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Reg. No.: | | | | | | |

COMMON HALF YEARLY EXAMINATION - 2025

Std - X

Time :3.00 Hrs | Mathematics | Marks: 100

Part - I (Marks : 14)

Note: i) Answer all the questions. ii) Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer. 14 x 1 = 14

1. 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)
2. If $f(x) = 3x - 2$, $g(x) = 2x + k$ and if fog = gof, then find the value of k
   a) 1 b) -1 c) 0 d) 2
3. The value of $(1^3 + 2^3 + 3^3 + ...+15^3) - (1+2+3+....+15)$ is
   a) 14400 b) 14200 c) 14280 d) 14520
4. If $59 \equiv 3 \pmod 7$, $46 \equiv 4 \pmod 7$ then $105 \equiv$ ..... (mod 7)
   a) 4 b) 2 c) 3 d) 0
5. The values of a and b if $4x^4 - 24x^3 + 76x^2 + ax + b$ is a perfect square are
   a) 100, 120 b) 10, 12 c) -120, 100 d) 12, 10
6. The number of excluded values of $\frac{x^3 + x^2 - 10x + 8}{x^4 + 8x^2 - 9}$ is .....
   a) 0 b) 1 c) 2 d) 3
7. The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If PQ = 10cm, then the length of AB is
   a) $6\frac{2}{3}$ cm b) $\frac{10\sqrt{6}}{3}$ cm c) $66\frac{2}{3}$ cm d) 15cm
8. In a ΔABC, AD is the bisector of $\angle BAC$, if AB = 8cm, BD = 6 cm and DC = 3cm. The length of the side AC is
   a) 6cm b) 4cm c) 3cm d) 8 cm
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 then the equation of the line AB is
   a) 8x + 5y = 40 b) 8x - 5y = 40 c) x = 8 d) y = 5
10. $a\cot\theta + b\operatorname{cosec}\theta = p$ and $b\cot\theta + a\operatorname{cosec}\theta = q$ then $p^2 - q^2$ is equal to
    a) $a^2 - b^2$ b) $b^2 - a^2$ c) $a^2 + b^2$ d) b - a
11. The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is 45°. The height of location of the cloud from the lake is
    a) $\frac{h(1+\tan\beta)}{1-\tan\beta}$ b) $\frac{h(1-\tan\beta)}{1+\tan\beta}$ c) $h\tan(45^\circ - \beta)$ d) none of these

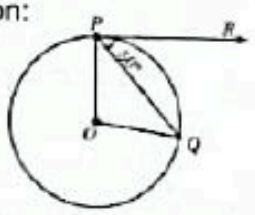
12. A shuttle cock used for playing badminton has the shape of the combination of
    a) a cylinder and a sphere
    b) a hemisphere and a cone
    c) a sphere and a cone
    d) frustum of a cone and a hemisphere
13. If the standard deviation of x, y, z is p then the standard deviation of $3x + 5$, $3y + 5$, $3z + 5$ is
    a) $3p + 5$ b) $3p$ c) $p + 5$ d) $9p + 15$
14. A page is selected at random from a book. The probability that the digit at units place of the page number chosen is less than 7 is
    a) $\frac{3}{10}$ b) $\frac{7}{10}$ c) $\frac{3}{9}$ d) $\frac{7}{9}$

Part - II (Marks: 20)

Answer any 10 questions. Question No. 28 compulsory.

Each question carries 2 marks. **10 x 2 = 20**

15. Let A = {1, 2} and B={1,2,3,4}, C = {5, 6} and D = {5, 6, 7, 8}. Verify whether A x C is a subset of B x D?
16. Let X = {1, 2, 3, 4} and Y = {2, 4, 6, 8, 10} and R = {(1,2), (2,4), (3,6) (4,8). Show that R is a function and find its domain, co-domain and range?
17. If 3 + k, 18-k, 5k +1 are in A.P. then find k.
18. Find the values of x, y and z from the following equation $\begin{pmatrix} x+y & 2 \\ 5+z & xy \end{pmatrix} = \begin{pmatrix} 6 & 2 \\ 5 & 8 \end{pmatrix}$
19. The number of volleyball games that must be scheduled in a league with n teams is given by $G(n) = \frac{n^2 - n}{2}$ Where each team plays with every other team exactly once. A league schedules 15 games. How many teams are in the league.
20. Determine the nature of roots for the following quadratic equation: $2x^2 - 2x + 9 = 0$
21. In figure O is the centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ find $\angle POQ$.



22. Find the slope of a line joining the points $(\sin\theta - \cos\theta)$ and $(-\sin\theta, \cos\theta)$
23. Check whether the given lines are parallel or perpendicular $\frac{x}{3} + \frac{y}{4} + \frac{1}{7} = 0$ and $\frac{2x}{3} + \frac{y}{2} + \frac{1}{10} = 0$
24. Prove that $\tan^2\theta - \sin^2\theta = \tan^2\theta \sin^2\theta$.
25. If the circumference of a conical wooden piece is 484 cm then find its volume when its height is 105cm.

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

27. Two coins are tossed together. What is the probability of getting different faces on the coins.

28. An industrial metallic bucket is in the shape of the frustum of a right circular cone whose top and bottom diameters are 10m and 4m and whose height is 4m. Find the curved surface area of the bucket.

Part - III (Marks: 50)

Answer any 10 questions. Questions No. 42 is compulsory: Each question carries 5 marks **10 x 5 = 50**

29. A company has four categories of employees given by Assistants (A), Clerks (C), Managers (M) and an Executive Officer (E). The company provide ₹10,000,₹25,000, ₹50,000 and ₹1,00,000 as salaries to the people who work in the categories A, C, M and E respectively. If A1, A2, A3, A4 and A5 were Assistants, C1, C2, C3, C4 were Clerks; M1, M2, M3 were managers and E1, E2 were Executive officers and if the relation R is defined by xRy, where x is the salary given to person y, express the relation R through an ordered pair and an arrow diagram.

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) + 2f(1) iv) $\frac{f(1) - 3f(4)}{f(-3)}$

31. Find the sum of the Geometric seris 3 + 6 + 12 + ... + 1536.

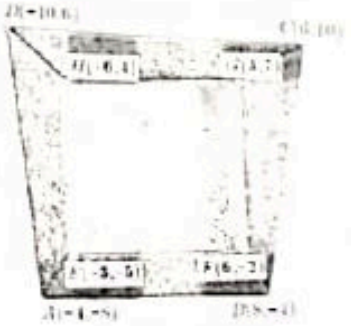
32. The sum of first n, 2n and 3n terms of an A.P. are S_1, S_2 and S_3 respectively. Prove that $S_3 = 3 (S_2 - S_1)$

33. Find the GCD of the following by division algorithm.
$2x^4 + 13x^3 + 27x^2 + 23x + 7$, $x^3 + 3x^2 + 3x + 1$, $x^2 + 2x + 1$

34. If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$, $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$ show that A (B+C) = AB + AC.

35. P and Q are the mid-points of the sides CA and CB respectively of a ΔABC, right angled at C. Prove that $4(AQ^2 + BP^2) = 5AB^2$.

36. In the figure, the quadrilateral swimming pool shown is surrounded by concrete patio. Find the area of the patio.



37. As observed from the top of a 60m high lighthouse from the sea level, the angles of depression of two ships are 28° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. ($\tan 28° = 0.5317$)

38. A jewel box is in the shape of a cuboid of dimensions 30cm x 15cm x 10cm surmounted by a half part of a cylinder. Find the volume of the box.

39. An aluminium sphere of radius 12cm is melted to make a cylinder of radius 8cm. Find the height of the cylinder.

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

41. Two dice are rolled together. Find the probability of getting a doublet or sum of faces as 4.

42. The owner of a milk store finds that he can sell 980 litres of milk each week at ₹14/litre and 1220 litres of milk each week at ₹16/litre. Assuming a linear relationship between selling price and demand, how many litres could he sell weekly at ₹17/litre?

Part - IV (Marks: 16)

Answer both questions. Each question carries 8 marks: **2 x 8 = 16**

43. a) Construct a triangle ΔPQR such that QR = 5cm, $\angle P = 30°$ and the altitude from P to QR is of length 4.2 cm.

(OR)

b) Draw the two tangents from a point which is 5cm away from the centre of a circle of diameter 6cm. Also measure the lengths of the tangents.

44. a) Nishanth is the winner in a Marathon race of 12km distance. He ran at the uniform speed of 12km/hr and reached the destination in 1 hour. He was followed by Aradhana, Jeyanth, Sathya and Swetha with their respective speed of 6km/ hr, 4km/hr, 3km/hr and 2 km/hr. And they covered the distance in 2 hrs, 3hrs, 4hrs and 6 hours respectively.

Draw the speed-time graph and use it to find the time taken to Kaushik with his speed of 2.4 km/hr.

(OR)

b) Draw the graph of $y = x^2 + 4x + 3$ and hence find the roots of $x^2 + x + 1 = 0$.
