Acknowledgement .....

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"MATHS KI GATHA"
(MATHS REGULAR BOOK)

Here, I Would like to express my deep sense of gratitude to Almighty who has guided me towards my path; my parents
(Praveen Jain & Kalpana Jain)

AND

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The **FIRST** edition is also dedicated towards all my dear students without whom this would not be possible

Vote Of Thanks !!!!!!!!!!

- CA MEGHA NAHTA

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CH - 1

RATIO, PROPORTION, INDICES & LOGARITHM

UNIT I: RATIO

Ex. 1: The ratio of the number of boys to the number of girls in a school of 720 students is 3 : 5. If 18 new girls are admitted in the school, find how many new boys may be admitted so that the ratio of the number of boys to the number of girls may change to 2 : 3.

Sol.:

Ex. 2: Find in what ratio will the total wages of the workers of a factory be increased or decreased if there be a reduction in the number of workers in the ratio 15 : 11 and an increment in their wages in the ratio 22 : 25.

Sol.:

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EXERCISE 1(A)

Choose the most appropriate option (a) (b) (c) or (d).

1. The inverse ratio of 11 : 15 is

(a) 15 : 11 (b) $\sqrt{11} : \sqrt{15}$ (c) 121 : 225 (d) none of these

2. The ratio of two quantities is 3 : 4. If the antecedent is 15, the consequent is

(a) 16 (b) 60 (c) 22 (d) 20

3. The ratio of the quantities is 5 : 7. If the consequent of its inverse ratio is 5, the antecedent is

(a) 5 (b) $\sqrt{5}$ (c) 7 (d) none of these

4. The ratio compounded of 2 : 3, 9 : 4, 5 : 6 and 8 : 10 is

(a) 1 : 1 (b) 1 : 5 (c) 3 : 8 (d) none of these

5. The duplicate ratio of 3 : 4 is

	(a)$\sqrt{3}$: 2	(b) 4 : 3	(c) 9 : 16	(d) none of these
6.	The sub-duplicate ratio of 25 : 36 is			
	(a) 6 : 5	(b) 36 : 25	(c) 50 : 72	(d) 5 : 6
7.	The triplicate ratio of 2 : 3 is			
	(a) 8 : 27	(b) 6 : 9	(c) 3 : 2	(d) none of these
8.	The sub-triplicate ratio of 8 : 27 is			
	(a) 27 : 8	(b) 24 : 81	(c) 2 : 3	(d) none of these
9.	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
10.	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
11.	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
12.	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
13.	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
14.	The angles of a triangle are in ratio 2 : 7 : 11. The angles are			

	(a) (20, 70, 90)	(b) (30, 70, 80)	(c) (18, 63, 99)	(d) none of these
15.	Division of RS 324 between X and Y is in the ratio 11 : 7. X & Y would get Rupees			
	(a) (204, 120)	(b) (200, 124)	(c) (180, 144)	d) none of these
16.	Anand earns Rs 80 in 7 hours and Promode Rs 90 in 12 hours. The ratio of their earnings is			
	(a) 32 : 21	(b) 23 : 12	(c) 8 : 9	(d) none of these
17.	The ratio of two numbers is 7 : 10 and their difference is 105. The numbers are			
	(a) (200, 305)	(b) (185, 290)	(c) (245, 350)	(d) none of these
18.	P, Q and R are three cities. The ratio of average temperature between P and Q is 11 : 12 and that			
	between P and R is 9 : 8. The ratio between the average temperature of Q and R is			
	(a) 22 : 27	(b) 27 : 22	(c) 32 : 33	(d) none of these
19.	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
20.	If p : q is the sub-duplicate ratio of $p-x^2 : q-x^2$ then x^2 is			
	(A) $\frac{p}{p+q}$	(b) $\frac{q}{p+q}$	(c) $\frac{pq}{p+q}$	(d) none of these
21.	If 2s : 3t is the duplicate ratio of 2s – p : 3t – p then			
	(a) $p^2 = 6st$	(b) $p = 6st$	(c) $2p = 3st$	(d) none of these
22.	If $p : q = 2 : 3$ and $x : y = 4 : 5$, then the value of $5px + 3qy : 10px + 4qy$ is			
	(a) 71 : 82	(b) 27 : 28	(c) 17 : 28	(d) none of these
23.	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

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

(a) (40, 50) (b) (50, 40) (c) (400, 500) (d) none of these

25. The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 kms. in 5 hours, the speed of the first train is

(a) 10 Km/hr (b) 50 Km/hr (c) 70 Km/hr (d) none of these

UNIT II: PROPORTIONS

Ex.1 : *Find the mean proportion between 1.25 and 1.8.*

Sol.: Mean proportion between 1.25 and 1.8 is $\sqrt{1.25 \times 1.8} = \sqrt{2.25} = 1.5$.

Ex.2 : *If* $\frac{a}{3} = \frac{b}{4} = \frac{c}{7}$, *then prove that* $\frac{a+b+c}{c} = 2$

Sol.:

Ex. 3: *A dealer mixes tea costing Rs 6.92 per kg. with tea costing Rs 7.77 per kg and sells the mixture at Rs 8.80 per kg and earns a profit of* $17\frac{1}{2}$*on his sale price. In what proportion does he mix them?*

Sol.:

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EXERCISE 1(B)

Choose the most appropriate option (a) (b) (c) or (d).

1. The fourth proportional to 4, 6, 8 is

(a) 12 (b) 32 (c) 48 (d) none of these

2. The third proportional to 12, 18 is

(a) 24 (b) 27 (c) 36 (d) none of these

3. The mean proportional between 25, 81 is

(a) 40 (b) 50 (c) 45 (d) none of these

4. 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

5. The fourth proportional to 2a, a^2, c is

(a) ac/2 (b) ac (c) 2/ac (d) none of these

6. If four numbers 1/2, 1/3, 1/5, 1/x are proportional then x is

(a) 6/5 (b) 5/6 (c) 15/2 (d) none of these

7. The mean proportional between $12x^2$ and $27y^2$ is

(a) 18xy (b) 81xy (c) 8xy (d) none of these

(Hint: Let z be the mean proportional and $z = (\sqrt{12x^2 \text{ and } 27y^2})$

8. If A = B/2 = C/5, then A : B : C is

(a) 3 : 5 : 2 (b) 2 : 5 : 3 (c) 1 : 2 : 5 (d) none of these

9.	If $a/3 = b/4 = c/7$, then $a + b + c/c$ is			
	(a) 1	(b) 3	(c) 2	(d) none of these
10.	If $p/q = r/s = 2.5/1.5$, the value of ps : qr is			
	(a) 3/5	(b) 1:1	(c) 5/3	(d) none of these
11.	If $x : y = z : w = 2.5 : 1.5$, the value of $(x + z)/(y + w)$ is			
	(a) 1	(b) 3/5	(c) 5/3	(d) none of these
12.	If $(5x - 3y)/(5y - 3x) = 3/4$, the value of x : y is			
	(a) 2 : 9	(b) 7 : 2	(c) 7 : 9	(d) none of these
13.	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
14.	If $x/2 = y/3 = z/7$, then the value of $(2x - 5y + 4z)/2y$ is			
	(a) 6/23	(b) 23/6	(c) 3/2	(d) 17/6
15.	If $x : y = 2 : 3$, $y : z = 4 : 3$ then x : y : z is			
	(a) 2 : 3 : 4	(b) 4 : 3 : 2	(c) 3 : 2 : 4	(d) none of these
16.	Division of Rs 750 into 3 parts in the ratio 4 : 5 : 6 is			
	(a) (200, 250, 300)	(b) (250, 250, 250)	(c) (350, 250, 150)	(d) 8 : 12 : 9
17.	The sum of the ages of 3 persons is 150 years. 10 years ago their ages were in the ratio 7 : 8 : 9.			
	Their present ages are			
	(a) (45, 50, 55)	(b) (40, 60, 50)	(c) (35, 45, 70)	(d) none of these
18.	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
19.	If x/y = z/w, implies y/x = w/z, then the process is called			
	(a) Dividendo	b) Componendo	(c) Alternendo	(d) none of these
20.	If p/q = r/s = p – r/q – s, the process is called			
	(a) Substrendo	(b) Addendo	(c) Invertendo	(d) none of these
21.	If a/b = c/d, implies (a + b)/(a – b) = (c + d)/(c – d), the process is called			
	(a) Componendo	(b) Dividendo	(c) Componendo and Dividendo	(d) none of these
22.	If u/v = w/p, then (u – v)/(u + v) = (w – p)/(w + p). The process is called			
	(a) Invertendo	(b) Alternendo	(c) Addendo	(d) none of these
23.	12, 16, *, 20 are in proportion. Then * is			
	(a) 25	(b) 14	(c) 15	(d) none of these
24.	4, *, 9, 13½ are in proportion. Then * is			
	(a) 6	(b) 8	(c) 9	(d) none of these
25.	The mean proportional between 1.4 gms and 5.6 gms is			
	(a) 28 gms	(b) 2.8 gms	(c) 3.2 gms	(d) none of these
26.	If $\frac{a}{4}=\frac{b}{5}=\frac{c}{9}$ then $\frac{a+b+c}{c}$ is			
	(a) 4	(b) 2	(c) 7	(d) none of these.
27.	Two numbers are in the ratio 3 : 4; if 6 be added to each terms of the ratio, then the new ratio will be			
	4 : 5, then the numbers are			

(a) 14, 20 (b) 17, 19 (c) 18 and 24 (d) none of these

28. If $\frac{a}{4}=\frac{b}{5}$ then

$\frac{a+4}{a-4}=\frac{b-5}{b+5}$ (b) $\frac{a+4}{a-4}=\frac{b+5}{b-5}$ (c) $\frac{a-4}{a+4}=\frac{b+5}{b-5}$ (d) none of these

29. If a : b = 4 : 1 then $\sqrt{\frac{a}{b}}+\sqrt{\frac{b}{a}}$ is

(a) 5/2 (b) 4 (c) 5 (d) none of these

30. If $\frac{x}{b+c-a}=\frac{y}{c+a-b}=\frac{z}{a+b-c}$ then (b – c)x + (c – a)y + (a – b)z is

(a) 1 (b) 0 (c) 5 (d) none of these

UNIT III: INDICES

Ex 1. *Find x, if* $x\sqrt{X} = (x\sqrt{X})^x$

Sol.:

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EXERCISE 1(C)

Choose the most appropriate option (a) (b) (c) or (d).

1. $4x^{-1/4}$ is expressed as

*(a) $-4x^{1/4}$ (b) x^{-1} (c) $4/x^{1/4}$ (d) none of these

2. The value of $8^{1/3}$ is

(a) $\sqrt[3]{2}$ (b) 4 (c) 2 (d) none of these

3. The value of $2 \times (32)^{1/5}$ is

(a) 2 (b) 10 (c) 4 (d) none of these

4. The value of $4/(32)^{1/5}$ is

(a) 8 (b) 2 (c) 4 (d) none of these

5. The value of $(8/27)^{1/3}$ is

(a) 2/3 (b) 3/2 (c) 2/9 (d) none of these

6. The value of $2(256)^{-1/8}$ is

(a) 1 (b) 2 (c) 1/2 (d) none of these

7. $2^{½} \cdot 4^{¾}$ is equal to

(a) a fraction (b) a positive integer (c) a negative integer (d) none of these

8. $\left(\frac{81x^4}{y^{-8}}\right)^{1/4}$ has simplified value equal to

(a) xy^2 (b) x^2y (c) $9xy^2$ (d) none of these

9. $x^{a-b} \times x^{b-c} \times x^{c-a}$ is equal to

(a) x (b) 1 (c) 0 (d) none of these

10. The value of $\left(\frac{2p^2q^3}{3xy}\right)^0$ where p, q, x, y ≠ 0 is equal to

(a) 0 (b) 2/3 (c) 1 (d) none of these

11. $\{(3^3)^2 \times (4^2)^3 \times (5^3)^2\} / \{(3^2)^3 \times (4^3)^2 \times (5^2)^3\}$ is

(a) 3/4 (b) 4/5 (c) 4/7 (d) 1

12. Which is True ?

(a) $2^0 > (1/2)^0$ (b) $2^0 < (1/2)^0$ (c) $2^0 = (1/2)^0$ (d) none of these

13. If $x^{1/p} = y^{1/q} = z^{1/r}$ and xyz = 1, then the value of p + q + r is

(a) 1 (b) 0 (c) 1/2 (d) none of these

14. The value of $y^{a-b} \times y^{b-c} \times y^{c-a} \times y^{-a-b}$ is

(a) y^{a+b} (b) y (c) 1 (d) $1/y^{a+b}$

15. The True option is

(a) $x^{2/3} = \sqrt[3]{x^2}$ (b) $x^{2/3} = \sqrt{x^3}$ (c) $x^{2/3} > \sqrt[3]{x^2}$ (d) $x^{2/3} < \sqrt[3]{x^2}$

16. The simplified value of $16x^{-3}y^2 \times 8^{-1}x^3y^{-2}$ is

(a) 2xy (b) xy/2 (c) 2 (d) none of these

17. The value of $(8/27)^{-1/3} \times (32/243)^{-1/5}$ is

(a) 9/4 (b) 4/9 (c) 2/3 (d) none of these

18. The value of $\{(x+y)^{2/3}\,(x-y)^{3/2} / \sqrt{x+y}\,\sqrt{(x+y)^3}\}^6$ is

(a) $(x+y)^2$ (b) $(x-y)$ (c) $x+y$ (d) none of these

19. Simplified value of $(125)^{2/3} \times \sqrt{25} \times \sqrt[3]{5^3} \times 5^{1/2}$ is

(a) 5 (b) 1/5 (c) 1 (d) none of these

20. $[\{(2)^{1/2} \cdot (4)^{3/4} \cdot (8)^{5/6} \cdot (16)^{7/8} \cdot (32)^{9/10}\}^4]^{3/25}$ is

(a) A fraction (b) an integer (c) 1 (d) none of these

21. $[1-\{1-(1-x^2)^{-1}\}^{-1}]^{-1/2}$ is equal to

(a) x (b) 1/x (c) 1 (d) none of these

22. $\left[(x^n)^{n-\frac{1}{n}}\right]^{\frac{1}{n+1}}$ is equal to

(a) x^n (b) x^{n+1} (c) x^{n-1} (d) none of these

23. If $a^3-b^3 = (a-b)\,(a^2+ab+b^2)$, then the simplified form of
$\left[\frac{x^l}{x^m}\right]^{l^2+lm+m^2} \left[\frac{x^m}{x^n}\right]^{m^2+mn+n^2} \left[\frac{x^n}{x^l}\right]^{l^2+ln+n^2}$

(a) 0 (b) 1 (c) x (d) none f these

24. Using $(a-b)^3 = a^3-b^3-3ab(a-b)$ tick the correct of these when $x = p^{1/3} - p^{-1/3}$

(a) $x^3+3x = p + 1/p$ (b) $x^3 + 3x = p - 1/p$ (c) $x^3 + 3x = p + 1$ (d) none of these

25. On simplification, $1/(1+a^{m-n}+a^{m-p}) + 1/(1+a^{n-m}+a^{n-p}) + 1/(1+a^{p-m}+a^{p-n})$ is equal to

(a) 0 (b) a (c) 1 (d) 1/a

26. The value of $\left(\frac{x^a}{x^b}\right)^{a+b} \times \left(\frac{x^b}{x^c}\right)^{b+c} \times \left(\frac{x^c}{x^a}\right)^{c+a}$

(a) 1 (b) 0 (c) 2 (d) none of these

27. If $x = 3^{1/3} + 3^{-1/3}$, then $3x^3 - 9x$ is

(a) 15 (b) 10 (c) 12 (d) none of these

28. If $a^x = b$, $b^y = c$, $c^z = a$, then xyz is

(a) 1 (b) 2 (c) 3 (d) none of these

29. The value of $\left[\frac{x^a}{x^b}\right]^{a^2+ab+b^2} \left[\frac{x^b}{x^c}\right]^{b^2+bc+c^2} \left[\frac{x^c}{x^a}\right]^{c^2+ca+a^2}$

(a) 1 (b) 0 (c) –1 (d) none of these

30. If $2^x = 3^y = 6^{-z}$, $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$

(a) 1 (b) 0 (c) 2 (d) none of these

UNIT IV: LOGARITHM

Ex. 1: Find the logarithm of 64 to the base $2\sqrt{2}$

Sol.:

Ex. 2: If a=log2412, b=log3624, and c=log4836 then prove that 1+abc = 2bc

Sol.:

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EXERCISE 1(D)

Choose the most appropriate option (a) (b) (c) or (d).

1. log 6 + log 5 is expressed as

(a) log 11 (b) log 30 (c) log 5/6 (d) none of these

2. log28 is equal to

(a) 2 (b) 8 (c) 3 (d) none of these

3. log 32/4 is equal to

(a) log 32/log 4 (b) log 32 – log 4 (c) 2^3 (d) none of these

4. log (1 × 2 × 3) is equal to

(a) log 1 + log 2 + log 3 (b) log 3 (c) log 2 (d) none of these

5. The value of log 0.0001 to the base 0.1 is

(a) –4 (b) 4 (c) 1/4 (d) none of these

6. If 2 log x = 4 log 3, the x is equal to

(a) 3 (b) 9 (c) 2 (d) none of these

7. $\log_{\sqrt{2}}64$ is equal to

(a) 12 (b) 6 (c) 1 (d) none of these

8. $\log_{2\sqrt{3}}1728$ is equal to

(a) $2\sqrt{3}$ (b) 2 (c) 6 (d) none of these

9. log (1/81) to the base 9 is equal to

	(a) 2	(b) ½	(c) –2	(d) none of these
10.	log 0.0625 to the base 2 is equal to			
	(a) 4	(b) 5	(c) 1	(d) none of these
11.	Given log2 = 0.3010 and log3 = 0.4771 the value of log 6 is			
	(a) 0.9030	(b) 0.9542	(c) 0.7781	(d) none of these
12.	The value of log2 log2 log2 16			
	(a) 0	(b) 2	(c) 1	(d) none of these
13.	The value of log 1/3 to the base 9 is			
	(a) – ½	(b) ½	(c) 1	(d) none of these
14.	If log x + log y = log (x+y), y can be expressed as			
	(a) x–1	(b) x	(c) x/x–1	(d) none of these
15.	The value of log2 [log2 {log3 (log327^3)}] is equal to			
	(a) 1	(b) 2	(c) 0	(d) none of these
16.	If log2x + log4x + log16x = 21/4, these x is equal to			
	(a) 8	(b) 4	(c) 16	(d) none of these
17.	Given that log102 = *x* and log103 = y, the value of log1060 is expressed as			
	(a) x – y + 1	(b) x + y + 1	(c) x – y – 1	(d) none of these
18.	Given that log102 = x, log103 = y, then log101.2 is expressed in terms of *x* and y as			
	(a) x + 2y – 1	(b) x + y – 1	(c) 2x + y – 1	(d) none of these
19.	Given that log x = m + n and log y = m – n, the value of log $10x/y^2$ is expressed in terms of m and n as			

(a) $1 - m + 3n$ (b) $m - 1 + 3n$ (c) $m + 3n + 1$ (d) none of these

20. The simplified value of $2\log 105 + \log 108 - \frac{1}{2}\log 104$ is:

(a) 1/2 (b) 4 (c) 2 (d) none of these

21. $\log [1 - \{1 - (1 - x^2)^{-1}\}^{-1}]^{-1/2}$ can be written as

(a) $\log x^2$ (b) $\log x$ (c) $\log 1/x$ (d) none of these

22. The simplified value of $\log \sqrt[4]{7293\sqrt{9^{-1}27^{4/3}}}$ is

(a) log 3 (b) log 2 (c) log ½ (d) none of these

23. The value of $(\log ba \times \log cb \times \log ac)^3$ is equal to

(a) 3 (b) 0 (c) 1 (d) none of these

24. The logarithm of 64 to the base $2\sqrt{2}$ is

(a) 2 (b) $2\sqrt{2}$ (c) ½ (d) none of these

25. The value of $\log 825$ given $\log 2 = 0.3010$ is

(a) 1 (b) 2 (c) 1.5482 (d) none of these

ANSWER

Exercise 1(A)

1.	(a)	2.	(d)	3.	(c)	4.	(a)	5.	(c)	6.	(d)	7.	(a)	8.	(c)
9.	(a)	10.	(c)	11.	(d)	12.	(d)	13.	(a)	14.	(c)	15.	(d)	16.	(a)
17.	(c)	18.	(b)	19.	(b)	20.	(c)	21.	(a)	22.	(c)	23.	(a)	24.	(c)
25.	(c)														

Exercise 1(B)

1.	(a)	2.	(b)	3.	(c)	4.	(d)	5.	(a)	6.	(c)	7.	(a)	8.	(c)
9.	(c)	10.	(b)	11.	(c)	12.	(d)	13.	(a)	14.	(d)	15.	(d)	16.	(a)
17.	(a)	18.	(b)	19.	(d)	20.	(a)	21.	(c)	22.	(d)	23.	(c)	24.	(a)
25.	(b)	26.	(b)	27.	(c)	28.	(b)	29.	(a)	30.	(b)				

Exercise 1(C)

1.	(c)	2.	(c)	3.	(c)	4.	(b)	5.	(a)	6.	(a)	7.	(b)	8.	(d)
9.	(b)	10.	(c)	11.	(d)	12.	(c)	13.	(b)	14.	(d)	15.	(a)	16.	(c)
17.	(a)	18.	(c)	19.	(d)	20.	(b)	21.	(a)	22.	(c)	23.	(b)	24.	(b)
25.	(c)	26.	(a)	27.	(b)	28.	(a)	29.	(a)	30.	(b)				

Exercise 1(D)

1.	(b)	2.	(c)	3.	(b)	4.	(a)	5.	(b)	6.	(b)	7.	(a)	8.	(c)
9.	(c)	10.	(d)	11.	(c)	12.	(c)	13.	(a)	14.	(c)	15.	(c)	16.	(a)
17.	(b)	18.	(c)	19.	(a)	20.	(c)	21.	(b)	22.	(a)	23.	(c)	24.	(d)
25.	(c)														

"KAR LO PAST APNI MUTHI ME"

Past Exam Questions

2006 – Nov

1. Two numbers are in the ratio 2 : 3 and the difference of their squares is 320. The numbers are :

(a) 12,18 (b) 16,24 (c) 14,21 (d) Non e .

2. If p : q is the sub-duplicate ratio of $p - x^2$: $q - x^2$, then x^2 is :

(a) $\frac{p}{p+q}$ (b) $\frac{q}{p+q}$ (c) $\frac{qp}{p-q}$ (d) None.

3. An alloy is to contain copper and zinc in the ratio 9 : 4. The zinc required to melt with 24 kg of copper:

(a) $10\frac{2}{3}$ kg (b) $10\frac{1}{3}$ kg (c) $9\frac{2}{3}$ kg (d) 9kg

4. $7 \log\left(\frac{16}{15}\right) + 5 \log\left(\frac{25}{24}\right) + 3 \log\left(\frac{81}{80}\right)$ | is equal to :

(a) 0 (b) 1 (c) log 2 (d) log 3

2007- Feb

5. Two numbers are in the ratio 7 **:** 8. If 3 is added to each of them, their ratio becomes 8 : 9. The numbers are :

(a) 14,16 (b) 24,27 (c) 21,24 (d) 16,18

6. A box contains Rs. 56 in the form of coins of one rupee, 50 paise and 25 paise. The number of 50 paise

coin is double the number of 25 paise coins and four times the numbers of one rupee coins. The numbers of 50 paise coins in the box is :

(a) 64 (b) 32 (c) 16 (d) 14

7. Value of $(a^{1/8} + a^{-1/8})(a^{1/8} - a^{-1/8})(a^{1/4} + a^{-1/4})(a^{1/2} + a^{-1/2})$ is :

(a) $a + \frac{1}{a}$ (b) $a - \frac{1}{a}$ (c) $a^2 + \frac{1}{a^2}$ (d) $a^2 - \frac{1}{a^2}$

8. The value of the expression : $a^{\log_a b.\log_b^c.\log_c^d.\log_d t}$

(a) t (b) abcdt (c) (a + b + c + d +1) (d) None.

9. If $\log_{10000} x = \frac{-1}{4}$, then x is given by:

(a) $\frac{1}{100}$ (b) $\frac{1}{10}$ (c) $\frac{1}{20}$ (d) None of these.

2007 – May

10. Eight people are planning to share equally the cost of a rental car. If one person withdraws from the arrangement and the others share equally entire cost of the car, then the share of each of the remaining persons increased by:

(a) 1/9 (b) 1/8 (c) 1/7 (d) 7/8

11. A bag contains Rs. 187 in the form of 1 rupee, 50 paise and 10 paise coins in the ratio 3:4:5. Find the number of each type of coins :

(a) 102,136,170 (b) 136,102,170 (c) 170, 102, 136 (d) None

12. Simplification of $\frac{x^{m+3n}.x^{4m-9n}}{x^{6m-6n}}$ is:

(a) x^m (b) x^{-m} (c) x^n (d) x^{-n}

13. If log (2a - 3b) = log a - log b, then a = :

(a) $\frac{3b^2}{2b-1}$ (b) $\frac{3b}{2b-1}$ (c) $\frac{b^2}{2b+1}$ (d) $\frac{3b^2}{2b+1}$

2007 – Aug

14. On simplification $\frac{1}{1+Z^{a-b}+Z^{a-c}}+\frac{1}{1+Z^{b-c}+Z^{b-a}}+\frac{1}{1+Z^{c-a}+Z^{c-b}}$ reduces to:

(a) $\frac{1}{Z^{2(a+b+c)}}$ (b) $\frac{1}{Z^{(a+b+c)}}$ (c) 1 (d) 0

15. Ratio of earnings of A and B is 4 : 7. If the earnings of A increase by 50% and those of B decrease by 25%,the new ratio of their earning becomes 8 : 7. What is A's earning ?

(a) Rs. 21,000 (b) Rs. 26,000 (c) Rs. 28,000 (d) Data inadequate.

16. P, Q and R are three cities. The ratio of average temperature between P and Q is 11 :12 and that between P and R is 9 : 8. The ratio between the average temperature of Q and R is

(a) 22:27 (b) 27:22 (c) 32:33 (d) None.

17. $\frac{1}{\log_{ab}(abc)}+\frac{1}{\log_{bc}(abc)}+\frac{1}{\log_{ca}(abc)}$ is equal to:

(a) 0 (b) 1 (c) 2 (d) -1

18. Number of digits in the numeral for 2^{64}. [Given log 2 = 0.30103]:

(a) 18 digits (b) 19 digits (c) 20 digits (d) 21 digits.

2007- Nov

19. Rs. 407 are to be divided among A, B and C so that their shares are in the ratio $\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$. The respective shares of A, B, C are :

(a) Rs.165.Rs.132.Rs.no (b) Rs. 165, Rs. 110, Rs. 132

(c) Rs. 132, Rs. 110, Rs. 165 (d) Rs. 110, Rs.132, Rs. 165

20. The incomes of A and B are in the ratio 3 : 2 and their expenditures in the ratio 5 : 3. If each saves Rs. 1,500, then B's income is :

(a) Rs. 6,000 (b) Rs. 4,500 (c) Rs. 3,000 (d) Rs. 7,500

21. If $4^x = 5^y = 20^z$ then z is equal to :

(a) xy (b) $\frac{x+y}{xy}$ **(c)** $\frac{1}{xy}$ (d) $\frac{xy}{x+y}$

22. $\left(\frac{\sqrt{3}}{9}\right)^{5/2}\left(\frac{9}{3\sqrt{3}}\right)^{7/2} \times 9$ is equal to

(a) 1 (b) $\sqrt{3}$ (c) $3\sqrt{3}$ (d) $\frac{3}{9\sqrt{3}}$

23. The value $\frac{\log_3 8}{\log_9 16.\log_4 10}$ is :

(a) $3\log_{10}2$ (b) $7\log_{10}3$ (c) $3\log_e z$ (d) None.

Feb 08

24. In 40 litres mixture of glycerine and water, the ratio of glycerine and water is 3:1. The quantity of water added in the mixture in order to make this ratio 2:1 is:

(a) 15 litres (b) 10 litres (c) 8 litres (d) 5 litres.

25. The third proportional between $(a^2 - b^2)$ and $(a+b)^2$ is :

(a) $\frac{a+b}{a-b}$ (b) $\frac{a-b}{a+b}$ (c) $\frac{(a-b)^2}{a+b}$ (d) $\frac{(a+b)^3}{a-b}$

26. If $2^x - 2^{x-1} = 4$ then x^x is equal to :

(a) 7 (b) 3 (c) 27 (d) 9

27. If $x = \frac{e^n - e^{-n}}{e^n + e^{-n}}$, then the value of n is:

(a) $\frac{1}{2}\log_e \frac{1+x}{1-x}$ (b) $\log_e \frac{1+x}{1-x}$ (c) $\log_e \frac{1-x}{1+x}$ (d) $\log_e \frac{1-x}{1+x}$

28. log 144 is equal to:

(a) 2 log 4 + 2 log 2 (b) 4 log 2 + 2 log 3 (c) 3 log 2+ 4 log 3 (d) 3 log 2 - 4 log 3

2008 - June

29. In what ratio should tea worth Rs. 10 per kg be mixed with tea worth Rs. 14 per kg, so that the average price of the mixture may be Rs. 11 per kg?

(a) 2:1 (b) 3:1 (c) 3:2 (d) 4:3

30. The ages of two persons are in the ratio 5:7. Eighteen years ago their ages were in the ratio of 8:13,

	their present ages (in years) are:
	(a) 50, 70 (b) 70, 50 (c) 40,56 (d) None.
31.	$x = y^a$, $y = z^b$ and $z = x^c$ then abc is:
	(a) 2 (b) 1 (c) **3** (d) 4
32.	If $\log_2 [\log_3 (\log_2 x)] = 1$, then x equals :
	(a) 128 (b) 256 (c) 512 (d) None.
33.	If $\log \left(\frac{a+b}{4}\right) = \frac{1}{2}(\log a + \log b)$ then: $\frac{a}{b} + \frac{b}{a}$
	(a) 12 (b) 14 (c) 16 (d) 8
34.	If A, B and C started a business by investing Rs. 1,26,000, Rs. 84,000 and Rs. 2,10,000. If at the end of
	The year profit is Rs. 2,42,000 then the share of each is :
	(a) 72,600, 48,400, 1,21,000 (b) 48,400, 1,21,000, 72,600
	(c) 72,000,49,000,1,21,000 (d) 48,000,1,21,400,72,600
35.	If $\frac{p}{q} = -\frac{2}{3}$ then the value of $\frac{2p+q}{2p-q}$ is
	(a) 1 (b) -1/7 (c) 1/7 (d) 7
36.	Fourth proportional to x, 2x, (x+1) is:
	(a) (x+2) (b) (x-2) (c) (2x+2) (d) (2x-2)

37. If $x = 3^{1/3} + 3^{-1/3}$ then find value of $3x^3 - 9x$

(a) 3 (b) 9 (c) 12 (d) 10

38. Find the value of: $[1 - \{1 - (1 - x^2)^{-1}\}^{-1}]^{-1/2}$

(a) 1/x (b) x (c) **1** (d)- None of these.

39. $\log (m + n) = \log m + \log n$, m can be expressed as :

(a) $m = \frac{n}{n-1}$ (b) $m = \frac{n}{n+1}$ (c) $m = \frac{n+1}{n}$ (d) $m = \frac{n+1}{n-1}$

40. $\log_4 (x^2 + x) - \log_4 (x+1) = 2$. Find x

(a) 16 (b) 0 (c) – 1 (d) None of these.

2009 - Dec

41. $\frac{2^n + 2^{n-1}}{2^{n+1} - 2^n}$

(a) 1/2 (b) 3/2 (c) 2/3 (d) 1/3

42. $2^x \times 3^y \times 5^z = 360$. Then what is the value of x, y, z.?

(a) 3,2,1 (b) 1,2,3 (c) 2,3,1 (d) 1,3,2

43. Find the value of $[\log_{10}\sqrt{25} - \log_{10}(2^3) + \log_{10}(4)^2]^x$

(a) x (b) 10 (c) 1 (d) None.

2010 – June

44. If $2^x - 2^{x-1} = 4$ then x^x is equal to :

(a) 7 (b) 3 (c) 27 (d) 9

45. If $\log_a b + \log_a c = 0$ then

(a) $b = c$ (b) $b = -c$ (c) $b = c = 1$ (d) b and c are reciprocals.

46. What must be added to each term of the ratio 49 : 68, so that it becomes 3:4?

(a) 3 (b) 5 (c) 8 (d) 9

47. The students of two classes are in the ratio 5 : 7, if 10 students left from each class, the remaining students are in the ratio of 4 : 6 then the number of students in each class is:

(a) 30, 40 (b) 25, 24 (c) 40, 60 (d) 50,70

2010 - Dec

48. The value of $2 \log x + 2 \log x^2 + 2 \log x^3 +$ ---------- $+ 2 \log x^n$ will be:

(a) $\frac{n(n+1)\log x}{2}$ (b) $n(n+1)\log x$ (c) $n^2 \log x$ (d) None of these.

49. The recurring decimal 2.7777 ..... can be expressed as:

(a) 24/9 (b) 22/9 (c) 26/9 (d) 25/9

50. Solve : $\left(\frac{\log x_{10} - 3}{2}\right) + \left(\frac{11 - \log x_{10}}{3}\right) = 2$

(a) 10^{-1} (b) 10^{2} (c) 10 (d) 10^{3}

51. If A:B = 2:5, then (10A + 3B):(5A + 2B) is equal to:

(a) 7:4 (b) 7:3 (c) 6:5 (d) 7:9

2011 – June

52. If n = m! where ('m' is a positive integer > 2) then the value of:

$$\frac{1}{\log_2^n} + \frac{1}{\log_3^n} + \frac{1}{\log_4^n} + \cdots \ldots \ldots + \frac{1}{\log_m^n}$$

(a) 1 (b) 0 (c) -1 (d) 2

53. In a film shooting, A and B received money in a certain ratio and B and C also received the money in the same ratio. If A gets Rs. 1,60,000 and C gets Rs. 2,50,000. Find the amount received by B ?

(a) Rs. 2,00,000 (b) Rs. 2,50,000 (c) Rs. 1,00,000 (d) Rs. 1,50,000

2011 - Dec

54. The ratio Compounded of 4:5 and sub-duplicate of "a":9 is 8:15. Then Value of "a" is:

(a) 2 (b) 3 (c) 4 (d) 5

55. If $\log_2 x + \log_4 x = 6$, then the Value of x is :

(a) 16 (b) 32 (c) 64 (d) 128

56. If X Varies inversely as square of Y and given that Y = 2 for X = 1, then the Value of X for Y = 6 will be:

(a) 3 (b) 9 (c) 1/3 (d) 1/9

2012 – June

57. The value of $\frac{(3^{n+1}+3^n)}{(3^{n+3}-3^{n+1})}$ is equal to:

(a) 1/5 (b) 1/6 (c) ¼ (d) 1/9

58. If $\log_x y = 100$ and $\log_2 x = 10$, then the value of 'y' is :

(a) 2^{10} (b) 2^{100} (c) $2^{1,000}$ (d) $2^{10,000}$

59. Which of the numbers are not in proportion ?

(a) 6, 8, 5, 7 (b) 7, 14, 6 (c) 18, 27, 12,18 (d) 8, 6,12, 9

2012 – Dec

60. Find the value of x, if $x\,(x)^{1/3} = (x^{1/3})^x$

(a) 3 (b) 4 (c) 2 (d) 6

61. Which of the following is true. If $\frac{1}{ab}+\frac{1}{bc}+\frac{1}{ca}=\frac{1}{abc}$

(a) $\log (ab + bc + ca) = abc$ (b) $\log\left(\frac{1}{a}+\frac{1}{b}+\frac{I}{c}\right) = abc$

(c) $\log (abc) = 0$ (d) $\log (a + b + c) = 0$

62. Find two numbers such that mean proportional between them is 18 and third proportional between them is 144

(a) 9, 36 (b) 8, 32 (c) 7, 28 (d) 6, 24

2013 - June

63. For what value of x, the equation $\left(\log_{\sqrt{x}} - 2\right)^2 = \log x^2$ is true?

(a) 16 (b) 32 (c) 8 (d) 4

64. The mean proportional between 24 and 54 is :

(a) 33 (b) 34 (c) 35 (d) 36

65. The triplicate ratio of 4 : 5 is:

(a) 125:64 (b) 16:25 (c) 64 : 125 (d) 120 : 46

2013 - Dec

66. If $\sqrt[3]{a} + \sqrt[3]{b} + \sqrt[3]{c} = 0 = 0$, then the value of $\left(\frac{a+b+c}{3}\right)^3$

(a) abc (b) 9abc (c) $\frac{1}{abc}$ (d) $\frac{1}{9abc}$

67. Find three numbers in the ratio 1 : 2 : 3, so that the sum of their squares is equal to 504

(a) 6, 12,18 (b) 3,6, 9 (c) 4, 8, 12 (d) 5,10,15

68. The value of $\log_4 9 \cdot \log_3 2$ is:

(a) 3 (b) 9 (c) 2 (d) 1

69. The value of $(\log_y x \cdot \log_2 y \cdot \log_x z)^3$ is

(a) 0 (b) -1 (c) 1 (d) 3

70. Divide 80 into two parts so that their product is maximum, then the numbers are:

(a) 25,55 (b) 35,45 (c) 40,40 (d) 15,65

2014 – June

71. If x : y = 2:3, then (5x+2y):(3x-y)=

(a) 19:3 (b) 16:3 (c) 7 :2 (d) 7 : 3

72. If $(25)^{150} = (25x)^{50}$; then the value of x will be :

(a) 5^3 (b) 5^4 (c) 5^2 (d) 5

73 The value of $\left(\frac{y^a}{y^b}\right)^{a^2+ab+b^2} \times \left(\frac{y^b}{y^c}\right)^{b^2+bc+c^2} \times \left(\frac{y^c}{y^a}\right)^{c^2+ac+a2}$ is equal to ____.

(a) y (b) -1 (c) 1 (d) None of these

74. If the salary of P is 25% lower than that of Q and the salary of R is 20% higher than that of Q, the ratio of the salary of R and P will be:

(a) 5 : 8 (b) 8 : 5 (c) 5 : 3 (d) 3 : 5

75. If $x^2 + y^2 = 7xy$, then $\log \frac{1}{3}(x+y) =$ ___.

(a) (log x+log y) (b) $\frac{1}{2}$ (log x + log y) (c) $\frac{1}{3}$ (log x / log y) (d) $\frac{1}{3}$ (log x + log y)

76. A person has assets worth Rs. 1,48,200. He wish to divide it amongst his wife, son and daughter in the ratio 3:2:1 respectively. From this assets, the share of his son will be:

(a) Rs. 24,700 (b) Rs. 49,400 (c) Rs. 74,100 (d) Rs. 37,050

77. If $x = \log_{24}12$, $y = \log_{36}24$ and $z = \log_{48}36$, then $xyz + 1 =$ ____

(a) 2xy (b) 2xz (c) 2yz (d) 2

2014 – Dec

78 If $\log x = a + b$, $\log y = a - b$ then the value of $\log \frac{10x}{y^2} =$ _____.

(a) 1 - a + 3b (b) a -1 + 3b (c) a + 3b + 1 (d) 1 - b + 3a

79. If $x = 1 + \log_p qr$, $y = 1 + \log_q rp$ and $z = 1 + \log_r pq$ then the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} =$ _____

(a) 0 (b) 1 (c) -1 (d) 3

80. For three months, the salary of a person are In the ratio 2: 4:5. If the difference between the productof salaries of the first two months and last two months is Rs. 4,80,00,000; then the salary of the person for the second month will be:

(a) Rs. 4,000 (b) Rs. 6,000 (c) Rs. 8,000 (d) Rs. 12,000

2015 – June

81. A dealer mixes rice costing Rs. 13.84 per Kg. with rice costing Rs. 15.54 and sells the mixture at Rs. 17.60 per Kg. So, he earns a profit of 14.6% on his sale price. The proportion in which he mixesthe two qualities of rice is:

(a) 3:7 (b) **5** : 7 (c) 7:9 (d) 9:1

82. If $p^x = q$, $q^y = r$ and $r^2 = p^6$, then the value of xyz will be:

(a) 0 (b) 1 (c) 3 (d) 6

83 If $\log x = m + n$ and $\log y = m - n$, then $\log (10x/y^2) =$

(a) 3n - m + 1 (b) 3m - n + 1 (c) 3n + n + 1 (d) 3m + n + 1

84 If $15(2p^2 - q^2) = 7pq$, where p and q are positive, then p: q will be:

(a) 5:6 (b) 5 : 7 (c) 3 : 5 (d) 8 : 3

85. The ratio of third proportion of 12,30 to the mean proportion of 9, 25 is:

(a) 2:1 (b) 5:1 (c) 7:15 (d) 3:5

2015 – Dec

86. The value of $\log_5 3 \times \log_3 4 \times \log_2 5$.

(a) 0 (b) 1 (c) 2 (d) $\frac{1}{2}$

87. What number must be added to each of the numbers 10,18, 22, 38 to make the numbers is proportion?

(a) 2 (b) 4 (c) 8 (d) None of these.

88. The value of $\frac{2^n+2^{n-1}}{2^{n+1}-2^n}$ is:

(a) $\frac{1}{2}$ (b) $\frac{3}{2}$ (c) $\frac{2}{3}$ (d) 2

2016 – June

89. The integral part of a logarithm is called _____ and the decimal part of a logarithm is called _____.

(a) Mantissa, Characteristic (b) Characteristic, Mantissa

(c) Whole, Decimal (d) None of these.

90. The value of $\left[\frac{x^2-(y-z)^2}{(x+z)^2-y^2}+\frac{y^2-(x-z)^2}{(x+y)^2-z^2}+\frac{z^2-(x-y)^2}{(y+z)^2-x^2}\right]$ is

(a) 0 (b) 1 (c) -1 (d)

91. X, Y, Z together starts a business. If X invests 3 times as much as Y invests and Y invests two third of what Z invests, then the ratio of capitals of X, Y, Z is:

(a) 3:9:2 (b) 6:3:2 (c) 3:6:2 (d) 6:2:3

92. If $\log_4(x^2 + x) - \log_4(x + 1) = 2$, then the value of X is:

(a) 2 (b) 3 (c) 16 (d) 8

93. Value of $\frac{1}{\log_3^{60}}+-\frac{1}{\log_4^{60}}+\frac{1}{\log_5^{60}}$ is:

(a) 0 (b) 1 (c) **5** (d) 60

94. If $3^x = 5^y = 75^z$, then

(a) $x + y - z = 0$ (b) $\frac{2}{x}+\frac{1}{y}=\frac{1}{z}$ (c) $\frac{1}{x}+\frac{2}{y}=\frac{1}{z}$ (d) $\frac{2}{x}+\frac{1}{z}=\frac{1}{y}$

2016 – Dec

95. If log 2 - 0.3010 and log 3 = 0.4771, then the value of log 24 is:

(a) 1.0791 (b) 1.7323 (c) 1.3801 (d) 1.8301

96. If abc = 2, then the value of $\frac{1}{1+a+2b^{-1}}+\frac{1}{1+\frac{1}{2}b+c^{-1}}+\frac{1}{1+c+a^{-1}}$ is:

(a) 1 (b) 2 (c) 3 (d) $\frac{1}{2}$

97. There are total 23 coins of Rs. 1, Rs. 2 and Rs. 5 in a bag. If their value is Rs. 43 and the ratio of coins of Rs. 1 and Rs. 2 is 3:2. Then the number of coins of Rs. 1 is:

(a) 12 (b) 5 (c) 10 (d) 14

2017 – June

98. If a:b = 2:3, b:c = 4:5 and c: d = 6 : 7, then a: d is:

(a) 24:35 (b) 8 :15 (c) 16:35 (d) 7:15

99. The value of log $(1^3 + 2^3 + 3^3 + \ldots\ldots n^3)$ is equal to:

(a) 3 log 1 + 3 log 2 + …….. + 3 log n (b) 2 log n + 2 log (n+1) - 2 log 2

(c) log n + log (n+1) + log (2n+1) - log 6 (d) 1

100. If $a = \frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}-\sqrt{5}}$ and $b = \frac{\sqrt{6}-\sqrt{5}}{\sqrt{6}+\sqrt{5}}$ then the value of $\frac{1}{a^2}+\frac{1}{b^2}$ is equal to:

(a) 480 (b) 482 (c) 484 (d) 486

2017 – Dec

101. The ratio of the number Rs. 5 coins and Rs.10 coins Is 8: 15; If the value of Rs. 5 coins is 360, then the number of Rs. 10 coins will be:

(a) 72 (b) 120 (c) 135 (d) 185

102. If log3 [log4 (log2 x)] = 0, then the value of 'x' will be:

(a)4. (b) 8 (c) 16 . (d) 32

103. If $\log\left(\frac{X-Y}{2}\right) = \frac{1}{2}(\log x + \log y)$, then the value of x^2+y^2 =_____

(a) 2xy (b) 4xy (c) 2x (d) 6xy

104. If $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}$ and $\frac{1}{X}$ are in proportion, than the value of 'x' will be:

(a) $\frac{15}{2}$ (b) $\frac{6}{5}$ (c) $\frac{10}{3}$ (d) $\frac{5}{6}$

ANSWERS

1	B	11	A	21	D	31	B	41	B	51	A	61	D	71	B	81	A
2	D	12	B	22	A	32	C	42	A	52	A	62	A	72	B	82	D
3	A	13	A	23	A	33	B	43	C	53	A	63	A	73	C	83	A
4	C	14	C	24	D	34	A	44		54	C	64	D	74	B	84	A
5	C	15	D	25	D	35	C	45	D	55	A	65	C	75	B	85	B
6	A	16	B	26	C	36	C	46	C	56	D	66	A	76	B	86	C
7	B	17	C	27	A	37	D	47	D	57	B	67	A	77	C	87	A
8	A	18	C	28	B	38	B	48	B	58	C	68	D	78	A	88	B
9	B	19	A	29	B	39	A	49	D	59	A	69	C	79	B	89	B
10	C	20	A	30	A	40	A	50	A	60	B	70	C	80	C	90	B

91	D	97	A	104	A
92	C	98	C		
93	B	99	B		
94	C	100	B		
95	C	101	C		
96	A	102	C		
97	A	103	D		

STUDENT NOTES

CH - 2

EQUATIONS & MATRICES

UNIT I: EQUATIONS

LINEAR EQUATIONS

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE (A)

1. The equation $-7x + 1 = 5 - 3x$ will be satisfied for x equal to:

a) 2 b) –1 c) 1 d) none of these

2. 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

3. Pick up the correct value of x for $\frac{x}{30} = \frac{2}{45}$

a) $x = 5$ b) $x = 7$ c) $x = 1\frac{1}{3}$ d) none of these

4. The solution of the equation $\frac{x+24}{5} = 4 + \frac{x}{4}$

a) 6 b) 10 c) 16 d) none of these

5. 8 is the solution of the equation

$\frac{x+4}{4} + \frac{x-5}{3} = 11$ b) $\frac{x+4}{2} + \frac{x+10}{9} = 8$ c) $\frac{x+24}{5} = 4 + \frac{x}{4}$ d) $\frac{x-15}{10} + \frac{x+5}{5} = 4$

6. The value of y that satisfies the equation $\frac{y+11}{6} - \frac{y+1}{9} = \frac{y+7}{4}$ is

a) –1 b) 7 c) 1 d) – 1/7

7. The solution of the equation $(p+2)(p-3)+(p+3)(p-4)=p(2p-5)$ is

a) 6 b) 7 c) 5 d) none of these

8. The equation $\frac{12x+1}{4}=\frac{15x-1}{5}+\frac{2x-5}{3x-1}$ is true for

a) $x=1$ b) $x=2$ c) $x=5$ d) $x=7$

9. 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

ILLUSTRATIONS:

1. *The denominator of a fraction exceeds the numerator by 5 and if 3 be added to both the fraction becomes 3/4 . Find the fraction.*

Sol: Let x be the numerator and the fraction be $\frac{x}{x+5}$. By the question $\frac{x+3}{x+5+3}=\frac{3}{4}$ or

$4x+12=3x+24$ or $x=12$

The required fraction is 12/17

2. *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.*

Sol:

3. *A number consists of two digits the digit in the ten's place is twice the digit in the unit's place. If 18*

be subtracted from the number the digits are reversed. Find the number.

Sol:

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EXERCISE (B)

Choose the most appropriate option (a) (b) (c) or (d).

1. The sum of two numbers is 52 and their difference is 2. The numbers are

a) 17 and 15 b) 12 and 10 c) 27 and 25 d) none of these

2. The diagonal of a rectangle is 5 cm and one of at sides is 4 cm. Its area is

a) 20 sq.cm. b) 12 sq.cm. c) 10 sq.cm. d) none of these

3. Divide 56 into two parts such that three times the 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

4. The sum of the digits of a two digit number is 10. If 18 be subtracted from it the digits in the resulting number will be equal. The number is

a) 37 b) 73 c) 75 d) none of these numbers.

5. The fourth part of a number exceeds the sixth part by 4. The number is

	a) 84	b) 44	c) 48	d) none of these
6.	Ten years ago the age of a 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
7.	The product of two numbers is 3200 and the quotient when the larger number is divided by the			
	smaller is 2.The numbers are			
	a) (16, 200)	b) (160, 20)	c) (60, 30)	d) (80, 40)
8.	The denominator of a fraction exceeds the numerator by 2. If 5 be added to the numerator the fraction			
	increases by unity. The fraction is.			
	5/7	b) 1/3	c) 7/9	d) 3/5
9.	Three persons Mr. Roy, Mr. Paul and Mr. Singh together have Rs. 51. Mr. Paul has Rs. 4 less than Mr.			
	Roy and Mr. Singh has got Rs. 5 less than Mr. Roy. They have the money as.			
	a) (Rs. 20, Rs. 16, Rs. 15)	b) (Rs. 15, Rs. 20, Rs. 16)	c) (Rs. 25, Rs. 11, Rs. 15)	d) none of these
10.	A number consists of two digits. The digits in the ten's place is 3 times the digit in the unit's place. If 54			
	is subtracted from the number the digits are reversed. The number is			
	a) 39	b) 92	c) 93	d) 94
11.	One student is asked to divide a half of a number by 6 and other half by 4 and then to add the two			
	quantities. Instead of doing so the student divides the given number by 5. If the answer is 4 short of			
	the correct answer then the number was			
	a) 320	b) 400	c) 480	d) none of these.

12. If a number of which the half is greater than 1/5 th of the number by 15 then the number is

a) 50 b) 40 c) 80 d) none of these.

Elimination Method: In this method two given linear equations are reduced to a linear equation in one unknown by eliminating one of the unknowns and then solving for the other unknown.

Ex. 1: *Solve: $2x + 5y = 9$ and $3x - y = 5$.*

Sol.:

Ex. 2: *Solve for x, y and z :*

$$\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=5,\ \frac{2}{x}-\frac{3}{y}-\frac{4}{z}=-11,\ \frac{3}{x}+\frac{2}{y}-\frac{1}{z}=-6$$

Sol.: We put $u=\frac{1}{x}$, $v=\frac{1}{y}$, $w=\frac{1}{z}$ we get'

$u + v + w = 5$ ..... (i) $2u - 3v - 4w = -11$..... (ii)

$3u + 2v - w = -6$..... (iii) By (i) + (iii) $4u + 3v = -1$ ..... (iv)

By (iii) x 4 $12u + 8v - 4w = -24$ .....(v) By (ii) – (v) $-10u - 11v = 13$
or $10u + 11v = -13$ ..... (vi)

By (iv) × 11 $44x + 33v = -11$ .....(vii) By (vi) × 3 $30u + 33v = -39$ .....(viii)

By (vii) – (viii) $14u = 28$ or $u = 2$

Putting $u = 2$ in (iv) 4 $2 + 3v = -1$ or $8 + 3v = -1$ or $3v = -9$ or $v = -3$

Putting u = 2, v = –3 in (i) or 2–3 + w = 5

or –1 + w = 5 or w = 5 + 1 or w = 6

$x = \frac{1}{u} = ½$ $y = -\frac{1}{v} = \frac{1}{-3}$ $z = \frac{1}{w} = \frac{1}{6}$

ILLUSTRATIONS:

1. *If the numerator of a fraction is increased by 2 and the denominator by 1 it becomes 1. Again if the numerator is decreased by 4 and the denominator by 2 it becomes 1/2 . Find the fraction.*

SOL.: Let x/y be the required fraction.

By the question $\frac{x+2}{y+1} = 1, \frac{x-4}{y-2} = \frac{1}{2}$

Thus $x + 2 = y + 1$ or $x - y = -1$ ..... (i) and $2x - 8 = y - 2$ or $2x - y = 6$ ..... (ii)

By (i) – (ii) – $x = -7$ or $x = 7$

from (i) 7 – y = –1 or y = 8

So the required fraction is 7/8.

2. *The age of a man is three times the sum of the ages of his two sons and 5 years hence his age will be double the sum of their ages. Find the present age of the man?*

SOL.:

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EXERCISE (C)

Choose the most appropriate option (a), (b), (c) or (d).

1. Monthly incomes of two persons are in the ratio 4 : 5 and their monthly expenses are in the ratio 7 : 9. If each saves Rs. 50 per month find their monthly incomes.

a) (500, 400) b) (400, 500) c) (300, 600) d) (350, 550)

2. Find the fraction which is equal to 1/2 when both its numerator and denominator are increased by 2. It is equal to 3/4 when both are increased by 12.

a) 3/8 b) 5/8 c) 2/8 d) 2/3

3. The age of a person is twice the sum of the ages of his two sons and five years ago his age was thrice the sum of their ages. Find his present age.

a) 60 years b) 52 years c) 51 years d) 50 years

4. A number between 10 and 100 is five times the sum of its digits. If 9 be added to it the digits are reversed find the number.

a) 54 b) 53 c) 45 d) 55

5. The wages of 8 men and 6 boys amount to Rs. 33. If 4 men earn Rs. 4.50 more than 5 boys determine the wages of each man and boy.

a) (Rs. 1.50, Rs. 3) b) (Rs. 3, Rs. 1.50) c) (Rs. 2.50, Rs. 2) d) (Rs. 2, Rs. 2.50)

6. A number consisting of two digits is four times the sum of its digits and if 27 be added to it the digits are reversed. The number is :

a) 63 b) 35 c) 36 d) 60

7. Of two numbers, 1/5th of the greater is equal to 1/3rd of the smaller and their sum is 16. The numbers are:

a) (6, 10) b) (9, 7) c) (12, 4) d) (11, 5)

8. *y* is older than *x* by 7 years 15 years back *x*'s age was 3/4 of *y*'s age. Their present ages are:

a) (x=36, y=43) b) (x=50, y=43) c) (x=43, y=50) d) (x=40, y=47)

9. The sum of the digits in a three digit number is 12. If the digits are reversed the number is increased by 495 but reversing only of the ten's and unit digits increases the number by 36. The number is

a) 327 b) 372 c) 237 d) 273

10. Two numbers are such that twice the greater number exceeds twice the smaller one by 18 and 1/3rd of the smaller and 1/5th of the greater number are together 21. The numbers are:

a) (36, 45) b) (45, 36) c) (50, 41) d) (55, 46)

11. The demand and supply equations for a certain commodity are $4q + 7p = 17$ and $p = \frac{q}{3} + \frac{7}{4}$ respectively where p is the market price and q is the quantity then the equilibrium price and quantity are

a)2,3/4 b) 3,1/2 c) 5,3/5 d) None of these

QUADRATIC EQUATION

Ex. 1: Solve $x^2 - 5x + 6 = 0$

Sol.: 1st method : $x^2 - 5x + 6 = 0$

or $x2 - 2x - 3x + 6 = 0$ or $x(x-2) - 3(x-2) = 0$ or $(x-2)(x-3) = 0$ or $x = 2$ or 3

2nd method (By formula) $x2 - 5x + 6 = 0$

Here $a = 1, b = -5, c = 6$ (comparing the equation with $ax2 + bx + c = 0$)

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{25-24}}{2}$,

$\frac{5 \pm 1}{2} = 6/2$ and $4/2$

$x = 3$ and 2

Ex. 2: Examine the nature of the roots of the following equations.

i) $x^2 - 8x + 16 = 0$ ii) $3x^2 - 8x + 4 = 0$ iii) $5x^2 - 4x + 2 = 0$ iv) $2x^2 - 6x - 3 = 0$

Sol.: (i) $a = 1, b = -8, c = 16$

$b^2 - 4ac = (-8)2 - 4.1.16 = 64 - 64 = 0$

The roots are real and equal

(ii)

(iii) $5x^2 - 4x + 2 = 0$

$b^2 - 4ac = (-4)^2 - 4.5.2 = 16 - 40 = -24 < 0$

The roots are imaginary and unequal.

ILLUSTRATIONS:

1. *If α and β be the roots of $x^2 + 7x + 12 = 0$ find the equation whose roots are $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$.*

SOL.:

2. *If α, β be the roots of $2x^2 - 4x - 1 = 0$ find the value of $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$*

SOL.:

3. *Solve for x : $4^x - 3.2^{x+2} + 2^5 = 0$*

SOL.: $4^x - 3.2^{x+2} + 2^5 = 0$

or $(2^x)^2 - 3.2^x.\ 2^2 + 32 = 0$ or $(2^x)^2 - 12.\ 2^x + 32 = 0$ or $y^2 - 12y + 32 = 0$ (taking $y = 2x$)

or $y^2 - 8y - 4y + 32 = 0$ or $y(y-8) - 4(y-8) = 0$ $(y-8)(y-4) = 0$

either $y - 8 = 0$ or $y - 4 = 0$ $y = 8$ or $y = 4$.

$\Rightarrow 2^x = 8 = 2^3$ or $2^x = 4 = 2^2$ Therefore $x = 3$ or $x = 2$.

4. *If one root of the equation is $2-\sqrt{3}$,form the equation given that the roots are irrational*

SOL.:

5. *If α, β are the two roots of the equation $x^2 - px + q = 0$ form the equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$*

SOL.:

6. *If the roots of the equation $p(q-r)x^2 + q(r-p)x + r(p-q) = 0$ are equal show that $\frac{2}{q} = \frac{1}{p} + \frac{1}{r}$*

SOL.: Since the roots of the given equation are equal the discriminant must be zero

ie. $q^2(r-p)^2 - 4.\, p(q-r)\, r(p-q) = 0$

or $q^2 r^2 + q^2 p^2 - 2q^2 rp - 4pr\,(pq - pr - q^2 + qr) = 0$

or $p^2q^2 + q^2r^2 + 4p^2r^2 + 2q^2pr - 4p^2qr - 4pqr^2 = 0$

or $(pq + qr - 2rp)2 = 0$

$pq + qr = 2pr$

or $\frac{pq+qr}{2pr} = 1$ or, $\frac{q}{2}\frac{(p+r)}{pr} = 1$ or, $\frac{1}{r} + \frac{1}{p} = \frac{2}{q}$

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EXERCISE (D)

Choose the most appropriate option (a) (b) (c) or (d).

1. If the roots of the equation $2x^2 + 8x - m^3 = 0$ are equal then value of m is

(a) – 3 (b) – 1 (c) 1 (d) – 2

2. If $2^{2x+3} - 3^2 . 2^x + 1 = 0$ then values of x are

(a) 0, 1 (b) 1, 2 (c) 0, 3 (d) 0, – 3

3. The values of

$$4+\cfrac{1}{4+\cfrac{1}{4+\cfrac{1}{4+\ldots\ldots\infty}}}$$

(a) $1\pm\sqrt{2}$ (b) $2\pm\sqrt{5}$ (c) $2\pm\sqrt{5}$ (d) none of these

4. If $\alpha\beta$ be the roots of the equation $2x^2 - 4x - 3 = 0$ the value of $\alpha^2 + \beta^2$ is

a) 5 b) 7 c) 3 d) – 4

5 If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares

of their reciprocals then $\frac{a^2}{ac} + \frac{bc}{a^2}$ is equal to

a) 2 b) –2 c) 1 d) –1

6. he equation $x^2 - (p+4)x + 2p + 5 = 0$ has equal roots the values of p will be.

a) ± 1 b) 2 c) ± 2 d) –2

7. 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) $p \geq 1/4$ d) $p \leq ¼$

8. If $x = m$ is one of the solutions 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)

9. 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

10. If $L + M + N = 0$ and L, M, N are rationals the roots of the equation $(M+N-L)x^2 + (N+L-M)x +$

$(L+M-N) = 0$ are

a) real and irrational b) real and rational c) imaginary and equal d) real and equal

11. If α and β are the roots of $x^2 = x + 1$ then value of $\frac{\alpha^2}{\beta} - \frac{\beta^2}{\alpha}$ is

a) $2\sqrt{5}$ b) $\sqrt{5}$ c) $3\sqrt{5}$ d) –2

12. If $p \neq q$ and $p^2 = 5p - 3$ and $q^2 = 5q - 3$ the equation having roots as $\frac{p}{q}$ and $\frac{q}{p}$ is

a) $x^2 - 19x + 3 = 0$ b) $3x^2 - 19x - 3 = 0$ c) $3x^2 - 19x + 3 = 0$ d) $3x^2 + 19x + 3 = 0$

13. 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) 1/5 d) –1/5

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EXERCISE (E)

Choose the most appropriate option (a) (b) (c) or (d).

1. The sum of 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)

2. The difference of two positive integers is 3 and the sum of their squares is 89. Taking the smaller integer as x form a quadratic equation and solve it to find the integers. The integers are.

   a) (7, 4) b) (5, 8) c) (3, 6) d) (2, 5)

3. Five times of a positive whole number is 3 less than twice the square of the number. The number is

   a) 3 b) 4 c) –3 d) 2

4. The area of a rectangular field is 2000 sq.m and its perimeter is 180m. Form a quadratic equation by taking the length of the field as x and solve it to find the length and breadth of the field. The length and breadth are

   a) (205m, 80m) b) (50m, 40m) c) (60m, 50m) d) none

5. Two squares have sides p cm and (p + 5) cms. The sum of their squares is 625 sq. cm. The sides of the squares are

   a) (10 cm, 30 cm) b) (12 cm, 25 cm) c) 15 cm, 20 cm) d) none of these

6. Divide 50 into two parts such that the sum of their reciprocals is 1/12. The numbers are

   a) (24, 26) b) (28, 22) c) (27, 23) d) (20, 30)

7. There are two consecutive numbers such that the difference of their reciprocals is 1/240. The numbers are

a) (15, 16) b) (17, 18) c) (13, 14) d) (12, 13)

8. The hypotenuse of a right–angled triangle is 20cm. The difference between its other two sides be 4cm. The sides are

a) (11cm, 15cm) b) (12cm, 16cm) c) (20cm, 24cm) d) none of these

9. The sum of two numbers is 45 and the mean proportional between them is 18. The numbers are

a) (15, 30) b) (32, 13) c) (36, 9) d) (25, 20)

10. The sides of an equilateral triangle are shortened by 12 units 13 units and 14 units respectively and a right angle triangle is formed. The side of the equilateral triangle is

a) 17 units b) 16 units c) 15 units d) 18 units

11. A distributor of apple Juice has 5000 bottle in the store that it wishes to distribute in a month. From experience it is known that demand D (in number of bottles) is given by $D = -2000p^2 + 2000p + 17000$. The price per bottle that will result zero inventory is

a) Rs. 3 b) Rs. 5 c) Rs. 2 d) none of these

12. The sum of two irrational numbers multiplied by the larger one is 70 and their difference is multiplied by the smaller one is 12; the two numbers are

a) $3\sqrt{2}, 2\sqrt{3}$ (b)$5\sqrt{2}, 3\sqrt{5}$ (c)$2\sqrt{2}, 5\sqrt{2}$ d) none of these

CUBIC EQUATION

1.	Solve $x^3 - 7x + 6 = 0$
Sol:	Putting $x = 1$ L.H.S is Zero. So $(x-1)$ is a factor of $x^3 - 7x + 6$
	We write $x^3-7x+6 = 0$ in such a way that $(x-1)$ becomes its factor. This can be achieved by
	writing the equation in the following form. or $x^3-x^2+x^2-x-6x+6 = 0$ or $x^2(x-1) + x(x-1) - 6(x-1) = 0$
	or $(x-1)(x^2+x-6) = 0$ or $(x-1)(x^2+3x-2x-6) = 0$
	or $(x-1)\{ x(x+3) - 2(x+3) \} = 0$ or $(x-1)(x-2)(x+3) = 0$
	or $x = 1, 2, -3$
2.	Solve for real x: $x^3 + x + 2 = 0$
SOL.:	By trial we find that $x = -1$ makes the LHS zero. So $(x+1)$ is a factor of $x^3 + x + 2$
	We write $x^3 + x + 2 = 0$ as $x^3 + x^2 - x^2 - x + 2x + 2 = 0$
	or $x^2(x+1) - x(x+1) + 2(x+1) = 0$
	or $(x+1)\ (x^2 - x + 2) = 0$.
	Either $x + 1 = 0$; $x = -1$
	or $x^2 - x + 2 = 0$ i.e. $x = -1$
	i. .e. $x = \frac{1\pm\sqrt{1-8}}{2} = \frac{1\pm\sqrt{-7}}{2}$
	As x $= \frac{1\pm\sqrt{-7}}{2}$ is not real, $x = -1$ is the required sol..

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EXERCISE (F)

Choose the most appropriate option (a), (b), (c) or (d)

1. The solution of the cubic equation $x^3-6x^2+11x-6=0$ is given by the triplet :

a) (–1, 1 –2) b) (1, 2, 3) c) (–2, 2, 3) d) (0, 4, –5)

2. The cubic equation $x^3+2x^2-x-2=0$ has 3 roots namely.

a) (1, –1, 2) b) (–1, 1, –2) c) (–1, 2, –2) d) (1, 2, 2)

3. $x, x-4, x+5$ are the factors of the left–hand side of the equation.

a) $x^3+2x^2-x-2=0$ b) $x^3+x^2-20x=0$ c) $x^3-3x^2-4x+12=0$ d) $x^3-6x^2+11x-6=0$

4. The equation $3x^3+5x^2=3x+5$ has got 3 roots and hence the factors of the left–hand side of the equation $3x^3+5x^2-3x-5=0$ are

a) $x-1, x-2, x-5/3$ b) $x-1, x+1, 3x+5$ c) $x+1, x-1, 3x-5$ d) $x-1, x+1, x-2$

5. The roots of the equation $x^3+7x^2-21x-27=0$ are

a) (– 3, – 9, – 1) b) (3, – 9, – 1) c) (3, 9, 1) d) (– 3, 9, 1)

6. The roots of $x^3+x^2-x-1=0$ are

a) (– 1, – 1, 1) b) (1, 1, – 1) c) (– 1, – 1, – 1) d) (1, 1, 1)

7. The satisfying value of $x^3+x^2-20x=0$ are

a) (1, 4, – 5) b) (2, 4, – 5) c) (0, – 4, 5) d) (0, 4, – 5)

8. The roots of the cubic equation $x^3+7x^2-21x-27=0$ are

a) (–3, –9, –1) b) (3, –9, –1) c) (3, 9, 1) d) (–3, 9, 1)

9. If $4x^3+8x^2-x-2=0$ then value of $(2x+3)$ is given by

a) 4, –1, 2 b) –4, 2, 1 c) 2, –4, –1 d) none of these.

10. The rational root of the equation $2x^3 - x^2 - 4x + 2 = 0$ is

a) 1/2 b) -1/2 c) 2 d) – 2.

ANSWERS

Exercise A

1.	(b)	**2.**	(a)	**3.**	(c)	**4.**	(c)	**5.**	(b)	**6.**	(d)	**7.**	(a)	**8.**	(d)		
9.	(c)																

Exercise B

1.	(c)	**2.**	(b)	**3.**	(a)	**4.**	(b)	**5.**	(c)	**6.**	(a)	**7.**	(d)	**8.**	(d)		
9.	(a)	**10.**	(c)	**11.**	(c)	**12.**	(a)										

Exercise C

1.	(b)	**2.**	(a)	**3.**	(d)	**4.**	(c)	**5.**	(b)	**6.**	(c)	**7.**	(a)	**8.**	(a)		
9.	(c)	**10.**	(b)	**11.**	(a)												

Exercise D

1.	(d)	**2.**	(d)	**3.**	(b)	**4.**	(b)	**5.**	(a)	**6.**	(c)	**7.**	(d)	**8.**	(b)		
9.	(a)	**10.**	(b)	**11.**	(d)	**12.**	(c)	**13.**	(b)								

Exercise E

1.	(c)	**2.**	(b)	**3.**	(a)	**4.**	(b)	**5.**	(c)	**6.**	(d)	**7.**	(a)	**8.**	(b)		
9.	(c)	**10.**	(a)	**11.**	(a)	**12.**	(c)										

Exercise F

1.	(c)	**2.**	(b)	**3.**	(b)	**4.**	(b)	**5.**	(b)	**6.**	(a)	**7.**	(d)	**8.**	(b)		
9.	(a)	**10.**	(c)														

"KAR LO PAST APNI MUTHI ME"

Past Exam Questions

2006 – Nov

1. On solving $\sqrt{\frac{x}{1-x}} + \sqrt{\frac{1-x}{x}} = 2\frac{1}{6}$, we get one val of x as:

(a) $\frac{4}{13}$ (b) $\frac{1}{13}$ (c) $\frac{2}{13}$ (d) $\frac{3}{13}$

2. Find the positive value of k for which the equations : $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ will have real roots :

(a) 12 (b) 16 (c) 18 (d) 22.

2007 – Feb

3. A man sells 6 radios and 4 televisions for Rs. 18,480. If 14 radios and 2 televisions are sold for the same amount, what is the price of a television?

(a) Rs. 1,848 (b) Rs. 840 (c) Rs. 1,680 (d) Rs. 3,360

4. If one root of a equation is $2 + \sqrt{5}$, then the quadratic equation is:

(a) $x^2 + 4x - 1 = 0$ (b) $x^2 - 4x - 1 = 0$ (c) $x^2 + 4x + 1 - 0$ (d) $x^2 - 4x + 1 = 0$

2007 – May

5. A man starts his job with a certain monthly salary and earns a fixed increment every year. If his salary was Rs. 1,500 after 4 years of service and Rs. 1,800 after 10 years of service, what was his starting salary

and what is the annual increment in rupees?

(a) Rs. 1,300, Rs. 50 (b) Rs. 1,100, Rs. 50 (c) Rs. 1,500, Rs. 30 (d) None.

2007 – Aug

6. The value of $\sqrt{6+\sqrt{6+\sqrt{6+\cdots\ldots\ldots\infty}}}$ is :

(a) -3 , (b) 2 (c) 3 (d) 4

2007 - Nov

7. Area of a rectangular garden is 8000 square metres. Ratio in length and breadth is 5:4. A path of uniform width, runs all round the inside of the garden. If the path occupies 3200 m^2, what is its width?

(a) 12m (b) 6m (c) 10m (d) 4m.

2008 - Feb

8. A man went to the Reserve Bank of India with Rs. **1**,000. He asked the cashier to give him Rs. 5 and Rs. 10 notes only in return. The man got 175 notes in all. Find how many notes of Rs. 5 and Rs. 10 did he receive?

(a) (25, 150) (b) (40, 110) (c) (150,25) (d) None.

2008 - June

9. A man rowing at the rate of 5 km in ah hour in still water takes thrice as much time in going 40 km up the

river as in going 40 km down. Find the rate at which the river flows :

(a) 9 km/hr (b) 2.5 km/hr (c) 12 km/hr (d) None.

10. The value of

$$2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\cdots\infty}}}}$$ is :

(a) $1 \pm \sqrt{2}$ (b) $2 \pm \sqrt{5}$. (c) $2 \pm \sqrt{3}$ (d) None.

2008 – Dec

11. If $x^3 - 6x^2 + 11x - 6 = 0$ then find the value of $(3x - 4)$.

(a) (1,2,3) (b) (-1,2,5) (c) (-1,3, 5) (d) (2, 3, 5)

12. If $(2+\sqrt{3})$ is a root of a quadratic equation $x^2 + px + q = 0$ then find the value of p and q.

(a) (4.-1) (b) (4,1) (c) (-4,1) (d) (2,3)

2008 - Dec

13. If area and perimeter of a rectangle is 6000 cm^2 and 340 cm respectively, then the length of rectangle is :

(a) 140 (b) 120 (c) 170 (d) 200

2009 - June

14. One root of the equation : $x^2 - 2(5+m)x+3(7+m)=0$ is reciprocal of the other. Find the value of M.

(a) - 7 (b) 7 (c) 1/7 (d) - 1/7

2009 – Dec

15. If the length of a rectangle is 5 cm more than the breadth and if the perimeter of the rectangle is 40 cm, then the length & breadth of the rectangle will be :

(a) 7.5 cm, 2.5 cm (b) 10 cm, 5 cm (c) 12.5 cm, 7.5 cm (d) 15.5 cm, 10.5 cm.

16. Roots of the equation $3x^2 - 14x + k = 0$ will be reciprocal of each other if:

(a) $k = -3$ (b) $k = 0$ (c) $k = 3$ (d) $k = 14$.

17. Positive value of 'k' for which the roots of equation $12x^2 + kx + 5 = 0$ are in ratio 3:2, is:

(a) 5/12 (b) 12/5 (c) $\frac{3\sqrt{10}}{2}$ (d) $5\sqrt{10}$

18. If one root of the equation $x^2-3x+k=0$ is 2, then value of k will be:

(a) -10 (b) 0 (c) 2 (d) 10

2011 - June

19. If the ratio of (5x - 3y) and (5y - 3x) is 3:4, then the value of x : y is :

(a) 27:29 (b) 29 :27 (c) 3 : 4 (d) 4:3

20. If roots of equation $x^2 + x + r = 0$ are '$\propto$' and 'β' and $\propto^3 + \beta^3 = -6$. Find the value 'r' ?

(a) $\frac{-5}{3}$ (b) $\frac{7}{3}$ (c) $\frac{-4}{3}$ (d) 1

2011 - Dec

21. If one root of the Equation $px^2 + qx + r = 0$ is r then other root of the Equation will be:

(a) 1/q (b) 1/r (c) 1/p (d) $\frac{1}{p+q}$

22. 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

23. If p & q are the roots of the Equation $x^2 - bx + C = 0$, then what is the Equation whose roots are (pq + p +

q) and (pq - p - q)?

(a) $x^2 - 2cx + C^2 - b^2 = 0$ (b) $x^2 - 2bx + C^2 + b^2 = 0$

(c) $8cx^2 - 2(b + c)x + C^2 = 0$ (d) $x^2 + 2bx - (C^2 - b^2) = 0$

2012 - June

24. If arithmetic mean between roots of a quadratic equation is 8 and the geometric mean between them is

5, the equation is _____.

(a) $x^2-16x -25 = 0$ (b) $x^2-16x + 25 = 0$ (c) $x^2-16x + 5 = 0$ (d) None of these.

25. The minimum value of the function $x^2 - 6x + 10$ is _____.

(a) 1 (b) 2 (c) 3 (d) 10

25. If one of the roots of the equation $x^2 + px + a$ is $\sqrt{3}+2$, then the value of 'p' and 'a' is:

(a) -4,-1 (b) 4,-1 (c) - 4, 1 (d) 4, 1

2012 – Dec

26. If $\log_{10} 5 + \log_{10} (5x +1) = \log_{10} (x + 5) + 1$ then, the value of x = _____.

(a) 7 (b) 3 (c) 5 (d) 10

27. If $|x - 2| + |x - 3| = 7$ then, 'x' will be equal to

(a) 6 (b) -1 (c) 6 and -1 (d) None of the above.

28. Roots of equation $2x^2 + 3x + 7 = 0$ are α and β. The value of $\alpha\beta^{-1} + \beta\alpha^{-1}$ is

(a) 2 (b) 3/7 (c) 7/2 (d) -19/14

29. The quadratic equation $x^2 - 2kx + 16 = 0$ will have equal roots when the value of 'k' is _____.

(a) ± 1 (b) ± 2 (c) ± 3 (d) ± 4

2013 - June

30. If α and β are the roots of the equation $x^2 + 7x + 12 = 0$, then the equation whose roots $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$ will be:

(a) $x^2 - 14x + 49 = 0$ (b) $x^2 - 24x + 144 = 0$ (c) $x^2 - 50x + 49 = 0$ (d) $x^2 - 19x + 144 = 0$

2013 - Dec

31. If $b^2 - 4ac$ is a perfect square but not equal to zero than the roots are:

(a) real and equal (b) real, irrational and equal

(c) real, rational and unequal (d) Imaginary.

32. A seller makes an offer of selling certain articles that can be described by the equation $x = 25 - 2y$ where "x" is the price per unit and 'y' denotes the number of unit. The cost price of the article is Rs. 10 per unit.

The maximum quantity that can be offered in a single deal to avoid loss is _____.

(a) 6 (b) 7 (c) 8 (d) 9

33. If $kx - 4 = (k - 1)x$, then which of the following is true?

(a) $x = -5$ (b) $x = -4$ (c) $x = -3$ (d) $x = +4$

34. The value of 'K' for which the system of equations $kx + 2y = 5$ and $3x + y = 1$ has no solution is:

(a) 5 (b) $\frac{2}{3}$ (c) 6 (d) $\frac{3}{2}$

2014 - June

35. The roots of the equation $y^3+y^2-y-1=0$ are:

(a) (1, 1, -1) (b) (-1.-1,1) (c) (1,1,1) (d) None of these

36. The equation $x + 5y = 33$; $\frac{x+y}{x-y} = \frac{13}{3}$ has the solution (x, y) as:

(a) (4, 8) (b) (8, 5) (c) (4,16) (d) (16,4)

37. The number of students in each section of a school is 36. After admitting 12 new students, four new sections were started. If total number of students in each section now is 30, than the number of sections initially were.

(a) 6 (b) 10 (c) 14 (d) 18

37. If α and β be the roots of the quadratic equation $2x^2 - 4x = 1$. the value of $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ is _____.

(a) -11 (b) 22 (c) -22 (d) 11

38. A person on a tour has Rs. 9,600 for his expenses. If his tour is extended by 16 days, he has to cut down his daily expenses by Rs. 20, his original duration of tour had been.

(a) 48 days (b) 64 days (c) 80 days (d) 96 days

39. The present age of a man is 8 years more than thrice the sum of the ages of his two grandsons who are twins. After 8 years, his age will be 10 years more than twice the sum of the ages of his grandsons. The age of a man when his grandsons were born was:

(a) 86 years (b) 73 years (c) 68 years (d) 63 years

2015 - June

40. The roots of the cubic equation $x^3 - 7x + 6 = 0$ are:

(a) 1,2 and 3 (b) 1, -2 and 3 (c) 1,2 and - 3 (d) 1, -2 and - 3

2015 - Dec

41. If the roots of the equation $4x^2 - 12x + k = 0$ are equal, then the value of k is:

(a) -3 (b) 3 (c) -9 (d) 9

42. If $\alpha + \beta = -2$ and $\alpha\beta = -3$, then α, β are the roots of the equation, which is:

(a) $x^2 - 2x - 3 = 0$ (b) $x^2 + 2x - 3 = 0$ (c) $x^2 + 2x + 3 = 0$ (d) $x^2 - 2x + 3 = 0$

43. Let E_1 and E_2 are two linear equations in two variables x and y. (0,1) is a solution of both equations E_1 and E_2. (2, -1) is a solution of equation E_1 only and (-2, -1) is solution of E_2 only then E_1 and E_2 are

(a) $X = 0, y = 1$ (b) $2x - y = -1, 4x + y = 1$

(c) $x + y = 1, x - y = -1$ (d) $x + 2y = 2, x + y = 1$

2016 - June

44. If difference between the roots of the equation $x^2 - kx + 8 = 0$ is 4, then the value of K is:

(a) 0 (b) ± 4 (c) $\pm 8\sqrt{3}$ (d) $\pm 4\sqrt{3}$

45. If $Z^{x+y} = Z^{2x-y} = \sqrt{8}$, 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

46. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of each article (in Rs.) was 2 more than thrice the number of articles produced on that day. If the total cost of production on that day was Rs. 800, the number of articles produced was

(a) 14 (b) 16 (c) 12 (d) 18

47. If α, β are the roots of the equation $x^2 + x + 5 = 0$ then $\frac{\alpha^2}{\beta} + \frac{\alpha}{\beta^2}$ is equal to

(a) $\frac{16}{5}$ (b) 2 (c) 3 (d) $\frac{14}{5}$

48. If $\frac{3}{x+y} + \frac{2}{x-y} = -1$ and $\frac{1}{x+y} - \frac{\uparrow}{x-y} = \frac{4}{3}$ then (x, y) is :

(a) (2, 1) (b) (1,2) (c) (-1,2) (d) (- 2, 1)

2017 Dec.

49. The roots of the cubic equation $x^3 + 7x^2 - 21x - 27 = 0$ are

(a) —1,3,9 (b) 1,—3,9 (c) — 1, 3, — 9 (d) — 1, — 3, 9

50. The difference between the roots of the equation x^2 — 7x —9 =. 0 is:

(a) 7 (b)$\sqrt{85}$ (c) 9 . (d) $2\sqrt{85}$

51. If the sum of two numbers is 13 and the sum of their squares is 85, then the numbers will be: :

(a) 3,10 (b) 5,8 (c) 4, 9 (d) 6, 7

52. If $u^{5X} = v^{5y} = W^{5z}$ and $u^2 = vw$, then the value of xy + xz — 2yz will be:

(a)5 (b)2 (c) 1 (d) 0

UNIT –II MATRICES

Ex. 1 : *The annual sale volume of three products X , Y , Z whose sale prices per unit are Rs. 3.50 Rs.2.75 , Rs. 1.50 respectively. In two different market I and II are shown below.*

Market	Product		
	X	Y	Z
I	6,000	9,000	13,000
II	12,000	6,000	17,000

Find the total revenue in each market with the help of matrices.

Sol.:

Ex. 2: *(a) Show that the matrix* $A=\begin{bmatrix}1 & 0 & -1\\ 3 & 4 & 5\\ 0 & -6 & -7\end{bmatrix}$ *satisfies the equation:*

$A^3 + 2A^2 - A - 20\ I = 0$

Sol.:

Ex 3. if $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then show that $A^2 - (a+d)A = (bc-ad)I$.

Sol.:

Ex.4 : If $A = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$ $B = \begin{pmatrix} a & 1 \\ b & -1 \end{pmatrix}$ and $(A+B)^2 = A^2 + B^2$, find the value of a and b.

Sol.:

Ex. 5: *A company employs 60 labourers from either of party A and B, comprising of persons in different age groups as under*

Category	I (20-25 years)	II (26-30 years)	III (31-40 years)
Party A	25	25	15
Party B	20	30	10

Category	Rates
I	1,200
II	1,000
III	600

Rate of Labour applicable to categories I, II and III are Rs. 1,200, Rs. 1,000 and Rs. 600 respectively. Using matrices, Find which party is economically preferable over the other.

Sol. :

Category	I (20-25 years)	II (26-30 years)	III (31-40 years)
Party A	25	25	15
Party B	20	30	10

Rates :

Category	Rates
I	1,200
II	1,000
III	600

Labour charge payable ton each party can be given by

$$\begin{pmatrix} 25X1200 + 25X1000 + 15X600 \\ 20X1200 + 30X1000 + 10X600 \end{pmatrix} = \begin{pmatrix} 6,40,000 \\ 60,000 \end{pmatrix}$$

Therefore, Party B is more economical as compared to party A.

Ex. 6: *In a Certain city there are 5 colleges and 20 school. Each school has 3 peons, 1 clerk, and 1 head clerk, where a college has 5 peons , 3 clerk , 1 Head Clerk and additional staff of a caretaker. The monthly salary of a employee is as follow:*

Peon	₹1100
Clerk	₹1700
Head-Clerk	₹3000
Caretaker	₹2500

Using matrix method , find the total monthly bill of each college.

Sol.:

Ex. 7: *There are two families A and B .There are 4 men, 6 women and 2 Children in a Family A and 2 men, 2 women, and 4 children in Family B .The recommended requirement of calories in Man: 2400, Woman : 1900, Child : 1800 and for proteins in Man: 55 gm, Woman: 45 gm and Child: 33 gm.*

Sol.: Represent the above information by matrices in using matrix multiplication method

The members of the two families can be represented by the 2 × 3 matrix.

$$F = \begin{matrix} \\ A \\ B \end{matrix}\begin{matrix} \begin{matrix} M & W & C \end{matrix} \\ \begin{bmatrix} 4 & 6 & 2 \\ 2 & 2 & 4 \end{bmatrix} \end{matrix}$$

And the recommended daily requirement of calories and proteins for each member can be represented by the 3 × 2 matrix:

$$F = \begin{matrix} \\ M \\ w \\ c \end{matrix}\begin{matrix} \begin{matrix} \text{calories} & \text{Protiens} \end{matrix} \\ \begin{bmatrix} 2400 & 55 \\ 1900 & 45 \\ 1800 & 33 \end{bmatrix} \end{matrix}$$

The total requirements of calories and proteins for each of the families is given by matrix multiplication.

$$FR = \begin{bmatrix} 4 & 6 & 2 \\ 2 & 2 & 4 \end{bmatrix}\begin{bmatrix} 2400 & 55 \\ 1900 & 45 \\ 1800 & 33 \end{bmatrix} = \begin{matrix} A \\ B \end{matrix}\begin{bmatrix} 24600 & 556 \\ 15800 & 332 \end{bmatrix}$$

Hence finally A requires 24,600 calories and 556 gm proteins and Family B requires 15,800 calories and 332 gm proteins.

DETERMINANTS

Ex.8: *Find the determinant value of the following matrices.* $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$

Sol. by definition

$\Delta = 1\begin{vmatrix} 5 & 6 \\ 8 & 9 \end{vmatrix} - 2\begin{vmatrix} 4 & 6 \\ 7 & 9 \end{vmatrix} + 3\begin{vmatrix} 4 & 5 \\ 7 & 8 \end{vmatrix}$

$= 1(45 - 48) - 2(36 - 42) + 3(32 - 35)$

$= -3 + 12 - 9 = 0$

ADJOINT OF MATRIX

Ex.9: *Find the Adjoint of the Matrix.* $A = \begin{bmatrix} 1 & 4 & 0 \\ -1 & 2 & 2 \\ 0 & 0 & 2 \end{bmatrix}$

Sol.: The Co-factors of elements of $A = \begin{bmatrix} 1 & 4 & 0 \\ -1 & 2 & 2 \\ 0 & 0 & 2 \end{bmatrix}$ are calculated below:

$A_{11} = (-1)^{1+1}\begin{vmatrix} 2 & 2 \\ 0 & 2 \end{vmatrix} = 4$

$A_{12} = (-1)^{1+2}\begin{vmatrix} -1 & 2 \\ 0 & 2 \end{vmatrix} = 2$

$A_{13} = (-1)^{1+3}\begin{vmatrix} -1 & 2 \\ 0 & 0 \end{vmatrix} = 0$

$A_{21} = (-1)^{2+1}\begin{vmatrix} 4 & 0 \\ 0 & 2 \end{vmatrix} = -8$

$A_{22} = (-1)^{2+2}\begin{vmatrix} 1 & 0 \\ 0 & 2 \end{vmatrix} = 2$

$A_{23} = (-1)^{2+3}\begin{vmatrix} 1 & 4 \\ 0 & 0 \end{vmatrix} = 0$

$A_{32} = (-1)^{3+2}\begin{vmatrix} 1 & 0 \\ -1 & 2 \end{vmatrix} = -2$

$A_{33} = (-1)^{3+3}\begin{vmatrix} 1 & 4 \\ -1 & 2 \end{vmatrix} = 6$

Now Adj. $A = \begin{pmatrix} 4 & -8 & 8 \\ 2 & 2 & -2 \\ 0 & 0 & 6 \end{pmatrix}$

INVERSE OF A MATRIX

Ex.10: *Solve the following system of equations by matrix inversion method :*

$2x + 8y + 5z = 5$

$X + y + z = (-2)$

$X + 2y - z = -2$

Sol.: The given system of equations can be written in the form, AX = B.

Where $= \begin{pmatrix} 2 & 8 & 5 \\ 1 & 1 & 1 \\ 1 & 2 & 1 \end{pmatrix}$ X $= \begin{pmatrix} X \\ Y \\ Z \end{pmatrix}$ and B $= \begin{pmatrix} 5 \\ -2 \\ 2 \end{pmatrix}$

det (A) $= \begin{vmatrix} 2 & 8 & 5 \\ 1 & 1 & 1 \\ 1 & 2 & -1 \end{vmatrix}$ = 2 (-1–2) – 8 (-1 -1) + 5(2–1)

= -6 + 16 + 5

= 15 ≠ 0

Hence, the system has a unique Sol. as A is non-singular. The Sol. is given by $X = A^{-1}B$

To and A-1, we find the cofactors.

A11 = -3; A12 = + 2; A13 = 1, A21 = + 18; A22 =-7; A23 + 4; A31 = 3; A22 = +3; A33 = -6

Co-factor of A $= \begin{pmatrix} -3 & 2 & 1 \\ 18 & -7 & 4 \\ 3 & 3 & -6 \end{pmatrix}$

Adj: A = (co-factor A)$^T = \begin{pmatrix} -3 & 18 & 3 \\ 2 & -7 & 3 \\ 1 & 4 & -6 \end{pmatrix}$

$A^{-1} = \frac{1}{\det(A)} = \begin{pmatrix} -3 & 18 & 3 \\ 2 & -7 & 3 \\ 1 & 4 & -6 \end{pmatrix} = \frac{1}{15}\begin{pmatrix} -3 & 18 & 3 \\ 2 & -7 & 3 \\ 1 & 4 & -6 \end{pmatrix}$

Therefore $X = \frac{1}{15}\begin{pmatrix} -3 & 18 & 3 \\ 2 & -7 & 3 \\ 1 & 4 & -6 \end{pmatrix}\begin{pmatrix} 5 \\ -2 \\ 2 \end{pmatrix}$

$= \frac{1}{15}\begin{pmatrix} -15 & 36+6 \\ 10+14+6 & \\ 5 & 8-12 \end{pmatrix} = \begin{pmatrix} -3 \\ 2 \\ 1 \end{pmatrix}$

Hence, x = -3; y = 2 and z = -1

Ex.11: *Show that the matrix* $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ *satisfies the equation* $A^2 - 5A - 2I = 0$

Hence, deduce the value of A^{-1}

Sol.: $A^2 = \begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix} = \begin{bmatrix}1+6 & 2+8\\3+12 & 6+16\end{bmatrix} = \begin{bmatrix}7 & 10\\15 & 12\end{bmatrix}$

$A^2 - 5A - 2I = \begin{bmatrix}7 & 10\\15 & 12\end{bmatrix} - 5\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix} - 2\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$

$\begin{bmatrix}7-5-2 & 10-10\\15-15 & 22-20-2\end{bmatrix} = \begin{bmatrix}0 & 0\\0 & 0\end{bmatrix} = 0$

Since $A^2 - 5A - 2I = 0$,

$\Rightarrow A^{-1}(A^2 - 5A - 2I) = 0$

$\Rightarrow A - 5I - 2A^{-1} = 0$

$\Rightarrow 2A^{-1} = A - 5I$

$\Rightarrow A^{-1} = \frac{1}{2}(A - 5I)$

$= \frac{1}{2}\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix} - \frac{5}{2}\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$

$= \begin{bmatrix}\frac{1}{2}-\frac{5}{2} & 1-0\\\frac{3}{2}-0 & 2-\frac{5}{2}\end{bmatrix}$

$= \begin{bmatrix}-2 & 1\\\frac{3}{2} & -\frac{1}{2}\end{bmatrix}$

$A^{-1} = \begin{bmatrix}-2 & 1\\\frac{3}{2} & -\frac{1}{2}\end{bmatrix}$

Ex.12: *Fine the inverse of the matrix* $\begin{pmatrix}2 & -3\\4 & -1\end{pmatrix}$

Sol.:

Ex 13: *Using the inverse of the coefficient matrix, solve the following system of equations:*

$x + y + z = 3$

$x + 2y + 3z = 4$

$x + 4y + 9z = 6$

Sol.:

SOL. OF LINEAR EQUATIONS IN THREE VARIABLES (CRAMER'S RULE)

Ex.14: Solve the equations:

1) $2x - y + z = 4$

$X + 3y + 2z = 12$

$3x + 2y + 3z = 16$

Sol.:

Ex.15: $x + y + 3z = 6$

$x - 3y - 3z = -4$

$5x - 3y + 3z = 8$

Sol:

$$X = \frac{\Delta x}{x} = \frac{\begin{vmatrix} 6 & 1 & 3 \\ -4 & -3 & -3 \\ 8 & -3 & 3 \end{vmatrix}}{\begin{vmatrix} 1 & 1 & 3 \\ 1 & -3 & -3 \\ 5 & -3 & 3 \end{vmatrix}} = \frac{6(-9-9)-1(12+24)+3(12+24)}{1(-9-9)-1(3+15)+3(-3+15)}$$

$$= \frac{-108-12X4+108}{0} = \frac{-12}{0}$$

Since $\Delta x \neq 0$ and $\Delta = 0$, therefore the system of equations are inconsistent.

Ex.16: *The given equations are:*

$x + y - z = -2$

$3x + 2y + 3z = 13$

$2x + 7y + 4z = 31$

Sol.:

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE A

Choose the most appropriate option (a), (b), (c), or (d)

1. If a matrix has 16 elements; what are the possible orders it can have

(a) 2×8 ; 8×1; 4×4; 1×16; 16×1

(b) 2×8 ; 8×2; 4×4; 1×16; 16×1

	(c) 2×8 ; 8×2; 4×1; 1×16; 16×1		(d) 2×4 ; 8×2; 4×4; 1×16; 16×1	
2.	Transpose of a rectangular matrix is a			
	(a) rectangular matrix	(b) diagonal matrix	(c) square matrix	(d) scaler matrix
3.	Transpose of a row matrix is			
	(a) zero matrix	(b) diagonal matrix	(c) column matrix	(d) row matrix
4.	Two matrices A and B are multiplied to get AB if			
	(a) both are rectangular		(b) both have same order	
	(c) no. of columns of A is equal to rows of B		(d) no. of rows of A is equal to no. of columns of B	
5.	If $\|A\| = 0$, then A is			
	(a) zero matrix	(b) singular matrix	(c) non-singular matrix	(d) 0
6.	If A is a symmetric matrix, then $A^t =$			
	(a) A	(b) $\|A\|$	(c) 0	(d) diagonal matrix
7.	If the order of matrix A is $m \times p$. And the order of B is $p \times n$. Then the order of matrix AB is?			
	(a) $m \times n$	(b) $n \times m$	(c) $n \times p$	(d) $m \times p$
8.	If A and B are matrices, then which from the following is true?			
	(a) $A + B \neq B + A$	(b) $(At)t \neq A$	(c) $AB \neq BA$	(d) all are true
9.	What is a, if $A = \begin{pmatrix} 2 & 3 \\ 4 & a \end{pmatrix}$ is a singular matrix?			
	(a) 5	(b) 6	(c) 7	(d) 8
10.	If $A = \begin{pmatrix} 2i & 3i \\ 2i & -i \end{pmatrix}$			
	(a) 2	(b) 8	(c) 4	(d) 5

11. If $\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix}\begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$ then order of matrix $A = ?$

(a) 2 x 2 (b) 2 x 3 (c) 3 x 2 (d) 3 x 3

12. Using 12-16 Let A = $\begin{pmatrix} 2 & -3 \\ 4 & 5 \end{pmatrix}$, B = $\begin{pmatrix} 1 & 5 \\ 6 & -7 \end{pmatrix}$ C = $\begin{pmatrix} 2 & 5 \\ 3 & 4 \end{pmatrix}$ Find (A+B)

$\begin{bmatrix} 3 & 2 \\ 10 & -2 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 2 \\ -10 & -2 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 3 \\ = 10 & -2 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & -1 \\ 10 & -2 \end{bmatrix}$

13. Find A–B.

(a) $\begin{bmatrix} 1 & -2 \\ -2 & -2 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -8 \\ -2 & 12 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 8 \\ -2 & -12 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -8 \\ -12 & -2 \end{bmatrix}$

14. 3A – C

(a) $\begin{pmatrix} -4 & -14 \\ 9 & 11 \end{pmatrix}$ (b) $\begin{pmatrix} 4 & -14 \\ -9 & -11 \end{pmatrix}$ (c) $\begin{pmatrix} 4 & -14 \\ 9 & 11 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & -3 \\ 4 & 5 \end{pmatrix}$

15. AB

(a) $\begin{pmatrix} -16 & 31 \\ 34 & -15 \end{pmatrix}$ (b) $\begin{pmatrix} 16 & 31 \\ 34 & -15 \end{pmatrix}$ (c) $\begin{pmatrix} 16 & 31 \\ 34 & 5 \end{pmatrix}$ (d) $\begin{pmatrix} 2 & -3 \\ 4 & 5 \end{pmatrix}$

16. BA

(a) $\begin{pmatrix} 22 & 22 \\ -16 & -53 \end{pmatrix}$ (b) $\begin{pmatrix} -22 & 22 \\ 16 & -53 \end{pmatrix}$ (c) $\begin{pmatrix} 22 & -11 \\ 16 & 53 \end{pmatrix}$ (d) $\begin{pmatrix} 22 & -33 \\ 16 & 53 \end{pmatrix}$

17. $\begin{pmatrix} a & -b \\ b & a \end{pmatrix} + \begin{pmatrix} a & b \\ -b & a \end{pmatrix}$

(a) $\begin{bmatrix} a^2+b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$ (b) $\begin{bmatrix} -a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$ (c) $\begin{bmatrix} a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$ (d) $\begin{bmatrix} a^2-b^2 & 0 \\ 0 & a^2-b^2 \end{bmatrix}$

18. $\begin{pmatrix} a^2+b^2 & b^2+c^2 \\ a^2+c^2 & a^2+b^2 \end{pmatrix} + \begin{pmatrix} -2ab & -2bc \\ +2ac & +2ab \end{pmatrix}$

a) $\begin{bmatrix} a^2+b^2+2ab & b^2+c^2-2bc \\ a^2+c^2+2ac & a^2+b^2+2ab \end{bmatrix}$ or $\begin{bmatrix} (a+b)^2 & (b-c)^2 \\ (a+c)^2 & (a+b)^2 \end{bmatrix}$

b) $\begin{bmatrix} a^2+b^2-2ab & b^2+c^2+2bc \\ a^2+c^2+2ac & a^2+b^2+2ab \end{bmatrix}$ or $\begin{bmatrix} (a-b)^2 & (b+c)^2 \\ (a+c)^2 & (a+b)^2 \end{bmatrix}$

c) $\begin{bmatrix} a^2+b^2-2ab & b^2+c^2-2bc \\ a^2+c^2+2ac & a^2+b^2+2ab \end{bmatrix}$ or $\begin{bmatrix} (a-b)^2 & (b-c)^2 \\ (a+c)^2 & (a+b)^2 \end{bmatrix}$

d) $\begin{bmatrix} a^2+b^2-2ab & b^2+c^2-2bc \\ a^2+c^2-2ac & a^2+b^2+2ab \end{bmatrix}$ or $\begin{bmatrix} (a-b)^2 & (b-c)^2 \\ (a-c)^2 & (a+b)^2 \end{bmatrix}$

19. $\begin{pmatrix} l & m \\ n & o \end{pmatrix} + \begin{pmatrix} -p & q \\ r & s \end{pmatrix}$

(a) $\begin{bmatrix} l+p & m+q \\ n+r & s \end{bmatrix}$ (b) $\begin{bmatrix} l+p & m+q \\ n-r & s \end{bmatrix}$ (c) $\begin{bmatrix} l+p & m-q \\ n+r & s \end{bmatrix}$ (d) $\begin{bmatrix} l-p & m+q \\ n+r & s \end{bmatrix}$

20. $\begin{pmatrix} a & b \\ -b & a \end{pmatrix} + \begin{pmatrix} a & b \\ b & -a \end{pmatrix}$

(a) $\begin{bmatrix} a^2+b^2 & 0 \\ 0 & -a^2-b^2 \end{bmatrix}$ (b) $\begin{bmatrix} a^2+b^2 & 0 \\ 0 & -a^2+b^2 \end{bmatrix}$ (c) $\begin{bmatrix} -a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$ (d) $\begin{bmatrix} a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$

21. $\begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix} \text{X} \begin{pmatrix} 3 & 4 & 5 & 6 \end{pmatrix}$

(a) $\begin{bmatrix} 3 & 4 & 5 & 6 \\ 6 & 8 & 10 & 12 \\ 15 & 20 & 25 & 30 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 4 & 5 & 6 \\ 6 & 8 & 10 & 12 \\ 12 & 16 & 20 & 24 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 4 & 5 & 6 \\ 6 & 8 & 10 & 12 \\ 12 & 16 & 20 & 24 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 4 & 5 & 6 \\ 6 & 8 & 10 & 12 \\ 24 & 16 & 16 & 12 \end{bmatrix}$

22. $\begin{pmatrix} x & y \\ 2 & 3 \end{pmatrix} \text{X} \begin{pmatrix} 1 & 2 & 3 \\ x & y & z \end{pmatrix}$

(a) $\begin{bmatrix} x+2xy & 3x+y^2 & 3xyz \\ 2+3x & 4+3y & 6+3z \end{bmatrix}$ (b) $\begin{bmatrix} x+xy & 2x+y^2 & 3x+yz \\ 2+3x & 4+3y & 6+3z \end{bmatrix}$

(c) $\begin{bmatrix} x+2xy & 2xy+y^2 & 12yz \\ 2+3x & 4+3y & 6+3z \end{bmatrix}$ (d) $\begin{bmatrix} x-xy & 2x-y^2 & 3x-yz \\ 2+3x & 4+3y & 6+3z \end{bmatrix}$

23. $\begin{pmatrix} 1 & -2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix} \text{X} \begin{pmatrix} 1 & 3 & 5 \\ 0 & 2 & 4 \\ 3 & 0 & 5 \end{pmatrix}$

(a) $\begin{bmatrix} 10 & -1 & 12 \\ 22 & 22 & 70 \\ 34 & 37 & 112 \end{bmatrix}$ (b) $\begin{bmatrix} 10 & 1 & 28 \\ 22 & -2 & 70 \\ 34 & -5 & 112 \end{bmatrix}$ (c $\begin{bmatrix} 10 & 1 & 28 \\ 22 & -2 & -70 \\ 34 & -5 & 112 \end{bmatrix}$ (d) $\begin{bmatrix} 10 & 1 & 28 \\ 22 & -2 & 70 \\ 34 & -5 & -112 \end{bmatrix}$

24. $\begin{pmatrix} -3 & -1 & 3 \\ -1 & 0 & 2 \end{pmatrix} \text{X} \begin{pmatrix} 2 & -3 \\ 1 & 0 \\ 3 & 1 \end{pmatrix}$

(a) $\begin{bmatrix} 14 & -6 \\ 4 & -5 \end{bmatrix}$ (b) $\begin{bmatrix} 14 & -6 \\ 4 & 5 \end{bmatrix}$ (c) $\begin{bmatrix} 14 & -6 \\ -4 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} -14 & -6 \\ 4 & 5 \end{bmatrix}$

25. If $A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & 0 & 4 \end{bmatrix}$, $B = \begin{pmatrix} 1 & 2 & 3 & 0 \\ 2 & 3 & 0 & 1 \\ 3 & 0 & 1 & 2 \end{pmatrix}$ Find AB. Does BA exist?

(a) AB exists but BA not Exists (b) AB not exists BA Exists

(c) Both Ab and BA not Exists (d) None of these

26. If $A = \begin{pmatrix} 0 & 2 & 2 & 3 \\ 3 & 2 & 1 & 0 \end{pmatrix}$; $B = \begin{pmatrix} 0 & 3 \\ 1 & 2 \\ 2 & 1 \\ 3 & 0 \end{pmatrix}$

(a) $AB \neq BA$ (b) $AB = BA$ (c) AB exists BA not exists (d) AB not exists BA exists

27. If $A = \begin{pmatrix} 0 & i \\ i & 0 \end{pmatrix}$; where $i^2 = -1$ Find A^2, A^3 etc.

(a) $A^2 = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$ $A^3 = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$ (b) $A^2 = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ $A^3 = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$

(c) $A^2 = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ $A^3 = \begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$ (d) $A^2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $A^3 = \begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$

28. Find the elements C23, C32, C31in the product C=AB.

Where $A = \begin{pmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ 1 & 1 & 2 \end{pmatrix}$; $B = \begin{pmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$

a) C23= 8, C32= =-1, C22= 7, C31= 5 and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ 0 & 5 & 5 \end{bmatrix}$

b) C23= 8, C32= =5, C22= 7, C31=0 and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ 0 & 5 & 5 \end{bmatrix}$

c) C23= 8, C32= –1, C22 = 7, C31 = 5 and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ -2 & 5 & 5 \end{bmatrix}$

d) C23= 8, C32= –1, C22= 7, C31 = 5 and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ 0 & -5 & -5 \end{bmatrix}$

29. Using matrix Cramers method $\Delta x = 1$, $\Delta y = -1$, $\Delta Z = 1$, $\Delta = 1$, find x, y and z values

(a) $X = 1$, $y = -1$ and z= -1 (b) $X = -1$, $y = 1$ and $z = 1$

(c) X = 1 , y = –1 and z= 1 (d) X = –1 , y = –1 and z = 1

30. 4x – 5y – 2z= 0; 2x + 2y + z = 2; 2x + 2y + 8z = –1 then the values of x, y, z using crammers rule

(a) X = 1 , y = –1 and z = 1 (b) inconsistent (c) X = 1 , y = –1 and z = 1 (d) none of these

31. x + y = –1; y + z = 1; z + x = 0

(a) X = –1; y = 0; z = 1 (b) X = 1; y = 0; z = 1 (c) X = 1; y = 0; z = –1 (d) X = –1; y = 0; z = –1

32. If $A = \begin{bmatrix} 6 & 5 \\ 3 & 9 \end{bmatrix}$, find (A')'

(a) A (b) –A (c) A^2 (d) none of these

33. Chose the correct alternative; If $2\begin{bmatrix} x & y \\ z & p \end{bmatrix} - 9\begin{bmatrix} -2 & 3 \\ 1 & 0 \end{bmatrix} = 18\ I$

(a) X=18 ; z= 9/2 (b) x= 0 , z= -9/2 (c) X= 0 ; z= 9/2 (d) None of these

34. $\begin{bmatrix} 0 & 3 & -4 \\ -3 & 0 & -5 \\ 4 & 4 & 8 \end{bmatrix}$ is a

(a) Symmetric matrix (b) Null matrix (c) Skew - symmetric matrix (d) None of these

35. If $A = \begin{bmatrix} 6 & 10 \\ 3 & 5 \end{bmatrix}$

(a) Is a singular matrix (b) Non-singular matrix (c) Identity matrix (d) Symmetric matrix

ANSWERS

1	(b)	2	(a)	3	(c)	4	(c)	5	(b)
6	(a)	7	(a)	8	(c)	9	(b)	10	(b)
11	(d)	12	(a)	13	(b)	14	(c)	15	(a)
16	(a)	17	(a)	18	(c)	19	(d)	20	(a)
21	(a)	22	(b)	23	(a)	24	(b)	25	(a)
26	(a)	27	(b)	28	(b)	29	(c)	30	(b)
31	(a)	32	(a)	33	(c)	34	(d)	35	(a)

ADDITIONAL QUESTIONS

MULTIPLE CHOICE QUESTIONS

1. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 7 & -1 & 3 \\ 3 & 6 & 0 \end{bmatrix}$ then $A + B =$

(a) $\begin{bmatrix} 8 & 3 & 6 \\ 6 & 10 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 8 & 1 & 6 \\ 6 & 10 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 8 & 1 & 6 \\ 6 & 10 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 8 & 2 & 0 \\ 6 & -2 & 0 \end{bmatrix}$

Ans: (b)

2. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 2 & 3 & 0 \\ 3 & 5 & 7 \end{bmatrix}$ then $3A =$

(a) $\begin{bmatrix} 6 & 0 & 0 \\ 5 & 6 & 0 \\ 6 & 8 & 10 \end{bmatrix}$ (b) $\begin{bmatrix} 9 & 3 & 3 \\ 6 & 6 & 0 \\ 6 & 15 & 21 \end{bmatrix}$ (c) $\begin{bmatrix} 9 & 0 & 0 \\ 6 & 9 & 0 \\ 9 & 15 & 21 \end{bmatrix}$ (d) $\begin{bmatrix} 6 & 0 & 0 \\ 6 & 6 & 0 \\ 6 & 10 & 21 \end{bmatrix}$

Ans: ⟨(c)

3. If $A + B = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ andA-B $= \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ findA and B.

Ans: $A = \begin{pmatrix} 5 & 0 \\ 1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 0 \\ 7 & 1 \end{pmatrix}$

4. Find a matrix A such that 2A- 3B + 5C = 0 where $B = \begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$

Ans: $A = \begin{pmatrix} -8 & 3 & 5 \\ -13 & -1 & -9 \end{pmatrix}$

5. Solve the matrix equation $\begin{bmatrix} a^2 \\ b^2 \end{bmatrix} 3 \begin{bmatrix} a \\ 2b \end{bmatrix} = \begin{bmatrix} -2 \\ 9 \end{bmatrix}$

Ans: A = 1, 2 and $b = 3 \pm 3\sqrt{2}$

6. Find the value of x such that $\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ t5 & 3 & 2 \end{bmatrix} \begin{bmatrix}] \\ 2 \\ x \end{bmatrix} = 0$

Ans: x = -2 or x = -14

7.	If $A = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 5 \\ 8 & 11 \end{bmatrix}$ find the matrix Z such that $3A + 5B + 2Z = 0$.
Ans:	$Z = \begin{bmatrix} -16 & -14 \\ -26 & -32 \end{bmatrix}$
8.	Find the matrix A such that $A \begin{bmatrix} 3 & 4 \\ 6 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 8 \\ 9 & 4 \end{bmatrix}$
Ans:	$A = \begin{bmatrix} 22/9 & -8/9 \\ 1/3 & 4/3 \end{bmatrix}$
9.	Find a and b if $\begin{pmatrix} 2 & -3 \\ 1 & a \end{pmatrix} \begin{pmatrix} 1 & 5 & b \\ 0 & 2 & -3 \end{pmatrix} = \begin{pmatrix} 2 & 4 & 1 \\ 1 & -1 & 5 \end{pmatrix}$
Ans:	a = -3 and b = - 4
10.	If $A = \begin{pmatrix} 3 & 2 \\ 4 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} a & b \\ 3 & 5 \end{pmatrix}$ find a and b such that AB = BA. Compute 3A + 5B.
Ans:	$\begin{bmatrix} 83/2 & 27/2 \\ 27 & 28 \end{bmatrix}$
11.	r the matrix $A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix}$, find the numbers a and b such that $A^2 + aA + bI = 0$. Hence find A^{-1}.
Ans:	a = - 4 and b = 1. $A^{-1} = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$
12.	Show that $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the equation $x^2 - 4x - 5 = 0$. Hence find A^{-1}.
Ans:	$A^{-1} = \frac{1}{5}\begin{bmatrix} -3 & 2 & 2 \\ 2 & -3 & 2 \\ 2 & 2 & -3 \end{bmatrix}$
13.	Find the matrix A satisfying the matrix equation $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
Ans:	$A = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

14. Find the matrix X satisfying the matrix equation $X\begin{bmatrix}5 & 3\\ -1 & -2\end{bmatrix}=\begin{bmatrix}14 & 7\\ 7 & 7\end{bmatrix}$

Ans: $\begin{bmatrix}3 & 1\\ 1 & -2\end{bmatrix}$

15. Solve the following system of equations using Cramer's rule:

(a) $x - 2y = 4, -3x + 5y = -7$

(b) $3x + y = 19, 3x-y = 23$

(d) $3x + y-2z = 3, x-y-z = -1, x + y- z=1$

(e) $3x + y + z = 2, 2x - 4y + 3z = -1, 4x + y - 3z = -11$

(f) $\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4, \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1, \frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2$

Ans: (a) $x = -6$ and $y = -5$ (b) $x = 7$ and $y = -2$ (d) $x = 2, y = 1, z = 2$ (e) $x = -1, y = 2, z = 3$

(f) $x = 2, y = 3, z = 5$

16. Find the matrix product AB, if it is defined. $A=\begin{bmatrix}1 & 3 & -3\\ 3 & 0 & 5\end{bmatrix}, B=\begin{bmatrix}3 & 0\\ -3 & 1\\ 0 & 5\end{bmatrix}$

(a) $\begin{bmatrix}-12 & -6\\ 25 & 9\end{bmatrix}$ (b) $\begin{bmatrix}3 & -9 & 0\\ 0 & 0 & 25\end{bmatrix}$ (c) AB is undefined (d)

Ans: (d)

17. Perform the matrix operation. Let A = [-5 2] and B = [1 0]. Find 2A + 3B.

(a) [-10 4] (b) [-2 2] (c) [-9 4] (d) [-7 4]

Ans: (d)

18. Find the inverse of the matrix, if it exists. $A=\begin{bmatrix}-5 & 4\\ 0 & 4\end{bmatrix}$

(a) $\begin{bmatrix}-\frac{1}{5} & -\frac{1}{5}\\ 0 & \frac{1}{4}\end{bmatrix}$ (b) $\begin{bmatrix}-\frac{1}{5} & \frac{1}{5}\\ 0 & \frac{1}{4}\end{bmatrix}$ (c) $\begin{bmatrix}\frac{1}{4} & \frac{1}{5}\\ 0 & -\frac{1}{5}\end{bmatrix}$ (d) $\begin{bmatrix}0 & \frac{1}{4}\\ -\frac{1}{5} & \frac{1}{5}\end{bmatrix}$

Ans: *(b)*

19. Compute the determinant of the matrix by cofactor expansion. $\begin{bmatrix} 4 & 2 & 7 \\ 9 & 3 & 5 \\ 7 & 9 & 4 \end{bmatrix}$

(a) 1084 (b) -286 (c) 286 (d) 146

Ans: (c)

20. $\begin{bmatrix} 3 & 1 & 2 \\ -3 & -1 & -6 \\ 6 & 5 & 3 \end{bmatrix}$

(a) -9 (b) -36 (c) 0 (d) 36

Ans: (d)

21. If the order of matrix A is m × p. And the order of B is p × n. Then the order of matrix AB is?

(a) n × p (b) m × n (c) n × p (d) n × m

Ans: (b)

22. If A and B are matrices, then which from the following is true?

(a) AB ≠ BA (b) (At)t ≠ A (c) A + B ≠ B + A (d) all are true

Ans: (a)

23. The number of non-zero rows in an echelon form is called?

(a) rank of a matrix (b) cofactor of the matrix

(c) reduced echelon form (d) conjugate of the matrix

Ans: (a)

24. Transpose of a rectangular matrix is a

(a) scaler matrix (b) square matrix (c) diagonal matrix (d) rectangular matrix

Ans: (d)

25. Transpose of a column matrix is

(a) row matrix (b) zero matrix (c) column matrix (d) diagonal matrix

Ans: (a)

26. Two matrices A and B are multiplied to get AB if

(a) both are rectangular (b) both have same order

(c) no. of columns of A is equal to columns of B

(d) no. of rows of A is equal to no. of columns of B

Ans: (c)

27. If $|A| = 0$, then A is

(a) 0 (b) zero matrix (c) singular matrix (d) non-singular matrix

Ans: (c)

28. If A is a symmetric matrix, then $A^t = .$

(a) 0 ' (b) A (c) |A| (d) diagonal matrix

Ans: (b)

29. Additive inverse of a matrix A is

(a) adj A/|A| (b) A^2 (c) |A| (d) A '

Ans: (a)

30. For a non-trivial solution | A | is

(a) $|A| > 0$ (b) $|A| < 0$ (c) $|A| \neq 0$ (d) $|A| = 0$

Ans: (d)

31. Two matrices A and B are multiplied to get BA if

(a) no. of rows of A is equal to no. of columns of B

(b) no. of columns of A is equal to columns of B

(c) both have same order

(d) both are rectangular

Ans: (a)

32. A matrix having m rows and n columns with $m \neq n$ is said to be a

(a) scaler matrix (b) identity matrix (c) square matrix (d) rectangular matrix

Ans: (a)

33. [a b c] is a

(a) zero matrix (b) row matrix (c) column matrix (d) diagonal matrix

Ans: (b)

34. Two matrices A and B are added if

(a) no. of rows of A is equal to no. of columns of B (b) no. of columns of A is equal to columns of B

(c) both have same order (d) both are rectangular

Ans: (c)

35. Transpose of a row matrix is

(a) zero matrix (b) row matrix (c) column matrix (d) diagonal matrix

Ans: (c)

36. Matrices obtained by changing rows and columns is called

(a) symmetric (b) transpose (c) rectangular matrix (d) None of Above

Ans: (b)

37. [0 0 0] is

(a) null matrix (b) scaler matrix (c) identity matrix (d) diagonal matrix

Ans: (a)

38. If A is a matrix of order m × n and B is a matrix of order n x p then order of AB is

(a) p × n (b) m × p (c) p × m (d) n ×p

	Ans: (b)
39.	Transpose of a square matrix is a
	a) scaler matrix (b) square matrix (c) diagonal matrix (d) rectangular matrix
	Ans: (c)
40.	If $\|A\| \neq 0$, then A is
	(a) non * singular matrix (b) singular matrix (c) diagonal matrix (d) zero matrix
	Ans: (a)
41.	Two matrices **A** and B are equal if
	(a) both are rectangular (b) both have same order
	(c) no. of columns of A is equal to columns of B
	(d) both have same order and equal corresponding elements
	Ans: (d)
42.	Order of a matrix [2 5 7] is
	(a) 1×1 (b) 1×3 (c) 3×1 (d) 3×3
	Ans: (b)
43.	A matrix having m rows and n columns with $m = n$ is said to be a
	(a) scaler matrix (b) identity matrix (c) square matrix (d) rectangular matrix

Ans: (c)

44. Equations having a common solution are called

(a) linear equations (b) simultaneous equations (c) homogeneous equations (d) None of Above

Ans: (c)

45. If a matrix has m rows and n columns then order is

(a) $m \times n$ (b) $m \times m$ (c) $m + n$ (d) $n \times n$

Ans: (a)

46. If the order of matrix A is m×p. And the order of B is p×n. Then the order of matrix AB is ?

(a) m×n (b) n×m (c) n×p (d) m×p

Ans: (a)

47. If A and B are matrices, then which from the following is true ?

(a) $A + B \neq B + A$ (b) $(At)^t \neq A$ (c) $AB \neq BA$ (d) all are true

Ans: (c)

48. What is a, if $B = \begin{bmatrix} 1 & 4 \\ 2 & a \end{bmatrix}$ is a singular matrix ?

(a) 5 (b) 6 (c) 7 (d) 8

Ans: (d)

49. If $A = \begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ then $|A| = ?$

(a) 2 (b) 3 (c) 4 (d) 5

Ans: (b)

50. If $\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix} A = \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$ then order of matrix A = ?

(a) 2×2 (b) 2×3 (c) 3×2 (d) 3×3

Ans: (b)

51. Transpose of a rectangular matrix is a

(a) rectangular matrix (b) diagonal matrix (c) square matrix (d) scaler matrix

Ans: (a)

52. Two matrices A and B are multiplied to get AB if

(a) both are rectangular (b) both have same order

(c) no. of columns of A is equal to rows of B (d) no. of rows of A is equal to no. of columns of B

Ans: (c)

53. If A is a symmetric matrix, then $A^t =$

(a) A , (b) |A| (c) 0 (d) diagonal matrix

Ans: (a)

54. If $A = \begin{pmatrix} 2i & 3i \\ 2i & -i \end{pmatrix}$ $(i^2 = -1)$ then |A| =?

(a) 2 (b) 8 (c) 4 (d) 5

Ans: (b)

55. $\begin{pmatrix} a & -b \\ b & a \end{pmatrix} + \begin{pmatrix} a & b \\ -b & a \end{pmatrix}$

(a) $\begin{bmatrix} a^2+b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$ (b) $\begin{bmatrix} -a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$

(c) $\begin{bmatrix} a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$ (d) $\begin{bmatrix} a^2-b^2 & 0 \\ 0 & a^2-b^2 \end{bmatrix}$

Ans: (a)

56. $\begin{pmatrix} a & b \\ -b & a \end{pmatrix} \times \begin{pmatrix} a & b \\ b & -a \end{pmatrix}$

(a) $\begin{bmatrix} a^2+b^2 & 0 \\ o & -a^2-b^2 \end{bmatrix}$ (b) $\begin{bmatrix} a^2+b^2 & 0 \\ 0 & -a^2+b^2 \end{bmatrix}$

(c) $\begin{bmatrix} -a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$ (d) $\begin{bmatrix} a^2-b^2 & 0 \\ 0 & a^2+b^2 \end{bmatrix}$

Ans: (a)

57. $\begin{pmatrix} -3 & -1 & 3 \\ -1 & 0 & 2 \end{pmatrix} \times \begin{pmatrix} 2 & -3 \\ 1 & 0 \\ 3 & 1 \end{pmatrix}$

(a) $\begin{bmatrix} 14 & -6 \\ 4 & -5 \end{bmatrix}$ (b) $\begin{bmatrix} 14 & -6 \\ 4 & 5 \end{bmatrix}$ (c) $\begin{bmatrix} 14 & -6 \\ -4 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} -14 & -6 \\ 4 & 5 \end{bmatrix}$

Ans: (b)

58. The elements C_{23}, C_{32}, C_{31} in the product $C = AB$.

Where $A = \begin{pmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ 1 & f & 2 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 3 & 0 \\ -1 & 2 & 1 \\ 0 & 0 & 2 \end{pmatrix}$

(a) $C_{23} = 8, C_{32} = -1, C_{22} = 7, C_{31} = 5$ and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ 0 & 5 & 5 \end{bmatrix}$

(b) $C_{23} = 8, C_{32} = 5, C_{22} = 7, C_{31} = 0$ and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ 0 & 5 & 5 \end{bmatrix}$

(c) $C_{23} = 8, C_{32} = -1, C_{22} = 7, C_{31} = 5$ and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ -2 & 5 & 5 \end{bmatrix}$

(d) $C_{23} = 8, = -1, = 7, C_{31} = 5$ and $AB = \begin{bmatrix} -1 & 12 & 11 \\ -1 & 7 & 8 \\ 0 & -5 & -5 \end{bmatrix}$

Ans: (b)

CH - 3

LINEAR INEQUALITIES

Ex,: 1 A manufacturer produces two products A and B, and has his machines in operation for 24 hours a day.Production of A requires 2 hours of processing in machine M_1 and 6 hours in machine M_2. n Productio of B requires 6 hours of processing in machine M_1 and 2 hours in machine M_2. The manufacturer earns a profit of Rs. 5 on each unit of A and Rs. 2 on each unit of B. How many units of each product should be produced in a day in order to achieve maximum profit?

Sol.

Ex.: 2 A company produces two products A and B, each of which requires processing in two machines. The first machine can be used at most for 60 hours, the second machine can be used at most for

	40 hours. The product A requires 2 hours on machine one and one hour on machine two. The
	product B requires one hour on machine one and two hours on machine two. Express above situation
	using linear inequalities.
Sol	Let the company produce, x number of product A and y number of product B. As each of product A
	requires 2 hours in machine one and one hour in machine two, x number of product A requires 2x
	hours in machine one and x hours in machine two. Similarly, y number of product B requires y hours
	in machine one and 2y hours in machine two. But machine one can be used for 60 hours and machine
	two for 40 hours.
	Hence $2x + y$ cannot exceed 60 and $x + 2y$ y cannot exceed 40. In other words, $2x + y \leq 60$ and $x + 2y \leq 40$.
	Thus, the conditions can be expressed using linear inequalities.
Ex.3:	*A fertilizer company produces two types of fertilizers called grade I and grade II. 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.
Sol.	

Ex.:4 *Graph the inequalities $5x_1 + 4x_2 \geq 9$, $x_1 + x_2 \geq 3$, $x_1 \geq 0$ and $x_2 \geq 0$ and mark the common region.*

Sol. We draw the straight lines $5x_1 + 4x_2 = 9$ and $x_1 + x_2 = 3$.

Table for $5x_1 + 4x_2 = 9$

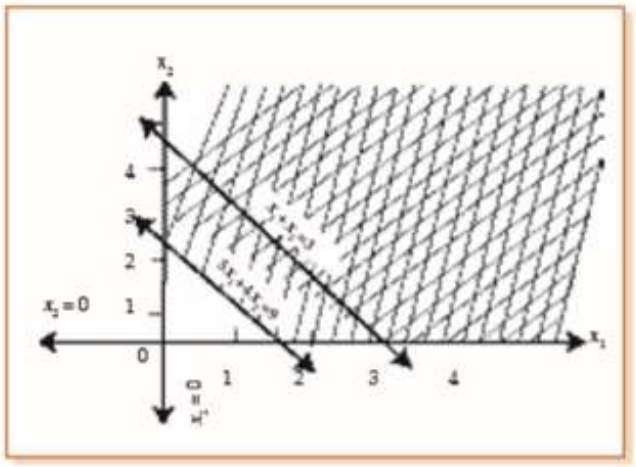
x_1	0	9/5
x_2	9/4	0

Table for $x_1 + x_2 = 3$

x_1	0	3
x_2	3	0

Now, if we take the point (4, 4), we find
$5x_1 + 4x_2 \geq 9$
i.e., $5.4 + 4.4 \geq 9$ or, $36 \geq 9$ (True)
$x_1 + x_2 \geq 3$
i.e., $4 + 4 \geq 3$
$8 \geq 3$ (True)

Hence (4, 4) is in the region which satisfies the inequalities. We mark the region being satisfied by the inequalities and note that the cross-hatched region is satisfied by all the inequalities. Ex.: Draw the graph of the solution set of the following inequality and equality:



Ex. 5: *Draw the graphs of the following inequalities:*
$x + y \leq 4$,
$x - y \leq 4$,
$x \geq -2$.

Sol:

Ex. 6 : *Draw the graphs of the following linear inequalities:*

$5x + 4y \leq 100$, $5x + y \geq 40$,

$3x + 5y \leq 75$, $x \geq 0, y \geq 0$. *and mark the common region.*

Sol:

Ex. 7 : *Draw the graphs of the following linear inequalities:*

$5x + 8y \leq 2000$, $x \leq 175$, $x \geq 0$.

$7x + 4y \leq 1400$, $y \leq 225$, $y \geq 0$. *and mark the common region:*

Sol. Let us plot the line AB $(5x + 8y = 2{,}000)$ by joining the points A(400, 0) and B(0, 250).

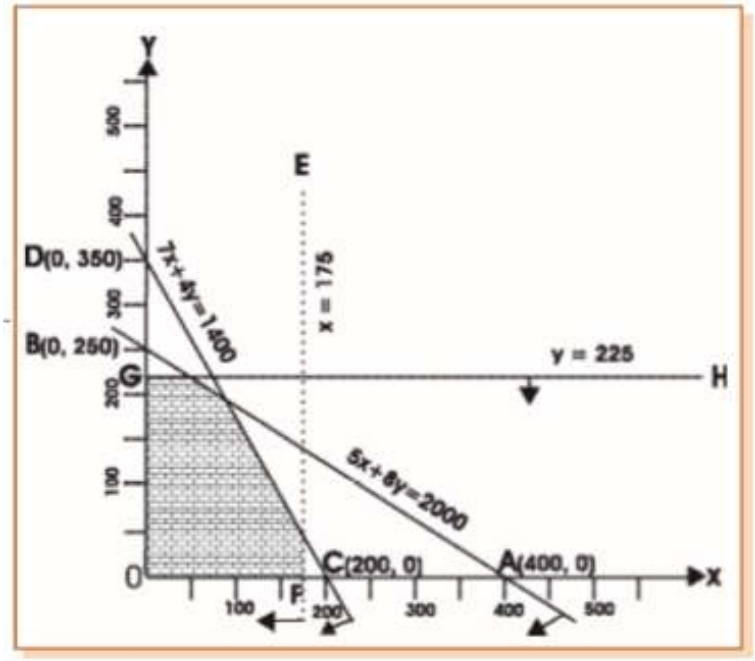
Similarly, we plot the line CD $(7x + 4y = 1400)$ by joining the points C(200, 0) and D(0, 350).

x	400	0
y	0	250

x	200	0
y	0	350

Also, we draw the lines EF$(x = 175)$ and GH $(y = 225)$.

The required graph is shown alongside in which the common region is shaded.



Ex. 8 : *Draw the graphs of the following linear inequalities:*

$x + y \geq 1$, $7x + 9y \leq 63$, $y \leq 5$, $x \leq 6$, $x \geq 0$, $y \geq 0$.

and mark the common region.

Sol :

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EXERCISE

Choose the correct answer (a),(b),(c) or (d)

1. (i) An employer recruits experienced (x) and fresh workmen (y) for his firm under the condition that he cannot employ more than 9 people. x and y can be related by the inequality

(a) $x + y \neq 9$ (b) $x + y \leq 9$ $x \geq 0, y \geq 0$ (c) $x + y \geq 9$ $x \geq 0, y \geq 0$ (d) none of these

(ii) On the average experienced person does 5 units of work while a fresh one 3 units of work daily but the employer has to maintain an output of at least 30 units of work per day. This situation can be expressed as

(a) $5x + 3y \leq 30$ (b) $5x + 3y > 30$ (c) $5x + 3y \geq 30\ x \geq 0, y \geq 0$ (d) none of these€

(iii) 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

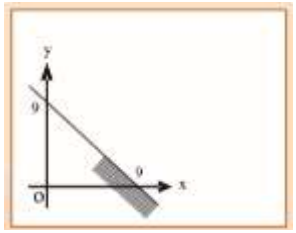
(a) $y \geq x/5$ (b) $5y \leq x$ (c) $5y \geq x$ (d) none of these

(iv) The union however forbids him to employ less than 2 experienced person to each fresh person. This situation can be expressed as

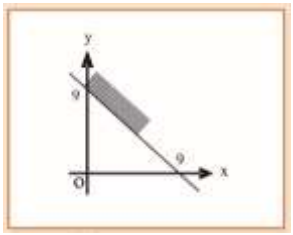
(a) $x \leq y/2$ (b) $y \leq x/2$ (c) $y \geq x/2$ (d) $x > 2y$

(v) The graph to express the inequality $x + y \leq 9$ is

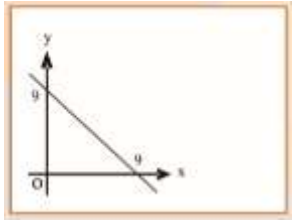
(a)



(b)



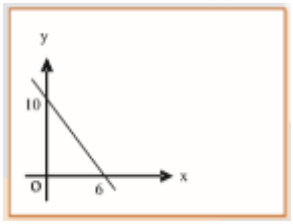
(c)



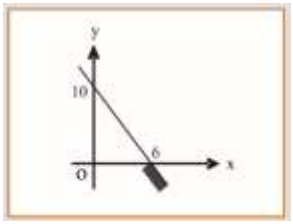
(d) none of these

(vi) The graph to express the inequality $5x + 3y \geq 30$ is

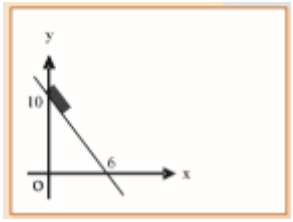
(a)



(b)



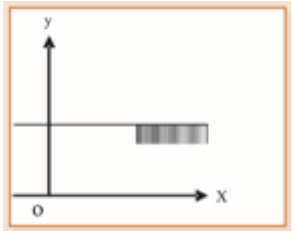
(c)



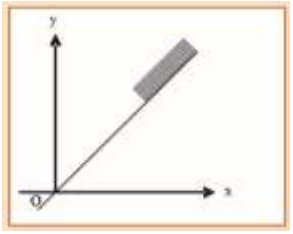
(d) none of these

(vii) The graph to express the inequality $y \leq \left(\frac{1}{2}\right) x$ is indicated by

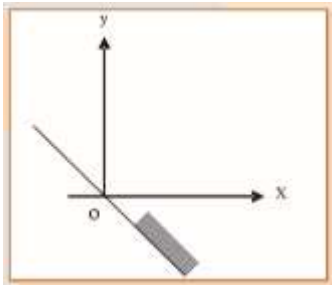
(a)



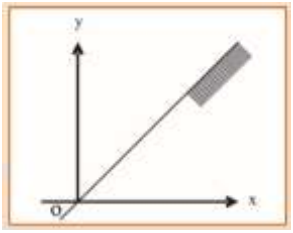
(b)



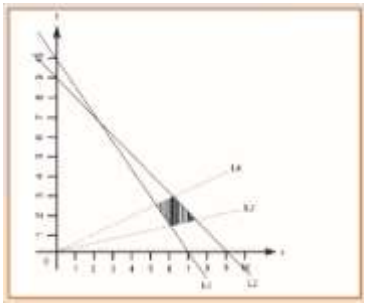
(c)



(d)



(viii)



L1 : 5x + 3y = 30 L2 : x+y = 9 L3 : y = x/3 L4 : y = x/2

The common region (shaded part) shown in the diagram refers to

(a) $5x + 3y \leq 30$
$x + y \leq 9$
$y \leq 1/5\ x$
$y \leq x/2$

(b) $5x + 3y \geq 30$
$x + y \leq 9$
$y \geq x/3$
$y \leq x/2$
$x \geq 0, y \geq 0$

(c) $5x + 3y \geq 30$
$x + y \geq 9$
$y \leq x/3$
$y \geq x/2$
$x \geq 0, y \geq 0$

(d) $5x + 3y > 30$
$x + y < 9$
$y \geq 9$
$y \leq x/2$
$x \geq 0, y \geq 0$

2. 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

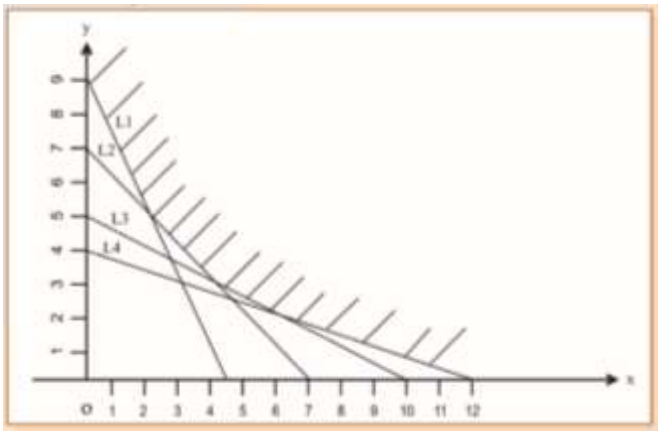
(a) $2x + y \leq 9$
$x + y \leq 7$
$x + 2y \leq 10$
$2x + 3y \leq 12$
$x > 0, y > 0$

(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) $2x + y \geq 9$
$x + y \geq 7$
$x + 2y \geq 10$
$2x + 3y \geq 12$
$x \geq 0, y \geq 0,$

3 Graphs of the inequations are drawn below :



L1 : $2x + y = 9$ L2 : $x + y = 7$ L3 : $x + 2y = 10$ L4 : $x + 3y = 12$

The common region (shaded part) indicated on the diagram is expressed by the set of€inequalities

(a) $2x + y \leq 9$
$x + y \geq 7$
$x + 2y \geq 10$
$x + 3y \geq 12$

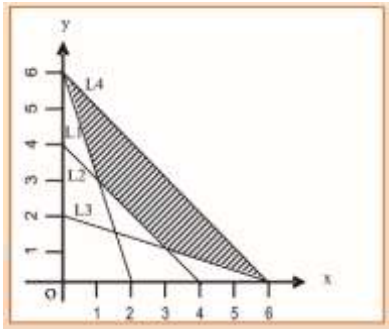
(b) $2x + y \geq 9$
$x + y \leq 7$
$x + 2y \geq 10$
$x + 3y \geq 12$

(c) $2x + y \geq 9$
$x + y \geq 7$
$x + 2y \geq 10$
$x + 3y \geq 12$
$x \geq 0, y \geq 0$

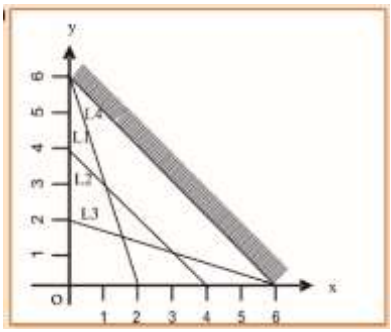
(d) none of these

4. The common region satisfied by the inequalities L1: $3x + y \geq 6$, L2: $x + y \geq 4$, L3: $x + 3y \geq 6$, and L4: $x + y \leq 6$ is indicated by

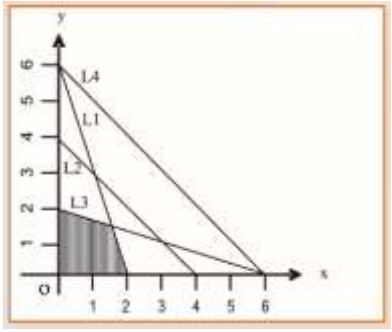
(a)



(b)

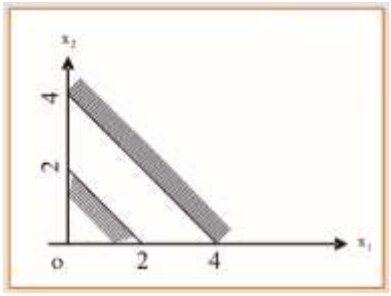


(c)



(d) none of these

5. The region indicated by the shading in the graph is expressed by inequalities



(a) $x_1 + x_2 \leq 2$
$2x_1 + 2x_2 \geq 8$
$x_1 \geq 0$, $x_2 \geq 0$,

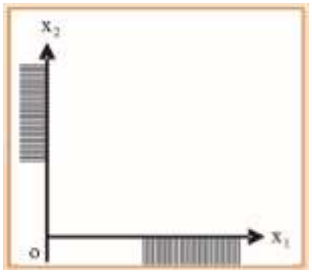
(b) $x_1 + x_2 \leq 2$
x_2 $x_1 + x_2 \leq 4$

(c) $x_1 + x_2 \geq 2$
$2x_1 + 2x_2 \geq 8$

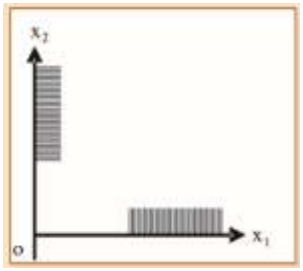
(d) $x_1 + x2 \leq 2$
$2x_1 + 2x_2 > 8$

6. (i) The inequalities $x_1 \geq 0$, $x_2 \geq 0$, are represented by one of the graphs shown below:

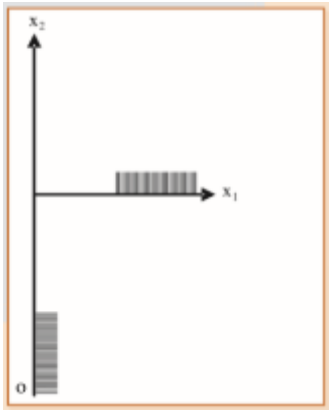
(a)



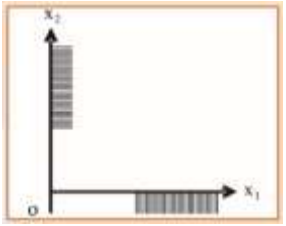
(b)



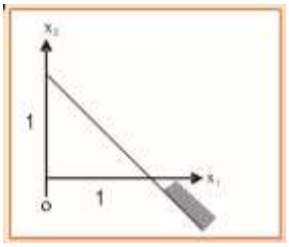
(c)



(d)



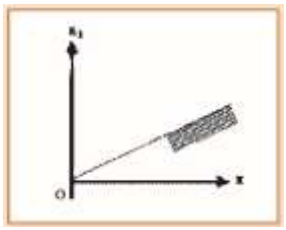
(ii) The region is expressed as



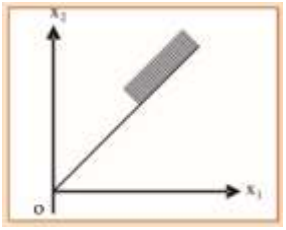
(a) $x_1 - x_2 \geq 1$ (b) $x_1 + x_2 \leq 1$ (c) $x_1 + x_2 \geq 1$ (d) none of these

(iii) The inequality $-x_1 + 2x_2 \leq 0$ is indicated on the graph as

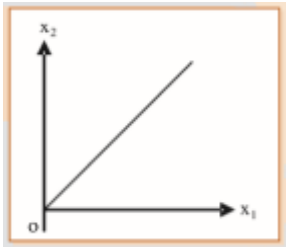
(a)



(b)

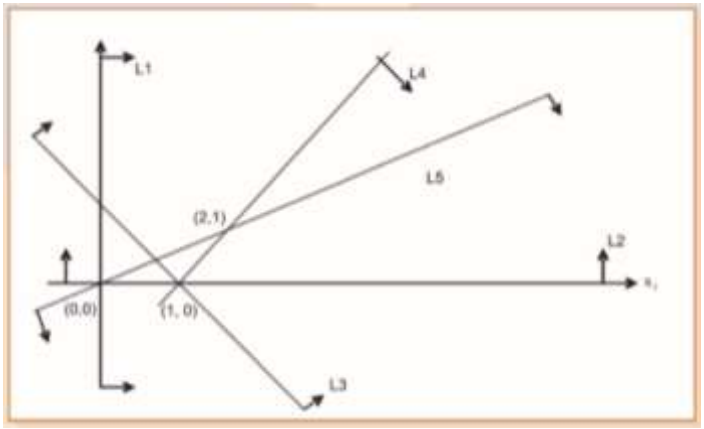


(c)



(d) none of these

7.



The common region indicated on the graph is expressed by the set of five inequalities

(a) L1 : $x_1 \geq 0$
L2 : $x_2 \geq 0$

$L3 : x_1 + x_2 \leq 1$
$L4 : x_1 - x_2 \geq 1$
$L5 : -x_1 + 2x_2 \leq 0$

(b) $L1 : x_1 \geq 0$
$L2 : x2 \geq 0$
$L3 : x_1 + x_2 \geq 1$
$L4 : x_1 - x_2 \geq 1$
$L5 :- x_1 + 2x_2 \leq 0$

(c) $L1 : x_1 \leq 0$
$L2 : x2 \leq 0$
$L3 : x_1 + x_2 \geq 1$
$L4 : x_1 - x_2 \geq 1$
$L5 :- x_1 + 2x_2 \leq 0$

(d) None of these

8. A firm makes two types of products : Type A and Type B. The profit on product A is Nu. 20 each and that on product B is Nu. 30 each. Both types are processed on three machines M1, M2 and M3. The time required in hours by each product and total time available in hours per week on each machine are as follows:

Machine	Product A	Product B	Available Time
M1	3	3	36
M2	5	2	50
M3	2	6	60

The constraints can be formulated taking x_1 = number of units A and x_2 = number of unit of B as

(a) $x_1 + x_2 \leq 12$
$5x_1 + 2x_2 \leq 50$
$2x_1 + 6x_2 \leq 60$

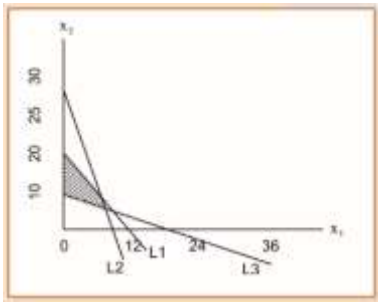
(b) $3x_1 + 3x_2 \geq 36$
$5x_1 + 2x_2 \leq 50$
$2x_1 + 6x_2 \geq 60$
$x_1 \geq 0, x_2 \geq 0$

(c) $3x_1 + 3x_2 \leq 36$
$5x_1 + 2x_2 \leq 50$
$2x_1 + 6x_2 \leq 60$
$x_1 \geq 0, x_2 \geq 0$

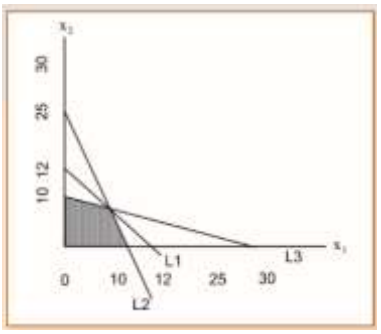
(d) none of these

9. 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

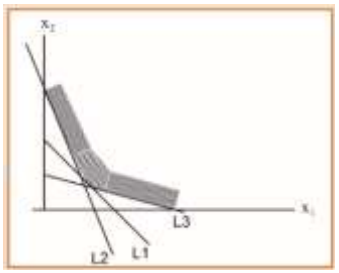
(a)



(b)



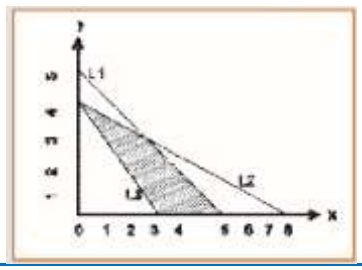
(c)



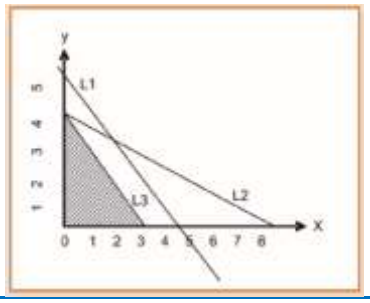
(d) none of these

10. The common region satisfying the set of inequalities $x \geq 0$, $y \geq 0$, L1: $x+y \leq 5$, L2: $x+2y \leq 8$ and L3: $4x+3y \geq 12$ is indicated by

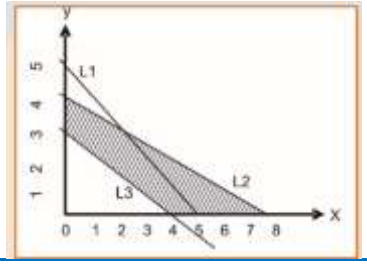
(a)



(b)



(c)



(d) none of these

ANSWERS

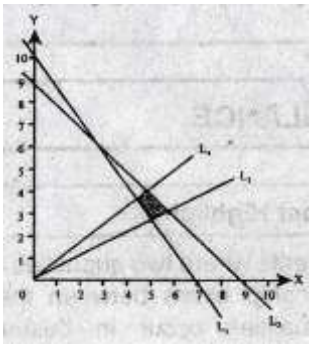
1. (i) (b) (ii) (c) (iii) (a) (iv) (b) (v) (a) (vi) (c) (vii) (d) (viii) (e)
2. (d) 3. (c) 4. (a) 5. (a) 6. (i) (b) (ii) (c) (iii) (a)
7. (b) 8. (c) 9. (b) 10. (a)

"KAR LO PAST APNI MUTHI ME"

Past Exam Questions

2006 - Nov

1. Graphs of Inequations are drawn below



$L_1 : 5x + 3y = 30$ $L_2 : x + y = 9$

$L_3 : y = \frac{x}{3}$ $L_4 : y = \frac{x}{2}$

The common region (shaded part) shown in the diagram refers to the inequalities:

(a) $5x + 3y \leq 30$
$x + y \leq 9$
$y \leq \frac{1}{2}x$
$y \leq x/2$
$x \geq 0, y \geq 0$

(b) $5x + 3y \geq 30$
$x + y \leq 9$
$y \geq x/3$
$y \leq x/2$
$x \geq 0, y \geq 0.$

(c) $5x + 3y \geq 30$
$x + y \geq 9$
$y \leq x/3$
$y \geq x/2$
$x \geq 0, y \geq 0.$

(d) $5x + 3y > 30$
$x + y < 9$
$y \geq 9$
$y \leq x/2$
$x \geq 0, y \geq 0.$

2. If $\left|x+\frac{1}{4}\right| > \frac{7}{4}$, then :

(a) $x < \frac{-3}{2}$ or $x > 2$ (b) $x < -2$ or $x > \frac{3}{2}$ (c) $-2 < x < \frac{3}{2}$ (d) None of these.

2007- Feb

3 If $\left|\frac{3x-4}{4}\right| \leq \frac{5}{12}$, the solution set is:

(a) $\left\{x: \frac{19}{18} \leq x \leq \frac{29}{18}\right\}$ (b) $\left\{x: \frac{7}{9} \leq x \leq \frac{17}{9}\right\}$ (c) $\left\{x: \frac{-29}{18} \leq x \leq \frac{-19}{18}\right\}$ (d) None of these.

4. On solving the inequalities $6x + y \geq 18$, $x + 4y \geq 12$, $2x + y \geq 10$, we get the following situation :

(a) (0, 18), (12, 0), (4, 2) & (7, 6) (b) (3, 0), (0, 3), (4, 2), & (7, 6)

(c) (5, 0), (0, 10), (4, 2) & (7, 6) (d) (0,18), (12, 0), (4, 2), (0, 0) and (7, 6)

2007 – May

5. A car manufacturing company manufactures cars of two types A and B. Model A requires 150 man-hours for assembling, 50 manhours for painting and 10 man-hours for checking and testing. Model B requires 60 man-hours for assembling, 40 man-hours for painting and 20 man-hours for checking and testing. There are available 30 thousand manhours for assembling, 13 thousand man-hours for painting and 5 thousand man-hours for checking and testing. Express the above situation using linear inequalities. Let the company manufacture x units of type A model of car and y units of type B model of car. Then, the inequalities are:

(a) $5x + 2y \geq 1000$; $5x + 4y \geq 1300$, $x + 2y \leq 500$; $x \geq 0$, $y \geq 0$,

(b) $5x + 2y \leq 1000$, $5x + 4y \leq 1300$, $x + 2y \geq 500$; $x \geq 0$, $y \geq 0$.

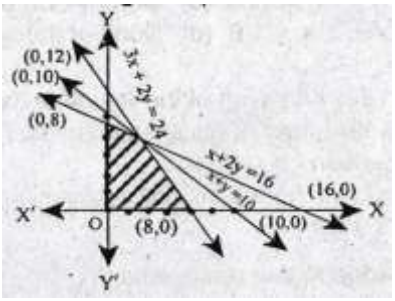
(c) $5x + 2y \leq 1{,}000$, $5x + 4y \leq 1300$, $x + 2y \geq 500$; $x > 0$, $y \geq 0$.

(d) $5x + 2y = 1000$, $5x + 4y \leq 1300$, $x + 2y = 500$; $x \geq 0$, $y \geq 0$.

[6] The rules and regulations demand that the employer should employ not more than 5 experienced hands to 1 fresh one and this fact is represen-ted by : (Taking experienced person as x and fresh person as y)

(a) $y \geq \frac{x}{5}$ (b) $5y \leq x$ (c) $5y \geq x$ (d) None

[7] The shaded region represents :



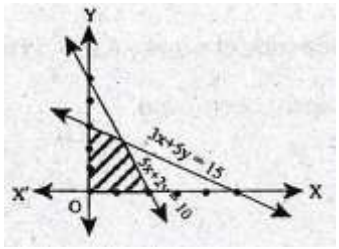
(a) $3x + 2y < 24$, $x + 2y \geq 16$, $x + y \leq 10x$, $\times \geq 0$, $y \geq 0$

(b) $3x + 2y < 24$, $x + 2y \leq 16$, $x + y \geq 10$, $x \geq 0$, $y \geq 0$

'(c) $3x + 2y < 24$, $x + 2y < 16$, $x + y \leq 10$, $x > 0$, $y \geq 0$

(d) None of these.

[8] The shaded region represents :

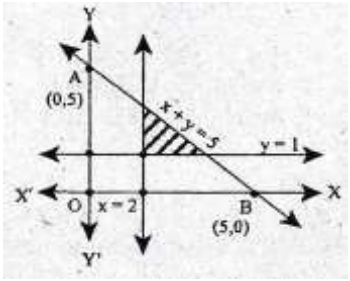


(a) $3x + 5y<15, 5x + 2y \geq 10, x, y \geq 0$ (b) $3x + 5y \leq 15, 5x + 2y \leq 10, x, y \geq 0$

(c) $3x + 5y \geq 15, 5x + 2y \geq 10, x, y, \geq 0$ (d) None of these.

2008 – Feb

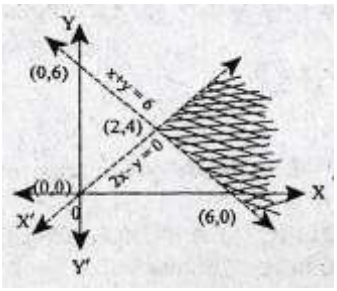
[9] The shaded region represents :



(a) $x + y \leq 5, x \geq 2, y < 1$ (b) $x + y \leq 5, x \geq 2, y \geq 1$ (c) $x + y \geq 5, x \geq 2, y \geq 1$ (d) None of these

2008 – June

[10] The shaded region represents :



(a) $x + y > 6, 2x - y > 0$ (b) $x + y < 6, 2x - y > 0$ (c) $x + y > 6, 2x - y < 0$ (d) None of these

[11] If $a > 0$ and $b < 0$, it follows that:

(a) $\frac{1}{a} > \frac{1}{b}$ (b) $\frac{1}{a} < \frac{1}{b}$ (c) $\frac{1}{a} = \frac{1}{b}$ (d) None of these

	2008 – Dec
[12]	The Linear relationship between two variables in an inequality:
	(a) $ax + by \leq c$. (b) $ax\ by \leq c$ (c) $axy + by \leq c$ (d) $ax + bxy \leq c$
	2010 – June
[13]	The solution of the inequality $\frac{5-2x}{3} \leq \frac{x}{6} - 5$ is
	(a) $x \geq 8$ (b) $x \leq 8$ (c) $x = 8$ (d) None of these.
[14]	On the average an experienced person does 7 units of work while a fresh one work 5 units of work
	daily but the employer has to maintain an output of atleast 35 units of work per day. The situation can
	be expressed as: .
	(a) $7x + 5y < 35$ (b) $7x + 5y \leq 35$ (c) $7x + 5y > 35$ (d) $7x + 5y \geq 35$
	2011 – June
[15]	Solution space of the inequalities $2x + y \leq 10$ and $x - y \leq 5$:
	(i) includes the origin.
	(ii) includes the points (4, 3)
	which one is correct ?
	(a) Only (i) (b) Only (ii) (c) Both (i) and (ii) (d) None of the above
16.	On an average, experienced person does 5 units of work while a fresh person does 3 units of work

daily but the employer has to maintain the output of atleast 30 units of work per day. The situation can be expressed as.

(a) $5x + 3y \leq 30$ (b) $5x + 3y \geq 30$ (c) $5x + 3y > 30$ (d) $5x + 3y = 30$

2012 – June

17. Find the range of real values of x satisfying the inequalities $3x - 2 > 7$ and $4x - 13 > 15$

(a) $x>3$ (b) $x>7$ (c) $x < 7$ (d) $x < 3$

2012 - Dec

18. On the average, experienced person does 5 units of work while a fresh one **3** units work daily but the employer have to maintain the output of at least **30** units of work per day. The situation can be expressed as.

(a) $5x + 3y \leq 30$ (b) $5x + 3y \geq 30$ (c) $5x + 3y = 30$ (d) None of these.

2013 – June

19. The union forbids employer to employ less than two experienced person (x) to each fresh person (y). This situation can be expressed as:

(a) $x \leq y/2$. (b) $y \leq x/2$ (c) $y \geq x/2$ (d) None of these.

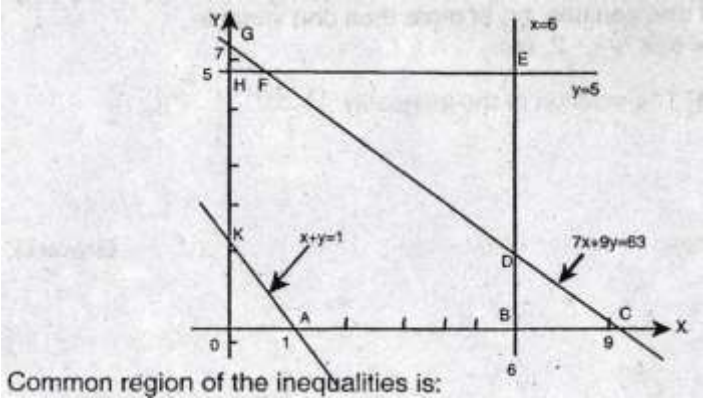
2013 – Dec

20. The solution of the inequality $8x + 6 < 12x + 14$ is:

(a) (-2,2) (b) (0,-2) (c) (2,) (d) (- 2,)

2014 – June

21. The graph of linear inequalities $7x+9y \leq 63$, $x+y \geq 1$, $0 \leq x \leq 6$ and

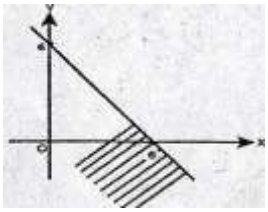
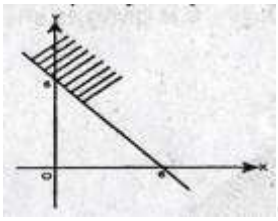
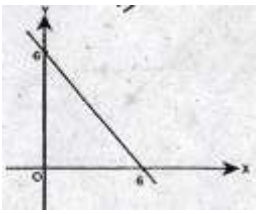


Common region of the inequalities is:

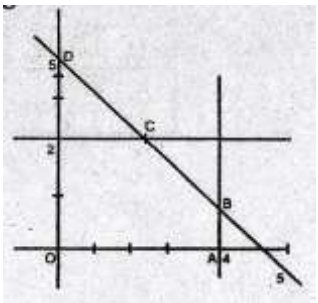
(a) BCDB and DEFD (b) Unbounded (c) HFGH (d) ABDFHKA

2014 – Dec

22. The graph to express the inequality $x + y \leq 6$ is:

(a)  (b)  (c)  (d) None of these

23. The graph of linear inequalities $x + y \geq 5$; $x + y \leq 5$; $0 \leq x \leq 4$ and $0 \leq y \geq 2$ is given below:



The common region of the inequalities will be:

(a) OABCEO (b) ECDE (c) Line Segment DC (d) Line Segment BC

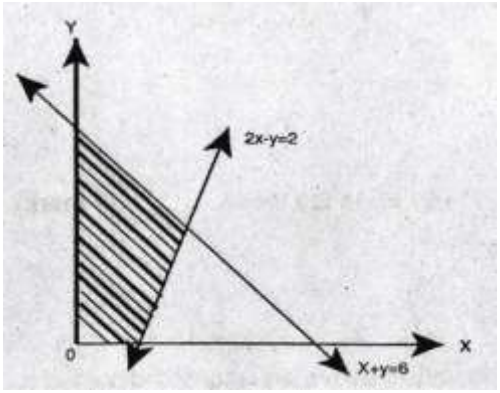
2015 – June

24. The common region in the graph of linear inequalities $2x + y > 18$, $x + y \geq 12$ and $3x + 2y \leq 34$ is:

(a) unbounded (b) infeasible (c) feasible and bounded (d) feasible and unbounded

2015 – Dec

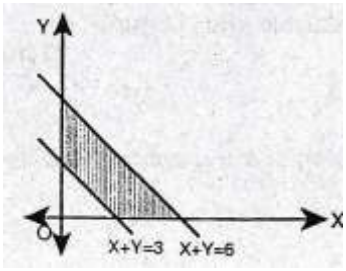
25. The common shaded region in the graph represents the linear inequalities as:

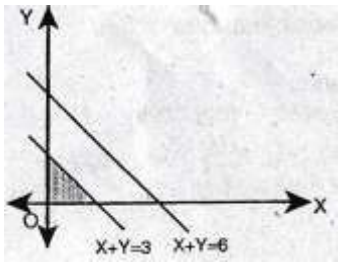


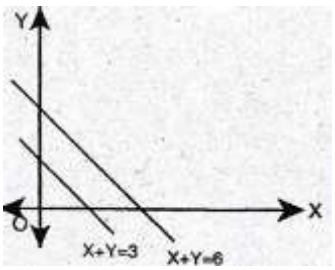
(a) $x + y \geq 6$, $2x - y - 2 \geq 0$, $x, y \geq 0$ (b) $x + y \geq 6$, $2x - y - 2 \leq 0$, $x, y \geq 0$ (c) $x + y \leq 6$, $2x - y - 2 \leq 0$, $x, y \geq 0$ (d) $x + y \leq 6$, $2x - y - 2 \geq 0$, $x, y > 0$

2016 – June

26. The common region of $x+y \leq 6$; $x+y \geq 3$; $x \geq 0$; $y \geq 0$, is (as shown by shaded region):

(a) 

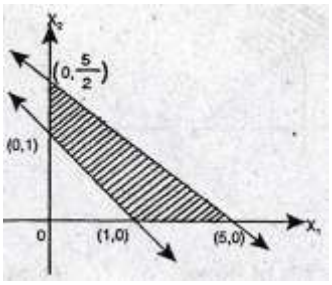
(b) 

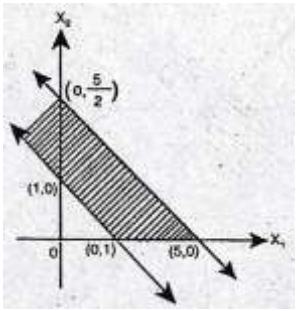
(c) 

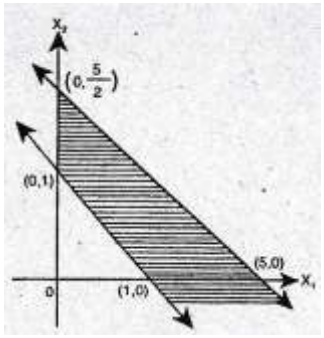
(d) None

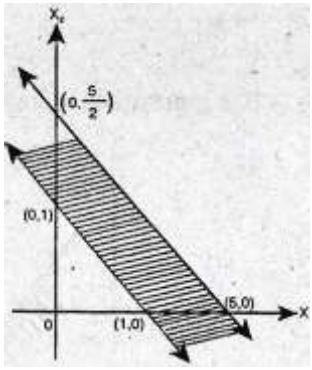
2016 – Dec

27. The common region by the inequalities $x_1 + 2x_2 \leq 5$, $x_1 + x_2 \geq 1$, $x_1 \geq 0$, $x_2 \geq 0$ is given as shaded portion in:

(a) 

(b) 

(c) 

(d) 

2017 – June

28. A dietician wishes to mix together two kinds of food so that the vitamins content of the mixture is atleast 9 units of vitamin A, 7units of vitamin B, 10 units of vitamin C, 12 units of vitamin D. The vitamin content per kg. of each food is shown in table. Assuming 'x' units of food I is to be mixed with 'y' units of food II the situation can be expressed as:

	A	B	C	D
Food I	2	1	1	2
Food II	1	1	2	3

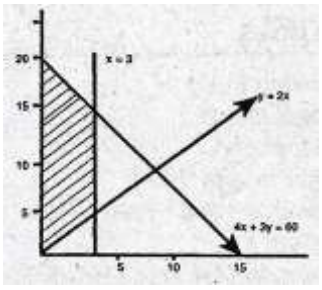
(a) $2x + y \leq 9$, $x + y \leq 7$, $x + 2y \leq 10$, $2x + 3y \leq 12$, $x > 0, y > 0$

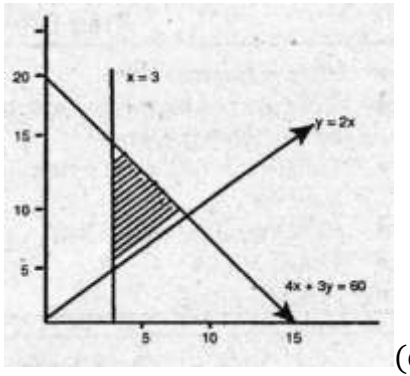
(b) $2x + y \geq 30$, $x + y \leq 7$, $x + 2y \geq 10$, $2x + 3y \geq 12$, $x > 0, y > 0$

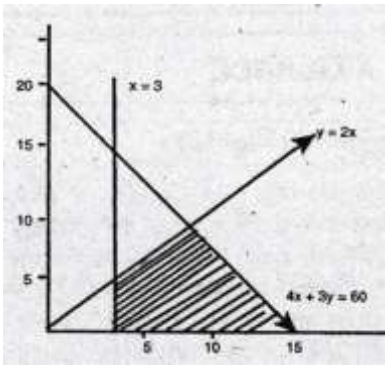
(c) $2x + y \geq 9$, $x + y \geq 7$, $x + 2y \leq 10$, $x + 3y \leq 12$, $x \geq 0, y > 0$

(d) $2x + y \geq 9$, $x + y > 7$, $x + 2y \geq 10$, $2x + 3y \geq 12$, $x \geq 0, y \geq 0$

29. The common regions by the inequalities $4x + 3y \leq 60$; $y \geq 2x$; $x \geq 3$, $x \geq 0$ and $y \geq 0$ is

(a) 

(b) 

(c) 

(d) None

ANSWERS

1	B	11	A	21	D
2	B	12	A	22	A
3	B	13	A	23	C
4	A	14	D	24	C
5	C	15	A	25	D
6	A	16	B	26	A
7	C	17	B	27	A
8	B	18	B	28	D
9	B	19	B	29	C
10	A	20	D		

STUDENT NOTES

CH - 4

TIME VALUE OF MONEY

SUMMARY

CONCEPT BOOSTER PROBLEMS – SIMPLE INTEREST

Ex. 1:	How much interest will be earned on Rs. 2000 at 6% simple interest for 2 years?
Ex. 2:	Sania deposited Rs. 50,000 in a bank for two years with the interest rate of 5.5% p.a. How much
	interest would she earn?
Ex. 3:	In Ex. 2 what will be the final value of investment?
Ex. 4:	Sachin deposited Rs. 1,00,000 in his bank for 2 years at simple interest rate of 6%. How much interest
	would he earn? How much would be the final value of deposit?
Ex. 5:	Find the rate of interest if the amount owed after 6 months is Rs. 1050, borrowed amount being Rs.
	1000
Ex. 6:	Rahul invested Rs. 70,000 in a bank at the rate of 6.5% p.a. simple interest rate. He received Rs. 85,925
	after the end of term. Find out the period for which sum was invested by Rahul.
Ex. 7:	Kapil deposited some amount in a bank for 7 ½ years at the rate of 6% p.a. simple interest. Kapil
	received Rs. 1,01,500 at the end of the term. Compute initial deposit of Kapil.
Ex. 8:	A sum of Rs. 46,875 was lent out at simple interest and at the end of 1 year 8 months the total amount
	was Rs. 50,000. Find the rate of interest percent per annum.
Ex. 9:	What sum of money will produce Rs. 28,600 as an interest in 3 years and 3 months at 2.5% p.a. simple
	interest?
Ex. 10:	In what time will Rs. 85,000 amount to Rs. 1,57,675 at 4.5 % p.a. ?

PRACTICE SESSION – A FOR BETTER UNDERSTANDING

TOPIC: SIMPLE INTEREST

1. S.I on Rs. 3,500 for 3 years at 12% per annum is

(a) Rs. 1,200 (b) Rs. 1,260 (c) Rs. 2,260 (d) none of these

2. P = 5,000, R = 15, T = 4 ½ using I = PRT/100, I will be

(a) Rs. 3,375 (b) Rs. 3,300 (c) Rs. 3,735 (d) none of these

3. If P = 5,000, T = 1, I = Rs, 300, R will be

(a) 5% (b) 4% (c) 6% (d) none of these

4. If P = Rs. 4,500, A = Rs. 7,200, than Simple interest i.e. I will be

(a) Rs. 2,000 (b) Rs. 3,000 (c) Rs. 2,500 (d) Rs. 2,700

5. P = Rs. 12,000, A = Rs. 16,500, T = 2 ½ years. Rate percent per annum simple interest will be

(a) 15% (b) 12% (c) 10% (d) none of these

6. P = Rs. 10,000, I = Rs. 2,500, R = 12 ½% SI. The number of years T will be

(a) 1 ½ years (b) 2 years (c) 3 years (d) none of these

7. P = Rs. 8,500, A = Rs. 10,200, R = 12 ½ % SI, t will be.

(a) 1 yr. 7 mth. (b) 2 yrs. (c) 1 ½ yr. (d) none of these

8. The sum required to earn a monthly interest of rs. 1,200 at 18% per annum SI is

(a) Rs. 50,000 (b) Rs. 60,000 (c) Rs. 80,000 (d) none of these

9. A sum of money amount to rs. 6,200 in 2 years and R. 7,400 in 3 years. The principal and rate of interest are

(a) Rs. 3,800, 31.57% (b) Rs. 3,000, 20% (c) Rs. 3,500, 15% (d) none of these

10. A sum of money doubles itself in 10 years. The number of years it would triple itself is

(a) 25 years. (b) 15 years. (c) 20 years (d) none of these

CONCEPT BOOSTER PROBLEMS – COMPOUND INTEREST

Ex. 11: Saina deposited Rs. 1,00,000 in a nationalized bank for three years. If the rate of interest is 7% p.a., calculate the interest that bank has to pay to Saina after three years if interest is compounded annually. Also calculate the amount at the end of third year.

Ex. 12: Rs. 2,000 is invested at annual rate of interest of 10%. What is the amount after two years if compounding is done (a) Annually (b) Semi-annually (c) Quarterly (d) monthly.

Ex. 13: Determine the compound amount and compound interest on Rs. 1000 at 6% compounded semi-annually for 6 years. Given that $(1 + i)^n = 1.42576$ for $i = 3\%$ and $n = 12$.

Ex. 14: Compute the compound interest on Rs. 4,000 for 1½ years at 10% per annum compounded half-yearly.

Ex. 15: On what sum will the compound interest at 5% per annum for two years compounded annually be Rs. 1,640?

Ex. 16: What annual rate of interest compounded annually doubles an investment in 7 years? Given that $2^{1/7} = 1.104090$

Ex. 17: In what time will Rs. 8,000 amount to Rs. 8,820 at 10% per annum interest compounded half-yearly?

Ex. 18: Find the rate percent per annum if Rs. 2,00,000 amount to Rs. 2,31,525 in 1½ year interest being compounded half-yearly.

Ex. 19: A certain sum invested at 4% per annum compounded semi-annually amounts to Rs.78,030 at the end of one year. Find the sum.

Ex. 20: Rs. 16,000 invested at 10% p.a. compounded semi-annually amounts to rs. 18,522. Find the time period of investment.

Ex. 21: A person opened an account on April, 2011 with a deposit of Rs. 800. The account paid 6% interest compounded quarterly. On October 1, 2011 he closed the account and added enough additional money to invest in a 6 month time-deposit for Rs. 1,000, earning 6% compounded monthly.

(a) How much additional amount did the person invest on October 1?

(b) What was the maturity value of his time deposit on April 1 2012?

(c) How much total interest was earned?

Given that $(1 + i)^n$ is 1.03022500 for i=1½ % n = 2 and $(1+ i)^n$ is 1.03037751 for i = ½ % and n = 6.

CONCEPT BOOSTER PROBLEMS – EFFECTIVE RATE OF INTEREST

Ex. 22: Rs. 5,000 is invested in a Term Deposit Scheme that fetches interest 6% per annum compounded quarterly. What will be the interest after one year? What is effective rate of interest?

Ex. 23: Find the amount of compound interest and effective rate of interest if an amount of Rs. 20,000 is deposited in a bank for one year at the rate of 8% per annum compounded semi annually.

Ex. 24: Which is a better investment 3% per year compounded monthly or 3.2% per year simple interest? Given that $(1+0.0025)12 = 1.0304$.

PRACTICE SESSION – B FOR BETTER UNDERSTANDING

TOPIC: COMPOUND INTEREST & EFFECTIVE RATE OF INTEREST

1. If P = Rs. 1,000, R = 5% p.a, n = 4; What is Amount and C.I. is

(a) Rs. 1,215.50, Rs. 215.50 (b) Rs. 1,125, Rs. 125

(c) Rs. 2,115, Rs. 115 (d) none of these

2. Rs. 100 will become after 20 years at 5% p.a compound interest amount of

(a) Rs. 250 (b) Rs. 205 (c) rs. 265.50 (d) none of these

3. The effective rate of interest corresponding to a nominal rate 3% p.a payable half yearly is

(a) 3.2% p.a (b) 3.25% p.a (c) 3.0225% p.a (d) none of these

4. A machine is depreciated at the rate of 20% on reducing balance. The original cost of the machine was Rs. 1,00,000 and its ultimate scrap value was Rs. 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

5. If A = Rs. 1,000, n = 2 years, R = 6% p.a compound interest payable half-yearly, then principal (P) is

(a) Rs. 888.80 (b) Rs. 885 (c) 800 (d) none of these

6. 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 (app) (d) none of these

7. The difference between C.I and S.I on a certain sum of money invested for 3 years at 6% p.a is Rs. 110.16. The sum is

(a) Rs. 3,000 (b) Rs. 3,700 (c) Rs. 12,000 (d) Rs. 10,000

8. The useful life of a machine is estimated to be 10 years and cost Rs. 10,000. Rate of depreciation is 10% p.a. The scrap value at the end of its life is

(a) Rs. 3,486.78 (b) Rs. 4,383 (c) Rs. 3,400 (d) none of these

9. The effective rate of interest corresponding a nominal rate of 7% p.a convertible quarterly is

(a) 7% (b) 7.5% (c) 5% (d) 7.18%

10. The C.I on Rs. 16000 for 1 ½ years at 10% p.a payable half -yearly is

(a) Rs. 2,222 (b) Rs. 2,522 (c) Rs. 2,500 (d) none of these

11. The C.I on Rs. 40000 at 10% p.a for 1 year when the interest is payable quarterly is

(a) Rs. 4,000 (b) Rs. 4,100 (c) Rs. 4,152.51 (d) none of thes

12. The difference between the S.I and the C.I on Rs. 2,400 for 2 years at 5% p.a is

(a) Rs. 5 (b) Rs. 10 (c) Rs. 16 (d) Rs. 6

13. The annual birth and death rates per 1,000 are 39.4 and 19.4 respectively. The number of years in which the population will be doubled assuming there is no immigration or emigration is

(a) 35 years. (b) 30 years. (c) 25 years (d) none of these

14. The C.I on Rs. 4,000 for 6 months at 12% p.a payable quarterly is

(a) Rs. 243.60 (b) Rs. 240 (c) Rs. 243 (d) none of these

CONCEPT BOOSTER PROBLEMS – FUTURE VALUE

Ex. 25: You invest Rs. 3000 in a two year investment that pays you 12% per annum. Calculate the future value of the investment.

Ex. 26: Find the future value of an annuity of Rs. 500 made annually for 7 years at interest rate of 14% compounded annually. Given that $(1.14)7 = 2.5023$.

Ex. 27: Rs. 200 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 annuity after 10^{th} payment? Given that $(1.005)10 = 1.0511$

Ex. 28: Z invests Rs. 10,000 every year starting from today for next 10 years. Suppose interest rate is 8% per annum compounded annually. Calculate future value of the annuity. Given that $(1 + 0.08)^{10} = 2.15892500$.

SINKING FUND CONCEPT RELATED TO FUTURE VALUE

Ex. 34: How much amount is required to be invested every year so as to accumulate Rs. 300000 at the end of 10 years if interest is compounded annually at 10%?

CONCEPT BOOSTER PROBLEMS – PRESENT VALUE

Ex. 29: What is the present value of Rs. 1 to be received after two years compounded annually at 10% interest rate?

Ex. 30: Find the present value of Rs. 10,000 to be required after 5 years if the interest rate be 9%. Given that $(1.09)^5=1.5386$.

LOAN BORROWING / EMI CONCEPT RELATED TO PRESENT VALUE

Ex. 31: S borrows Rs. 5,00,000 to buy a house. If he pays equal instalments for 20 years and 10% interest on outstanding balance what will be the equal annual instalment?

Ex. 32: Rs. 5,000 is paid every year for ten years to pay off a loan. What is the loan amount if interest rate be 14% per annum compounded annually?

Ex. 33: Suppose your mom decides to gift you Rs. 10,000 every year starting from today for the next five years. You deposit this amount in a bank as and when you receive and get 10% per annum interest rate compounded annually. What is the present value of this annuity?

CONCEPT BOOSTER PROBLEMS – MIXED PROBLEMS

Ex. 35: ABC Ltd. wants to lease out an asset costing Rs. 3,60,000 for a five year period. It has fixed a rental of Rs. 1,05,000 per annum payable annually starting from the end of first year. Suppose rate of interest is 14% per annum compounded annually on which money can be invested by the company. Is this agreement favourable to the company?

Ex. 36: A company is considering proposal of purchasing a machine either by making full payment of Rs. 4,000 or by leasing it for four years at an annual rate of Rs. 1,250. Which course of action is preferable if the company can borrow money at 14% compounded annually?

Ex. 37: A machine can be purchased for Rs. 50000. Machine will contribute Rs. 12000 per year for the next five years. Assume borrowing cost is 10% per annum compounded annually. Determine whether machine should be purchased or not.

Ex. 38: A machine with useful life of seven years costs Rs. 10,000 while another machine with useful life of five years costs Rs. 8,000. The first machine saves labour expenses of Rs. 1,900 annually and the second one saves labour expenses of Rs. 2,200 annually. Determine the preferred course of action. Assume cost of borrowing as 10% compounded per annum.

SOME IMPORTANT CONCEPTS

VALUATION OF BOND

Ex. 39: An investor intends purchasing a three year Rs. 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%?

PERPETUITY

Ex. 40 Ramesh wants to retire and receive Rs. 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?

Ex. 41: Assuming that the discount rate is 7% per annum, how much would you pay to receive Rs. 50, growing at 5%, annually, forever?

NET PRESENT VALUE

Ex. 43: Compute the net present value for a project with a net investment of Rs. 1,00,000 and net cash flows year one is Rs. 55,000; for year two is Rs. 80,000 and for year three is Rs. 15,000. Further, the company's cost of capital is 10%? [PVIF @ 10% for three years are 0.909, 0.826 and 0.751]

COMPOUND ANNUAL GROWTH RATE (CAGR)

Ex.44: Suppose the revenues of a company for four years, V(t) in the above formula, have been

Year	2013	2014	2015	2016
Revenues	100	120	160	210

Calculate Compound annual Growth Rate.

PRACTICE SESSION – C FOR BETTER UNDERSTANDING

TOPIC: ANNUITY RELATED

1. The present value of an annuity of Rs. 3000 for 15 years at 4.5% p.a CI is

(a) Rs. 23,809.41 (b) Rs. 32,218.63 (c) Rs. 32,908.41 (d) none of these

2. The amount of an annuity certain of Rs. 150 for 12 years at 3.5% p.a C.I is

(a) Rs. 2,190.28 (b) Rs. 1,290.28 (c) Rs. 2,180.28 (d) none of these

3. A loan of Rs. 10,000 is to be paid back in 30 equal instalments. The amount of each installment to cover the principal and at 4% p.a CI is

(a) Rs. 587.87 (b) Rs. 587 (c) Rs. 578.87 (d) none of these

4. A = Rs. 1,200 n = 12 years i = 0.08, V = ?

Using the formula $V = \frac{A}{i}\left[1 - \frac{1}{(1+i)^n}\right]$ Value of v will be

(a) Rs. 3,039 (b) Rs. 3,990 (c) Rs. 9930 (d) none of these

5. a = Rs. 100 n = 10, i = 5% find the FV of annuity

Using the formula FV = a / {1 + i) ^{n} – 1}, FV is equal to

(a) Rs. 1,258 (b) Rs. 2,581 (c) Rs. 1,528 (d) none of these

6. If the amount of an annuity after 25 years at 5% p.a C.I is Rs. 50,000 the annuity will be

(a) Rs. 1,406.90 (b) Rs. 1,046.90 (c) Rs. 1,146.90 (d) none of these

7. Given annuity of Rs. 100 amounts to Rs. 3137.12 at 4.5% p.a C. I. The number of years will be

(a) 25 years (appx.) (b) 20 years (appx.) (c) 22 years (d) none of these

8. A company borrows Rs. 10,000 on condition to repay it with compound interest at 5% p.a by annual installments of Rs. 1000 each. The number of years by which the debt will be clear is

(a) 14.2 years (b) 10 years (c) 12 years (d) none of these

9. Mr. X borrowed Rs. 5,120 at 12 ½ % p.a C.I. At the end of 3 yrs, the money was repaid along with the interest accrued. The amount of interest paid by him is

(a) Rs. 2,100 (b) Rs. 2,170 (c) Rs. 2,000 (d) none of these

10. Mr. Paul borrows Rs. 20,000 on condition to repay it with C.I. at 5% p.a in annual installments of Rs. 2000 each. The number of years for the debt to be paid off is

(a) 10 years (b) 12 years (c) 11 years (d) none of these

11. A person invests Rs. 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 12^{th} time is.

(a) Rs. 11,764.50 (b) Rs. 10,000 (c) Rs. 12,000 (d) none of these

12. The present value of annuity of Rs. 5,000 per annum for 12 years at 4% p.a C.I. annually is

(a) Rs. 46,000 (b) Rs. 46,850 (c) Rs. 15,000 (d) none of these

13. A person desires to create a fund to be invested at 10% CI per annum to provide for a prize of Rs. 300 every year. Using V = a/I find V and V will be

(a) Rs. 2,000 (b) Rs. 2,500 (c) Rs. 3,000 (d) none of these

PRACTICE SESSION – D FOR BETTER UNDERSTANDING

TOPIC: MIXED PROBLEMS

1. A = Rs. 5,200, R = 5% p.a., T = 6 years, P will be

(a) Rs. 2,000 (b) Rs. 3,880 (c) s. 3,000 (d) none of these

2. If P = 1,000, n = 4 years., R = 5% p.a then C. I will be

(a) Rs. 215.50 (b) Rs. 210 (c) Rs. 220 (d) none of these

3. The time in which a sum of money will be double at 5% p.a C.I is

(a) Rs. 10 years (b) 12 years (c) 14.2 years (d) none of these

4. If A = Rs. 10,000, n = 18yrs., R = 4% p.a C.I, P will be

(a) Rs. 4,000 (b) Rs. 4,900 (c) Rs. 4,500 (d) none of these

5. The time by which a sum of money would treble it self at 8% p. a C. I is

(a) 14.28 years (b) 14 years (c) 12 years (d) none of these

6. The present value of an annuity of Rs. 80 a years for 20 years at 5% p.a is

(a) Rs. 997 (appx.) (b) Rs. 900 (c) Rs. 1,000 (d) none of these

7. A person bought a house paying Rs. 20,000 cash down and Rs. 4,000 at the end of each year for 25 yrs. at 5% p.a. C.I. The cash down price is

(a) Rs. 75,000 (b) Rs. 76,000 (c) Rs. 76,392 (d) none of these

8. A man purchased a house valued at Rs. 3,00,000. He paid Rs. 2,00,000 at the time of purchase and agreed to pay the balance with interest at 12% per annum compounded half yearly in 20 equal half yearly instalments. If the first instalment is paid after six months from the date of purchase then the amount of each instalment is

[Given log 10.6 = 1.0253 and log 31.19 = 1.494]

(a) Rs. 8,719.66 (b) Rs. 8,769.21 (c) Rs. 7,893.13 (d) none of these.

ANSWERS

EXERCISE : 4(A)									
1	2	3	4	5	6	7	8	9	10
B	A	C	D	A	B	A	C	A	C

EXERCISE : 4(B)									
1	2	3	4	5	6	7	8	9	10
A	C	C	B	A	C	B	A	B	D
11	12	13							
A	D	C							

EXERCISE : 4(C)									
1	2	3	4	5	6	7	8	9	10
B	A	C	D	A	B	B	A	B	D
11	12	13							
A	D	C							

EXERCISE : 4(D)									
1	2	3	4	5	6	7	8		
B	A	C	D	A	A	C	A		

ADDITIONAL QUESTION BANK

1. The difference between compound and simple interest at 5% per annum for 4 years on Rs. 20,000 is Rs. _____

(a) 250 (b) 277 (c) 300 (d) 310

2. The compound interest on half-yearly rests on Rs. 10,000 the rate for the first and second years being 6% and for the third year 9% p.a. is Rs._____.

(a) 2,200 (b) 2,287 (c) 2,285 (d) None

3. The present value of Rs. 10,000 due in 2 years at 5% p.a. compound interest when the interest is paid on yearly basis is Rs. _____.

(a) 9,070 (b) 9,000 (c) 9,061 (d) None

4. The present value of Rs. 10,000 due in 2 years at 5% p.a. compound interest when the interest is paid on half-yearly basis is Rs. _____.

(a) 9,070 (b) 9,069 (c) 9,061 (d) None

5. Johnson left Rs. 1,00,000 with the direction that it should be divided in such a way that his minor sons Tom, Dick and Harry aged 9, 12 and 15 years should each receive equally after attaining the age 25 years. The rate of interest being 3.5%, how much each son receive after getting 25 years old?

(a) 50,000 (b) 51,994 (c) 52,000 (d) None

6. A machine depreciates at 10% of its value at the beginning of a year. The cost and scrap value realized at the time of sale being Rs. 23,240 and Rs. 9,000 respectively. For how many years the machine was put to use?

(a) 7 years (b) 8 years (c) 9 years (d) 10 years

7. Alibaba borrows Rs. 6 lakhs Housing Loan at 6% repayable in 20 annual installments commencing at the end of the first year. How much annual payment is necessary.

(a) 52,420 (b) 52,419 (c) 52,310 (d) 52,320

8. A sinking fund is created for redeeming debentures worth Rs. 5 lakhs at the end of 25 years. How much provision needs to be made out of profits each year provided sinking fund investments can earn interest at 4% p.a.?

(a) 12,006 (b) 12,040 (c) 12,039 (d) 12,035

9. A machine costs Rs. 5,20,000 with an estimated life of 25 years. A sinking fund is created to replace it by a new model at 25% higher cost after 25 years with a scrap value realization of Rs. 25000. what amount should be set aside every year if the sinking fund investments accumulate at 3.5% compound interest p.a.?

(a) 16,000 (b) 16,500 (c) 16,050 (d) 16,005

10. Raja aged 40 wishes his wife Rani to have Rs. 40 lakhs at his death. If his expectation of life is another 30 years and he starts making equal annual investments commencing now at 3% compound interest p.a. how much should he invest annually?

(a) 84,448 (b) 84,450 (c) 84,449 (d) 84,077

11. Appu retires at 60 years receiving a pension of 14,400 a year paid in half-yearly installments for rest of his life after reckoning his life expectation to be 13 years and that interest at 4% p.a. is payable half-yearly. What single sum is equivalent to his pension?

(a) 1,45,000 (b) 1,44,900 (c) 1,44,800 (d) 1,44,700

Answer

1	2	3	4	5	6	7	8	9	10	11
D	D	A	C	D	C	C	A	C	D	B

LET'S DANGAL WITH ICAI PAST EXAMS QUESTIONS

2006 – Nov

1. Rs. 8,000 becomes Rs. 10,000 in two years at simple interest. The amount that will become Rs. 6,875 in 3 years at the same rate of interest is:

(a) Rs. 4,850 (b) Rs. 5,000 (c) Rs. 5,500 (d) Rs. 5,275

2. The difference between the simple and compound interest on a certain sum for 3 year at 5% p.a. is Rs. 228.75. The compound interest on the sum for 2 years at 5% p.a. is :

(a) Rs. 3,175 (b) Rs. 3,075 (c) Rs. 3,275 (d) Rs. 2,975.

3. Mr. X Invests Rs. 10,000 every year starting from today for next 10 years suppose interest rate is 8% per annum compounded annually. Calculate future value of the annuity:

(Given that $(1 + 0.08)^{10} = 2.15892500$]

(a) Rs. 156454.88 (b) Rs. 144865.625 (c) Rs. 156554.88 (d) None of these

4. The present value of an annuity of Rs. 3,000 for 15 years at 4.5% p.a. C.I. is: [Given that $(1.045)^{15} = 1.935282$]

(a) Rs. 23,809.67 (b) Rs. 32,218.67 (c) Rs. 32,908.67 (d) None of these

2007 - Feb

5. The rate of simple interest on a sum of money is 6% p.a. for first 3 years, 8% p.a. for the next five years and 10% p.a. for the period beyond 8 years. If the simple interest accrued by the sum for a period for 10 years is Rs. 1,560. The sum is :

(a) Rs. 1,500 (b) Rs. 2,000 (c) Rs. 3,000 (d) Rs. 5,000

6. A sum of money doubles itself in 10 years. The number of years it would treble itself is :

(a) 25 years (b) 15 years (c) 20 years (d) None.

7 what time will Rs. 3,90,625 amount to Rs. 4,56,976 at 8% per annum, when the interest is compounded semi-annually? [Given :$(1.04)^4 = 1.16986$]

(a) 2 years (b) 4 years (c) 5 years (d) 7 years

8. A machine can be purchased for Rs. 50,000. Machine will contribute Rs. 12,000 per year for the next five years. Assume borrowing cost is 10% per annum. Determine whether 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

9. How much amount is required to be invested every year so as to accumulate Rs. 3,00,000 at the end of 10 years, if interest is compounded annually at 10%? [Give $(1.1)^{10} = 2.5937$]

(a) Rs. 18,823.65 (b) Rs. 18,828.65 (c) Rs. 18,832.65 (d) Rs. 18,882.65

2007 - May

10. A certain sum of money amounts to Rs. 6,300 in two years and Rs. 7,875 in three years nine months at simple interest. Find the rate of interest per annum:

(a) 20% (b) 18% (c) 15% (d) 10%

11. How long will Rs. 12,000 take to amount to Rs. 14,000 at 5% p.a. converted quarterly? [Given : $(1.0125)^{12.4} = 1.1666$]

(a) 3 years (b) 3.1 years (c) 13.5 years (d) 12.4 years.

12. A company is considering proposal of purchasing a machine either by making full payment of Rs. 4,000 or by leasing it for four years at an annual rate of Rs. 1,250. Which course of action is preferable, if the company can borrow money at 14% compounded annually? [Given : $(1.14)^4 = 1.68896$]

(a) Leasing is preferable (b) Should be purchased (c) No difference (d) None

13. Vipul purchases a car for Rs. 5,50,000. He gets a loan of Rs. 5,00,000 at 15% p.a. from a Bank and balance Rs. 50,000 he pays at the time of purchase. He has to pay the whole amount of loan in 12 equal monthly instalments with interest starting from the end of the first month. The money he has to pay at the end of every month is: [Given $(1.0125)^{12} = 1.16075452$]

(a) Rs. 45,130.43 (b) Rs. 45,230.43 (c) Rs. 45,330.43 (d) None of these

2007 - Aug

14. If Rs. 1,000 be invested at interest rate of 5% and the interest be added to the principal every 10 years, then the number of years in which it will amount to Rs. 2,000 is :

(a) $16\frac{2}{3}$ years (b) $6\frac{1}{4}$ years (c) 16 years (d) $6\frac{2}{3}$ years.

15. The annual birth and death rates per 1000 are 39.4 and 19.4 respectively. The number of years in which the population will be doubled assuming there is no immigration or emigration is :

(a) 35 years (b) 30 years (c) 25 years (d) None of these.

16. The effective rate equivalent to nominal rate of 6% compounded monthly is:

(a) 6.05 (b) 6.16 (c) 6.26 (d) 6.07

17. A company establishes a sinking fund to provide for the payment of Rs. 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) Rs. 6,142 (b) Rs. 6,049 (c) Rs. 6,052 (d) Rs. 6,159

2007 - Nov

18. A person borrows Rs. 5,000 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) Rs. 112.50 (b) Rs. 125 (c) Rs.225 (d) Rs. 167.50

19. A person deposited Rs. 5,000 in a bank. The deposit was left to accumulate at 6% compounded quarterly for the first five years and at 8% compounded semi-annually for the next eight years. The compound amount at the end of 13 years is :

(a) Rs. 12621.50 (b) Rs. 12613.10 (c) Rs. 13613.10 (d) None.

20. Raja aged 40 wishes his wife Rani to have Rs. 40 lakhs at his death. If his expectation of life is another 30 years and he starts making equal annual investments commencing now at 3% compound interest p.a. How much should he invest annually?

(a) Rs. 84,077 (b) Rs. 81,628 (c) Rs. 84,449 (d) Rs. 84,247

2008 – Feb

21. Two equal sums of money were lent at simple interest at 11 % p.a. for $3\frac{1}{2}$ years and $4\frac{1}{2}$ years respectively.

If the difference in interests for two periods was Rs. 412.50, then each sum is:

(a) Rs. 3,250 (b) Rs. 3,500 (c) Rs. 3,750 (d) Rs. 4,350

22. Anshul's father wishes to have Rs. 75,000 in a bank account when his first college expenses begin.

How much amount his father should deposit now at 6.5% compounded annually if Anshul is to start college in 8 years hence from now?

(a) Rs. 45,360 (b) Rs. 46,360 (c) Rs. 55,360 (d) Rs. 48,360.

2008 - Feb

23. A company may obtain a machine either by leasing it for 5 years (useful life) at an annual rent of Rs. 2,000 or by purchasing the machine for Rs. 8,100. If the company can borrow money at 18% per annum, which alternative is preferable?

(a) Leasing (b) Purchasing (c) Can't say (d) None of these

2008 - June

24. 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

25. The difference between compound interest and simple interest on a certain sum for 2 years @ 10% p.a. is Rs. 10. Find the sum :

(a) Rs. 1,010 (b) Rs. 1,095 (c) Rs. 1,000 (d) Rs. 990

26. A machine worth Rs. 4,90,740 is depreciated at 15% on its opening value each year. When its value would reduce to Rs. 2,00,000 :

(a) 5 years 6 months (b) 5 years 7 months (c) 5 years 5 months (d) None.

27. A sinking fund is created for redeeming debentures worth Rs. 5 lacs at the end of 25 years. How much provision needs to be made out of profits each year provided sinking fund investments can earn interest at 4% p.a.?

(a) Rs. 12,006 (b) Rs. 12,040 (c) Rs. 12,039 (d) Rs. 12,035

2008 - Dec

28. If the difference between simple interest and compound interest is Rs. 11 at the rate of 10% for two years, then find the sum.

(a) Rs. 1,200 (b) Rs. 1,100 (c) Rs. 1,000 (d) None of these

29. 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) $A(n, i) = A\left[\frac{(1+i)^n-1}{i(1+i)^n}\right]$

30. Find the numbers of years in which a sum doubles itself at the rate of 8% per annum.

(a) $11\frac{1}{2}$ (b) $12\frac{1}{2}$ (c) $9\frac{1}{2}$ (d) $13\frac{1}{2}$

2009 – June

31. In how many years, a sum will become double at 5% p.a. compound interest.

(a) 14.0 years (b) 14.1 years (c) 14.2 years (d) 14.3 years

32. The time by which a sum of money is 8 times of itself if it doubles itself in 15 years.

(a) 42 years (b) 43 years (c) 45 years (d) 46 years

33. What is the rate of simple interest if a sum of money amounts to Rs. 2,784 in 4 years and Rs. 2,688 in 3 years ?

(a) 1%p.a. (b) 4%p.a. (c) 5% p.a. (d) 8% p.a.

34. A sum amount to Rs. 1,331 at a principal of Rs. 1,000 at 10% compounded annually. Find the time.

(a) 3.31 years (b) 4 years (c) 3 years (d) 2 years

35. Paul borrows Rs. 20,000 on condition to repay it with compound interest at 5% p.a. in annual instalment of Rs. 2,000 each..Find the number of years in which the debt would be paid off.

(a) 10 years (b) 12 years (c) 14 years (d) 15 years

2009 – Dec

36. In how many years, a sum of Rs. 1,000 compounded annually @ 10%, will amount to Rs. 1,331 ?

(a) 6 years (b) 5 years (c) **4** years (d) **3** years

37. The compound interest for a certain sum @ 5% p.a. for first year is Rs. 25. The S-l for the same money @ 5% p.a. for 2 years will be.

(a) Rs. 40 (b) Rs. 50 (c) Rs. **60** (d) **Rs. 70**

38. At what % rate of compound interest (C.i) will a sum of money become 16 times in four years, if interest is being calculated compounding annually:

(a) r = 100% (b) r=10% (c) r = **200%** **(d) r = 20% •**

2010 - June

39. Find the present value of an annuity of Rs. **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) Rs. 7,360 (b) Rs. 8,360 (c) Rs. 12,000 (d) None of these.

40. If the simple interest on a sum of money at 12% p.a. for two years is Rs. 3,600. The compound interest on the same sum for two years at the-same rate is :

(a) Rs. 3,816 (b) Rs. 3,806 (c) Rs. 3,861 (d) Rs. 3,860 .

2010 - Dec

41. The future value of an annuity of Rs. 5,000 is made annually for 8 years at interest rate of 9% compounded annually [Given that $(1.09)^8 = 1.99256$] is

(a) Rs. 55,142.22 (b) Rs. 65,142.22 (c) Rs. 65,532.22 (d) Rs. 57,425.22

42. The effective annual rate of interest corresponding to nominal rate 6% p.a. payable half yearly is

(a) 6.06% (b) 6.07% (c) 6.08% (d) 6.09%

43. The cost of Machinery is Rs. 1,25,000/- If its useful life is estimated to be 20 years and the rate of depreciation of its cost is 10% p.a., then the scrap value of the Machinery is [given that $(0.9)^{20} = 0.1215$]

(a) Rs. 15,187 (b) Rs. 15,400 (c) Rs. 15,300 (d) Rs. 15,250

44. Mr. X invests 'P' amount at Simple Interest rate 10% and Mr. Y invests 'Q' amount at Compound Interest rate 5% compounded annually. At the end of two years both get the same amount of interest, then the relation between two amounts P and Q is given by :

(a) $P = \frac{41Q}{80}$ (b) $P = \frac{41Q}{40}$ (c) $P = \frac{41Q}{100}$ (d) $P = \frac{41Q}{200}$

2011 – June

45. If the difference of S.I and C.I is Rs. 72 at 12% for 2 years. Calculate the amount.

(a) Rs. 8,000 (b) Rs. 6,000 (c) Rs. 5,000 (d) Rs. 7,750.

46. 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

47. By mistake a clerk, calculated the simple interest on principal for 5 months at 6.5% p.a. instead of 6 months at 5.5% p.a. If the error in calculation was Rs. 25.40. The original sum of principal was _____.

(a) Rs. 60,690 (b) Rs. 60,960 (c) Rs. 90,660 (d) Rs. 90,690

2011 – Dec

48. If the Simple Interest on Rs. 1,400 for 3 years is less than the simple interest on Rs.1,800 for the same period by Rs. 80, then the rate of interest is

(a) 5.67% (b) 6.67% (c) 7.20% (d) 5.00%

49. Nominal rate of interest is 9.9% p.a. If interest is Compounded monthly, What will be the effective rate of interest (given $\left(\frac{4033}{4000}\right)^{12} = 1.1036$ (approx))?

(a) 10.36% (b) 9.36% (c) 11.36%' (d) 9.9%

50. The S.I. on a sum of money is $\frac{4}{9}$ of the principal and the no. of years is equal to the rate of interest per annum. Find the rate of interest per annum ?

(a) 5% (b) 20/3% (c) 22/7% (d) 6%

2012 - June

51. Simple interest on Rs. 2,000 for 5 months at 16% p.a. is _____.

(a) Rs. 133.33 (b) Rs. 133.26 (c) Rs. 134.00 (d) Rs. 132.09

2012 - Dec

52. How much investment is required to yield an Annual income of Rs. 420 at 7% p.a. Simple interest.

' (a) Rs. 6,000 (b) Rs. 6,420 (c) Rs. 5,580 (d) Rs. 5,000

53. Mr. **X** invests Rs. 90,500 in post office at 7.5% p.a. simple interest. While calculating the rate was

wrongly taken as 5.7% p.a.

The difference in amounts at maturity is Rs. 9,774. Find the period for which the sum was invested:

(a) 7 years (b) 5.8 years (c) **6** years (d) **8** years

2013 - June

54. The difference between compound and simple interest on a certain sum of money for 2 years at 4% p.a. is Rs. 1. The sum (in Rs.) is:

(a) 625 (b) 630 (c) 640 (d) .635

55. **A** sum of money compounded annually becomes Rs. 1,140 in two years and Rs. 1,710 in three years. Find the rate of interest per annum.

(a) 30% (b) 40% (c) 50% (d) 60%

2013 - Dec

56. On what sum difference between compound interest and simple interest for two years at 7% p.a. interest is Rs. 29.4

(a) Rs. 5,000 (b) Rs. 5,500 (c) Rs. 6,000 (d) Rs. 6,500

57. In what time will a sum of money double its y at 6.25% p.a. simple interest?

(a) 5 years (b) 8 years (c) 12 years (d) 16 years

58. What principal will amount to Rs. 370 in 6 years at 8% p.a. at simple interest?

(a) Rs. 210 (b) Rs. 250 (c) Rs.310 (d) Rs. 350

2014 – June

59. The partners **A** and B together lent Rs. 3,903 at 4% per annum interest compounded annually. After a span of 7 years, A gets the same amount as B gets after 9 years. The share of A in the sum of Rs. 3,903 would have been :

(a) Rs. 1,875 (b) Rs. 2,280 (c) Rs. 2,028 (d) Rs. 2,820

60. If a sum triples in 15 years at simple rate of interest,* the rate of interest per annum will be:

(a) 13.0% (b) 13.3% (c) 13.5% (d) 18.0%

61. How much amount is required to be invested every year as to accumulate Rs. 6,00,000 at the end of 10 years, if interest is compounded annually at 10% rate of interest [Given: $(1.1)^{10} = 2.59374$].

(a) Rs. 37,467 (b) Rs. 37,476 (c) Rs. 37,647 (d) Rs. 37,674

2014 - Dec

62. The future value of an annuity of Rs. 1,000 made annually for 5 years at the interest of 14% compounded annually is: (Given $(1.14)^5 = 1.92541$)

(a) Rs. 5,610 (b) Rs. 6,610 (c) Rs. 6,160 (d) Rs. 5,160

63. A sum of money invested of compound interest doubles itself in four years. It becomes 32 times of itself at the same rate of compound interest in

(a) 12 years (b) 16 years (c) 20 years (d) 24 years

64. A certain sum of money was invested at simple rate of interest for three years. If the same has been invested at a rate that was seven percent higher, the interest amount would have been Rs. 882 more. The amount of sum invested is:

(a) Rs. 12,600 (b) Rs. 6,800 (c) Rs. 4,200 (d) Rs. 2,800

2015 – June

65. A sum of money doubles itself in 8 years at simple interest. The number of years it would triple itself is _____.

(a) 20 years (b) 12 years (c) **16** years (d) None of these.

66. A sum of Rs. 44,000 is divided into three parts such that the corresponding interest earned after 2 years, 3 years and 6 years may be equal. If the rates of simple interest are 6% p.a., 8% p.a. and 6% p.a. respectively, then the smallest part of the sum will be:

(a) Rs. 4,000 (b) Rs. 8,000 (c) Rs. 10,000 (d) Rs. 12,000

2015 – Dec

67. Suppose your parent decides to open a PPF (Public Provident Fund) account in a bank towards your name with Rs. 10,000 every year starting from today for next 15 years. When you receive and get 8.5% per annum interest rate compounded annually. What is the present value of this annuity? (Give Ans. in Rs. without any fraction.) (Given P (15,0.085) = 8.304236576)

(a) 83,042 (b) 1,66,084 (c) 93,042 (d) 8,30,423

68. In how many years will a sum of money become four times at 12% p.a. simple interest?

(a) 18 years (b) 21 years (c) 25 years (d) 28 years

69. The simple interest for a certain sum for 2 years at 10% per annum is Rs. 90. The corresponding compound interest is (In Rs.):

(a) 99 (b) 95.60 (c) 94.50 (d) 108

2016 - June

70. Mr. X bought an electronic item for Rs. 1,000. What would be the future value of the same item after 2 years, if the value is compounded semi annually at 22% per annum?

(a) Rs. 1488.40 (b) Rs. 1518.07 (c) Rs. 2008.07 (d) Rs. 2200.00

71. If an amount is kept at simple interest, it earns an interest of Rs. 600 in first two years but when kept at compound interest it earns an interest of Rs. 660 for the same period, then the rate of interest and principal amount respectively are:

(a) 20%, Rs. 1,200 (b) 10%, Rs. 1,200 (c) 2Q%, Rs. 1,500 (d) 10%, Rs. 1,500

72. The sum invested at 4% per annum compounded Semiannually amounts to Rs. 7,803 at the end of one year, is:

(a) Rs. 7,000 (b) Rs. 7,500 (c) Rs. 7,225 (d) Rs. 8,000

2016 - Dec

73. A compound interest on a sum for 2 years is Rs. 30 more than the simple interest at the rate of 5% per annum then the sum is:

(a) Rs. 11,000 (b) Rs. 13,000 (c) Rs. 12,000 (d) Rs. 15,000

74. A person lends Rs. 6,000 for 4 years and Rs. 8,000 for 3 years at simple interest. If he gets Rs. 2,400 as total interest, the rate of interest is:

(a) 5% (b) 4% (c) 6% (d) 7%

75. The future value of an annuity of Rs. 1,500 made annually for five years at interest rate 10% compounded annually is (Given that $(1.1)^5 = 1.61051$):

(a) Rs. 9517.56 (b) Rs. 9157.65 (c) Rs. 9715.56 .. (d) Rs. 9175.65

2017 – June

76. The difference between the Compound interest and Simple interest at 10% per annum for 4 years on Rs. 10,000 is Rs. _____.

(a) 650 (b) 640 (c) 641 (d) 600

77. How much amount is required to be invested every year as to accumulate Rs. 7,96,870 at the end of 10 years, if interest compounded annually at 10% given that A(10, 0.1) = 15.9374?

(a) Rs. 40,000 (b) Rs. 4,50,000 (c) Rs. 48,000 (d) Rs. 50,000

ANSWERS

1	B	11	B	21	C	31	D	41	A	51	A	61	C	71	C
2	B	12	A	22	A	32	C	42	D	52	A	62	B	72	B
3	A	13	A	23	A	33	B	43	A	53	C	63	C	73	C
4	B	14	A	24	A	34	C	44	A	54	A	64	C	74	A
5	B	15	A	25	C	35	D	45	C	55	C	65	C	75	B
6	C	16	B	26	A	36	D	46	C	56	C	66	B	76	C
7	A	17	B	27	A	37	B	47	B	57	D	67	C	77	D
8	B	18	A	28	B	38	A	48	B	58	B	68	C		
9	A	19	B	29	A	39	A	49	A	59	C	69	C		
10	A	20	B	30	B	40	A	50	B	60	B	70	B		

CH - 5

BASIC CONCEPTS OF PERMUTATION & COMBINATION

FACTORIAL

Ex.: 1

Example 4: Find n if $\lfloor n+1 = 30 \lfloor n-1$

Solution: $\lfloor n+1 = 30 \lfloor n-1 \Rightarrow (n+1).n \lfloor n-1 = 30 \lfloor n-1$

PERMUTATIONS

Ex.2 *How many three letters words can be formed using the letters of the words*

(a) SQUARE and (b) HEXAGON?

Sol. a. Since the word 'SQUARE' consists of 6 different letters, the number of permutations of choosing 3 letters out of six equals ${}^{6}P_{3} = 6 \times 5 \times 4 = 120$.

b. Since the word 'HEXAGON' contains 7 different letters, the number of permutations is ${}^{7}P_{3} = 7 \times$

Ex 3.: *First, second and third prizes are to be awarded at an engineering fair in which 13 exhibits have been entered. In how many different ways can the prizes be awarded?*

Sol.

Ex 4.: *In how many different ways can 3 students be associated with 4 chartered accountants, assuming that each chartered accountant can take at most one student?*

Sol. This equals the number of permutations of choosing 3 persons out of 4. Hence , the answer is ${}^{4}P =$

$4 \times 3 \times 2 = 24$.

Ex. 4: *If six times the number permutations of n things taken 3 at a time is equal to seven times the number of permutations of (n – 1) things taken 3 at a time, find n.*

Sol.

Ex. 5: *Compute the sum of 4 digit numbers which can be formed with the four digits 1, 3, 5, 7, if each digit is used only once in each arrangement.*

Sol. The number of arrangements of 4 different digits taken 4 at a time is given by ${}^4P_4 = 4! = 24$. All the four digits will occur equal number of times at each of the positions, namely ones, tens, hundreds, thousands.

Thus, each digit will occur $24 / 4 = 6$ times in each of the positions. The sum of digits in one's position will be $6 \times (1 + 3 + 5 + 7) = 96$. Similar is the case in ten's, hundred's and thousand's places.

Therefore, the sum will be $96 + 96 \times 10 + 96 \times 100 + 96 \times 1000 = 1{,}06{,}656$.

Ex. 6: *When Dr. Ram arrives in his dispensary, he finds 12 patients waiting to see him. If he can see only*

one patient at a time, find the number of ways, he can schedule his patients (a) if they all want their turn, and (b) if 3 leave in disgust before Dr. Ram gets around to seeing them.

Sol.

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 5 (A)

Choose the most appropriate option (a) (b) (c) or (d)

1. ${}^4P_3$ is evaluated as

   a) 43 b) 34 c) 24 d) None of these

2. ${}^4P_4$ is equal to

   a) 1 b) 24 c) 0 d) none of these

3. ⌊7 is equal to

   a) 5040 b) 4050 c) 5050 d) none of these

4. ⌊0 is a symbol equal to

   a) 0 b) 1 c) Infinity d) none of these

5. In ${}^nP_r$, n is always

   a) an integer b) a fraction c) a positive integer d) none of these

6. In ${}^nP_r$, the restriction is

   a) $n > r$ b) $n \geq r$ c) $n \leq r$ d) none of these

7. In ${}^nP_r = n\ (n-1)\ (n-2)$ .....(n–r+1), the number of factors is

	a) n b) r−1 c) n−r d) r
8.	${}^{n}P_{r}$ can also written as
	a) $\frac{\lfloor n}{\lfloor n-r}$ b) $\frac{\lfloor n}{\lfloor r \lfloor n-r}$ c) $\frac{\lfloor r}{\lfloor n-r}$ d) none of these
9.	If ${}^{n}P_{4} = 12 \times {}^{n}P_{2}$, the n is equal to
	a) −1 b) 6 c) 5 d) none of these
10.	If . nP3 : nP2 = 3 : 1, then n is equal to
	a) 7 b) 4 c) 5 d) none of these
11.	m+nP2 = 56, m−nP2 = 30 then
	a) m =6, n = 2 b) m = 7, n= 1 c) m=4,n=4 d) none of these
12.	if 5Pr = 60, then the value of r is
	a) 3 b) 2 c) 4 d) none of these
13.	If ${}^{n1+n2}P_{2} = 132$, ${}^{n1-n2}P_{2} = 30$ then,
	a) n_1=6,n_2=6 b) $n_1 = 10, n_2 = 2$ c) $n_1 = 9, n_2 = 3$ d) none of these
14.	The number of ways the letters of the word `COMPUTER' can be rearranged is
	a) 40,320 b) 40,319 c) 40,318 d) none of these
15.	The number of arrangements of the letters in the word `FAILURE', so that vowels are always
	coming together is
	a) 576 b) 575 c) 570 d) none of these
16.	10 examination papers are arranged in such a way that the best and worst papers never come
	together. The number of arrangements is

a) $9\underline{|8}$ b) $\underline{|10}$ c) $8\underline{|9}$ d) none of these

17. n articles are arranged in such a way that 2 particular articles never come together. The number of such arrangements is

a) $(n-2)\,\underline{|n-1}$ b) $(n-1)\,\underline{|n-2}$ c) $\underline{|n}$ d) none of these

18. If 12 school teams are participating in a quiz contest, then the number of ways the first, second and third positions may be won is

a) 1,230 b) 1,320 c) 3,210 d) none of these

19. The sum of all 4 digit number containing the digits 2, 4, 6, 8, without repetitions is

a) 1,33,330 b) 1,22,220 c) 2,13,330 d) 1,33,320

20. The number of 4 digit numbers greater than 5,000 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

21. 4 digit numbers to be formed out of the figures 0, 1, 2, 3, 4 (no digit is repeated) then number of such numbers is

(a) 120 (b) 20 (c) 96. (d) none of these

22. The number of ways the letters of the word `TRIANGLE' to be arranged so that the word 'angle' will be always present is

(a) 20 (b) 60 (c) 24 (d) 32

23. If the letters word 'DAUGHTER' are to be arranged so that vowels occupy the odd places, then number of different words are

(a) 2,880 (b) 676 (c) 625 (d) 576

PERMUTATION WITH RESTRICATIONS

Ex. 1: There are 6 books on Economics, 3 on Mathematics and 2 on Accountancy. In how many ways can these be placed on a shelf if the books on the same subject are to be together?

Sol.:

Ex. 2: How many different numbers can be formed by using any three out of five digits 1, 2, 3, 4, 5, no digit being repeated in any number?

How many of these will (i) begin with a specified digit? (ii) begin with a specified digit and end with another specified digit?

Sol.: Here we have 5 different digits and we have to find out the number of permutations of them 3 at a time. Required number is ${}^5P_3 = 5.4.3 = 60$.

(i) If the numbers begin with a specified digit, then we have to find the number of Permutations of the remaining 4 digits taken 2 at a time. Thus, desire number is ${}^4P_2 = 4.3 = 12$.

(ii) Here two digits are fixed; first and last; hence, we are left with the choice of finding the number of permutations of 3 things taken one at a time i.e., ${}^3P_1 = 3$.

Ex. 3: How many four digit numbers can be formed out of the digits 1,2,3,5,7,8,9, if no digit is repeated in

any number? How many of these will be greater than 3000?

Sol.:

Ex. 4: Find the total number of numbers greater than 2000 that can be formed with the digits 1, 2, 3, 4, 5 no digit being repeated in any number.

Sol.:

Ex. 5: *There are 6 students of whom 2 are Indians, 2 Americans, and the remaining 2 are Russians. They have to stand in a row for a photograph so that the two Indians are together, the two Americans are together and so also the two Russians. Find the number of ways in which they can do so.*

Sol.: The two Indians can stand together in ${}^{2}P_{2} = 2! = 2$ ways. So is the case with the two Americans and the two Russians.

Now these 3 groups of 2 each can stand in a row in ${}^{3}P_{3} = 3 \times 2 = 6$ ways. Hence by the generalized fundamental principle, the total number of ways in which they can stand for a photograph under given conditions is

$6 \times 2 \times 2 \times 2 = 48$

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 5 (B)

Choose the most appropriate option (a) (b) (c) or (d)

1. The number of ways in which 7 girls form a ring is

(a) 700 (b) 710 (c) 720 (d) none of these

2. The number of ways in which 7 boys sit in a round table so that two particular boys may sit together is

(a) 240 (b) 200 (c) 120 (d) none of these

3. If 50 different jewels can be set to form a necklace then the number of ways is

(a) $\frac{1}{2}\lfloor 50$ (b) $\frac{1}{2}\lfloor 49$ (c) $\lfloor 49$ (d) none of these

4. 3 ladies and 3 gents can be seated at a round table so that any two and only two of the ladies sit together. The number of ways is

(a) 70 (b) 27 (c) 72 (d) none of these

5. The number of ways in which the letters of the word `DOGMATIC' can be arranged is

(a) 40,319 (b) 40,320 (c) 40,321 (d) none of these

6. The number of arrangements of 10 different things taken 4 at a time in which one particular thing always occurs is

(a) 2015 (b) 2016 (c) 2014 (d) none of these

7. The number of permutations of 10 different things taken 4 at a time in which one particular thing never occurs is

(a) 3,020 (b) 3,025 (c) 3,024 (d) none of these

8. Mr. X and Mr. Y enter into a railway compartment having six vacant seats. The number of ways in which they can occupy the seats is

(a) 25 (b) 31 (c) 32 (d) 30

9. The number of numbers lying between 100 and 1000 can be formed with the digits 1, 2, 3, 4, 5, 6, 7 is

(a) 210 (b) 200 (c) 110 (d) none of these

10. The number of numbers lying between 10 and 1000 can be formed with the digits 2,3,4,0,8,9 is

(a) 124 (b) 120 (c) 125 (d) none of these

11. In a group of boys the number of arrangement of 4 boys is 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

12. The value of $\sum_{r=1}^{10} r.r_{P_r}$ is

(a) $^{11}P_{11}$ (b) $^{11}P_{11} - 1$ (c) $^{11}P_{11} + 1$ (d) none of these

13. The total number of 9 digit numbers of different digits is

(a) $10\underline{|9}$ (b) $8\underline{|9}$ (c) $9\underline{|9}$ (d) none of these

14. 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) $(\llcorner 3)^2$ (d) none of these

15. There are 5 speakers A, B, C, D and E. The number of ways in which A will speak always before B is

(a) 24 (b) $\llcorner 4 \times \llcorner 2$ (c) $\llcorner 5$ (d) none of these

16. There are 10 trains plying between Calcutta and Delhi. The number of ways in which a person can go from Calcutta to Delhi and return by a different train is

(a) 99 (b) 90 (c) 80 (d) none of these

17. The number of ways in which 8 sweats of different sizes can be distributed among 8 persons of different ages so that the largest sweat always goes to be younger assuming that each one of then gets a sweat is

(a) $\llcorner 8$ (b) 5040 (c) 5039 (d) none of these

18. The number of arrangements in which the letters of the word `MONDAY' be arranged so that the words thus formed begin with M and do not end with N is

(a) 720 (b) 120 (c) 96 (d) none of these

19. The total number of ways in which six '+' and four '–' signs can be arranged in a line such that no two '–' signs occur together is

(a) ⌊7 / ⌊3 (b) ⌊6 × ⌊7 / ⌊3 (c) 35 (d) none of these

20. The number of ways in which the letters 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.

21. 5 persons are sitting in a round table in such way that Tallest Person is always on the right–side of the shortest person; the number of such arrangements is

(a) 6 (b) 8 (c) 24 (d) none of these

COMBINATIONS

Ex. 1: *Find the number of different poker hands in a pack of 52 playing cards.*

Sol.: This is the number of combinations of 52 cards taken five at a time. Now applying the formula,

$${}^{52}C_5 = 52!/5!\,(52-5)! = 52!/5!\,47! = \frac{52\times51\times50\times49\times48\times47!}{5\times4\times3\times2\times1\times47!}$$

Ex. 2: *A committee is to be formed of 3 persons out of 12. Find the number of ways of forming such a committee.*

Sol.:

Ex. 3: *A building contractor needs three helpers and ten men apply. In how many ways can these selections take place?*

Sol.: There is no regard for order in this problem. Hence, the contractor can select in any of ${}^{10}C_3$ ways i.e.,

$(10\times9\times8)\,/\,(3\times2\times1) = 120$ ways.

Ex. 4: *In each case, find n:*

(a) 4. ${}^{n}C_2 = {}^{n+2}C_3$ *(b) ${}^{n+2}C_n = 45$.*

Sol.: (a) We are given that $4.\,{}^{n}C_2 = {}^{n+2}C_3$. Now applying the formula,

$$4\times\frac{n!}{2!(n-2)!} = \frac{(n+2)!}{3!(n+2-3)!}$$

Or, $\frac{4\times n.(n-1)(n-2)!}{2!(n-2)!} = \frac{(n+2)(n+1).n.(n-1)!}{3!(n-1)!}$

$4n(n-1)\,/2 = (n+2)\,(n+1)n\,/3!$

or, $4n(n-1)\,/\,2 = (n+2)(n+1)n\,/3\times2\times1$

	or, $12(n-1)=(n+2)(n+1)$
	or, $12n-12 = n^2 + 3n + 2$
	or, $n^2 - 9n + 14 = 0$.
	or, $n^2 - 2n - 7n + 14 = 0$.
	or, $(n-2)(n-7) = 0$
	$\therefore n=2$ or 7.
	(b) We are given that ${}^{n+2}C_n = 45$. Applying the formula,
	$(n+2)!/\{n!(n+2-n)!\} = 45$
	or, $(n+2)(n+1)\,n! / n!\,2! = 45$
	or, $(n+1)(n+2) = 45\times 2! = 90$
	or, $n^2+3n-88 = 0$
	or, $n^2+11n-8n-88 = 0$
	or, $(n+11)(n-8) = 0$
	Thus, n equals either – 11 or 8. But negative value is not possible. Therefore we conclude that n=8.
Ex. 5:	*A box contains 7 red, 6 white and 4 blue balls. How many selections of three balls can be made so*
	that (a) all three are red (b) none is red (c) one is of each colour?
Sol.:	(a) All three balls will be of red colour if they are taken out of 7 red balls and this can be done in
	${}^7C_3 = 7! / 3!(7-3)!$
	$= 7! / 3!4! = 7\times6\times5\times4! / (3\times2\times4!) = 7\times6\times5 / (3\times2) = 35$ ways
	Hence, 35 selections (groups) will be there such that all three balls are red.

(b) None of the three will be red if these are chosen from (6 white and 4 blue balls) 10 balls and this can be done in $^{10}C_3 = 10!/\{3!(10-3)!\} = 10! / 3!7!$

$= 10\times9\times8\times7! / (3\times2\times1\times7!) = 10\times9\times8 /(3\times2) = 120$ ways.

Hence, the selections (or groups) of three such that none is a red ball are 120 in number. One red ball can be chosen from 7 balls in $^{7}C_1 = 7$ ways. One white ball can be chosen from 6 white balls in $^{6}C_1$ ways. One blue ball can be chosen from 4 blue balls in $^{4}C_1 = 4$ ways. Hence, by generalized fundamental principle, the number of groups of three balls such that one is of each colour $= 7\times6\times4 =$ 168 ways.

Ex. 6: *If $^{10}P_r$ = 6,04,800 and $^{10}C_r$ = 120; find the value of r*

Sol.:

Ex. 7: *Find r if $^{18}C_r = {}^{18}C_{r+2}$*

Sol.:

Ex. 8: If ${}^{28}C_{2r} : {}^{24}C_{2r-4} = 225 : 11$, find r.

Sol.

Ex. 9: Find x if ${}^{12}C_5 + 2\,{}^{12}C_4 + {}^{12}C_3 = {}^{14}C_x$

Sol.: $\text{L.H.S} = {}^{12}C5 + 2\,{}^{12}C_4 + {}^{12}C_3$

$= {}^{12}C_5 + {}^{12}C_4 + {}^{12}C_4 + {}^{12}C_3$

$= {}^{13}C_5 + {}^{13}C4$

$= {}^{14}C_5$

Also ${}^{n}C_r = {}^{n}C_{n-r}$.

Therefore ${}^{14}C_5 = {}^{14}C_{14-5} = {}^{14}C_9$

Hence, L.H.S $= {}^{14}C_5 = {}^{14}C_9 = {}^{14}C_x$

= R.H.S by the given equality

This implies, either x = 5 or x = 9.

Ex. 10: *How many different permutations are possible from the letters of the word `CALCULUS'?*

S. Hence , by result (I), the number of different permutations from the letters of the word `CALCULUS'

taken all at a time

$= \frac{8!}{2!2!2!1!1!}$

$= \frac{8\times7\times6\times5\times4\times3\times2}{2\times2\times2} = 7 \times 6 \times 5 \times 4 \times 3 \times 2 = 5{,}040$

Ex. 11: *An examination paper with 10 questions consists of 6 questions in Algebra and 4 questions in Geometry. At least one question from each section is to be attempted. In how many ways can this be done?*

Sol.:

Ex. 12: *A man has 5 friends. In how many ways can he invite one or more of his friends to dinner?*

Sol.:

Ex. 13: *There are 7 men and 3 ladies. Find the number of ways in which a committee of 6 can be formed of them if the committee is to include atleast two ladies?*

Sol.:

Ex. 14: *Find the number of ways of selecting 4 letters from the word `EXAMINATION'.*

Sol.:

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 5 (C)

Choose the most appropriate option (a, b, c or d)

1. The value of ${}^{12}C_4 + {}^{12}C_3$ is

(a) 715 (b) 710 (C) 716 (d) none of these

2. If ${}^{n}p_r = 336$ and ${}^{n}C_r = 56$, then n and r will be

	(a) (3, 2)	(b) (8, 3)	(c) (7, 4)	(d) none of thes
3.	If ${}^{18}C_r = {}^{18}C_{r+2}$, the value of ${}^{r}C_5$ is			
	(a) 55	(b) 50	(c) 56	(d) none of these
4.	If ${}^{n}c_{r-1} = 56$, ${}^{n}c_r = 28$ and ${}^{n}c_{r+1} = 8$, then r is equal to			
	(a) 8	(b) 6	(c) 5	(d) none of these
5.	A person has 8 friends. The number of ways in which he may invite one or more of them to a dinner			
	is.			
	(a) 250	(b) 255	(c) 200	(d) none of these
6.	The number of ways in which a person can chose one or more of the four electrical appliances : T.V,			
	Refrigerator, Washing Machine and a cooler is			
	(a) 15	(b) 25	(c) 24	(d) none of these
7.	If ${}^{n}c_{10} = {}^{n}c_{14}$, then ${}^{25}c_n$ is			
	(a) 24	(b) 25	(c) 1	(d) none of these
8.	Out of 7 gents and 4 ladies a committee of 5 is to be formed. The number of committees such that			
	each committee includes at least one lady is			
	(a) 400	(b) 440	(c) 441	(d) none of these
9.	If ${}^{28}c_{2r} : {}^{24}c_{2r-4} = 225 : 11$, then the value of r is			
	(a) 7	(b) 5	c) 6	(d) none of these
10.	The number of diagonals in a decagon is			
	(a) 30	b) 35	(c) 45	(d) none of these
11.	There are 12 points in a plane of which 5 are collinear. The number of triangles is			

	(a) 200	(b) 211	(c) 210	(d) none of these
12.	The number of straight lines obtained by joining 16 points on a plane, no three of them being on the same line is			
	(a) 120	(b) 110	(c) 210	(d) none of these
13.	At an election there are 5 candidates and 3 members are to be elected. A voter is entitled to vote for any number of candidates not greater than the number to be elected. The number of ways a voter choose to vote is			
	(a) 20	(b) 22	(c) 25	(d) none of these
14.	Every two persons shakes hands with each other in a party and the total number of hand shakes is 66. The number of guests in the party is			
	(a) 11	(b) 12	(c) 13	(d) 14
15.	The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines is			
	(a) 6	(b) 18	(c) 12	(d) 9
16.	The number of ways in which 12 students can be equally divided into three groups is			
	(a) 5775	(b) 7575	(c) 7755	(d) none of these
17.	The number of ways in which 15 mangoes can be equally divided among 3 students is			
	(a) $\lfloor\underline{15} / \lfloor\underline{(5)}^4$	(b) $\lfloor\underline{15} / \lfloor\underline{(5)}^3$	(c) $\lfloor\underline{15} / \lfloor\underline{(5)}^2$	(d) none of these
18.	8 points are 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

19. A committee of 3 ladies and 4 gents is to be formed out of 8 ladies and 7 gents. Mrs. X refuses to serve in a committee in which Mr. Y is a member. The number of such committees is

(a) 1530 (b) 1500 (c) 1520 (d) 1540

20. If ${}^{500}C_{92} = {}^{499}C_{92} + {}^{n}C_{91}$ then n is

(a) 501 (b) 500 (c) 502 (d) 499

21. The Supreme Court has given a 6 to 3 decision upholding a lower court; the number of ways it can give a majority decision reversing the lower court is

(a) 256 (b) 276 (c) 245 (d) 226.

22. Five bulbs of which three are defective are to be tried in two bulb points in a dark room. Number of trials the room shall be lighted is

(a) 6 (b) 8 (c) 5 (d) 7.

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 5(D)

Choose the appropriate option (a, b ,c or d)

1. The letters of the words `CALCUTTA' and `AMERICA' are arranged in all possible ways. The ratio of the number of there arrangements is

(a) 1:2 (b) 2:1 (c) 2:2 (d) none of these

2. The ways of selecting 4 letters from the word `EXAMINATION' is

(a) 136 (b) 130 (c) 125 (d) none of these

3. 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) $4950 \times \llcorner 7!$ (d) none of these

4. ~~Eight guests have to be seated 4 on each side of a long rectangular table.2 particular guests desire to sit on one side of the table and 3 on the other side. The number of ways in which the sitting arrangements can be made is~~

~~(a) 1732 (b) 1728 (c) 1730 (d) 1278.~~

5. A question paper contains 6 questions, each having an alternative. The number of ways an examine can answer one or more questions is

(a) 720 (b) 728 (c) 729 (d) none of these

6. ${}^{51}c_{31}$ is equal to

(a) ${}^{51}c_{20}$ (b) $2.{}^{50}c_{20}$ (c) $2.{}^{45}c_{15}$ (d) none of these

7. The number of words that can be made by rearranging the letters of the word APURNA so that vowels and consonants appear alternate is

(a) 18 (b) 35 (c) 36 (d) none of these

8. The number of arrangement of the letters of the word `COMMERCE' is

(a) $\underline{|8}$ (b) $\underline{|8} / (\underline{|2}\underline{|2}\underline{|2})$ (c) 7 ! (d) none of these

9. ~~A candidate is required to answer 6 out of 12 questions which are divided into two groups containing 6 questions in each group. He is not permitted to attempt not more than four from any~~

~~group. The number of choices are.~~

~~(a) 750 (b) 850 (c) 800 (d) none of these~~

10. ~~The results of 8 matches (Win, Loss or Draw) are to be predicted. The number of different forecasts containing exactly 6 correct results is~~

~~(a) 316 (b) 214 (c) 112 d) none of these~~

11. 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

12. ~~The number of different factors the number 75,600 has is~~

~~(a) 120 (b) 121 (c) 119 (d) none of these~~

13. The number of 4 digit numbers formed with the digits 1, 1, 2, 2, 3, 4 is

(a) 100 (b) 101 (c) 201 (d) none of these

14. The number of ways a person can contribute to a fund out of 1 ten-rupee note, 1 five rupee note, 1 two-rupee and 1 one rupee note is

(a) 15 (b) 25 (c) 10 (d) none of these

15. The number of ways in which 9 things can be divided into twice groups containing 2,3, and 4 things respectively is

(a) 1250 (b) 1260 (c) 1200 (d) none of these

16. $^{(n-1)}P_r + r.^{(n-1)}P_{(r-1)}$ is equal to

(a) ^nC_r (b) $\lfloor n / (\lfloor r \lfloor n-r)$ (c) ^nP_r (d) none of these

17. ∟2n can be written as

(a) $2^n \{ 1.3.5....(2n-1)\} \lfloor n$ (b) $2^n \lfloor n$ (c) $\{1.3.5.....(2n-1)\}$ (d) none of these

18. The number of even numbers greater than 300 can be formed with the digits 1, 2, 3, 4, 5 without repetition is

(a) 110 (b) 112 (c) 111 (d) none of these

19. 5 letters are written and there are five letter-boxes. The number of ways the letters can be dropped into the boxes, are in each

(a) 119 (b) 120 (c) 121 (d) none of these

20. ${}^nC_1 + {}^nC_2 + {}^nC_3 + {}^nC_4 + ...+ {}^nC_n$ equals

(a) $2^n - 1$ (b) 2^n (c) $2^n + 1$ (d) none of these

ANSWERS

Exercise 5(A)

1	2	3	4	5	6	7	8	9	10
C	b	a	b	c	B	d	a	b	c
11	12	13	14	15	16	17	18	19	20
B	b	c	b	a	C	a	b	d	a
21	22	23							
C	c	a							

Exercise 5 (B)

1	2	3	4	5	6	7	8	9	10
C	a	b	c	b	B	c	d	a	c
11	12	13	14	15	16	17	18	19	20

C	b	c	b	a	B	b	c	c	a
21									
A									

Exercise 5 (C)

1	2	3	4	5	6	7	8	9	10
A	b	c	b	b	A	b	c	a	b
11	12	13	14	15	16	17	18	19	20
C	a	c	b	b	A	b	c	d	d
21	22								
A	d								

Exercise 5 (D)

1	2	3	4	5	6	7	8	9	10
B	a	c	b	b	A	c	B & c	b	c
11	12	13	14	15	16	17	18	19	20
B	c	d	a	b	C	a	c	b	a

"KAR LO PAST APNI MUTHI ME"

Past Exam Questions

2006 – Nov

[1] The number of triangles that can be formed by choosing the vertices from a set of 12 points, seven of which lie on the same straight line, is:

(a) 185 (b) 175 (c) 115 (d) 105

[2] A code word is to consist of two English alphabets followed by two distinct numbers between 1 and 9. How many such code words are there?

(a) 6,15,800 . (b) 46,800 (c) 7,19,500 (d) 4,10,800

[3] A boy has 3 library tickets and 8 books of his interest in the library of these 8, he does not want to borrow Mathematics part-ll unless Mathematics part-1 is also borrowed? In how many ways can he choose the three books to be borrowed?

(a) 41 (b) 51 (c) 61 (d) 71

2007 – Feb

[4] An examination paper consists of 12 questions divided into two parts A and B. Part A contains 7 questions and part **B** contains 5 questions. A candidate is required to attempt 8 questions selecting at least 3 from each part. In how many maximum ways can the candidate select the questions?

(a) 35 (b) 175 (c) 210 (d) 420

[5] A Supreme Court Bench consists of 5 judges. In how many ways, the bench can give a majority division?

(a) 10 (b) 5 (c) **15** (d) **16**

[6] Given : P (7, k) = 60 P(7, k - 3). Then:

(a) k = 9 (b) k = 8 (c) k = **5** (d) k = **0**

[7] The number of ways in which n books can be arranged on a shelf so that two particular books are not together is :

(a) (n - 2) × (n - 1)! (b) (n - 2) × (n + 1)!

(c) (n - 1) × (n + 1)! (d) (n - 2) × (n + 2)!

2007 – May

[8] In how many ways can the letters of the word FAILURE be arranged so that the consonants may occupy only odd positions?

(a) 576 (b) 476 (c) 376 (d) 276

[9] Five bulbs-of which three are defective are to be tried in two lights-points in a dark-room. In how many trials the room shall be lighted?

(a) 10 (b) 7 (c) 3 (d) None of these

[10] In how many ways can a party of 4 men and 4 woman be seated at a circular table, so that no two woman are adjacent?

(a) 164 (b) 174 (c) 144 (d) 154

[11] The value of $\sum_{r=1}^{5} {}^{5}C_r$ is :

(a) 29 (b) 31 (c) 35 (d) 26

2007 – Aug

[12] If ${}^{6}P_r = 24\ {}^{6}C_r$, then find f:

(a) 4 (b) 6 (c) 2 (d) 1

[13] Find the number of combinations of the letters of the word COLLEGE taken four together:

(a) 18 (b) 16 . (c) 20 (d) 26

[14] How many words can be formed with the letters of the word 'ORIENTAL so that A and E always occupy odd places:

(a) 540 (b) 8640 (c) 8460 (d) 8450

[15] If ${}^{1000}C_{98} = {}^{999}C_{97} +$, find x :

(a) 999 (b) 998 (c) 997 (d) 1000

2007 – Nov

[16] How many numbers greater than a million can be formed with the digits 4, 5, 5, 0, 4, 5, 3?

(a) 260 (b) 360 (c) 280 (d) 380

[17] A building contractor needs three helpers out of ten men supply. In how many ways can these selections take place?

(a) 36 (b) 15 (c) 150 (d) 120

2008 – Feb

[18] There are three blue balls, four red balls and five green balls. In how many ways can they be arranged in a row?

(a) 26,720 (b) 27,720 (c) 27,820 (d) 26,620

[19] **If** C(n, r): C(n, r + 1) = 1 : 2 and C (n, r + 1): C (n, r + 2) = 2:3, determine the value of n and r:

(a) (14, 4) (b) (12,4) (c) (14,6) (d) None

2008 – June

[20] Six seats of articled clerks are vacant in a 'Chartered Accountant Firm'. How many different batches of candidates can be chosen out of ten candidates?

(a) 216 (b) 210 (c) 220 (d) None

[21] Six persons A, B, C, D, E and F are to be seated at a circular table. In how many ways can this be done, if A must always have either B or C on his right and B must always have either C or D on his right?

(a) 3 (b) 6 (c) 12 (d) 18

2008 – Dec

[22] If ${}^{n}P_{r} = {}^{n}P_{r+1}$ and ${}^{n}C_{r} = {}^{n}C_{r-1}$ then find the value of 'n'

(a) 2 (b) 3 (c) 4 (d) 5

[23] How many six digit telephone numbers can be formed by using 10 distinct digits?

(a) 10^{6} (b) 6^{10} (c) ${}^{10}C_{6}$ (d) ${}^{10}P_{6}$

[24] In how many ways a committee of 6 members can be formed from a group of 7 boys and 4 girls having at least 2 girls in the committee.

(a) 731 (b) 137 (c) 371 (d) 351

2009 – June

[25] Number of ways of painting a face of a cube by 6 colours is ____.

(a) 36 (b) 6 (c) 24 (d) 1

[26] If _____ ^{18} Cr = ^{18} Cr + 2 find the value of ${}^{r}C_{5}$.

(a) 55 (b) 50 (c) 56 (d) None of these

[27] 7 books are to be. arranged in such a way so that two particular books are always at first and last place. Final the number of arrangements.

(a) 60 (b) .120 (c) 240 (d) 480

[28] Find the number of arrangements in which the letters of the word 'MONDAY' be arranged so that the words thus formed begin with 'M' and do not end with 'N'.

(a) 720 (b) 120 (c) 96 (d) None.

[29] In how many ways can 17 billiard balls be arranged if 7 of them are black, 6 red and 4 white ?

(a) 4084080 (b) 1 (c) 8048040 (d) None of these

2009 - Dec

[30] $(n + 1)! = 20 (n - 1)!$, find n

(a) 6 (b) 5 (c) 4 (d) 10

[31] Out of 4 gents and 6 ladies, a committee is to be formed find the number of ways the committee can be formed such that it comprises of at least 2 gents and at least the number of ladies should be double of gents.

(a) 94 (b) 132 (c) 136 (d) 104

[32] Six points are on a circle. The number of quadrilaterals that can be formed are:

(a) 30 (b) 360 (c) 15 (d) None of the above

2010 – June

[33] The number of ways of arranging 6 boys and 4 girls in a row so that all 4 girls are together is :

(a) 6!. 4! (b) 2 (7!.,4!) (c) 7I.4! (d) 2. (6!. 4!)

[34] How many numbers not exceeding 1000 can be made from the digits 1,2, 3, 4, 5, 6, 7, 8, 9 if repetition is not allowed.

(a) 364 (b) 585 (c) 728 (d) 819

2010 – Dec

[35] A garden having 6 tall trees in a row. In how many ways 5 children stand, one in a gap between the trees in order to pose for a photograph ?

(a) 24 (b) 120 (c) 720 (d) 30

[36] ${}^{15}C_3 + {}^{15}C_{13}$ is equal to:

(a) 16_{c_3} (b) $30_{c_{16}}$ (c) $15_{c_{16}}$ (d) $15_{c_{15}}$

[37] How many ways a team of 11 players can be made out of 15 players if one particular player is not to be selected in the team.

(a) 364 (b) 728 (c) 1,001 (d) 1,234

2011 - June

[38] Find the number of arrangements of 5 things taken out of 12 things, in which one particular thing must always be included.

(a) 39,000 (b) 37,600 (c) 39,600 (d) 36,000

2011 – Dec

[39] In how many ways 3 prizes out of 5 can be distributed amongst 3 brothers Equally?

(a) 10 (b) 45 (c) 60 (d) 120

[40] There are 12 questions to be Answered to be Yes or No. How many ways can these be Ans.ed?

(a) 1024 (b) 2048 (c) 4096 (d) None

2012 – June

[41] The letters of the word "VIOLENT' are arranged so that the vowels occupy even place only. The number of permutations is _____.

	(a) 144	(b) 120	(c) 24	(d) 72
[42]	If ${}^{n}P_4 = 20\ ({}^{n}P_2)$ then the value of 'n' is _____.			
	(a) -2	(b) 7	(c) - **2** and 7 both	(d) None of these.
	2012 – Dec			
[43]	A man has 3 sons and 6 schools within his reach. In how many ways, he can send them to school, if two of his sons are to read in the same school?			
	(a) ${}^{6}P_2$	b) ${}^{6}P_3$	(c) 6^3	(d) 3^6
[44]	How many permutations can be formed from the letters of the word "DRAUGHT', if both vowels may not be separated ?			
	(a) 720	(b) 1,440	(c) 140	(d) 1,000
[45]	If ${}^{13}C_6 + 2\ {}^{13}C_5 + {}^{13}C_4 = {}^{15}C_x$ then, x = _____.			
	(a) 6	(b) 7	(c) 8	(d) 9
	2013 – June			
[46]	A polygon has 44 diagonals then the number of its sides are:			
	(a) 8	(b) 9	(c) 10	(d) 11
[47]	The number of words that can be formed out of the letters of the word "ARTICLE" so that vowels occupy even place is:			
	(a) 36	(b) 144	(c) 574	(d) 754
[48]	Number of ways of shaking hands in a group of 10 persons shaking hands to each other are:			
	(a) 45	(b) 54	(c) 90	(d) 10

2013 – Dec

[49] If ${}^{15}C_{3r} = {}^{15}C_{r+3}$, then 'r' is equal is

(a) 2 (b), 3 (c) **4** (d) 5

[50] How many different words can be formed with the letters of the word "LIBERTY"

(a) 4050 (b) 5040 (c) 5400 (d) 4500

[51] In how many ways can a family consist of three children here different birthdays in a leap year

(a) ${}^{365}C_3$ (b) ${}^{366}C_3 - 3$ (c) $366 \times 365 \times 364$ (d) ${}^{366}C_3$

2014 – June

[52] If ${}^{1000}C_{98} = {}^{999}C_{97} + {}^{x}C_{901}$, then the value of x will be :

(a) 999 (b) 998 (c) 997 (d) None of these.

[53 If six times the number of permutations of 'n' items taken 3 at a time is equal to seven times the number of permutation of (n - 1) items taken 3 at a time, then the value of 'n' will be:

(a) 7 (b) 9 (c) 13 (d) 21

2014 – Dec

[54] If ${}^{6}P_r = 360$, then the value of 'r' is:

(a) 5 (b) 3 (c) 4 (d) None of these.

[55] There are 5 books on English, 4 Books on Tamil and 3 books on Hindi. In how many ways can these books be placed on a shelf if the books on the same subjects are to be together?

(a) 1,36,800 (b) 1,83,600 (c) 1,03,680 (d) 1,63,800

[56] 5 Men and 4 Women to sit in a row in such a manner that the woman always occupy the even places.

The number of such arrangement will be:

(a) 126 (b) 1056 (c) 2080 (d) 2880

2015 – June

[57] The four digit numbers that can be formed out of the seven digits 1,2, 3, 5, 7, 8, 9 such that no digit is repeated in any number and are greater than 3000 are:

(a) 120 (b) 480 (c) G00 (d) 840

[58] A person has ten friends of whom six are relatives. If he invites five guests such that three of them are his relatives, then the total number of ways in which he can invite them are:

(a) 30 (b) 60 (c) 120 (d) 75

[59] A student has three books on computer, three books on Economics and five books on Commerce. If

these books are to be arranged subject wise, then these can be placed on a shelf in the number of ways:

(a) 25290 (b) 25920 (c) 4230 (d) 4320

2015 - Dec

[60] An examination paper with 10 questions consists of 6 questions in mathematics and 4 questions in

statistic part. At least one question from each part is to be attempted in how many ways can this be done?

(a) 1024 (b) 945 (c) 1005 (d) 1022

[61] If ${}^{n}p_{r} = 720$ and ${}^{n}c_{r} = 120$, then value of V is:

(a) 4 (b) 5 (c) 6 (d) 3

[62] There are 6 men and 4 women in a group, then the number of ways in which a committee of 5 persons can be formed of them, if the committee is to include at least 2 women are:

(a) 180 (b) 186 (c) 120 (d) 105

2016 – June

[63] In how many ways can a selection of 6 out of 4 teachers and 8 students be done so as to include at least two teachers?.

(a) 220 (b) 672 (c) 596 (d) 968

[64] There are 10 students in a class including 3 girls. The number of ways to arrange them in a row when any two girls out of three never comes together:

(a) ${}^{8}P_{3}|\underline{7}$ (b) ${}^{3}P_{3}|\underline{7}$ (c) ${}^{8}P_{3}|\underline{10}$ (d) None of these.

2016 – June

[65] The maximum number of points of inter section of 10 circles will be:

(a) 2 (b) 20 (c) 90 (d) 180

2016 – Dec

[66] If ${}^{n+1}C_{r+1} : {}^{n}C_{r} : {}^{n-1}C_{r-1} = 8:3:1$, then n is equal to:

(a) 20 (b) 16 (c) 10 (d) 15

[67] The number of numbers between 1,000 and 10,000, which can be formed by the digits 1,2,3, 4, 5, 6 without repetition is:

(a) 720 (b) 180 (c) 360 (d) 540

[68] The number of ways in which 4 persons can occupy 9 vacant seats is:

(a) 6048 (b) 3024 (c) 1512 (d) 4536

2017 – June

[69] If ${}^{10}C_3 + 2.{}^{10}C_4 + {}^{10}C_5 = {}^{n}C_5$ then value of n is:

(a) 10 (b) 11 (c) 12 (d) 13

[70] The number of parallelograms, formed from a set of six parallel lines intersecting another set of four parallel lines is:

(a) 360 (b) 90 (c) 180 (d) 45

[71] The number of words which can be formed by letters of the word 'ALLAHABAD' is:

(a) 7560 (b) 3780 (c) 30240 (d) 15120

ANSWERS

1	A	11	B	21	D	31	B	41	A	51	C	61	D
2	B	12	A	22	B	32	C	42	B	52	A	62	B
3	A	13	A	23	D	33	C	43	B	53	D	63	B
4	D	14	B	24	C	34	B	44	B	54	C	64	A
5	D	15	A	25	B	35	B	45	A	55	C	65	C
6	C	16	B	26	C	36	A	46	D	56	D	66	D
7	A	17	D	27	C	37	A	47	B	57	C	67	C
8	A	18	B	28	C	38	C	48	A	58	C	68	B
9	B	19	A	29	A	39	C	49	B	59	B	69	C
10	C	20	B	30	C	40	C	50	B	60	B	70	B
												71	A

CH - 6

SEQUENCE & SERIES- ARITHMETIC PROGRESSION & GEOMETRIC PROGRESSION

ARITHMETIC PROGRESSION (A.P.)

Ex. 1 *Find the 7th term of the A.P. 8, 5, 2, –1, –4,.....*

Sol.: Here $a = 8, d = 5 - 8 = -3$

Now $t_7 = 8 + (7 - 1)\, d$

$= 8 + (7 - 1)\,(-3)$

$= 8 + 6\,(-3)$

$= 8 - 18$

$= -10$

Ex. 2 *Which term of the AP* $\frac{3}{\sqrt{7}}, \frac{4}{\sqrt{7}}, \frac{5}{\sqrt{7}}, \ldots\ldots\ldots$ *is* $\frac{17}{\sqrt{7}}$*?*

Sol.:

Ex. 3: *If* 5^{th} *and* 12^{th} *terms of an A.P. are 14 and 35 respectively, find the A.P.*

Sol.:

Ex. 4: *Find the arithmetic mean between 4 and 10.*

Sol.: We know that the A.M. of a & b is = (a + b) /2

Hence, The A. M between 4 & 10 = (4 + 10) /2 = 7

Ex. 5: *Insert 4 arithmetic means between 4 and 324.*

Sol.:

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EXERCISE 6 (A)

Choose the most appropriate option (a), (b) , (c) or (d).

1. The nth element of the sequence 1, 3, 5, 7,…….is

   (a) n (b) 2n – 1 (c) 2n +1 (d) none of these

2. The nth element of the sequence –1, 2, –4, 8 ….. is

   (a) $(-1)^n 2^{n-1}$ (b) 2^{n-1} (c) 2^n (d) none of these

3. $\sum_{i=4}^{7} \sqrt{2i-1}$ can be written as

   (a) $\sqrt{7}+\sqrt{9}+\sqrt{11}+\sqrt{13}$ (b) $2\sqrt{7}+2\sqrt{9}+2\sqrt{12}\sqrt{13}$

   (c) $2\sqrt{7}+2\sqrt{9}+2\sqrt{12}\sqrt{13}$ (d) none of these

4. The sum to ∞ of the series –5, 25, –125 , 625, ….. can be written as

   (a) $\sum_{k=1}^{\infty}(-5)^k$ (b) $\sum_{k=1}^{\infty}(5)^k$ (c) $\sum_{k=1}^{\infty}-5^k$ (d) none of these

5. The first three terms of sequence when nth term tn is $n^2 - 2n$ are

   (a) –1, 0, 3 (b) 1, 0, 2 (c) –1, 0, –3 (d) none of these

6. Which term of the progression –1, –3, –5, …. Is –39

   (a) 21st (b) 20th (c) 19th (d) none of these

7. The value of x such that 8x + 4, 6x – 2, 2x + 7 will form an AP is

   (a) 15 (b) 2 (c) 15/2 (d) none of the these

8. The mth term of an A. P. is n and nth term is m. The rth term of it is

   (a) m + n +r (b) n + m – 2r (c) m + n + r/2 (d) m + n – r

9. The number of the terms of the series $10 + 9\frac{2}{3} + 9\frac{1}{3} + 9 + \ldots\ldots\ldots$ will amount to 155 is

   (a) 30 (b) 31 (c) 32 (d) none of these

10.	The nth term of the series whose sum to n terms is $5n^2 + 2n$ is
	(a) 3n – 10 (b) 10n – 2 (c) 10n – 3 (d) none of these
11.	The 20th term of the progression 1, 4, 7, 10.....is
	(a) 58 (b) 52 (c) 50 (d) none of these
12.	The last term of the series 5, 7, 9,..... to 21 terms is
	(a) 44 (b) 43 (c) 45 (d) none of these
13.	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
14.	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
15.	The two arithmetic means between –6 and 14 is
	(a) 2/3, 1/3 (b) 2/3, $7\frac{1}{3}$ (c) -2/3, $-7\frac{1}{3}$ (d) none of these
16.	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) 8, 5, 2
17.	The sum of n terms of an AP is $3n^2 + 5n$. The series is
	(a) 8, 14, 20, 26 (b) 8, 22, 42, 68 (c) 22, 68, 114, ... (d) none of these
18.	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
19.	The pth term of an AP is (3p – 1)/6. The sum of the first n terms of the AP is
	(a) n (3n + 1) (b) n/12 (3n + 1) (c) n/12 (3n – 1) (d) none of these
20.	The arithmetic mean between 33 and 77 is
	(a) 50 (b) 45 (c) 55 (d) none of these
21.	The 4 arithmetic means between –2 and 23 are

(a) 3, 13, 8, 18 (b) 18, 3, 8, 13 (c) 3, 8, 13, 18 (d) none of these

22. The first term of an A.P is 14 and the sums of the first five terms and the first ten terms are equal is magnitude but opposite in sign. The 3rd term of the AP i

(a) $6\frac{4}{11}$ (b) 6 (c) 4/11 (d) none of thes

23. The sum of a certain number of terms of an AP series –8, –6, –4, …… is 52. The number of terms is

(a) 12 (b) 13 (c) 11 (d) none of these

24. The first and the last term of an AP are –4 and 146. The sum of the terms is 7171. The number of terms is

(a) 101 (b) 100 (c) 99 (d) none of these

25. The sum of the series 3 ½ + 7 + 10 ½ + 14 + …. to 17 terms is

(a) 530 (b) 535 (c) 535 ½ (d) none of these

GEOMETRIC PROGRESSION (G.P.)

Ex. 1: *Which term of the progression 1, 2, 4, 8,... is 256?*

Sol.: $a = 1, r = 2/1 = 2, n = ?\ t_n = 256$

$t_n = ar^{n-1}$

or $256 = 1 \times 2^{n-1}$ i.e., $2^8 = 2^{n-1}$ or, $n - 1 = 8$ i.e., $n = 9$

Thus 9^{th} term of the G. P. is 256

Ex. 2: *Insert 3 geometric means between 1/9 and 9.*

Sol.:

Ex. 3: *Find the G.P where 4th term is 8 and 8th term is 128/625*

Sol.:

Sum of first n terms of a G P Series

Ex. 1: *Find the sum of 1 + 2 + 4 + 8 + ... to 8 terms.,*

Sol.: Here a = 1, r = 2/1 = 2 , n = 8

Let S = 1 + 2 + 4 + 8 + ... to 8 terms

$= 1 (2^8 - 1) / (2 - 1) = 2^8 - 1 = 255$

Ex. 2: *Find the sum to n terms of 6 + 27 + 128 + 629 + ...*

Sol.: Required Sum $= (5 + 1) + (5^2 + 2) + (5^3 + 3) + (5^4 + 4) +$ ... to n terms

$= (5 + 52 + 53 + ... + 5n) + (1 + 2 + 3 + .. +$ n terms

$= \{5 (5^n - 1) / (5 - 1)\} + \{n (n + 1) / 2\}$

$= \{5 (5^n - 1) /4\} + \{n (n + 1) / 2\}$

Ex. 3: *Find the sum to n terms of the series 3 + 33 + 333 + ...*

Sol.:

Ex. 4: *Find the sum of n terms of the series 0.7 + 0.77 + 0.777 + ... to n terms*

Sol.: Let S denote the required sum.

i.e. $S = 0.7 + 0.77 + 0.777 + \ldots..$ to n terms

$= 7\ (0.1 + 0.11 + 0.111 + \ldots.$ to n terms)

$= \frac{7}{9}(0.9 + 0.99 + 0.999 + \ldots$ to n terms)

$= \frac{7}{9}\{(1 - 1/10) + (1 - 1/10^2) + (1 - 1/10^3) + \ldots + (1 - 1/10^n)\}$

$= \frac{7}{9}\{n - 1/10)\ (1 + 1/10 + 1/10^2 + \ldots. + 1/10^{n-1})\}$

So $S = \frac{7}{9}\{n - \frac{1}{10})\ (1 - 1/10^n)/(1 - 1/10)\}$

$= \frac{7}{9}\{n - (1 - 10^{-n}) / 9)\}$

$= \frac{7}{81}\{9n - 1 + 10^{-n}\}$

Ex. 5: *Evaluate $0.21\dot{7}\dot{5}$ using the sum of an infinite geometric series.*

Sol.: $0.21\dot{7}\dot{5} = 0.2175757575 \ldots...$

$0.21\dot{7}\dot{5} = 0.21 + 0.0075 + 0.000075 + \ldots.$

	$= 0.21 + 75\ (\ 1 + 1/10^2 + 1/10^4 + ...\ ) / 104$
	$= 0.21 + 75\ \{1 / (1 - 1/10^2\} / 104$
	$= 0.21 + (75/10^4) \times 10^2 /99$
	$=21/100 + (¾\ ) \times (1/99\ )$
	$= 21/100 + 1/132$
	$= (\ 693 + 25\ )/3300 = 718/3300 = 359/1650$
Ex. 6:	*Find three numbers in G. P whose sum is 19 and product is 216.*
Sol.:	Let the 3 numbers be a/r, a, ar.
	According to the question $a/r \times a \times ar = 216$
	or $a^3 = 6^3 => a = 6$
	So the numbers are 6/r, 6, 6r
	Again $6/r + 6 + 6r = 19$
	or $6/r + 6r = 13$ or $6 + 6r2 = 13r$
	or $6r^2 - 13r + 6 = 0$ or $6r^2 - 4r - 9r + 6 = 0$
	or $2r(3r - 2) - 3\ (3r - 2) = 2$ or $(3r - 2)\ (2r - 3) = 0$ or, $r = 2/3\ ,\ 3/2$
	So the numbers are $6/(2/3),\ 6,\ 6 \times (2/3\ ) = 9\ ,\ 6\ ,\ 4$
	or $6/(3/2),\ 6\ ,\ 6 \times (3/2) = 4\ ,\ 6\ ,\ 9$

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EXERCISE 6 (B)

Choose the most appropriate option (a), (b), (c) or (d)

1. The 7th term of the series 6, 12, 24,……is

   (a) 384 (b) 834 (c) 438 (d) none of these

2. t8 of the series 6, 12, 24,…is

   (a) 786 (b) 768 (c) 867 (d) none of these

3. t12 of the series –128, 64, –32, ….is

   (a) – 1/16 (b) 16 (c) 1/16 (d) none of these

4. The 4th term of the series 0.04, 0.2, 1, … is

   (a) 0.5 (b) 1/2 (c) 5 (d) none of these

5. The last term of the series 1, 2, 4,…. to 10 terms is

   (a) 512 (b) 256 (c) 1024 (d) none of these

6. The last term of the series 1, –3, 9, –27 up to 7 terms is

   (a) 297 (b) 729 (c) 927 (d) none of these

7. The last term of the series x2, x, 1, …. to 31 terms is

   (a) x^{28} (b) 1/x (c) $1/x^{28}$ (d) none of these

8. The sum of the series –2, 6, –18, …. to 7 terms is

   (a) –1094 (b) 1094 (c) – 1049 (d) none of these

9. The sum of the series 243, 81, 27, …. to 8 terms is

   (a) 36 (b) $\left(36\frac{13}{30}\right)$ (c) $36\frac{1}{9}$ (d) none of these

10. The sum of the series $\frac{1}{\sqrt{3}} + 1 + \frac{3}{\sqrt{3}} + \cdots$ to 18 terms

	(a) $9841\frac{(1+\sqrt{3})}{\sqrt{3}}$ (b) 9841 (c) $\frac{9841}{\sqrt{3}}$ (d)None of these
11.	The second term of a G P is 24 and the fifth term is 81. The series is
	(a) 16, 36, 24, 54,.. (b) 24, 36, 53,... (c) 16, 24, 36, 54,.. (d) none of these
12.	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
13.	In a G. P, the product of the first three terms 27/8. The middle term is
	(a) 3/2 (b) 2/3 (c) 2/5 (d) none of these
14.	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) Rs. 163 (b) Rs. 183 (c) Rs. 163.83 (d) none of these
15.	Sum of n terms of the series 4 + 44 + 444 + ... is
	(a) $4/9\{10/9(10^n-1)-n\}$ (b) $10/9(10^n-1)-n$ (c) $4/9(10^n-1)-n$ (d) none of these
16.	Sum of n terms of the series 0.1 + 0.11 + 0.111 + ... is
	(a) $1/9\{n-(1-(0.1)^n)\}$ (b) $1/9\{n-(1-(0.1)^n)/9\}$ (c) $n-1-(0.1)^n/9$ (d) none of these
17.	The sum of the first 20 terms of a G. P is 244 times the sum of its first 10 terms. The common ratio is
	(a) ± 3 (b) ± 3 (c) 3 (d) none of these
18.	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
19.	The product of 3 numbers in G P is 729 and the sum of squares is 819. The numbers are
	(a) 9, 3, 27 (b) 27, 3, 9 (c) 3, 9, 27 (d) none of these
20.	The sum of the series 1 + 2 + 4 + 8 + .. to n term
	(a) 2^n-1 (b) 2n – 1 (c) $1/2^n-1$ (d) none of these
21.	The sum of the infinite GP 14, – 2, + 2/7, – 2/49, + ... is

(a) $4\frac{1}{12}$ (b) $12\frac{1}{4}$ (c) 12 (d) none of these

22. The sum of the infinite G. P. 1 - 1/3 + 1/9 - 1/27 +... is

(a) 0.33 (b) 0.57 (c) 0.75 (d) none of these

23. The number of terms to be taken so that 1 + 2 + 4 + 8 + will be 8191 i s

(a) 10 (b) 13 (c) 12 (d) none of these

24. Four geometric means between 4 and 972 are

(a) 12, 36, 108, 324 (b) 12, 24, 108, 320 (c) 10, 36, 108, 320 (d) none of these

ILLUSTRATIONS:

1. *A person is employed in a company at Rs. 3000 per month and he would get an increase of Rs. 100 per year. Find the total amount which he receives in 25 years and the monthly salary in the last year*

SOL.

2. *A person borrows Rs. 8,000 at 2.76% Simple Interest per annum. The principal and the interest are*

to be paid in the 10 monthly instalments. If each instalment is double the preceding one, find the value of the first and the last instalment.

SOL. Interest to be paid = 2.76 × 10 × 8000 / 100 × 12 = Rs. 184

Total amount to be paid in 10 monthly instalment is Rs. (8000 + 184) = Rs. 8184

The instalments form a G P with common ratio 2 and so Rs. 8184 = a (2^{10} – 1) / (2 – 1),

a = 1st instalment

Here a = Rs. 8184 / 1023 = Rs. 8

The last instalment = ar $^{10-1}$ = 8 × 2^9 = 8 × 512 = Rs. 4096

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EXERCISE 6 (C)

Choose the most appropriate option (a), (b), (c) or (d).

1. Three numbers are in AP and their sum is 21. If 1, 5, 15 are added to them respectively, they form a G. P. The numbers are

(a) 5, 7, 9 (b) 9, 5, 7 (c) 7, 5, 9 (d) none of these

2. The sum of 1 + 1/3 + 1/32 + 1/33 + … + $1/3^{n-1}$ is

(a) 2/3 (b) 3/2 (c) 4/5 (d) none of these

3. The sum of the infinite series 1 + 2/3 + 4/9 + .. is

(a) 1/3 (b) 3 (c) 2/3 (d) none of these

4. The sum of the first two terms of a G.P. is 5/3 and the sum to infinity of the series is 3. The common ratio is

	(a) 1/3	(b) 2/3	(c) – 2/3	(d) none of these
5.	If p, q and r are in A.P. and x, y, z are in G.P. then $x^{q-r}. y^{r-p}. z^{p-q}$ is equal to			
	(a) 0	(b) –1	(c) 1	(d) none of these
6.	The sum of three numbers in G.P. is 70. If the two extremes by multiplied each by 4 and the mean by 5,			
	the products are in AP. The numbers are			
	(a) 12, 18, 40	(b) 10, 20, 40	(c) 40, 20, 10	(d) none of these
7.	The sum of 3 numbers in A.P. is 15. If 1, 4 and 19 be added to them respectively, the results are is G. P.			
	The numbers are			
	(a) 26, 5, –16	(b) 2, 5, 8	(c) 5, 8, 2	(d) none of these
8.	Given x, y, z are in G.P. and $x^p = y^q = z^\sigma$, then $1/p$, $1/q$, $1/\sigma$ are in			
	(a) A.P.	(b) G.P.	(c) Both A.P. and G.P.	(d) none of these
9.	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
10.	If A be the A.M. of two positive unequal quantities x and y and G be their G. M, then			
	(a) $A < G$	(b) A>G	(c) $A \geq G$	(d) $A \leq G$
11.	The A.M. of two positive numbers is 40 and their G. M. is 24. The numbers are			
	(a) (72, 8)	(b) (70, 10)	(c) (60, 20)	(d) none of these
12.	Three numbers are in A.P. and their sum is 15. If 8, 6, 4 be added to them respectively, the numbers			
	are in G.P. The numbers are			
	(a) 2, 6, 7	(b) 4, 6, 5	(c) 3, 5, 7	(d) none of these
13.	The sum of four numbers in G. P. is 60 and the A.M. of the first and the last is 18. The numbers are			
	(a) 4, 8, 16, 32	(b) 4, 16, 8, 32	(c) 16, 8, 4, 20	(d) none of these
14.	A sum of Rs. 6240 is paid off in 30 instalments such that each instalment is Rs. 10 more than the			

	proceeding installment. The value of the 1st instalment is
	(a) Rs. 36 (b) Rs. 30 (c) Rs. 60 (d) none of these
15.	The sum of $1.03 + (1.03)^2 + (1.03)^3 + \ldots$ to n terms is
	(a) $103\{(1.03)^n - 1\}$ (b) $103/3\{(1.03)^n - 1\}$ (c) $(1.03)^n - 1$ (d) none of these
16.	If x, y, z are in A.P. and x, y, (z + 1) are in G.P. then
	$(x - z)^2 = 4x$ (b) $z^2 = (x - y)$ (c) $z = x - y$ (d) none of these
17.	The numbers x, 8, y are in G.P. and the numbers x, y, –8 are in A.P. The value of x and y are
	(a) (–8, –8) (b) (16, 4) (c) (8, 8) (d) none of these
18.	The nth term of the series 16, 8, 4,.... in $1/2^{17}$. The value of n is
	(a) 20 (b) 21 (c) 22 (d) none of these
19.	The sum of n terms of a G.P. whose first terms 1 and the common ratio is 1/2 , is equal to $1\frac{127}{128}$ The
	value of n is
	(a) 7 (b) 8 (c) 6 (d) none of these
20.	T_4 of a G.P. in x, t10 = y and t16 = z. Then
	(a) $x^2 = yz$ (b) $z^2 = xy$ (c) y2 = zx (d) none of these
21.	If x, y, z are in G.P., then
	(a) $y^2 = xz$ (b) $y(z^2 + x^2) = x(z^2 + y^2)$ (c) 2y = x+z (d) none of these
22.	The sum of all odd numbers between 200 and 300 is
	(a) 11,600 (b) 12,490 (c) 12,500 (d) 24,750
23.	The sum of all natural numbers between 500 and 1000 which are divisible by 13, is
	(a) 28,405 (b) 24,805 (c) 28,540 (d) none of these
24.	If unity is added to the sum of any number of terms of the A.P. 3, 5, 7, 9,..... the resulting sum is
	(a) 'a' perfect cube (b) 'a' perfect square (c) 'a' number (d) none of these

25. The sum of all natural numbers from 100 to 300 which are exactly divisible by 4 or 5 is

(a) 10,200 (b) 15,200 (c) 16,200 (d) none of these

26. The sum of all natural numbers from 100 to 300 which are exactly divisible by 4 and 5 is

(a) 2,200 (b) 2,000 (c) 2,220 (d) none of these

27. A person pays Rs. 975 by monthly instalment each less then the former by Rs. 5. The first instalment is Rs. 100. The time by which the entire amount will be paid is

(a) 10 months (b) 15 months (c) 14 months (d) none of these

28. A person saved Rs. 16,500 in ten years. In each year after the first year he saved Rs. 100 more than he did in the preceding year. The amount of money he saved in the 1st year was

(a) Rs. 1000 (b) Rs. 1500 (c) Rs. 1200 (d) none of these

29. At 10% C.I. p.a., a sum of money accumulate to Rs. 9625 in 5 years. The sum invested initially is

(a) Rs. 5976.37 (b) Rs. 5970 (c) Rs. 5975 (d) Rs. 5370.96

30. The population of a country was 55 crore in 2005 and is growing at 2% p.a. C.I. the population is the year 2015 is estimated as

(a) 5705 (b) 6005 (c) 6700 (d) none of these

ANSWERS

Exercise A

1.	(b)	**2.**	(a)	**3.**	(a)	**4.**	(a)	**5.**	(a)	**6.**	(b)	**7.**	(c)	**8.**	(d)
9.	(a), (b)	**10**	(c)	**11.**	(a)	**12.**	(c)	**13.**	(b)	**14.**	(a)	**15.**	(b)	**16.**	(c), (d)
17.	(b)	**18.**	(b)	**19.**	(b)	**20.**	(c)	**21.**	(c)	**22.**	(a)	**23.**	(b)	**24.**	(a)
25.	(c)														

Exercise B

1.	(a)	**2.**	(b)	**3.**	(c)	**4.**	(c)	**5.**	(a)	**6.**	(b)	**7.**	(c)	**8.**	(a)
9.	(d)	**10.**	(a)	**11.**	(c)	**12.**	(c)	**13.**	(a)	**14.**	(c)	**15.**	(a)	**16.**	(b)
17.	(a)	**18.**	(b)	**19.**	(c)	**20.**	(a)	**21.**	(b)	**22.**	(c)	**23.**	(b)	**24.**	(a)

Exercise C

1.	(a)	**2.**	(d)	**3.**	(b)	**4.**	(b), (c)	**5.**	(c)	**6.**	(b), (c)	**7.**	(a), (b)	**8.**	(a)
9.	(c)	**10.**	(b)	**11.**	(a)	**12.**	(c)	**13.**	(a)	**14.**	(d)	**15.**	(b)	**16.**	(a)
17.	(a), (b)	**18.**	(c)	**19.**	(b)	**20.**	(c)	**21.**	(a)	**22.**	(c)	**23.**	(a)	**24.**	(b)
25.	(c)	**26.**	(a)	**27.**	(b)	**28.**	(c)	**29.**	(a)	**30.**	(d)				

"KAR LO PAST APNI MUTHI ME"

Past Exam Questions

2006 – Nov

1. The sum of all natural numbers between 100 and 1000 which are multiple of 5 is:

(a) 98,450 (b) 96,450 (c) 97,450 (d) 95,450

2. Find n such that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be the geometric mean between a and b :

(a) 1/2 (b) 1 (c) -1/2 (d) 0

3. The sum of an A P, whose first term is - 4 and last term is 146 is 7171. Find the value of n.

(a) 99 (b) 100 + (c) 101 (d) 102

4. If the first term of a G.P exceeds the second term by 2 and the sum to infinity is 50, the series is :

(a) 10,8, $\frac{32}{5}$, ... (b) 10, 8, $\frac{5}{2}$, ... (c) 10, $\frac{10}{3}$, $\frac{10}{9}$, ... (d) None

2007 – Feb

5. $\sum/n^2$ defines

(a) $\frac{n(n+1)(2n+1)}{6}$ (b) $\frac{n(n+1)}{2}$ (c) $\left[\frac{n(n+1)}{2}\right]^2$ (d) None of these

6. Divide 30 into five parts in A.P., such that the first and last parts are in the ratio 2 :3 :

(a) $\frac{24}{5}, \frac{27}{5}, 6, \frac{33}{5}, \frac{36}{5}$ (b) $6, \frac{36}{5}.\frac{33}{5}, \frac{24}{5}\frac{27}{5}$ (c) $\frac{27}{5}, \frac{24}{4}, \frac{36}{5}, \frac{33}{5}, 6$ (d) $6, \frac{24}{5}, \frac{27}{5}, \frac{33}{5}, \frac{36}{5}$

7. If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b, c are in G.P; the x, y, z are in :

(a) A.P. (b) G.P. (c) Both (a) & (b) (d) None

8. Find the sum to n terms of the series : 7 + 77 + 777 + ... to n terms:

(a) $\frac{7}{9}(10^{n+1} - 10) - \frac{7n}{9}$ (b) $\frac{7}{9}(10^{n+1} - 10) + \frac{7n}{9}$

(c) $\frac{7}{81}(10^{n+1} - 10) - \frac{7n}{9}$ (d) $\frac{7}{81}(10^{n+1} - 10) + \frac{7n}{9}$

2007 – May

9. Find the sum of all natural numbers between 250 and 1,000 which are exactly divisible by 3:

(a) 1,56,375 (b) 1,56,357 (c) 1,65,375 (d) 1,65,357

10. If the pth term of a G.P. is x and the qth term is y, then find the nth term:

(a) $\left[\frac{x^{(n-q)}}{y^{(n-p)}}\right]$ (b) $\left[\frac{x^{(n-q)}}{y^{(n-p)}}\right]^{(p-q)}$ (c) 1 (d) $\left[\frac{x^{(n-q)}}{y^{(n-p)}}\right]^{\frac{1}{p-q}}$

11. A person pays Rs. 975 in monthly instalments, each instalment is less than former by Rs. 5. The amount of first instalment is Rs. 100. In what time will the entire amount be paid?

(a) 26 months (b) 15 months (c) Both (a) & (b) (d) 18 months

2007 – Aug

12. If the sum of n terms of an A.P. is $(3n^2 - n)$ and its common difference is 6, then its first term is :

(a) 3 (b) 2 (c) 4 (d) 1

13. Find the sum of the series : 2 + 7 + 12+ ..... 297.

(a) 8970 (b) 8870 (c) 7630 (d) 9875

14. A certain bail when dropped to the ground rebounds to $\frac{4}{5}^{th}$ of the height from which it falls; it is dropped from a height of 100 metres find the total distance it travels before finally coming to rest:

(a) 600m (b) 700m (c) 900m (d) 200m

15. In a G.P if the (p + q)th term is m and (p - q)th term is n, then the pth term is :

(a) mn (b) $\sqrt{mn}$ (c) m^2 (d) n^2

	2007 – Nov
16.	The sum of the series : $0.5 + 0.55 + 0.555 + \ldots\ldots\ldots$ to n terms is :
	(a) $\frac{5n}{9} + \frac{5}{9}[1 - (0.1)^n]$ (b) $\frac{5n}{9} - \frac{5}{81}[1 - (0.1)^n]$
	(c) $\frac{5n}{9} + \frac{5}{81}[1 - (0.1)^n]$ (d) $\frac{5n}{9} + \frac{5}{81}[1 + (0.1)^n]$
17.	A contractor who fails to complete a building in a certain specified time is compelled to forfeit Rs.
	200 for the first day of extra time required and thereafter forfeited amount is increased by Rs. 25
	for every day. If he loses Rs. 9,450, for how many days did he over-run the contract time?
	(a) 19 days (b) 21 days (c) 23 days (d) 25 days
18.	The first, second and seventh term of A.P. are in G.P. and the common difference is 2, the 2nd
	term of A.P. is :
	(a) 5/2 (b) 2 (c) 3/2 (d) 1/2
	2008 – Feb
19.	A man employed in a company is promised a salary of Rs. 3,000 every month for the first year and
	an increment of Rs. 1,000 in his monthly salary every succeeding year. How much does the man
	earn from the company in 20 years?
	(a) Rs. 30,00,000 (b) Rs. 27,50,000 (c) Rs. 19,10,000 (d) Rs. 7,90,000
20.	If a, b, c are in A.P. and x, y, z are in G.P, then the value of $x^{(b-c)}.y^{(c-a)}.z^{(a-b)}$
	(a) 1 (b) 0 (c) b(c - a) (d) None
21.	Insert 4 A.M.'s between 3 and 18 :
	(a) 12, 15,9,6 (b) 6,9, 12, 15 (c) 9,6,12,15 (d) 15,12,9,6

22. If $x = 1 + \frac{1}{3} + \frac{1}{3^2} + \ldots\ldots\ldots\ldots \infty$

$y = 1 + \frac{1}{4} + \frac{1}{4^2} + \ldots\ldots\ldots\ldots \infty$ Find xy.

(a) 2 (b) 1 (c) 8/9 (d) ½

23. On 1st January every year a person buys National Saving Certificates of value exceeding that of his last year's purchase by Rs. 100. After 10 years, he finds that the total value of the certificates purchased by him is Rs. 54,500. Find the value of certificates purchased by him in the first year:

(a) Rs. 6,000 (b) Rs. 4,000 (c) Rs. 5,000 (d) Rs. 5,500

24. Find three numbers in G.P. such that their sum is 21, and the sum of their squares is 189 :

(a) 5, 7, 9 (b) 3, 7, 11 c) 3, 6, 12 (d) 4, 8, 9

25. Find the ninth term of the series : $\sqrt{2}, 5\sqrt{2}, 9\sqrt{2}, \ldots\ldots\ldots$

(a) $25\sqrt{2}$ (b) $31\sqrt{2}$ (c) $33\sqrt{2}$ (d) $52\sqrt{2}$

26. The sum of how many terms of the sequence 256, 128, 64,..... is 511.

(a) 8 (b) 9 (c) 7 (d) None of these.

27. $(x + 1), 3x, (4x + 2)$ are in A.P. Find the value of x

(a) 2 (b) 3 (c) 4 (d) 5

28. Find two numbers whose A.M. is 10 and G.M. is 8.

(a) [10,10] . (b) [16,4] (c) [18,2] (d) [14,6]

29. $\sum n^2$ defines :

(a) $\frac{n(n+1)(2n+1)}{6}$ (b) $\frac{n(n+1)}{2}$ (c) $\left[\frac{n(n+1)}{2}\right]^2$ (d) None of these

30. The sum of terms of an infinite GP is 15. And the sum of the squares of the term is 45. Find the common ratio.

(a) 3/2 (b) 1 (c) -2/3 (d) 2/3

31. If in an A.P., Tn represents nth term. If $t_7 : t_{10} = 5 : 7$ then $t_8 : t_{11} =$ ____

(a) 13: 16 (b) 17:23 (e) 14:17 (d) 15:19

32. The sum of an A P, whose first term is - 4 and last term is 146 is 7171. Find the value of n.

(a) 99 (b) 100 (c) 101 (d) 102

33. Find the sum to infinity of the following series: 1 – 1 + 1 – 1 + 1 – 1 +..... ∞

(a) 1 (b) ∞ (c) ½ (d) Does not exist

34. If a_1, a_2, a_3 represents first, second and third terms of an AP respectively, the first term is 2 and $(a_1 + a_2)a_3$ is minimum, then the common difference is equal to

(a) 5/2 (b) -5/2 (c) 2/5 (d) - 2/5

35. Divide 144 into three parts which are in AP and such that the largest is twice the smallest, the smallest of three numbers will be :

(a) 48 (b) 36 (c) 13 (d) 32

36. Sum of series $1 + \frac{4}{5} + \frac{7}{5^2} + \frac{10}{5^3} + \ldots \infty$ is

(a) 15/36 (b) 35/36 (c) 35/16 (d) 15/16

37. If G be Geometric Mean between two numbers a and b, then the value of $\frac{1}{G^2 - a^2} + \frac{1}{G^2 - b^2}$ is equal to

(a) G^2 (b) $3\,G^2$ (c) $1/G^2$ (d) $2/G^2$

38. If Sum (S_n) of 'n'- terms of an Arithmetic Progression is $(2n^2 + n)$. What is the difference of its 10^{th}

	and 1st term ?
	(a) 207 (b) 36 (c) 90 (d) 63
39.	Find the product of: (243), $(243)^{1/6}$, $(243)^{1/36}$, ... ∞
	(a) 1,024 (b) 27 (c) 729 (d) 246
40.	Insert two Arithmetic means between 68 and 260
	(a) 132,196 (b) 130,194 (c) 70, 258 (d) None of the above.
41.	Geometric Mean of P,P^2,P^3 ....., P^n will be :
	(a) P^{n+1} (b) $P^{\frac{1+n}{2}}$ (c) $P^{\frac{n(n+1)}{2}}$ (d) None of the above.
42.	Find the numbers whose arithmetic mean is 12.5 and geometric mean is 10.
	(a) 20 and 5 (b) 10 and 5 (c) 5 and 4 (d) None of these
43.	If sum of 3 arithmetic means between "a" and 22 is 42, then "a" = _____
	(a) 14 (b) 11 (c) 10 (d) 6
44.	If each month Rs. 100 increases in any sum then find out the total sum after 10 months, if the sum
	of first month is Rs. 2,000.
	(a) Rs. 24,500 (b) Rs. 24,000 (c) Rs. 50,000 (d) Rs. 60,000
45.	The sum of all two Digit odd numbers is
	(a) 2475 (b) 2575 (c) 4950 (d) 5049
46.	If 5th term of a G.P. is $3\sqrt{3}$,then the product of first nine terms is:
	(a) 8 (b) 27 (c) 243 (d) 9
47.	The sum of the third and ninth term of an A.P. is 8. Find the sum of the first 11 terms of the

	progression.
	(a) 44 (b) 22 (c) 19 (d) 11
48.	If 8th term of an A.P is 15, then sum of its 15 terms is:
	(a) 15 (b) 0 (c) 225 (d) 225/2
49.	Find the sum of the infinite terms $2, \frac{4}{y}, \frac{8}{y^2}, \frac{16}{y^3}$ .....; if $y > 2$
	(a) $\frac{2y}{y-2}$ (b) $\frac{4y}{y-2}$ (c) $\frac{3y}{y-2}$ (d) None of these.
50.	The 4th term of an A.P. is three times the first and the 7th term exceeds twice the third term by 1.
	Find the first term 'a' and common difference 'd'.
	(a) $a = 3, d = 2$ (b) $a = 4, d = 3$ (c) $a = 5, d = 4$ (d) $a = 6, d = 5$
51.	In an A.P., if common difference is 2, Sum of. n terms is 49, 7th term is 13 then n = _____.
	(a) 0 (b) 5 (c) 7 (d) 13
52.	The first term of a G.P. where second term is 2 and sum of infinite term is 8 will be:
	(a) 6 (b) 3 (c) 4 (d) 1
53.	If the sum of n terms of an A.P be $2n^2 + 5n$, then its 'nth' term is:
	(a) 4n - 2 (b) 3n – 4 (c) 4n + 3 (d) 3n + 4
	2013 - June
54.	If the sum of n terms of an A.P be $3n^2 - n$ and its common difference is 6, then its first term is :
	(a) 2 (b) 3 (c) 4 (d) 5
55.	If the sum of the 4lh term and the 12th term of an A.P. is 8, what is the sum of the first 15 terms of

	the progression?
	(a) 60 (b) 120 (c) 110 (d) 150
56.	If 'n' arithmetic means are inserted between 7 & 71 and 5th arithmetic mean is 27, then 'n' is equal to:
	(a) 15 (b) 16 (c) 17 (d) 18
57.	In a G.P. the sixth term is 729 and the common difference is 3, then the first term of G.P. is:
	(a) 2 (b) 3 (c) 4 (d) 7
	2013 - Dec
58.	An Arithmetic progression has 13 terms whose sum is 143. The third term is 5 so the first term is:
	(a) 4 (b) 7 (c) 9 (d) 2
59.	If Geometric mean (G.M.) Of a, b, c, d is 3, then G.M. of $\frac{1}{a},\frac{1}{b},\frac{1}{c},\frac{1}{d}$ will be:
	(a) 1/3 (b) 3 (c) 81 (d) 1/81
	2014 – June
60.	The sum to m terms of the series 1+11+111+.... upto m terms, is equal to:
	(a) $\frac{1}{81}(10^{m+1} - 9m - 10)$ (b) $\frac{1}{27}(10^{m+1} - 9m - 10)$ (c) $10^{m+1} - 9m - 10$ (d) None
61.	The sum of the infinite G.P. $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} +$ ..... is equal to:
	(a) 1.95 (b) 1.5 (c) 1.75 (d) None of these
62.	value of $1^3+2^3+3^3+4^3+$ ..... $+m^3$ is equal to:
	(a) $\left[\frac{m(m+1)}{2}\right]^3$ (b) $\frac{m(m+1)(2m+1)}{6}$ (c) $\left[\frac{m(m+1)}{2}\right]^2$ (d) None of these.
63.	If x, y, z are the terms in G.P. then the terms $x^2 + y^2$, $xy + yz$, $y^2 + z^2$ are in:

(a) A.P. (b) G.P. (c) H.P. (d) None of these.

64. If $S_n = n^2p$ and $S_m = m^2p$ $(m \neq n)$ is the sum of an A.P., then S_P = _____

(a) p^2 (b) p^3 (c) $2p^3$ (d) p^4

2014 – Dec

65. The arithmetic mean of the square of first 2n natural numbers is:

(a) $\frac{1}{6}(2n + 1)(4n - 1)$ (b) $\frac{1}{6}(2n- 1)(4n - 1)$ (c) $\frac{1}{6}(2n- 1)(4n + 1)$ (d) $\frac{1}{6}(2n + 1)(4n + 1)$

66. If the sum of first 'n' terms of an A.P. is $6n^2 + 6n$, then the fourth term of the series:

(a) 120 (b) 72 (c) 48 (d) 24

2015 – June

67. If S be the sum, P the product and R is the sum of reciprocals of n-terms in G.P then P^2R^n =_____.

(a) S^{2n} (b) S^n (c) S^{-2n} (d) S^{-n}

68. The sum of the series 1 + 11 + 111 + ... to n terms is _____.

(a) $\frac{1}{27}(10^{n+1} - 9n - 10)$ (b) $10^{n+1} - 9n - 10$ (c) $\frac{1}{81}(10^{n+1} - 9n - 10)$ (d) None of these

69. If third term and seventh term of an A.P are eighteen and thirty respectively, then sum of first twenty terms will be:

(a) 540 (b) 610 (c) 740 (d) 810

2015 – Dec

70. If the sum of 'n' terms of an Arithmetic Progression (A.P) is $3x^2 + 5x$ and its m^{th} term is 164, then

	the value of m is:
	(a) 27 (b) 28 (c) 24 (d) 26
71.	If a, b, c are in Arithmetic Progression (A.P.), then the value of a – b + c is:
	(a) a (b) –b (c) b (d) c
72.	Find the two numbers whose geometric mean is 5 and arithmetic mean in 7.5.
	(a) 10 and 5 (b) 13.9 and 1.91 (c) 12 and 3 (d) None of the above
	2016 – June
73.	The sum of n terms of the series $\log x + \log \frac{x^2}{y} + \text{tog} \frac{x^2}{y^2} +$ ..... is
	(a) $\frac{n}{2}\left[2n \log \left(\frac{x}{y}\right) + \log xy\right]$ (b) $\frac{n}{2}\left[n \log xy + \log \left(\frac{x}{y}\right)\right]$
	(c) $\frac{n}{2}\left[n \log \left(\frac{x}{y}\right) - \log xy\right]$ (d) $\frac{n}{2}\left[n \log \left(\frac{x}{y}\right) + \log xy\right]$
74.	A G. P. (Geometric Progression) consists of 2n terms. If the sum of the terms occupying the odd
	places is S_1 and that of terms in the even places is S_2, the common ratio of the progression is:
	(a) n (b) $2S_1$ (c) $\frac{S_2}{S_1}$ (d) $\frac{S_1}{S_2}$
75.	If $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$ are in arithmetic progression then a^2, b^2, c^2, are in
	(a) Arithmetic Progression (b) Geometric Progression
	(c) Both in arithmetic and geometric Progression (d) None of these
	2016 – Dec
76.	The income of a person is Rs. 5,00,000 in the firm in the first year and he receives an increase of

(a) Rs. 56,75,000 (b) Rs. 72,50,000 (c) Rs. 15,67,500 (d) None of these

77. If the Sum 50 + 45 + 40 + 35 + _____ is zero, then the number of terms is:

(a) 22 (b) 20 (c) 21 (d) 25

78. The number 2.353535 _____ in $\frac{p}{q}$ form is:

(a) $\frac{235}{99}$ (b) $\frac{234}{99}$ (c) $\frac{230}{99}$ (d) $\frac{233}{99}$

2017 – June

79. The sum of n terms of the series 1 + (1 + 3) + (1 + 3 + 5) + ... Is

(a) $\frac{n(n+1)(2n+1)}{6}$ (b) $\frac{n(n+1)(n+2)}{6}$ (c) $\frac{n(n+1)(2n+1)}{3}$ (d) None of these.

80. The sum of first 20 terms of a GP is 1025 times the sum of ,rst 10 terms of same GP then common ratio is:

(a) $\sqrt{2}$ (b) 2 (c) $2\sqrt{2}$ (d) 1/2

81. The value C such that a, - 3, b, 5, c are in A.P. is:

(a) -7 (b) 1 (c) 13 (d) 9

ANSWERS

1	**A**	**11**	**B**	**21**	**B**	**31**	**B**	**41**	**B**	**51**	**C**	**61**	**B**	**71**	**C**
2	C	12	B	22	A	32	C	42	A	52	C	62	C	72	B
3	C	13	A	23	C	33	C	43	D	53	C	63	B	73	D
4	A	14	C	24	C	34	B	44	A	54	A	64	B	74	C
5	A	15	B	25	C	35	D	45	A	55	A	65	D	75	A
6	A	16	B	26	B	36	C	46	B	56	A	66	C	76	A
7	A	17	B	27	B	37	C	47	A	57	B	67	B	77	C
8	C	18	A	28	B	38	B	48	C	58	D	68	C	78	D
9	A	19	A	29	A	39	C	49	A	59	A	69	D	79	A
10	D	20	A	30	D	40	A	50	A	60	A	70	A	80	B
														81	D

STUDENT NOTES

CH - 7

SETS, FUNCTION & RELATIONS

SETS

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 7 (A)

Choose the most appropriate option or options (a) (b) (c) or (d).

1. The number of subsets of the set {2, 3, 5} is

(a) 3 (b) 8 (c) 6 (d) none of these

2. The number of subsets of a set containing n elements is

(a) 2^n (b) 2^{-n} (c) n (d) none of these

3. The null set is represented by

(a){ Ø } (b) { 0 } (c) Ø (d) none of these

4. A = {2, 3, 5, 7} , B { 4, 6, 8, 10} then A ∩ B can be written as

(a) { } (b) { Ø } (c) (AUB)' (d) None of these

5. The set {x|0<x<5} represents the set when x may take integral values only

(a) {0, 1, 2, 3, 4, 5} (b) {1, 2, 3, 4} (c) {1, 2, 3, 4, 5 } (d) none of these

6. The set {0, 2, 4, 6, 8, 10} can be written as

(a) {2x | 0<x <5} (b) {x : 0<x<5} (c) {2x : 0≤x≤5} (d) none of these

	Using Q.7 to Q.10 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}			
7.	The cardinal number of P ∩ Q is			
	(a) 3	(b) 2	(c) 0	(d) none of these
8.	The cardinal number of P∪ Q is			
	(a) 10	(b) 9	(c) 8	(d) none of these
9.	n (P^1) is			
	(a) 10	(b) 5	(c) 6	(d) none of these
10.	n(Q^1) is			
	(a) 4	(b) 10	(c) 4	(d) none of these
11	The set of cubes of the natural number is			
	(a) a finite set	(b) an infinite set	(c) a null set	(d) none of these
12	The set {2^x|x is any positive rational number} is			
	(a) an infinite set	(b) a null set	(c) a finite set	(d) none of these
13	{1– $(-1)^x$} for all integral x is the set			
	(a) {0}	(b) {2}	(c) {0, 2}	(d) none of these
14	E is a set of positive even number and O is a set of positive odd numbers, then E ∪ O is a			
	(a) set of whole numbers	(b) N		
	(c) a set of rational number	(d) none of these		
15	If R is the set of positive rational number and E is the set of real numbers then			
	(a) R⊆ E	(b) R ⊂ E	(c) E ⊂ R	(d) none of these

16	If N is the set of natural numbers and I is the set of positive integers, then			
	(a) N = I	(b) N ⊂ I	(c) N ⊆ I	(d) none of these
15	If I is the set of isosceles triangles and E is the set of equilateral triangles, then			
	(a) I ⊂ E	(b) E ⊂ I	(c) E = I	(d) none of these
16	If R is the set of isosceles right angled triangles and I is set of isosceles triangles, then			
	(a) R = I	(b) R⊃ I	(c) R ⊂ I	(d) none of these
17	{n(n+1)/2 : n is a positive integer} is			
	(a) a finite set	(b) an infinite set	(c) is an empty set	(d) none of these
18	If A = {1, 2, 3, 5, 7}, and B = {x^2 : x A}			
	(a) n(b) = n(A)	(b) n(B) > n(A)	(c) n(A)= n(B)	(d) n(A)<n(B)
19	A ∪ A is equal to			
	(a) A	(b) E	(c) ∅	(d) none of these
20	A ∩ A is equal to			
	(a) ∅	(b) A	(c) E	(d) none of these
21	(A ∪ B)' is equal to			
	(a) (A ∩ B)'	(b) A ∪ B'	(c) A' ∩ B'	(d) none of these
22	(A ∩ B)' is equal to			
	(a) (A' ∪ B)'	(b) A' ∪ B'	(c) A' ∩ B'	(d) none of these
23	A ∪ E is equal to (E is a superset of A)			
	(a) A	(b) E	(c) ∅	(d) none of these15
24	A ∩ B)' is equal to			

	(a) $(A' \cup B)'$	(b) $A' \cup B'$	(c) $A' \cap B'$	(d) none of these
25	$A \cup E$ is equal to (E is a superset of A)			
	(a) A	(b) E	(c) $\emptyset$	(d) none of these
26	$A \cap E$ is equal to (E is a superset of A)			
	(a) A	(b) E	(c) $\emptyset$	(d) none of these
27	$E \cup E$ is equal to (E is a superset of A)			
	(a) E	(b) $\emptyset$	(c) 2E	(d) none of these
28	$A \cap E'$ is equal to (E is a superset of A)			
	(a) E	(b) $\emptyset$	(c) A	(d) none of these
29	$A \cap \emptyset$ is equal to (E is a superset of A)			
	(a) A	(b) E	(c) $\emptyset$	(d) none of these
30	$A \cup A'$ is equal to (E is a superset of A)			
	(a) E	(b) $\emptyset$	(c) A	(d) none of these
31	If $E = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, the subset of E satisfying $5 + x > 10$ is			
	(a) {5, 6, 7, 8, 9}	(b) {6, 7, 8, 9}	(c) {7, 8, 9}	(d) none of these
32	If $A \Delta B = (A–B) \cup (B–A)$ and $A = \{1, 2, 3, 4\}$, $B = \{3,5,7\}$ than $A \Delta B$ is			
	(a) {1, 2, 4, 5, 7}	(b) {3}	(c) {1, 2, 3, 4, 5, 7}	(d) none of these

FUNCTIONS

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 7 (B)

Choose the most appropriate option/options (a) (b) (c) or (d).

1. If A = {x, y, z}, B = {p, q, r, s} which of the relation on A to B are function.

(a) {n, p), (x, q), (y, r), (z, s)}, (b) {(x, s), (y, s), (z, s)}

(c) {(y, p), (y, q), (y, r),(z, s), (d) {(x, p), (y, r), (z, s)}

2 {(x, y)|x+y = 5} where x, y ∈ R is a

(a) not a function (b) a composite function (c) one-one mapping (d) none of these

3 {(x, y)|x = 4} where x, y ∈ R is a

(a) not a function (b) function (c) one-one mapping (d) none of these

4 {(x, y), y=x2} where x, y ∈ R is

(a) not a function (b) a function (c) inverse mapping (d) none of these

5 {(x, y)|x<y} where x, y ∈ R is

(a) not a function (b) a function (c) one-one mapping (d) none of these

6. The domain of {(1, 7), (2, 6)} is

(a) (1, 6) (b) (7, 6) (c) (1, 2) (d) {6, 7}

7 The range of {(3, 0), (2, 0), (1, 0), (0, 0)} is

(a) {0, 0} (b) {0} (c) {0, 0, 0, 0} (d) none of these

8 The domain and range of {(x,y) : y = x2} where x, y ∈ R is

	(a) (reals, natural numbers) (b) (reals, positive reals) c) (reals, reals) (d) none of these
9	Let the domain of x be the set {1}. Which of the following functions are equal to 1
	(a) f(x) = x2, g(x) = x (b) f(a) = x, g(x) = 1–x
	(c) f(x) = x2 + x + 2, g(x) = (x+ 1)2 (d) none of these
10	If f(x) = 1/1–x, f(–1) is
	(a) 0 (b) ½ (c) 0 (d) none of these
11	If g(x) = (x–1)/x, g(–½) is
	(a) 1 (b) 2 (c) 3/2 (d) 3
12	If f(x) = 1/1–x and g(x) = (x–1)/x, than fog(x) is
	(a) x (b) 1/x (c) –x (d) none of these
13	If f(x) = 1/1–x and g(x) = (x–1)/x, then g of(x) is
	(a) x–1 (b) x (c) 1/x (d) none of these
14	The function f(x) = 2^x is
	(a) one-one mapping (b) one-many (c) many-one (d) none of these
15	The range of the function f(x) = log10(1 + x) for the domain of real values of x when 0 ≤ x≤9 is
	(a) [0, 1] (b) [0, 1, 2] (c) [0, 1] (d) none of these
16	The Inverse function f–1 of f(x) = 2x is
	(a) 1/2x (b)x/2 (c) 1/x (d) none of these
17	If f(x) = x+3, g(x) = x2, then fog(x) is
	(a) $x^2 + 3$ (b) $x^2 + x + 3$ (c) $(x + 3)^2$ (d) none of these
18	If f(x) = x+3, g(x) = x2, then f(x).g(x) is

(a) $(x + 3)^2$ (b) $x^2 + 3$ (c) $x^3 + 3x^2$ (d) none of these

19 The Inverse h–1 when $h(x) = \log 10x$ i

(a) $\log 10^x$ (b) 10^x (c) $\log 10(1/x)$ (d) none of these

20 For the function $h(x) = 10^{1+x}$ the domain of real values of x where $0 \leq x \leq 9$, the range is

(a) $10 \leq h(x) \leq 10^{10}$ (b) $0 \leq h(x) \leq 10^{10}$ (c) $0 \leq h(x) \leq 10$ (d) none of these

RELATIONS

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 7 (C)

Choose the most appropriate option/options (a) (b) (c) or (d).

1. "Is smaller than" over the set of eggs in a box is

(a) Transitive (T) (b) Symmetric (S) (c) Reflexive (R) (d) Equivalence (E)

2. "Is equal to" over the set of all rational numbers is

(a) (T) (b) (S) (c) (R) (d) E

[By using using R = Reflexive; T = Transitive, S = Symmetric and E = Equivalence fromQ.No. 2 to 8]

3 "has the same father as" …… over the set of children

(a) R (b) S (c) T (d) none of these

4. "is perpendicular to" over the set of straight lines in a given plane is

(a) R (b) S (c) T (d) E

5 "is the reciprocal of" …….. over the set of non-zero real numbers is

(a) S (b) R (c) T (d) none of these

6 $\{ (x, y)/x \in, y \in y, y = x \}$ is

(a) R (b) S (c) T (d) none of these

7 $\{(x,y) / x + y = 2x$ where x and y are positive integers$\}$, is

(a) R (b) S (c) T (d) E

8 "Is the square of" over n set of real numbers is

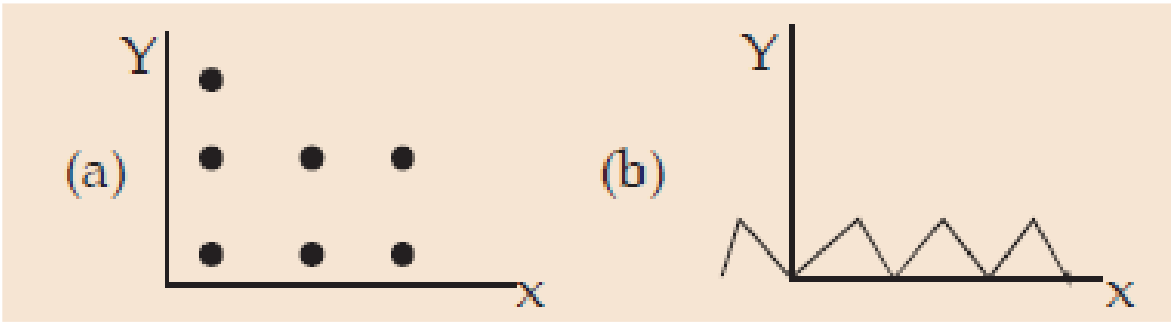
	(a) R (b) S (c) T (d) none of these
9	If A has 32 elements, B has 42 elements and A ∪ B has 62 elements, the number of elements
	in A ∩ B is
	(a) 12 (b) 74 (c) 10 (d) none of these
10	In a group of 20 children, 8 drink tea but not coffee and 13 like tea. The number of children
	drinking coffee but not tea is
	(a) 6 (b) 7 (c) 1 (d) none of these
11	The number of subsets of the sets {6, 8, 11} is
	(a) 9 (b) 6 (c) 8 (d) none of these
12	The sets V = {x / x+2=0}, R={x / x^2+2x=0} and S = {x : x^2 + x – 2 = 0} are equal to one
	another if x is equal to
	(a) –2 (b) 2 (c) ½ (d) none of these
13	If the universal set E = {x |x is a positive integer <25}, A = {2, 6, 8, 14, 22}, B = {4, 8, 10, 14}
	Then
	(a) (A ∩ B)'=A' ∪ B' b) (A ∩ B)'= A' ∩ B' (c) (A' ∩ B)'= ∅ (d) none of these
14	If the set P has 3 elements, Q four and R two then the set P × Q × R contains
	(a) 9 elements (b) 20 elements (c) 24 elements (d) none of these
15	Given A = {2, 3}, B = {4, 5}, C = {5, 6} then A × (B ∩ C) is
	(a) {(2, 5), (3, 5)} (b) {(5, 2), (5, 3)} (c) {(2, 3), (5, 5)} (d) none of these
16	A town has a total population of 50,000. Out of it 28,000 read the newspaper X and 23,000 read Y
	while 4,000 read both the papers. The number of persons not reading X and Y both is

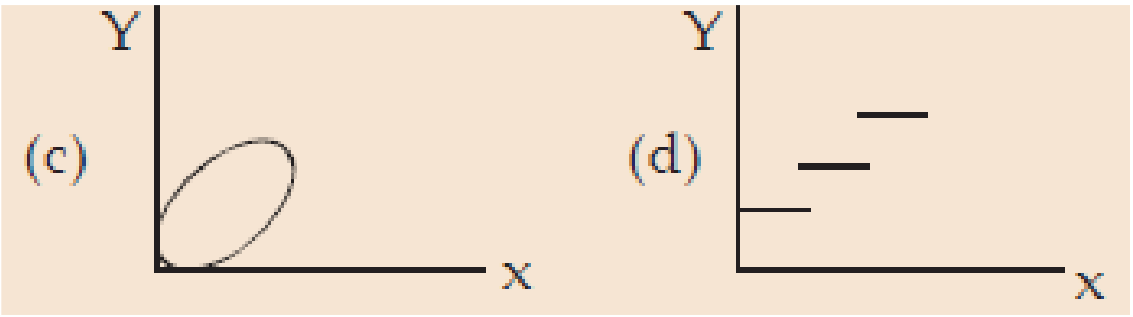
(a) 2,000 (b) 3,000 (c) 2,500 (d) none of these

17 If A = { 1, 2, 3, 5, 7} and B = {1, 3, 6, 10, 15}. Cardinal number of A-B is

(a) 3 (b) 4 (c) 6 (d) none of these

18 Which of the diagram is graph of a function





19 At a certain conference of 100 people there are 29 Indian women and 23 Indian men. Out of these Indian people 4 are doctors and 24 are either men or doctors. There are no foreign doctors. The number of women doctors attending the conference is

(a) 2 (b) 4 (c) 1 (d) none of these

20 Let A = {a, b}. Set of subsets of A is called power set of A denoted by P(A). Now n(P(A) is

(a) 2 (b) 4 (c) 3 (d) none of these

21 Out of 2000 employees in an office 48% preferred Coffee (c), 54% liked (T), 64% used to smoke (S). Out of the total 28% used C and T, 32% used T and S and 30% preferred C and S, only 6% did none of these. The number having all the three is

(a) 360 (b) 300 (c) 380 (d) none of these

22 Referred to the data of Q. 21 the number of employees having T and S but not C is

(a) 200 (b) 280 (c) 300 (d) none of these

23 Referred to the data of Q. 21 the number of employees preferring only coffee is

(a) 100 (b) 260 (c) 160 (d) none of these

24 If $f(x) = x + 3$, $g(x) = x^{2,}$ then g of (x) is

(a) $(x + 3)^2$ (b) $x^2 + 3$ (c) $x^2 (x + 3)$, (d) none of these

25 If $f(x) = 1/1–x$, then $f^{-1}(x)$ is

(a) 1–x (b) (x–1)/x (c) x/(x–1) (d) none of these

ANSWERS

Exercise A

1.	b	2.	a	3.	c	4.	a	5.	b	6.	c	7.	b	8.	c
9.	a	10.	b	11.	b	12.	a	13.	c	14.	b	15.	b	16.	a
17.	b	18.	c	19.	b	20.	c	21.	a	22.	b	23.	c	24.	b
25.	b	26.	a	27.	a	28.	b	29.	c	30.	a	31.	b	32.	a

Exercise B

1.	b, d	2.	c	3.	a	4.	b	5.	a	6.	c	7.	b	8.	b
9.	a	10.	b	11.	d	12.	a	13.	b	14.	a	15.	a	16.	b
17.	a	18.	c	19.	b	20.	a								

Exercise C

1.	a	2.	a,b,c,d	3.	a, b, c	4.	b	5.	a	6.	a, b, c	7.	a, b	8.	d
9.	a	10.	b	11.	c	12.	a	13.	a	14.	c	15.	a	16.	b
17.	a	18.	b	19.	c	20.	b	21.	a	22.	b	23.	c	24.	a
25.	b														

"KAR LO PAST APNI MUTHI ME"

Past Exam Questions

2006 – Nov

[1] Out of 20 members in a family, 11 like to take tea and 14 like coffee. Assume that each one likes at least one of the two drinks. Find how many like both coffee and tea :

(a) 2 c (b) 3 (c) 4 (d) 5

2007 – Feb

[2} In a group of 70 people, 45 speak Hindi, 33 speak English and 10 speak neither Hindi nor English. Find how many can speak both English as well as Hindi:

(a) 13 (b) 19 (c) 18 (d) 28

[3] Let R is the set of real numbers, such that the function f: R→R and g : R → 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) $x^2 - 6x + 1$.

2007 – May

[4] In a survey of 300 companies, the number of companies using different media - Newspapers (N), Radio (R) and Television (T) are as follows :

$n(N) = 200, n(R) = 100, n(T) = 40, n(N \cap R) = 50, n(R \cap T) = 20, n(N \cap T) = 25$ and $n(N \cap R \cap T) = 5$.

Find the numbers, of companies using none of these media :

(a) 20 companies (b) 250 companies (c) 30 companies (d) 50 companies

[5] If R is the set of real numbers such that the function f: R → R is defined by $f(x) = (x + 1)^2$, then find

(fof):

(a) $(x + 1)^2 + 1$ (b) $x^2 + 1$ (c) $\{(x+ 1)^2 + 1)^2$ (d) None

2007 – Aug

[6] If f: R → R, $f(x) = 2x + 7$, then the inverse of f is :

(a) $f^{-1}(x) = (x - 7)/2$ (b) $f^{-1}(x) = (x + 7)/2$ (c) $f^{-1}(x) = (x - 3)/2$ (d) None.

7 In a town of 20,000 families it was found that 40% families buy newspaper A, 20% families buy

newspaper B and 10% families buy newspaper C, 5% families buy A and B, 3% buy B and C and 4% buy

A and C. If 2% families buy all the three newspapers, then the number of families which buy A only is:

(a) 6600 (b) 6300 (c) 5600 (d) 600.

2007 – Nov

8 Let f: R → R be such that $f(x) = 2^x$, then $f(x + y)$ equals :

(a) f(x) + f(y) (b) f(x).f(y) (c) f(x) ÷ f (y) (d) None of these

2008 – Feb

9. Out of total 150 students, 45 passed in Accounts, 30 in Economics and 50 in Maths, 30 in both Accounts

and Maths, 32 in both Maths and Economics, 35 in both Accounts and Economics, 25 students passed in all the three subjects. Find the numbers who passed at least in any one of the subjects :

(a) 63 (b) 53 (c) 73 (d) None.

2008 – June

10 If $f(x) = \frac{2+x}{2-x}$, then $f^{-1}(x)$:

(a) $\frac{2(x-1)}{x+1}$ (b) $\frac{2(x+1)}{x-1}$ (c) $\frac{x+1}{x-1}$ (d) $\frac{x-1}{x+1}$

2008-Dec

11 If A = {1,2, 3, 4,}

B = {2, 4, 6, 8,}

f (1) = 2, f (2) = 4, f (3) = 6 and

f (4) = 8, And f: A → B then f^{-1} is :

(a) {(2,1), (4, 2), (6, 3), (8, 4)} (b) {(1,2), (2, 4), (3, 6), (4, 8)}

(c) {(1.4). (2. 2), (3, 6), (4, 8)} (d) None of these

12 If $f(x) = x^2 + x - 1$ and 4f (x) = f (2x) then find 'x'.

(a) 4/3 (b) 3/2 (c) - 3/4 (d) None of these

13. If A = {p, q, r, s}

B = {q, s, t}

C = {m, q, n}

Find C - (A Λ B)

(a) {m, n} (b) {p, q} (c) {r, s} (d) {p, r}

2009 – Dec

14 X = {x, y, w, z}, y = {1,2,3,4}

H = {(x, 1), (y, 2), (y, 3), (z, 4), (x, 4)}

(a) H is a function from X to Y (b) H is not a function from X to Y

(c) H is a relation from Y to X (d) None of the above

15 Given the function f(x) = (2x + 3), then the value of f(2x) - 2f(x) + 3 will be :

(a) 3 (b) 2 (c) 1 (d) 0

16 If f (x) = 2x + h then find f(x + h) - 2f (x)

(a) h - 2x (b) 2x – h (c) 2x + h (d) None of these

2010 – June

17. If A = {x : x^2 - 3x + 2 = 0},

B = {x : x^2 + 4x - 12 = 0}, then

B - A is Equal to

(a) {- 6} (b) {1} (c) {1,2} (d) {2,-6}

18. If F : A → R is a real valued function defined by f(x) = $\frac{1}{x}$, then A = ____.

(a) R (b) R-{1} (c) R-{0} (d) R-N

19. In the set N of all natural numbers the relation R defined by a R b "if and only if, a divide b", then the relation R is :

(a) Partial order relation (b) Equivalence relation

c) Symmetric relation (d) None of these.

2010 – Dec

20. For any two sets A and B, A∩ (A' ∪B) = _____, where A' represent the compliment of the set A

(a) A∩B (b) A∪B (c) A'∪B (d) None of these

21. If f: R→R, f(x) = x + 1,

g : R→R g(x) = x^2 + 1

then fog(-2) equals to

(a) 6 (b) 5 (c) -2 (d) None

22. If A⊂B, then which one of the following is true

(a) A∩B =B (b) A∪B=B (c) A∩B =A^1 (d) A∩B = φ

23. If f(x- 1) = x^2-4x + 8 , then f (x + 1) = _____

(a) x^2+8 (b) x^2+7 (c) x^2+4 (d) x^2- 4x

2011 – June

24. There are 40 students, 30 of them passed in English, 25 of them passed in Maths and 15 of them passed in both. Assuming that every Student has passed at least in one subject. How many student's

passed in English only but not in Maths.

(a) 15 (b) 20 (c) 10 (d) 25

25. If A = {± 2, ± 3}, B = {1,4,9} and F = {(2, 4), (-2, 4), (3, 9), (-3, 4)} then 'F' is defined as :

(a) One to one function from A into B. (b) One to one function from A onto B.

(c) Many to one function from A onto B. (d) Many to one function from A into B.

26. If f (x) = $\frac{x}{\sqrt{1+x^2}}$ and g (x) = $\frac{x}{\sqrt{1-x^2}}$ Find fog ?

(a) x (b) $\frac{1}{x}$ (a) $\frac{x}{\sqrt{1-x^2}}$ (d) $x\sqrt{1-x^2}$

2011 – Dec

27. f(x) = 3+x, for - 3< x <0 and 3 - 2x for 0< x <3, then Value of f(2) will be

(a) - 1 (b) 1 (c) 3 (d) 5

28. If A = (1, 2, 3, 4, 5), B = (2, 4) and C = (1,3, 5) then (A - C) × B is

(a) {(2, 2), (2, 4), (4, 2), (4, 4), (5, 2), {5, 4)} (b) {(1,2), (1,4), (3, 2), (3, 4), (5, 2); (5, 4)}

(c) {(2, 2), (4, 2), (4, 4), (4, 5)} (d) {(2, 2), (2, 4), (4, 2), (4, 4)}

29. For any two sets A and B the set (AUB')' is Equal to (where' denotes compliment of the set)

(a) B – A (b) A – B (c) A' - B' (d) B' - A'

30. The number of proper sub set of the set {3, 4, 5, 6, 7} is

(a) 32 (b) 31 (c) 30 (d) 25

2012 – June

31. On the set of lines, being perpendicular is a _____ relation.

(a) Reflexive (b) Symmetric (c) Transitive (d) None of these.

32. The range of the function f: N - N; $f(x) = (-1)^{x-1}$, is

2012 – Dec

33. For a group of 200 persons, 100 are interested in music, 70 in photography and 40 in swimming, Further more 40 are interested in both music and photography, 30 in both music and swimming, 20 in photography and swimming and 10 in all the three. How many are interested in photography but not in music and swimming?

(a) 30 (b) 15 (c) 25 (d) 20

34. If f: R → R is a function, defined by $f(x) = 10x - 7$, if $g(x) = f^{-1}(x)$, then g(x) is equal to

(a) $\frac{1}{10x-7}$ (b) $\frac{1}{10x+7}$ (c) $\frac{x+7}{10}$ (d) $\frac{x-7}{10}$

35. The number of elements in range of constant function is

(a) One (b) Zero (c) Infinite (d) Indetermined

36. Let A = {1,2, 3}, then the relation R = {1,1), (2, 3), (2, 2), (3, 3), (1,2)} is:

(a) Symmetric (b) Transitive (c) Reflexive (d) Equivalence

37. If $f(x) = x + 2$, $g(x) = 7^x$, than g of (x) = _____

(a) $7^x . x + 2.7^x$ (b) $7^x + 2$ (c) 49 (7^X) (d) None of these

2013 - June

38. If $f(x) = \log\left(\frac{1+x}{1-x}\right)$, then $f\left(\frac{2x}{1+x^2}\right)$ is equal to:

(a) f(x) (b) 2f(x) (c) 3f(x) (d) -f(x)

39. if $f(x) = (a - x^n)^{1/n}$, $a > 0$ and 'n' is a positive integer, then f(f(x)) = _____.**2013 - Dec**

(a) x (b) a (c) $x^{1/n}$ (d) $a^{1/n}$

40. Of the 200 candidates who were interviewed for a position at call centre, 100 had a two-wheeler, 70 had a credit card and 140 had a mobile phone, 40 of them had both a two-wheeler and a credit card, 30 had both a credit card and a mobile phone, 60 had both a two-wheeler and a mobile phone, and 10 had all three. How many candidates had none of the three?

(a) 0 (b) 20 (c) 10 (d) 18

41. If $f(x) = \frac{x^2 - 25}{x - 5}$, then f(5) is

(a) 0 (b) 1 (c) 10 (d) not defined

2014 - June

42. Let A = {1,2,3} and B = {6,4,7}. Then, the relation R = {(2,4), (3,6)} will be:

(a) Function from A to B (b) Function from B to A

(c) Both A and B (d) Not a function

43. In a class of 50 students, 35 opted for Mathematics and 37 opted for Commerce. The number of such students who opted for both Mathematics and Commerce are:

(a) 13 (b) 15 (c) 22 (d) 28

44. The range of {(1,0), (2,0), (3,0), (4,0), (0,0)} is:

(a) {1,2,3,4,0} (b) {0} (c) {1,2,3,4} (d) None of these

2014 - Dec

45. Let N be the set of all Natural numbers; E be the set of all even natural numbers then the function f: N → E defined as f (x) = 2x +/x ∈N is:

(a) One-one into (b) One-one onto (c) Many-one into (d) Many-one onto

46. If A = {2, 3}, B = {4, 5}, C = {5, 6}, then A × (B ∩ C) = _____

(a) {(5, 2), (5, 3)} (b) {(2, 5), {3, 5)} (c) {(2, 4), (3, 5)} (d) {(3, 5), (2, 6)}

47. If S = {1, 2, 3} then the relation {(1, 1), (2, 2), (1, 2), (2, 1)} is symmetric and

(a) Reflexive but not transitive (b) Reflexive as well as transitive

(c) Transitive but not reflexive (d) Neither transitive nor reflexive

48. If f(x) = then $\frac{x}{x-1}$, then $\frac{f(x/y)}{f(y/x)}$ = _____

(a) x/y (b) y/x (c) -x/y (d) -y/x

2015 - June

49. If N be the set of all natural numbers and E be the set of all even natural numbers then the function f: N

→ E, such that f (x) = 2x for all X ∈ N is

(a) one-one onto (b) one-one into (c) many-one onto (d) constant

2015 - Dec

50. If A =.{x, y, z}, B = {a, b, c, d}, then which of the following relation from the set A to set B is a function?

(a) {(x, a), (x, b), (y, c), (z, d)} (b) {(x, a), (y, b), (z, d)}

(c) {(x, c), (z, b), (z, c)} (d) {a, z), (b, y), (c, z), (d, x)}

51. In a class of 80 students, 35% students can play only cricket, 45% students can play only table tennis and the remaining students can play both the games. In all how many students can play cricket?

(a) 55 (b) 44 (c) 36 (d) 28

52. If $f(x) = 2x + 2$ and $g(x) = x^2$, then the value of fog (4) is:

(a) 18 (b) 22 (c) 34 (d) 128

2016 - June

53. If set $A = \left\{x: \frac{x}{2} \in z, 0 \leq x \leq 10\right\}$,

B = {x: x is one digit prime number}

and $C = \left\{x: \frac{x}{3} \in N, x \leq 12\right\}$

then A ∩ (B∩C) is equal to -

(a) ϕ (b) Set A (c) Set B (d) Set C

54. Let A be the set of squares of natural numbers and let x∈A, y∈A then

(a) X + Y∈A (b) X-Y∈A (c) $\frac{X}{Y} \in A$ (d) xy ∈ **A**

55. The domain (D) and range (R) of the function f(x) = 2 - |x + 1| is

(a) D = Real numbers, R = (2, ∞) (b) D = Integers, R = (0, 2)

(c) D = Integers, R = (- ∞, ∞) (d) D = Real numbers, R = (- ∞, 2)

56. If R is the set of all real numbers, then the function f: R→R defined by $f(x) = 2^x$

(a) one-one onto (b) one-one into (c) many-one into (d) many-one onto

57. The inverse function f^{-1} of f(x) = 100x is:

(a) $\frac{x}{100}$ (b) $\frac{1}{100x}$ (c) $\frac{1}{x}$ (d) None of these

58. The number of subsets of the set formed by the word Allahabad is:

(a) 128 (b) 16 (c) 32 (d) 64

2017 - June

59. The range of function f defined by $f(x) = \frac{x}{x^2+1}$ is:

(a) $\left\{x: \frac{-1}{2} < x < \frac{1}{2}\right\}$ (b) $\left\{x: \frac{-1}{2} \leq x < \frac{1}{2}\right\}$ (c) $\left\{x: \frac{-1}{2} \leq X \leq \frac{1}{2}\right\}$ (d) $\left\{x: x > \frac{1}{2} \text{ or } x < \frac{-1}{2}\right\}$

60. In a group of students 80 can speak Hindi, 60 can speak English and 40 can speak English and Hindi both, then number of students is:

(a) 100 (b) 140 (c) 180 (d) 60

61. If $f(x) = \frac{x-1}{x}$ and $g(x) = \frac{1}{1-x}$ then (fog).(x) is equal to:

(a) x - 1 (b) x (c) 1 - x (d) - x

ANSWERS

1	D	11	A	21	A	31	B	41	D	51	B
2	C	12	B	22	B	32	B	42	A	52	C
3	C	13	A	23	C	33	D	43	C	53	A
4	D	14	B	24	A	34	C	44	B	54	D
5	C	15	D	25	C	35	C	45	B	55	D
6	A	16	A	26	A	36	C	46	B	56	B
7	A	17	A	27	A	37	C	47	C	57	A
8	B	18	C	28	D	38	B	48	C	58	C
9	B	19	D	29	A	39	A	49	A	59	C
10	A	20	A	30	B	40	C	50	B	60	A
										61	B

CH - 8

BASIC CONCEPTS OF DIFFERENTIAL & INTEGRAL CALCULUS

(A) DIFFERENTIAL CALCULUS

SOME STANDARD RESULTS (FORMULAE)

(1) $\frac{d}{dx}(x)^n = nx^{n-1}$

(2) $\frac{d}{dx}(e^x) = e^x$

(3) $\frac{d}{dx}(a^x) = a^x \log_e a$

(4) $\frac{d}{dx}\ (constant) = 0$

(5) $\frac{d}{dx}(e^{ax}) = ae^{ex}$

(6) $\frac{d}{dx}\log x = \frac{1}{x}$

Ex. 1: Differentiate each of the following functions with respect to x:

(a) $3x^2 + 5x - 2$

Sol.:

Ex. 2: (b) $a^x + x^a + a^a$

Sol.: Let $h(x) = a^x + x^a + a^a$

$\frac{d}{dx}\{h(x)\} = \frac{d}{dx}(a^x) + \frac{d}{dx}(x^a) + \frac{d}{dx}(a^a)$, a^a *is constant*

$= a^x \log a + ax^{a-1} + 0 = a^x \log a + ax^{a-1}$.

Ex. 3: (c) $\frac{1}{3}x^3 - 5x^2 + 6x - 2\log x + 3$

Sol.:

Ex. 4: (d) $e^x \log x$

Sol.:

Ex. 5: (e) $y = 2^x x^5$

Sol.: $\frac{dy}{dx} = x^5 \frac{d}{dx} 2^x + 2^x \frac{d}{dx} x^5$ (Product Rule)

$= x^5\, 2^x \log e\, 2 + 5.\, 2^x\, x^4$

Ex. 6: (f) $\frac{x^2}{e^x}$

Sol.:

Ex. 7: (g) $e^x / \log x$

Sol.:

Ex. 8: (h) $2^x \log x$

Sol.: Let $h(x) = 2^x \log x$

The given function h(x) is appearing here as product of two functions

$f(x) = 2^x$ and $g(x) = \log x$

$$\frac{d}{dx}\{h(x)\} = \frac{d}{dx}(2^x \log x) = 2^x \frac{d}{dx}\log x + \log x \frac{d}{dx} 2^x$$

$$2^x \times \frac{1}{x} + \log x \, 2^x \log 2 = \frac{2^x}{x} + 2^x \log 2 \log x$$

Ex. 9: (i) $\frac{2x}{3x^3+7}$

Sol.: Let $h(x) = \frac{2x}{3x^3+7}$ [Given function appears as the quotient of two functions]

$$\frac{d}{dx}\{h(x)\} = \frac{3x^3+7\frac{d}{dx}(2x) - 2x\frac{d}{dx}(3x^3+7)}{(3x^3+7)^2}$$

$$= \frac{(3x^3+7).2 - 2x\,(9x^2+0)}{(3x^3+7)^2} = \frac{2\{(3x^3+7) - 9x^3\}}{(3x^3+7)^2} = \frac{2(7-6x^3)}{(3x^3+7)^2}$$

DERIVATIVE OF A FUNCTION OF FUNCTION

Ex. 10: Differentiate $\log (1+x^2)$ w.r.t to x

Sol.:

IMPLICIT FUNCTIONS

Ex. 11: Find $\frac{dy}{dx}$ for $x^2y^2 + 3xy + y = 0$

Sol.: $x^2y^2 + 3xy + y = 0$

Differentiating with respect to x we see

$x^2 \frac{d}{dx} y^2 + y^2 \frac{d}{dx} x^2 + 3x \frac{d(y)}{dx} y + 3y \frac{d}{dx} (x) + \frac{dy}{dx} = 0$

or $2yx^2 \frac{dy}{dx} + 2xy^2 + 3x \frac{dy}{dx} + 3y \frac{d(x)}{dx} + \frac{dy}{dx} = 0, \frac{d}{dx} (x) = 1 , \frac{d(y^2)}{dx} = 2y \frac{dy}{dx}$ (chain rule)

or $(2yx^2 + 3x + 1) \frac{dy}{dx} + 2xy^2 + 3y = 0$

or $\frac{dy}{dx} = - (2xy^2 + 3y)/ (2yx^2 + 3x + 1)$

This is the procedure for differentiation of Implicit Function.

PARAMETRIC EQUATION

Ex. 12: Find $\frac{dy}{dx}$ if $x = at^3$, $y = a/t^3$

Sol.:

LOGARITHMIC DIFFERENTIATION

Ex. 13: *Differentiate x^x w.r.t. x*

Sol.:

SOME MORE EXAMPLES

1. *If $y = \sqrt{\frac{1-x}{1+x}}$ show that $(1-x^2)\frac{dy}{dx} + y = 0$.*

Sol.: Taking logarithm, we may write $\log y = \frac{1}{2}\{\log(1-x) - \log(1+x)\}$

Differentiating throughout we have

$$\frac{1}{y}\frac{dy}{dx} = \frac{1}{2}\frac{d}{dx}\{\log(1-x) - \log(1+x)\} = \frac{1}{2}\left(\frac{-1}{1-x} - \frac{1}{1+x}\right) = -\frac{1}{1-x^2}$$

By cross–multiplication $(1-x^2)\frac{dy}{dx} = -y$

Transposing $(1-x^2)\frac{dy}{dx} + y = 0$

2. *Differentiate the following w.r.t. x :*

(a) $\log\left(x + \sqrt{x^2+a^2}\right)$

Sol.: $y = \log\left(x + \sqrt{x^2+a^2}\right)$

$\frac{dy}{dx} = \frac{1}{(x+\sqrt{x^2+a^2})}\left(1 + \frac{1}{2\sqrt{x^2+a^2}}(2x)\right)$

$= \frac{1}{(x+\sqrt{x^2+a^2})} + \frac{x}{(x+\sqrt{x^2+a^2})\sqrt{x^2+a^2}}$

$= \frac{(x+\sqrt{x^2+a^2})}{(x+\sqrt{x^2+a^2})\sqrt{x^2+a^2}} = \frac{1}{\sqrt{x^2+a^2}}$

(b) $\log(\sqrt{x-a} + \sqrt{x-b})$

Sol.: **Let y =** $\log(\sqrt{x-a} + \sqrt{x-b})$

or $\frac{dy}{dx} = \frac{1}{\sqrt{x-a}+\sqrt{x-b)}}\left(\frac{1}{2\sqrt{x-a}} + \frac{1}{2\sqrt{x-b}}\right)$

$= \frac{(\sqrt{x-a}+\sqrt{x-b})}{(\sqrt{x-a}+\sqrt{x-b})2\sqrt{x-a}\sqrt{x-b}}$

$= \frac{1}{2\sqrt{x-a}\sqrt{x-b}}$

3. *If $x^m y^n = (x+y)^{m+n}$ prove that $dy/dx = Y/X$*

Sol.: $x^m y^n = (x+y)^{m+n}$

Taking log on both sides

$\log x^m y^n = (m+n) \log (x + y)$

or $m \log x + n \log y = (m+n) \log (x+y)$

so $\frac{m}{x} + \frac{n}{y}\frac{dy}{dx} = \frac{(m+n)}{(x+y)}(1 + \frac{dy}{dx})$

or $\left(\frac{n}{y} - \frac{(m+n)}{(x+y)}\right)\frac{dy}{dx} = \frac{(m+n)}{(x+y)} = \frac{m}{x}$

or $\frac{(nx+ny-my-ny)}{y(x+y)}\frac{dy}{dx} = \frac{mx+nx-mx-my}{x(x+y)}$

or $\frac{(nx-my)}{y}\frac{dy}{dx} = \frac{nx-my}{x}$

or $\frac{dy}{dx} = \frac{y}{x}$ proved,

4. If $x^y = e^{x-y}$ prove that $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$

Sol.:

BASIC IDEA ABOUT HIGHER ORDER DIFFERENTIATION

Ex. : If $y = ae^{mx} + be^{-mx}$ prove that $\frac{d^2y}{dx^2} = m^2y$

Sol.:

WORD PROBLEMS

Ex. 1: *The total cost function of a firm is where is the total cost and is outpout. A tax at the rate of ` 2 per unit of output is imposed and the producer adds it to his cost. If the market demand function is given by ,where ` p is the price per unit of output, find the profit maximising output and price for maximum profit.*

Sol.:

Ex. 2: *The cost function of a company is given by:*

$C(x) = 100x - 8x^2 + \frac{X^3}{3}$

where x denotes the output. Find the level of output at which:

(i) marginal cost is minimum

(ii) average cost is minimum

Sol.: $M(x) = \text{Marginal Cost} = C(x) = \frac{d}{dx}(100x - 8x^2 + \frac{X^3}{3}) = = 100 - 16x + x^2$

A(x) = Average Cost = $\frac{C(x)}{X}$ = 100x – 8x² + $\frac{X^3}{3}$

(i) M(x) is maximum or minimum when M¢(x) = -16 + 2x = 0 or, x = 8.

$M^2(8) = M''(x)]_{X=8} = [2]_{X=8} = 2 > 0$

Hence, marginal cost is minimum at x = 8.

(ii) A(x) is maximum or minimum when A¢(x) = -8 + $\frac{2X}{3}$ = 0, or x = 12

$A^2(12)\ A''(x)]_{x=12} = \frac{2}{3}\Big]_{X=12} = \frac{2}{3} > 0$

Hence, average cost is minimum at x = 12.

A(x) = Average Cost = 100 – 8n + $\frac{X^3}{3}$ = 100 – 8 (12) + $\frac{144}{3}$

=100 – 96 + 48 = 52

AGAR DARR HAI BHAGANA, TO MATHS HAI BANANA

EXERCISE 8(A)

Choose the most appropriate option (a) (b) (c) or (d).

1. The gradient of the curve y = 2x³ – 3x² – 12x + 8 at x = 0 is

a) –12 b) 12 c) 0 d) none of these

2. The gradient of the curve y = 2x³ –5x² – 3x at x = 0 is

a) 3 b) –3 c) 1/3 d) none of these

3. The derivative of y = $\sqrt{x+1}$ is

a) 1/ $\sqrt{x+1}$ b) -1/ $\sqrt{x+1}$ c) ½ $\sqrt{x+1}$ d) none of these

4. If f(x) = e^{aX^2+bX+c} the f '(x) is

a) e^{aX^2+bX+c} b) e^{aX^2+bX+c} (2ax+b) c)2ax+b d) none of these

5. if f(x) = $\frac{X^2+1}{X^2-1}$ then f'(x) is

a) $-4x / (x^2 - 1)^2$ b) $4x / (x^2 - 1)^2$ c) $x / (x^2 - 1)^2$ d) none of these

6. If y = x (x –1) (x – 2) then $\frac{dy}{dx}$ is

a) $3x^2 - 6x + 2$ b) $-6x + 2$ c) $3x^2 + 2$ d) none of these

7. The gradient of the curve $y - xy + 2px + 3qy = 0$ at the point (3, 2) is -2/3 The values of p and q are

a) (1/2, 1/2) b) (2, 2) c) (–1/2, –1/2) d) (1/2, 1/6)

8. The curve $y^2 = ux^3 + v$ passes through the point P(2, 3) and $\frac{dy}{dx} = 4$ at P. The values of u and v are

a) (u = 2, v = 7) b) (u = 2, v =– 7) c) (u = –2, v =– 7) d) (0, -1)

9. The gradient of the curve y + px + qy = 0 at (1, 1) is ½ . The values of p and q are

a) (–1, 1) b) (2, –1) c) (1, 2) d) (0, -1)

10. If xy = 1 then y^2 + dy/dx is equal to

a) 1 b) 0 c) –1 d) none of these

11. The derivative of the function $\sqrt{x} + \sqrt{x}$ is

a) $1/2\sqrt{x} + \sqrt{x}$ b) $1+1/2\sqrt{x}$ c) $1/2\sqrt{x} + \sqrt{x}\,(1 + 1/2\sqrt{x})$ d) none of these

12. Given $e^{-xy} - 4xy = 0$, dy/dx can be proved to be

a) – y /x b) y / x c) x / y d) none of these

13. If $x^2/a^2 - y^2/a^2 = 1$, dy/dx can be expressed as

a) x/y b) $x/\sqrt{x^2 - a^2}$ c) $1/\sqrt{x^2/a^2 - 1}$ d) none of these

14.	If $\log (x / y) = x + y$, dy/dx may be found to be
	a)y(1-x)/x(1+y) b)y/x c)1-x/1+y d) none of these
15.	If $f(x, y) = x^3 + y^3 - 3axy = 0$, $d\frac{ay}{x}$ can be found out as
	a) $ay-x^2/y^2+ax$ b) $ay-x^2/y^2-ax$ c)$ay+x^2/y^2+ax$ d) none of these
16.	Given $x = at^2, y = 2at; \frac{ay}{dx}$ is calculated as
	a) t b) –1/t c) 1/t d) none of these
17.	Given $x = 2t + 5, y = t^2 - 2$; dy/dx is calculated as
	a) t b) –1/t c) 1/t d) none of these
18.	If $y = 1/\sqrt{x}$ then dy/dx is equal to
	a) $\frac{1}{2x\sqrt{x}}$ b) $\frac{-1}{x\sqrt{x}}$ c) $-\frac{1}{2x\sqrt{x}}$ d) none of these
19.	If $x = 3t^2 - 1, y = t^3 - t$, then dy/dx is equal to
	a) $3t^2-1/6t$ b) $3t^2-1$ c)3t -1/6t d) none of these
20.	The slope of the tangent to the curve $y = \sqrt{4-x^2}$ at the point, where the ordinate and the
	abscissa are equal, is
	a) –1 b) 1 c) 0 d) none of these
21.	The slope of the tangent to the curve $y = x^2 - x$ at the point, where the line $y = 2$ cuts the
	curve in the Ist quadrant, is
	a) 2 b) 3 c) –3 d) none of these
22.	For the curve $x^2 + y^2 + 2gx + 2hy = 0$, the value of dy/dx at (0, 0) is
	a) -g/h b) g/h c) h/g d) none of these
23.	If $y = e^{3x} - e^{2x} / e^{3x} + e^{2x}$ then dy/dx is equal to
	a) $2e^{5x}$ b) $1/(e^{5x} + e^{2x})^2$ c) $e^{5x}/(e^{5x} + e^{2x})$ d) none of these

24.	If $x^y \cdot y^x = M$, where M is constant then dy/dx is equal to
	a) -y/x b) $\frac{-y(y+x \log y)}{x(x \log x+x)}$ c) $\frac{y+x \log y)}{y \log x+x)}$ d) none of these
25.	Given $x = t + t^{-1}$ and $y = t - t^{-1}$ the value of dy/dx at t = 2 is
	a) 3/5 b) –3/5 c) 5/3 d) none of these
26.	If $x^3 - 2x^2 y2 + 5x + y - 5 = 0$ then dy/dx at x = 1, y = 1 is equal to
	a) 4/3 b) – 4/3 c) 3/4 d) none of these
27.	The derivative of $x^2 \log x$ is
	a) 1+2log x b) x(1 + 2 log x) c) 2 log x d) none of these
28.	The derivative of $\frac{3-5x}{3+5x}$ is
	a) $30/(3+5x)^2$ b) $1/(3+5x)^2$ c) $-30/(3+5x)^2$ d) none of these
29.	Let $y = \sqrt{2x} + 3^{2x}$ then dy/dx is equal to
	a) $(1/2x) + 2.3^{2x} \log_e 3$ b) 1/ 2x c) $2.3^{2x} \log_e 3$ d) none of these
30.	The derivative of $\log [e^x \{x-2/x+2\}^{3/4}]$ is
	a) $x^2 + 1/x^2 + 4$ b) $x^2 - 1/x^2 - 4$ c) $1/x^2 - 4$ d) none of these
31.	The derivative of $e^{3x2 - 6x+2}$ is
	a) $30(1-5x)^5$ b) $(1-5x)^5$ c) $6(x-1)\, e^{3x2 - 6x+2}$ d) none of these
32.	If $y = e^x + 1/e^x - 1$ then dy/dx is equal to
	a) $-2e^x/(e^x - 1)^2$ b) $2e^x/(e^x - 1)^2$ c) $-2/(e^x - 1)^2$ d) none of these
33.	If $f(x) = \{(a+x)/(1+x)\}^{a+1+2x}$ the value of f'(0) is
	a) a^{a+1} b) $a^{a+1}[1 - a^2/a + 2 \log a]$ c) 2 log a d) none of these
34.	If $x = at^2$, $y = 2at$ then $[dy/dx]_{t=2}$ is equal to
	a) ½ b) –2 c) –1/2 d) none of these

35.	Let $f(x) = (\sqrt{x} + \frac{1}{\sqrt{x}})^2$ then $f'(2)$ is equal to
	a) ¾ b) ½ c) 0 d) none of these
36.	$f(x) = x^2 - 6x + 8$ then $f'(5) - f'(8)$ is equal to
	a) $f'(2)$ b) $3f'(2)$ c) $2f'(2)$ d) none of these
37.	If $y = (x + \sqrt{x^2 + m^2})^n$ then dy/dx is equal to
	a) ny b) $ny/\sqrt{x^2 + m^2}$ c) $-ny/\sqrt{x^2 + m^2}$ d) none of these
38.	If $y = + \sqrt{x}/m + \sqrt{m}/x$ then $2xy\, dy/dx - x/m + m/x$ is equal to
	a) 0 b) 1 c) –1 d) none of these
39.	If $y = 1 + x + x^2/2! + x^3/3! + \ldots\ldots\ldots + x^n/n + \ldots\ldots\ldots$ Then $dy/dx - y$ is proved to be
	a) 1 b) –1 c) 0 d) none of these
40.	$f(x) = x^k$ and $f'(1) = 10$ the value of k is
	a) 10 b) –10 c) 1/10 d) none of these
41.	If $y = x^2 + m^2$ then $y\, y_1$ (where $y_1 = dy/dx$) is equal to
	a) –x b) x c) 1/x d) none of these
42.	If $y = e^x + e^{-x}$ then $dy/dx - \sqrt{y^2 - 4}$ is equal to
	a) 1 b) –1 c) 0 d) none of these
43.	The derivative of $(x^2 - 1)/x$ is
	a) $1 + 1/x^2$ b) $1 - 1/x^2$ c) $1/x^2$ d) none of these
44.	The differential coefficients of $(x^2 + 1)/x$ is
	a) $1 + 1/x^2$ b) $1 - 1/x^2$ c) $1/x^2$ d) none of these
45.	If $y = e^{\sqrt{2}x}$ then dy/dx is equal to _____.

	a) $e^{\sqrt{2x}}/\sqrt{2x}$ b) $e^{\sqrt{2x}}$ c) $e^{\sqrt{2x}}/\sqrt{2x}$ d) none of these
46.	If $y = \sqrt{x}^{\sqrt{\ldots\ldots\infty}}$ then dy/dx is equal to _____.
	a) $\frac{y2}{2-y\log x}$ b) $\frac{y2}{x(2-y\log x)}$ c) $\frac{y2}{\log x)}$ d) none of these
47.	If $x = (1 - t^2)/(1 + t^2)$ $y = 2t/(1 + t^2)$ then dy/dx at t =1 is _____.
	a) ½ b) 1 c) 0 d) none of these
48.	$f(x) = x^2/e^x$ then f'(1) is equal to _____.
	a) – 1/e b) 1/e c) e d) none of these
49.	If $y = (x + \sqrt{x^2 - 1})^m$ then $(x^2 - 1)(dy/dx)^2 - m_2y_2$ is proved to be
	a) –1 b) 1 c) 0 d) none of these
50.	If $f(x) = \frac{4 - 2x}{2+l3x+3x2}$ then the values of x for which f'(x) = 0 is
	a) 2 $(1 \pm \sqrt{\frac{5}{3}}\,0)$ b) $(1 \pm \sqrt{3})$ c)2 d) none of these

(B) INTEGRAL CALCULUS

BASIC FORMULAE

i) $\int x^n dx = \frac{x^{n+1}}{n+1} + c,\ n \neq -1$ (If $n=-1, \frac{x^{n+1}}{n+1} = \frac{1}{0}$ which is not defined)

ii) $\int dx = x$, since $\int 1dx = \int x^0 dx = \frac{x1}{1} = x$

iii) $\int e^x dx = e^x + c$, since $\frac{d}{dx} e^x = e^x$

iv) $\int e^{ax} dx = \frac{e^{ax}}{a} + c$, since $\frac{d}{dx}\left(\frac{e^{ax}}{a}\right) = e^{ax}$

v) $\int \frac{dx}{x} = \log x + c$, since $\frac{d}{dx} \log x = \frac{1}{x}$

vi) $\int a^x dx = a^x / \log_e a + c$, since $\frac{d}{dx}\left(\frac{a^x}{\log_e^a}\right) = a^x$

Note: *In the answer for all integral sums we add +c (constant of integration) since the differentiation of constant is always zero.*

Elementary Rules:

$\int c\, f(x)\, dx = c \int f(x)\, dx$ where c is constant.

$\int \{ f(x)\, dx \pm g(x) \}\, dx = \int f(x) dx \pm \int g(x) dx$

Ex. 1: *Find* (a) $\int \sqrt{x}\,dx$, (b) $\int \frac{1}{\sqrt{x}}dx$, (c) $\int e^{-3x}dx$ (d) $\int 3^x dx$ (e) $\int x\sqrt{x}\ dx$

Sol. (a)

(b) $\int \frac{1}{\sqrt{x}}dx = \int x^{-\frac{1}{2}}dx = \frac{x^{-\frac{1}{2}+1}}{-\frac{1}{2}+1} + c = 2\sqrt{x} + c$ where c is arbitrary constant.

(c)

(d) $\int 3^x\ dx = \frac{3^x}{\log_e 3} + c.$

(e)

Ex. 2: *Evaluate the following integral :*

i) *$\int (x + 1/x)^2\ dx$*

Sol: $= \int x^2\,dx + 2\int dx + \int dx/x^2$

$= x^3/x + 2x + x^{-2+1} / -2+1$

$= x^3/x + 2x = 1/x + c$

ii) *$\int \sqrt{x}(x^3 + 2x - 3)\ dx = \int x^{7/2}\ dx + 2\int x^{3/2}\ dx - 3\int x^{1/2}/dx$*

Sol: $= \frac{x^{7/2+1}}{7/2+1} + \frac{2x^{3/2+1}}{3/2+1} - \frac{3x^{1/1/2+1}}{1/2+1}$

$= \frac{2x^{9/2}}{9} + \frac{4x^{5/2}}{\frac{3}{2}+1} - \frac{3x^{\frac{1}{2}+1}}{\frac{1}{2}+1}$

iii) $\int e^{3x} + e^{-3x}\,dx = \int e^{2x}\,dx + \int e^{-4x}\,dx$

Sol: $= \frac{e^{2x}}{2} + \frac{e^{-4x}}{-4} = \frac{e^{2x}}{2} - \frac{1}{4e^{4x}} + c$

iv) $\int \frac{x^2}{x+1}\,dx = \int \frac{x^2-1+1}{x+1}\,dx$

Sol: $= \int \frac{(x^2-1)}{x+1}\,dx + \int \frac{dx}{x+1}$

$= \int (x-1)dx + \log(x+1) = \frac{x^2}{2} - x + \log(x+1) + c$

v) $\int \frac{x^3+5x^2-3}{x+2}\,dx$

Sol: By simple division $= \int \frac{x^3+5x^2-3}{x+2}\,dx$

$= \int \{x^2 + 3x - 6 + \frac{9}{(x+2)}\}\,dx$

$= \frac{x^3}{3} + \frac{3x^2}{2} - 6x + 9\log(x+2) + c$

METHOD OF SUBSTITUTION (CHANGE OF VARIABLE)

Ex. 1: $\int (2x+3)^7\,dx$

Sol: We put $(2x + 3) = t \rightarrow$ so $2\,dx = dt$ or $dx = dt / 2$

Therefore $\int (2x+3)^7\,dx = \frac{1}{2}\int t^7\,dt = \frac{t^8}{2x8} = \frac{t^8}{16} = \frac{(2x+3)^8}{16} + c$

Ex. 2: $\int \frac{x^2}{(x^2+1)^3}dx$

Sol: We put $(x^2 + 1) = t$ so $2x\,dx = dt$ or $x\,dx = dt / 2$

$= \int \frac{x^2\,x}{t^3}\,dx$

	$= ½ \int \frac{t-1}{t^3} dt$
	$= ½ \int \frac{dt}{t^2} - ½ \int \frac{dt}{t^3}$
	$= ½ \times \frac{t^{-2+1}}{(-2+1)} - ½ \times \frac{t^{-3+1}}{(-3+1)}$
	$= - ½ \ 1/t + ¼ \frac{1}{t^2}$
	$= ¼ \frac{1}{t^2} - ½ \ 1/t$
	$= ¼ . \frac{1}{x^2+1} - ½ . \frac{1}{x^2+1} + c$
	IMPORTANT STANDARD FORMULA
a)	$\int \frac{dx}{x^2-a^2} - \frac{1}{2a} \log \frac{x-a}{x+a} + c$
b)	$\int \frac{dx}{x^2-a^2} = \frac{1}{2a} \log \frac{a+x}{a-x} + c$
c)	$\int \frac{dx}{\sqrt{x^2-a^2}} = \log \lvert x + \sqrt{x^2+a^2} \rvert + c$
d)	$\int \frac{dx}{\sqrt{x^2-a^2}} = \log (x + \sqrt{x^2+a^2}) + c$
e)	$\int e^x \{f(x) + f'(x)\} dx = e^x \{f(x) + c$
f)	$\int \sqrt{x^2 + a^2} \, dx = \frac{x}{2} \sqrt{x^2 + a^2} + \frac{a^2}{2} \log(x + \sqrt{x^2 + a^2}) + c$
g)	$\int x^2 - a^2 \, dx = \frac{x}{2} \sqrt{x^2 - a^2} - \frac{a^2}{2} \log(x + \sqrt{x^2 - a^2}) + c$
h)	$\int \frac{f'(x)}{f(x)} dx = \log f(x) + c$

Ex.1	(a) $\int \frac{e^x}{e^{2x}-4}\,dx$
	$= \int \frac{dz}{z^2-2^2}$ where z= e^x dz = e^x dx 1/4 $\log(\frac{e^x-2}{e^x+2}) + c$
	(b) $\int \frac{1}{x+\sqrt{x^2-1}}\,dx$
	$= \int \frac{x-\sqrt{x^2-1}}{(x+\sqrt{x^2-1})(x+\sqrt{x^2-1})}dx$ $= \int (x - \sqrt{x^2-1})\,dx$
	$= \frac{x^2}{2} - \frac{x}{2}\sqrt{x^2-1} + ½ \log (x + \sqrt{x^2-1}) + c$
	(c) $\int e^x (x^3+3x^2)\,dx$
	$= \int e^x \{f(x)+f'(x)\}dx$. Where $f(x) = x^3$ [by (e) above)] = $e^x x^3 + c$
	METHOD OF PARTIAL FRACTION
Ex.1	$\int \frac{(3x+2)dx}{(x-2)(x-3)}$
Sol.	Let $\frac{(3x+2)}{(x-2)(x-3)} = \frac{A}{(x-2)} + \frac{B}{(x-3)}$
	[Here degree of the numerator must be lower than that of the denominator; the denominator contains non–
	repeated linear factor]
	so 3x + 2 = A (x – 3) + B (x – 2)
	We put x = 2 and get
	3.2 + 2 = A (2–3) + B (2–2) => A = –8
	we put x = 3 and get

	3.3 +2 = A (3–3) + B (3–2) => B= 11
	$\int \frac{(3x+2)dx}{(x-2)^2)(x-3)}$ -8 $\int \frac{dx}{(x-2)}$ + 11 $\int \frac{dx}{(x-3)}$
	=–log(x–2)+11log(x -3)+c
Ex.2:	$\int \frac{dx}{X(X^3+1)}$
Sol:	$\int \frac{dx}{X(X^3+1)}$
	$= \int \frac{X^2 dx}{x^3(X^3+1)}$ we put $x^3 = z$, $3x^2\,dx = dz$
	$=1/3 \int \frac{dz}{z(z+1)}$
	$= 1/3 \int (\frac{1}{z} - \frac{1}{z+1})\,dz$
	$= 1/3$ [logz –log(z-1)]
	$= 1/3 \log (\frac{X^3}{X^3-1)}) + c$
Ex.3:	Find the equation of the curve where slope at (x, y) is 9x and which passes through the origin.
Sol.:	$\therefore \int dy =$ or $y = 9x^2/2 + c$
	DEFINITE INTEGRATION
Ex.1:	$\int_0^2 x^5\ dx$
Sol.	

Ex.2: $\int_1^2 (x^5 - 5x + 2)\ dx$

Sol.

Ex. 3: Evaluate $\int_{-2}^{2} \frac{x^4\,dx}{a^{10}-x^{10}}$ (a>2)

Sol.: $\frac{x^4\,dx}{a^{10}-x^{10}} = \frac{x^4\,dx}{(a^5)2-(x^5)2}$

let $x^5 = t$ so that $5x^4\,dx = dt$

Now $f \frac{x^4\,dx}{(a^5)2-(x^5)2}$

$= 1/5\ f \frac{5x^4\,dx}{(a^5)2-(x^5)2}$

$= 1/5\ f \frac{dt}{(a^5)2-t^2}$

$= \frac{1}{10^5} \log \frac{a^5+x^5}{a^5-x^5}$ (by standard formula b)

Therefore, $\int_{-2}^{2} \frac{x^4\,dx}{a^{10}-x^{10}}$

$\int_{-2}^{2} \frac{x^4\,dx}{a^{10}-x^{10}}$ (by prop. VI)

$= 2 \times \frac{1}{10a^5} \log \left[\frac{a^5+x^5}{a^5-x^5}\right]_0^2$

$= \frac{1}{5a^5} \log \frac{a^5+32}{a^5-32}$

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EXERCISE 8(B) [K = CONSTANT]

Choose the most appropriate option (a) (b) (c) or (d).

1. Evaluate = $\int 5x^2\,dx$:

(a) $5 / 3x^3 + k$ (b) $\frac{5x^3}{3} + k$ (c) $5x^3$ (d) none of these

2. Integration of $3 - 2x - x^4$ will become

(a) $- x^2 - x^5 / 5$ b) $3x - x^2 - \frac{x^5}{5} + k$ c) $3x - x^2 + \frac{x^5}{5} + k$ (d) none of these

3. Given $f(x) = 4x^3 + 3x^2 - 2x + 5$ and $\int f(x)\,dx$ is

(a) $x^4 + x^3 - x^2 + 5x$ (b) $x^4 + x^3 - x^2 + 5x + k$ (c) $12x^2 + 6x - 2x^2$ (d) none of these

4. Evaluate $\int (x^2 - 1)dx$

(a) $x^5/5 - 2/3\, x^3 + x + k$ (b) $\frac{x^3}{3} - x + k$ (c) $2x$ (d) none of these

5. $\int (1 - 3x)(1 + x)\,dx$ is equal to

(a) $x - x^2 - x^3$ (b) $x^3 - x^2 + x$ (c) $x - x^2 - x^3 + k$ (d) none of these

6. $\int [\sqrt{x} - 1/\sqrt{x}]\,dx$ is equal to

(a) $\frac{2}{3}x^{3/2} - 2x^{1/2} + k$ (b) $\frac{2}{3}\sqrt{x} - 2\sqrt{x} + k$ (c) $\frac{1}{2\sqrt{x}} + \frac{1}{2x\sqrt{x}} + k$ (d) none of these

7. The integral of $px^3 + qx^2 + rk + w/x$ is equal to

(a) $px^2 + qx + r + k$ (b) $px^3/3 + qx^2/2 + rx$ (c) $3px + 2q - w/x^2$ (d) none of these

8. Use method of substitution to integrate the function $f(x) = (4x + 5)^6$ and the answer is

(a) $1/28\,(4x + 5)^7 + k$ (b) $(4x + 5)^7/7 + k$ (c) $(4x + 5)^7/7$ (d) none of these

9. Use method of substitution to evaluate $\int x\,(x^2 + 4)^5\,dx$ and the answer is

	(a) $(x^2 + 4)^6 + k$ (b) $1/12 (x^2 + 4)^6 + k$ (c) $(x^2 + 4)^6/ + k$ (d) none of these
10.	Integrate $(x + a)^n$ and the result will be
	a) $\frac{(x+a)^{n+1}}{n+1} + k$ b) $\frac{(x+a)^{n+1}}{n+1}$ c)$(x+a)^{n+1}$ (d) none of these
11.	$\int 8x^2/(x^3+2)^3 dx$ is equal to
	(a) $-4/3(x^3 + 2)^2 + k$ b)- $\frac{4}{3(x^3+2)2} + k$ c) $\frac{4}{3(x^3+2)2} + k$ (d) none of these
12.	Using method of partial fraction the integration of f(x) when f(x) = $\frac{1}{x^2-a^2}$ and the answer is
	(a) log x- $\frac{a}{x+a} + k$ (b) log (x – a) – log (x + a) + k c) $\frac{1}{2a}$ log $(\frac{x-a}{x+a}) + k$ (d) none of these
13.	Use integration by parts to evaluate $\int x^2 e^{3x} dx$
	(a) $x^2 e^{3x}/3 - 2x e^{3x}/9 + 2/27 e3x + k$ (b) $x^2 e^{3x} - 2x e^{3x} + 2e^{3x} + k$
	(c) $e^{3x}/3 - x e^{3x}/9 + 2e^{3x} + k$ (d) none of these
14.	$\int \log x dx$ is equal to
	(a) x logx + k (b) x logx – x^2 + k (c) x logx + k (d) none of these
15.	$\int xe^x dx$ is
	(a) $(x - 1)e^x + k$ (b) $(x - 1) e^x$ (c) $x e^x + k$ (d) none of these
16.	$\int (\log x)^2 dx$ and the result is
	(a) $x (logx)^2 - 2x logx + 2x + k$ (b) $x (logx)^2 - 2x + k$ (c) 2x logx – 2x + k (d) none of these
17.	Using method of partial fraction to evaluate $\int (x+5) dx/(x+1)(x+2)^2$ we get
	(a) 4 log (x + 1) – 4 log (x + 2) + 3/x + 2 + k (b) 4 log (x + 2) – 3/x + 2 + k
	(c) 4 log (x + 1) – 4 log (x + 2) (d) none of these
18.	Evaluate $\int_0^1 (2x^2 - x^3) dx$ and the value is

	(a) 4/3 + k (b) 5/12 (c) – 4/3 (d) none
19.	Evaluate $\int_2^4 (2x \cdot - 2).^2$ dx and the value is
	(a) 104 (b) 100 (c) 10 (d) none
20.	Evaluate $\int_0^1 (xe^x d)$dx and the value is
	(a) –1 (b) 10 (c) 10/9 (d) +1
21.	$\int x^2 (1 + \log x)$ dx is equal to
	(a) $x^x \log x + k$ (b) $e^{x^2} + k$ (c) $\frac{x^2}{2} + k$ (d) $x^x + c$
22.	If $f(x) = \sqrt{1+x^2}$ then $\int f(x)dx$ is
	(a) $2/3\ x\ (1 + x^2)^{3/2} + k$ (b) $x/2\ \sqrt{1 + x^2} + \frac{1}{2} \log (x + \sqrt{x^2 + 1})\ k$
	(c) $2/3\ x\ (1 + x^2)^{3/2} + k$ (d) none of these
23.	$\int d(x^2 + 1) / \sqrt{x^2 + 2}$ is equal to
	(a) $\frac{x}{\sqrt{2}} (\sqrt{x^2 + 2}) + k$ (b) $\sqrt{x^2 + 2}) + k$ (c) $1/(x^2 + 2)^{3/2} + k$ (d) none of these
24.	$\int (e^x + e^{-x})^2 (e^x + e^{-x})$ dx is
	(a) $1/3\ (e^x + e^{-x})^3 + k$ (b) $\frac{1}{2}\ (e^x + e^{-x})^2 + k$ (c) $e^x + k$ (d) none of these
25.	$\int_o^a [f(x) + f_{-x})]$ dx is equal to
	(a) $\int_0^a 2\, f(x)dx$ (b) $\int_{-a}^a f(x)dx$ (c) 0 (d) $\int_{-a}^a -f(-x)dx$
26.	$\int xe^x / (x+1)^2$ dx is equal to
	(a) $e^x/(x + 1) + k$ (b) $e^x/x + k$ (c) $e^x + k$ (d) none of these
27.	$\int (x^4 + 3/x)$ dx is equal to

	(a) $x^5/5 + 3 \log |x|$ (b) $1/5\ x^5 + 3 \log |x| + k$ (c) $1/5\ x^5 + k$ (d) none of these
28.	Evaluate the integral $\int (1-x)^3 / x\ dx$ and the answer is equal to
	(a) $\log |x| - 3x + 3/2x^2 + k$ (b) $\log x - 2 + 3x^2 + k$ (c) $\log x + 3x^2 + k$ (d) none of these
29.	The equation of the curve in the form y = f(x) if the curve passes through the point
	(1, 0) and f'(x) = 2x – 1 is
	(a) $y = x^2 - x$ (b) $x = y^2 - y$ (c) $y = x^2$ (d) none of these
30.	Evaluate $\int_1^4 (2x + 5)\ dx$ and the value is
	a) 3 (b) 10 (c) 30 (d) none of these
31.	$\int_1^2 \frac{2x}{1+x^2}$ is equal to
	(a) $\log_e (5/2)$ (b) $\log_e 5 - \log_e 2 + k$ (c) $\log_e (2/5)$ (d) none of these
32.	$\int_0^4 \sqrt{3x} + 4\ dx$ is equal to
	(a) 9/112 (b) 112/9 (c) 11/9 (d) none of these
33.	$\int_0^2 \frac{x+2}{x+1}\ dx$ is
	(a) $2 + \log_e 2$ (b) $2 + \log_e 3$ (c) $\log_e 3$ (d) none of these
34.	Evaluate $\int_1^{e^2} \frac{dx}{x(1+\log x)^2}$ and the value is
	(a) 3/2 (b) 1/3 (c) 26/3 (d) ½ ($\log_e 5$)
35.	$\int_0^4 \frac{(x+1)(x+4)}{\sqrt{x}}\ dx$ is equal to
	(a) 51 ½ (b) 48/5 (c) 48 (d) 55 7/15
36.	The equation of the curve which passes through the point (1, 3) and has the slope 4x – 3 at any point (x, y) is
	(a) $y = 2x^3 - 3x + 4$ (b) $y = 2x^2 - 3x + 4$ (c) $x = 2y^2 - 3y + 4$ (d) none of these

37. The value of $\int_2^3 f(5-x)dx - \int_2^3 f(x)dx$ is

(a) 1 (b) 0 (c) –1 (d) none of these

38. $\int (x-1)e^x / x^2 \, dx$ is equal to

(a) $e^x/x + k$ (b) $e^{-x}/x + k$ (c) $- e^x/x + k$ (d) none of these

39. $\int \frac{e^x (x\log x+1}{x} dx$ is equal to

(a) $e^x \log x + k$ (b) $e^x + k$ (c) $\log x + k$ (d) none of these

40. $\int \log x^2 \, dx$ is equal to

(a) $x (\log x - 1) + k$ (b) $2x (\log x - 1) + k$ (c) $2 (\log x - 1) + k$ (d) none of these

41. $\int_1^2 x\log x \, dx$ is equal to

(a) 2 log 2 (b) – ¾ (c) 2 log 2 – ¾ (d) none of these

42. Evaluate $\int_1^2 (\frac{x^2-1}{x^2}) e^{x+\frac{1}{x}} dx$. The value is

(a) $e^2 (\sqrt{} e-1)$ (b) $e^2 [\sqrt{e} -1]+k$ (c) $e^2 \sqrt{e}$ (d) none of these

43. $\int_0^2 3x^2\_dx$ is

(a) 7 (b) –8 (c) 8 (d) none of these

44. Evaluate$\int \frac{(2-x)e^x}{(1-x)^2} dx$ and the value is

(a)$\frac{e^x}{1-x} + k$ (b)$e^x + k$ (c) $\frac{1}{1-x} + k$ (d) none of these

45. Using integration by parts f $x^3 \log x dx$

(a) $x^4/16 + k$ (b) $x^4/16 (4 \log x - 1) + k$ (c) $4 \log x - 1 + k$ (d) none of these

46. $\int \log (\log x)/x \, dx$ is

(a) log (log x – 1) + k b) log x – 1 + k (c) [log (log x – 1)] log x + k (d) none of these

47. $\int (\log x)^2 \, x \, dx$ is equal to

(a) $\frac{x^2}{2}[(\log x)^2 - \log x + ½] + k$ b) $(\log x)^2 - \log x + ½ + k$ c) $\frac{x^2}{2}[(\log x)^2 + ½] + k$ (d) none of these

48. Evaluate $\int (\frac{e^x - e^{-x}}{e^x + e^{-x}}) \, dx$ and the value is

(a) $\log_e |e^x + e^{-x}|$ (b) $\log_e |e^x + e^{-x}| + k$ (c) $\log_e |e^x - e^{-x}| + k$ (d) none of these

49. By the method of partial fraction $\int \frac{3x}{(x^2 - x - 2)} \, dx$ is

(a) $2 \log_e |x-2| + \log_e |x+1| + k$ (b) $2 \log_e |x-2| - \log_e |x+1| + k$

(c) $\log_e |x-2| + \log_e |x+1| + k$ (d) none of these

50. If $f'(x) = x - 1$, the equation of a curve $y = f(x)$ passing through the point (1, 0) is given by

(a) $y = x^2 - 2x + 1$ (b) $y = x^2/2 - x + 1$ (c) $y = x^2/2 - x + ½$ (d) none of these

ANSWERS

Exercise 8(A)

1.	(a)	2.	(b)	3.	(c)	4.	(b)	5.	(a)	6.	(a)	7.	(d)	8.	(b)
9.	(d)	10.	(b)	11.	(c)	12.	(a)	13.	(a)	14.	(a)	15.	(b)	16.	(c)
17.	(a)	18.	(c)	19.	(a)	20.	(a)	21.	(b)	22.	(a)	23.	(d)	24.	(b)
25.	(c)	26.	(a)	27.	(b)	28.	(c)	29.	(a)	30.	(b)	31.	(c)	32.	(a)
33.	(b)	34.	(a)	35.	(a)	36.	(b)	37.	(b)	38.	(a)	39.	(c)	40.	(a)
41.	(b)	42.	(c)	43.	(a)	44.	(b)	45.	(a)	46.	(b)	47.	(c)	48.	(b)
49.	(c)	50.	(a)												

Exercise 8(B)

1.	(b)	2.	(b)	3.	(b)	4.	(b)	5.	(c)	6.	(a)	7.	(d)	8.	(a)
9.	(b)	10.	(a)	11.	(b)	12.	(c)	13.	(a)	14.	(d)	15.	(a)	16.	(a)
17.	(a)	18.	(b)	19.	(a)	20.	(d)	21.	(d)	22.	(b)	23.	(a)	24.	(a)

"KAR LO PAST APNI MUTHI ME"

Past Exam Questions

1. $\lim_{x \to 2} \frac{x^n - 2^n}{x - 2} = 80$ and neN, then :

(a) n = 5 (b) n = 0 (c) n = 4 (d) None

2. Let $f(x) = \begin{cases} x & \text{when } x > 0 \\ 0 & \text{when } x = 0 \\ -x & \text{when } x < 0 \end{cases}$ Now f(x) is:

(a/ Undefined at x = 0 (b) Continuous at x = 0 (c) Discontinuous at x = 0 (d) None

3. The slope of the tangent at the point (2, -2) to the curve $x^2 + xy + y^2 - 4 = 0$is given by:

(a) 0 (b) 1 (c) -1 (d) None

4. The derivative of $x^2 \log x$ is :

(a) $1+2 \log x$ (b) $2 \log x$ (c) $x (1 + 2 \log x)$ (d) None of these

5. $\int_0^1 (e^x + e^{-x})\, dx$ is :

(a) $e - e^{-1}$ (b) $e^{-1} - e$ (c) $e + e^{-1}$ (d) None

6. $\int \frac{8x^2}{(x^3+2)^3}\, dx$ is equal to:

(a) $-\frac{4}{3}(x^3 + 2)^2 + C$ (b) $-\frac{4}{3}(x^3 + 2)^{-2} + C$ (c) $\frac{4}{3}(x^3 + 2)^2 + C$ (d) None of these

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7. If $f(x) = ax^2 + bx + c$ then $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ is :

~~(a) ax + 2b (b) 2ax + b (c) 2ax - b (d) None~~

8. ~~A function f(x) is defined as follows : $f(x) = \begin{cases} x \text{ when } x < 1 \\ 1 + x \text{ when } x > 1 \\ 3/2 \text{ when } x = 1 \end{cases}$ Then f(x) is:~~

~~(a) Discontinuous at x = 1 (b) Undefined at x = ½ (c) Continuous at x = 1 (d) None of these~~

9. If $x = y \log (xy)$, then $\frac{dy}{dx}$ is equal to:

(a) $\frac{x + y}{x (1 + \log xy)}$ (b) $\frac{x-y}{x (1 + \log xy)}$ (c) $\frac{x + y}{x (\log x + \log y)}$ (d) $\frac{x-y}{x (\log x + \log y)}$

10. If $y = 2x + \frac{4}{x}$, then $x^2 \frac{d^2y}{dx^2} + X \frac{dy}{dx}$ - y yields

(a) 3 (b) 1 (c) 0 (d) 4

11. Evaluate : $\int \frac{dx}{\sqrt{x^2+a^2}}$:

(a) $\frac{1}{2}\log\left(x + \sqrt{x^2 + a^2}\right) + C$ (b) $\log\left(x + \sqrt{x^2 + a^2}\right) + C$

(c) Iog $(x\sqrt{x^2 + a^2}) + C$ (d) $\frac{1}{2}$ Iog $\left(x\sqrt{x^2 + a^2}\right) + C$

12. the value of. $\int_0^2 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{2-x}} dx$ is :

(a) 0 (b) 3 (c) 2 (d) 1

2007 - May

13. ~~$\lim_{x \to 1} \frac{e^{-x} - e}{x - 1}$ is equal to:~~

~~(a) e (b) $-\frac{1}{e}$ (c) $\frac{1}{e}$ (d) 0~~

14. ~~$\lim_{x \to \infty} \frac{(a - bx)}{x^2}$ is equal to:~~

~~(a) 1 (b) 0 (c) a (d) - ∞~~

15. ~~The function $f(x) = \frac{x^2-9}{x-3}$ is undefined at x = 3. What value must be assigned to f(3), if f(x) is to be continuous at x = 3?~~

~~(a) 6 (b) 0 (c) 9 (d) 3~~

16. If $f(x) = x^k$ and $f'(1) = 10$, then the value of k is :

(a) 10 (b) -10 (c) 1/10 (d) None

17. Given $x = 2t + 5; y = t^2 - 2$, then $\frac{dy}{dx}$ is calculated as:

(a) t (b) 1/t (c) 1/t (d) None

18. The integral of $(e^{3x} + e^{-3x}) / e^x$ is:

(a) $\frac{e^{2x}}{2} + \frac{e^{-4x}}{4} + C$ (b) $\frac{e^{2x}}{2} - \frac{e^{-4x}}{4} + C$ (c) $e^{2x} - e^{-4x} + C$ (d) None of these

19. $\int x^2 e^{3x} dx$ is :

(a) $x^2.e^{3x} - 2xe^{3x} + 2e^{3x} + C$ (b) $\frac{e^{3x}}{3} - \frac{x.e^{3x}}{9} + 2e^{3x} + C$ (c) $\frac{x^2.e^{3x}}{3} - \frac{2x.e^{3x}}{9} + \frac{2}{27}e^{3x} + C$ (d) None of these

20. $\int_1^2 \frac{2x}{1+x^2} dx$:

(a) $\log_e \frac{5}{2}$ (b) $\log_e 5 - \log_e 2 + 1$ (c) $\log_e \frac{2}{5}$ (d) None of these

2007-Aug

21. ~~$\lim_{h\to\infty} \left(\frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \ldots\ldots\ldots + \frac{1}{3^n}\right)$ is equal to:~~

~~(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) 2 (d) 1~~

22. ~~The total cost C of purchasing of a certain commodity is given by~~

~~$C(x) = \begin{cases} 3x, 0 \le x \le 100 \\ 100 + 2x, 100 < x \le 500 \\ 500 + x, x > 500 \end{cases}$~~

~~At x = 500, the function C (x) is:~~

~~(a) Continuous (b) Discontinuous (c) Both (a) & (b) (d) Neither (a) nor (b)~~

23. If $x^y = y^x$, then $\frac{dy}{dx}$ gives:

(a) $\frac{x\,(x\log y - y)}{y\,(y\log x - x)}$ (b) $\frac{x\,(y\log x - x)}{y\,(x\log y - y)}$ (c) $\frac{y\,(x\log y - y)}{x\,(y\log x - x)}$ (d) None of these

24. If $x^3 - 2x^2y^2 + 5x + y = 5$, then $\frac{dy}{dx}$ at x s 1 and y = 1 is:

(a) 4/3 (b) -5/4 (c) 4/5 (d) -4/3

25. The value of $\int_1^e \frac{(1+\log x)}{x} dx$ is : [Given Loge =1]

(a) ½ (b) 3/2 (c) 1 (d) 5/2

26. Find $\int \frac{x^3}{(x^2+1)^3} dx$:

(a) $\frac{1}{4}\left[\frac{2x^2+1}{(x^2+1)^2}\right]$ (b) $\frac{1}{4}\left[\frac{2x^2+1}{(x^2+1)^2}\right]$ (a) $\frac{1}{2}\left[\frac{2x^2+1}{(x^2+1)^2}\right]$ (d) $-\frac{1}{2}\left[\frac{2x^2+1}{(x^2+1)^2}\right]$

27. ~~$\lim_{x \to 1} \frac{x + x^2 + x^3 \ldots\ldots\ldots + x^n - n}{x - 1}$~~

~~(a) n (b) $\frac{n(n+1)}{2}$ (c) (n + 1) (d) n(n + 1)~~

28. ~~If $f(x) = \frac{x^2 - 1}{x - 1}$ for $x \neq 1$, f (x) = 2 for x = 1 ,Then the function f(x) at x = 1 is:~~

~~(a) Continuous (b) Discontinuous (c) Not defined (d) None of these~~

29. If $y = \left(x + \sqrt{x^2 + m^2}\right)^n$ then $\frac{dy}{dx} =$:

(a) $\frac{ny}{\sqrt{x^2+m^2}}$ (b) n y (c) $-\frac{ny}{\sqrt{x^2+m^2}}$ (d) None

30. If xy (x - y) = 0, find & $\frac{dy}{dx}$:

(a) $\frac{y(2x-y)}{x(2y-x)}$ (b) $\frac{x(2x-y)}{y(2y-x)}$ (c) $\frac{y(2y-x)}{x(2x-y)}$ (d) None of these

31. If $y = \sqrt{x}^{\sqrt{x}^{\cdots\cdots\infty}}$ then $\frac{dy}{dx}$ is equal to:

(a) $\frac{y^2}{1ogx}$ (b) $\frac{y^2}{2-ylogx}$ (c) $\frac{y^2}{x(2-ylogx)}$ (d) None

32. $\int \frac{1}{x^2 - a^2} dx$ is:

(a) log (x - a) - log (x+ a) + C (b) log x - $\frac{a}{x+a}$ + C (c) $\frac{1}{2a}$ Log $\left(\frac{x-a}{x+a}\right)$ + C (d) None of these

33. The value of $\int_0^1 \frac{dx}{(1+x)(2+x)}$ is:

(a) log $\frac{3}{4}$ (b) log $\frac{4}{3}$ (c) log 12 (d) None

34. If $y = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots\ldots\ldots + \frac{x^n}{n} + \ldots\ldots\ldots$ then $\frac{dy}{dx}$ y is equal to :

(a) 1 (b) 1 (c) 0 (d) None

35. ~~$\lim_{x \to 0} \frac{4^{x+1} - 4}{2x}$~~ :

~~(a) Does not exist (b) Exists and is equal to 2 (c) Exists and is equal to 4 $\log_e 2$ (d) None of these~~

36. ~~f (x) = $\frac{x^2-1}{x^3-1}$ is undefined at x = 1, the value of f (x) at x = 1 such that it is continuous at x = 1 is :~~

~~(a) $\frac{3}{2}$ (b) $\frac{2}{3}$ (c) $-\frac{3}{2}$ (d) None~~

37. The slope of the tangent to the curve $y = \sqrt{4 - x^2}$ at the point, where the ordinate and the abscissa are equal, is

(a) -1 (b) 1 (c) 0 (d) None

38. The value of $\int_2^3 f(5-x)dx - \int_2^3 f(x)\,dx$ is:

(a) 1 (b) 0 (c) -1 (d) None

39. $\int \frac{e^{\log e^x}}{x} dx$ is:

(a) $x^{-1} + C$ (b) $x + C$ (c) $x^2 + C$ (d) None

40. ~~$\lim_{x\to 0} \frac{3x+|x|}{7x-5|x|}$ is equal to:~~

~~(a) $\frac{1}{6}$ (b) 1 (c) does not exist (d) 2~~

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41. ~~The points of discontinuity of the function : $f(x) = \frac{(2x^2+6x-5)}{(12x^2+x-20)}$ are:~~

~~(a) $-\frac{4}{5}$ and $\frac{5}{3}$ (b) $-\frac{4}{3}$ and $\frac{5}{4}$ (c) $\frac{4}{5}$ and $-\frac{5}{3}$ (d) $\frac{4}{3}$ and $-\frac{5}{4}$~~

42. Differentiate $e^{(x^x)}$:

(a) $(1 + \log x)$ (b) $x^x (1 + \log x)$ (c) $e^{(x^x)} (1 + \log x)x^x$ (d) $e^{(x^x)} (1 + \log x)$

43. If $x^m y^n = (x + y)^{m+n}$, then find $\frac{dy}{dx}$:

(a) $\frac{x}{y}$ (b) $\frac{y}{x}$ (c) xy (d) None

44. Evaluate $\int \frac{1}{(x-1)(x-2)} dx$:

(a) $\log\left(\frac{x-2}{x-1}\right) + C$ (b) $\log[(x-2)(x-1)] + C$ (c) $\log\left(\frac{x-1}{x-2}\right) + C$ (d) None

45. $\int_1^4 (2x + 5)dx$ and the value is :

(a) 10 (b) 3 (c) 30 (d) None

46. If $f(x) = \frac{x^2+x-6}{(x-2)}$ then $\lim_{x\to 2} f(X)$

(a) 4 (b) 5 (c) 3 (d) 1

47. $\lim_{x\to b} \frac{1}{(x-b)}$ is:

(a) $\propto$ (b) $-\infty$ (c) does not exist (d) 0

48. Let a function be defined as follows: $f(X) = \begin{cases} 4x, \text{when} 0 < x < 1 \\ 5 - x, \text{when} x \geq 0 \end{cases}$

(a) continuous at $x = 1$ (b) continuous at $x = 0$

(c) continuous no where. (d) continuous for all, except $x = 1$

49. If $f(x) = a^x x^a$ then find $f'(x)$.

(a) $f(x)[a + \log a]$ (b) $f(x)\left[\frac{a}{x} - \log a\right]$ (c) $f(x)\left[\frac{a}{x} - \log a\right]$ (d) $f(x)[a + x \log a]$

50. $\int \frac{1}{x(x^5+1)} dx$

(a) $\log\left(\frac{x^5}{x^5-1}\right) + C$ (b) $\frac{1}{5}\log\left(\frac{x^5}{x^5+1}\right) + C$ (c) $\frac{1}{3}\log\left(\frac{x^5}{x^5+1}\right) + C$ (d) $\frac{1}{3}\log\left(\frac{x^5+1}{x^5}\right) + C$

51. $\frac{\text{Lim}}{x\to 3} \frac{x^n - 3^n}{x-3} = 108$. Find n

(a) 4 (b) – 4 (c) 1 (d) None of these

52. $\frac{\lim}{x\to c} \frac{(x+2)^{3/2} - (c+2)^{3/2}}{x-c} =$

(a) C (b) 1/c (c) 0 (d) None of the above.

53. Find the value of $\int_{-3}^{3} x\sqrt{8 - x^2} dx$

(a) 1 (b) -1 (c) 0 (d) None of these

54. If $x^3y^2 = (x - y)^5$. Find $\frac{dy}{dx}$ at(1,2).

(a) -7/9 (b) 7/9 (c) 9/7 (d) -9/7

55. Evaluate $\int x.e^x\, dx$

(a) $e^x (x + 1) + c$ (b) $e^x (x - 1) + c$ (c) $e^x + c$ (d) $x - e^x + c$

56. Find $\int \frac{x^3}{(x^2+1)^3}\, dx$

(a) $1/4\,(x^2 + 1)^{-2} + 1/2(x^2 + 1)^{-1} + C$ (b) $1/4\,(x^2 + 1)^{-1} - 1/2(x^2 + 1) + C$

(c) $1/4\,(x^2 + 1)^{-2} - 1/2(x^2 + 1)^{-1} + C$ (d) None of these

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57. ~~$f(x) = \begin{cases} 5 - \frac{x^2}{5}, & 0 < x < 5 \\ 0 & x = 5 \\ 5 - \frac{5^3}{x^2} & x > 5 \end{cases}$ Then f(x) is:~~

~~(a) Continuous at x = 5 (b) Discontinuous at x = 5 (c) Undefined at x = 5 (d) None of the above~~

58. ~~$\lim_{x \to -1/3} \frac{9x^2 - 1}{3x + 1}$~~

~~(a) ∞ (b) 1 (c) 2 (d) - 2~~

59. ~~$\lim_{x \to 0} \frac{6x + 8xe^x}{\log(1 + 2x)}$~~

~~(a) 7 (b) 14 (c) 4 (d) None~~

60. $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$

(a) $2x^{1/2}\left(\frac{1}{3}x - 1\right)$ (b) $2x^{1/2}\left(\frac{1}{3}x + 1\right)$ (c) $2\left(\frac{1}{3}x + x^{1/2}\right)$ (d) None of these.

61. $\int_0^1 \left(\frac{1-x}{1+x}\right) dx$

(a) 2 log 2 – 1 (b) 4 log 2 -1 (c) 2 log 2 (d) None of these

62. $x = 21 + 5$ and $y = t^2 - 5$, then $\frac{dy}{dx} = ?$

(a) t (b) -1/t (c) 1/t (d) 0

63. $x = at^2$ $y = 2$ at, $\frac{dy}{dx} = ?$

(a) 1/t (b) -1/t (c) t (d) None of the above

64. Find the second derivative of $y = \sqrt{x+1}$

(a) $1/2\ (x\ +\ 1)^{-1/2}$ (b) $-1/4\ (x+1)^{-3/2}$ (c) $1/4\ (x\ +\ 1)^{-1/2}$ (d) None of these.

65. ~~Lim $x \to \infty \frac{\sqrt{2x^2+3}}{4x+1}$ equal to~~

~~(a) ½ $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $\sqrt{2}$ (d) 0~~

66. ~~The function $y = x$ is~~

~~(a) Discontinuous at $x = 0$ (b) Discontinuous every where.~~

~~(c) Continuous every where. (d) Continuous every where except $x = 0$~~

67. ~~If $f(x) = \left\{\frac{x^2 + k(1-x) - 2x}{x-2}\right\}$ If $x \neq 2$ and $f(x) = 2$ if $x = 2$ is continuous at $x = 2$ then $k =$~~

~~(a) 0 (b) -1 (c) 1 (d) 2~~

68. ~~Equal to~~

~~(a) $\int \frac{dx}{\sqrt{3x+4} - \sqrt{3x+1}} \frac{2}{27}[(3x+4)^{3/2} - (3x+1)^{3/2}] + c$ (b) $\frac{2}{27}[(3x+4)^{3/2} + (3x+1)^{3/2}] + c$~~

~~(c) $\frac{2}{3}[(3x+4)^{3/2}-(3x+1)^{3/2}]+c$ (d) None of these.~~

69. $\int_1^2 \frac{x\,dx}{x^2+2} =$ _____

(a) $\log\sqrt{2}$ (b) $\log\sqrt{3}$ (c) $\log\frac{1}{\sqrt{2}}$ (d) $\log\frac{1}{\sqrt{3}}$

70. If $x^2 + y^2 = 4$ then

(a) $y\frac{d^2y}{dx^2} - \left(2\frac{dy}{dx}\right)^2 + 1 = 0$ (b) $y\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 + 1 = 0$

(c) $y\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^2 - 1 = 0$ (d) $y\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 + 1 = 0$

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71. ~~Value of $\lim_{x\to 0}\frac{\sqrt{4+3x}-\sqrt{4-3x}}{x}$ is~~

~~a) 3/4 (b) 5/2 (c) 0 (d) 3/2~~

72. $\lim_{y\to 0}\frac{3y+|y|}{7y-5|y|} =$

(a) 2 (b) 1/6 (c) 3/7 (d) Does not exit

73. ~~The cost function for the production of x units of a commodity is given by~~

~~$C(x) = 2x^3 - 15x^2 + 36x + 15$~~

~~The cost will be minimum when 'x' is equal to~~

~~(a) 3 (b) 2 ; (c) 1 (d) 4~~

74. $\int\frac{6x+4}{(x-2)(x-3)}$ dx is equal to

(a) 22 log (x-3) -16 (x-2) (b) 11 log (x-3) - 8 (x-2)

(c) 22 log (x-3)-16 log (x-2) (d) 22 log (x-3) + 16 log (x-2)

75. $\int\frac{1}{x(1+\log x)^2}$ dx is equal to

	(a) $-\frac{1}{2(1+\log x)^2}+C$ (b) $\frac{1}{(1+\log x)}+C$ (c) $-\frac{1}{(1+\log x)}+C$ (d) None of these
76.	~~If $\lim_{x\to 2}\frac{(x^2-4)}{(x^2+2x-8)}=k$, Find $\lim_{x\to k}(3x+4)$~~
	~~(a) 5 (b) 6 (c) 8 (d) None of the above.~~
77.	~~Function f (x) = K.x -1 for x < 2 = x - k for x ≥ 2 is continuous at x = 2 The value of 'k' is _____.~~
	~~(a) 2 (b) 1 (c) -1 (d) -2~~
78.	Solve : $\int_{-1}^{1}(e^x - e^{-x})\,dx$
	a) 0 (b) 1 (c) 12 (d) None of the above.
79.	Solve : $\int\frac{(\log x^x)^2}{x^3}.dx$
	(a) $\frac{3}{2}(\log x)^3+C$ (b) $\frac{1}{3}(\log x)^3+C$ (c) $\frac{1}{6}(\log x)^3+C$ (d) $\frac{3}{7}(\log x)^3+C$
80.	If f (x) = ${}^xC_3$; then f'(1) = ?
	(a) $\frac{1}{6}$ (b) $\frac{-1}{6}$ (c) $\frac{5}{6}$ (d) $\frac{-5}{6}$
81.	Given, $y=\int(e^{a\log x}+e^{x\log a})dx$; then $\frac{dy}{dx}$
	(a) $x^a a^x$, (b) $x^a + a^x$ (c) $ax^{x-1}+a^x\log a$ (d) None of the above.
82.	If f'(x) = $3x^2-\frac{2}{x^3}$, f (1) = 0 and f (x) = _____.
	(a) $\frac{x^3}{3}-x^{-2}-2$ (b) x^3+x^2+2 (c) $x^3+x^{-2}-2$ (d) None of these
83.	~~The points of discontinuity of the function, $F(x)=\frac{x^2+2x+5}{x^2-3x+2}$ are~~
	~~(a) x = 0, x = t (b) x = 1, x = 2 (c) x = 0, x = 2 (d) None of these~~
84.	$\int_{-1}^{1}\frac{\lvert x\rvert}{x}\,dx$ = _____
	(a) -1 (b) 0 (c) 1 (d) 2

85. $\frac{d}{dx}\left[2^{\log_2 x}\right]$

(a) 1 (b) 0 (c) ½ (d) $2^x.\log_2 x$

86. $\int \frac{e^x}{(1+x)^3}dx - \int \frac{e^x}{2(1+x)^2}dx =$ _____

(a) 0 (b) $\frac{e^x}{2(1+x)^2} + C$ (c) $-\frac{e^x}{2(1+x)^2} + C$ (d) $\frac{e^x}{(1+x)^2} + C$

87. If $Y = X^x$ then $\frac{d^2Y}{dx^2} =$ _____

(a) $\frac{dY}{dx}(1 + \log x) + Y\frac{d}{dx}(1 + 1ogx)$ (b) $\frac{dY}{dx}(1 + \log x) + \frac{d}{dx}(1 + \log x)$

c) $\frac{dY}{dx}(1 + \log x) - Y\frac{d}{dx}(1 + \log x)$ (d) $\frac{dY}{dx}(1 + \log x) - \frac{d}{dx}(1 + \log x)$

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88. ~~Evaluate $\lim_{n\to\infty} \frac{2 + 8 + 18 + \ldots\ldots\ldots\ldots + 2n^2}{n^3}$~~

~~(a) 1/3 (b) 2/3 (c) 4/3 (d) 1~~

89. ~~If $g(x) = -\sqrt{25 - x^2}$, then $\lim_{x\to 1} \frac{g(x)-g(1)}{x-1}$ is equal to _____.~~

~~(a) 0 (b) $1/\sqrt{24}$ (c) $\sqrt{24}$ (d) None of these.~~

90. If $x = c\,t$, $y = c/t$, then $\frac{dy}{dx}$ is equal to:

(a) 1/t (b) $t.e^t$ (c) $-1/t^2$ (d) None of these.

91. $\int_0^1 \frac{dx}{[ax+b(1-x)]^2} =$ _____

a) a/b (b) b/a c) ab (d) 1/ab

92. If $y = e^{a\log x} + e^{x\log a}$, then $\frac{dy}{dx} =$

(a) $x^a + a^x$ (b) $a\,x^{a-1} + a^x \log a$ (c) $a\,x^{a-1} + x\,a^{x-1}$ (d) $x^x + a^a$

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93. ~~$\lim_{x \to 1} \frac{(x-1)}{(2x^2 - 7x + 5)}$ is equal to~~

~~(a) 1/3 (b) 1/3 (c) 1 (d) None of these.~~

94. $\int 2^{3x} . 3^{2x} . 5^{x} . dx =$ _____

(a) $\frac{2^{3x}.3^{2x}.5^{x}}{\log (720)} + c$ (b) $\frac{2^{3x}.3^{2x}.5^{x}}{\log (360)} + c$ (c) $\frac{2^{3x}.3^{2x}.5^{x}}{\log (180)} + c$ (d) $\frac{2^{3x}.3^{2x}.5^{x}}{\log (90)} + c$

95. For the functions $y = x^3 - 3x$, the value of $\frac{d^2y}{dx^2}$ at which $\frac{dy}{dx}$ is zero, is

(a) ±1 (b) ±3 (c) ± 6 (d) None of these.

96. The equation of the tangent to the curve, $f = x^2 - 3x + 2$, at the point (2, 7) is -

(a) y = 2x - 13 (b) y = 10x (c) y = 10x - 13 (d) y = 10

97. If $y = \log \left(\frac{5 - 4x^2}{3 + 5x^2}\right)$, Then $\frac{dy}{dx}$ = _____

(a) $\frac{8}{4x-5} - \frac{10}{3+5x}$ (b) $(4x^2 - 5) - (3 + 5x^2)$ (c) $\frac{8x}{4x^2-5} - \frac{10x}{3+5x^2}$ (d) 8x – 10

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98. ~~$\lim_{x \to 0^+} \frac{2e^{\frac{1}{x}} - 3x}{e^{\frac{1}{x}} + x} =$ _____.~~

~~(a) -3 (b) 0 (c) 2 (d) 4~~

99. ~~Evaluate $\lim_{n \to \infty} \frac{(n+2)! + (n+1)!}{(n+2)! - (n+1)!}$.~~

~~(a) 1 (b) 2 (c) ∞ (d) 0~~

100. If $y = \log_y x$, then $\frac{dy}{dx}$ is equal to:

(a) $\frac{1}{x + \log y}$ (b) $\frac{1}{x + x \log y}$ (c) $\frac{1}{1 + x \log y}$ (d) $\frac{1}{y + \log x}$

101. $\int_1^2 \frac{(\log_e(ex))^n}{x}$ dx (n + -1) is equal to :

(a) $\left[\frac{(\log_e(2e))^{n+1-1}}{n+1}\right]$ (b) $[(\log_e(2e))^{(n+1)} + 1]$ (c) $\frac{(\log_e(2e))^{n+1}}{n+1} - \frac{(\log_e 2)^{n+1}}{n+1}$ (d) None of these

102. If x = log t, y = e^t then $\frac{dy}{dx}$ =

(a) 1/t (b) $t.e^t$ (c) $-1/t^2$ (d) None of these

103. $\int 2^{3x}.3^{2x}.5^x$ dx = _____

(a) $\frac{2^{3x}.3^{2x}.5^x}{\log(270)} + C$ (b) $\frac{2^{3x}.3^{2x}.5^x}{\log(360)} + C$ (c) $\frac{2^{3x}.3^{2x}.5^x}{\log(180)} + C$ (d) $\frac{2^{3x}.3^{2x}.5^x}{\log(90)} + C$

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104. ~~$\lim_{x\to 0} \frac{1}{x}$ is~~

~~(a) + ∞ (b) - ∞ (c) 0 (d) does not exist~~

105. ~~If $\lim_{x\to 2} \frac{x^2 - ax + x - a}{x - 2}$ = l, then which of the following is correct?~~

~~(a) a = 1,1 = 2 (b) a = 2,1 = 3 (c) a = -2,1 = -1 (d) a = -2,1 = 3~~

106 ~~The points on the curve $y = x^3 - x^2 - x + 1$, where the tangent is parallel to x - axis are~~

~~(a) $\left(\frac{-1}{3}, \frac{32}{27}\right)$ and (1,0) (b) (0, 0) and (1, 0) (c) (1, 0) and (1,1) (d) (0,1) and (1, 1)~~

107. $\int (a)^{2x}$ dx _____

(a) $\frac{a^{2x}}{2\log a}$ (b) $\frac{2.a^{2x}}{\log a}$ (c) $\frac{a^{2x}.\log a}{2}$ (d) None of these

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108. ~~$\lim_{x\to\infty} \frac{1^2+2^2+3^2+4^2+ \ldots\ldots\ldots\ldots + x^2}{x^3}$~~ – _____.

~~(a) $\frac{1}{3}$ (b) + ∞ (c) - ∞ (d) None of these~~

109 $\int_0^5 \frac{x^2 dx}{x^2+(5-x)^2}$ is equal to _____ .

(a) 5 (b) $\frac{5}{2}$ (c) 1 (d) None of these

110. If $y = ae^{nx} + be^{-nx}$, then $\frac{d^2y}{dx^2}$ is equal to _____ .

(a) n^2y (b) $-n^2y$ (c) ny (d) None of these

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111. A function f(x) is defined as under: $f(x) = \begin{cases} x + 2 & \text{When } x \leq 1 \\ 5 - px, & \text{When } x > 1 \end{cases}$

The value of 'p' for which f (x) is continuous at x = 1 will be:

(a) 1 (b) 2 (c) -1 (d) -2

112. The value of $\lim_{x \to k} \frac{(x+2)^{5/3} - (k+2)^{5/3}}{x-k}$ = _____

(a) $\frac{5}{3} k^{2/3}$ (b) $\frac{5}{3} (k+2)^{2/3}$ (c) $\frac{5}{3} (k+2)^{5/3}$ (d) None of these

113. If $f(x) = \begin{cases} x - 1 & \text{When } x > 0 \\ -\frac{1}{2} & \text{When } x = 0 \\ x + 1 & \text{when } x < 0, \end{cases}$ then f(x) is:

(a) Continuous at x = 0 (b) Undefined at x = 0

(c) Discontinuous at x = 0 (d) None of these.

114. The value of definite integral $\int_0^2 |1 - x| dx$ = _____

a) 0 (b) ½ (c) 3/2 (d) 1

115. If $y = 1 + \frac{x}{\lfloor 1} + \frac{x^2}{\lfloor 2} + \ldots\ldots\ldots + \frac{x^n}{\lfloor n} + \ldots\ldots\ldots$, then the value of $\frac{dy}{dx} - y$ = _____

(a) 1- (b) 0 (c) 2 (d) -1

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116. If $f(x) = \frac{x - |x|}{x}$, $x \neq 0$ and f (0) = 2, then f (x) is

(a) undefined (b) continuous at x = 0 (c) continuous at x = **2** (d) not continuous.

117. The value of $\lim_{x \to 0} \frac{9^x - 3^x}{4^x - 2^x}$ is

(a) log 3 / log 2 (b) log (3/2) (c) log **6** (d) 1

118. The value of $\int_0^{1/2} \frac{dx}{\sqrt{3-2x}}$ is

(a) 1 (b) $1 - \sqrt{3/2}$ (c) $\sqrt{3} - \sqrt{2}$ (d) $\sqrt{2} - \sqrt{3}$

119. The value of $\int_0^2 x\, e^{x^2} dx$ is

(a) 1 (b) e-1 (c) (e/2) -1 (d) $\frac{1}{2}(e^4 - 1)$

120. If $x^p y^q = (x + y)^{p+q}$, then $\frac{dy}{dx}$ is equal to _____

(a) $\frac{q}{p}$ (b) $\frac{x}{y}$ (c) $\frac{y}{x}$ (d) $\frac{p}{q}$

121. If $e^{xy} - 4xy = 4$ then $\frac{dy}{dx}$ = _____

(a) $\frac{y}{x}$ (b) $\frac{-y}{x}$ (c) $\frac{x}{y}$ (d) $\frac{-x}{y}$

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122. ~~If $\lim_{x \to 3} \frac{x^n - 3^n}{x - 3}$ = 405, then the value of 'n' is:~~

~~(a) 3 (b) 5 (c) -3 (d) 4~~

123. ~~A function f(x) defined as follows: $f(x) = \begin{cases} x + 1 & \text{when } x \leq 1 \\ 3 - px & \text{when } x \geq 1 \end{cases}$~~

~~The value of 'p' for which f(x) is continuous at x = 1 is:~~

~~(a) 0 (b) -1 (c) 1 (d) 2~~

124. If $u = 3t^4 + 5t^3 + 2t^2 + t + 4$, then the value of $\frac{du}{dt}$ at t = -1 is:

(a) 0 . (b) 1 (c) 2 (d) 5

125. The value of $\int_1^2 \frac{1-x}{1+x} dx$ is equal to:

(a) $\log \frac{3}{2} - 1$ (b) $2 \log \frac{3}{2} - 1$ (c) $\frac{1}{2} \log \frac{3}{2} - 1$ (d) $\frac{1}{2} \log \frac{2}{3} - 1$

126. The slope of the tangent to the curve $y = \frac{x-1}{x+2}$ at x = 2 is:

(a) $\frac{3}{16}$ (b) $-\frac{3}{16}$ (c) $\frac{1}{4}$ (d) $-\frac{1}{4}$

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127. ~~$\lim_{x \to 2} \frac{(x-2)}{|x-2|}$ is equal to —~~

~~(a) 0 (b) 1 (c) -1 (d) Does not exist~~

128. If $f(x) = \begin{bmatrix} x^2 & x \geq 0 \\ \alpha x + \beta & x > 0 \end{bmatrix}$, is a continuous function, then

(a) $\alpha = 0$, β is any real number (b) $\alpha = o$, $\beta = 1$

(c) $\beta = 0$, α is any real number (d) $\alpha = 0$, $\beta = 2$

129. $\int_0^2 \frac{3^{\sqrt{x}}}{\sqrt{x}} dx$ is equal to _____

(a) $\frac{2\sqrt{2}}{\log_e^3}$ (b) 0 (c) $\frac{2}{\log_e^3}(3^{\sqrt{2}} - 1)$ (d) $\frac{3^{\sqrt{2}}}{\sqrt{2}}$

130. $\int \frac{x}{(x^2+1)(x^2+2)} dx$ is equal to _____

(a) $\log\left(\frac{x^2+1}{x^2+2}\right) + c$ (b) $\frac{1}{2}\log\left(\frac{x^2+1}{x^2+2}\right) + c$ (c) $\frac{1}{2}\log\left(\frac{x^2+2}{x^2+1}\right) + c$ (d) $-\log\left(\frac{x^2+1}{x^2+2}\right) + c$

131. If $y = \sqrt{\frac{1-x}{1+x}}$, then $\frac{dy}{dx}$ is equal to -

(a) $\frac{y}{X^2-1}$ (b) $\frac{y}{1-X^2}$ (c) $\frac{y}{1+X^2}$ (d) $\frac{y}{y^2-1}$

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132. If $f(x) = \frac{x^3+a^3}{x+a}$, when $x \neq -a$ $= k$ if $x = -a$ then f(x) is continuous at $x = -a$, if k is equal to

(a) $-2a^2$ (b) $-3a^2$ (c) $2a^2$ (d) $3a^2$

133. $\lim_{n\to\infty}$ (0.7 + 0.07 + 0.007 + _____ to n terms) is equal to

(a) $\frac{77}{98}$ (b) $\frac{6}{9}$ (c) $\frac{7}{9}$ (d) $\frac{31}{40}$

134. $\lim_{x\to 0} \frac{\log_e(1+x)}{e^{2x}-1}$ is equal to:

(a) 1 (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) -1

135. Differential Co-efficient of $\log_e\left(\sqrt{x-1} + \sqrt{x+1}\right)$ with respect to x is:

(a) $\frac{I}{2\sqrt{x^2-1}}$ (b) $\frac{1}{2\sqrt{x^2+1}}$ (c) $\frac{1}{2(x^2-1)}$ (d) $\frac{1}{\sqrt{x-1}+\sqrt{x+1}}$

136. If $f(x) = \log_e\left(\frac{x-1}{x+1}\right)$, then the value of x at which $f(x) = 1$, is

(a) 0 (b) 1 (c) $\pm\sqrt{3}$ (d) $\pm\sqrt{2}$

137. $\int_1^e \frac{e^x(x\log_e x+1)}{x}$ dx is equal to:

(a) e + 1 (b) e^e (c) e - 1 (d) e^x + 1

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138. ~~The function f(x) = $\left(\sqrt{1-x^2}/\sqrt{1-x^3}\right)$ is not defined at x = 1, the value of f(x) which will make f(x) continuous at x = 1 will be :~~

~~(a) $\sqrt{\frac{2}{3}}$ (b) $\frac{\sqrt{2}}{3}$ (c) $\frac{2}{\sqrt{3}}$ (d) $\frac{2}{3}$~~

139. ~~$\lim_{n\to\infty} \frac{(n-1)^n}{n^n}$ is equal to:~~

~~(a) e (b) $\frac{1}{e}$ (c) – e (d) $\frac{-1}{e}$~~

140. The equation of the curve which passes through the point (1,2) and has the slope 3x - 4 at any point (x, y) is:0

(a) $2y = 3x^2-8x + 9$ (b) $y = 6x^2 - 8x + 9$ (c) $y = x^2-8x + 9$ (d) $2y = 3x^2 - 8x + c$

141. The value of $\int_1^2 \frac{x}{x^2+1}$ dx is equal to:

(a) $\log_e\left(\frac{5}{2}\right)$ (b) $\frac{1}{2}\log_e\left(\frac{5}{2}\right)$ (c) $\log_e(5) - \log_e 2 + c$ (d) None of these.

142. If $x = at^3 + bt^2 – t$ and $y = at^2 - 2bt$, then the value of $\frac{dy}{dx}$ at t = 0 is :

(a) 2b (b) -2b (c) $\frac{1}{2b}$ (d) $-\frac{1}{2b}$

143. The value of $\int e^x[f(x)+f'(x)]dx =$ _____

(a) $e^x f(x) + c$ (b) $e^x f'(x) + c$

(c) $\left[\frac{f'(x)}{f(x)}\right] + c$ (d) $e^x\left[\frac{f(x)}{f'(x)}\right] + c$

144. If $x^y = e^{x-y}$ then is equal to:

(a) $\frac{2\log x}{(1+\log x)^2}$ (b) $\frac{\log x}{(1+\log x)}$

(c) $\frac{\log x}{(1+\log x)^2}$ (d) None of the above

145. If $y = 1 + \frac{x}{\lfloor 1} + \frac{x^2}{\lfloor 2} + \frac{x^3}{\lfloor 3} + \ldots\ldots\ldots\ldots \infty$, then the value of $\frac{dy}{dx}$ is equal

(a)x (b)y (c)1 (d)0

146. $\int xe^{x^2} dx$ is equal to:

(a) $2e^{x^2}+c$ (b) $e^{x^2}+c$

(c) $\frac{1}{2}.e^{x^2}+c$ (d) $xe^{x^2}+c$

147. If $x = at^2, y = 2at$ then the value of $\frac{dy}{dx}$ at t = 2 is:

(a) 2 (b) 4 (c) ½ (d) ¼

148. If $y = \log x^x$ then $\frac{dy}{dx}$ is equal to:0

(a) log ex (b) $\log \frac{e}{x}$ (c) $\log \frac{x}{e}$ (d) 1

ANSWERS

1	A	11	B	21	A	31	C	41	B	51	A	61	A
2	B	12	D	22	B	32	C	42	C	52	D	62	A
3	B	13	B	23	C	33	B	43	B	53	C	63	A
4	C	14	B	24	A	34	C	44	A	54	A	64	B
5	A	15	A	25	B	35	C	45	C	55	B	65	A

6	B	16	A	26	B	36	B	46	B	56	C	66	C
7	B	17	A	27	B	37	A	47	C	57	A	67	D
8	A	18	B	28	A	38	B	48	A	58	D	68	B
9	B	19	C	29	A	39	B	49	C	59	A	69	A
10	C	20	A	30	A	40	C	50	B	60	B	70	B

71	A	81	B	91	D	101	A	111	B	121	B	131	A
72	D	82	C	92	B	102	B	112	B	122	B	132	D
73	A	83	B	93	B	103	B	113	C	123	C	133	C
74	C	84	B	94	B	104	D	114	D	124	A	134	B
75	C	85	A	95	C	105	B	115	A	125	B	135	A
76	B	86	C	96	C	106	A	116	D	126	A	136	C
77	B	87	A	97	C	107	A	117	A	127	D	137	B
78	A	88	B	98	C	108	A	118	C	128	C	138	A
79	B	89	C	99	A	109	B	119	D	129	C	139	B
80	B	90	C	100	B	110	A	120	C	130	B	140	A

141	B	143	A	144	C	146	C	148	A
142	A	144	C	145	B	147	C		