

CHAPTER-1. SETS

Q.1 Write the following sets in roster form?

(i) $A = \{x : x \text{ is an integer and } -5 \leq x \leq 5\}$

(ii) $B = \{x : x \text{ is a natural number and } -2 < x < 4\}$

(iii) $C = \{x : x \text{ is a two-digit natural number such that sum of digit is } 9\}$

(iv) $E = \{x : x \in N \text{ and } x + 6 < 10\}$

(v) $H = \{x : x \text{ is an integer, } x^2 \leq 9\}$

Q.2 Write the following sets in set builder form ?

(i) $\{1, 2, 3, 5, 6, 15, 30\}$

(ii) $\{I, N, D, A\}$

(iii) $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$

Q.3 Write down the subset of $\{1, 2, 3, 4\}$?

Q.4 Write down the proper subsets of $\{a, b, c\}$?

Q.5 Write down the power set of $\{5, 6, 7\}$?

Q.6 For the set $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 6, 8\}$, Verify the following result :

if $U = \{1, 2, 3, \dots, 9, 10\}$?

(i) $A - B = A \cap B^c$

(ii) $(A \cap B)^c = A^c \cup B^c$

(iii) $(A \cup B)^c = A^c \cap B^c$

Q.7 If $A = \{4, 5, 8, 12\}$, $B = \{1, 4, 6, 9\}$ and $A = \{4, 5, 8, 12\}$, $C = \{1, 2, 4, 7, 8, 10\}$, then find?

(i) $A - (B - A)$

(ii) $A - (C - B)$

If A,B,C are any three sets which are subsets of universal set U, then prove the following :

Q.8 $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$? Q.9 $A \cup (B \cup C) = (A \cup B) \cup C$?

Q.10 $(A \cup B)^c = A^c \cap B^c$?

Q.11 Prove that $A \cup B = A \cap B$ iff $A = B$?

Q.12 Prove that $A \subset B = B^c \subset A^c$?

Q.13 If $n(U) = 80$, $n(A) = 52$, $n(B) = 46$ and $n(A \cap B) = 53$. By using Venn diagram, find $n(A \cup B)$?

Q.14 In a survey of 500 students the following information has produced: 285 take Economics, 195 take Mathematics, 115 take History, 45 take Economics and History, 70 take Economics and Mathematics, 50 take Mathematics and History, 50 do not take any of three subject. How many students take all three subjects? How many take exactly one of three subjects?

Q.15 In a group of 50 persons, the number of persons like products A, B and C were found to be as follow : Product A=17, Product B=13, Product C = 15, Products A and B = 9, Products B and C = 4, Products A and C = 5, Products A, B and C = 3. Find the number of persons who like?

(i) Product A only

(ii) Product B only

(iii) Product C only

(iv) Products B and C but not A

(v) Products A and C but not A

(vi) Products A and B but not C

(vii) At least one of the three products

(viii) None of three products.

CHAPTRR-2. RELATIONS AND FUNCTIONS

Q.1 Find x and y , if $\left(\frac{x}{2}+1, y-\frac{3}{2}\right) = \left(\frac{5}{2}, \frac{1}{2}\right)$?

Q.2 If $A = \{5, 6\}$ and $B = \{4, 5, 6\}$, show that $A \times B \neq B \times A$?

Q.3 If $x \in (-1, 2, 3, 4)$ and $y \in (4, 6, 9, 10)$, form the set of all ordered pairs such that $x + y = 5$?

Q.4 Let $A = \left(\frac{1}{2}, 2\right)$, $B = \{2, 3, 5\}$, $C = \{-1, -2\}$, verify that?

(i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

(ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

Q.5 Let $f(x) = x^3 - \frac{1}{x^3}$, then show that $f(x) + f\left(\frac{1}{x}\right) = 0$?

Q.6 If $y = f(x) = \frac{px-q}{qx-p}$, prove that $f(y) = x$?

Q.7 Let $f = \{(1,1), (2,3), (0,-1), (-1,-3)\}$ be a linear function from Z into Z . Find $f(x)$?

Q.8 Find the domain of $\frac{1}{x^2 - 5x + 6}$?

Find the domain and range of following functions :

Q.9 $f(x) = \frac{3x}{3x-9}$?

Q.10 $f(x) = \frac{x}{\sqrt{x-5}}$?

Q.11 $f(x) = \frac{|x-3|}{x-3}$?

Q.12 $f(x) = \sqrt{25-x^2}$?

Q.13 $f(x) = \frac{1}{\sqrt{4-x^2}}$?

Q.14 $f(x) = \sqrt{x^2 - 4x + 3}$?

CHAPTER-3 TRIGONOMETRIC FUNCTIONS

Q.1 Prove that $\tan A + \tan(60^\circ + A) - \tan(60^\circ - A) = 3 \tan 3A$?

Q.2 Solve the equation $\tan x + \tan 2x + \tan 3x = \tan x \tan 2x \tan 3x$?

Q.3 Find the value of ?

(i) $\sin 225^\circ$ (ii) $\tan(-330^\circ)$ (iii) $\cot \frac{15\pi}{4}$ (iv) $\operatorname{cosec}(-2025^\circ)$

Q.4 Evaluate : $\sin^2 \frac{\pi}{18} + \sin^2 \frac{\pi}{9} + \sin^2 \frac{7\pi}{18} + \sin^2 \frac{4\pi}{9}$?

Q.5 Prove that : $\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} = \tan 54^\circ$?

Q.6 Evaluate : $\tan \frac{13\pi}{12}$?

Q.7 Prove that : $\cos 2A = \frac{\cot^2 A - 1}{2 \cot A}$?

Q.8 Solve for x , $\sec(90^\circ + A) + x \sin A \tan(90^\circ + A) = \cos(90^\circ + A)$?

Q.9 Find the value of other t-ratios in each of the following : Find $\cot \frac{\theta}{2}, \tan \frac{\theta}{2}$?

(i) $\cos \theta = -\frac{1}{2}, \theta$ in quadrant II (ii) $\cot \theta = -\frac{5}{12}, \theta$ in quad II. (iii) $\tan \theta = \frac{4}{3}, \theta$ in III.

Q.10 $\sin^2 A = \cos^2(A - B) + \cos^2 B - 2 \cos(A - B) \cos A \cos B$?

Q.11 $\frac{\sin(B - C)}{\cos B \cos C} + \frac{\sin(C - A)}{\cos C \cos A} + \frac{\sin(A - B)}{\cos A \cos B} = 0$?

Q.12 $\tan 13A - \tan 9A - \tan 4A = \tan 13A \tan 9A \tan 4A$?

Q.13 $\tan(x - y) + \tan(y - z) + \tan(z - x) = \tan(x - y) \tan(y - z) \tan(z - x)$?

Q.14 $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 60^\circ = \frac{1}{16}$?

Q.15 $\cos x + \cos\left(\frac{2\pi}{3} - x\right) + \cos\left(\frac{2\pi}{3} + x\right) = 0$?

Q.16 $\frac{\sec 8x - 1}{\sec 4x - 1} = \frac{\tan 8x}{\tan 2x}$?

Q.17 If $\sin A = \frac{1}{2}\left(x + \frac{1}{x}\right)$, prove that $\sin 3A + \frac{1}{2}\left(x^3 + \frac{1}{x^3}\right) = 0$?

Q.18 $2 \cos A = \sqrt{2 + \sqrt{2 + 2 \cos 4x}}$?

Q.19 $\frac{\cos^3 A - \cos 3A}{\cos A} + \frac{\sin^3 A + \sin 3A}{\sin A} = 3$?

Q.20 $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$?

Q.21 If $\tan(A + B) = n \tan(A - B)$, show that $(n + 1) \sin 2A = (n - 1) \sin 2B$?

Q.22 If $\sin x = k \sin(x + 2y)$, then prove that $\tan(x + y) = \left(\frac{1 + k}{1 - k}\right) \tan y$?

Q.23 If $\cos \theta = \frac{\cos \phi - e}{1 - e \cos \phi}$, show that $\tan \frac{\theta}{2} = \pm \sqrt{\frac{1 + e}{1 - e}} \tan \frac{\phi}{2}$?

CHAPTER- 4 PRINCIPLE OF MATHEMATICAL INDUCTION

By using the principle of mathematical induction , prove the following for all $n \in N$.

Q.1 $4+8+12+\dots+4n=2n(n+1)$?

Q.2 $1^2+2^2+3^2+\dots+n^2=\frac{n(n+1)(2n+1)}{6}$?

Q.3 $1.2+2.3+3.4+\dots+n(n+1)=\frac{n(n+1)(n+2)}{3}$?

Q.4 $1.2+2.2^2+3.2^3+\dots+n.2^n=(n-1)2^{n+1}+2$?

Q.5 $\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\dots+\frac{1}{n(n+1)(n+2)}=\frac{n(n+3)}{4(n+1)(n+2)}$?

Q.6 $\left(1+\frac{3}{1}\right)\left(1+\frac{5}{4}\right)\left(1+\frac{7}{9}\right)\dots\left(1+\frac{2n+1}{n^2}\right)=(n+1)^2$?

Q.7 $10^{2n-1}+1$ is divisible by 11 ?

Q.8 4^n-3n-1 is multiple of 9 ?

Q.9 $10^n+3.4^{n+2}+5$ is divisible by 9 ?

Q.10 $n(n+1)(n+5)$ is divisible by 3 ?

Q.11 $2n+7 < (n+3)^2$?

Q.12 $1^2+2^2+3^2+\dots+n^2 > \frac{n^3}{3}$?

CHAPTER-5 COMPLEX NUMBERS AND QUADRATIC EQUATION

Express the following in the form $x+iy$:

Q.1 $l^9 + i^{19}$?

Q.2 $-(5+6i) + (1+i) - (3-i)$?

Q.3 $\left(\frac{1}{2} + \frac{7}{2}i\right) - \left(4 + \frac{5}{2}i\right)$?

Q.4 $2i^2 + 6i^3 + 3i^{16} - 6i^{19} + 4i^{25}$?

Q.5 $\left(\frac{1}{3} + 3i\right)^3$?

Find the multiplicative inverse of the following complex numbers :

Q.6 $(5-7i)^2$?

Q.7 $\frac{(1+i)^2}{3-i}$?

Q.8 $z_1 = 3-7i$ and $z_2 = 5+8i$, then verify that ?

(i) $z_1 + \bar{z}_1 = 2\text{Re}(z_1)$

(ii) $\overline{z_1 + z_2} = \bar{z}_1 + \bar{z}_2$

(iii) $\overline{z_1 z_2} = \bar{z}_1 \bar{z}_2$

Q.9 If $z_1 = 2-i, z_2 = 1+i$, find $\left| \frac{z_1 + z_2 + 1}{z_1 - z_2 + i} \right|$?

Q.10 Find the modulus of complex number $\frac{(1+i)(2+i)}{3+i}$? Write polar form also.

Q.11 Solve $8x^2 + 64 = 0$?

Q.12 Solve $x^2 - 4x + 13 = 0$?

Q.13 Simply : $(\sqrt{5}-7i)(\sqrt{5}-7i)^2 + (-2+7i)^2$?

Q.14 Find the values of x and y , if $(x+iy)(1+i) = 1-i$?

Q.15 Let $z_1 = (2-i)$ and $z_2 = -2+i$. Find $\text{Im}\left(\frac{1}{z_1 z_2}\right)$?

Q.16 If $(x+iy)^{\frac{1}{3}} = a+ib$, then prove that $4(a^2 - b^2) = \frac{x}{a} + \frac{y}{b}$?

Q.17 Find the value of $x^3 - 4x^2 - 9x + 27$, if $x = 4 + \sqrt{7}i$?

Q.18 Show that : $\frac{\sqrt{a^2+1}+ai}{\sqrt{a^2+1}-ai} + \frac{\sqrt{a^2+1}-ai}{\sqrt{a^2+1}+ai} = \frac{2}{2a^2+1}$, where $a \in R$?

Find the square root of following complex numbers :

Q.19 $7+24i$?

Q.20 $4+6\sqrt{-5}$?

Q.21 i ?

Q.22 $i-l$?

Solve the following inequalities for real x:

Q.1 $4 - x \leq 3x + 12$?

Q.2 $\frac{x+1}{2} \geq \frac{2-x}{-3}$?

Q.3 $\frac{5x+7}{11} > \frac{8-x}{-5}$?

Q.4 $37 - (3x+5) \geq 9x - 8(x-3)$?

Q.5 $\frac{1}{2} \left(\frac{3x}{5} + 4 \right) \geq \frac{1}{3} (x-6)$?

Q.6 $\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$?

Q.7 $\frac{2x+3}{5} - 2 < \frac{3(x-2)}{5}$?

Q.8 $\frac{2x-3}{4} + 8 \geq 2 + \frac{4x}{3}$?

Q.9 $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$?

Q.10 Find all pair of consecutive even natural numbers both of which are larger than 5, such that their sum is less than 23 ?

Q.11 $7 < \frac{3x+11}{2} \leq 11$?

Q.12 $\frac{1-7x}{2} > 3, \frac{3x+8}{5} < -11$?

Q.13 $\frac{x-3}{x-5} > 0$?

Q.14 $\frac{7x-5}{8x+3} > 4$?

Q.15 $2x-5 \geq 7, \frac{2x-1}{1+2x} < 3$?

Solve the following system of inequalities graphically :

Q.16 $x - 2y + 11 > 0, 2x - 3y + 18 \geq 0$ and $y \geq 0$?

Q.17 $x + 2y \leq 8, x - y \leq 2, x > 0$ and $y > 0$?

Q.18 $x + 2y \geq 0, 2x + y \leq 4, x > 0$ and $y < 2$?

Q.19 $x + 2y \geq 2, x - y \leq 3, y \leq 4$ and $x \geq 0$?

Q.20 $x + y \leq 5, 4x + y \geq 4, x + 5y \geq 5, x \leq 4, y \leq 3$?

CHAPTER-7 PERMUTATIONS AND COMBINATIONS

Q.1 If $|n+2| = 60|n-1|$, find n ?

Q.2 If $\frac{1}{|9|} + \frac{1}{|10|} = \frac{x}{|11|}$, find x ?

Q.3 Find r , if ${}^5P_r = {}^6P_{r-1}$?

Q.4 Find n , if ${}^{2n}P_3 = 100 {}^n P_2$?

Q.5 If $2^n P_{10} = {}^n P_{12}$, find n ?

Q.6 Sandy has 5 shirts, 4 pants, 3 pairs of socks and 2 kinds of shoes. In how many different ways can he dress himself ? (He does not know about colour combinations!)

Q.7 in how many ways can captain and vice captain be chosen out of 11 players ?

Q.8 In how many ways can 5 children be arranged in a row such that two boys Ajay and Sachin
(i) always sit together (ii) never sit together ?

Q.9 How many words can be formed by taking 4 letters at a time out of the letters of the word :
(i) MATHEMATICS (ii) EXAMINATION (iii) EXPRESSION ?

Q.10 Find the number of ways in which (i) a selection (ii) an arrangement of 4 letters can be made from the letters of the word INFINITE ?

CHAPTER-8 BINOMIAL THEOREM

Q.1 Write down the number of terms in the expansion of $(1+a)^{12} + (1-a)^{12}$?

Expand the following :

Q.2 $\left(\frac{x}{3} + \frac{1}{x}\right)^5$?

Q.3 $\left(\frac{2x}{3} - \frac{3}{2x}\right)^4$?

Q.4 Simplify $(x+a)^5 + (x-a)^5$, hence evaluate $(\sqrt{3}+1)^5 + (\sqrt{3}-1)^5$?

Q.5 Find the value of : $(a^2 + \sqrt{a^2-1})^4 + (a^2 - \sqrt{a^2+1})^4$?

Q.6 $(1.04)^3$?

Q.7 Using binomial theorem, prove that $6^n - 5n - 1$ is always by 25, where $n \in N$?

Q.8 Write the general term in the expansion of $(x^2 - y)^6$?

Q.9 Find the 10th term in the expansion of : $\left(2x^2 + \frac{1}{x}\right)^{12}$?

Q.10 Find the 11th term from the end in the expansion of $\left(2x - \frac{1}{x^2}\right)^{25}$?

Q.11 $x^9 y^{-3}$ in the expansion of $\left(\frac{2x^2}{y} + \frac{y}{3x}\right)^{12}$?

Q.12 Find the term involving $a^2 b^5$ in the expansion of $(a-2b)^4 (a+b)^3$?

Q.13 Find the coefficient of x^5 in the expansion of $(1+2x)^6 (1-x)^7$?

Find the term independent of x in the following expansions (if any)

Q.14 $\left(2x - \frac{1}{x}\right)^{10}$?

Q.15 $\left(\frac{4x^2}{3} - \frac{3}{2x}\right)^9$?

Find the middle terms in :

Q.16 $\left(\frac{2x^2}{3} - \frac{3}{2x^2}\right)^{10}$?

Q.17 $\left(ax - \frac{b}{x}\right)^{21}$?

Q.18 Prove that there is no term involving x^6 in $\left(2x^2 - \frac{3}{x}\right)^{11}$, $x \neq 0$?

Q.19 If the coefficients of x, x^2 and x^3 in the expansion of $(1+x)^{2n}$ are in A.P., then show that $2n^2 - 9n + 7 = 0$?

CHAPTER-9 SEQUENCES AND SERIES

Q.1 If the $(m+n)$ th term of a G.P. is p and $[m-n]$ th term is q , show that m th and

$$n \text{th terms are } \sqrt{pq} \text{ and } p \cdot \left(\frac{q}{p}\right)^{\frac{m}{2n}} ?$$

Q.2 Find the sum of n terms of the series whose n th term is $n^2 + 2n + 2 + 2^n$?

Q.3 Find the n terms of the series $5+1-3-7\dots$? Q.4 Find κ , so that $\frac{2}{3}, \kappa, \frac{5}{8}$ are in A.P. ?

Q.5 Find the 20th terms of G.P. $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \dots$? Q.6 Insert two G.M. between 3 and 81 ?

Q.7 In a G.P. if $a_3 = 24$ and $a_6 = 192$, find 10th term ? Q.8 Evaluate $\sum_{k=1}^{11} (2+3^k)$?

Q.9 If a, b, c are p th, q th and r th terms respectively of an A.P., prove that ?

$$(i) \quad p(b-c) + q(c-a) + r(a-b) = 0 \quad (ii) \quad a(q-r) + b(r-p) + c(p-q) = 0$$

Q.10 Find the 20th terms from the end of the sequence 3, 8, 13, ..., 253 ?

Q.11 Solve the equation $2+5+8+11+\dots+x=155$?

Q.12 If the sum of n terms of two arithmetic series are in ratio :?

$$(i) \quad (14-4n):(3n+5), \text{ find the ratio of } 8^{\text{th}} \text{ terms } (ii) \quad (2+3n):(3+2n), \text{ find the ratio of } 7^{\text{th}} \text{ terms.}$$

Q.13 The n th term of an A.P. is p and the sum of first n terms is s . Prove that the first

$$\text{term is } \frac{2s-pn}{n} ?$$

Q.14 If p th term of a G.P. is P and q th term is Q , prove that n th term is $\left(\frac{P^{n-q}}{Q^{n-p}}\right)^{\frac{1}{p-q}}$?

Q.15 If the first terms of a G.P. is 5 and the sum of first three is $\frac{31}{5}$, find the common ratio?

Q.16 In a G.P. the first term is 7, the last term is 448, and the sum is 889. Find the common ratio?

Q.17 If S_1, S_2, S_3 are sum of first $n, 2n, 3n$ terms of a G.P., show that $S_1(S_3 - S_2) = (S_2 - S_1)^2$?

Q.18 If S_n represents the sum of n terms of a G.P. whose first term and common ratio are

$$a \text{ and } r \text{ respectively, prove that } S_1 + S_2 + S_3 + \dots + S_n = \frac{na}{1-r} - \frac{ar(1-r^n)}{(1-r)^2} ?$$

Q.19 If G_1, G_2 are two G.M's. between a and b , show that ?

$$(i) \quad G_1 G_2 = ab \quad (ii) \quad \frac{G_1^2}{G_2} + \frac{G_2^2}{G_1} = a + b$$

Q.20 If $S_1, S_2, S_3, \dots, S_p$ be the sums of n terms of A.P. whose first terms are 1, 2, 3, ..., p and whose common difference are 1, 3, 5, ..., $(2p-1)$ respectively, show that

$$S_1 + S_2 + S_3 + \dots + S_p = \frac{np}{2}(np+1) ?$$

Q.21 If a, b, c are in A.P. and x, y, z are in G.P., prove that $x^{b-c} \cdot y^{c-a} \cdot z^{a-b} = 1$?

CHAPTER-10 STRAIGHT LINES

- Q.1 Reduce the straight line $\sqrt{3}x + y - 8 = 0$ to normal form and hence find p .
- Q.2 Find the value of κ for which the line $(\kappa - 3)x - (4 - \kappa)y + \kappa^2 - 7\kappa + 6 = 0$?
(i) parallel to x -axis (ii) parallel to y -axis (iii) passing through origin
- Q.3 Find the equation of the line through the point $(0, 2)$ making an angle $\frac{2\pi}{3}$ with positive of line parallel to it and crossing the y -axis at a distance of 2 units below the origin ?
- Q.4 $P(a, b)$ is the mid- point of a line segment between axes. Show that equation of the line is $\frac{x}{a} + \frac{y}{b} = 2$?
- Q.5 Find the equation of a line perpendicular to the line $2x + 5y + 7 = 0$ and with y -intercept -3 ?
- Q.6 Find the equation of a line parallel to $x - 2y + 8 = 0$ and passing through the point $(1, 2)$?
- Q.7 Find the eq. of a straight line perpendicular to $2x = 3y + 5$ and with x -intercept -4 ?
- Q.8 Show that the product of perpendicular on the line $\frac{x}{a} \cos \theta + \frac{y}{b} \sin \theta = 1$ from the points $(\pm\sqrt{a^2 - b^2}, 0)$ is b^2 ?
- Q.9 Find equation of the line mid way between the parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$?

CHAPTER-11 CONIC SECTIONS

Q.1 Length of the latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is $\frac{2b^2}{a}$?

Find the centre and radius of following circle

Q.2 $\left(x - \frac{1}{2}\right)^2 + \left(y + \frac{1}{3}\right)^2 = \frac{1}{4}$?

Q.3 $x^2 + y^2 - 8x + 10y - 12 = 0$?

Find the equation of parabolas satisfying the following conditions :

Q.4 Focus (2,0), directrix $x = -2$?

Q.5 Vertex (0,0), passing through (2,3) and axis is along x -axis?

Q.6 Focus (3,-4), directrix $x + y - 2 = 0$?

Q.7 Find the equation of the circle :?

(i) whose centre is (0,-4) and which touches the x -axis.

(ii) whose centre is (3,4) and which touches the y -axis.

Q.8 Find the equation of circles which touch both the axes and touch the line $x = 2a$?

Q.9 Find the equation circles which pass through two points on x -axis at distances of 4 units from the origin and whose radius is 5 units?

In each of the parabolas :

Q.10 $y^2 = -4x$

Q.11 $3x^2 = 4y$

Q.12 If the parabola $y^2 = 4px$ passes through the point (3,-2), find the length of latus rectum and the coordinates of the focus?

Find the equation to the ellipse referred to its axes as coordinate axes.

Q.13 whose major axis = 8, eccentricity = $\frac{1}{2}$?

Q.14 which passes through the point (-3,1) and has eccentricity $\sqrt{\frac{2}{5}}$?

Q.15 Find the equation of the ellipse whose eccentricity is $\frac{1}{2}$ and whose foci are $(\pm 2, 0)$?

Find the equation to the hyperbola referred to its axes as coordinate axes if

Q.16 The distance between the foci is 5 and conjugate axis is 3 ?

Q.17 The distance between foci is 16 and eccentricity is $\sqrt{2}$?

Q.18 Find the equation of the ellipse with foci at $(\pm 5, 0)$ and $5x - 36 = 0$ as one directrix?

Q.19 Vertices at $(\pm 5, 0)$, foci at $(\pm 4, 0)$?

Q.20 Foci at $(\pm 3, 0)$, passing through (4,1) ?

CHAPTER-12 INTRODUCTION TO THREE DIMENSIONAL GEOMETRY

Find the distance between the following point :

Q.1 $(0,1,2)$ and $(2,-1,3)$?

Q.2 $(2,3,4)$ and $(-1,2,3)$?

Prove that the following points are collinear.

Q.3 $(2,-2,1);(0,2,-1);(-1,4,-2)$

Q.4 $(2,-4,1);(4,4,3);(3,0,2)$?

Q.5 Show that the points $(4,2,4), (10,2,-2)$ and $(2,0,-4)$ are the vertices of an equilateral triangle?

Q.6 Show that the points $(1,2,3), (-1,-2,-1), (2,3,2)$ and $(4,7,6)$ are the vertices of a parallelogram?

Q.7 Show that the points $(1,1,1), (-2,4,1), (-1,5,5)$ and $(2,5,5)$ are the vertices of a square ?

Q.8 If A and B be the points $(3,4,5)$ and $(-1,3,-7)$ respectively, find the equation of the set of point P such that $PA^2 + PB^2 = \kappa^2$, where κ is a constant ?

Q.9 Find the ratio in which the line joining the points $(2,4,-3)$ and $(-3,5,4)$ is divided by the xy -plane?

Q.10 Prove that the points $(3,-1,-1), (5,-4,0), (2,3,-2)$ and $(0,6,-3)$ taken in order form a parallelogram?

Q.11 Find the coordinates of the points which trisect PQ, given that P is $(4,2,-6)$ and Q is $(10,-16,6)$?

Q.12 The centroid of a triangle ABC is $(7,-2,5)$. If the coordinates of A and B are $(2,6,-4)$ and $(4,-2,3)$. Find the coordinates of C ?

CHAPTER-13 LIMITS AND DERIVATIVES

Q.1 $\lim_{x \rightarrow 0} ((x-1)^2 + 5) ?$

Q.2 $\lim_{x \rightarrow 0} \frac{\sin 3x - \sin x}{\sin x} ?$

Q.3 $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{\sin^3 x} ?$

Q.4 $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3} ?$

Q.5 $\lim_{x \rightarrow \pi/2} \frac{\cot x - \cos x}{\cos^3 x} ?$

Q.6 $\lim_{x \rightarrow 0} \frac{\tan 2x - \sin 2x}{x^3} ?$

Q.7 $\lim_{x \rightarrow 0} \frac{\sin 4x - \tan 4x}{x^3} ?$

Q.8 $\lim_{x \rightarrow \pi/2} \frac{\cos^2 x}{1 - \sin^2 x} ?$

Find the derivative of the following (30-31)

Q.9 $f(x) = 2x - \frac{3}{4} ?$

Q.10 $f(x) = (ax+b)^n ?$

Q.11 $6x^{100} - x^{55} + x ?$

Q.12 $(px+q)\left(\frac{r}{x} + s\right) ?$

Q.13 $x^{-3}(5+3x) ?$

Q.14 $\lim_{x \rightarrow 2} \left[\frac{1}{x-2} - \frac{2(2x-3)}{x^3 - 3x^2 + 2x} \right] ?$

Q.15 $\lim_{x \rightarrow 1} \frac{\sqrt{x^2-1} + \sqrt{x-1}}{\sqrt{x^2-1}} ?$

Q.16 $\lim_{x \rightarrow 1} \frac{\sqrt[3]{x-1}}{\sqrt{x-1}} ?$

Q.17 If $f(x) = \begin{cases} mx^2n & x < 0 \\ nx+m & 0 \leq x \leq 1 \\ nx^3+m & x > 1 \end{cases}$ For what integers m and n both $\lim_{x \rightarrow 0} f(x)$ and

$\lim_{x \rightarrow 1} f(x)$ exist?

Q.18 $\lim_{x \rightarrow 0} \frac{\sqrt{1+2x} - \sqrt{1-2x}}{\sin x} ?$

Q.19 $\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 - \sin x}{(\pi - 2x)^2} ?$

Find the derivative of following using first principle.

Q.20 $\frac{1}{\sqrt{x}} ?$

Q.21 $\sin x ?$

Find the derivative w.r.t. x .

Q.22 $\frac{2}{x+1} - \frac{x^2}{3x-1} ?$

Q.23 $\frac{px^2 + qx + r}{ax+b} ?$

Q.24 $\sin^2 x ?$

Q.25 $x \sin x ?$

Q.26 $x^2 \cos^2 x ?$

Q.27 $\sec^3 \frac{x}{2} ?$

CHAPTER-15 STATISTICS

Q.1 Find the mean deviation from the mean as well as from median for the series 1,2,3,4,4,5,6,7?

Q.2 Calculate the mean deviation about the mean from the following data:?

| | | | | | |
|-------|---|----|----|----|----|
| x_i | 3 | 23 | 9 | 27 | 17 |
| f_i | 8 | 9 | 10 | 5 | 12 |

Q.3 Find the mean deviation about from the mean as well as from the median for the following series : ?

| | | | | | |
|-----------|----|----|----|----|----|
| x | 10 | 11 | 12 | 13 | 14 |
| Frequency | 3 | 12 | 18 | 12 | 3 |

Q.4 Find the mean deviation from mean for the following distribution:?

| | | | | |
|-----------|-----|-----|-----|------|
| Class | 2-4 | 4-6 | 6-8 | 8-10 |
| Frequency | 3 | 4 | 2 | 1 |

Q.5

| | | | | | |
|-----------|------|-------|-------|-------|-------|
| Class | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
| Frequency | 5 | 8 | 15 | 16 | 6 |

Q.6 Find the mean and variance for the following distribution :?

| | | | | | | | |
|-----------|------|-------|-------|--------|---------|---------|---------|
| Class | 0-30 | 30-60 | 60-90 | 90-120 | 120-150 | 150-180 | 180-210 |
| Frequency | 2 | 3 | 5 | 10 | 3 | 5 | 2 |

Q.7 The annual rainfall (in cm) at different places was as follow.

| | | | | | | |
|------------------|------|------|------|------|------|------|
| Year | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
| Rainfall (in cm) | 73 | 79 | 111 | 79 | 55 | 59 |

Estimate the mean rainfall and the standard deviation?

Q.8 Calculate the standard deviation from the following data :?

| | | | | | | | | |
|-----------|---|----|----|----|----|----|----|----|
| Mid-point | 5 | 15 | 25 | 35 | 45 | 55 | 65 | 75 |
| Frequency | 5 | 8 | 7 | 12 | 28 | 20 | 10 | 10 |

Q.9 Find the mean, variance and standard deviation for the following data using cut method?

| | | | | | | | | | |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Class | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
| Frequency | 3 | 4 | 7 | 7 | 15 | 9 | 6 | 6 | 3 |

CHAPTER-16 PROBABILITY

- Q.1 What is the chance that a non- leap year should have fifty three Sunday?
- Q.2 The odds in favour of occurrence of an event are 5 : 13. Find the probability that it will occur?
- Q.3 What are the odds in favour of getting a spade if card is drawn from a well shuffled deck of cards ?
- Q.4 A pair of dice is thrown. Find the probability of getting a doublet?
- Q.5 A pair of dice is thrown. Find the probability of getting a sum of 10 or more, if 5 appears on the first die?
- Q.6 In a single throw of three dice, find the probability of getting :?
- (i) a total of 5 (ii) a total of at most 5
- (iii) a total of at least 5 (iv) the same number on all the dice.
- Q.7 In a single throw of two dice, find the probability of getting a total of 10 or 11?
- Q.8 (i) What is probability that the numbers selected from the numbers 1, 2, 3,....., 30 is prime number? You may assume that each of the 30 numbers is equally likely to be selected.
- (ii) What is the probability that a number selected from 1, 2, 3,....., 25 is a prime number if each of the 25 numbers is equally likely to be selected?
- Q.9 In a single throw of two dice, find ?
- (i) P (an odd number on one die and 6 on the other)
- (ii) P (a number >4 on each dice)
- (iii) P (a total of 11)
- (iv) P (a total of 8)
- (v) P (a total of 12)
- Q.10 Two dice are thrown. Find the probability of getting an odd number on one and a multiple of 3 on the other?
- Q.11 In a single throw of two dice, find the probability that the neither a doublet nor a total of 9 will appear ?
- Q.12 A card is drawn from a well shuffled deck of 52 cards. Find the probability of drawing :
- (i) a black king
- (ii) a jack, queen, king or an ace
- (iii) a card, which is neither a heart nor a king
- (iv) a spade or club.

SECTION-1

Q.1 Evaluate $\lim_{x \rightarrow 0} \frac{px + x \cos x}{q \sin x}$?

Q.2 Solve the equation $2z = |z| + 2i$, where z is a complex number?

Or

Convert $\frac{1+7i}{(2-i)^2}$ into polar form?

Q.3 Let S_n be the sum of first n terms of an A.P. If $S_{2n} = 3S_n$ then prove that $\frac{S_{3n}}{3S_n} = 6$?

Or

Find the sum to n terms : $0.3 + 0.33 + 0.333 + \dots$?

Q.4 Find the co-ordinates of the point which is equidistant from four points $(0,0,0), (a,0,0), (0,b,0)$ and $(0,0,c)$?

Q.5 The letters of the word 'SOCIETY' are placed at random in a row. What is the probability that three vowels come together ?

Q.6 If $\theta + \phi = \alpha$ and $\tan \theta = k \tan \phi$, prove that $\sin \alpha = \frac{k+1}{k-1} \sin(\theta - \phi)$?

Or

For $\sin \frac{x}{2}, \cos \frac{x}{2}$ and $\tan \frac{x}{2}$ if

Q.7 Evaluate $\lim_{x \rightarrow 0} \frac{5^x - 3^x}{\sin x}$?

Q.8 Find the domain and range of the function $f(x) = \frac{x+1}{2x+1}$?

Q.9 If α and β be two distinct roots satisfying the equation $a \cos \theta + b \sin \theta = c$, show that

$\tan(\alpha + \beta) = \frac{2ab}{a^2 - b^2}$? Or

Prove that $\tan 82\frac{1}{2}^\circ = (\sqrt{3} + \sqrt{2})(\sqrt{2} + 1)$?

Q.10 Prove by P.M.I. that $\frac{n^5}{5} + \frac{n^3}{3} + \frac{7n}{15}$ is a natural number for all $n \in N$?

Or

Use P.M.I. prove that $10^n + 3 \cdot 4^{n+2} + 5$ is divisible by 9 for all $n \in N$?

Q.11 Solve $\frac{x-3}{x+5} > 0$?

Q.12 Verify by method of contradiction that $p : \sqrt{3}$ is irrational?

Q.13 Prove that : $\cos 2\alpha = 2 \sin^2 \beta + 4 \cos(\alpha + \beta) \sin \alpha \sin \beta + \cos 2(\alpha + \beta)$?

Or

If $\cos \theta = \frac{a \cos \phi + b}{a + b \cos \phi}$, prove that $\cos \frac{\theta}{2} = \sqrt{\frac{a-b}{a+b}} \tan \frac{\phi}{2}$?

SECTION-II

Q.1 Prove that ?

(i) $\tan 70^\circ = \tan 20^\circ + 2 \tan 50^\circ$. (ii) $\tan(60^\circ + A) \tan(60^\circ - A) = \frac{2 \cos 2A + 1}{2 \cos 2A - 1}$.

Q.2 If $\cos \theta = \frac{\cos \phi - e}{1 - e \cos \phi}$, show that $\tan \frac{\theta}{2} = \pm \sqrt{\frac{1+e}{1-e}} \tan \frac{\phi}{2}$?

Q.3 Find the equation of the circle passing through the vertices of the triangle whose sides are $x + y = 2, 3x - 4y = 6$ and $x - y = 0$?

Q.4 If p, q, r are in A.P., while x, y, z are in G.P., prove that $x^{q-r} \cdot y^{r-p} \cdot z^{p-q} = 1$?

Q.5 Evaluate: $\lim_{y \rightarrow 0} \frac{(x+y) \sec(x+y) - x \sec x}{y}$?

Q.6 If $2 \tan \alpha = 3 \tan \beta$, show that $\tan(\alpha - \beta) = \frac{\sin 2\beta}{5 - \cos 2\beta}$?

Q.7 If S_1, S_2, S_3 are sum of $n, 2n$ and $3n$ terms of a G.P. show that $S_1(S_3 - S_2) = (S_2 - S_1)^2$?

Or

Find the sum of the series $1.2.3. + 2.3.4. + 3.4.5. + \dots$ to n terms?

Q.8 Find the modulus and argument of the complex number?

$$z = \frac{i-1}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$$

Q.9 If $\tan \alpha = \frac{Q \sin \beta}{P + Q \cos \beta}$, prove that $\tan(\beta - \alpha) = \frac{P \sin \beta}{Q + P \cos \beta}$?

Or

Prove that $\sin A \sin(60^\circ - A) \sin(60^\circ + A) = \frac{1}{4} \sin 3A$?

Q.10 If α and β are different complex numbers with $|\beta| = 1$, then find $\left| \frac{\beta - \alpha}{1 - \overline{\alpha}\beta} \right|$?

Q.11 If S be the sum, P the product and R the sum of the reciprocal of n terms in a G.P., prove that

$$P^2 = \left(\frac{S}{R} \right)^n ?$$

Or

The sum of two numbers is 6 times their G.M. Show that the numbers are in the ratio

$$3 + 2\sqrt{2} : 3 - 2\sqrt{2} ?$$

Q.12 Find the mean deviation from the mean for the following data :

$$\begin{array}{l} x_i : 5 \quad 10 \quad 15 \quad 20 \quad 25 \\ f_i : 7 \quad 4 \quad 6 \quad 3 \quad 5 \end{array}$$

Q.13 If p th term of a G.P. is P and its q th term is Q . Prove that the n th term is $\left(\frac{P^{n-q}}{Q^{n-p}} \right)^{\frac{1}{p-q}}$?

Or

If a, b, c , are in A.P. and x, y, z are in G.P. Prove that $x^{b-c} \cdot y^{c-a} \cdot z^{a-b} = 1$?

Q.14 Evaluate $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$?

Q.15 If $\sin \theta = n \sin(\theta + 2\alpha)$, show that $\tan(\theta + \alpha) = \frac{1+n}{1-n} \tan \alpha$?

