TIRUVALLUR DISTRICT

COMMON HALF YEARLY EXAMINATION - 2025

Standard X

Reg.No. ☐☐☐☐☐☐

MATHEMATICS

Time : 3.00 hrs *Marks : 100*

Part – I

I. Choose the correct answer: **14 x 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. $f(x) = (x+1)^3 - (x-1)^3$ represents a function which is

   a) linear b) cubic c) reciprocal d) quadratic

3. The least number that is divisible by all the numbers from 1 to 10

   a) 2025 b) 5220 c) 5025 d) 2520

4. The value of $(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + ... + 15)$

   a) 14400 b) 14200 c) 14280 d) 14520

5. The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is

   a) $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ b) $16\left|\frac{y^2}{x^2z^4}\right|$ c) $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ d) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$

6. Graph of a quadratic equation is a _____.

   a) Straight line b) Circle c) Parabola d) Hyperbola

7. How many tangents can be drawn to the circle from an exterior point?

   a) One b) Two c) Infinite d) Zero

8. If (8,7) (3,P) and (6,6) are collinear, then. the value of P is

   a) 3 b) 6 c) 9 d) 12

9. The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is

   a) $7x - 3y + 4 = 0$ b) $3x - 7y + 4 = 0$ c) $3x + 7y = 0$ d) $7x - 3y = 0$

10. $\tan\theta \operatorname{cosec}^2\theta - \tan\theta$ is equal to

    a) $\sec\theta$ b) $\cot^2\theta$ c) $\sin\theta$ d) $\cot\theta$

11. If the ratio of the height of a tower and the length of it's shadow is $\sqrt{3} : 1$ then the angle of elevation of the sun has measure

    a) 45° b) 30° c) 90° d) 60°

12. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is

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

13. Variance of first 20 natural number is

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

14. Which of the following is incorrect?

a) $P(A) > 1$ b) $0 \leq P(A) \leq 1$ c) $P(\phi) = 0$ d) $P(A) + P(\bar{A}) = 1$

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory) **10 x 2 = 20**

15. $A = \{m, n\}$; $B = \phi$ Find $A \times B$, $A \times A$

16. If $f(x) = 3x - 2$; $g(x) = 2x + k$ and if $f \circ g = g \circ f$, then find the value of k.

17. If $13824 = 2^a \times 3^b$ then find a and b.

18. Which term of an A.P 16, 11,6,1,... is – 54?

19. Find the excluded value of $\frac{t}{t^2-5t+6}$

20. Determine the quadratic equation, whose sum and product of roots are – 9, 20.

21. A man goes 18m due east and then 24m due north. Find the distance of his current position from the starting point?

22. Show that the points P(–1.5, 3) , Q(6, –2), R(–3, 4) are collinear.

23. Find the intercepts made by the following line on the coordinate axes. $3x - 2y - 6 = 0$

24. Prove that $\sec\theta - \cos\theta = \tan\theta \sin\theta$

25. Find the angle of elevation of the top of a tower from a point on the ground, which is 30m away from the feet of tower of height $10\sqrt{3}$ m.

26. The radius of a spherical balloon increases from 12cm to 16cm as air being pumped into it. Find the ratio of the surface area of the balloons in the two cases.

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

28. Find the range of 10 prime Numbers.

Part - III

III. Answer any 10 questions. (Q.No.42 is compulsory) $10 \times 5 = 50$

29. Let $A = \{x \in N / 1 < x < 4\}$, $B = \{x \in W / 0 \leq x < 2\}$ and $C = \{x \in N / x < 3\}$ Then verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$

30. Let $f : A \to B$ be a function defined by $f(x) = \frac{x}{2} - 1$, where $A = \{2,4,6,10,12\}$. $B = \{0,1,2,4,5,9\}$. Represent f by
(i) Set of ordered pairs (ii) A table (iii) An arrow diagram (iv) A graph

31. Rekha has 15 square colour papers of sizes 10cm, 11cm, 12cm ... 24cm. How much area can be decorated with these colour papers?

32. If $A = \begin{bmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{bmatrix}$, verify that $(AB)^T = B^T A^T$

33. State and prove Basic Proportionality theorem.

34. Find the area of the quadrilateral whose vertices are at $(-9, -2)$ $(-8, -4)$ $(2, 2)$ and $(1, -3)$

35. Find the equation of a straight line through the intersection of lines $5x - 6y = 2$, $3x + 2y = 10$ and perpendicular to the line $4x - 7y + 13 = 0$

36. From the top of a tower 50m high, the angles of depression of the top and bottom of a tree are observed to be 30° and 45° respectively. Find the height of the tree.
$(\sqrt{3} = 1.732)$

37. A girl wishes to prepare birthday caps in the form of right circular cones for her birthday party, using a sheet of paper whose area is 5720 cm^2, how many caps can be made with radius 5cm and height 12cm.

38. A right circular cylindrical container of base radius 6cm and height 15cm is full of ice cream. The ice cream is to be filled in cones of height 9cm and base radius 3cm, having a hemispherical cap. Find the number of cones needed to empty the container.

39. Find the variance and standard deviation of the wages of 9 workers given below:
₹310, ₹290, ₹320, ₹280, ₹300, ₹290, ₹320, ₹310, ₹280

40. Two unbiased dice are rolled once. Find the probability of getting

(i) A doublet (equal numbers on both dice)

(ii) The product as a prime number

(iii) The sum as a prime number

(iv) The sum as 1

41. In a class of 50 students 28 opted for NCC, 30 opted for NSS and 18 opted both NCC and NSS. One of the students is selected at random . Find the probability that

(i) The student opted for NCC but not NSS.

(ii) The student opted for NSS but not NCC.

(iii) The student opted for exactly one of them

42. Find the sum : $7 + 77 + 777 + ...$

Part - IV

IV. Answer all the questions. **2 x 8 = 16**

43. a) Construct a triangle similar to a given triangle PQR with it's sides equal to $\frac{7}{3}$ of the corresponding sides of the triangle PQR (scale factor $\frac{7}{3} > 1$)

(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 length of the tangents.

44. a) Draw the graph of $xy = 24$, $x, y > 0$ using the graph find,

i) y when $x = 3$

ii) x when $y = 6$

(OR)

b) Discuss the nature of solutions of $x^2 - 8x + 16 = 0$.

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