10th Std
Mathematics

Time Allowed : 3 hrs Maximum Marks : 100

Instructions : (1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

Note : This question paper contains four parts.

Part - I (Marks : 14)

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

1. $A=\{a, b, p\}$, $B = \{2, 3\}$, $C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$ is
(A) 8 (B) 20 (C) 12 (D) 16

2. If $n(A \times B) = 6$, and $A = \{1, 3\}$ then $n(B)$ is
(1) 1 (2) 2 (3) 3 (4) 6

3. If 6 times of 6^{th} term of an A.P is equal to 7 times the 7th term, then the 13th term of the A.P. is
(1) 0 (2) 6 (3) 7 (4) 13

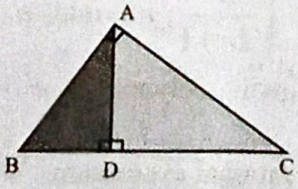
4. Let $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c\}$. Which of the following is a relation from A to B?
(1) $\{(1, b), (1, c), (3, a), (4, b)\}$ (2) $\{(1, a), (b, 4), (c, 3)\}$
(3) $\{(1, a), (a, 1), (2, b), (b, 2)\}$ (4) $\{(a, 4), (b, 3), (c, 2)\}$

5. The values of a and b if $4x^4 - 24x^3 + 76x^2 + ax + b$ is a perfect square are
(1) 100,120 (2) 10,12 (3) –120,100 (4) 12,10

6. If $r(x) = 0$ when $f(x)$ is divided by $g(x)$ then $g(x)$ is called _____ of the polynomials.
(1) Dividend (2) quotient (3) remainder (4) GCD

7. If in ΔABC, $DE \parallel BC$, $AB = 3.6$ cm, $AC = 2.4$ cm and $AD = 2.1$ cm then the length of AE is
(1) 1.4 cm (2) 1.8 cm (3) 1.2 cm (4) 1.05 cm

8. In the adjacent figure $\angle BAC = 90°$ and $AD \perp BC$ then



(1) $BD.CD = BC^2$ (2) $AB.AC = BC^2$ (3) $BD.CD = AD^2$ (4) $AB.AC = AD^2$

9. If (5,7), (3, p) and (6,6) are collinear, then the value of p is

(1) 3 (2) 6 (3) 9 (4) 12

10. When proving that a quadrilateral is a trapezium, it is necessary to show

(1) Two sides are parallel. (2) Two parallel and two non-parallel sides.

(3) Opposite sides are parallel. (4) All sides are of equal length.

11. If a letter is chosen at random from the English alphabets $\{a, b, ..., z\}$ then the probability that the letter chosen precedes x.

(1) $\frac{12}{13}$ (2) $\frac{1}{13}$ (3) $\frac{23}{26}$ (4) $\frac{3}{26}$

12. The angle of depression of the top and bottom of 20 m tall building from the top of a multistoried building are 30° and 60° respectively. The height of the multistoried building and the distance between two buildings (in metres) is

(1) $20, 10\sqrt{3}$ (2) $30, 5\sqrt{3}$ (3) 20, 10 (4) $30, 10\sqrt{3}$

13. In a hollow cylinder, the sum of the external and internal radii is 14 cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is.

(1) 5600π cm^3 (2) 11200π cm^3 (3) 56π cm^3 (4) 3600π cm^3

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

(1) $\frac{3}{10}$ (2) $\frac{7}{10}$ (3) $\frac{3}{9}$ (4) $\frac{7}{9}$

Part - II

(Marks : 20)

Note : Answer 10 questions. Question No.28 is compulsory. $10\times2 = 20$

15. A Relation $\mathbb{R}$ is given by the set $\{(x, y) / y = x + 3, x \in \{0, 1, 2, 3, 4, 5\}\}$. Determine its domain and range.

16. Let A = {1, 2, 3, 4 , ... , 45} and R be the relation defined as "is square of " on A. Write R as a subset of A × A. Also, find the domain and range of R.

17. Find all positive integers which when divided by 3 leaves remainder 2.

18. Find a_8 and a_{15} whose n^{th} term is $a_n = \begin{cases} \frac{n^2-1}{n+3}; & n \text{ is even, } n \in \mathbb{N} \\ \frac{n^2}{2n+1}; & n \text{ is odd, } n \in \mathbb{N} \end{cases}$

19. Find the LCM of each pair of the following polynomial $a^2 + 4a - 12, a^2 - 5a + 6$ whose GCD is $a - 2$

20. Find the square root of the following rational expression. $\frac{121(a+b)^8(x+y)^8(b-c)^8}{81(b-c)^4(a-b)^{12}(b-c)^4}$

21. In ΔABC, D and E are points on the sides AB and AC respectively such that DE || BC If $\frac{AD}{DB} = \frac{3}{4}$ and AC = 15 cm find AE.

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

23. Find the area of the triangle formed by the points (1,–1), (–4, 6) and (–3, –5)

24. Find the equation of a line whose intercepts on the x and y axes are 4, –6.

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

26. If the ratio of radii of two spheres is 4 : 7, find the ratio of their volumes.

27. Find the range and coefficient of range of the following data. 63, 89, 98, 125, 79, 108, 117, 68

28. If $P(A) = \frac{2}{3}$, $P(B) = \frac{2}{5}$, $P(A \cup B) = 13$ then find $P(A \cap B)$.

Part - III

(Marks : 50)

Note : Answer 10 questions. Question No. 42 is compulsory. $10 \times 5 = 50$

29. A Relation R is given by the set $\{(x, y) / y = x + 3, x \in \{0, 1, 2, 3, 4, 5\}\}$. Determine its domain and range.

30. 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
    (i) $(A \cap B) \times C = (A \times C) \cap (B \times C)$
    (ii) $A \times (B - C) = (A \times B) - (A \times C)$

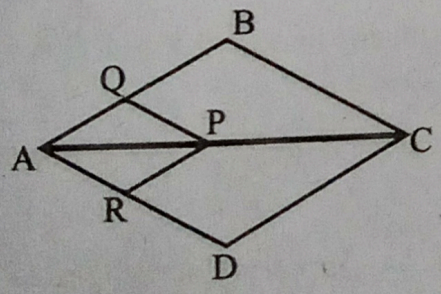
31. If d is the Highest Common Factor of 32 and 60, find x and y satisfying $d = 32x + 60y$.

32. Find the middle term(s) of an A.P. 9, 15, 21, 27,...,183.

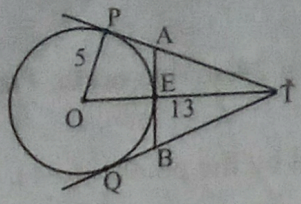
33. Find the GCD of of the following pair of polynomials:
    $12(x^4 - x^3)$, $8(x^4 - 3x^3 + 2x^2)$ whose LCM is $24x^3 (x - 1)(x - 2)$

34. Solve the following quadratic equation by completing the square method: $9x^2 - 12x + 4 = 0$

35. In fig. if PQ || BC and PR ||CD prove that
    (i) $\frac{AR}{AD} = \frac{AQ}{AB}$ (ii) $\frac{QB}{AQ} = \frac{DR}{AR}$.

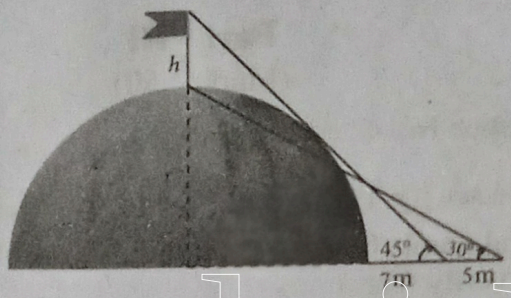


36. In figure, O is the centre of the circle with radius 5 cm. T is a point such that OT = 13 cm and OT intersects the circle E, if AB is the tangent to the circle at E, find the length of AB.



37. The line through the points (–2,6) and (4,8) is perpendicular to the line through the points (8, 12) and (x, 24) . Find the value of x.

38. A flag pole 'h' metres is on the top of the hemispherical dome of radius 'r' metres. A man is standing 7 m away from the dome. Seeing the top of the pole at an angle 45° and moving 5 m away from the dome and seeing the bottom of the pole at an angle 30°. Find (i) the height of the pole (ii) radius of the dome.



39. 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)

40. 4 persons live in a conical tent whose slant height is 19 cm. If each person require 22 cm^2 of the floor area, then find the height of the tent.

41. A card is drawn from a pack of 52 cards. Find the probability of getting a Queen or a diamond or a black card.

42. In a town of 8000 people, 1300 are over 50 years and 3000 are females. It is known that 30% of the females are over 50 years. What is the probability that a chosen individual from the town is either a female or over 50 years?

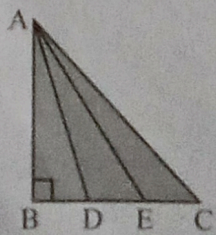
Part - IV (Marks : 16)

Note : Answer both questions. **2 × 8 = 16**

43. a) Construct a ΔPQR in which the base PQ = 4.5 cm, ∠R=35° and the median from R to RG is 6 cm.

(OR)

b) In the adjacent figure, ABC is a right angled triangle with right angle at B and points D, E trisect BC. Prove that $8AE^2 = 3AC^2 + 5AD^2$.



44. a) Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$.

(OR)

b) A boat takes 1.6 hours longer to go 36 kms up a river than down the river. If the speed of the water current is 4 km per hr, what is the speed of the boat in still water?