

I. Answer **all** the questions.

1. If  $A = \{1, 2\}$ ,  $B = \{1, 2, 3, 4\}$ ,  $C = \{5, 6\}$  and  $D = \{5, 6, 7, 8\}$  then state which of the following statement is true.

- 1)  $(A \times B) \subset (A \times D)$       2)  $(D \times A) \subset (B \times A)$       3)  $(B \times D) \subset (A \times C)$       4)  $(A \times C) \subset (B \times D)$

2.  $\sum n^3 = \underline{\hspace{2cm}}$

- 1)  $(\sum n^3)$       2)  $(\sum n)^2$       3)  $\frac{n(n+1)(2n+1)}{6}$       4)  $\frac{n(n+1)}{2}$

3. The next term of the sequence  $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \dots$  is

- 1)  $\frac{1}{27}$       2)  $\frac{1}{81}$       3)  $\frac{1}{24}$       4)  $\frac{2}{3}$

4. Which of the following should be added to make  $x^4 + 64$  a perfect square

- 1)  $-8x^2$       2)  $8x^2$       3)  $16x^2$       4)  $4x^2$

5. A tangent is perpendicular to the radius at the

- 1) chord      2) centre      3) infinity      4) point of contact

6. If A is a point on the Y-axis whose ordinate is 8 and B is a point on the x-axis whose abscissa is 5 then the equation of the line AB is

- 1)  $x=8$       2)  $8x+5y=40$       3)  $y=5$       4)  $8x-5y=40$

7. Graph of a linear polynomial is a

- 1) Hyperbola      2) circle      3) Straight line      4) parabola

8. The total surface area of a hemi-sphere is how much times the square of the radius

- 1)  $4\pi$       2)  $\pi$       3)  $2\pi$       4)  $3\pi$

9. If the distance between the points  $(2, y_1)$  and  $(2, y_2)$  is 7 units, then  $|y_1 - y_2|$  is

- 1) 7      2)  $\sqrt{7}$       3) 4      4) 0

10.  $\operatorname{cosec}^2 67^\circ - \tan^2 23^\circ = \underline{\hspace{2cm}}$

- 1) 0      2) 1      3) -1      4) 2

11. A page is selected at random from a book. the probability that the digit at the place of a page number chosen is less than 7 is

- 1)  $\frac{7}{10}$       2)  $\frac{3}{9}$       3)  $\frac{7}{9}$       4)  $\frac{3}{10}$

12. 'STATISTICS' is derived from the \_\_\_\_\_ word

- 1) Greek      2) Latin      3) Arabian      4) None

13. If  $f(x) + f(1-x) = 2$  then  $f\left(\frac{1}{2}\right)$  is

- 1) -1      2) 1      3) -9

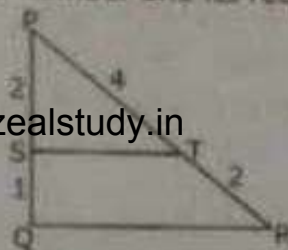
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24. The parabola  $y = -3x^2$  is  
 1) open upward      2) open downward      3) open rightward      4) open leftward

## PART-II

II. Answer **10** questions. Question No.28 is compulsory. 10 × 2 =

15. Today is Tuesday. My uncle will come after 45 days. In which day my uncle will come.
16. Find the sum of  $1+3+5+\dots+55$
17. Show that the function  $f: \mathbb{N} \rightarrow \mathbb{N}$  defined by  $f(m) = m^2 + m + 3$  is one-one function.
18. The LCM and GCD of two polynomials are  $x^5y^4z^2$  and  $x^2z^3$ . If one of the polynomials is  $x^2z^3$ , find the other polynomial.
19. Simplify  $\frac{4x}{x^2-1} - \frac{x+1}{x-1}$
20. If the difference between a number and its reciprocal is  $\frac{24}{5}$ , find the number
21. Show that  $\Delta PST \sim \Delta PQR$



22. PQ is a tangent drawn from a point P to a circle with centre O and QOR is a diameter of the circle such that  $\angle POR = 120^\circ$ , find  $\angle OPQ$ .
23. Show that the points  $(a, b+c)$ ,  $(b, c+a)$  and  $(c, a+b)$  are collinear.
24. Calculate the slope and y-intercept of the straight line  $8x - 7y + 6 = 0$ .
25. If  $x = a \sec \theta + 6 \tan \theta$  and  $y = a \tan \theta + b \sec \theta$ , then prove that  $x^2 - y^2 =$
26. Find the mass of 200 steel spherical ball bearings, each of which has radius given that the density of steel is  $7.95 \text{ g/cm}^3$ .
27. The variance of 65 scores is 64. If of them is divided by 2, find the deviation and variance of the new scores.
28. A number is selected at random out of first 100 natural numbers. What is the probability that it is either a multiple of 11 or 13.

## PART-III

III. Answer **10** questions: Question No.42 is compulsory. 1

29. Given  $A = \{1, 2, 3\}$ ,  $B = \{2, 3, 5\}$ ,  $C = \{3, 4\}$  and  $D = \{1, 3, 5\}$ , check if  $(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$  is true?
30. Let  $A = \{3, 4, 5, 6, 7, 8\}$ ,  $Q =$  set of real numbers be two sets. Let  $f: P \rightarrow Q$  be given by  $f(x) = \frac{12}{x-2}$ . Represent this function (i) an arrow diagram, (ii) ordered pairs, (iii) a table and, (iv) as a graph.
31. Find the sum to n terms of the series  $1 + 5 + 15 + 35 + 55 + 555 + \dots$
32. Find the polynomial  $3x^4 + 6x^3 - 12x^2 - 24x$ ,  $4x^4 + 14x^3 + 8x^2 - 8x$



33. Given that  $A = \begin{pmatrix} p & 0 \\ 0 & 2 \end{pmatrix}$ ,  $B = \begin{pmatrix} 0 & -q \\ 1 & 0 \end{pmatrix}$ ,  $C = \begin{pmatrix} 2 & -2 \\ 2 & 2 \end{pmatrix}$  and if  $BA = C^2$ . Find the value of  $p$  and  $q$ .

34. (i) Find the zeroes of the quadratic equation  $x^2 + 8x + 12 = 0$

(ii) Determine the nature of roots for the quadratic equation  $9x^2 - 24x + 16 = 0$

35. The hypotenuse of a right triangle is 6m more than twice of the shortest side. If the third side is 2m less than the hypotenuse, find the sides of the triangle?

36. If the area of the quadrilateral whose vertices, taken in order, are  $(1, 2)$ ,  $(-3, 4)$ ,  $(-5, -6)$  and  $(4, k)$  is 43 sq. units, find  $k$ .

37. PQRS is a rhombus. Its diagonals PR and QS intersect at the point M and satisfy  $QS = 2PR$ . If the coordinates of S and M are  $(1, 1)$  and  $(2, -1)$  respectively, find the coordinates of P.

38. A road is flanked on either side by continuous rows of houses of height  $4\sqrt{3}$  m with no space in between them. A pedestrian is standing on the median of the road facing a row house. The angle of elevation from the pedestrian to the top of the house is  $30^\circ$ . Find the width of the road.

39. A right angled triangle whose sides are 6cm, 8cm and 10cm is revolved about the sides containing the right angle in two ways. Find the difference in volumes of the two solids so formed.

40. A hollow cylindrical pipe is of length 40cm. Its internal and external radii are 4cm and 12cm respectively. It is melted and cast into a solid cylinder of length 10cm. Find the radius of the new solid.

41. The time taken (in minutes) to complete a homework by 8 students in a day given by 38, 40, 47, 44, 46, 43, 49, 53. Find the coefficient of variation.

42. If the  $P^{\text{th}}$  term of an AP is  $q$  and the  $q^{\text{th}}$  term is  $p$ , then prove that its  $n^{\text{th}}$  term is  $(p+1-n)$  and hence prove that its  $(p+q)^{\text{th}}$  term is zero.

## PART-IV

IV. Answer **Both** the questions.

2 x 8 =

43. (a) If radii of two concentric circles are 4cm and 5cm then find the length of chord of one circle which is tangent to the other circle.

(or)

(b) Take a point which is 11cm away from the centre of a circle of radius 4cm. Draw the two tangents to the circle from that point.

44. (a) From a group of  $2x^2$  black bees, square root of half of the group went to a tree. Again eight-ninth of the bees went to the same tree. The remainder got caught up in a fragrant lotus. How many bees were there in total?

(or)

(b) Draw the graph of  $y = 2x^2$  and hence solve  $2x^2 - x - 6 = 0$ .