

I. Choose The Correct Answer:

15X1=15

- For any two sets P and Q, $P \cap Q$ is
A) $\{x : x \in P \text{ or } x \in Q\}$ B) $\{x : x \in P \text{ and } x \notin Q\}$ C) $\{x : x \in P \text{ and } x \in Q\}$ D) $\{x : x \notin P \text{ and } x \in Q\}$
- If a, b, c are in G.P, then $\frac{a-b}{b-c}$ is equal to
A) a/b B) a/c C) b/a D) c/b
- If $1 + 2 + 3 + \dots + n = k$ then $1^3 + 2^3 + 3^3 + \dots + n^3$ is equal to
A) $\frac{k(k+1)}{2}$ B) $(k+1)^3$ C) k^2 D) k^3
- The square root of $x^2 + y^2 + z^2 - 2xy + 2yz - 2zx$
A) $|x + y + z|$ B) $|x + y - z|$ C) $|x - y - z|$ D) $|x - y + z|$
- The G.C.D of $(x^3 + 1)$ and $x^4 - 1$ is
A) $x^3 + 1$ B) $x - 1$ C) $x + 1$ D) $x^3 - 1$
- A is of order $m \times n$ and B is of order $p \times q$, addition of A and B is possible only if
A) $n = p$ B) $m = p, n = q$ C) $m = p$ D) $n = q$
- Slope of the line joining the points (3, 2) and (-1, a) is $-3/2$, then the value of a is
A) 3 B) 4 C) 1 D) 2
- The equation of the straight line passing through the origin and perpendicular to the straight line $2x + 3y - 7 = 0$ is
A) $y + 5 = 0$ B) $2x + 3y = 0$ C) $3x - 2y = 0$ D) $y - 5 = 0$
- The areas of two similar triangles are 16cm^2 and 36cm^2 respectively. If the altitude of the first triangle is 3cm, then the corresponding altitude of the other triangle is
A) 6.5cm B) 6cm C) 4cm D) 4.5cm
- In ΔABC is right angled triangle where angle $B = 90^\circ$ and BD perpendicular to AC. If $BD = 8$ cm, $AD = 4$ cm, then CD is
A) 24 cm B) 16 cm C) 32 cm D) 38 cm
- A man is 28.5m away from a tower. His eye level above the ground is 1.5m. The angle of elevation of the tower from his is 45° . Then the height of the tower is
A) 30m B) 27.5m C) 28.5m D) 27m
- $9\tan^2\theta - 9\sec^2\theta =$
A) 1 B) 0 C) 9 D) -9
- Curved surface area of a solid sphere is 24cm^2 . If the sphere is divided into two hemispheres, then the total surface area of one of the hemispheres is
A) 12cm^2 B) 8cm^2 C) 16cm^2 D) 18cm^2
- If the variance of a data is 12.25, then the S.D is
A) 3 B) 2.5 C) 3.5 D) 3.25
- If A and B are mutually exclusive events and S is the sample space such that $p(A) = \frac{1}{3} p(B)$ and $S = A \cup B$, Then $p(A) =$
A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) $\frac{3}{8}$

II. Answer any 9 out of 14 (Q.NO:16 to 29) and 30th question is compulsory:

10X2 = 20

- If $x = \{10, 11, 12, 13, 14\}$, $Y = \{0, 1, 2, 3, 5\}$ determine the following relations from X and Y are functioning? State its type. (Give reason) $f_1 = \{(10,1)(11,2)(12,3)(13,5)(14,3)\}$
- Use venn diagram to verify $(A \cap B) \cup (A \setminus B) = A$
- Find the value of k for which the roots are real and equal in the following equation $12x^2 + 4kx + 3 = 0$.
- Find a quadratic polynomial if the sum and product of zeros of it are -4 and 3 respectively.
- Construct 2×3 matrix $A = [a_{ij}] = |2i - 3j|$
- Solve for x and y if $\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} + 3 \begin{bmatrix} 2x \\ -y \end{bmatrix} = \begin{bmatrix} -9 \\ 4 \end{bmatrix}$
- Find the value of k for which the given points are collinear (k, k), (2, 3) and (4, 5)
- Find the slope and y-intercept of the line whose equation is $10x + 15y + 6 = 0$
- Prove that $\frac{1 + \cos\theta - \sin^2\theta}{\sin\theta(1 + \cos\theta)} = \cot\theta$
- A ladder leaning against a vertical wall makes an angle of 60° with the ground. The foot of the ladder is 3.5 m away from the wall. Find the length of the ladder.
- Volume of a hollow sphere is $\frac{11352}{7} \text{cm}^3$. If the outer radius is 8cm, find the inner radius of the sphere.

(Take $\pi = 22/7$)

27. The ratio between the base radius and the height of a right circular cylinder is 2:5. If its Curved surface area is $\frac{3960}{7}$ sq.cm, find the height and radius. (Use $\pi = \frac{22}{7}$)
28. A group of 100 candidates have their average height 163.8 cm with coefficient of variation 3.2. what is the S.D of Their heights?
29. A box contains 4 Green, 5 Blue and 3 Red balls. A ball is drawn at random. Find the probability that the selected ball is
i) Red in colour ii) not Green in colour
30. a) In a geometric sequence, the first is $\frac{1}{3}$ and the sixth term is $\frac{1}{729}$, find the G.P.
(OR)
b) AB and CD are two chords of a circle which intersect each other internally at P, If AP = 12 cm, AB = 15 cm and CP = CD, then find CD

III. Answer any 8 out of 14 (Q.NO:31 to 44) and 45th question is compulsory:

9X5 = 45

31. A function $f: [-3, 7) \rightarrow R$ is defined as follows
- $$f(x) = \begin{cases} 4x^2 - 1; & -3 \leq x < 2 \\ 3x - 2; & 2 \leq x \leq 4 \\ 2x - 3; & 4 < x < 7 \end{cases}$$
- Find i) $f(1) - f(-3)$ ii) $f(5) + f(6)$ iii) $\frac{f(3) + f(-1)}{2f(6) - f(1)}$
32. A radio station surveyed 190 students to determine the types of music they liked. The survey revealed That 114 liked rock music, 50 liked folk music, 41 liked classical music, 14 liked rock and folk music, 15 liked rock and classical music, 11 liked classical and folk music. 5 liked all the three types of music.
Find i) How many did not like any of the three types? ii) How many liked any two types only?
iii) How many liked folk music but not rock music?
33. If s_1, s_2 and s_3 are the sum of first $n, 2n$ and $3n$ terms of a geometric series respectively then prove that $s_1(s_3 - s_2) = (s_2 - s_1)^2$.
34. Find the sum of all 3 digit natural numbers, which are divisible by 9.
35. If $m - nx + 28x^2 + 12x^3 + 9x^4$ is a perfect square, then find the value of 'm' and 'n'.
36. Find a quadratic equation whose roots are the reciprocal of the roots of the equation $4x^2 - 3x - 1 = 0$.
37. A fraction is such that if the numerator is multiplied by 3 and the denominator is reduced by 3, we get $\frac{18}{11}$, but if the Numerator is increased by 8 and the denominator is doubled, we get $\frac{2}{5}$. Find the fraction.
38. If $A = \begin{pmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$ and $C = (2 \ 1)$ find $(AB)C = A(BC)$.
39. In what ratio is the line joining the points (-5, 1) and (2, 3) divided by y-axis? Also, find the point of intersection.
40. In an isosceles ΔPQR $PQ=PR$. The base QR lies on the x-axis, P lies on the y-axis and $2x - 3y + 9 = 0$ is the equation of PQ. Find the equation of the straight line along PR.
41. ABCD is a quadrilateral with $AB = AD$. If AE and AF are internal bisectors of $\angle BAC$ and $\angle DAC$ respectively, Then prove that $EF \parallel BD$.
42. A boy standing on the ground, spots a balloon moving with the wind in a horizontal line at a constant height. The angle of elevation of the balloon from the boy at an instant is 60° . After two minutes, from the same point of Observation, the angle of elevation reduces to 30° . If the speed of wind is $29\sqrt{3}$ m/min, then find the height of the balloon from the ground level.
43. Let O and C be the centre of the base and the vertex of the right circular cone. Let B be any point on the circumference of the base. If the radius of the cone is 6cm and if $\angle OBC = 60^\circ$, then find the height and C.S.A.
44. A card is drawn from a deck of 52 cards. Find the probability of getting a King or a Heart or a Red card.
45. a) Prove that the standard deviation of the first n natural numbers is square root of $\frac{n^2 - 1}{12}$
(OR)
b) Spherical shaped marbles of diameter 1.4cm each, are dropped into a cylindrical beaker of diameter 7cm containing some water. Find the number of marbles that should be dropped into the beaker so that the water level rises by 5.6cm.