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# COMMON HALF YEARLY EXAMINATION - 2025

## Std - X

Time :3.00 Hrs

Mathematics

Marks: 100

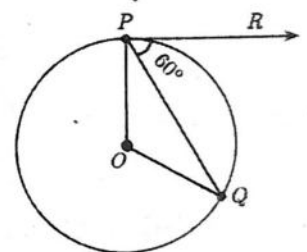
### Part - I

Note: i) Answer all the questions:

14 x 1 = 14

ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

- If there are 1024 relations from a set  $A = \{1, 2, 3, 4, 5\}$  to a set  $B$ , then the number of elements in  $B$  is  
a) 3                      b) 2                      c) 4                      d) 8
- If  $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$  is a function given by  $g(x) = \alpha x + \beta$  then the values of  $\alpha$  and  $\beta$  are  
a)  $(-1, 2)$               b)  $(2, -1)$               c)  $(-1, -2)$               d)  $(1, 2)$
- The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is  
a) 2025                      b) 5220                      c) 5025                      d) 2520
- The sequences  $-3, -3, -3, \dots$  is  
a) an A.P. only              b) a G.P. only              c) both A.P. and G.P.              d) neither A.P nor G.P
- If  $(x - 6)$  is the HCF of  $x^2 - 2x - 24$  and  $x^2 - kx - 6$  then the value of  $k$   
a) 3                      b) 5                      c) 6                      d) 8
- Transpose of a column matrix is  
a) unit matrix              b) diagonal matrix              c) column matrix  
d) row matrix
- In figure if  $PR$  is tangent to the circle at  $P$  and  $O$  is the centre of the circle, then  $\angle POQ$  is  
a)  $120^\circ$                       b)  $100^\circ$                       c)  $110^\circ$   
d)  $90^\circ$
- The straight line given by the equation  $y = 11$  is  
a) parallel to  $x$  axis              b) parallel to  $y$  axis              c) passing through the origin  
d) passing through the point  $(11, 0)$
- $(2, 1)$  is the point of intersection of two lines  
a)  $x - y - 3 = 0$ ;  $3x - y - 7 = 0$                       b)  $x + y = 3$ ;  $3x + y = 7$   
c)  $3x + y = 3$ ;  $x + y = 7$                       d)  $x + 3y - 3 = 0$ ;  $x - y - 7 = 0$
- If  $\sin\theta = \cos\theta$ , then  $2 \tan^2 \theta + \sin^2 \theta - 1$  is equal to  
a)  $-\frac{3}{2}$                       b)  $\frac{3}{2}$                       c)  $\frac{2}{3}$                       d)  $-\frac{2}{3}$
- If two solid hemisphere of the same base radius  $r$  units are joined together along their bases, then curved surface area of this new solid is  
a)  $4\pi r^2$  sq. units              b)  $6\pi r^2$  sq. units              c)  $3\pi r^2$  sq. units              d)  $8\pi r^2$  sq. units
- The height and radius of the cone of which the frustum is a part are  $h_1$  units and  $r_1$



units respectively. Height of the frustum is  $h_2$  units and the radius of the smaller base is  $r_2$  units. If  $h_2 : h_1 = 1:2$  then  $r_2 : r_1$  is

a) 1 : 3

b) 1:2

c) 2:1

d) 3:1

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 cannot be the probability of an event?

a)  $2/3$ 

b) -1.5

c) 15%

d) 0.7

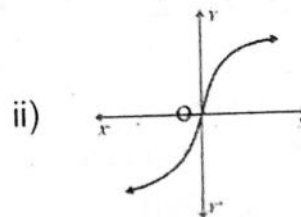
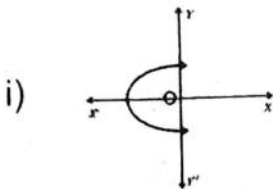
### Part - II

Answer any 10 questions . Question No. 28 compulsory.

10x2=20

15. If  $B \times A = \{(-2,3), (-2,4), (0,3), (0,4), (3,3), (3,4)\}$ , find A and B.

16. Determine whether the graph given below represent functions. Give reason for your answer concerning each graph.



17. We have 34 cakes. Each box can hold 5 cakes only. How many boxes we need to pack and how many cakes are unpacked?

18. Find the sum to infinity of  $9+3+1+\dots$

19. Solve :  $2x^2 - x + \frac{1}{8} = 0$

20. If  $A = \begin{bmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{bmatrix}$  then find the transpose of  $-A$ .

21. If  $\triangle ABC$  is similar to  $\triangle DEF$  such that  $BC = 3$  cm,  $EF = 4$  cm and area of  $\triangle ABC = 5\text{cm}^2$  Find the area of  $\triangle DEF$ .

22. Find the slope of a line joining the points  $(5, \sqrt{5})$  with the origin.

23. Find the intercepts made by the line  $4x - 9y + 36 = 0$  on the coordinate axes.

24. Prove that  $\frac{\cos \theta}{1 + \sin \theta} = \sec \theta - \tan \theta$ .

25. A cylindrical drum has a height of 20 cm and base radius of 14cm. Find its total surface area.

26. If the range and the smallest value of a set of data are 36.6 and 13.4 respectively, then find the largest value.

27. What is the probability that a leap year selected at random will contain 53 Saturdays?

28. Find the value of a volume of a sphere whose surface area is  $36\pi$  sq.cm.

### Part - III

Answer any 10 questions. Q. No. 42 is compulsory:

10 x 5 = 50

29. Let  $A = \{x \in W \mid x < 2\}$ ,  $B = \{x \in N \mid 1 < x \leq 4\}$  and  $C = \{3, 5\}$ . Verify that  $(A \cup B) \times C = (A \times C) \cup (B \times C)$

30. if  $f(x) = x - 4$ ,  $g(x) = x^2$  and  $h(x) = 3x - 5$ . Prove that  $(f \circ g) \circ h = f \circ (g \circ h)$
31. A brick staircase has a total of 30 steps. Then bottom step requires 100 bricks. Each successive step requires two bricks less than the previous step.
- How many bricks are required for the top most step?
  - How many bricks are required to build the stair case?
32. Find the sum to  $n$  terms of the series  $5 + 55 + 555 + \dots$
33. Find the value of  $m$  and  $n$ , if  $x^4 - 8x^3 + mx^2 + nx + 16$  is a perfect square.
34. If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  show that  $A^2 - 5A + 7I_2 = 0$
35. State and prove Pythagoras theorem.
36. Find the area of the quadrilateral formed by the points  $(8, 6)$ ,  $(5, 11)$ ,  $(-5, 12)$  and  $(-4, 3)$
37. From the top of a lighthouse, the angle of depression of two ships on the opposite sides of it are observed to be  $30^\circ$  and  $60^\circ$ . If the height of the lighthouse is  $h$  meters and the line joining the ships passes through the foot of the lighthouse, show that the distance between the ships is  $\frac{4h}{\sqrt{3}}$  m
38. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.
39. An aluminium sphere of radius 12 cm is melted to make a cylinder of radius 8 cm. Find the height of the cylinder.
40. The marks scored by the students in a slip test are given below. Find the standard deviation of their marks.
- |     |   |   |   |    |    |
|-----|---|---|---|----|----|
| $x$ | 4 | 6 | 8 | 10 | 12 |
| $f$ | 7 | 3 | 5 | 9  | 5  |
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 a straight line perpendicular to  $2x - 3y + 6 = 0$  and passes through the midpoint of the line segment joining the points  $(-4, -7)$  and  $(6, 5)$

#### Part - IV

**Answer all the questions:**

**2 x 8 = 16**

43. a) Construct a triangle  $\Delta PQR$  such that  $QR = 5\text{cm}$ ,  $\angle P = 30^\circ$  and the altitude from  $P$  to  $QR$  is of length 4.2 cm. **(OR)**
- b) Draw the two tangents from a point which is 10cm away from the centre of a circle of radius 5cm. Also measure the lengths of the tangents.
44. a) Discuss the nature of solutions of the quadratic equation  $x^2 - 8x + 16 = 0$  **(OR)**
- b) Varshika draw 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference (approximately related) of each circle as shown in the table and use it to find the circumference of a circle when its diameter is 6cm.

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