T

COMMON HALF YEARLY EXAMINATION - 2024

Standard - X   Reg.No. ☐☐☐☐☐☐

Time: 3.00 hrs.   **MATHEMATICS**   *Marks:100*

PART - I

Note : i) Answer all the questions.

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

   iii) Each question carries 1 mark.   **14×1=14**

1. 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

2. If f : N → N is defined as $f(x) = x^2$ the pre-image of 4

   a) 0   b) 1   c) 2   d) 4

3. Euclid's division algorithm is a repeated application of division lemma until we get remainder as _____.

   a) 1   b) 2   c) 3   d) 0

4. If 6 times of 6th term of an A.P is equal to 7 times the 7th term, then the 13th term of the A.P is

   a) 0   b) 6   c) 7   d) 13

5. If (x - 6) is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ thenthe value of k is

   a) 3   b) 5   c) 6   d) 8

6. Find the matrix X if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$

   a) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ d) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$

7. In a ΔABC, AD is the bisector of ∠BAC. If AB = 8cm, BD = 6cm and Dc = 3cm. The length of the side AC is

   a) 6cm   b) 4cm   c) 3cm   d) 8cm

8. If in triangles ABC and EDF, $\dfrac{AB}{DE} = \dfrac{BC}{FD}$ then they will be similar, when

   a) ∠B = ∠E   b) ∠A = ∠D   c) ∠B = ∠D   d) ∠A = ∠F

9. A man walks near a wall, such that the distance between him and the wall is 10 units. Consider the wall to be the Y axis. The path travelled by the man is

   a) x = 10   b) y = 10   c) x = 0   d) y = 0

10. What is the minimum number of measurements required to determine the height or distance or angle of elevation?

    a) 4   b) 3   c) 2   d) 1

11. If the ratio of the height of a tower and the 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°

12. A frustum of a right circular cone is of height 16cm with radii of its ends as 8cm and 20cm. Then, the volume of the frustum is

a) 3328 πcm^3 b) 3228 πcm^3 c) 3240 πcm^3 d) 3340 πcm^3

13. Variance of first 20 natural numbers is

a) 32.25   b) 44.25   c) 33.25   d) 30

14. If a letter is chosen at random from the English alphabets {a,b,....z} then the probability that the letter chosen precedes X

a) $\dfrac{1}{13}$ b) $\dfrac{23}{26}$ c) $\dfrac{12}{13}$ d) $\dfrac{3}{26}$
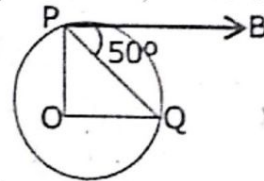
PART - II (Marks : 20)

Answer any TEN questions. Question No.28 is compulsory.
Each question carries 2 marks.   10×2=20

15. If A × B = {(3,2), (3,4), (5,2) (5,4)} then find A and B.

16. Find f 0 g and g 0 f when f(x) = 2x + 1 and g(x) = x^2 - 2

17. Today is Tuesday. My uncle will come after 45 days. In which day my uncle will be coming?

18. Reduce the rational expression to its lowest form $\dfrac{x^2 - 11x + 18}{x^2 - 4x + 4}$

19. The product of Kumaran's age (in years) two years ago and his age four years from now is one more than twice his present age. What is his present age?

20. If α, β are the roots of the equation $3x^2 + 7x - 2 = 0$, find the values of $\dfrac{\alpha}{\beta} + \dfrac{\beta}{\alpha}$

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 ∠POQ.

22. The line joining the points A(0, 5) and B(4, 1) is a tangent to a circle whose centre C is at the point [4, 4] find the equation of the line AB.

23. Find the image of the point [3, 8] with respect to the line x + 3y = 7 assuming the line to be a plane mirror.

24. Prove that secθ - cosθ = tanθ sinθ

25. Find the maximum volume of a cone that can be carved out of a solid hemisphere of radius r units.

26. If for distribution, Σ(x - 5) = 3 and total number of observations is 18, find the mean.

27. Two dice are thrown together. What is the probability that only odd numbers turn upon both dice.

28. A sphere, a cylinder and a cone are of the same height which is equal to its radius, where as cone and cylinder are of same height. Find the ratio of their curved surface areas.

PART - III (Marks : 50)

Answer any Ten questions. Question No.42 is compulsory.

Each question carries 5 marks.   **10×5=50**

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

30. The distance S an object travels under the influence of gravity in time t seconds is given by $S(t) = \frac{1}{2}gt^2 + at + b$ where, (g is the acceleration due to gravity), a, b are constants. Verify whether the function S(t) is one-one or not.

31. A man repays a loan of ₹65,000 by paying ₹400 in the first month and then increasing the payment by ₹300 every month. How long will it take for him to clear the loan?

32. If a, b, c are three consecutive terms of an A.P. and x, y, z are three consecutive terms of a G.P. then prove that $x^{b-c} \times y^{c-a} \times z^{a-b} = 1$.

33. Find the square root of $37x^2 - 28x^3 + 4x^4 + 42x + 9$

34. If $A = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}$, $C = \begin{pmatrix} 2 & 0 \\ 1 & 2 \end{pmatrix}$ verify that $(A - B)C = AC - BC$.

35. State and prove Pythagoras theorem.

36. Find the area of the quadrilateral formed by the points (-9, 0), (-8, 6), (-1, -2) and (-6, -3)

37. An aeroplane at an altitude of 1800m 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. ($\sqrt{3} = 1.732$)

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

39. A funnel consists of a frustum of a cone attached to a cylindrical portion 12cm long attached at the bottom. If the total height be 20cm, diameter of the cylindrical portion be 12cm and the diameter of the top of the funnel be 24cm. Find the outer surface area of the funnel.

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. A coin is tossed thrice. Find the probability of getting exactly two heads or at least one tail or two consecutive heads.

42. Prove analytically that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and is equal to half of its length.

PART - IV (Marks : 16)

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

43. a) Construct a ΔPQR in which PQ = 8cm, ∠R = 60° and the median RG from R to PQ is 5.8cm. Find the length of the altitude from R to PQ.

(OR)

b) Draw a tangent to the circle from the point P having radius 3.6cm, and centre at O. Point P is at a distance 7.2cm from the centre.

44. a) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve $x^2 + 3x - 4 = 0$.

(OR)

b) A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as show below.

No.of. participants (x)	2	4	6	8	10
Amount for each participant in ₹(y)	180	90	60	45	36

  i) Find the constant of variation.

  ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12.