CLASS : 10

Register Number

COMMON HALF YEARLY EXAMINATION-2024-25

MATHEMATICS

Time Allowed : 3.00 Hours] [Max. Marks : 100

PART – I

I. **Answer all of the following:** 14x1=14

1. If n (AxB) = 6 and A = {1,3} then n(B) is ----------
   a) 1 b) 2 c) 3 d) 6
2. If the ordered pairs (a+2, 4) and (5, 2a+b) are equal then (a,b) is ----------
   a) (2,2) b) (5,1) c) (2,3) d) (3, -2)
3. 7^{4k} = ------- (mod 100)
   a) 1 b) 2 c) 3 d) 4
4. The 8th term of the sequence 1,1, 2, 3, 5, 8, ... is
   a) 25 b) 24 c) 23 d) 21
5. If (x-6) is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of K is
   a) 3 b) 5 c) 6 d) -8
6. If α and β are the roots of $ax^2 + bx + c = 0$ then one of the quadratic equations whose roots are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$ is
   a) $ax^2 + bx + c = 0$ b) $bx^2 + ax + c = 0$
   c) $cx^2 + bx + a = 0$ d) $cx^2 + ax + b = 0$
7. If in ΔABC, DE || BC, AB = 3.6 cm, AC = 2.4 cm, and AD = 2.1 cm, Then the length of AE is ----------
   a) 1.4 cm b) 1.8 cm c) 1.2 cm d) 1.05 cm
8. The point of intersection of 3x - y = 4 and x + y = 8 is ----------
   a) (5,3) b) (2,4) c) (3,5) d) (4,4)
9. If A is a point on the Y - axis whose ordinate is 8 and B is a point on the X axis whose abscissae is 5 than the equation of the line AB is ----------
   a) 8x + 5y = 40 b) 8x - 5y = 40 c) x = 8 d) y = 5
10. If the ratio of the height of a tower and length of its shadow is $\sqrt{3} : 1$ then the angle of elevation of the sun has measure
    a) 45° b) 30° c) 90° d) 60°
11. The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is
    a) $\frac{9\pi h^2}{8}$ sq. units b) $24\pi h^2$ sq. units c) $\frac{8\pi h^2}{9}$ sq. units d) $\frac{56\pi h^2}{9}$ sq. units
12. A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2 units then $r_1 : r_2$ is
    a) 2 : 1 b) 1 : 2 c) 4 : 1 d) 1 : 4
13. The standard deviation of a data is 3 If each value is multiplied by 5 then the new variance is
    a) 3 b) 15 c) 5 d) 225
14. Which of the following incorrect?
    a) P(A) > 1 b) $0 \le P(A) \le 1$ c) $P(\phi) = 0$ d) $P(A) + P(\overline{A}) = 1$

PART - II

II. **Answer any 10 questions. Question No. 28 is compulsory.** 10x2=20

15. A Relation R is given by the set {x,y} / y = x + 3, x ∈ {0, 1, 2, 3, 4, 5}}. Determine its domain and range.
16. Find K if fof (k) = 5, where f(k) = 2k - 1
17. If $13824 = 2^a \times 3^b$ then find a and b.
18. If $1^3 + 2^3 + 3^3 + \ldots + K^3 = 44100$ then find 1 + 2 + 3 + ...K
19. Simplify $\frac{x(x+1)}{x-2} + \frac{x(1-x)}{x-2}$
20. Determine the nature of roots : $15x^2 + 11x + 2 = 0$
21. If AD is the bisector of ∠A. If BD = 4 cm, DC = 3cm and AB = 6 cm, Find AC.
22. Find the slope of a line joining the poinjts $(5, \sqrt{5})$ and origin.

23. Find the equation of a line. Whose intercepts on x and y axis are 4 and -6.

24. Prove that $1 + \frac{\cot^2\theta}{1 + \operatorname{cosec}\theta} = \operatorname{cosec}\theta$

25. If the total surface area of a cone of radius 7 cm is 704 cm^2. Then find its slant height?

26. The range of a set of data is 13.67 and the largest value is 70.08. Find the smallest value.

27. A coin is tossed thrice. What is the probability of getting two consecutive tails?

28. The radii of two right circular cylinders are in the ratio 2 : 3. Find the ratio of their volumes if their heights are in the ratio 5 :3

PART - III

III. Answer the following any 10 questions. Q.No.42 is compulsory. 10x5=50

29. Let A = The set of all natural numbers less than 8, B = The set of all prime number less than 8, C = The set of even prime number. Verify that A x (B - C) = (A x B) - (A x C)

30. If the function $f : R \to R$ is defined by

$$f(x) = \begin{cases} 2x + 7 ; & x < -2 \\ x^2 - 2 ; & -2 \le x < 3 \\ 3x - 2 ; & x \ge 3 \end{cases}$$

, then find the Values of (i) f(4) (ii) f(-2) (iii) f(4) + 2 f(1) (iv) $\frac{f(1) - 3f(4)}{f(-3)}$

31. The ratio of 6th and 8th term of an A.P is 7 : 9, Find the ratio of 9th and 13th term

32. Find the sum to n terms of the series 5 + 55 + 555 + ...

33. Solve : x + y + z = 5 ; 2x - y + z = 9 ; x - 2y + 3z = 16

34. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the value of a and b.

35. If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, Show that $A^2 - 5A + 7I_2 = 0$

36. The Hypotenuse of a right triangle is 6m more than twice of the shortest side. If the third side is 2m less that the hypotenuse Find the sides of the triangle.

37. Find the area of the quadrilateral formed by the points (8,6), (5,11), (-5,12) and (-4,3).

38. An Aeroplane at an altitude of 1800 m finds that two boats are sailing towards it in the same direction. The angles of depression of the boats as observed from the aeroplane are 60° and 30° respectively. Find the distance between the two boats ($\sqrt{3}$ = 1.732)

39. A toy is in the shape of a cylinder surmounted by a hemisphere. The height of the toy is 25 cm. Find the total surface area of the toy if its common diameter is 12 cm.

40. Water is flowing at the rate of 15 Km per hour through a pipe of diameter 14 cm into a rectangular tank which is 50m long and 44 m wide. Find the time in which the level of the water in the tanks will rise by 21 cm.

41. Two dice are rolled once. Find the probability of getting an even number on the first die or a total of face sum 8.

42. Find the equation of the straight line which passes through the mid point of the line segment joining (4,2) and (3,1) whose angle of inclination is 30°.

PART - IV

IV. Answer the following. 2x8=16

43. a) Varshika drew 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference of each circle as show in the table and use it to find the circumference of a circle when its diameter is 6 cm.

Diameter (x) cm	1	2	3	4	5
Circumference (y) cm	3.1	6.2	9.3	12.4	15.5

(OR)

b) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve : $x^2 + 3x - 4$

44. a) Construct a ΔABC such that AB = 5.5 cm ∠C = 25° and the altitude from C to AB is 4cm.

(OR)

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