SECTION - A

Questions 1 to 20 carry 1 mark each.

1. The points (–4, 0), (4, 0), (0, 3) are the vertices of a
   (a) right triangle    (b) isosceles triangle    (c) equilateral triangle (d) scalene triangle

2. The point which divides the line segment joining the points (7, –6) and (3, 4) in ratio 1 : 2 internally lies in the
   (a) I quadrant    (b) II quadrant    (c) III quadrant    (d) IV quadrant

3. The value of the expression \[\cosec (75° + θ) – \sec (15° – θ) – \tan (55° + θ) + \cot (35° – θ)\] is
   (a) -1    (b) 0    (c) 1    (d) \(\frac{3}{2}\)

4. The value of (tan\(1°\) tan\(2°\) tan\(3°\) ... tan\(89°\)) is
   (a) 0    (b) 1    (c) 2    (d) \(\frac{1}{2}\)

5. If \(\cos 9α = \sinα\) and \(9α < 90°\), then the value of tan\(5α\) is
   (a) \(\frac{1}{\sqrt{3}}\)    (b) \(\sqrt{3}\)    (c) 1    (d) 0

6. Let \(x = \frac{7}{20 \times 25}\) be a rational number. Then \(x\) has decimal expansion, which terminates:
   (a) after four places of decimal    (b) after three places of decimal
   (c) after two places of decimal    (d) after five places of decimal

7. On dividing a positive integer \(n\) by 9, we get 7 as a remainder. What will be the remainder if
   (3\(n – 1\)) is divided by 9?
   (a) 1    (b) 2    (c) 3    (d) 4

8. If the pair of equations 2\(x + 3y = 7\) and \(kx + \frac{9}{2}y = 12\) have no solution, then the value of \(k\) is:
   (a) \(\frac{2}{3}\)    (b) - 3    (c) 3    (d) \(\frac{3}{2}\)

9. If \(P\left(-\frac{a}{3}, 4\right)\) is the mid-point of the line segment joining the points \(Q (–6, 5)\) and \(R (–2, 3)\),
   then the value of \(a\) is
   (a) - 4    (b) - 12    (c) 12    (d) - 6
10. For the following distribution:

<table>
<thead>
<tr>
<th>Class</th>
<th>0-5</th>
<th>5-10</th>
<th>10-15</th>
<th>15-20</th>
<th>20-25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>10</td>
<td>15</td>
<td>12</td>
<td>20</td>
<td>9</td>
</tr>
</tbody>
</table>

the sum of lower limits of the median class and modal class is
(a) 15  (b) 25  (c) 30  (d) 35

11. If one of the zeroes of the cubic polynomial \( x^3 + ax^2 + bx + c \) is \(-1\), then the product of the other two zeroes is ________

OR

If \( 1 \) is a root of the equation \( x^2 + kx - \frac{5}{4} = 0 \), then the value of \( k \) is ______

12. The 10th term of the AP: 5, 8, 11, 14, ... is _____

13. The perimeters of two similar triangles \( \Delta ABC \) and \( \Delta PQR \) are 35cm and 45cm respectively, then the ratio of the areas of the two triangles is ________

14. If the probability of an event is \( p \), the probability of its complementary event will be ______

15. A shuttle cock used for playing badminton has the shape of the combination of __________

16. If the angle between two tangents drawn from an external point ‘P’ to a circle of radius ‘r’ and centre O is 60\(^\circ\), then find the length of OP.

OR

If the radii of two concentric circles are 4 cm and 5 cm, then find the length of each chord of one circle which is tangent to the other circle.

17. If adjoining figure, DE \parallel BC and AD = 1 cm, BD = 2 cm. What is the ratio of the area of \( \Delta ABC \) to the area of \( \Delta ADE \)?

18. Does the rational number \( \frac{441}{2^2 \cdot 5^7 \cdot 7^2} \) has a terminating or a non-terminating decimal representation?

19. Write the nature of roots of the quadratic equation \( 9x^2 - 6x - 2 = 0 \).

20. The nth term of an AP is \( 7 - 4n \). Find its common difference.

SECTION – B

Questions 21 to 26 carry 2 marks each.

21. Cards marked with all 2-digit numbers are placed in a box and are mixed thoroughly. One card is drawn at random. Find the probability that the number on the card is (i) divisible by 10 (ii) a perfect square number.

OR

The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) hearts (ii) queen.

22. A drinking glass is in the shape of a frustum of a cone of height 14 cm. The diameters of its two circular ends are 4 cm and 2 cm. Find the capacity of the glass.
23. A passenger is travelling in an airplane. An airplane is flying at a height of 3000 m above the level ground. He observes that the angle of depression from the plane to the foot of a tree is \( \alpha \), such that \( \cos 3\alpha = \sin(120^\circ - 4\alpha) \). Find the distance that the airplane must fly to be directly above the tree.

![Diagram of an airplane and tree](image)

24. In the above right sided figure, \( \angle A = \angle B \) and \( AD = BE \). Show that \( DE \parallel AB \)

**OR**

In the rectangle \( ABCD \), \( E \) is a point on \( AB \) such that \( AE = \frac{2}{3} \) \( AB \). If \( AB = 6 \) km and \( AD = 3 \) km, then find \( DE \).

25. In an AP, the sum of first \( n \) terms is \( \frac{5n^2}{2} + \frac{3n}{2} \). Find its 20th term.

26. Prove that "The tangent to a circle is perpendicular to the radius through the point of contact".

**SECTION – C**

Questions 13 to 22 carry 3 marks each.

27. Prove that \( \sqrt{5} \) is an irrational number.

**OR**

Use Euclid’s division algorithm to find the HCF of 504 and 980.

28. In the below figure, \( OACB \) is a quadrant of a circle with centre \( O \) and radius 3.5 cm. If \( OD = 2 \) cm, find the area of the (i) quadrant \( OACB \), (ii) shaded region.

![Quadrant of a circle](image)

29. If \( A, B \) and \( C \) are interior angles of a triangle \( ABC \), then show that \( \tan \left( \frac{A+B}{2} \right) = \cot \frac{C}{2} \).

**OR**

Prove that \( \frac{\sin A + \cos A}{\sin A - \cos A} + \frac{\sin A - \cos A}{\sin A + \cos A} = \frac{2}{2 \sin^2 A - 1} \).

30. Four friends \( A, B, C \) and \( D \) are playing in a rectangular park. They are trying to find the coordinates by taking origin in the middle of the park such that their positions in order will form a parallelogram \( ABCD \). They are able to find the coordinates of \( A(3, -4), B(-1, -3) \) and \( C(-6, 2) \). Find the coordinates of \( D \) and then find the area of \( ABCD \).
31. Show that $\frac{1}{2}$ and $\frac{-3}{2}$ are the zeroes of the polynomial $4x^2 + 4x - 3$ and verify the relationship between zeroes and coefficients of the polynomial.

32. Manoj selected a project to collect the number of runs scored by some batsmen of India in one-day cricket matches. After collecting the data, he prepared frequency distribution table and then prepares the given below cumulative frequency curve for the same. Construct the frequency distribution table using the less than cumulative frequency curve and then find the mode.

33. The sum of the numerator and denominator of a fraction is 4 more than twice the numerator. If the numerator and denominator both increased by 3, they are in the ratio 2:3. Determine the fraction.

OR

Determine the values of m and n, so that the following system of linear equations has infinite number of solutions: $(2m - 1)x + 3y - 5 = 0; 3x + (n - 1)y - 2 = 0$.

34. A sum of Rs. 1600 is to be used to give 10 cash prize to students of a school for their overall academic performance. If each prize is Rs. 20 less than its preceding prize, find the value of each of the prizes.

SECTION – D

Questions 23 to 30 carry 4 marks each.

35. The angle of elevation of the top of a vertical tower from a point on the ground is $60^\circ$. From another point 10m vertically above the first, its angle of elevation is $45^\circ$. Find the height of the tower.
36. A motor boat whose speed is 20 km/h in still water takes 1 hour more to go 48 km upstream than to return downstream to the same spot. Find the speed of the stream.

**OR**

A shopkeeper buys some books for Rs. 80. If he has bought 4 more books for the same amount, each book would have cost Rs. 1 less. Find the number of books he bought.

37. Construct a \( \triangle ABC \) in which \( AC = 6 \) cm, \( AB = 5 \) cm and \( \angle BAC = 45^0 \), then construct a triangle similar to the given triangle whose sides are \( \frac{6}{5} \) of the corresponding sides of the \( \triangle ABC \).

**OR**

Draw a line segment \( AB \) of length 8 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle.

38. Prove that “If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.”

39. A container shaped like a right circular cylinder having diameter 12 cm and height 15 cm is full of ice cream. The ice cream is to be filled into cones of height 12 cm and diameter 6 cm, having a hemispherical shape on the top. Find the number of such cones which can be filled with ice cream.

**OR**

A building is in the form of cylinder surmounted by a hemispherical dome (see below figure). The base diameter of the dome is equal to \( \frac{2}{3} \) of the total height of the building. Find the height of the building if it contains \( 67 \frac{1}{21} \) m\(^3\) of air.

![Image](image_url)

40. The following distribution gives the height of the students:

<table>
<thead>
<tr>
<th>Height (in cm)</th>
<th>Less than 120</th>
<th>Less than 140</th>
<th>Less than 160</th>
<th>Less than 180</th>
<th>Less than 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students</td>
<td>12</td>
<td>26</td>
<td>34</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>

Convert the distribution above to more than type cumulative frequency distribution, and draw its ogive.