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Note: * - Internal Choice Questions
SECTION – A
Questions 1 to 6 carry 1 mark each.

1. Find the total surface area of a hemisphere of radius 10 cm. (Use $\pi = 3.14$)

2. If the point (3, 4) lies on the graph of the equation $3y = ax + 7$, find the value of $a$.

3. Simplify: $\frac{\sqrt{32} + \sqrt{48}}{\sqrt{8} + \sqrt{12}}$

4. If its perimeter of an equilateral triangle is 180 cm, what will be its area?

5. For what value of $m$ is $x^3 - 2mx^2 + 16$ divisible by $x + 2$?

6. In the below figure, $\angle ABC = 69^\circ$, $\angle ACB = 31^\circ$, find $\angle BDC$.

SECTION – B
Questions 6 to 12 carry 2 marks each.

7. A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water will fall into the sea in a minute?

8. Show that 1.272727… can be expressed in the form of $\frac{p}{q}$, where $p$ and $q$ are integers and $q \neq 0$. 
9. Find the value of \(x^3 + y^3 + 15xy - 125\) if \(x + y = 5\).

10. The angles of quadrilateral are in the ratio 3 : 5 : 9 : 13. Find all the angles of the quadrilateral.

11. Find the area of a triangle two sides of which are 18cm and 10cm and the perimeter is 42cm.

12. In the below figure, ABCD is a parallelogram, \(AE \perp DC\) and \(CF \perp AD\). If \(AB = 16\) cm, \(AE = 8\) cm and \(CF = 10\) cm, find \(AD\).

\[\text{Diagram of parallelogram ABCD with AE and CF perpendicular to DC and AD.}\]

\[\begin{align*}
A & \quad \quad B \\
D & \quad \quad \quad \quad C \\
\quad \quad E
\end{align*}\]

SECTIONS – C

Questions 13 to 22 carry 3 marks each.

13. In the below figure, ABCD is a quadrilateral and BE \parallel AC and also BE meets DC produced at E. Show that area of \(\Delta ADE\) is equal to the area of the quadrilateral ABCD.

\[\text{Diagram of quadrilateral ABCD with BE parallel to AC and extending to DC at E.}\]

\[\begin{align*}
A & \quad \quad B \\
D & \quad \quad \quad \quad C \\
\quad \quad E
\end{align*}\]

OR

Show that a median of a triangle divides it into two triangles of equal areas.

14. AB is a line-segment. P and Q are points on opposite sides of AB such that each of them is equidistant from the points A and B (see below left figure). Show that the line PQ is the perpendicular bisector of AB.

\[\text{Diagram of line-segment AB with points P and Q equidistant from A and B.}\]

\[\begin{align*}
P & \quad \quad A \\
\quad \quad B
Q
\end{align*}\]

OR

ABCD is a quadrilateral in which \(AD = BC\) and \(\angle DAB = \angle CBA\) (see the above right sided figure). Prove that (i) \(\Delta ABD \cong \Delta BAC\) (ii) \(BD = AC\) (iii) \(\angle ABD = \angle BAC\).
15. A patient in a hospital is given soup daily in a cylindrical bowl of diameter 7 cm. If the bowl is filled with soup to a height of 4 cm, how much soup the hospital has to prepare daily to serve 250 patients?

16. Factorise $x^3 - 23x^2 + 142x - 120$.

17. A floral design on a floor is made up of 16 tiles which are triangular, the sides of the triangle being 9 cm, 28 cm and 35 cm. Find the cost of polishing the tiles at the rate of 50p per cm².

18. In the below left figure, if $AB \parallel CD$, $CD \parallel EF$ and $y : z = 3 : 7$, find $x$.

OR

In the above right sided figure, if $AB \parallel CD$, $EF \perp CD$ and $GED = 126°$, find $\angle AGE$, $\angle GEF$ and $\angle FGE$.

19. If a point $C$ lies between two points $A$ and $B$ such that $AC = BC$, then prove that $AC = \frac{1}{2}AB$.

Explain by drawing the figure.

20. Solve the equation $2x + 1 = x - 3$, and represent the solution(s) on (i) the number line, (ii) the Cartesian plane.

21. A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc.

22. Find the value of $a$ and $b$ in

$$\frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = a + b\sqrt{3}$$

OR

Simplify

$$\frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}} + \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$$

by rationalizing the denominator.

SECTION – D

Questions 23 to 30 carry 4 marks each.

23. Prove that "The sum of either pair of opposite angles of a cyclic quadrilateral is 180°."

OR

Prove that "The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle."
24. A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of Rs 498.96. If the cost of white-washing is Rs 2.00 per square metre, find the (i) inside surface area of the dome, (ii) volume of the air inside the dome.

**OR**

Monica has a piece of canvas whose area is 551 m\(^2\). She uses it to have a conical tent made, with a base radius of 7 m. Assuming that all the stitching margins and the wastage incurred while cutting, amounts to approximately 1 m\(^2\), find the volume of the tent that can be made with it.

25. Construct a triangle XYZ in which \(\angle Y = 30^\circ\), \(\angle Z = 90^\circ\) and XY + YZ + ZX = 11 cm.

26. Find the value of \(\frac{4}{(216)^{-3}} + \frac{1}{(256)^{-3}} + \frac{2}{(243)^{-3}}\)

27. Show that if the diagonals of a quadrilateral bisect each other at right angles, then it is a rhombus.

28. Plot the points A (4, 4) and (–4, 4) on a graph sheet. Join the lines OA, OB and BA. What figure do you obtain.

29. The taxi fare in a city is as follows: For the first kilometre, the fare is Rs 8 and for the subsequent distance it is Rs 5 per km. Taking the distance covered as x km and total fare as Rs y, write a linear equation for this information, and draw its graph.

30. If \(x^3 + ax^2 + bx + 6\) has \((x – 2)\) as a factor and leaves a remainder 3 when divided by \((x – 3)\), find the values of a and b.

**OR**

Without actual division, prove that \(2x^4 – 6x^3 +3x^2 +3x – 2\) is exactly divisible by \(x^2 – 3x + 2\).