Question Bank
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MI

1. If A and B are subsets of the universal set X and $n(x)=50$, $n(A)=35$, $n(B)=20$ $n(A' \cap B')=5$ find $n(A \cup B)$, $n(A' \cap B)$
2. Let $A=\{1,2,3,4\}$ $B=\{4,5,6\}$ $C=\{5,6\}$ Find i) $A \times (B \cap C)$ ii) $(A \times B) \cap (A \times C)$ iii) $A \times (B \cup C)$ iv) $(A \times B) \cup (A \times C)$
3. Find x if $f(x)=0$ where $f(x)=6x^2+x-2$
4. $f(x)=2x^2+3$ $g(x)=5x-2$ find gof
5. If $f(x)=3x+5$ $g(x)=6x-1$ Find i) $(fg)(3)$ ii) $(f-g)(2)$ iii) $(f+g)(1)$
6. solve the quadratic eq^n $8x^2+2x+1=0$ $i=\sqrt{-1}$
7. Express in the form of $a+ib$ state value of a and b i) $\frac{3+2i}{2-5i}+\frac{3-2i}{2+5i}$ ii) $\frac{2+\sqrt{-3}}{4+\sqrt{-3}}$
8. Find the sum to n terms $5+55+555+\cdots$
9. Find three nos. in G.P. such that their sum is 21 and sum of their squares is 189.
10. If A(1,3) and B(2,1) are points, find the equation of the locus of point P such that $PA=PB$
11. Find the slope of line passing through the points A(2,-1) and B(5,1)
12. Find the value of x if

i) $\begin{vmatrix} x & -1 & 2 \\ 2x & 1 & -3 \\ 3 & -4 & 5 \end{vmatrix} = 29$ ii) $\begin{vmatrix} 2 & 1 & x+1 \\ -1 & 3 & -4 \\ 0 & -5 & 3 \end{vmatrix} = 0$

13. If area of triangle with vertices A(k,0) B(4,0) C(0,2) is 4 sq. units find k
14. Show that the following equations are consistent $2x+3y+4=0$, $x+2y+3=0$, $3x+4y+5=0$

15. Evaluate

i) $\begin{vmatrix} -2 & 12 \\ -7 & 0 \end{vmatrix}$ ii) $\begin{vmatrix} 3 & -4 & 5 \\ 1 & 1 & -2 \\ 2 & 3 & 1 \end{vmatrix}$ iii) $\begin{vmatrix} 1 & i & 3 \\ i^3 & 2 & 5 \\ 3 & 2 & i^4 \end{vmatrix}$

16. Solve the following equations using Cramer's Rule
$2x - y + z = 1$, $x + 2y + 3z = 8$, $3x + y - 4z = 1$

17. Find Area of triangle whose vertices are
i) $P(3, 6)$ $Q(-1, 3)$ $R(2, -1)$
ii) $(3, 2)$ $(-1, 5)$ $(-2, -3)$

18. Using determinants show that following pts are collinear $P(5, 0)$ $Q(10, -3)$ $R(-5, 6)$

19. Evaluate
i) $\lim_{x \to 5} \frac{x^3 - 125}{x^2 - 25}$ ii) $\lim_{u \to 1} \frac{u^4 - 1}{u^3 - 1}$ iii) $\lim_{x \to 2} \frac{x^{-3} - 2^{-3}}{x - 2}$

20 Evaluate
i) $\lim_{x \to 3} \frac{x^2 + 2x - 15}{x^2 - 5x + 6}$ ii) $\lim_{z \to 2} \frac{z^2 - 5z + 6}{z^2 - 4}$
iii) $\lim_{x \to 3} \left[\frac{1}{x - 3} - \frac{9x}{x^3 - 27}\right]$

21. Evaluate
i) $\lim_{x \to 0} \frac{9^x - 5^x}{4^x - 1}$ ii) $\lim_{x \to 0} \frac{15^x - 5^x - 3^x + 1}{x^2}$ iii) $\lim_{x \to 0} \frac{5^x + 3^x - 2^x - 1}{x}$
iv) $\lim_{x \to 0} \frac{(2^x - 1)2}{(3^x - 1)\log(1 + x)}$ v) $\lim_{x \to 0} \frac{\log(2 + x) - \log(2 - x)}{x}$

22) Examine the continuity of
i) $f(x) = \frac{x^2 + 18x - 19}{x - 1}$ for $x \neq 1$
$= 20$ for $x = 1$ at $x = 1$
ii) $f(x) = \frac{x^3 - 27}{x^2 - 9}$ for $0 \leq x < 3$
$= \frac{9}{2}$ for $3 \leq x \leq 6$ at $x = 3$

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23. Differentiate the following w.r.t x.

i) $7x\sqrt{x}$ ii) $x^3 \log x$ iii) $x\sqrt{x} + \log x - e^x$

iv) $\frac{x}{x+1}$ v) $\frac{e^x}{e^x+1}$ vi) $\frac{2^x}{\log x}$

vii) $x^3 \cdot 3^x$ viii) $x^{5/2} + 5 \cdot x^{7/5}$

24. The demand function of a commodity is given as $P = 20 + D - D^2$ find the rate at which price is changing when demand is 3.

25. If the total cost function is given by $C = 5x^3 + 2x^2 + 7$. find the average cost and the marginal cost when $x = 4$

Maths-II

Q.1 The heights (in cm) of 10 students are given below:
148, 171, 158, 151, 154, 159, 152, 163, 171, 145
Calculate Q_1 and Q_3

Q.2 Calculate D_4 and P_{48} from the following data.

Mid Value	2.5	7.5	12.5	17.5	22.5	Total
Frequency	7	18	25	30	20	100

Q.3 The median of the following incomplete table is 92. Find the missing frequencies.

CI	30-50	50-70	70-90	90-110	110-130	130-150	Total
f	6	?	18	20	?	10	80

Q.4 Calculate S.D for the following date.

X	24	25	26	27	28	29	30
F	6	5	3	2	4	7	3

Q.5 Compute Variance and S.D

X	1	3	5	7	9
Frequency	5	10	20	10	5

Q.6 Given below is the information about marks obtained in Mathematics & Statistics by 100 students in a class. Which subject shows the highest variability in marks?

	Mathematics	Statistics
Mean	20	25
S.D	2	3

Q.7 Find Sk_p for the following set of observations
17, 17, 21, 14, 15, 20, 19, 16, 13, 17, 18

Q.8 Find Sk_b for the following set of observations
18, 27, 10, 25, 31, 13, 28

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Q.9 The mean and Variance of the distribution is 60 and 100 respectively Find the mode and the median of the distribution if Skp = -0.3

Q.10 Two dice are thrown simultaneously 25 times. The following pairs of observations are obtained.

(2,3) (2,5) (5,5) (4,5) (6,4) (3,2) (5,2) (4,1)
(2,5) (6,1) (3,1) (3,3) (4,3) (4,5) (2,5) (3,4)
(2,5) (3,4) (2,5) (4,3) (5,2), (4,5) (4,3) (2,3)
(4,1)

Prepare a bivariate frequency distribution table for the above data. Also obtain the marginal distributions.

Q.11 Following data gives height in cm (X) and weight in Kgs (Y) of 20 boys. Prepare a bivariate frequency table by taking class intervals 150-154, 155-159 --- etc for X and 35-39, 40-44 --- etc for Y. Also find Marginal frequency distributions.

(152, 40) (160, 54) (163, 52) (150, 35)
(154, 36) (160, 49) (166, 54) (157, 38)
(159, 43) (153, 48) (152, 41) (158, 51)
(155, 44) (156, 47) (156, 43) (166, 53)
(160, 50) (151, 39) (153, 50) (158, 46)

Q.12 Find correlation coefficient from the following data ($\sqrt{3} = 1.732$)

X	3	6	2	9	5
Y	4	5	8	6	7

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Q.13 Find correlation coefficient between X and Y series for the following data.
$n = 15$, $\bar{x} = 25$, $\bar{y} = 18$, $\sigma_x = 3.01$,
$\sigma_y = 3.03$, $\sum (x_i - \bar{x})(y_i - \bar{y}) = 122$.

Q.14 Given that $r = 0.4$, $\sigma_y = 3$
$\sum (x_i - \bar{x})(y_i - \bar{y}) = 108$, $\sum (x_i - \bar{x})^2 = 900$
Find the number of pairs of observation

Q.15 How many numbers between 100 and 1000 have the digit 7 exactly once?

Q.16 Find n if $\frac{n}{8!} = \frac{3}{6!} + \frac{1}{4!}$

Q.17 Find n if $\frac{(17-n)!}{(14-n)!} = 5!$

Q.18 A code word is formed by 2 distinct English letters followed by two non-zero distinct digits. Find the number of such code words. Also, find the number of such code words that end with an even digit.

Q.19 Find the number of arrangements of letters in the word "CONSTITUTION" that begin and end with N.

Q.20 Find n if ${}^{2n}C_3 : {}^{n}C_2 = 52 : 3$

Q.21 Find n and r if ${}^{n}P_r = 720$ and ${}^{n}C_{n-r} = 120$

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Q.22 Find the value of $\sum_{r=1}^{4} {}^{21-r}C_4 + {}^{17}C_5$

Q.23 A committee of 10 persons is to be formed from a group of 10 women and 8 men. How many possible committees will have men in majority.

Q.24 Find n if ${}^{n}P_6 : {}^{n}P_3 = 120 : 1$

Q.25 A coin and die are tossed. State sample space of following events.
a) A: Getting a head & an even number
b) B: Getting a prime number
c) C: Getting a tail and perfect square

Q.26 Two cards are drawn from a pack of 52 cards. Find the probability that,
a) Both are black b) Both are diamond.
c) Both are ace cards d) Both are face cards.
e) One is Spade & other is non-spade
f) Both are from same suit.
g) Both are from same denomination

Q.27 The letters of the word SAVITA are arranged at random. Find the probability that Vowels are always together

Q.28 If $P(A) = 1/4$, $P(B) = 2/5$ and $P(A \cup B) = 1/2$
Find a) $P(A \cap B)$ b) $P(A \cap B')$
c) $P(A' \cap B)$ d) $P(A' \cup B')$
e) $P(A' \cap B')$

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Q.29 Solve, (a) $3x - 36 > 0$
(b) $|7x - 4| < 10$
(c) $|2x + 7| \leq 25$

Q.30 Solve the following inequations graphically in 2-D plane.
(a) $y - 5x \geq 0$
(b) $\frac{1}{4}x + \frac{1}{2}y \leq 1$

Q.31 Find the graphical solution of
(a) $3x + 4y \leq 60$, $x + 3y \leq 30$, $x \geq 0$, $y \geq 0$
(b) $0 \leq x \leq 350$, $0 \leq y \leq 150$
(c) $x - y \leq 0$, $2x - y \geq -2$

Q.32 Find the single discount equivalent to the discount series of 5%, 7% and 9%.

Q.33 Find Compound interest on ₹ 1,00,000 for 2 years at 8% per annum compounded half yearly ?

Q.34 Teena, Leena and Meena invest in a partnership in the ratio 7/2, 4/3, 6/5. After 4 months, Teena increases her share 50%. If the total profit at the end of one year is ₹ 21,600, then what is Leena's share in the profit.

Q.35 Rasika bought ₹ 40 shares at a discount of 40%. Find the income if she invests ₹ 12,000 in these shares and recieves a divid 11%. On the nominal values of the shares