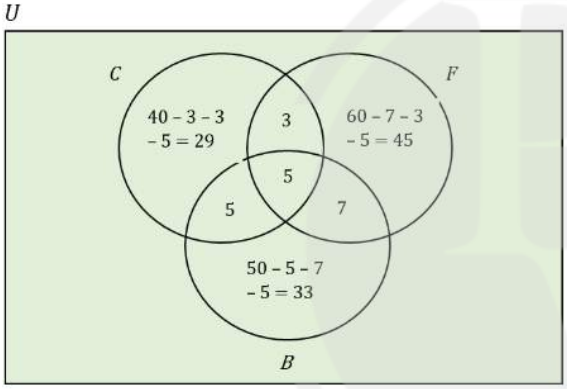
$n(C' \cap V') = n(U) - n(C \cup V)$
$= 100 - 50$
$= 50$
Therefore 50 people like neither chocolate or vanilla ice cream.
Hence, the correct option is (D).

Q9 Text Solution:
Given:
Percentage of car owners: $n(C) = 70\%$
Percentage of bike owners: $n(B) = 60\%$

Percentage of people who own both:
$n(C \cap B) = 40\%$
Now, percentage of the population owns either a car or a bike:
$n(C \cup B) = n(C) + n(B) - n(C \cap B)$
$\Rightarrow n(C \cup B) = 70 + 60 - 40$
$\Rightarrow n(C \cap T) = 90\%$
Hence, the correct option is (B).

Q10 **Text Solution:**

Let F be the set of students who play football, B be the set of students who play basketball, and C be the set of students who play cricket.
Given: $n(F) = 60$, $n(B) = 50$ and $n(C) = 40$,
$n(F \cap B) = 15$, $n(B \cap C) = 10$,
$n(F \cap C) = 8$ and $n(F \cap B \cap C) = 5$
From the Venn diagram,



Therefore, number of students who play cricket only = 29.
Hence, the correct option is (B).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

PROBABILITY

Q1 The probability that exactly one head appears in a single throw of two fair coins is

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$

(C) $\frac{1}{4}$ (D) none

Q2 Three coins are tossed together. The probability of getting three tails is

(A) $\frac{5}{8}$ (B) $\frac{3}{8}$

(C) $\frac{1}{8}$ (D) None

Q3 The probability of throwing more than 4 in a single throw from an ordinary die is

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$

(C) 1 (D) None

Q4 The chance of getting a sum of 6 in a single throw with two dice is

(A) $\frac{3}{36}$ (B) $\frac{4}{36}$

(C) $\frac{5}{36}$ (D) $\frac{6}{36}$

Q5 A bag contain 6 white and 5 black balls. One ball is drawn. The probability that it is white is

(A) $\frac{5}{11}$ (B) 1

(C) $\frac{6}{11}$ (D) $\frac{1}{11}$

Q6 Two dice are thrown at a time. The probability that the numbers shown are equal is

(A) $\frac{2}{6}$ (B) $\frac{5}{6}$

(C) $\frac{1}{6}$ (D) none

Q7 Three coins are tossed together. The probability of getting at least two heads is

(A) $\frac{1}{2}$ (B) $\frac{3}{8}$

(C) $\frac{1}{8}$ (D) None

Q8 A bag contains 15 one rupee coins, 25 two rupee coins and 10 five rupee coins. If a coin is selected at random from the bag, then the probability of not selecting a one rupee coin is

(A) 0.30 (B) 0.70

(C) 0.25 (D) 0.20

Q9 If $P(A) = \frac{5}{9}$, then the odds against the event A is

(A) 5 : 9 (B) 5 : 4

(C) 4 : 5 (D) 5 : 14

Q10 A committee of 7 members is to be formed from a group comprising 8 gentlemen and 5 ladies. What is the probability that the committee would comprise 2 ladies?

(A) $\frac{37}{210}$ (B) $\frac{24}{110}$

(C) $\frac{140}{429}$ (D) None of these

Answer Key

Q1	(B)	Q6	(C)
Q2	(C)	Q7	(A)
Q3	(B)	Q8	(B)
Q4	(C)	Q9	(C)
Q5	(C)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

The sample space of throwing two coins in a single time is given by:
$\{(H,H),(H,T),(T,H),(T,T)\}$
$\Rightarrow$ Total no. of possible outcomes $= 4$
Now, the outcomes of appearing exactly one head is $(H,\ T),\ (T,\ H)$.
$\Rightarrow$ Total no. of favorable outcomes $= 2$
We know that,
Probability $= \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$
$= \frac{2}{4}$
$= \frac{1}{2}$
Hence, the correct option is (B).

Q2 Text Solution:

The sample space of tossing 3 coins is given by,
$S = \{HHH,\ TTT,\ HTT,\ THT,\ TTH,\ THH,\ HTH,\ HHT\}$
where, $\{H\ \Rightarrow Heads,\ T\ \Rightarrow Tails\}$
Here, total outcomes $= 8$
Favorable outcomes $= \{TTT\} = 1$
We know that,
Probability (P) $= \frac{\text{Favorable Outcomes}}{\text{Total Number of Outcomes}}$
$\Rightarrow \frac{1}{8}$
Hence, the correct option is (C) .

Q3 Text Solution:

When a dice is thrown,
The sample space is given as,
$S = \{1,2,3,4,5,6\}$
$\Rightarrow$ Total outcomes $= 6$
Also, favorable outcomes i.e. Number greater than $4 = \{5,\ 6\} = 2$
We know that,
Probability $= \frac{\text{Favorable Outcomes}}{\text{Total Number of Outcomes}}$
$= \frac{2}{6}$
$= \frac{1}{3}$
Hence, the correct option is (B).

Q4 Text Solution:

As we throw two dice in a single time, we get the sample space as
Total outcomes $= (1,1),(1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)$
Total outcomes $= 36$
Favorable outcomes $= (1,5),(2,4),(3,3),(4,2),(5,1)$
Thus, the number of favorable outcomes $= 5$
We know that,
Probability $= \frac{\text{Favorable outcomes}}{\text{Total numbers of outcomes}}$
$= \frac{5}{36}$
Hence, the correct option is (C).

Q5 Text Solution:

Given,
Number of white balls $= 6$
Number of black balls $= 5$
Thus, the possible outcomes $= 6 + 5 = 11$
Now, the favorable outcomes are white balls i.e., 6
We know that,
Probability $= \frac{\text{Favorable outcomes}}{\text{Total numbers of outcomes}}$
$= \frac{6}{11}$
Hence, the correct option is (C).

Q6 Text Solution:

As we throw two dice in a single time, we get the sample space as
Total outcomes (1,1),(1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)
Thus, total outcomes$= 36$
Now, the favorable outcomes of getting equal numbers:
$\{(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)\}$
$\Rightarrow$Number of favorable outcomes $= 6$
We know that,

Probability $= \frac{\text{Favorable outcomes}}{\text{Total numbers of outcomes}}$

$= \frac{6}{36} = \frac{1}{6}$

Q7 Text Solution:

When 3 coins are tossed,

The sample space is given as,

$S = \{HHH, TTT, HTT, THT, TTH, THH, HTH, HHT\}$

where, $\{H \rightarrow$ Heads, $T \rightarrow$ Tails$\}$

So, Total outcomes $= 8$

Favorable outcomes: {THH, HTH, HHT, HHH} = 4

Thus, Probability of getting at least 2 heads

$= \frac{4}{8}$

$= \frac{1}{2}$

Hence, the correct option is (A).

Q8 Text Solution:

We know that,

Probability $= \frac{\text{Number of favourable outcomes}}{\text{Total outcomes}}$

Number of favourable outcomes

$= 25 + 10 = 35$

Total outcomes $= 25 + 10 + 15 = 50$

Therefore, the required probability

$= \frac{35}{50} = \frac{7}{10} = 0.7$

Hence, the correct option is (B) i.e., 0.7.

Q9 Text Solution:

We know that,

Probability of the event is given by $\frac{p}{p+q}$,

where $\frac{p}{q}$ are the odds in favor of an event and $\frac{q}{p}$ are the odds against an event.

Given, $P(A) = \frac{5}{9}$

$\Rightarrow \frac{p}{p+q} = \frac{5}{9}$

$\Rightarrow 9p = 5p + 5q$

$\Rightarrow 4p = 5q$

$\Rightarrow \frac{q}{p} = \frac{4}{5}$

Hence, the correct option is (C).

Q10 Text Solution:

Given that,

Number of gentlemen $= 8$

Number of ladies $= 5$

Total members $= 8 + 5 = 13$

Total ways of selection of 7 members

$= {}^{13}C_7 = \frac{13!}{6! \times 7!}$

$= \frac{13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7}{6!}$

$= 11 \times 12 \times 13$

Since, the committee should have 2 ladies, thus the number of gentlemen would be 5 .

Thus, the possible ways

$= {}^5C_2 \times {}^8C_5$

$= \frac{5!}{2! \times 3!} \times \frac{8!}{3! \times 5!}$

$= 10 \times 56$

Therefore, the required probability

$= \frac{10 \times 56}{11 \times 12 \times 13} = \frac{140}{429}$

Hence, the correct option is (C).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 5

SETS, RELATION AND FUNCTION

Q1 If $A = \{x, y, z\}, B = \{p, q, r, s\}$, then which of the relations on A and B are functions?
(A) $\{(x, p), (x, q), (y, r), (z, s)\}$
(B) $\{(x, s), (y, s), (y, q)\}$
(C) $\{(y, p), (y, q), (y, r), (z, s)\}$
(D) $\{(x, p), (y, r), (z, r)\}$

Q2 If $f\left(x\right) = \frac{1}{1-x}$, $f(-1)$ is
(A) 0 (B) $\frac{1}{2}$
(C) 1 (D) none of these

Q3 A is {1, 2, 3, 4, 5} and B is {2, 4, 6, 8, 10, 12}. If a function is defined from set A to B where f(x) = 2x, then range of f is:
(A) {1, 2, 3, 4, 5}
(B) {2, 4, 6, 8, 10}
(C) {1, 4, 9, 16, 25}
(D) {2, 4, 6, 8, 10, 12}

Q4 If $f: R \to R, f(x) = 2x + 7$, then the inverse of f is
(A) $f^{-1}\left(x\right) = \frac{x-7}{2}$ (B) $f^{-1}\left(x\right) = \frac{x+7}{2}$
(C) $f^{-1}\left(x\right) = \frac{x-3}{2}$ (D) none

Q5 Let R is the set of real numbers, such that the function $f: R \to R$ and $g: R \to R$ are defined by f(x) = x^2+ 3x + 1 and g(x) = 2x - 3. Find (fog).
(A) $4x^2$ + 6x + 1 (B) x^2 + 6x + 1
(C) $4x^2$ - 6x + 1 (D) x^2 - 6x + 1

Q6 If $f: R \to R, f(x) = x + 1$, $g: R \to R, g\left(x\right) = x^2 + 1$, then $fog(-2)$ equals to
(A) 6 (B) 5
(C) -2 (D) none

Q7 The range of the function $f(x) = \log_{10}(1 + x)$ for the domain of real values of x when $0 \leq x \leq 9$ is
(A) [0, 1] (B) [0, 1, 2]
(C) {0, 1} (D) None of these

Q8 If $A = \{1, 2, 3\}$ then the relation $R = \{(1, 1), (2, 3), (2, 2), (3, 3), (1, 2)\}$ on A is
(A) Reflexive (B) Symmetric
(C) Transitive (D) Equivalence

Q9 If a relation R is represented by {(8, 2), (6, 4), (1, 9), (3, 7)}, then the domain is
(A) (1, 3, 6, 8)
(B) (1, 2, 3, 4, 6, 7, 8, 9)
(C) (2, 4, 7, 9)
(D) None of these

Q10 "is perpendicular to" over the set of straight lines in a given plane is
(A) Reflexive (B) Symmetric
(C) Transitive (D) Equivalence

Answer Key

Q1	(D)	Q6	(A)
Q2	(B)	Q7	(A)
Q3	(B)	Q8	(A)
Q4	(A)	Q9	(C)
Q5	(C)	Q10	(B)

Hints & Solutions

Q1 Text Solution:

Given: A = {x, y, z}, B = {p, q, r, s}

We know that,

The relation from A to B is a function if and only if every element of A has a unique image in B i.e no two different ordered pairs have the same first element.

For option (A): {(x, p), (x, q), (y, r), (z, s)}

Here, two different ordered pairs i.e. (x, p),(x, q), have the same first element, thus it is not a function.

For option (B): {(x, s), (y, s), (y, q)}

Here, two different ordered pairs i.e. (y, s), (y, q) have the same first element, thus it is not a function.

For option (C): {(y, p), (y, q), (y, r), (z, s)}

Here, three different ordered pairs i.e. (y, p), (y, q), (y, r) have the same first element, thus it is not a function.

For option (D): {(x, p), (y, r), (z, r)}

Clearly, each first element of set A has a unique image in set B, thus it is a function.

Hence, the correct option is (D).

Q2 Text Solution:

Given: $f\left(x\right) = \frac{1}{1-x}$

Let us consider $x = -1$, then

$$f\left(-1\right) = \frac{1}{1-(-1)}$$
$$= \frac{1}{1+1}$$
$$= \frac{1}{2}$$

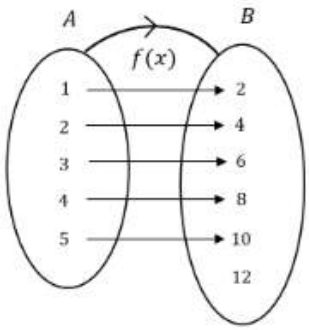
Hence, the correct option is (B) i.e., $\frac{1}{2}$.

Q3 Text Solution:

Given: A = {1, 2, 3, 4, 5} and B = {2, 4, 6, 8, 10, 12}

Since, f(x) = 2x

Thus



Therefore, Range

= {2, 4, 6, 8, 10}

Hence, the correct option is (B) i.e., {2, 4, 6, 8, 10}

Q4 Text Solution:

Given, $y = 2x + 7$

$\Rightarrow 2x = y - 7$

$\Rightarrow x = \frac{y-7}{2}$

$\Rightarrow f^{-1}\left(y\right) = \frac{y-7}{2}$

$\Rightarrow f^{-1}\left(x\right) = \frac{x-7}{2}$

Q5 Text Solution:

Given: $f\left(x\right) = x^2 + 3x + 1$ and $g(x) = 2x - 3$

Thus, $fog = f\left(g(x)\right)$

$= f\left(2x - 3\right)$

$= (2x - 3)^2 + 3\left(2x - 3\right) + 2$

$= 4x^2 + 9 - 12x + 6x - 9 + 1$

$= 4x^2 - 6x + 1$

Therefore, the correct option is (C).

Q6 Text Solution:

Given: $f(x) = x + 1, g\left(x\right) = x^2 + 1$

Now, $g\left(-2\right) = (-2)^2 + 1$

$= 4 + 1 = 5$

Thus, $fog(-2) = f(g(-2))$

$= f(5)$

$= 5 + 1 = 6$

Therefore, $fog(-2) = 6$

Hence, the correct option is (A) i.e., 6.

Q7 Text Solution:

Given: $f(x) = \log_{10}(1+x)$

Domain of real values of x, i.e. $x \in 0, 1, 2, 3, 4, 5, 6, 7, 8, 9$

For lowest value i.e. $f(0) = \log_{10}(1+0)$

$= \log_{10}(1) = 0 \quad (\because \log_{10} 1 = 0)$

For highest value i.e. $f(9) = \log_{10}(1+9)$

$= \log_{10}(10) = 1 \quad (\because \log_{10} 10 = 1)$

'OR'

Given, $0 \le x \le 9$

$\Rightarrow 1+0 \le 1+x \le 1+9$

$\Rightarrow 1 \le (1+x) \le 10$

$\Rightarrow \log_{10} 1 \le \log_{10}(1+x) \le \log_{10} 10$

$\Rightarrow 0 \le \log_{10}(1+x) \le 1$

Therefore, the range of $f(x) = \log_{10}(1+x)$ is $[0, 1]$.

Hence, the answer is option (A).

Q8 Text Solution:

Given: $A = \{1, 2, 3\}$ and $R = \{(1, 1), (2, 3), (2, 2), (3, 3), (1, 2)\}$

We know that,

For some set A,

Reflexive relation: If $(a, a) \in R$ for all $a \in A$

Symmetric relation: If $a, b \in A$ such that $(a, b) \in R$ then $(b, a) \in R$.

Transitive relation: If $a, b, c \in A$ such that $(a, b) \in R$ and $(b, c) \in R$ then $(a, c) \in R$.

Here, all ordered pairs of set A i.e. (1, 1), (2, 2), (3, 3) are in set R, thus it is a reflexive relation.

Also, $(2, 3) \in R$ but $(3, 2) \notin R$, thus it is not a symmetric relation.

Now, $(1, 2) \in R$ and $(2, 3) \in R$ but $(1, 3) \notin R$, thus it is not a transitive relation.

Hence, the correct option is (A) i.e., Reflexive.

Q9 Text Solution:

Given,

$R = \{(8, 2), (6, 4), (1, 9), (3, 7)\}$

Thus, $R^{-1} = \{(2, 8), (4, 6), (9, 1), (7, 3)\}$

Therefore, Domain of $R^{-1} = (2, 4, 7, 9)$

Hence, the correct option is (C).

Q10 Text Solution:

We know that,

For some set A,

- Reflexive relation: If $(a, a) \in R$ for all $a \in A$
- Symmetric relation: If $a, b \in \mathrm{A}$ such that $(a, b) \in \mathrm{R}$ then $(b, a) \in \mathrm{R}$.
- Transitive relation: If $a, b, c \in \mathrm{A}$ such that $(a, b) \in \mathrm{R}$ and $(b, c) \in \mathrm{R}$ then $(a, c) \in R$
- Equivalence relation: A relation which is a reflexive, symmetric as well as transitive.

Here,

We know a line cannot be perpendicular to itself, i.e. it is not reflexive.

If a line a perpendicular to line b, then line b will also be perpendicular to line a, thus it is symmetric.

Also, if a line a is perpendicular to line b, and line b is perpendicular to line c, then line a will be parallel to line c but not perpendicular, thus it is not transitive.

Therefore, it is a symmetric relation.

Hence, the correct option is (B) i.e. Symmetric.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

SETS, RELATION AND FUNCTION

Q1 If $A = \{1, 3, 5\}$ and $B = \{2, 3\}$, then find $A \times B$.
(A) {(1, 2), (1, 3), (3, 2)}
(B) {(1, 2), (1, 3), (3, 3), (5, 5)}
(C) {(1, 2), (1, 3), (3, 2), (3, 3), (5, 2), (5, 3)}
(D) None of these

Q2 The domain of $\{1, 7\}, \{2, 6\}$ is
(A) $(1, 6)$ (B) $(7, 6)$
(C) $\{1, 2\}$ (D) $\{6, 7\}$

Q3 The range of $\{(3, 0), (2, 0), (1, 0), (0, 0)\}$ is
(A) $\{3, 2, 1, 0\}$
(B) $\{0\}$
(C) $\{3, 2, 1\}$
(D) None of these

Q4 Identify the elements of P if set $Q = \{1, 2, 3\}$ and $P \times Q = \{(4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3), (6, 1), (6, 2), (6, 3)\}$
(A) $\{3, 4, 5\}$ (B) $\{4, 5, 6\}$
(C) $\{5, 6, 7\}$ (D) None

Q5 If P has three elements, Q has four and R has two then how many elements does the Cartesian product set $P \times Q \times R$ will have
(A) 24 (B) 9
(C) 29 (D) None

Q6 If A = {1, 2} and B = {3, 4}. Determine the number of relations from A and B.
(A) 3 (B) 16
(C) 5 (D) 6

Q7 Let R be the relation in the set N given by $R = (a, b) : a = b - 2, b > 6$.
Which of the following options is correct?
(A) (2, 4) ∈ R
(B) (3, 8) ∈ R
(C) $(6, 8) \in R$
(D) (8, 7) ∈ R

Q8 Let $P = (1, 2, x), Q = (a, x, y), R = (x, y, z)$ then $P \times Q$ is
(A) $[(1, a), (1, x), (1, y), (2, a), (2, x), (2, y), (x, a), (x, x), (x, y)]$
(B) $[(1, x), (1, y), (1, z), (2, x), (2, y), (2, z), (x, x), (x, y), (x, z)]$
(C) $[(a, x), (a, y), (a, z), (x, x), (x, y), (x, z), (y, x), (y, y), (y, z)]$
(D) $[(1, x), (1, y)(2, x), (2, y), (x, x), (x, y)]$

Q9 Find the domain of the relation R defined by $\{(x, y) : x, y \in N, xy = 8\}$
(A) {1, 8}
(B) {1, 2, 4, 8}
(C) {1, 2, 4, 8, 16}
(D) None

Q10 If $n(A) = 3$, $n(B) = 2$, A and B are two sets, then find the number of relations $A \times B$ have?
(A) 6 (B) 12
(C) 32 (D) 64

Answer Key

Q1	(C)	Q6	(B)
Q2	(C)	Q7	(C)
Q3	(B)	Q8	(A)
Q4	(B)	Q9	(B)
Q5	(A)	Q10	(D)

Hints & Solutions

Q1 Text Solution:

Given: $A = \{1,\ 3,\ 5\}$ and $B = \{2,\ 3\}$

We know that, If A and B are two non-empty sets then the cartesian product of A and B is the set of all ordered pairs $(a,\ b)$ such that $a \in A$ and $b \in B$.

Thus, $A \times B = \{1, 3, 5\} \times \{2, 3\}$

$= \{(1, 2), (1, 3), (3, 2), (3, 3), (5, 2), (5, 3)\}$

Hence, the correct option is (C).

Q2 Text Solution:

Given set: $\{(1, 7), (2,\ 6)\}$

In a function $(x,\ y)$,

x represents the domain and y represents the range.

As per the above set,

Domain $= \{1, 2\}$

Hence, the correct answer is option (C) i.e., $\{1, 2\}$.

Q3 Text Solution:

Given set, $\{(3,\ 0), (2,\ 0), (1, 0), (0,\ 0)\}$

In a function (x, y),

x represents the domain and y represents the range.

As per the above set,

Domain $= \{3, 2, 1, 0\}$

Range $= \{0\}$

Hence, the correct answer is option (B) i.e., $\{0\}$.

Q4 Text Solution:

Given, $Q = \{1,\ 2,\ 3\}$

We know that,

If A and B are two non-empty sets then the set of all ordered pairs $(a,\ b)$ such that a belongs to A and b belongs to B, is called the cartesian product of A and B.

Since,

$P \times Q =$

$\{(4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3),$

$(6, 1), (6, 2), (6, 3)\}$

Thus, $P = \{4,\ 5,\ 6\}$

Hence, the correct answer is option (B) i.e, $\{4, 5, 6\}$.

Q5 Text Solution:

The cartesian product will have elements equal to the product of the number of elements in each set.

Given,

$n(P) = 3,\ n(Q) = 4$ and $n(R) = 2$

Therefore,

$\Rightarrow n(P \times Q \times R) = 3 \times 4 \times 2$

$\Rightarrow n(P \times Q \times R) = 24$

Hence, the correct option is (A) i.e., 24.

Q6 Text Solution:

Given: A = {1, 2} and B = {3, 4}

We know that,

If set A has m elements and set B has n elements, then the number of relations from A to B $= 2^{mn}$

Here, $m = 2$ and $n = 2$

Thus, the number of relations $= 2^{mn}$

$= 2^{2\times2}$

$= 2^4$

$= 16$

Therefore, the correct option is (B) i.e., 16

Q7 Text Solution:

Given,

$R = (a,\ b) :\ a = b - 2,\ b > 6$

For option (A): (2, 4) ∈ R

Since, $b > 6$ but $4 \not> 6$, thus it is incorrect.

For option (B): (3, 8) ∈ R

As, $a = b - 2$,

$\Rightarrow 3 = 8 - 2$

$\Rightarrow 3 = 6$, which is not true, thus it is incorrect.

For option (C): (6, 8) ∈ R

As, $a = b - 2$,

$\Rightarrow 6 = 8 - 2$

$\Rightarrow 6 = 6$, which is true, thus it is correct.

For option (D): (8, 7) ∈ R

As, $a = b - 2$,

$\Rightarrow 8 = 7 - 2$

$\Rightarrow 8 = 5$, which is not true, thus it is incorrect.

Hence, the correct option is (C).

Q8 Text Solution:

Given: $P = (1, 2, x)$ and $Q = (a, x, y)$

We know that, If A and B are two non-empty sets then the set of all ordered pairs (a, b) such that a belongs to A and b belongs to B, is called the cartesian product of A and B.

Thus,

$$P \times Q = [(1, a), (1, x), (1, y), (2, a), (2, x), (2, y), (x, a), (x, x), (x, y)]$$

Hence, the correct answer is option (A).

Q9 Text Solution:

Given: $\{(x,\ y) :\ x,\ y \in N,\ xy = 8\}$

Since, $x,\ y \in N$ and $xy = 8$

Thus, the possible ordered pairs are:

(1, 8), (2, 4), (4, 2), (8, 1).

Therefore, the domain of the given relation = {1, 2, 4, 8}

Hence, the correct option is (B).

Q10 Text Solution:

Given: $n(A) = 3, n(B) = 2$

Thus, the number of relations $A \times B$ have

= $2^{n(a) \times n(b)}$

= $2^{3 \times 2}$

= 64

Hence, the correct option is (D) i.e. 64.

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QUANTITATIVE APTITUDE

DPP: 2

PROBABILITY

Q1 If $P(A \cap B) = 0$, then the two events A and B are
(A) Mutually exclusive
(B) Exhaustive
(C) Equally likely
(D) Independent

Q2 If A and B are two mutually exclusive events such that $P(A \cup B) = \frac{2}{3}$, $P(A) = \frac{2}{5}$, then $P(B) =$
(A) $\frac{4}{15}$ (B) $\frac{4}{9}$
(C) $\frac{5}{9}$ (D) $\frac{7}{15}$

Q3 When two unbiased coins are tossed, the probability of getting both heads or both tails is
(A) 1 (B) $\frac{3}{2}$
(C) $\frac{1}{2}$ (D) none

Q4 The chance of getting 7 or 11 in a throw of 2 dice is
(A) $\frac{7}{9}$ (B) $\frac{5}{9}$
(C) $\frac{2}{9}$ (D) None

Q5 If two events A and B, $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{2}{3}$ then find $P(A \cap B)$.
(A) $\frac{1}{4}$ (B) $\frac{1}{6}$
(C) $\frac{2}{3}$ (D) $\frac{1}{2}$

Q6 A number is selected at random from the first 1000 natural numbers. What is the probability that the number so selected would be a multiple of 7 or 11?
(A) 0.25 (B) 0.22
(C) 0.33 (D) 0.24

Q7 The probability that a card drawn at random from the pack of playing cards may be either a queen or an ace is
(A) $\frac{2}{13}$ (B) $\frac{11}{13}$
(C) $\frac{9}{13}$ (D) None

Q8 A bag contains 12 balls which are numbered from 1 to 12. If a ball is selected at random, what is the probability that the number of the ball will be a multiple of 5 or 6 ?
(A) 0.30 (B) 0.25
(C) 0.20 (D) $\frac{1}{3}$

Q9 Which of the following pairs of events are mutually exclusive?
(A) A: The team wins the football match.
B: The team lost the football match.
(B) A: The card drawn is a heart.
B: The card drawn is a red card.
(C) A: Anita is 20 years old.
B: She is a great dancer.
(D) A: The dice shows an even number.
B: The dice shows a prime number.

Q10 If A and B are mutually exclusive events, then
(A) $P(A) = P(A - B)$
(B) $P(B) = P(A - B)$
(C) $P(A) = P(A \cap B)$
(D) $P(B) = P(A \cap B)$

Answer Key

Q1	(A)	Q6	(B)
Q2	(A)	Q7	(A)
Q3	(C)	Q8	(D)
Q4	(C)	Q9	(A)
Q5	(B)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

Given: $P(A \cap B) = 0$

We know that,

Mutually exclusive events are those events that do not occur at the same time i.e. $P(A \cap B) = 0$

Hence, the correct answer is option (A) i.e. Mutually exclusive.

Q2 Text Solution:

Given: $P(A \cup B) = \frac{2}{3}$ and $P(A) = \frac{2}{5}$

Since, A and B are two mutually exclusive events thus

$P(A \cup B) = P(A) + P(B)$

$\Rightarrow \frac{2}{3} = \frac{2}{5} + P(B)$

$\Rightarrow P(B) = \frac{2}{3} - \frac{2}{5}$

$\Rightarrow P(B) = \frac{10-6}{15} = \frac{4}{15}$

Hence, the correct option is (A).

Q3 Text Solution:

The sample space on throwing two coins is given by,

$\{(H,H),(H,T),(T,T),(T,H)\}$

$\Rightarrow$Total number of outcomes $= 4$

Let A and B be the event of getting both heads (H, H) and both tails (T, T) respectively.

Thus, $P(A) = \frac{1}{4}$ and $P(B) = \frac{1}{4}$

Therefore, the probability of getting both heads or both tails

$= P(A) + P(B)$

$= \frac{1}{4} + \frac{1}{4}$

$= \frac{1}{2}$

Hence, the correct option is (C).

Q4 Text Solution:

The sample space of throwing two dice is given as,

S = {(1,1),(1,2),(1,3),(1,4),(1,5),(1,6), (2,1),(2,2),(2,3),(2,4), (2,5),(2,6), (3,1),(3,2),(3,3),(3,4),(3,5),(3,6), (4,1),(4,2), (4,3),(4,4),(4,5),(4,6), {(5,1),(5,2),(5,3),(5,4),(5,5),(5,6), {(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)}

Let A and B be the event of getting 7 i.e. {(1,6), (2,5),(3,4),(4,3),(5,2), (6,1)} and 11 i.e. {(5,6),(6,5)} respectively.

Thus, $P(A) = \frac{6}{36}$ and $P(B) = \frac{2}{36}$

Therefore, the probability of getting 7 or 11 in a throw of 2 dice is given by

$P(A) + P(B)$

$= \frac{6}{36} + \frac{2}{36}$

$= \frac{8}{36}$

$= \frac{2}{9}$

Hence, the correct option is (C).

Q5 Text Solution:

Given: $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{2}{3}$

We know that,

$P(A \cap B) = P(A) + P(B) - P(A \cup B)$

$\Rightarrow P(A \cap B) = \frac{1}{2} + \frac{1}{3} - \frac{2}{3}$

$\Rightarrow P(A \cap B) = \frac{3+2-4}{6}$

$\Rightarrow P(A \cap B) = \frac{1}{6}$

Hence, the correct option is (B).

Q6 Text Solution:

Given,

A number is selected at random from the first 1000 natural numbers.

According to the question,

$n(S) = 1000$

Number of multiples of 7 in first 1000 natural numbers,

$P(A) = \frac{1000}{7} = 142$ (approx)

Number of multiples of 11 in first 1000 natural numbers,

$P(B) = \frac{1000}{11} = 90$ (approx)

And, numbers divisible by 7 and 11 are

$P(A \cap B) = \frac{1000}{(11 \times 7)} = 12$

Therefore, the probability that the number so selected would be a multiple of 7 or 11 is given by:

$= P\left(A\right) + P\left(B\right) - P\left(A \cap B\right)$

$= \frac{142}{1000} + \frac{90}{1000} - \frac{12}{1000}$

$= \frac{142+90-12}{1000}$

$= 0.22$

Hence, the correct option is (B).

Q7 Text Solution:

We know that,

Total cards $= 52$

Number of queens $= 4$

Number of aces $= 4$

Let A and B be the events that the card is queen or ace respectively, then

$P(A) = \frac{4}{52} = \frac{1}{13}$ and $P(B) = \frac{4}{52} = \frac{1}{13}$

Thus, the probability that a card drawn is either a queen or an ace

$= P(A \cup B)$

$= P(A) + P(B)$ (since, the events are mutually exclusive)

$= \frac{1}{13} + \frac{1}{13}$

$= \frac{2}{13}$

Hence, the correct option is (A).

Q8 Text Solution:

Given,

A bag contains 12 balls which are numbered from 1 to 12

Here, total number of outcomes $= 12$

Let E_1 : Event that it is a multiple of $5 = \{5, 10\}$

E_2 : Event that it is a multiple of $6 = \{6, 12\}$

Since, both the events are mutually exclusive thus, the probability that number of the ball will be a multiple of 5 or 6

$= P\left(E_1\right) + P\left(E_2\right)$

$= \frac{2}{12} + \frac{2}{12}$

$= \frac{4}{12}$

$= \frac{1}{3}$

Hence, the correct option is (D).

Q9 Text Solution:

We know that,

Mutually exclusive events are those events that do not occur at the same time.

We know that,

Mutually exclusive events are those events that do not occur at the same time.

Clearly, option (A) i.e., the team wins the football match and the team loses the football match.

Hence, the correct answer is option (A).

Q10 Text Solution:

Given: A and B are mutually exclusive events.

Thus, $A \cap B = 0$

We know that,

$P(A - B) = P(A) - P(A \cap B)$

$[\because P(A \cap B) = 0]$

$\Rightarrow P(A - B) = P(A)$ $[\because P(A \cap B) = 0]$

Hence, the correct option is (A).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

PROBABILITY

Q1 If $P(A) = 0.45$, $P(B) = 0.35$, $P(A \text{ and } B) = 0.25$ then $P\left(\frac{A}{B}\right)$?

(A) 1.4 (B) 1.8

(C) 0.714 (D) 0.556

Q2 Given that for two events A and B, $P(A) = \frac{3}{5}$, $P(B) = \frac{2}{3}$ and $P(A \cup B) = \frac{3}{4}$, what is $P\left(\frac{A}{B}\right)$?

(A) 0.655 (B) $\frac{13}{60}$

(C) $\frac{31}{60}$ (D) 0.775

Q3 The probability of the occurrence of a number greater than 2 in a throw of a die if it is known that only even numbers can occur is

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$

(C) $\frac{2}{3}$ (D) None

Q4 A family has 2 children. The probability that both of them are boys if it is known that one of them is a boy

(A) 1 (B) $\frac{1}{2}$

(C) $\frac{3}{4}$ (D) None

Q5 A player has 7 cards in hand of which 5 are red and of these five 2 are kings. A card is drawn at random. The probability that it is a king, being known that it is red is

(A) $\frac{2}{5}$ (B) $\frac{3}{5}$

(C) $\frac{4}{5}$ (D) None

Q6 Two coins are tossed simultaneously. What is the probability that the second coin would show a tail given that the first coin has shown a head?

(A) 0.50 (B) 0.25

(C) 0.75 (D) 0.125

Q7 A, B, C are three mutually independent with probabilities 0.3, 0.2 and 0.4 respectively. What is $P(A \cap B \cap C)$?

(A) 0.400 (B) 0.240

(C) 0.024 (D) 0.500

Q8 If $P(A) = \frac{2}{3}$, $P(B) = \frac{3}{4}$, $P\left(\frac{A}{B}\right) = \frac{2}{3}$ then what is $P\left(\frac{B}{A}\right)$?

(A) $\frac{1}{3}$ (B) $\frac{2}{3}$

(C) $\frac{3}{4}$ (D) $\frac{1}{2}$

Q9 For any two events A_1, A_2: let $P(A_1) = \frac{2}{3}$, $P(A_2) = \frac{3}{8}$, $P(A_1 \cap A_2) = \frac{1}{4}$ then A_1, A_2 are

(A) Mutually Exclusive but not independent events

(B) Mutually Exclusive and independent events

(C) Independent but not mutually exclusive

(D) None

Q10 If $P(\overline{A} \cup \overline{B}) = \frac{5}{6}$, $P(A) = \frac{1}{2}$ and $P(B) = \frac{2}{3}$, what is $P(A \cup B)$?

(A) 1 (B) $\frac{5}{6}$

(C) $\frac{2}{3}$ (D) $\frac{4}{9}$

Answer Key

Q1	(C)	Q6	(B)
Q2	(D)	Q7	(C)
Q3	(C)	Q8	(C)
Q4	(D)	Q9	(C)
Q5	(A)	Q10	(A)

Hints & Solutions

Q1 Text Solution:

Given: $P(A) = 0.45$, $P(B) = 0.35$ and $P(A \cap B) = 0.25$

As we know,

$P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$

$\Rightarrow P\left(\frac{A}{B}\right) = \frac{0.25}{0.35}$

$\Rightarrow P\left(\frac{A}{B}\right) = \frac{5}{7}$

$\Rightarrow P\left(\frac{A}{B}\right) = 0.714$

Hence, the correct option is (C) i.e., 0.714.

Q2 Text Solution:

Given,

$P(A) = \frac{3}{5}$, $P(B) = \frac{2}{3}$ and $P(A \cup B) = \frac{3}{4}$

We know that,

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow P(A \cap B) = \frac{3}{5} + \frac{2}{3} - \frac{3}{4} = \frac{31}{60}$

Thus, $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$

$\Rightarrow P\left(\frac{A}{B}\right) = \frac{\frac{31}{60}}{\frac{2}{3}}$

$\Rightarrow P\left(\frac{A}{B}\right) = 0.775$

Hence, the correct option is (D) i.e. 0.775 .

Q3 Text Solution:

When a dice is thrown, the sample space is given as, $S = \{1, 2, 3, 4, 5, 6\}$

So, Total outcomes $= 6$

Let A be an event of getting number greater than 2, then Favorable outcomes $= \{3, 4, 5, 6\} = 4$

Let B be an event of getting even numbers, then Favorable outcomes $= \{2, 4, 6\} = 3$

Now, $A \cap B = \{4,\ 6\}$

Thus, $P(B) = \frac{3}{6} = \frac{1}{2}$ and $P(A \cap B) = \frac{2}{6} = \frac{1}{3}$

Therefore, $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$

$P\left(\frac{A}{B}\right) = \frac{\frac{1}{3}}{\frac{1}{2}}$

$P\left(\frac{A}{B}\right) = \frac{2}{3}$

Hence, the correct option is (C).

Q4 Text Solution:

Let B denote boys and G denote girls.

The sample space of 2 children is given as, $S = \{BB, GG, BG, GB\}$

Total outcomes $= 4$

Let A be an event where both are boys,

Favorable outcomes $= \{BB\} = 1$

$P(A) = \frac{1}{4}$

Let B be an event that atleast one child is a boy

Favorable outcomes $= \{BB, BG, GB\} = 3$

$P(B) = \frac{3}{4}$

Now, $A \cap B = \{BB\}$

Thus, $P(A \cap B) = \frac{1}{4}$

We know that,

$P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$

$\Rightarrow P\left(\frac{A}{B}\right) = \frac{\frac{1}{4}}{\frac{3}{4}}$

$\Rightarrow P\left(\frac{A}{B}\right) = \frac{1}{3}$

Hence, the correct option is (D) i.e., None.

Q5 Text Solution:

Given: Total number of cards $= 7$

Number of red cards $= 5$

Number of red king cards $= 2$

Let A represents red cards and B represents red king, thus $n(A) = 5, n(B) = 2$

Therefore, the required probability that the card is a king, being known that it is red is given as,

$P\left(\frac{B}{A}\right) = \frac{P(B \cap A)}{P(A)}$

$P\left(B \cap A\right) = P\left(B\right) = 2$

$P\left(A\right) = 5$

Thus, $P\left(\frac{B}{A}\right) = \frac{2}{5}$

Hence, the correct option is (A).

Q6 Text Solution:

The sample space for two coins is $\{HH, HT, TH, TT\}$

Thus, $n(S) = 4$

Favorable outcomes (E) for the first coin head

and second coin showing tail is $\{HT\}$

Thus, $n(E) = 1$

Therefore, the probability that the second coin would show a tail given that the first coin has shown a head:

$\Rightarrow \frac{n(E)}{n(S)} = \frac{1}{4} = 0.25$

Hence, the correct option is (B) i.e. 0.25 .

Q7 Text Solution:

Given: A, B, C are three mutually independent such that

$P(A) = 0.3,\ P(B) = 0.2,\ P(C) = 0.4$

As A, B and C are mutually independent, thus

$P(A \cap B \cap C) = P(A) \times P(B) \times P(C)$

$\Rightarrow P(A \cap B \cap C) = 0.3 \times 0.2 \times 0.4$

$\Rightarrow P(A \cap B \cap C) = 0.024$

Hence, the correct option is (C) i.e. 0.024 .

Q8 Text Solution:

Given: $P(A) = \frac{2}{3}$, $P(B) = \frac{3}{4}$ and $P\left(\frac{A}{B}\right) = \frac{2}{3}$

As we know that,

$\Rightarrow P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$

$\Rightarrow P\left(A \cap B\right) = P\left(\frac{A}{B}\right) \times P\left(B\right)$

$\Rightarrow P\left(A \cap B\right) = \frac{2}{3} \times \frac{3}{4} = \frac{1}{2}$

Now, $P\left(\frac{B}{A}\right) = \frac{P(A \cap B)}{P(A)} = \frac{\frac{1}{2}}{\frac{2}{3}} = \frac{3}{4}$

Therefore, $P\left(\frac{B}{A}\right) = \frac{3}{4}$

Hence, the correct option is (C).

Q9 Text Solution:

Given: $P(A_1) = \frac{2}{3}$, $P(A_2) = \frac{3}{8}$ and $P(A_1 \cap A_2) = \frac{1}{4}$

As we know, for mutually exclusive events

$P(A_1 \cap A_2) = 0$

On the contrary, given in the question,

$P(A_1 \cap A_2) = \frac{1}{4} \neq 0$

Thus, they are not mutually exclusive events.

Now, for independent events:

$P(A_1 \cap A_2) = P(A_1) \cdot P(A_2)$

Put the values and check for independent events,

$\Rightarrow \frac{1}{4} = \frac{2}{3} \times \frac{3}{8}$

$\Rightarrow \frac{1}{4} = \frac{6}{24}$

$\Rightarrow \frac{1}{4} = \frac{1}{4}$ (verified)

Thus, they are independent events however they are not mutually exclusive events.

Hence, the correct option is (C) i.e., Independent but not mutually exclusive.

Q10 Text Solution:

Given: $P(\overline{A} \cup \overline{B}) = \frac{5}{6}$, $P(A) = \frac{1}{2}$ and $P(B) = \frac{2}{3}$

We know that,

$P\left(\overline{A} \cup \overline{B}\right) = P\left(\overline{A \cap B}\right) = 1 - P\left(A \cap B\right)$

$\Rightarrow \frac{5}{6} = 1 - P\left(A \cap B\right)$

$\Rightarrow P\left(A \cap B\right) = 1 - \frac{5}{6} = \frac{1}{6}$

We also know that,

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{1}{2} + \frac{2}{3} - \frac{1}{6}$

$= \frac{7}{6} - \frac{1}{6}$

$= 1$

Hence, the correct option is (A) i.e. 1.

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

PROBABILITY

Q1 Which of the following set of function define a probability space on $S = \{a_1, a_2, a_3\}$?
(A) $P(a_1) = \frac{1}{3}, P(a_2) = \frac{1}{2}, P(a_3) = \frac{1}{4}$
(B) $P(a_1) = \frac{1}{3}, P(a_2) = \frac{1}{6}, P(a_3) = \frac{1}{2}$
(C) $P(a_1) = \frac{2}{3}, P(a_2) = \frac{2}{3}, P(a_3) = \frac{1}{4}$
(D) none

Q2 Let P be a probability function on $S = \{X_1, X_2, X_3\}$ if $P(X_1) = \frac{1}{4}$, $P(X_3) = \frac{1}{3}$ then $P(X_2)$ is
(A) $\frac{5}{12}$ (B) $\frac{7}{12}$
(C) $\frac{3}{4}$ (D) none

Q3 The probability distribution of a random variable is as follows:

x	1	2	3	4	5
P	$3k$	$2k$	$3k$	k	k

Find the value of k and $P(x < 3)$.
(A) $\frac{1}{10}, 0.2$
(B) $\frac{1}{10}, 0.5$
(C) $\frac{1}{5}, 1.5$
(D) None of the above

Q4 A random variable X taking values 0, 1, 2 has the following probability distribution for some number k.
$P(X) = k \; if \; X = 0$
$= 2k \; if \; X = 1$
$= 3k \; if \; X = 2$
Find the value of k.
(A) 1
(B) $\frac{1}{3}$
(C) $\frac{1}{6}$
(D) None of the above

Q5 If $P(a_1) = 0, P(a_2) = \frac{1}{3}, P(a_3) = \frac{2}{3}$ then $S = \{a_1, a_2, a_3\}$ is a probability space.
(A) true (B) false
(C) both (D) none

Q6 A random variable X has the following probability distribution:

X	0	1	2	3	4	5	6	7
$P(X)$	0	$2k$	$3k$	k	$2k$	k^2	$7k^2$	$2k^2 + k$

Find the value of k.
(A) 10
(B) -1
(C) $\frac{1}{10}$
(D) None of the above

Answer Key

Q1	(B)	Q4	(C)
Q2	(A)	Q5	(A)
Q3	(B)	Q6	(C)

Hints & Solutions

Q1 Text Solution:

Given: $S = \{a_1, a_2, a_3\}$

As we know that, the sum of all the probabilities is equal to 1.

For option (A):

$\frac{1}{3} + \frac{1}{2} + \frac{1}{4} = \frac{13}{12} \neq 1$

Here, the sum of probabilities is not equal to 1.

For option (B):

$\frac{1}{3} + \frac{1}{6} + \frac{1}{2} = \frac{6}{6} = 1$

Therefore, the sum of probabilities is equal to 1.

For option (C):

$\frac{2}{3} + \frac{2}{3} + \frac{1}{4} = \frac{19}{12} \neq 1$

Here, the sum of probabilities is not equal to 1.

Hence, the correct option is (B).

Q2 Text Solution:

Given, $P(X_1) = \frac{1}{4}$ and $P(X_3) = \frac{1}{3}$

We know that the sum of all probabilities of all the elements of the sample space is 1.

Thus, $P(X_1) + P(X_2) + P(X_3) = 1$

$\Rightarrow \frac{1}{4} + P(X_2) + \frac{1}{3} = 1$

$\Rightarrow P(X_2) = 1 - \frac{7}{12}$

$\Rightarrow P(X_2) = \frac{5}{12}$

Hence, the correct option is (A).

Q3 Text Solution:

As it is given as probability distribution function,

$\Rightarrow \sum P = 1$

$\Rightarrow 10k = 1$

$\Rightarrow k = \frac{1}{10}$

Now,

$$P(x < 3) = P(x = 1) + P(x = 2)$$
$$= 3k + 2k$$
$$= 5k$$
$$= 5\left(\frac{1}{10}\right) = \frac{1}{2} = 0.5$$

Hence, the correct option is (B) i.e., 0.5 .

Q4 Text Solution:

As it is given as probability distribution function,

$\Rightarrow \sum P(X) = 1$

$\Rightarrow P(X = 0) + P(X = 1) + P(X = 2) = 1$

$\Rightarrow k + 2k + 3k = 1$

$\Rightarrow 6k = 1$

$\Rightarrow k = \frac{1}{6}$

Therefore, the value of k is $\frac{1}{6}$.

Hence, the correct option is (C).

Q5 Text Solution:

Given,

$P(a_1) = 0, P(a_2) = \frac{1}{3}, P(a_3) = \frac{2}{3}$

As we know that $\sum p_i = 1$, where p_i's are the respective probabilities of the elements of sample space.

Thus checking by summing up the probabilities

$= 0 + \frac{1}{3} + \frac{2}{3} = 1$

Hence, the correct option is (A).

Q6 Text Solution:

We know that,

$\sum P(X) = 1$

$\Rightarrow 0 + 2k + 3k + k + 2k + k^2 + 7k^2 + 2k^2 + k = 1$

$\Rightarrow 10k^2 + 10k - k - 1 = 0$

$\Rightarrow 10k(k + 1) - (k + 1) = 0$

$\Rightarrow (10k - 1)(k + 1) = 0$

$\Rightarrow 10k - 1 = 0, \ k + 1 = 0$

$\Rightarrow k = \frac{1}{10}, \ k = -1$

Since, k cannot be negative.

Therefore, the value of k is $\frac{1}{10}$.

Hence, the correct option is (C).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 6

PROBABILITY

Q1 If two events cannot occur simultaneously in the same trial, then they are
(A) mutually exclusive events
(B) simple events
(C) favorable events
(D) none

Q2 If an unbiased coin is tossed once, then the two events Head and Tail are
(A) Mutually exclusive
(B) Exhaustive
(C) Equally likely
(D) All of these

Q3 A card is drawn from a well-shuffled pack of playing cards. The probability that it is a king is
(A) $\frac{1}{13}$ (B) $\frac{1}{4}$
(C) $\frac{4}{13}$ (D) none

Q4 The probability of an event can assume any value between
(A) -1 and 1 (B) 0 and 1
(C) -1 and 0 (D) none of these

Q5 If $P(A) = \frac{1}{3}$, then the odds against the event A is
(A) $2 : 1$
(B) $3 : 1$
(C) $3 : 2$
(D) $2 : 3$

Q6 If two random variables x and y are related by y = 2 – 3x, then the SD of y is given by
(A) $-3 \times S.D\ of\ x$
(B) $3 \times S.D\ of\ x$
(C) $9 \times S.D\ of\ x$
(D) $2 \times S.D\ of\ x$

Q7 If an unbiased coin is tossed twice, the probability of obtaining at least one tail is
(A) 0.25 (B) 0.50
(C) 0.75 (D) 1

Q8 There are 10 balls numbered from 1 to 10 in a box. If one of them is selected at random, what is the probability that the number printed on the ball would be an odd number greater than 4?
(A) 0.50 (B) 0.40
(C) 0.60 (D) 0.30

Q9 Two balls are drawn from a bag containing 5 white and 7 black balls at random. What is the probability that they would be of different colours?
(A) $\frac{35}{66}$
(B) $\frac{30}{66}$
(C) $\frac{12}{66}$
(D) none of the above

Q10 For two independent events A and B, what is $P(A + B)$, given $P(A) = \frac{3}{5}$ and $P(B) = \frac{2}{3}$.
(A) $\frac{11}{15}$ (B) $\frac{13}{15}$
(C) $\frac{7}{15}$ (D) 0.65

Q11 Two dice are thrown at a time. The probability that 'the difference of numbers shown is 1' is
(A) $\frac{11}{18}$ (B) $\frac{5}{18}$
(C) $\frac{7}{18}$ (D) none

Q12 If an unbiased coin is tossed three times, what is the probability of getting more than one head?
(A) $\frac{1}{8}$ (B) $\frac{3}{8}$
(C) $\frac{1}{2}$ (D) $\frac{1}{3}$

Q13

An article consists of two parts A and B. The manufacturing process of each part is such that probability of defect in A is 0.08 and that B is 0.05. What is the probability that the assembled product will not have any defect?

(A) 0.934 (B) 0.864
(C) 0.85 (D) 0.874

Q14 The probability of winning of a person is $\frac{6}{11}$ and at a result he gets ₹77. The expectation of this person is

(A) ₹35 (B) ₹42
(C) ₹58 (D) None

Q15 It is given that a family of 2 children has a girl, what is the probability that the other child is also a girl ?

(A) 0.50 (B) 0.75
(C) $\frac{1}{3}$ (D) $\frac{2}{3}$

Q16 The chance of getting a sum of 10 in a single throw with two dice is

(A) $\frac{10}{36}$ (B) $\frac{1}{12}$
(C) $\frac{5}{36}$ (D) none

Q17 If $2x + 3y + 4 = 0$ and $v(x) = 6$ then $v(y)$ is

(A) $\frac{8}{3}$ (B) 9
(C) -9 (D) 6

Q18 In a class 40% students read Mathematics, 25% Biology and 15% both Mathematics and Biology. One student is select at random. The probability that he reads Mathematics if it is known that he reads Biology is

(A) $\frac{2}{5}$ (B) $\frac{3}{5}$
(C) $\frac{4}{5}$ (D) None

Q19 A problem in probability was given to three CA students A, B and C whose chances of solving it are $\frac{1}{3}, \frac{1}{5}\ and\ \frac{1}{2}$ respectively. What is the probability that the problem would be solved?

(A) $\frac{4}{15}$ (B) $\frac{7}{15}$
(C) $\frac{11}{15}$ (D) $\frac{8}{15}$

Q20 For a group of subjects 30%, 40% and 50% failed in Physics, Chemistry and at least one of the two subjects respectively. If an examinee is selected at random, what is the probability that he passed in Physics if it is known that he failed in Chemistry?

(A) $\frac{1}{2}$
(B) $\frac{1}{3}$
(C) $\frac{1}{4}$
(D) $\frac{1}{6}$

Answer Key

Q1	(A)	Q11	(B)
Q2	(D)	Q12	(C)
Q3	(A)	Q13	(D)
Q4	(B)	Q14	(B)
Q5	(A)	Q15	(C)
Q6	(B)	Q16	(B)
Q7	(C)	Q17	(A)
Q8	(D)	Q18	(B)
Q9	(A)	Q19	(C)
Q10	(B)	Q20	(A)

Hints & Solutions

Q1 Text Solution:

Mutually exclusive events are those events that do not occur at the same time. For example, when a coin is tossed then the result will be either head or tail, but we cannot get both the results. Such events are also called disjoint events since they do not happen simultaneously.

Hence, the correct option is (A).

Q2 Text Solution:

We know that, the sample space of tossing two coins:

$S = \{H, T\}$,

where H represents head and T represents tail.

Now, $P(H) = \frac{1}{2}$ and $P(T) = \frac{1}{2}$

Also, $P(H) + P(T) = \frac{1}{2} + \frac{1}{2} = 1$

Thus, the events are Mutually exclusive, Exhaustive and Equally likely.

Hence, the correct answer is option (D) i.e All of these.

Q3 Text Solution:

Total number of cards $= 52$

Number of king cards $= 4$

We know that,

Probability $= \frac{\text{Number of favorable outcomes}}{\text{Total outcomes}}$

$\Rightarrow$ Probability (getting a king) $= \frac{4}{52} = \frac{1}{13}$

Hence, the correct option is (A) i.e., $\frac{1}{13}$.

Q4 Text Solution:

We know that,

The probability of an event can assume any value between 0 and 1.

Hence, the correct option is (B).

Q5 Text Solution:

We know that,

Probability of the event is given by $\frac{p}{p+q}$,

where $\frac{p}{q}$ are the odds in favor of an event and $\frac{q}{p}$ are the odds against an event.

Given, $P(A) = \frac{1}{3}$

$\Rightarrow \frac{p}{p+q} = \frac{1}{3}$

$\Rightarrow 3p = p + q$

$\Rightarrow 2p = q$

$\Rightarrow \frac{q}{p} = \frac{2}{1}$

Hence, the correct option is (A).

Q6 Text Solution:

Given: Random variables $\mathbf{x}$ and $\mathbf{y}$ are related by $y = 2 - 3x$

$\Rightarrow$ S.D of y = $|coefficient\ of\ x| \times$ S.D(x)

Thus SD of $y = |-3| \times SD(x)$

$= 3 \times S.D(x)$

Hence, the correct option is (B).

Q7 Text Solution:

The sample space on tossing two coins is given by $\{HH, HT, TH, TT\}$

Now, favorable outcomes $= \{TH, HT, TT\}$

We know that,

$\text{Probability (getting at least one tail)}$

$= \frac{\text{Number of favorable outcomes}}{\text{Total outcomes}}$

$= \frac{3}{4} = 0.75$

Hence, the correct option is (C) i.e. 0.75 .

Q8 Text Solution:

Given: 10 balls numbered from 1 to 10 in a box.

Total number of outcomes = 10

Now, the odd numbers greater than 4 are 5, 7 and 9.

$\Rightarrow$ Favorable outcomes = 3

Therefore, Probability (getting odd number greater than 4) $= \frac{3}{10} = 0.30$

Hence, the correct option is (D) i.e. 0.30.

Q9 Text Solution:

Since, a bag contains 5 white and 7 black balls.

Total number of balls in the bag $= 12$

Number of balls to be taken out $= 2$

Thus, the total cases will be ${}^{12}C_2$

As the balls have to be of different colors, thus the selection of white balls can done in ${}^{5}C_1$

ways and that of black ball can be done in ${}^7C_1$ ways

We know that,

Probability $= \frac{\text{Number of favorable outcomes}}{\text{Total outcomes}}$

Then, the probability of drawing 2 balls of different color

$= \frac{{}^5C_1 \times {}^7C_1}{{}^{12}C_2}$

$= \frac{5\times7}{66} = \frac{35}{66}$

Hence, the correct option is (A).

Q10 Text Solution:

Given: $P(A) = \frac{3}{5}$ and $P(B) = \frac{2}{3}$

Here A and B are independent events, thus

$P(A \cap B) = P(A) \times P(B)$

$\Rightarrow P(A+B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow P(A+B) = P(A) + P(B) - P(A) \cdot P(B)$

$\Rightarrow P(A+B) = \frac{3}{5} + \frac{2}{3} - \left(\frac{3}{5}\right)\left(\frac{2}{3}\right) = \frac{19}{15} - \frac{6}{15} = \frac{13}{15}$

Hence, the correct option is (B) i.e. $\frac{13}{15}$.

Q11 Text Solution:

The sample space of two dice is given by (1,1), (1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6), (3,1),(3,2),(3,3),(3,4),(3,5),(3,6),(4,1),(4,2),(4,3),(4,4), (4,5),(4,6),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,2), (6,3),(6,4),(6,5),(6,6)

$\Rightarrow$ Total number of sample space $= 36$

Now, favourable outcomes of getting the difference of numbers as 1 are:

$\{(2,1),(1,2),(3,2),(2,3),(4,3),(3,4),$
$(5,4),(4,5),(6,5),(5,6)\}$

Thus, number of favourable outcomes $= 10$

Then, the probability of getting the numbers with difference 1

$= \frac{10}{36}$

$= \frac{5}{18}$

Hence, the correct option is (B).

Q12 Text Solution:

The sample space of tossing three coins is given by:

$\{(HHH),(HHT),(HTH),(THH),$
$(TTH),(THT),(HTT),(TTT)\}$

$\Rightarrow$ Total outcomes $= 8$

Now, favorable outcomes: (H, H, H),(H, H, T),(T, H, H),(H, T, H)

$\Rightarrow$ Favorable outcomes $= 4$

Thus, Probability $= \frac{4}{8} = \frac{1}{2}$

Hence, the correct option is (C) i.e $\frac{1}{2}$.

Q13 Text Solution:

Given: Probability of defect in A, $P(A) = 0.08$

Probability of defect in B, $P(B) = 0.05$

Now, Probability that part A will have no defect,

$P(A)' = 1 - 0.08 = 0.92$

Now, Probability that part B will have no defect,

$P(B)' = 1 - 0.05 = 0.95$

Now Products are non defective will be given as,

$P(A' \cap B') = P(A)' \times P(B)'$

$\Rightarrow 0.92 \times 0.95$

$\Rightarrow 0.874$

Hence, the correct option is (D) i.e., 0.874 .

Q14 Text Solution:

Given: Probability of winning of a person $P(W) = \frac{6}{11}$

Winning amount $(A) = ₹77$

Expectation (E) will be given as,

$E = P(W) \times A$

$E = \frac{6}{11} \times 77$

$E = ₹42$

Hence, the correct option is (B) i.e., ₹42.

Q15 Text Solution:

Let A be the event that any one child is a girl and B is the event that both are girls.

Now, sample space $= \{BB, BG, GB, GG\}$

$\Rightarrow n(A) = n\{BB, GB, GG\} = 3$

$\Rightarrow n(B) = n\{GG\} = 1$

Thus, $P(A) = \frac{3}{4}$ *and* $P(B) = \frac{1}{4}$

Now, $A \cap B = \{GG\}$

$\Rightarrow P(A \cap B) = \frac{1}{4}$

Therefore, the probability of having a girl given that the other child is already a girl is

$P\left(\frac{B}{A}\right)=\frac{P(A\cap B)}{P(A)}=\frac{\frac{1}{4}}{\frac{3}{4}}=\frac{1}{3}$

Hence, the correct option is (C).

Q16 Text Solution:

The sample space of two dice is given by (1,1),(1,2),(1,3),(1,4),(1,5),(1,6),(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)

$\Rightarrow$ Total number of sample space $=36$

Now, the favourable outcomes are the points whose sum is 10 i.e. $(6,4),(4,6),(5,5)$

$\Rightarrow$ Number of favorable outcomes $=3$

Thus, probability (getting the sum of 10) $=\frac{3}{36}=\frac{1}{12}$

Hence, the correct option is (B).

Q17 Text Solution:

Given: $v(x)=6$

Also, $2x+3y+4=0$

$\Rightarrow 3y=-2x-4$

We know that,

$\text{var}(ax+b)=a^2\,\text{var}(x)$

Then,

$\Rightarrow v(3y)=v(-2x-4)$

$\Rightarrow 3^2v(y)=(-2)^2v(x)$

$\Rightarrow v(y)=\frac{4}{9}\times v(x)$

$\Rightarrow v(y)=\frac{4}{9}\times 6$

$\Rightarrow v(y)=\frac{8}{3}$

Hence, the correct option is (A).

Q18 Text Solution:

Let there be an event A where students reads Mathematics and B be an event where students read Biology.

Now, number of students who read:

Mathematics $=40\%=\frac{40}{100}=\frac{2}{5}$

Biology $=25\%=\frac{25}{100}=\frac{1}{4}$

Both Mathematics and Biology $=15\%=\frac{15}{100}=\frac{3}{20}$

From the given conditions,

$P(A)=\frac{2}{5}, P(B)=\frac{1}{4}$ and $P(A\cap B)=\frac{3}{20}$

According to the question,

Probability that he reads Mathematics if it is known that he reads Biology will be given by,

$P\left(\frac{A}{B}\right)=\frac{P(A\cap B)}{P(B)}$

$=\frac{\frac{3}{20}}{\frac{1}{4}}$

$=\frac{3}{20}\times\frac{4}{1}$

$=\frac{3}{5}$

Hence, the correct option is (B).

Q19 Text Solution:

Given: Probability was given to three CA students A, B and C whose chances of solving it are $\frac{1}{3}$, $\frac{1}{5}$ *and* $\frac{1}{2}$ respectively.

i.e. , $P(A)=\frac{1}{3}, P(B)=\frac{1}{5}$ and $P(C)=\frac{1}{2}$

Thus,

$P\left(\overline{A}\right)=1-\frac{1}{3}=\frac{2}{3}$

$P\left(\overline{B}\right)=1-\frac{1}{5}=\frac{4}{5}$

$P\left(\overline{C}\right)=1-\frac{1}{2}=\frac{1}{2}$

Thus, the probability that the problem would not be solved if none of them solved the problem is given by $P\left(\overline{A}\cap\overline{B}\cap\overline{C}\right)$.

Since, they are independent events thus

$P\left(\overline{A}\cap\overline{B}\cap\overline{C}\right)=P\left(\overline{A}\right)\times P\left(\overline{B}\right)\times P\left(\overline{C}\right)$

$P\left(\overline{A}\cap\overline{B}\cap\overline{C}\right)=\frac{2}{3}\times\frac{4}{5}\times\frac{1}{2}=\frac{4}{15}$

Therefore, the probability that the problem would be solved

= 1 - Probability (problem not solved)

$=1-\frac{4}{15}$

$=\frac{11}{15}$

Hence, the correct answer is option (C).

Q20 Text Solution:

Let A be the event that a student fails in Physics.

Let B be the event that a student fails in Chemistry.

According to the question,

$P(A)=0.30$ *and* $P(B)=0.40$

Also, the probability of failing in at least one of the subjects is 0.50.

$\Rightarrow P(A\cup B)=0.50$

We know that,

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow P(A) + P(B) - P(A \cap B) = 0.50$

$\Rightarrow 0.30 + 0.40 - P(A \cap B) = 0.50$

$\Rightarrow P(A \cap B) = 0.20$

Now, the probability that if student pass in Physics then he will fail in chemistry is denoted by $P\left(\frac{\overline{A}}{B}\right)$

We know that,

$P\left(\frac{\overline{A}}{B}\right) = \frac{P\left(\overline{A} \cap B\right)}{P(B)}$

$Here,\ P\left(\overline{A} \cap B\right) = P\left(B\right) - P\left(A \cap B\right)$

$= 0.40 - 0.20$

$= 0.20$

$\Rightarrow P\left(\frac{\overline{A}}{B}\right) = \frac{0.20}{0.40}$

$= \frac{1}{2}$

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 1

THEORETICAL DISTRIBUTIONS

Q1 The probability mass function of binomial distribution is given by
(A) $f(x) = p^x q^{n-x}$ (B) $f(x) = {}^nC_x p^x q^{n-x}$
(C) $f(x) = {}^nC_x q^x p^{n-x}$ (D) $f(x) = {}^nC_x p^{n-x} q^x$

Q2 In Binomial Distribution 'n' means
(A) Number of trials of the experiment
(B) The probability of getting success
(C) Number of success
(D) none

Q3 What is the probability of getting 3 heads if 6 unbiased coins are tossed simultaneously?
(A) 0.50 (B) 0.25
(C) 0.3125 (D) 0.6875

Q4 On average, every one out of 10 telephones is found busy. Six telephone numbers are selected at random. Find the probability that four of them will be busy.
(A) 0.1215 (B) 0.001215
(C) 0.00081 (D) None of these

Q5 Find the probability of getting at least 5 times head-on tossing an unbiased coin for 6 times by using the binomial distribution.
(A) $\frac{1}{2}$ (B) $\frac{3}{32}$
(C) $\frac{7}{64}$ (D) None of these

Q6 What is the probability of making 3 correct guesses in 5 True – False answer type questions?
(A) 0.3125 (B) 0.5676
(C) 0.6875 (D) 0.4325

Q7 If in Binomial distribution np = 9 and npq = 2.25 then q is equal to
(A) 0.25 (B) 0.75
(C) 1 (D) none

Q8 Standard deviation of binomial distribution is
(A) $(npq)^2$ (B) $\sqrt{npq}$
(C) $(np)^2$ (D) $\sqrt{np}$

Q9 An unbiased die is tossed 500 times. The mean of the number of 'sixes' in these 500 tosses is
(A) $\frac{50}{6}$ (B) $\frac{500}{6}$
(C) $\frac{5}{6}$ (D) None

Q10 The probability of a student passing a math test is 0.75. Find the mean and variance of the number of students passing in a group of 40 students.10, 0.75
(A) 10, 0.75 (B) 10, 7.5
(C) 30, 1.5 (D) 30, 7.5

Answer Key

Q1	(B)	Q6	(A)
Q2	(A)	Q7	(A)
Q3	(C)	Q8	(B)
Q4	(B)	Q9	(B)
Q5	(C)	Q10	(D)

Hints & Solutions

Q1 Text Solution:

Probability mass function of binomial distribution gives the probability that a discrete random variable will be exactly equal to a specific value. The probability mass function is only used for discrete random variables.

It is formulated as,

$f(x) = {}^{n}C_{x}p^{x}q^{n-x}$

where, n is Number of Trials, p is Probability of getting success and q Probability of getting failure

Hence, the correct options is (B).

Q2 Text Solution:

In Binomial distribution, number of trials is denoted by 'n' and probability of success is denoted by 'p' whereas probability of failure is denoted by 'q'.

Therefore, in Binomial Distribution 'n' means number of trials of the experiment.

Hence, the correct option is (A) i.e., Number of trials of the experiment.

Q3 Text Solution:

According to the question,

For probability of getting heads:

$n = 6,\ p = \frac{1}{2},\ q = \frac{1}{2},\ x = 3$

Binomial distribution is given by the formula,

$P(X = x) = {}^{n}C_{x}(p)^{x}(q)^{n-x}$

$P\left(X = 3\right) = {}^{6}C_{3}\left(\frac{1}{2}\right)^{3}\left(\frac{1}{2}\right)^{6-3}$

$\left[\because {}^{n}C_{x} = \frac{n!}{r!\times(n-r)!}\right]$

$= \frac{6!}{3!\times(6-3)!} \times \left(\frac{1}{8}\right)\left(\frac{1}{8}\right)$

$= \frac{20}{64} = 0.3125$

Therefore, the required probability is 0.3125.

Q4 Text Solution:

According to the question,

$p = \frac{1}{10}, q = 1 - \frac{1}{10} = \frac{9}{10}, n = 6$ and $x = 4$

Thus, the required probability

$= {}^{6}C_{4}\left(\frac{1}{10}\right)^{4}\left(\frac{9}{10}\right)^{6-4}$

$= \frac{6!}{4!\times(6-4)!} \times \left(\frac{1}{10}\right)^{4}\left(\frac{9}{10}\right)^{2}$

$= \frac{6!}{4!\times 2!} \times \left(\frac{1}{10}\right)^{4}\left(\frac{9}{10}\right)^{2}$

$= 15 \times \frac{1}{(10)^{4}} \times \frac{81}{(10)^{2}}$

$= \frac{1215}{(10)^{6}} = 0.001215$

Therefore, the required probability is 0.001215 .

Hence, the correct option is (B).

Q5 Text Solution:

According to the question,

For probability of getting head at least 5 times:

$n = 6, p = \frac{1}{2}, q = \frac{1}{2}, x = 5,\ 6$

Binomial distribution is given by the formula,

$P(X = x) = {}^{n}C_{x}(p)^{x}(q)^{n-x}$

Thus, the probability of getting at least 5 times

$= P\left(x \geq 5\right) = P\left(x = 5\right) + P\left(x = 6\right)$

$= {}^{6}C_{5}\left(\frac{1}{2}\right)^{5}\left(\frac{1}{2}\right)^{6-5} + {}^{6}C_{6}\left(\frac{1}{2}\right)^{6}\left(\frac{1}{2}\right)^{6-6}$

$= \frac{6!}{5!\times(6-5)!} \times \left(\frac{1}{2}\right)^{5}\left(\frac{1}{2}\right)^{1} + \frac{6!}{6!\times(6-6)!}$

$\times \left(\frac{1}{2}\right)^{6}\left(\frac{1}{2}\right)^{0}$

$= 6 \times \left(\frac{1}{2}\right)^{6} + 1 \times \left(\frac{1}{2}\right)^{6}$

$= \frac{7}{64}$

Hence, the correct option is (C).

Q6 Text Solution:

According to the question,

Number of trials: $n = 500$

Specific outcome (making 3 correct guesses): $x = 3$

Probability of success: $p = \frac{1}{2}$,

Probability of failure: $q = 1 - \frac{1}{2} = \frac{1}{2}$

Binomial distribution is given by the formula,

$P\left(X=x\right)={}^{n}C_{x}\left(p\right)^{x}\left(q\right)^{n-x}$

$P\left(X=3\right)={}^{5}C_{3}\left(\frac{1}{2}\right)^{3}\left(\frac{1}{2}\right)^{5-3}$

$\left[\because {}^{n}C_{x}=\frac{n!}{r!\times(n-r)!}\right]$

$=\frac{5!}{2!\times3!}\left(\frac{1}{8}\right)\left(\frac{1}{4}\right)$

$=\frac{10}{32}$

$=\frac{5}{16}$

$=0.3125$

Q7 Text Solution:

Given, np = 9 and npq = 2.25

$\Rightarrow \frac{npq}{np}=\frac{2.25}{9}$

$\Rightarrow q=0.25$

Therefore, the value of q is 0.25.

Hence, the correct answer is option (A).

Q8 Text Solution:

In binomial distribution, we get standard distribution by taking. square root of variance.

Since, Variance $=npq$

$\Rightarrow$ Standard deviation $=\sqrt{npq}$

Hence, the correct option is (B).

Q9 Text Solution:

According to the question,

Number of trials: $n=500$,

Probability of success: $p=\frac{1}{6}$,

Probability of failure: $q=1-\frac{1}{6}=\frac{5}{6}$

Thus, mean of the number of 'sixes' in these 500 tosses is calculated as:

$np=500\times\frac{1}{6}=\frac{500}{6}$

Hence, the correct option is (B).

Q10 Text Solution:

Given,

$p=0.75$ and $n=40$

Thus, mean $(\mu)=np=40(0.75)=30$

Variance $\left(\sigma^{2}\right)=npq=40\left(0.75\right)\left(1-0.75\right)$

$=40(0.75)(0.25)$

$=7.5$

Therefore, the mean is 30 and the variance is 7.5

.

Hence, the correct option is (D).

SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 2

THEORETICAL DISTRIBUTIONS

Q1 The probability of success for the binomial distribution satisfying the following relation, $4P(x=4)=P(x=2)$ and having the parameter n as six is

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$

(C) $\frac{1}{3}, -1$ (D) None of these

Q2 In Binomial distribution, $n=9$ and $p=\frac{1}{3}$, what is the value of variance?

(A) 8 (B) 4

(C) 2 (D) 16

Q3 What is the mode of the distribution for which mean and S.D. are 10 and $\sqrt{5}$ respectively?

(A) 10 (B) 10 and 11

(C) 10.5 (D) None of these

Q4 An experiment succeeds thrice as after it fails. If the experiment is repeated 5 times, what is the probability of having no success at all?

(A) $\frac{1}{512}$ (B) $\frac{5}{1024}$

(C) $\frac{1}{1024}$ (D) None of these

Q5 For binomial distribution $E(x)=2$, $V(x)=\frac{4}{3}$. Find the value of n.

(A) 3 (B) 4

(C) 5 (D) 6

Q6 In Binomial Distribution

(A) mean is greater than variance

(B) mean is less than variance

(C) mean is equal to variance

(D) none

Q7 "The mean of a Binomial distribution is 5 and standard deviation is 3".

(A) True (B) False

(C) Both (D) None

Q8 The mean of Binomial distribution is 20 and standard deviation is 4 then :

(A) $n=100,\ p=\frac{1}{5},\ q=\frac{4}{5}$

(B) $n=50,\ p=\frac{2}{5},\ q=\frac{2}{5}$

(C) $n=100,\ p=\frac{2}{5},\ q=\frac{4}{5}$

(D) $n=100,\ p=\frac{1}{5},\ q=\frac{3}{5}$

Q9 If $x\sim B(5,p)$ and $p(x=2)=0.4362$ and $p(x=3)=0.2181$ then $p=$

(A) $\frac{3}{4}$

(B) $\frac{1}{3}$

(C) $\frac{2}{3}$

(D) $\frac{1}{4}$

Q10 An experiment succeeds twice as often as it fails. What is the probability that in next five trials there will be at least three successes ?

(A) $\frac{33}{81}$

(B) $\frac{46}{81}$

(C) $\frac{64}{81}$

(D) $\frac{25}{81}$

Answer Key

Q1	(B)	Q6	(A)
Q2	(C)	Q7	(B)
Q3	(A)	Q8	(A)
Q4	(C)	Q9	(B)
Q5	(D)	Q10	(C)

Hints & Solutions

Q1 Text Solution:

Given, $4P(x=4)=P(x=2)$ and $n=6$

$\Rightarrow {}^6C_4p^4q^{6-4}={}^6C_2p^2q^{6-2}$

$\Rightarrow {}^6C_4p^4q^2={}^6C_2p^2q^4$

$\Rightarrow 4\times 15\times p^4q^2=15p^2q^4$

$\Rightarrow 4p^2=q^2$

$\Rightarrow 4p^2=(1-p)^2$

$\Rightarrow {}^6C_4p^4q^2={}^6C_2p^2q^4$

$\Rightarrow 4\times 15\times p^4q^2=15p^2q^4$

$\Rightarrow 4p^2=q^2$

$\Rightarrow 4p^2=(1-p)^2$

$\Rightarrow 4p^2-(1-p)^2=0$

$\Rightarrow [2p-(1-p)][(2p+(1+p)]=0$

Using, $a^2-b^2=(a-b)(a+b)$

$\Rightarrow [3p-1)][(3p+1]=0$

$\Rightarrow p=\frac{1}{3}$

(Since, p cannot be negative)

Therefore, the value of p is $\frac{1}{3}$.

Q2 Text Solution:

Given: $n=9$ and $p=\frac{1}{3}$

We know that,

$p+q=1$

$\Rightarrow \frac{1}{3}+q=1$

$\Rightarrow q=1-\frac{1}{3}$

$\Rightarrow q=\frac{2}{3}$

Now, Variance $=npq$

Substituting the values, we get

Variance $=9\times\frac{1}{3}\times\frac{2}{3}=2$

Therefore,the variance of the sample is 2.

Hence, the correct option is (C).

Q3 Text Solution:

Given: Mean $=10$ and S.D. $=\sqrt{5}$

i.e., $np=10$ and $\sqrt{npq}=\sqrt{5}$

$\Rightarrow np=10$ and $npq=5$

$\Rightarrow (10)q=5$

$\Rightarrow q=0.5$

Thus, $p=1-q=1-0.5=0.5$

Now, $(n+1)p=(20+1)0.5$

$=21(0.5)$

$=10.5$

Therefore, mode = Largest integer contained in $(n+1)p=10.$

Hence, the correct option is (A).

Q4 Text Solution:

According to the question, $p=3q$, where p is the probability of success and q is the probability of failure

$\Rightarrow p=3(1-p)$

$\Rightarrow p=3-3p$

$\Rightarrow 4p=3$

$\Rightarrow p=\frac{3}{4}$

Thus, $q=1-p=1-\frac{3}{4}=\frac{1}{4}$

Since, $n=5$, $p=\frac{3}{4}$ and $q=\frac{1}{4}$, thus the probability of having no success at all is

$f(0)={}^5C_0p^0q^5$

$=1(1)(\frac{1}{4})^5$

$=\frac{1}{1024}$

Therefore, the required probability is $\frac{1}{1024}$.

Hence, the correct option is (C).

Q5 Text Solution:

Given that ;

$E(x)=np=2$

$V(x)=npq=\frac{4}{3}$

Now ;

$\Rightarrow 2q=\frac{4}{3}$

$\Rightarrow q=\frac{2}{3}$

We know that ;

$\Rightarrow p+q=1$

$\Rightarrow p=1-q$

$\Rightarrow p=1-\frac{2}{3}$

$\Rightarrow p=\frac{1}{3}$

Since,

$\Rightarrow np = 2$

$\Rightarrow n \times \frac{1}{3} = 2$

$\Rightarrow n = 6$

Hence, the correct option is (D).

Q6 Text Solution:

In binomial distribution,

Mean $= np$ and Variance $= npq$

Also, we know that $q < 1$

So, we can say that $npq < np$.

Therefore, mean is greater than variance.

Hence, the correct answer is option (A) i.e. mean is greater than variance

Q7 Text Solution:

Given: Mean $= 5$ and Standard deviation $= 3$

We know that, Variance of a binomial variable is always less than its mean.

Since, standard deviation is square root of variance thus it will also be less than the mean.

Thus, the given statement is false.

'Or'

For a binomial distribution, We know that, Mean $= np$ and standard deviation $= \sqrt{npq}$

$\Rightarrow$ Standard deviation $= \sqrt{\text{Mean} \times q}$

$\Rightarrow 3 = \sqrt{5 \times q}$

Squaring both sides, we get

$\Rightarrow 9 = 5q$

$\Rightarrow q = \frac{9}{5} = 1.8$

Here, p and q represent the probability of success and failure respectively.

As the value of probability can never be greater than 1, thus $q = 1.8$ is not possible.

Hence, the correct option is (B) i.e., False.

Q8 Text Solution:

Given , Mean $= 20$; S.D $= 4$

i.e., $np = 20$

Variance $= npq = 4^2 = 16$

As, $npq = 16$

$\Rightarrow 20q = 16$

$\Rightarrow q = \frac{16}{20}$

$\Rightarrow q = \frac{4}{5}$

Thus, $p = 1 - q$

$\Rightarrow p = 1 - \frac{4}{5}$

$\Rightarrow p = \frac{1}{5}$

So, $np = 20$

$\Rightarrow n \times \frac{1}{5} = 20$

$\Rightarrow n = 100$

Hence, the correct option is (A).

Q9 Text Solution:

Given information:

$n = 5$

$p(x = 2) = 0.4362$

We know that,

$p(x = 2) = {}^5C_2 p^2 q^3 = 10p^2q^3 = 0.4362$ ..... (1)

Also, $p(x = 3) = 0.2181$

$p(x = 3) = {}^5C_3 p^3 q^2 = 10p^3q^2 = 0.2181$ ..... (2)

On dividing (1) by (2), we get

$\frac{10p^2q^3}{10p^3q^2} = \frac{0.4362}{0.2181}$

$\frac{q}{p} = 2$

$q = 2p$ ..... (3)

It is known that, $p + q = 1$, so, $q = 1 - p$

From equation (3), we get

$1 - p = 2p$

$2p + p = 1$

$3p = 1$

$p = \frac{1}{3}$

Thus, the value of p is $\frac{1}{3}$.

Hence, the correct option is (B) i.e., $\frac{1}{3}$.

Q10 Text Solution:

We know that,

Probability distribution for random variable $X = r$ and total $n$samples is given by : $P(X = r) = C_r^n\ (p)^r\ (q)^{n-r}$

Where p is probability of success and $p + q = 1$

Given that $p = 2q$

Now, $p + q = 1 \Rightarrow q = \frac{1}{3}$ and $p = \frac{2}{3}$

$P(x \geq 3) = P(X = 3) + P(X = 4) + P(X = 5)$

$= {}^5C_3 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^2 + {}^5C_4\ \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^1 + {}^5C_5\ \left(\frac{2}{3}\right)^5 \left(\frac{1}{3}\right)^0$

$= \left(\frac{2}{3}\right)^3 \left\{\frac{10}{9} + \frac{10}{9} + \frac{4}{9}\right\} = \frac{64}{81}$

Therefore, the required probability is $\frac{64}{81}$.

Hence, the correct option is (C).

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SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 3

THEORETICAL DISTRIBUTIONS

Q1 In Poisson Distribution, probability of success is very close to
(A) 1 (B) -1
(C) 0 (D) none

Q2 For a Poisson distribution,
(A) mean and standard deviation are equal
(B) mean and variance are equal
(C) standard deviation and variance are equal
(D) both (A) and (B)

Q3 If for a Poisson variable X, $f(2) = 3\ f(4)$, what is the variance of X?
(A) 2 (B) 4
(C) $\sqrt{2}$ (D) 3

Q4 If the standard deviation of a Poisson variate X is 2, what is $P(1.5 < X < 2.9)$?
(A) 0.231 (B) 0.158
(C) 0.15 (D) 0.146

Q5 If the mean of a Poisson variable X is 1, what is P (X = takes the value at least 1)?
(A) 0.456 (B) 0.821
(C) 0.632 (D) 0.254

Q6 If 1 percent of an airline's flights suffer a minor equipment failure in an aircraft, what is the probability that there will be exactly two such failures in the next 100 such flights?
(A) 0.50 (B) 0.184
(C) 0.265 (D) 0.256

Q7 For a Poisson variate X, $P(X = 1) = P(X = 2)$. What is the mean of X?
(A) 1.00 (B) 1.50
(C) 2.00 (D) 2.50

Q8 If 1.5 percent of items produced by a manufacturing units are known to be defective, What is the probability that a sample of 200items would contain no defective item?
(A) 0.05 (B) 0.15
(C) 0.20 (D) 0.22

Q9 X is a Poisson variate satisfying the following condition
$9P(X = 4) + 90\ P(X = 6) = P(X = 2)$.
What is the value of $P(X \leq 1)$?
(A) 0.5655 (B) 0.6559
(C) 0.7358 (D) 0.8201

Q10 If $X \sim P(m)$ and its coefficient of variation is 50, what is the probability that X would assume only non-zero values?
(A) 0.018 (B) 0.982
(C) 0.989 (D) 0.976

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Answer Key

Q1	(C)	Q6	(B)
Q2	(B)	Q7	(C)
Q3	(A)	Q8	(A)
Q4	(D)	Q9	(C)
Q5	(C)	Q10	(B)

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Hints & Solutions

Q1 Text Solution:

In Poisson distribution, number of trials i.e. n increases indefinitely and probability of success goes towards 0, such that np which is mean always remains finite.

Therefore, the probability of success is very close to 0 .

Hence, the correct option is (C) i.e. 0 .

Q2 Text Solution:

Poisson distribution is defined as a discrete probability function that means the variable can only take specific values in a given list of numbers, probably infinite.

It is formulated as, $f\left(x\right) = \left(\frac{e^{-m} \cdot m^{x}}{x!}\right)$

The mean and the variance of the Poisson distribution are the same, which is equal to the average number of successes that occur in the given interval of time.

Hence, the correct answer is option (B) i.e., mean and variance are equal.

Q3 Text Solution:

Given: $f(2) = 3\ f(4)$

Probability mass function will be given as,

$P\left(X = x\right) = \frac{e^{-m}m^{x}}{x!}$

In Poisson Distribution, Mean $\left(\overline{X}\right)$ =Variance $(\gamma) = m$

According to the question,

$\Rightarrow P\left(X = 2\right) = 3P\left(X = 4\right)$

$\Rightarrow \frac{e^{-m}m^{2}}{2!} = 3\left(\frac{e^{-m}m^{4}}{4!}\right)$

$\Rightarrow m^{2} = 4$

$\Rightarrow m = \sqrt{4}$

$\Rightarrow m = 2$

Hence, the correct option is (A) i.e., 2.

Q4 Text Solution:

Given: Standard Deviation (m) of a Poisson variate X is 2

To find: $P(1.5 < X < 2.9)$

In Poisson Distribution, Mean $\left(\overline{X}\right)$ = Variance $(\gamma) = m$

As we know, Standard deviation $(\sigma) = \sqrt{m}$

$\Rightarrow 2 = \sqrt{m}$

$\Rightarrow m = 4$

As X only takes discrete values, thus

For, $1.5 < X < 2.9$

$\Rightarrow X = 2$

Now, $P\left(X = x\right) = \frac{e^{-m} \times m^{x}}{x!}$

$P\left(X = 2\right) = \frac{e^{-4} \times 4^{2}}{2!}$

$= e^{-4} \times 8$

$= 0.146$

Hence, the correct option is (D) i.e., 0.146 .

Q5 Text Solution:

Given: Mean of Poisson variable $(m) = 1$

According to the question,

$P(X = \text{ takes the value at least } 1) = 1 - P(X = 0)$

Probability mass function will be given as,

$P\left(X = x\right) = \frac{e^{-m}m^{x}}{x!}$

$P\left(X = 0\right) = \frac{e^{-1}1^{0}}{0!}$

$= \frac{1}{e}$

$= 0.3678$

Now, P(X = takes the value at least 1)

$= 1 - 0.3678$

≈ 0.632

Hence, the correct option is (C) i.e., 0.632 .

Q6 Text Solution:

Given: Probability that an airline's flights suffer a minor equipment failure $(p) = 1\% = \frac{1}{100} = 0.01$

Number of flights $(n) = 100$

Thus, $m = np = 100(0.01)$

$\Rightarrow m = 1$

Probability mass function will be given as,

$P\left(X = x\right) = \frac{e^{-m}m^{x}}{x!}$

According to the question,

For exactly 2 equipment failure i.e. $x = 2$

$\Rightarrow P\left(X=2\right)=\frac{e^{-1}1^2}{2!}$

$=\frac{1}{2e}$

$=0.183932$

≈ 0.184

Hence, the correct option is (B) i.e., 0.184.

Q7 Text Solution:

Given: $P(X=1)=P(X=2)$

Probability mass function will be given as,

$P\left(X=x\right)=\frac{e^{-m}m^x}{x!}$

According to the question,

$\Rightarrow \frac{e^{-m}m^1}{1!}=\frac{e^{-m}m^2}{2!}$

$\Rightarrow 1=\frac{m}{2}$

$\Rightarrow m=2$

Therefore, the mean of X is 2 .

Hence, the correct answer is option (C) i.e., 2.00.

Q8 Text Solution:

Given: 1.5% defective items i.e. $(p)=\frac{1.5}{100}=0.015$

Number of units $(n)=200$

In Poisson Distribution,

$m=np=200(0.015)$

$\Rightarrow m=3$

Probability mass function will be given as,

$P\left(X=x\right)=\frac{e^{-m}m^x}{x!}$

As we want 0 defective unit according to the question, then $x=0$

$\Rightarrow P\left(X=0\right)=\frac{e^{-3}3^0}{0!}$

$=\frac{1}{e^3}=\frac{1}{(2.71828)^3}$

$=0.04978\approx 0.05$

Q9 Text Solution:

As we know, For the poisson distribution with mean m

$P\left(X=x\right)=\frac{e^{-m}m^x}{x!}$

According to the question,

$9P\left(X=4\right)+90P\left(X=6\right)=P\left(X=2\right)$

$\Rightarrow 9\left(\frac{e^{-m}m^4}{4!}\right)+90\left(\frac{e^{-m}m^6}{6!}\right)=\left(\frac{e^{-m}m^2}{2!}\right)$

Take e^{-m} and m^2 across the equation,

$\Rightarrow 9\frac{m^2}{24}+90\frac{m^4}{720}=\frac{1}{2}$

$\Rightarrow \frac{3m^2}{8}+\frac{m^4}{8}=\frac{1}{2}$

$\Rightarrow m^4+3m^2-4=0$

$\Rightarrow m^4+4m^2-m^2-4=0$

$\Rightarrow m^2\left(m^2+4\right)-1\left(m^2+4\right)=0$

$\Rightarrow \left(m^2-1\right)\left(m^2+4\right)=0$

$\Rightarrow m^2-1=0$ and $m^2+4=0$

$\Rightarrow m=\pm 1$ and $m^2=-4$, which is not possible.

So, $m=1$, as mean cannot be negative

Now, $P(X\leq 1)$ will be given as,

$P(X\leq 1)=P(X=0)+P(X=1)$ when $m=1$

$=\frac{e^{-1}1^0}{0!}+\frac{e^{-1}1^1}{1!}$

$=\frac{1}{e}+\frac{1}{e}$

$=\frac{2}{e}$

$=\frac{2}{2.71828}$

$=0.735759$

≈ 0.7358

Hence, the correct option is (C) i.e., 0.7358 .

Q10 Text Solution:

Given: Coefficient of variation $(C.V)=50$

Coefficient of Variation is given by the formula,

$\mathrm{C}.V=\frac{\sigma}{\overline{X}}\times 100$

$\left[\sigma\rightarrow \text{ Standard deviation, } \overline{X}\rightarrow \text{ Mean }\right]$

In Poisson Distribution, Mean $\left(\overline{X}\right)=$ Variance $(\gamma)=m$

As we know, Standard Deviation $(\sigma)=\sqrt{\gamma}=\sqrt{m}$

Put the respective values,

$50=\frac{\sqrt{m}}{m}\times 100$

$\Rightarrow \sqrt{m}=2$

$\Rightarrow m=4$

Probability mass function will be given as,

$P\left(X=x\right)=\frac{e^{-m}m^x}{x!}$

$P\left(X=0\right)=\frac{e^{-4}4^0}{0!}$

$=\frac{1}{e^4}=\frac{1}{(2.71282)^4}$

$=0.01846$

Thus, the probability that X would assume only non-zero values i.e.

$$P(X \geq 1) = 1 - P(X = 0)$$
$$= 1 - 0.01846$$
$$= 0.98154 \approx 0.982$$

Hence, the correct option is (B) i.e., 0.982 .

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SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 4

THEORETICAL DISTRIBUTIONS

Q1 Find the mean of x where x is a Poisson variate satisfying the condition P(x = 2) = P(x = 3).

(A) 6 (B) 4

(C) 3 (D) None of these

Q2 A discrete random variable x follows Poisson distribution, then the value of $P(x =$ at least 1) is:

(Given that $E(x) = 2.20$ and $e^{-2.20} = 0.1108$)

(A) 0.15 (B) 0.50

(C) 0.65 (D) 0.89

Q3 It is known that from the past experience that in a certain factory 3% products are defective. A sample of 100 items are taken at random. Find the probability that exactly 5 products are defective? (Given: $e^{-3} = 0.04979$)

(A) 0.01 (B) 0.5

(C) 0.100 (D) None of these

Q4 If the probability that an individual su ers from reaction of a given medicine is 0.001, determine the probability that out of 2,000 individuals, exactly 3 individuals su er from reaction. (Given: $e^{-2} = 0.1353$)

(A) 0.01028 (B) 0.1804

(C) 0.500 (D) None of these

Q5 The average number of accidents per day is 0.2. Assume that the number of accidents per day follows Poisson Distribution, then the probability that there will be three or more accidents per day is (Given, $e^{-0.2} = 0.8187$)

(A) 0.1000 (B) 0.0012

(C) 0.5000 (D) None of these

Q6 For a Poisson distribution, mean = 8 and variance = 7.

(A) True (B) False

(C) Both (D) None

Q7 In a total of 50 packets, the probability of defective bolt is 3%. The mean is

(A) 0.5 (B) 1.0

(C) 0.03 (D) 1.5

Q8 The number of accidents in a year attributed to taxi drivers in a locality follows Poisson distribution with an average 2. Out of 500 taxi drivers of that area, what is the number of drivers with at least 3 accidents in a year?

(A) 162 (B) 180

(C) 201 (D) 190

Q9 Between the hours of 2 P.M and 4 P.M, the average number of phone calls per minute coming into a switch board of a company is 2.5. Find the probability that during one particular minute there will be no phone call at all.

(A) 0.2138 (B) 0.7126

(C) 0.0821 (D) None of these

Q10 A car firm has two cars which it hires out daily. The number of demand for a car on each day is distributed as Poisson Distribution with mean 1.5. Calculate the number of days out of 100 days on which neither car is used.

(Given, $e^{-1.5} = 0.2231$)

(A) 22 (B) 18

(C) 29 (D) 32

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Answer Key

Q1	(C)	Q6	(B)
Q2	(D)	Q7	(D)
Q3	(C)	Q8	(A)
Q4	(B)	Q9	(C)
Q5	(B)	Q10	(A)

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Hints & Solutions

Q1 Text Solution:

Probability mass function is given by,

$P\left(X=x\right)=\frac{e^{-m}m^{x}}{x!}$

In Poisson Distribution, Mean $\left(\overline{X}\right)=m$

According to the question,

$P\left(X=2\right)=P\left(X=3\right)$

$\Rightarrow \frac{e^{-m}m^{2}}{2!}=\left(\frac{e^{-m}m^{3}}{3!}\right)$

$\Rightarrow \frac{1}{2!}=\frac{m}{3!}$

$\Rightarrow m=3$

Therefore, the required mean is 3 .

Hence, the correct option is (C).

Q2 Text Solution:

Given, $E(x)=m=2.20$

Thus, P(x = at least 1) = P($x\geq 1$)

$=1-P(x<1)$

$=1-P(x=0)$

$=1-\frac{e^{-m}m^{0}}{0!}$

$=1-e^{-2.20}$

$=1-0.1108$

$=0.89\ (\text{approx.})$

Therefore, the required probability is 0.89 .

Hence, the correct option is (D).

Q3 Text Solution:

Given,

$p=$ probability of defective product $=3\%=0.03$

$n=100$

Thus, mean $=np=100(0.03)=3$

We know, the Poisson distribution is given as: $\frac{e^{-m}\cdot m^{x}}{x!}$

Therefore, the probability that exactly 5 products are defective

$=\frac{e^{-3}\cdot(3)^{5}}{5!}$

$=\frac{0.04979\cdot(3)^{5}}{5!}$

$=0.100$

Hence, the correct option is (C).

Q4 Text Solution:

Given,

$n=2,000$ and $p=0.001$

Thus, $m=np=2000(0.001)=2$

Therefore, the probability that exactly 3 individuals suffer from reaction

$P\left(X=3\right)=\frac{e^{-m}\cdot m^{x}}{x!}$

$=\frac{e^{-2}\cdot(2)^{3}}{3!}$

$=\frac{0.1353.8}{6}$

$=0.1804$

Hence, the correct option is (B).

Q5 Text Solution:

Given: $m=0.2$

Thus, the probability that there will be three or more accidents per day is

$=1-\left[P\left(x=0\right)+P\left(x=1\right)+P\left(x=2\right)\right]$

$=1-\left[\frac{e^{-0.2}\cdot(0.2)^{0}}{0!}+\frac{e^{-0.2}\cdot(0.2)^{1}}{1!}+\frac{e^{-0.2}\cdot(0.2)^{2}}{2!}\right]$

$=1-\left[e^{-0.2}+e^{-0.2}\cdot\left(0.2\right)^{1}+\frac{e^{-0.2}\cdot(0.2)^{2}}{2!}\right]$

$=1-e^{-0.2}\left[1+0.2+0.02\right]$

$=1-0.8187\left(1.22\right)$

$=0.0012$

Hence, the correct option is (B).

Q6 Text Solution:

We know that, for Poisson Distribution,

Mean = Variance

Thus, mean = 8 and variance = 7 is not possible.

Therefore, the given statement is false.

Hence, the correct option is (B).

Q7 Text Solution:

According to the question,

$n = 50$ and $p = 3\% = \frac{3}{100} = 0.03$

Thus, mean $= np$

$= 50(0.03)$

$= \frac{150}{100}$

$= 1.5$

Therefore, the required mean is 1.5 .

Hence, the correct option is (D).

Q8 Text Solution:

Given,

Total no. of taxi drivers $(N) = 500$

Mean $(m) = 2$

The probability of at least 3 accidents is given by

$P(X \geq 3) = 1 - P(X < 3)$

We know that, $P\left(X = x\right) = \frac{e^{-m}m^x}{x!}$

$\Rightarrow P\left(X \geq 3\right) = 1 - P\left(X < 3\right)$

$\Rightarrow P\left(X \geq 3\right) = 1 - \left[P\left(0\right) + P\left(1\right) + P\left(2\right)\right]$

$\Rightarrow P\left(X \geq 3\right) = 1 - \left[\frac{e^{-2}2^0}{0!} + \frac{e^{-2}2^1}{1!} + \frac{e^{-2}2^2}{2!}\right]$

$\Rightarrow P\left(X \geq 3\right) = 1 - \frac{1}{(2.71828)^2}\left[1 + 2 + 2\right]$

$\Rightarrow P\left(X \geq 3\right) = 1 - \frac{1}{(2.71828)^2}\left[5\right]$

$\Rightarrow P\left(X \geq 3\right) = 1 - 0.06767$

$\Rightarrow P\left(X \geq 3\right) = 0.3233$

Now, the number of drivers with at least 3 accidents in a year,

$= N \times P(X \geq 3)$

$= 500 \times 0.3233$

$= 161.65 \approx 162$

Therefore, the number of drivers with at least 3 accidents in a year are 162 .

Hence, the correct option is (A) i.e., 162 .

Q9 Text Solution:

Given: $m = 2.5$

We know that,

We know, the Poisson distribution is given as: $\frac{e^{-m} \cdot m^x}{x!}$

Thus, $P\left(X = 0\right) = \frac{e^{-2.5} \cdot (2.5)^0}{0!}$

$= e^{-2.5}$

$= 0.0821$

Therefore, the required probability is 0.0821 .

Hence, the correct option is (C).

Q10 Text Solution:

Given: Mean $(m) = 1.5$ and $N = 100$

We know that,

$P\left(X = x\right) = \frac{e^{-m} \cdot m^x}{x!}$

Thus, P(neither car is used)$= P(X = 0)$

$= \frac{e^{-1.5} \cdot (1.5)^0}{0!}$

$= e^{-1.5}$

$= 0.2231$

Therefore, the number of days on which neither car is used $= 0.2231 \times 100 = 22.31 = 22$ (approx).

Hence, the correct option is (A).

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SAMPURNA JUNE 2024

QUANTITATIVE APTITUDE

DPP: 5

THEORETICAL DISTRIBUTION S

Q1 The probability density function of a normal variable x is given by

(A) $f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}}e^{\frac{-1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$ for $-\infty < x < \infty$

(B) $f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ for $0 < x < \infty$

(C) $f\left(x\right) = \frac{1}{\sqrt{2\pi\sigma}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ for $-\infty < x < \infty$

(D) None of these

Q2 What is the coefficient of variation of x, characterised by the following probability density function:

$f\left(x\right) = \frac{1}{4\sqrt{2\pi}}e^{\frac{-(x-10)^2}{32}}$ for $-\infty < x < \infty$

(A) 50 (B) 60

(C) 40 (D) 30

Q3 What is the first quartile of X having the following probability density function?

$f\left(x\right) = \frac{1}{\sqrt{72\pi}}e^{\frac{-(x-10)^2}{72}}$ for $-\infty < x < \infty$

(A) 4 (B) 5

(C) 5.95 (D) 6.75

Q4 The mean and mode of a normal distribution

(A) may be equal

(B) may be different

(C) are always equal

(D) (A) or (B)

Q5 The quartile deviation of a normal distribution with mean 10 and SD 4 is

(A) 0.675 (B) 67.50

(C) 2.70 (D) 3.20

Q6 If the quartile deviation of a normal curve is 4.05, then its mean deviation is

(A) 5.26 (B) 6.24

(C) 4.24 (D) 4.80

Q7 If the First quartile and mean deviation about median of a normal distribution are 13.25 and 8 respectively, then the mode of the distribution is

(A) 20 (B) 10

(C) 15 (D) 12

Q8 The mean deviation about median of a standard normal variate is

(A) 0.675 σ (B) 0.675

(C) 0.80σ (D) 0.80

Q9 If the mean deviation of a normal variable is 16, what is its quartile deviation?

(A) 10.00 (B) 13.50

(C) 15.00 (D) 12.05

Q10 If the two quartiles of $N\left(\mu, \sigma^2\right)$ are 14.6 and 25.4 respectively, what is the standard deviation of the distribution?

(A) 9 (B) 6

(C) 10 (D) 8

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Answer Key

Q1	(A)	Q6	(D)
Q2	(C)	Q7	(A)
Q3	(C)	Q8	(D)
Q4	(C)	Q9	(B)
Q5	(C)	Q10	(D)

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Hints & Solutions

Q1 Text Solution:

Probability density function defines the density of the probability that a continuous random variable will lie within a particular range of values.

It is formulated as, $f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}}e^{\frac{-1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$

for $-\infty < x < \infty$

Hence, the correct option is (A).

Q2 Text Solution:

General form of probability density function is given as,

$f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}\left(\frac{(x-\mu)^2}{\sigma^2}\right)}$

Given in the question, $f\left(x\right) = \frac{1}{4\sqrt{2\pi}}e^{\frac{-(x-10)^2}{32}}$

σ is the Standard deviation, μ is the mean

Comparing the coefficients,

$\sigma = 4,\ \mu = 10$

Coefficient of Variation is given by the formula,

$\Rightarrow$ C.V $= \frac{\sigma}{\mu} \times 100$

$\Rightarrow$ C .V $= \frac{4}{10} \times 100$

$\Rightarrow$ C.V $= 40$

Hence, the correct option is (C) i.e., 40 .

Q3 Text Solution:

General form of probability density function is given as,

$f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{1}{2}\left(\frac{(x-\mu)^2}{\sigma^2}\right)}$

Given in the question,

$f\left(x\right) = \frac{1}{\sqrt{72\pi}}e^{\frac{-(x-10)^2}{72}}$

where, σ is the Standard deviation, μ is the mean,

Comparing the coefficients,

$\Rightarrow 2\sigma^2 = 72$ and $\mu = 10$

$\Rightarrow \sigma = 6$ and $\mu = 10$

First Quartile is given as,

$Q_1 = \mu - 0.675(\sigma)$

$= 10 - 0.675(6)$

$= 10 - 4.05$

$= 5.95$

Hence, the correct option is (C) i.e., 5.95.

Q4 Text Solution:

Normal Distribution is also called Gaussian or bell curve. It is defined as probability distribution where the values of a random variable are distributed symmetrically. These values are equally distributed on the left and the right side of the central tendency.

It is formulated as,

$f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}}e^{\frac{-1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$ for $-\infty < x < \infty$

As normal distribution is symmetrical, i.e., mean, median and mode are all equal.

Hence, the correct option is (C) i.e., are always equal.

Q5 Text Solution:

Given: Mean $(\mu) = 10$, Standard Deviation $(\sigma) = 4$

Quartile deviation of normal distribution is given by the formula,

Quartile Deviation $= 0.675\sigma$

$= 0.675 \times 4$

≈ 2.70

Hence, the correct option is (C) i.e., 2. 70.

Q6 Text Solution:

Given: Quartile Deviation $(Q_D) = 4.05$

We know that, Quartile deviation is given as,

$\Rightarrow Q_D = 0.675 \times \sigma$

$\Rightarrow 4.05 = 0.675 \times \sigma$

$\Rightarrow \sigma = \frac{4.05}{0.675}$

$\Rightarrow \sigma = 6$

Now, Mean Deviation will be given as,

Mean Deviation $= 0.8 \times \sigma$

$= 0.8 \times 6$

$= 4.8$

Hence, the correct option is (D) i.e., 4.80 .

Q7 Text Solution:

Given: First Quartile $(Q_1) = 13.25$

Mean Deviation $= 8$

Mean deviation is given by the formula,

Mean Deviation

$\Rightarrow 8 = 0.8 \times \sigma$

$\Rightarrow \sigma = \frac{8}{0.8}$

$\Rightarrow \sigma = 10$

$[\sigma \rightarrow$ Standard Deviation]

First Quartile is given as,

$\Rightarrow Q_1 = \mu - 0.675(\sigma) \quad [\mu \rightarrow \text{Mean}]$

$\Rightarrow 13.25 = \mu - 0.675(10)$

$\Rightarrow \mu = 13.25 + 6.75$

$\Rightarrow \mu = 20$

As we know, in Normal Distribution,

Mean = Median = Mode

So, Mode $= 20$

Hence, the correct option is (A) i.e., 20.

Q8 Text Solution:

We know that, in standard normal variate,

Standard Deviation $(\sigma) = 1$

The relationship between standard deviation and mean deviation is given as,

Mean Deviation $= 0.8(\sigma)$

$= 0.8(1)$

$= 0.8$

Hence, the correct answer is option (D) i.e., 0.80

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Q9 Text Solution:

Given: Mean Deviation $= 16$

To find: Quartile Deviation (Q_D)

Mean deviation is given by the formula,

Mean Deviation

$= 0.8 \times \sigma \quad [\sigma \rightarrow \text{Standard Deviation}]$

$16 = 0.8\sigma$

$\sigma = \frac{16}{0.8}$

$\sigma = 20$

Quartile deviation is given as,

$Q_D = 0.675 \times \sigma$

$= 0.675(20)$

$= 13.50$

Hence, the correct option is (B) i.e., 13.50.

Q10 Text Solution:

Given: Quartile $1\ (Q_1) = 14.6$, Quartile $3\ (Q_3) = 25.4$

To find: Standard Deviation (σ)

As we know,

Quartile deviation is given as,

$Q_D = \frac{Q_3 - Q_1}{2}$

$Q_D = \frac{25.4 - 14.6}{2}$

$Q_D = 5.4$

Standard deviation is given as,

S.D $\left(\sigma\right) = \frac{3 \times Q_D}{2}$

$\sigma = \frac{3(5.4)}{2}$

$\sigma = \frac{16.2}{2}$

$\sigma = 8.1 \approx 8$

Hence, the correct option is (D) i.e., 8 .