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INTER CA SEPT'25

LECTURE SCHEDULE		
COMMENCEMENT	COMPLETION	TIMING
26.09.2024	30.05.2025	7-8 HOURS/DAY

TEST SCHEDULE		
MONTHS	NO. OF TESTS	MARKS
Oct - Apr	14 (2 Test / Month)	50
May - Aug	12 (6 Subjects x 2)	50
	12 (6 Subjects x 2)	100

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[6 Marks]

RATIO & PROPORTION

Meaning of Ratio:

If a and b are two quantities of the same kind (in same units), then the fraction a/b is called the ratio of a to b. It is written $a:b$. Thus, the ratio of a to $b = a/b$ or $a:b$. The quantities a and b are called the terms of the ratio, a is called the first term or **antecedent** and b is called the **second term or consequent.**

For example, in the ratio 3:2, the numbers 3 and 2 are terms of the ratio. 3 is the **first term** or **antecedent** and 2 is the **second term** or consequent.

1. The ratio compound of the two ratios $a:b$ and $c:d$ is $ac:bd$.
   For example compound ratio of 3: 4 and 5: 7 is 15: 28.
   Compound ratio of $2:3$, $5:7$ and $4:9$ is $40:189$.
2. (i) $a^2:b^2$ is called duplicate ratio of $a:b$. Duplicate ratio of $2:3$ is $4:9$.
   (ii) $a^3:b^3$ is called triplicate ratio of $a:b$. Triplicate ratio of $2:3$ is $8:27$
   (iii) $\sqrt{a}:\sqrt{b}$ is called sub-duplicate ratio of $a:b$. sub duplicate ratio of $4:9$ is $2:3$.
   (iv) $a^{1/3}:b^{1/3}$ is called sub-triplicate ratio of $a:b$. sub triplicate ratio of $8:27$ is $2:3$.
3. One ratio is the inverse of another if their ratio compound is 1: 1.
   Thus $a:b$ is the inverse of $b:a$ and vice-versa.

PROPORTION

Meaning of Proportion: The equality of two ratios is called proportion.

If, $a:b=c:d$ we say that a, b, c, d are proportional and, we write $a:b::c:d$ Here and d are known as extremes and b, c are known as means, d is called the called fourth proportional to a, b and c.

We always have: **Product of Means = Product of Extremes**

Continued Proportion: The quantities a, b, c, d,... are said to be in continued proportion if $\frac{a}{b}=\frac{b}{c}=\frac{c}{d}=\ldots$

If a, b, c are in continued proportion then $\frac{a}{b}=\frac{b}{c}$ or $b^2=ac$.

then b is called mean proportional between a and c. Also c is called third proportional to a and b.

INDICES

In a^x a=Base x =power / exponent / Index

Laws of Indices

1. $a^m \times a^n = a^{m+n}$
2. $\frac{a^m}{a^n} = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $(ab)^n = a^n \times b^n$
5. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
6. $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$
8. $a^0 = 1$
9. $a^{-m} = \frac{1}{a^m}$
10. If $a^m = x$ Then $a = x^{1/m}$
11. If $a^m = a^n$ Then $m = n$
12. If $a^m = b^m$ Then $a = b$
13. $\left(\frac{a}{b}\right)^{-x} = \left(\frac{b}{a}\right)^x$

7. $\sqrt{a} = a^{1/2}$

$a\sqrt{a} = a^{3/2}$

$a^2\sqrt{a} = a^{5/2}$

14. If $a^3 + b^3 + c^3 = 3abc$
Then either $a+b+c=0$ Or $a=b=c$
(Both simultaneously not possible)

Type of sums with answer 1

1. $x^{a-b} \times x^{b-c} \times x^{c-a}$ is equal to	5. $\sqrt[a+b]{\frac{x^{a^2}}{x^{b^2}}} \times \sqrt[b+c]{\frac{x^{b^2}}{x^{c^2}}} \times \sqrt[c+a]{\frac{x^{c^2}}{x^{a^2}}}$ is equal to
2. $\left(\frac{x^a}{x^b}\right)^{(a^2+ab+b^2)} \times \left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2} \times \left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2}$ is equal to	6. $\left(x^{\frac{b+c}{c-a}}\right)^{\frac{1}{a-b}} \times \left(x^{\frac{c+a}{a-b}}\right)^{\frac{1}{b-c}} \times \left(x^{\frac{a+b}{b-c}}\right)^{\frac{1}{c-a}}$ is equal to
3. $\left(\frac{x^a}{x^b}\right)^{a+b} \times \left(\frac{x^b}{x^c}\right)^{b+c} \times \left(\frac{x^c}{x^a}\right)^{c+a}$ is equal to	7. $\frac{1}{1+a^{m-n}+a^{m-p}} + \frac{1}{1+a^{n-m}+a^{n-p}} + \frac{1}{1+a^{p-m}+a^{p-n}}$ is equal to
4. $\left(\frac{x^b}{x^c}\right)^a \times \left(\frac{x^c}{x^a}\right)^b \times \left(\frac{x^a}{x^b}\right)^c$ is equal to	

LOGARITHM

$a^m = b \Rightarrow$ Exponent form
$m = \log_a b \Rightarrow$ Logarithmic form

[log with base e $\Rightarrow$ Natural logarithm
log with base 10 $\Rightarrow$ common logarithm]

1. $\log(ab) = \log a + \log b$
2. $\log\left(\frac{a}{b}\right) = \log a - \log b$
3. $\log\left(\frac{ab}{c}\right) = \log a + \log b - \log c$
4. $\log\left(\frac{a}{bc}\right) = \log a - [\log b + \log c]$
$= \log a - \log b - \log c$
5. $\log a^m = m \log a$
6. $\log_a a = 1$
7. $\log_a 1 = 0$
8. $(\log a)^m =$ No property
9. $\log(a+b) =$ No property
10. $\log 0 \Rightarrow$ Not defined
11. $\log(-5) \Rightarrow$ Not defined
12. If $\log_a m = \log_a n$
Then $m = n$
13. $\log_b a = \frac{1}{\log_a b}$
14. $\log_b a = \frac{\log_x a}{\log_x b}$
15. $x^{\log_x a} = a$

MCQ

1. Anand earns ₹ 80 in 7 hours and Pramod ₹ 90 in 12 hours. The ratio of their earnings is

   (a) 32 : 21 (b) 23 : 12 (c) 8 : 9 (d) 18:23

2. 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) 7:8:9

3. The first three terms of a proportion are 30, 40 and 60. Find the fourth proportional.

   (a) 90 (b) 60 (c) 80 (d) 75

4. Find the mean proportion between 3 and 27.

   (a) 10 (b) 12 (c) 9 (d) 14

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

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

6. If $3^x = 5^y = (75)^z$ then

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

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

7. If $a=\frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}-\sqrt{5}}, b=\frac{\sqrt{6}-\sqrt{5}}{\sqrt{6}+\sqrt{5}}$ then the value of $\frac{1}{a^2}+\frac{1}{b^2}$ is

   (a) 486 (b) 484 (c) 482 (d) 500

8. Given $\log_2$ = 0.3010 and $\log_3$ = 0.4771 the value of log 6 is

   (a) 0.9030 (b) 0.9542 (c) 0.7781 (d) 0.1761

9. $\log_2 x+\log_4 x+\log_{16} x = 21/4$, these x is equal to

   (a) 8 (b) 4 (c) 16 (d) 2

10. Given that $\log_{10} x = m+n-1$ and $\log_{10} y = m-n$, the value of $\log_{10}(100x/y^2)$ is expressed in terms of m and n as:

    (a) 1 – m + 3n (b) m – 1 + 3n (c) m + 3n + (d) m^{2-n2}

Answers

1	2	3	4	5	6	7	8	9	10
a	a	c	c	b	a	c	c	a	a

[5 Marks]

QUADRATIC EQUATION

An equation of the form $ax^2+bx+c=0$ where x is a variable and a, b, c are constants with a $a\neq 0$ is called a quadratic equation or equation of the second degree.

Sum and Product of the Roots:

Let one root be α and the other root be β

hus sum of roots $=-\frac{b}{a}=-\frac{coefficient\ of\ x}{coeffient\ of\ x^2}$

So the product of the roots $=\frac{c}{a}=\frac{cons\tan t\ term}{coefficient\ of\ x^2}$

HOW TO CONSTRUCT A QUADRATIC EQUATION

For the equation $ax^2+bx+c=0$ we have

or $x^2+\frac{b}{a}x+\frac{c}{a}=0$

or $x^2-\left(-\frac{b}{a}\right)x+\frac{c}{a}=0$

or $x^2-(Sum\ of\ the\ roots)x+\Pr oduct\ of\ the\ roots=0$

NATURE OF THE ROOTS

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

i) If $b^2-4ac=0$ the roots are real and equal;

ii) If $b^2-4ac>0$ then the roots are real and unequal (or distinct);

iii) If $b^2-4ac<0$ then the roots are imaginary;

iv) If b^2-4ac perfect square $(\neq 0)$ the roots are real, rational and unequal (distinct);

v) If $b^2-4ac>0$ but not a perfect square the rots are real, irrational and unequal.

Cubic Equations

A cubic equation is a polynomial equation of degree tree and it is of following form

$ax^3+bx^2+cx+d=0$

$[a\neq 0]$

$\alpha,\beta\ and\ \gamma$ are the roots of equation

Sum of roots $\Rightarrow \alpha+\beta+\gamma=-b/a$

Product of roots $\Rightarrow \alpha\beta\gamma=-d/a$

$\alpha\beta+\beta\gamma+\alpha\gamma\Rightarrow c/a$

.

MCQ

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

(a) 5 (b) 7 (c) 3 (d) -4

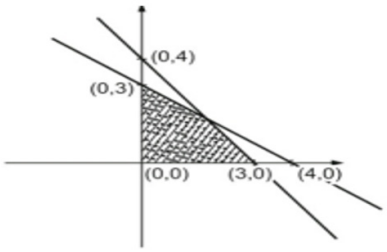
2. The roots of the equation $x^2+(2p-1)x+p^2=0$ are real if.

(a) $p\geq 1$ (b) $p\leq 4$ (c) $p\geq 1/4$ (d) $p\leq 1/4$

3. 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) $(0,4,-5)$

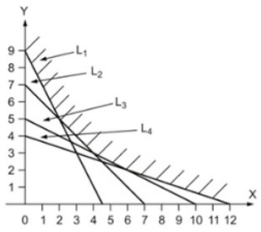
4. The following shaded region is the solution set of the linear inequations



(a) $3x+4y\geq 12, y+3x\geq 3, x\geq 0, y\geq 0$ (b) $3x+4y\leq 12, 4x+3y\leq 12, x\geq 0, y\geq 0$

(c) $3x+4y\leq 12, 4x+3y\geq 12, x\geq 0, y\geq 0$ (d) $3x+4y=12, 4x+3y=12, x\geq 0, y\geq 0$

5.



$L_1: 2x+y=9, L_2: x+y=7, L_3: x+2y=10, L_4: x+3y=12$

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) $2x+y\geq 9$, $x+y\geq 7$, $x+2y\leq 10$, $x+3y\leq 12$

Answers

1	2	3	4	5
b	d	b	b	c

[20 Marks]

Number Series, Coding & Decoding [5 Marks]

NUMBER SERIES

Example 1: Find the missing term of the series 2, 7, 16, _____ 46, 67, 92

Explanation: Here the terms of the series are +5, +9, +13, +17, +21 , +25...

Thus, 2 + 5 = 6; and 7 + 9 = 16 ...

So missing term = 16 + 13 = 29

Example 2: Find the wrong terms of the series 9, 29, 65, 126, 217, 344

Explanation: 2^3+1 ; $3^3 + 1$; $4^3 + 1$; ..

Here 29 is wrong term of series

ALPHABET SERIES

Alphabet series consists of letters of the alphabet placed in a specific pattern. For example, the series are in the following order of the numbers.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Example 3: Find the next term of the series BKS, DJT, FIU, HHV?

Explanation: In each term, the first letter is moved two steps forward, the second letter one step backward and third letter one step forward to obtain the corresponding letter of the next term. So the missing term is JGW.

Example 4: If in a certain language MYSTIFY is coded as NZTUJGZ, how is MENESIS coded in that language?

Explanation: Clearly, each letter in the word MYSTIFY is moved one step forward to obtain the corresponding letter of the code.

M Y S T I F Y

+1 ↓

N Z T U J G Z

So, in MENESIS, N will be coded as O, E as F, M as N and so on. Thus, the code becomes NFOFTJT.

Example 5: If PAINT is coded as 74128 and EXCEL is coded as 93596, then how would you encode ANCIENT ?

Explanation: Clearly, in the given code, the alphabets are coded as follows:

P	A	I	N	T	E	X	C	L
7	4	1	2	8	9	3	5	6

So, in ANCIENT, A is coded as 4, N is coded as 2, C as 5, I is coded as 3, E as 9, and T as 8. Hence, the correct code is 4251928.

Example 6: 10, 14, 16, 18, 23, 24 and 26

(a) 26 (b) 17 (c) 23 (d) 9

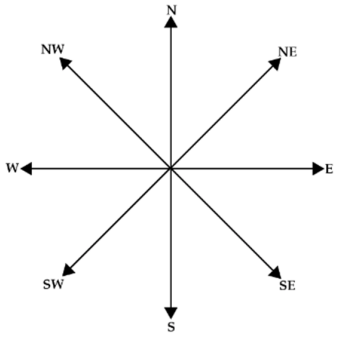
Explanation: Each of the above series are even number, except 23. answer :(c)

Example 7: 6, 9, 15, 21, 24, 26, 30

(a) 9 (b) 26 (c) 24 (d) 30

Explanation: All are multiples of 3, except 26, answer (b)

DIRECTION TESTS [5 Marks]

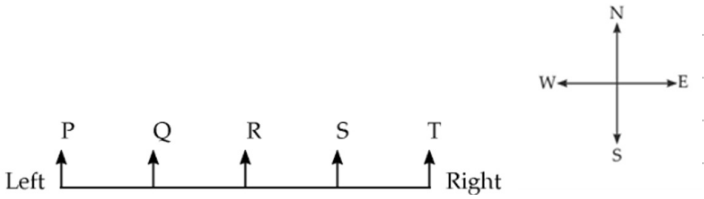


Always Remember:

Left + left	Down
Left + right	Up
Right + left	Up
Right + right	Down
Up + left	Left
Up + right	Right
Down + left	Right
Down + right	Left

SEATING ARRANGEMENTS [4 Marks]

(A) When direction of face is not clear, then we take based on diagram will be as follows:



From the above diagram, it is clear that

(i) Q, R, S, T are right of P but only Q is the immediate right of P.

(ii) S, R, Q, P are left of T but only S is the immediate left of T.

(iii) R, S, T are right of Q only R is the immediate right of Q.

(iv) R, Q, P are left of S but only R is the immediate left of S.

(v) S and T are right of R but only S is the immediate right of R.

(vi) Q and P are left of R but only Q is the immediate left of R.

(vii) A is the immediate left of Q while T is the immediate right of S.

BLOOD RELATIONS [6 Marks]

A person who is related to another by birth rather than by marriage.

To remember easily the relations may be divided into two sides as given below:

(i)	**Relations of Paternal side:**	(ii)	**Relations of Maternal side:**
	Father's father → Grandfather		Mother's father → Maternal grandfather
	Father's mother → Grandmother		Mother's mother → Maternal grandmother
	Father's brother → Uncle		Mother's brother → Maternal uncle
	Father's sister → Aunt		Mother's sister → Aunt
	Children of uncle → Cousin		Children of maternal uncle → Cousin
	Wife of uncle → Aunt		Wife of maternal uncle → Maternal aunty
	Children of aunt → Cousin		
	Husband of aunt → Uncle		

MCQ

1. In a certain code '256' means 'you are good', '637' means 'we are bad' and '358' means 'good and bad'. Which of the following represents 'and' in that code?
   (a) 2 (b) 5 (c) 8 (d) 3

2. If P x Q means P is to the south of Q: P+Q means P is to the north of Q; P% Q means P is to the east of Q; P - Q means P is to the west of Q: then in case of A %B+C-D, D is in which direction with respect to B?
   (a) North-west (b) South-east (c) North-east (d) South-east

Directions (Q. No. 03- 05): Study the following information carefully to answer the given questions.

Eight persons P to W are sitting in front of one another in two rows. Each row has four persons. P is between U and V and facing North. Q, who is to the immediate left of S is facing W. R is between T and S and W is to the immediate right of V.

3. Who is sitting in front of R?
   (a) U (b) Q (c) V (d) P

4. Who is to the immediate right of R?
   (a) S (b) U (c) W (d) T

5. In which of the following pairs, persons are sitting in front of each other?
   (a) SV (b) RV (c) TV (d) UR

6. Ramu's mother said to Ramu,"My mother has a son whose son is Achyut". How is Achyut relation to Ramu?
   (a) Uncle (b) Cousin (c) Brother (d) Nephew

7. Vijay says, Ananda's mother is the only daughter of my mother". How is Ananda relation to Vijay?
   (a) Brother (b) Father (c) Nephew (d) Grandfather

Answers

1	2	3	4	5	6	7
c	b	d	d	a	b	c

[8 Marks]

Statistics is originated from:

Latin word 'Status'

Italian word 'Statista'

German word 'Statistik'

French word 'Statistique'

The meaning of all above word is 'Political State'. In those days statistics was analogous to state or to be more precise, the data that are collected and maintained for the welfare of the people belonging to the state.

Definition of Statistics

Statistic when used as a singular noun may be defined as technique, formula or method used for collecting, analysing and presenting data. Statistic when used as a plural noun may defined as qualitative as well as quantitative data.

1. Discrete Variable or Non-Continuous Variable

The variable which can't take all values but only takes pre-defined values at set intervals e.g. Class that student belongs to, e.g. Number of students in a class can only be integers 10, 11, 12..etc,

2. Continuous Variable

The variable which can take any value e.g. Height of student.

3. Attributes

Attributes are those variables which cannot be numerically measured. Generally represented by some words e.g. honestly, nationality of students etc.

4. Primary Data

When data is collected and processed first hand by means of observations, interviews, questionnaires etc. it is referred as primary, e.g. Census conducted by government.

5. Secondary Data

When one uses data that was collected and processed by someone else, i.e. using second hand information, it is referred secondary data. The use of secondary data might involve representation further processing and analysis e.g. Use of Census data by health department to know demographics of a region.

Note: Primary data is always more reliable compare to secondary data.

Collection of Data:

1) Interview method:

Interview method again could be divided into

(a) Personal Interview method

(b) Indirect Interview method

(c) Telephone Interview method

a) Personal Interview Method:

- In personal interview method, the investigator meets the respondents directly and collects the required information then and there from them. In case of a natural calamity like a super cyclone or an earthquake or an epidemic like plague, we may collect the necessary data much more quickly and accurately by applying this method.
- It is suitable in case of natural calamities. Such as cyclone, earthquake, Tsunami, plague etc.

b) Indirect Interview Method:

- If there are some practical problems in reaching the respondents directly, as in the case of a rail accident, then we may take recourse for conducting Indirect Interview where the investigator collects the necessary information from the persons associated with the problems.

- It is suitable in case of accidents. e.g. Rail accidents, Road accidents.

c) Telephonic Interview Method:

- In this method investigator will ask the questions to the respondent on telephone and collect the information.
- It is less expensive as compare to other method.
- It is suitable for quick response.

2) Mailed Questionnaire Method:

- In this method a list of question in systematic order is prepared and dispatch to the respondent.
- Respondent has to write the information and sent it back to the investigator.
- It is suitable for coverage of wide area.
- The amount of Non- responses is maximum

3) Observation Method:

- In this method investigator will not ask any questions to the respondent but will take help of some instrument to collect information.
  E.g. to record weight of students of a class, investigator will request every student to stand on weighing machine and record the weights.
- It is most accurate.
- It applicable to collect only quantitative data where instrument is used.

Types of Classification of Data:

It is used to present the data in a neat, precise & condensed form. Statistical analysis is possible only for the classified data. There are four types of classification.

(i) Chronological or Temporal or Time Series Data:

When the data are classified in respect of successive time points or intervals, they are known as time series data.

E.g. The number of students appearing for C.A. Final exam for last 10 years.

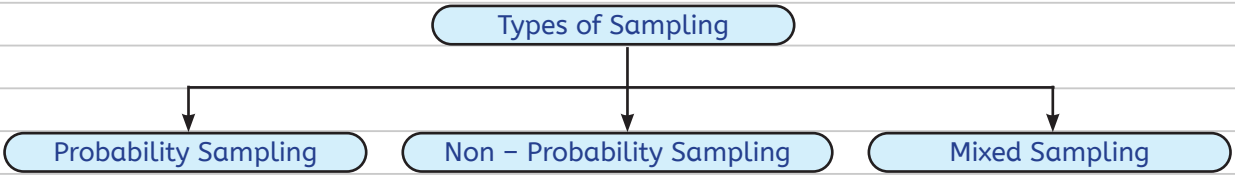
(ii) Geographical:

Data arranged according to area or region is called geographical area.

E.g. The number of Students appearing for C.A. Final exam of 2008 according to different states.

Different parts of a table

1. **Title:** Every table must be given a suitable title. It must be clear, brief and self-explanatory. Title is a description of the information presented in the table. It is written at the top of the table but below the table number.
2. **Caption:** Caption refers to the column headings. It may consists of one or more column headings. Under a column heading, there may be sub-heads.
3. **Stub:** are the designations of the rows or row headings. They are at the extreme left and perform the same function for the horizontal rows of numbers in the table as the column headings do for vertical columns of numbers.
4. **Body:** This most vital part of the table contains the numerical information.
5. **Box head:** The box head is on entire upper part of the table which includes columns and sub-columns, unit of measurement along with caption.



Simple Random Sampling [Probability Sampling]

- When the units are selected independent of each other in such a way that each unit belonging to the population has an equal chance of being a part of the sample, the sampling is known as Simple random sampling or just random sampling.
- The best method of drawing simple random sample is to use random sampling numbers.
- Simple random sampling is a very simple and effective method of drawing samples provided (i) the population is not very large (ii) the sample size is not very small and (iii) the population under consideration is not heterogeneous i.e. there is not much variability among the members forming the population. Simple random sampling is completely free from Sampler's biases.
- All the tests of signi¬ficance are based on the concept of simple random sampling.

Strati¬fied Sampling [Probability Sampling]

- If the population is large and heterogeneous, then we consider a somewhat, complicated sampling design known as strati¬fied sampling which comprises dividing the population into a number of strata or sub-populations in such a way that there should be very little variations among the units comprising a stratum and maximum variation should occur among the different strata.
- The stratifi¬ed sample consists of a number of sub samples, one from each stratum. Different sampling scheme may be applied to different strata and, in particular, if simple random sampling is applied for drawing units from all the strata, the sampling procedure is known as strati¬fied random sampling.
- The purpose of strati¬fied sampling are (i) to make representation of all the sub populations (ii) to provide an estimate of parameter not only for all the strata but also and overall estimate (iii) reduction of variability and thereby an increase in precision.
- Strati¬ed sampling is not advisable if (i) the population is not large (ii) some prior information is not available and (iii) there is not much heterogeneity among the units of population.

Multi Stage Sampling [Probability Sampling]

- In this type of complicated sampling, the population is supposed to compose of fi¬rst stage sampling units, each of which in its turn is supposed to compose of second stage sampling units, each of which again in its turn is supposed to compose of third stage sampling units and so on till we reach the ultimate sampling unit.
- Sampling also, in this type of sampling design, is carried out through stages. Firstly, only a number of ¬first stage units is selected. For each of the selected fi¬rst stage sampling units, a number of second stage sampling units is selected.
- The process is carried out until we select the ultimate sampling units. As an example of multi stage sampling, in order to ¬find the extent of unemployment in India, we may take state, district, police station and household as the fi¬rst stage, second stage, third stage and ultimate sampling units respectively.
- The coverage in case of multistage sampling is quite large. It also saves computational labour and is cost-effective. It adds edibility into the sampling process which is lacking in other sampling schemes. However, compared to stratifi-ed sampling, multistage sampling is likely to be less accurate.

Systematic Sampling [Mixed Sampling]

- It refers to a sampling scheme where the units constituting the sample are selected at regular interval after selecting the very first unit at random i.e., with equal probability.
- Systematic sampling is partly probability sampling in the sense that the first unit of the systematic sample is selected probabilistically and partly non- probability sampling in the sense that the remaining units of the sample are selected according to a fixed rule which is non-probabilistic in nature.
- Systematic sampling is a very convenient method of sampling when a complete and updated sampling frame is available. It is less time consuming, less expensive and simple as compared to the other methods of sampling.
- However, systematic sampling has a severe drawback. If there is an unknown and undetected periodicity in the sampling frame and the sampling interval is a multiple of that period, then we are going to get a most biased sample, which, by no stretch of imagination, can represent the population under investigation.

Purposive or Judgement sampling [Non Probability Sampling]

This type of sampling is dependent solely on the discretion of the sampler and he applies his own judgement based on his belief, prejudice, whims and interest to select the sample. Since this type of sampling is non-probabilistic, it is purely subjective and, as such, varies from person to person. No statistical hypothesis can be tested on the basis of a purposive sampling.

[4 Marks]

Test of Adequacy

1. Unit Test:

Condition: Formula for constructing an index number should be independent of the units in which prices and quantities are given.

Satisfy unit Test:

(i) All formulae except the simple aggregative index satisfy this test.

Does not satisfy unit test:

(i) Simple aggregative index formula.

2. Time Reversal Test:

Condition : Product of price index with give base and current period, and price index after interchanging base and current period is one.

Symbolically , $P_{01} \times P_{10} = 1$

P_{01} = Index number for '1' on 'o' as base

P_{10} = Index number for 'o' on '1' as base.

Satisfy time reversal test:

(i) Simple aggregative formula.

(ii) Fisher's formula.

(iii) Marshall - Edgeworth formula.

(iv) Walsh formula.

(v) Kelly's formula.

Does not satisfy time reversal test:

(i) Laspeyre's formula.

(ii) Paasche's formula.

(iii) Dorbish - Bowley's formula.

(iv) Average of relative method.

3. Factor Reversal Test:

Condition: Product of a price index and the quantity index should be equal to corresponding value index.

Symbolically, $P_{01} \times Q_{01} = \frac{\sum p_1 q_1}{\sum p_0 q_0}$

Satisfy factor reversal test.

(i) Fisher's formula

Does not satisfy factor reversal test:

(i) Laspeyre's formula.

(ii) Passche's formula.

(iii) Dorbish - Bowley's formula.

(iv) Marshall - Edgeworth formula.

4. Circular Test :

Condition : It is an extension of time reversal test. If price indices are $P_{01}, P_{12}, P_{23}, \ldots\ldots P_{n0}$ then condition is $P_{01} \times P_{12} \times P_{23} \times \ldots\ldots \times P_{no} = 1$

If three price indices are $P_{01} \times P_{12} \times P_{20} = 1$ then

$$P_{01} \times P_{12} \times P_{20} = 1$$

Satisfy Circular Test:

(i) Simple aggregative method.

(ii) Simple geometric mean of price relative.

(iii) Weighted aggregative with fixed weights. (i.e. Kelly's formula)

Does not satisfy circular test:

(i) Laspeyre's formula.

(ii) Paasche's formula.

(iii) Fisher's formula.

(iv) Dorbish - Bowley's formula.

(v) Marshall - Edgeworth Formula.

MCQ

1. P_{01} is the index for time

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

2. Theoretically, GM is the best average in the construction of index no's but in practice, mostly the AM is used

   (a) False (b) True (c) Both (d) None

3. The Cost of Living Index Numbers for the year 1996 and 1999 are 140 and 200 respectively. A person earns 11,200 p.m. in the year 1996. What should be his earnings p.m. in the year 1999 so as to maintain his former (that is of the year 1996) standard of living?

   (a) 14,000 (b) 15,000 (c) 16,000 (d) 12,000

Answers

1	2	3
a	b	c

[5 Marks]

$y = a + bx + bx$

b > 0	b = 0	b < 0
y = 5 + 2x	y = 5	y = 5 - 2x
x y	x y	x y
2 9	2 5	2 1
4 13	4 5	4 -3
6 17	6 5	6 -7
8 21	8 5	8 -11
r = 1	r = 0	r = - 1

Change of origin and change of scale
It is not affected by change of origin
It is not affected by magnitude of change of scale
It is affected by signs of change of scale

IF $U = 3x + 4$ and $V = 2y + 7$	If $U = -3x + 4$ and $V = -2y + 7$	$U = 3x + 4$ and $V = -2y + 7$
and $r_{(x,y)} = 0.75$	and $r_{(x,y)} = 0.75$	and $r_{(x,y)} = 0.75$
then $r_{(U,V)} = 0.75$	then $r_{(U,V)} = 0.75$	then $r_{(U,V)} = -0.75$
↓	↓	↓
Both Coefficients of change of scale are Positive	Both Coefficients of change of scale are Negative	Both Coefficients of change of scale are having opposite signs

Other formulas based on "r"

1) Coefficient of determination $= r^2$

$$r^2 = \frac{\text{Explaned variance}}{\text{Total variance}}$$

2) Coefficient of Non determination $= 1 - r^2$

$$1 - r^2 = \frac{\text{Un Explaned variance}}{\text{Total variance}}$$

3) Coefficient of alienation $= \sqrt{1 - r^2}$

[i.e. Square root of Coefficient of non-determination]

4) Standard Error [SE]

$$SE = \frac{1 - r^2}{\sqrt{n}}$$

5) Probable Error [PE]

$$PE = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$$

Important Points of Regression

1. Regression is mathematical relationship between two variables which are known as independent variable and dependent variable
2. regression is used to estimate dependent variable
3. Equation y on x is used to minimize vertical distance.
4. Equation x on y is used to minimize horizontal distance.
5. In the regression equation y on x byx represent the slope of the regression line
6. byx is the rate of change in value of y for unit change in the value of x.
7. In the regression equation y on x, y = a + bx 'a' represent y intersect which indicate the average value of the dependent variable when x = 0
8. $\frac{1}{b_{xy}}$ Represent the slope of the line x on y
9. b_{xy} is the rate of change in the value of x for a unit change in the value of y
10. In the regression equation x on y, x = a + by 'a' represent x intersect which indicate the average value of the dependent variable when y = 0
11. b_{xy} > 1, then b_{xy} < 1
12. $\left|\frac{b_{yx}+b_{xy}}{2}\right| \geq |r| [A.M \geq G.M]$
13. Karl pearsons correlation coefficient (r) is geometric mean of regression coefficient.
14. If r = 1, then regression lines coincide or identical.
15. Both regression coefficients and correlation coefficient has same signs. (i.e. all are +ve or all are -ve)
16. It r = 0, then regression lines are perpendicular to each other.
17. Regression coefficient is not affected by shift of origin.
18. Regression coefficient is affected by magnitudes of corresponding coefficient of Change of scale.
19. Lines of regression have point of intersection $\bar{x}, \bar{y}$

MCQ

1. From the following data

x :	2	3	5	4	7
y :	4	6	7	8	10

The coefficient of correlation was found to be 0.93. What is the correlation between u and v as given below ?

u :	10	15	25	20	35
v :	-24	-36	-42	-48	-60

(a) -0.93 (b) 0.6 (c) -0.93 (d) 0.93

2. If the relationship between two variables x and y is given by 2x+3y+4=0, then the value of the correlation coefficient between x and y is

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

3. If u = 2x + 5 and v = -3y - 6 and regression coefficient of y on x is 2.4, what is the regression coefficient of v on u?

(a) 3.6 (b) -3.6 (c) 2.4 (d) -2.4

4. Given the following equations as 3x + y = 13 and 2x + 5y = 20, which one is the regression equation of y on x?

(a) 1st equation (b) 2nd equation

(c) Both (a) and (b) (d) None

Answers

1	2	3	4
c	c	b	b

[14 Marks]

SIMPLE INTEREST

Simple Interest = Principal x Rate Interest x Number of years.

SI = P x R x N

Where R% is always expressed in the corresponding decimal form i.e. R = 2% is to be substituted in the above formula as R = 0.02.

COMPOUND INTEREST

$A = P\left(1+ {}^{i}/_{m}\right)^{mn}$ Where A is amount and P is Present Value or Principal.

$CI = A - P$ i is R/100 and m is No. of times compounding done in a year.

EFFECTIVE RATE OF INTEREST

Effective rate of interest can be defined as the equivalent annual rate of interest compounded annually if interest is compounded more than once in a year.

The effective interest rate can be computed directly by following formula:

$$E = \left[\left(1+ {}^{i}/_{m}\right)^{m} - 1\right] \times 100$$ Where E is the effective interest rate.

Example: Suppose 1000 is invested for a year at the rate of interest 6% .. compounded half yearly.

∴ Effective rate of interest is 6.09% p.a. [Using above formula]

Annuity

A series of payments, usually equal in size, made at equal intervals of times is called an annuity. Monthly Rental payments; premiums of life insurance; deposits into a recurring account in a bank; equal monthly payments got by a retired government servant as pension and loan installments of houses or automobiles.

(a) **Ordinary Annuity:** When all the periodic payments are made at the end of each payment period, it is called regular annuity (or ordinary annuity).

(b) **Annuity Due:** When all the periodic payments are made at the beginning of each payment period, it is called an annuity due.

AMOUNT OF AN ORDINARY ANNUITY	AMOUNT OF ANNUITY DUE
$A = \frac{P}{\left({}^{i}/_{m}\right)}\left[\left(1+ {}^{i}/_{m}\right)^{mn} - 1\right]$	$A = \frac{P}{\left({}^{i}/_{m}\right)}\left[\left(1+ {}^{i}/_{m}\right)^{mn} - 1\right]\left(1+ {}^{i}/_{m}\right)$
PRESENT VALUE OF AN ORDINARY ANNUITY	PRESENT VALUE OF ANNUITY DUE
$V = \frac{P}{\left({}^{i}/_{m}\right)}\left[1-\left(1+ {}^{i}/_{m}\right)^{-mn}\right]$	$V = \frac{P}{\left({}^{i}/_{m}\right)}\left[1-\left(1+ {}^{i}/_{m}\right)^{-mn}\right]$ [With one period Short] and Add initial cash payment in above Value

SINKING FUND

It is the fund credit for a specified purpose by way of sequence of periodic payments over a time period at a specified interest rate.

If A be the money set aside for each payment and S be the accumulated sum after n periods at the rate i per period (i.e., the amount in the sinking fund), then

1. $A = \frac{P}{\left(\frac{i}{m}\right)}\left[\left(1+\frac{i}{m}\right)^{mn}-1\right]$	2. $A = \frac{P}{\left(\frac{i}{m}\right)}\left[\left(1+\frac{i}{m}\right)^{mn}-1\right]\left(1+\frac{i}{m}\right)$
If the payments are made at the end of each period.	If the payments are made at the beginning of each period.

LEASING

Leasing is a financial arrangement under which the owner of the asset (lessor) allows the user of the asset (lessee) to use the asset for a defined period of time(lease period) for a consideration (lease rental) payable over a given period of time. This is a kind of taking an asset on rent.

Capital Expenditure (investment decision)

Capital expenditure means purchasing an asset (which results in outflows of money) today in anticipation of benefits (cash inflow) which would flow across the life of the investment. For taking investment decision we compare the present value of cash outflow and present value of cash inflows. If present value of cash inflows is greater than present value of cash outflows decision should be in the favour of investment.

Valuation of Bond

A bond is a debt security in which the issuer owes the holder a debt and is obliged to repay the principal and interest. Bonds are generally issued for a fixed term longer than one year. The bond issuer enters into contract with bondholder to pay interest.

PERPETUITY

Perpetuity is an annuity in which the periodic payments or receipts begin on a fixed date and continue indefinitely or perpetually. Fixed coupon payments on permanently invested (irredeemable) sums of money are prime examples of perpetuities.

$$V = \frac{P}{\left(\frac{i}{m}\right)}$$

Calculation of Growing Perpetuity:

A stream of cash flows that grows at a constant rate forever is known as growing perpetuity. The formula for determining the present value of growing perpetuity is as follows: $V = \frac{P}{i-g}$

NET PRESENT VALUE

Net present value = Present value of net cash inflow - Total net initial investment

Since it might be possible that some additional investment may also be required during the life time of the project then appropriate formula shall be:

Net present value = Present value of cash inflow - Present value of cash outflow

Decision Rule:

If NPV > 0 Accept the Proposal

If NPV < 0 Reject the Proposal

COMPOUND ANNUAL GROWTH RATE (CAGR)

Compound Annual Growth Rate (CAGR) is a business and investing specific term for the smoothed annualized gain of an investment over a given time periodit is not an accounting term, but remains widely used, particularly in growth industries or to compare the growth rates of two investments because CAGR dampens the effect of volatility of periodic returns that can render arithmetic means irrelevant. CAGR is often used to describe the growth over a period of time of some element of the business, for example revenue, units delivered, registered users, etc.

$$CAGR(t_0, t_n) = \left(\frac{V(t_n)}{V(t_0)}\right)^{\frac{1}{t_n - t_0}} - 1$$

Where $V(t_0)$ =Beginning Period; $V(t_n)$ =End Period

MCQ

1. 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) 12 years

2. 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

3. 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) 20 years

4. 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. 1,047.62 (c) Rs. 1,146.90 (d) Rs. 1,246.90

5. 10 years ago the Earning Per Share (EPS) of ABC Ltd. was 5 share. Its EPS for this year is 22. Compute at what rate, EPS of the company grow annually?
   (a) 15.97% (b) 16.77% (c) 18.64% (d) 14.79%

6. If the cost of capital be 12% per annum, then the net present value (in nearest) from the given cash flow is given as

Year	0	1	2	3
Operating profit (in thousand)	(100)	60	40	50

   (a) 21048 (b) 34185 (c) 51048 (d) 24187

7. Ms. Paul invested 1,00,000 in a mutual fund scheme in January 2018. After one year in January, 2019, she got a dividend amounting to 10,000 for first year. 12,000 for second year, 16,000 for third year, 18,000 for fourth year and 21,000 for fifth year in January 2023. What is Compounded Annual Growth Rate (CAGR) of dividend return? Given $1.2038^4 = 2.1$.
   (a) 20.38% (b) 18.59% (c) 16:36% (d) 15.89%

8. Govinda's mother decides to gift him 50,000 every year starting from today for the next five years. Govinda deposits this amount in a bank as and when he receives and gets 10% per annum interest rate, compounded annually. What is the present value of this annuity? Given P(4,0,10) 3.16987.

(a) 2,80,493.27 (b) 2,08,493.27

(c) 2,08,943.27 (d) 2,58,493.27

9. An investor intends purchasing a three year 1,000 par value bond having nominal interest rate of 10%. At what price the bond may be purchased now if it matures at par and the investor requires a rate of return of 14%?

(a) 907.625 (b) 907.525 (c) 907.675 (d) 907.135

10. Ramesh wants to retire and receive 3,000 a month. He wants to pass this monthly payment to future generations after his death. He can earn an interest of 8% compounded annually. How much will he need to set aside to achieve his perpetuity goal?

(a) 449757 (b) 449755 (c) 449775 (d) 449575

11. Assuming that the discount rate is 7% per annum, how much would you pay to receive 50, growing at 5%, annually, forever?

(a) 1500 (b) 2000 (c) 2500 (d) 3000

Answers

1	2	3	4	5	6	7	8	9	10	11
c	d	d	b	a	a	a	b	d	c	c

[11 Marks]

MCQ

1. 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) 350

2. The number of items in the set A is 40 in the Set B is 32; in the Set C is 50; in both A and B is 4; in both A and C is 5; in both B and C is 7; in all the set is 2. How many are in only one set?
   (a) 65 (b) 110 (c) 96 (d) 84

3. "Is smaller than" over the set of eggs in a box is
   (a) Transitive (T) (b) Symmetric (S)
   (c) Reflexive(R) (d) Equivalence (E)

4. "is perpendicular to" over the set of straight lines in a given plane is
   (a) R (b) S (c) T (d) E

5. The m^{th} term of an A. P. is n and n^{th} term is m. The r^{th} term of it is
   (a) m + n + r (b) n + m - 2r (c) m + n + r/2 (d) m + n - r

6. 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) –
   (c) 4/9 (10n -1) -n (d) 10/9 (10^n + 1)

7. If G be geometric mean between a & b, then the value of $\frac{1}{G^2-a^2}+\frac{1}{G^2-b^2}$ is equal to
   (a) G^2 (b) $3G^2$ (c) $1/G^2$ (d) $2/G^2$

8. Find the product of $243.243^{\frac{1}{6}}.243^{\frac{1}{36}}.....\text{to}\ \infty$
   (a) 1024 (b) 27 (c) 729 (d) 246

9. The sum of n terms of the series 1+(1+3)+(1+3+5)+....
   (a) $\frac{n(n+1)(2n+1)}{6}$ (b) $\frac{n(n+1)(2n+1)}{3}$ (c) $\frac{n(n+1)(n+2)}{6}$ (d) $\frac{n(n+1)(n+2)}{3}$

10. The sum of series $1/2+1/3^2+1/2^3+1/3^4+.....$ up to infinity is
    (a) 25/24 (b) 19/24 (c) 1/12 (d) 1/24

11. 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

12. If 50 different jewels can be set to form a necklace then the number of ways is
    (a) 1/2 $\lfloor 50$ (b) 1/2 $\lfloor 49$ (c) $\lfloor 49$ (d) $\lfloor 50$

13. 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) 2018

14. 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) 3,030

15. 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) 256

16. The number of diagonals in a decagon is

(a) 30 (b) 35 (c) 45 (d) 25

17. 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) 12

18. 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) 1500

Answers

1	2	3	4	5	6	7	8	9	10
a	c	a	b	d	a	c	c	a	b
11	12	13	14	15	16	17	18		
d	b	b	c	b	b	a	b		

[11 Marks]

Important Points of A.M. :

1. It is mathematical average.
2. It is based on all observations.
3. It is best of all averages.
4. It is rigidly defined.
5. It is capable of further algebraic treatment.
6. It has sampling stability. It is least affected by sampling fluctuations.
7. It is affected by extreme values.
8. It cannot be calculated for open end class intervals.
9. Sum of deviations from A.M. is zero.
10. It is affected by shift of origin.
11. It is affected by change of scale.
12. It satisfies linear relation between two variable.
13. Mean of first n natural numbers = $\frac{(n+1)}{2}$
14. Mean of first n odd natural numbers = n
15. It is characterised as the point of balance or centre of gravity.
16. It is the most stable of all measures of central tendency.
17. Mean of first n even natural numbers = n + 1.
18. It cannot be determined by inspections nor can it be located graphically.
19. It is not suitable for finding means for ratios such as speed, rates, percentage.
20. It cannot be used in the study of qualitative date, i.e. intelligence, beauty, honesty etc.

Important Points of Median :

1. It is not based on all observations.
2. It is not affected by extreme values.
3. It is also known as partition value.
4. It can be calculated for open end class intervals.
5. It can be determined graphically using ogive.
6. Sum of absolute deviations from median is minimum.
7. It requires the arrangement of data in ascending or descending order.
8. It is not capable of algebraic treatment. Mathematical properties are not applicable to median.
9. It is affected more by sampling fluctuation than A.M.
10. It is affected by shift to origin.
11. It is affected by change of scale.
12. It satisfy linear relation between two variables. e.g. If ax + by = C than relation between their medians is $aX_{me} + bY_{me} = C$
13. It is the most appropriate average in dealing with quantitative data.
14. If equal numbers of observation are added or deleted from each side of median, median remains the same.
15. If wrong observations and correct observations both are less than median or both are more than median, median remains unchanged.

Important Points of Mode

1. It is easy to understand.
2. It is simple to compute.
3. It is not based on all observations.
4. It is not affected by extreme values
5. It is not rigidly defined. There may be two or more values of mode.
6. It is not capable of further algebraic treatment. We cannot find the combined mode.
7. It is affected more by sampling fluctuation than A.M.
8. In certain situations mode is the only suitable average e.g. modal size of shirt, modal size of garments, modal size of shoes.
9. It can be determined graphically by histogram.
10. To determine mode class intervals must be of equal size.
11. It is affected by shift of origin.
12. It is affected by change of scale.
13. It satisfy linear relation between two variables. e.g. If ax + by = C then. a Mode (x) + b Mode (y) = C
14. It is a positional average.

Important Points of G.M.

1. It is used to find average rate of change in variable between any two periods. Eg. Average rate of increase in population per year average rate of interest. The GM is used find average percent increase in sales, production, population etc.
2. It is mathematical average.
3. It is based on all observations. It is rigidly defined.
4. It is capable of further algebraic treatment. It is most difficult to calculate.
5. It can not be calculated if one of the observation is zero. It can not be calculated if some observations negative. It is affected by shift of origin but can not be determined.
6. It is affected by change of scale. If y = ax then GM (y) = a GM(x). In construction of index numbers, GM is the best average.
7. When we want to give less weights to large numbers and more weight to small numbers, then GM is preferable than AM.

Important points of HM

1. If same distances are travelled with different speed, the average speed can be computed using HM.
2. Combined H.M.: if harmonic mean of n_1 observations is H_1 and n_2 observations is H_2 then. Combined H.M. is given by Combined H.M $\frac{n_1 + n_2}{\frac{n_1}{H_1} + \frac{n_2}{H_2}}$

Relationship among A.M., G.M., H.M.

Relationship among A.M., G.M., H.M. :

1. $GM^2 = AM \times HM$
2. For positive numbers
   $AM \geq GM \geq HM$
3. For positive distinct numbers
   $AM > GM > HM$

4. For positive equal numbers
   AM = GM =HM

Relationship among Mean, Median, Mode:

(Mean − mode) = 3(Mean − median)

Important Points of Range :

1. It is simple to calculate and easy to understand.
2. It is quickest of all methods.
3. It is not based on all observations.
4. It is affected by extreme values.
5. It can not be calculated for open and class intervals.
6. It is not affected by shift of origin.
7. It is affected only by positive magnitude of change of scale.
   e.g. If Y = ax + b then relation between range of x and y is
   Range (y) = Range (x).
8. It is used in quality control to find number of defectives.

Important Points of Quartile Deviation

1. It is based on middle 50% of the data.
2. It is the only measure of dispersion which can be calculated for open end class intervals.
3. It is not affected by extreme values.
4. It is not suitable for algebraic treatment.
5. It is not affected by shift of origin.
6. It is affected by positive magnitude of change of scale.
   e.g. y = ax + b then QD(y) = |a| QD(x)
7. For normal distribution.
   (i) $Q_1 = x - 0.675\ (\sigma)$
   (ii) $Q_3 = x + 0.675\ (\sigma)$
   (iii) Q.D. = $0.675\ (\sigma)$
   (iv) $\text{Median} = \frac{Q_1 + Q_3}{2}$

Important Points of Mean Deviation:

1. It is not affected by shift of origin
2. It is affected by positive magnitude of change of scale eg. Y = ax + b then M.D. (y) = |a| M.D(x)
3. For normal distribution M.D = 0.8 (S.D) = $\frac{4}{5}\sigma$
4. M.D about Mean for two numbers or equally repeated two numbers = $\frac{1}{2}$ |Range|
5. M.D about median is minimum

Important points of S.D

1. It is most accurate measure of dispersion.
2. It is used most commonly and most frequently.
3. It is all observations.
4. It is calculated using only A.M.
5. It is least affected by sampling fluctuation.
6. It is only measure of dispersion which is capable of further algebraic treatment.
7. It is affected by extreme values.
8. It cannot be calculated for open end class intervals.
9. For two numbers or equally repeated two numbers standard deviation is half of range.
10. Standard deviation is not affected by shift of origin.
11. Standard deviation is affected by change of scale. e.g. If Y = ax then
    $\sigma_y = |a|\sigma_x$ and Var (y) = a^2 Var(x)
12. Standard deviation is square root of variance.
13. It is used in most statistical analysis i.e. Correlation, Regression, Theoretical Distribution, sampling Theory etc.
14. For the n natural numbers S.D. = $\sqrt{\frac{n^2-1}{12}}$

Note: S.d. of two numbers or equally repeated two numbers is half of range between numbers

MCQ

1. The average score of girls in class X examination in a school is 67 and that of boys is 63. The average score for the whole class is 64.5, find the percentage of girls and boys in the class.
   (a) 37.5% & 62.5% (b) 38.5% & 63.5%
   (c) 73.5% & 26.5% (d) 39.5% & 68.5%

2. What is the GM for the numbers 8, 24 and 40 ?
   (a) 24 (b) 12 (c) $8\sqrt[3]{15}$ (d) None

3. An aeroplane flies from A to B at the rate of 500 km/ hr and comes back from B to a at the rate of 700 km/ hr. The average speed of the aeroplane is :
   (a) 600 km / hr (b) 583.33 km / hr
   (c) 100 35 km / hr (d) 620 km / hr

4. If the A.M. and H.M for two numbers are 5 and 3.2 respectively then the G.M. will be:
   (a) 4.05 (b) 16 (c) 4 (d) 4.10

5. When mean is 3.57 and mode is 2.13 then the value of median is _____
   (a) 3.09 (b) 5.01 (c) 4.01 (d) None

6. If x and y are related as 3x - 4y = 20 and the quartile deviation of x is 12, then the quartile deviation of y is :
   (a) 14 (b) 15 (c) 16 (d) 9

7. If two variables x and y is 5y - 3x = 10 and the mean and mean deviation about mean of x are 1 and 0.3 respectively, then the coefficient of mean deviation of y about mean is

(a) -5 (b) 6.92 (c) 50 (d) 4

8. If the SD of x is 3, what is the variance of (5 - 2x)?

(a) 36 (b) 6 (c) 1 (d) 9

9. The standard deviation of the weights (in kg) of the students of a class of 50 students was calculated to be 4.5 kg. Later on it was found that due to some fault in weighting machine, the weight of each student was under measured by 0.5 kg. The correct standard deviation of the weight will be :

(a) Less than 4.5 (b) Greater than 4.5

(c) Equal to 4.5 (d) Can be determined

10. Suppose a population A has 100 observations 101, 102, 103, .. 200 and another population B has 100 observations 151, 152, 153, 250. If V_A and V_B represents the variance of the two populations respectively, then V_A / V_B =

(a) $\frac{9}{4}$ (b) 1 (c) $\frac{4}{9}$ (d) $\frac{2}{3}$

Answers

1	2	3	4	5	6	7	8	9	10
a	c	b	c	a	d	b	a	c	b

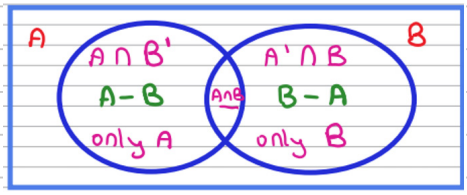
[6 Marks]

Probability Formula List

1. $p(A)=\frac{n(A)}{n(S)}$ $\quad 0\le P(A)\le 1$ [It cannot be negative and can never exceed 1]
   If $P(A)=0$ then A is impossible event
   If $P(A)=1$ then A is sure or certain event.

2. $P(A)'=1-P(A)$
3. $P(x\ge 1)=1-P(x=0)$
   P (At least one.) = 1 - P(none...)
4. $P(A\cup B)=P(A)+P(B)-P(A\cap B)$
   $P(A+B)=P(A)+P(B)-P(A\times B)$
   $P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)$
   P (at least one event) = $=P(A)+P(B)-P(\text{ Both })$

5. Demorgan's law
   $P(A'\cup B')=P(A\cap B)'=1-P(A\cap B)$
   $P(A'\cap B')=P(A\cup B)'=1-P(A\cup B)$



6. Special Formula: $P(A)=P(A\cap B)+P(A\cap B')$
   $P(B)=P(A\cap B)+P(A'\cap B)$
7. When events are dependent

$$P(A/B)=\frac{P(A\cap B)}{P(B)}$$ [A depends on B]

$$P(B/A)=\frac{P(A\cap B)}{P(A)}$$ [B depends on A]

Extra Formulas with complement events

$P(A'\cup B)=P(A')+P(B)-P(A'\cap B)$
$P(A\cup B')=P(A)+P(B')-P(A\cap B')$

$$P(A'/B)=\frac{P(A'\cap B)}{P(B)}$$

$$P(A/B')=\frac{P(A\cap B')}{P(B')}$$

$$P(A'/B')=\frac{P(A'\cap B')}{P(B')}$$

8. When events are independent

$$P(A\cap B)=P(A)\times P(B)\Rightarrow P(A'\cap B)=P(A')\times P(B)$$
$$P(A\cap B')=P(A)\times P(B')$$
$$P(A'\cap B')=P(A')\times P(B')$$

Note $\Rightarrow$ we can use above formula only if it is given in the question that events are independent.

9. When events are mutually exclusive.

$P(A\cap B)=0$

Note $\Rightarrow$ we can use above formula only if it is given in the question that event's are mutually exclusive

10. Two event's with non-zero probability cannot be simultaneously mutually exclusive and independent

If two events A and B are independent then they cannot be mutually exclusive

If two event's A and B are mutually exclusive then they cannot be independent.

11. $S=\{1,2,3,4,5,6\}\quad n(S)=6$

$A=\{1,2\},\ n(A)=2$ $B=\{3,4\},\ n(B)=2$ $B=\{5\},\ n(C)=1$	$A=\{1,2\},\ n(A)=2$ $B=\{3,4\},\ n(B)=2$ $B=\{5,6\},\ n(C)=2$
$\Downarrow$	$\Downarrow$
Here events are mutually exclusive but not exhaustive	Here events are mutually exclusive and exhaustive
$P(A\cup B\cup C)=P(A)+P(B)+P(C)$ $=\frac{2}{6}+\frac{2}{6}+\frac{1}{6}$ $=\frac{5}{6}<1$	$P(A\cup B\cup C)=P(A)+P(B)+P(C)$ $=\frac{2}{6}+\frac{2}{6}+\frac{2}{6}$ $=\frac{6}{6}=1$

12.

Odds in favour of event $A=A:A'$	Odd's in against of event $A=A':A$
Odds in favour of event $A=2:3$	Odd's in against of event $A=5:1$
$\therefore P(A)=\frac{2}{5}\Rightarrow\frac{2}{2+3}$ And	$\therefore P(A)=\frac{1}{6}\Rightarrow\frac{1}{5+1}$ And
$\therefore P(A')=\frac{3}{5}\Rightarrow\frac{3}{2+3}$	$P(A')=\frac{5}{6}\Rightarrow\frac{5}{5+1}$

Random Variable and Probability Distribution

1. Expected x = (Average) mean= $E(x)=\sum Px$

2. Expected x^2 = $E(x)^2=\sum Px^2$

3.

Variance $= V(x) = \sum Px^2 - \left(\sum Px\right)^2$ $= E(x^2) - [E(x)]^2$ $= E[x - E(x)]^2$	Variance $= E[x - x]^2$ $= E[x - \bar{x}]^2$ $= \frac{\sum [x - \bar{x}]^2}{n}$

4. $SD = \sqrt{\text{variance}} = \sqrt{V(x)}$

MCQ

1. If x be the sum of two numbers obtained when two dice are thrown simultaneously then P (x ≥ 7) is

   (a) $\frac{5}{12}$ (b) $\frac{7}{12}$ (c) $\frac{12}{36}$ (d) $\frac{3}{8}$

2. If P (A –B) = P (B –A), then the two events A and B satisfy the condition.

   (a) P (A) = P (B) (b) P (A) + P (B) = 1

   (c) P (A) P (B) (d) None of these

3. Find the probability of the event A:

   (a) if the odds in favour are 3: 2 (b) if the odd against it are 1: 4.

   (a) $\frac{5}{6}, \frac{2}{3}$ (b) $\frac{3}{5}, \frac{2}{5}$ (c) $\frac{3}{5}, \frac{4}{5}$ (d) $\frac{5}{6}, \frac{1}{5}$

4. A problem in statistics is given to three students A, B and C. Their chances of solving the problem are1/3, 1/4 and 1/5 respectively. If all of them try independently, what is the probability that

   (i) Problem is solved

   (ii) Exactly two students solved the problem.

   (a) $\frac{5}{7}, \frac{7}{20}$ (b) $\frac{9}{20}, \frac{7}{9}$ (c) $\frac{3}{5}, \frac{3}{20}$ (d) $\frac{7}{9}, \frac{9}{20}$

5. A bag contains 6 white and 4 red balls. If a person draws 2 balls and receives ₹10 and ₹20 for a white and red balls respectively, then his expected amount is.

   (a) ₹ 25 (b) ₹ 26 (c) ₹ 27 (d) ₹ 28

6. The probability distribution of a random variable is as follows:

x:	1	2	4	6	8
P:	k	2k	3k	3k	k

   The variance of x is

   (a) 1.41 (b) 4.41 (c) 3.41 (d) 4.14

Answers

1	2	3	4	5	6
b	a	c	c	d	b

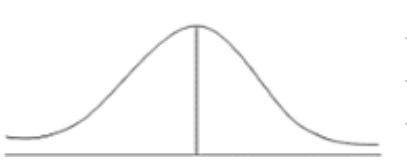
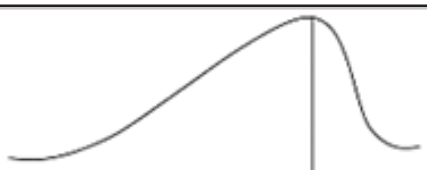
[6 Marks]

Binomial Distribution

1. The experiment is repeated a finite and fixed number of times.
2. Each trial has only two outcomes, namely "Success" and "Failure".
3. The trials are independent. Outcomes of one trial has no effect on the outcomes of other trial.
4. Probabilities of the outcomes do not change for each trial.

Important Points:

1. **Type:** It is discrete probability distribution.
2. **Parameters:** It is biparametric distribution. The parameters are P (Probability of Success) and n (number of trials).
3. **Conditions on Parameters:** n is small and finite and $0< p<1$.
4. **Probability Mass Function:** (p.m.f.)
   If 'X' is a random variable then
   $(x) = {}^nC_x\, p^x q^{(n-x)}$ $0 \le x \le n$
5. **Mean** : Mean of B.D. = n.p.
   Variance : Var = npq
   Standard deviation = $\sqrt{npq}$
6. **Relation between mean and variance :** Mean > Variance.
7. **Maximum Variance :** Variance of Binomial distribution is maximum when P = $q = \frac{1}{2}$ and maximum variance is $\frac{n}{4}$.
8. **Mode** : It is unimodal or bimodal distribution.
   (i) If (n+1) p is non-integer then Mode = largest integer of (n+1) P.
   (ii) If (n+1) p is an integer then Mode = (n+1) p and (n+1) p-1
9. **Shape of binomial distribution :**

	Value of P	Skewness	Shape
(i)	P = 0.5	Symmetric $\bar{x} = M_e = M_0$	
(ii)	P < 0.5	Skewed to the right i.e. positive skewness. $\bar{x} > M_e > M_0$	
(iii)	P > 0.5	Skewed to the left i.e. Negative skewness $\bar{x} < M_e < M_0$	

Poisson Distribution

1. Number of trials (n) is very large.($n \to \infty$)
2. Probability of success is very small. ($p \to 0$)
3. Mean of poisson distribution, m = np, which is finite and moderate.
4. Trials are independent.

Important Points :

1. **Type :** It is discrete probability distribution.
2. **Parameters :** It is uniparametric distribution. parameter is m = np.
3. **Condition on Parameter :** Since n and p are always positive, 'm' must be positive.
4. **Probability mass Function :** If x is discrete random variable then $f(x) = \frac{e^{-m} \times (m)^x}{x!}$

   x = 0, 1, 2, ……..∞.

   Where e = 2.71828.
5. **Mean :** Mean of P.D. , m = np.
6. **Variance :** Var = n.p.
7. **Relationship between mean and variance :** Mean = Variance.
8. **Mode :** It is unimodal or bimodal distribution.
   (i) If m is non - integer then mode = largest integer of m.
   (ii) If m is an integer then mode = m and (m^{-1}).
9. **Shape of poisson distribution :** It always positively skewed. As 'm' increases the distribution shifts to the right.
10. **Additive Property :** If x and y are two independent variables following Poisson distribution with parameters m_1 and m_2 respectively then Z = x +y also follows poisson distribution with parameters (m_1+m_2).
11. **Application of Poisson distribution :** Poisson distribution is applied when the total number of events is pretty large but the probability of occurrence is very small. Thus we can apply Poisson distribution, rather profitably, for the following cases:
    (a) The distribution of the no. of printing mistakes per page of a large book.
    (b) The distribution of the no. of road accidents on a busy road per minute.
    (c) The distribution of the no. of radio-active elements per minute in a fusion process.
    (d) The distribution of the no. of demands per minute for health centre and so on.

Normal Distribution

1. It is continuous probability distribution.
2. Probability of a particular value of x is negligible and almost zero.
3. Probability density function of normal distribution is $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\frac{(x-\mu)^2}{\sigma^2}}$
4. It is biparametric distribution. Parameters of normal distribution are mean (or) and variance (σ^2).

Characteristic of Normal Curve :

1. It is bell - shaped symmetrical curve.
2. Curve can be extended at both ends infinitely but never touches the horizontal line.
3. All three averages are equal, AM = Median = Mode.
4. Both Quartiles are equidistant from median.
5. Total area under the curve is considered as unity.

6. Area on each side of vertical line at the centre is 0.5.

7. Standard normal variate $z = \frac{x - \bar{x}}{\sigma}$ or $z = \frac{x - \mu}{\sigma}$.

Important Points :

1. Total area under normal curve is one Area between $-\infty$ to $\bar{x}$ = Area between $\bar{x}$ to $+\infty$ = 0.5.
2. mean $\bar{x}$ = 0 and standard deviation = 1 for standard normal curve.
3. Quartiles of Normal distribution
   Q1 = $\bar{x}$ - 0.675(σ).
   Q3 = $\bar{x}$ + 0.675(σ).
4. QD : MD : SD = 10 : 12 : 15
5. Points of inflexion of standard normal distribution are z = -1 and z = 1or x = μ - σ and x = μ + σ.

6. If x and y are independent normal variables with means and standard deviations as μ_1 and μ_2 and σ_1 and σ_2 respectively then z = x+y also follows normal distribution.
   with mean ($\mu_1 + \mu_2$) and SD = $\sqrt{\sigma_1^2 + \sigma_2^2}$

7. ϕ (a) is known as C.D.F
   ϕ (a) = P($x \leq a$)
   Area from a to $-\infty$

8. 99.73% of the values of a normal variable lies between $\mu \pm 3\sigma$, hence values outsides that limit is as low as 0.27%

9. There are two methods for fitting normal distribution:
   (1) Ordinate method
   (2) Area Method

MCQ

1. What is the probability of marking 3 correct guesses in 5 true – False Answer
   (a) 0.4156 (b) 0.32 (c) 0.3125 (d) 0.5235

2. For binomial distribution E(x) = 2, V(x) = 4/3. Find the value on n.
   (a) 3 (b) 4 (c) 5 (d) 6

3. If X follows Poisson distribution with parameter m = 5, find
   (i) P[X = 5], (ii) P[X ≥ 2] [Use e^{-5} = 0.0067]
   (a) 0.1745, 0.9598 (b) 0.27, 0.37
   (c) 0.1745, 0.29 (d) 0.21, 0.96

4. A manufacturer, who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contains at least two defectives:
   [Given : $e^{-0.5}$ = 0.6065]
   (a) 7 (b) 13 (c) 9 (d) 11

5. Identify the parameters of the following normal distribution

$$f(x)=\frac{1}{3\sqrt{2\pi}}e^{\left(\frac{-x^2}{18}+\frac{10x}{9}-\frac{50}{9}\right)},-\infty<x<\infty$$

(a) 10, 9 (b) 9, 10 (c) 10, 11 (d) None

6. The I.Q.'s of army volunteers in a given year are normally distributed with Mean = 110 and Standard Deviation = 10. The army wants to give advance training to 20% of those recruits with the highest scores. What is the lowest I.Q. score acceptable for the advanced training? The value of Z for the area 0.3 = 0.84.

(a)0.84 (b) 118.4 (c) 138.4 (d) 115.4

7. For a normal distribution with mean 150 and S.D. 45; find Q_1 and Q_3 :

(a) 119.35 and 190.65 respectively (b) 180.35 and 119.65 respectively

(c) 119.65 and 180.35 respectively (d) 123.45 and 183.65 respectively

Answers

1	2	3	4	5	6	7
c	d	a	c	a	b	c

[4 Marks]

Limits

The concept of limit of a function is a fundamental concept in calculus
[i.e. Derivatives and Integrations]
Consider function $\Rightarrow f(x) = x+3$

$f(x) = x+3$

Put $x = 1.999$	Put $x = 2$	Put $x = 2.001$
$\Downarrow$	$\Downarrow$	$\Downarrow$
$f(1.999) = 4.999$	$f(2) = 5$	$f(2001) = 5.001$
$\Downarrow$		$\Downarrow$
Value of x is close to 2 then value of $f(x)$ is close to 5		Value of x is close to 2 then value of $f(x)$ is close to 5
		$\Downarrow$
Value of x is close to 2 from left side on number line		Value of x is close to 2 from right side on number line
$\Downarrow$		$\Downarrow$
Left hand limit $\lim_{x\to 2^-} f(x)$		Right hand limit $\lim_{x\to 2^+} f(x)$
$\lim_{x\to 2} x+3$		$\lim_{x\to 2} x+3$
$=2+3$		$=2+3$
$=5$		$=5$

Types of Question

1. $\frac{k}{k} \Rightarrow$ *Answer*

$$\lim_{x\to 2} \frac{5x+3}{2x+7} = \frac{5(2)+3}{2(2)+7} = \frac{13}{11}$$

2. $\frac{0}{k} \Rightarrow$ *Answer* is zero

$$\lim_{x\to 2} \frac{2x-4}{5x+7} = \frac{2(2)-4}{5(2)+7} = \frac{}{17} = 0$$

3. $\frac{0}{k} \Rightarrow$ Limit does not exists

$$\lim_{x\to 2} \frac{5x+3}{x-2} = \frac{5(2)+3}{2-2} = \frac{13}{0}$$ =Limit does not exist at $x = 2$

4. $\frac{0}{0} \Rightarrow$ do not substitute value of directly in the equation but cancel that term from numerator and denominator which tends to Zero.

$$\lim_{x\to\infty} \frac{x^2-4}{x-2} = \frac{2^2-4}{2-2} = \frac{0}{0}$$

Formula list

1. $\lim_{x\to a} \frac{x^n - a^n}{x-a} = n\left(a^{n-1}\right)$
2. $\lim_{x\to 0} \frac{e^x - 1}{x} = 1$
3. $\lim_{x\to 0} \frac{a^x - 1}{x} = \log a$
4. $\lim_{x\to 0} \frac{\log(1+x)}{x} = 1$
5. $\lim_{x\to\infty} \left(1+\frac{1}{x}\right)^x = e$
6. $\lim_{x\to 0} \frac{(1+x)^{1/x}}{x} = e$
7. $\lim_{x\to\infty} \frac{1}{x} = 0$

Differentiation

SOME STANDARD RESULTS OF DIFEREBTIATION

1. $\frac{d}{dx}\left(x^n\right) = nx^{n-1}$
2. $\frac{d}{dx}(x) = 1$
3. $\frac{d}{dx}(\text{constant}) = 0$
4. $\frac{d}{dx}\left(1/x\right) = -1/x^2$
5. $\frac{d}{dx}\left(\sqrt{x}\right) = \frac{1}{2\sqrt{x}}$
6. $\frac{d}{dx}\left(e^x\right) = e^x$
7. $\frac{d}{dx}\left(a^x\right) = a^x \log_e a$
8. $\frac{d}{dx}(\log x) = \frac{1}{x}$
9. $\frac{d}{dx}(\log_a x) = \frac{1}{x \log_e a}$
10. $\frac{d}{dx}\left(kx^n\right) = knx^{n-1}$

Application of Differentiation

1. Total Revenue=Price per unit x No.of unit sold

   $R = P \times x$

2. Marginal Revenue=Derivative of R wrt number of unit sold

   $R_m = \frac{d(R)}{dx}$

3. Average Revenue $= \frac{\text{Total Revenue}}{\text{No. Of unit sold}}$ $R_a = \frac{R}{x} = P$

4. Total cost=fixed cost +variable cost

   $C = \text{fixed cost} + \text{no. of unit produced} \times \text{cost per unit}$

5. Marginal cost= Derivative of total cost wrt no. of unit produced

$$c_m = \frac{d(c)}{dx}$$

6. Average cost $= \dfrac{\text{Total cost}}{\text{No .Of unit produced}}$

$$c_a = c/x$$

7. Profit=Total Revenue-Total cost

$$\prod = R - C$$

Integration

1. $\int x^n dx = \dfrac{x^{n+1}}{n+1} + c$

$$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{n+1} \times \frac{1}{a} + c$$

2. $\int 1 dx = x + c$

3. $\int \dfrac{1}{x} dx = \log x + c$

$$\int \frac{1}{ax+b} dx = \log(ax+b) \times \frac{1}{a} + c$$

4. $\int e^x dx = e^x + c$

$$\int e^{ax+b} dx = e^{ax+b} \times \frac{1}{a} + c$$

5. $\int a^x dx = \dfrac{a^x}{\log a} + c$

$$\int a^{bx+c} dx = \frac{a^{bx+c}}{\log a} \times \frac{1}{b} + c$$

6. If power of N is equal to or greater than power of D then perform actual division

$$\frac{25}{3} = 8 + \frac{1}{3}$$

$$\begin{array}{r|l} & 8 \\ \hline 3 & 25 \\ & 24 \\ \hline & 1 \end{array}$$

7. If power of N is less than power of D then think about substitution

8. $\int \dfrac{f'(x)}{f(x)} dx = \log f(x) + c$

9. Integration by parts $\int UV\,dx$

$$\int UV\,dx = U\int V\,dx - \int\left(\frac{dU}{dx}\int V\,dx\right)dx + c$$

L $\rightarrow$ log A $\rightarrow$ Algebric E $\rightarrow$ Exponential

10. If we want to find integration of only log terms then always use by parts by taking V equal to 1.

$\int \log x\,dx$ then write down $\int \log x(1)\,dx$ and then use by parts

$$\int \log x\,dx = x\log x - x + c$$

11. SOME SPECIAL INTEGRALS

1 $$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a}\log\left(\frac{x-a}{x+a}\right)(x > a)$$

2. $$\int \frac{dx}{a^2 - x^2} = \frac{1}{2a}\log\left(\frac{a+x}{a-x}\right)(x < a)$$

3. $$\int \frac{dx}{\sqrt{x^2 - a^2}} = \log\left[x + \sqrt{x^2 - a^2}\right]$$

4. $$\int \frac{dx}{\sqrt{x^2 + a^2}} = \log\left[x + \sqrt{x^2 - a^2}\right]$$

5. $$\int \sqrt{x^2 + a^2}\,dx = \frac{x}{2}\sqrt{x^2 + a^2} + \frac{a^2}{2}\log\left[x + \sqrt{x^2 + a^2}\right]$$

6. $$\int \sqrt{x^2 - a^2}\,dx = \frac{x}{2}\sqrt{x^2 - a^2} + \frac{a^2}{2}\log\left[x + \sqrt{x^2 - a^2}\right]$$

7. $$\int e^x\left[f(x) + f'(x)\right]dx = e^x f(x)$$

12. Integration by Partial fraction

$$\int \frac{3x+2}{(x-2)(x-3)}\,dx$$

Let $$\frac{3x+2}{(x-2)(x-3)} = \frac{A}{x-2} + \frac{B}{x-3}$$

$$\frac{3x+2}{(x-2)(x-3)} = \frac{A(x-3) + B(x-2)}{(x-2)(x-3)}$$

$$3x+2 = A(x-2) + B(x-2)$$

Put $x=3$	Put $x=2$
$3(3)+2=A(0)+B(1)$	$3(3)+2=A(-1)+B(0)$
$B=1$	$A=-8$

$$\therefore \frac{3+2}{(x-2)(x-3)}=\frac{-8}{x-2}+\frac{11}{x-3}$$

$$\int\left(\frac{-8}{x-2}+\frac{11}{x-3}\right)dx$$

$$-8\log(x-2)+11\log(x-3)+c$$

13. Definite Integration

$$\int_1^2(5x+3)\,dx=\left[\frac{5x^2}{2}+3x\right]_1^2$$

$$=\left[\frac{5(4)}{2}+3(2)\right]-\left[\frac{5(1)}{2}+3(1)\right]$$

$$=10+6-\frac{5}{2}-3$$

$$=13-\frac{5}{2}$$

$$=21/2$$

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