General Instruction:
(i) All the questions are compulsory.
(ii) The question paper consists of 40 questions divided into 4 sections A, B, C, and D.
(iii) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.
(iv) There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
(v) Use of calculators is not permitted.

SECTION – A
Questions 1 to 20 carry 1 mark each.

1. \( n^2 - 1 \) is divisible by 8, if n is:
   (a) an integer.  (b) a natural number.  (c) an odd integer.  (d) an even integer.

2. The decimal expansion of the rational number \( \frac{33}{2.5} \) will terminate after
   (a) one decimal place  (b) two decimal places  (c) three decimal places  (d) more than 3 decimal places

3. The value of \( \tan^0 \tan^0 \tan^3^0 \ldots \tan^8^9^0 \) is
   (a) 0  (b) 1  (c) 3  (d) None of these

4. \( \cos^4 A - \sin^4 A \) is equal to
   (a) \( 1 - 2 \cos^2 A \)  (b) \( 2 \sin^2 A - 1 \)  (c) \( \sin^2 A - \cos^2 A \)  (d) \( 2 \cos^2 A - 1 \)

5. If \( \tan 2A = \cot (A - 18^\circ) \), where 2A is an acute angle, then the value of A is
   (a) 12\(^\circ\)  (b) 18\(^\circ\)  (c) 36\(^\circ\)  (d) 48\(^\circ\)

6. Graphically, the pair of equations \( 6x - 3y + 10 = 0 \), \( 2x - y + 9 = 0 \) represents two lines which are
   (a) intersecting at exactly one point  (b) intersecting at exactly two points  (c) coincident  (d) parallel

7. The perimeter of a triangle with vertices \((0, 4), (0, 0)\) and \((3, 0)\) is:
   (a) 5  (b) 12  (c) 11  (d) \( 7 + \sqrt{5} \)

8. 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

9. The ratio in which the point \((2, y)\) divides the join of \((-4, 3)\) and \((6, 3)\) is
   (a) 2 : 3  (b) 3 : 5  (c) 3 : 2  (d) 5 : 2
10. Consider the following frequency distribution:

<table>
<thead>
<tr>
<th>Class</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>13</td>
</tr>
<tr>
<td>6-11</td>
<td>10</td>
</tr>
<tr>
<td>12-17</td>
<td>15</td>
</tr>
<tr>
<td>18-23</td>
<td>8</td>
</tr>
<tr>
<td>24-29</td>
<td>11</td>
</tr>
</tbody>
</table>

The lower limit of the median class is
(a) 5.5  (b) 11.5  (c) 17.5  (d) none of these

11. A cylinder, a cone and a hemisphere have same base and same height then the ratio of their volumes is ______

12. If \( x = -\frac{1}{2} \), is a solution of the quadratic equation \( 3x^2 + 2kx - 3 = 0 \), then the value of \( k \) is ____

OR
If the zeroes of the quadratic polynomial \( ax^2 + bx + c, a \neq 0 \) are equal, then the sign of \( c \) and \( a \) are ______

13. The areas of two similar triangles ABC and PQR are in the ratio 9 :16. If BC = 4.5 cm, then the length of QR is _____

14. A card is drawn from a deck of 52 cards. The event E is that card is not a face card. The number of outcomes favourable to E is ______

15. In an AP, if \( a = 3.5, d = 0 \) and \( n = 101 \), then \( a_n \) will be _____

16. Find the positive root of \( \sqrt[3]{3x^2 + 6} = 9 \).

17. The L.C.M. and H.C.F. of \( x \) and 18 are 36 and 2 respectively. What is the number \( x \) ?

18. If 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.

OR
If PQ and PR are two tangents to a circle with centre O. If \( \angle QPR = 46^0 \), find \( \angle QOR \).

19. A segment AB is divided at point P such that \( \frac{PB}{AB} = \frac{3}{7} \) then find the ratio AP : PB.

20. Is series \( \sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12},..... \) an AP? Give reason.

SECTION – B

Questions 21 to 26 carry 2 marks each.

21. In \( \Delta ABC, AB = AC \). If the interior circle of \( \Delta ABC \) touches the sides AB, BC and CA at D, E and F respectively. Prove that E bisects BC.

22. While playing Ravi dropped a sphere of diameter 6 cm in a right circular cylindrical vessel partly filled with water. The diameter of the cylindrical vessel is 12 cm. If the sphere is completely submerged in water, by how much will the level of water rise in the cylindrical vessel?
23. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (i) a card of spade or an ace (ii) a black king

**OR**

A piggy bank contains hundred 50p coins, fifty Re 1 coins, twenty Rs 2 coins and ten Rs 5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin (i) will be a 50 p coin? (ii) will not be a Rs 5 coin?

24. If \( \triangle ABC \sim \triangle DEF \), \( AB = 4 \text{ cm} \), \( DE = 6 \), \( EF = 9 \text{ cm} \) and \( FD = 12 \text{ cm} \), then find the perimeter of \( \triangle ABC \).

**OR**

In given figure, if \( \angle ACB = \angle CDA \), \( AC = 8 \text{ cm} \) and \( AD = 3 \text{ cm} \), then find BD.

25. Check whether 100 is a term of the AP 25, 28, 31, …… or not?

26. An airplane or aeroplane (informally plane) is a powered, fixed-wing aircraft that is propelled forward by thrust from a jet engine, propeller or rocket engine. Airplanes come in a variety of sizes, shapes, and wing configurations. The essential components of an airplane are a wing system to sustain it in flight, tail surfaces to stabilize the wings, movable surfaces to control the attitude of the plane in flight, and a power plant to provide the thrust necessary to push the vehicle through the air. Provision must be made to support the plane when it is at rest on the ground and during takeoff and landing. Most planes feature an enclosed body (fuselage) to house the crew, passengers, and cargo; the cockpit is the area from which the pilot operates the controls and instruments to fly the plane. 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 \( \cos 3\alpha = \sin (135^\circ - 4\alpha) \). Find the distance that the airplane must fly to be directly above the tree.

\[ \text{3000 m} \]

**SECTION – C**

Questions 27 to 34 carry 3 marks each.

27. Show that any positive even integer can be written in the form 6q, 6q + 2, 6q + 4, where q is any integer.

**OR**

Prove that \( \sqrt{3} + \sqrt{5} \) is an irrational number.
28. In the given figure, O is the centre of the circle with AC = 24 cm, AB = 7 cm and \( \angle BOD = 90^\circ \). Find the area of the shaded region.

29. If \( \sec \theta = x + \frac{1}{4x} \), prove that \( \sec \theta + \tan \theta = 2x \) or \( \frac{1}{2x} \).

OR

If \( x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cdot \cos \theta \) and \( x \sin \theta = y \sin \theta \), prove that \( x^2 + y^2 = 1 \).

30. The below figure shows the arrangement of desks in a classroom. Arun, Bharath, Charan and Deepak are seated at A, B, C and D respectively. Deepak suggested to mark their position with triangle shaped as shown in below figure. He also observes that their position forming a quadrilateral ABCD and he wants to find out the area of the quadrilateral. How can you help Deepak to find the same?

31. In an election contested between A and B, A obtained votes equal to twice the no. of persons on the electoral roll who did not cast their votes and this later number was equal to twice his majority over B. If there were 18,000 persons on the electoral roll, how many voted for B.

OR

Solve the following pair of equations for x and y: \( 4x + \frac{6}{y} = 15 \), \( 6x - \frac{8}{y} = 14 \) and also find the value of p such that \( y = px - 2 \).
32. If the mth term of an AP is \( \frac{1}{n} \) and nth term is \( \frac{1}{m} \) then show that its (mn)th term is 1.

33. Aditya decided to collect the daily income details of all the Employees working in a small company where 50 employees are working. After collecting the data, he analyzed the data and prepared a report on the same. Using this report, he drew the following graph as given below. Prepare the frequency distribution table from the graph. Calculate the average daily income of the employees working in the company.

![Graph showing daily income distribution](image)

34. Find the value of a and b so that \( 8x^4 + 14x^3 - 2x^2 + ax + b \) is exactly divisible by \( 4x^2 + 3x - 2 \).

**SECTION – D**

Questions 35 to 40 carry 4 marks each.

35. The angle of elevation of an aeroplane from a point on the ground is \( 60^\circ \). After flight of 30 seconds the angle of elevation becomes \( 30^\circ \). If the aeroplane is flying at a constant height of \( 3000\sqrt{3} \) m, find the speed of the aeroplane.

36. The numerator of a fraction is 3 less than its denominator. If 2 is added to both the numerator and the denominator, then the sum of the new fraction and original fraction is \( \frac{29}{20} \). Find the original fraction.

**OR**

A train takes 2 hours less for a journey of 300 km if its speed is increased by 5 km/hr from its usual speed. Find the usual speed of the train.
37. A metallic solid sphere of radius 10.5 is melted and recasted into smaller solid cones, each of radius 3.5 cm and height 3 cm. How many cones will be made?

OR
The rainwater from 22m x 20m roof drains into cylindrical vessel of diameter 2m and height 3.5m. If the rainwater collected from the roof fills of \( \frac{4}{5} \) th of cylindrical vessel then find the rainfall in cm.

38. Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

39. Draw a triangle ABC with side BC = 7 cm, B = 45°, A = 105°. Then, construct a triangle whose sides are 4/3 times the corresponding sides of \( \Delta \ ABC \).

OR
Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points P and Q.

40. Find the values of x and y, if the median for the following data is 31.

<table>
<thead>
<tr>
<th>Class</th>
<th>0 – 10</th>
<th>10 – 20</th>
<th>20 – 30</th>
<th>30 – 40</th>
<th>40 – 50</th>
<th>50 – 60</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>5</td>
<td>x</td>
<td>6</td>
<td>y</td>
<td>6</td>
<td>5</td>
<td>40</td>
</tr>
</tbody>
</table>