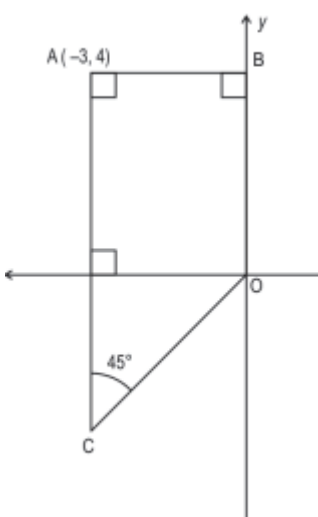
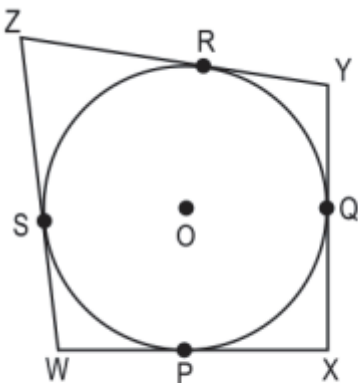
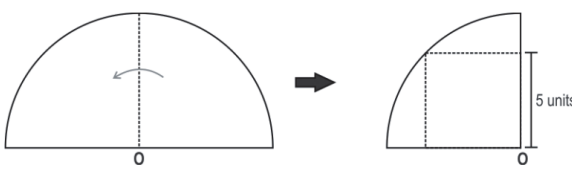
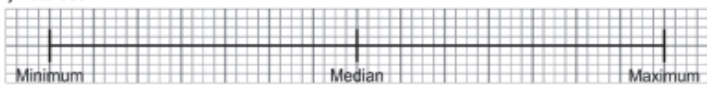
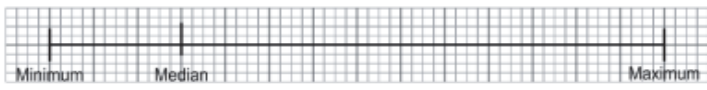


S. No	Question	Marks
Section A		
1.	A rational number $\frac{p}{q}$ (in lowest form) will have a terminating decimal expansion if the prime factorisation of q is of the form: A. $2^m 3^n$ B. $5^m 7^n$ C. $2^m 5^n$ D. $3^m 7^n$	1
2.	The graph of a quadratic polynomial intersects the x-axis at 1 and 5. Which of the following must be true about the polynomial? A. The sum of zeroes is 6 and the product is 5. B. The sum of zeroes is -6 and the product is 5. C. The sum of zeroes is 6 and the product is -5. D. The polynomial must be $x^2 - 6x - 5$.	1
3.	Students solve $x^2 + 4x + 5 = 0$ One student claims the equation has two real roots. Another calculates the discriminant and states the roots are non-real. The group must resolve the conceptual disagreement. What is the most appropriate mathematical resolution? A. Substitute values in the formula and approximate numerical roots. B. Compute $D = b^2 - 4ac$, interpret its sign, and justify the conclusion. C. Factorise the quadratic expression into two linear factors. D. Rearrange the equation and attempt graphical representation.	1
4.	Consider the quadratic equation: $2x^2 - 4x + 3 = 0$ Before attempting to solve it completely, a student evaluates the expression $b^2 - 4ac$. Why is this step useful? A. It helps determine whether factorisation over real numbers is possible. B. It provides the exact numerical values of the roots immediately. C. It converts the quadratic equation into a linear equation. D. It eliminates the need to use the quadratic formula.	1
5.	A sequence is defined by the rule: $a_n = 5 + 3(n - 1)$ Which of the following statements is correct? A. The sequence is not an AP because the first term is not 3. B. The sequence is an AP with common difference 5. C. The sequence is an AP with common difference 3. D. The sequence is an AP only for even values of n.	1

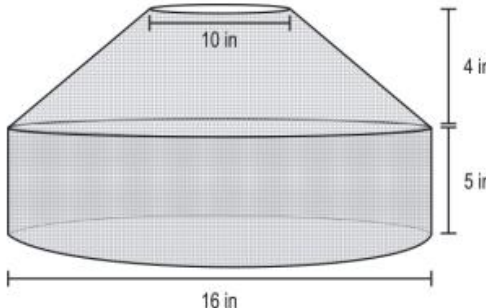
6.	A quadrilateral ABOC is drawn on a coordinate grid where O is the origin, $A(-3,4)$, and $\angle OCA = 45^\circ$. To determine the perimeter of quadrilateral ABOC, which combination of mathematical concepts must be understood?  A. Midpoint formula and area of triangle B. Distance formula and properties of a 45° triangle C. Slope formula and reflection property D. Pythagoras theorem only	1
7.	A group is solving: “$\triangle ABC$ has $AB:BC = 1:2$. Point A lies on the y-axis. Coordinates of B and C are known. Which formula can definitely be used to find A? i) Section Formula ii) Distance Formula” Student 1 suggests using the Section Formula because a ratio is given. Student 2 suggests checking whether any equal-length condition is involved. Which group decision is most appropriate? A. Assume $AB = BC$ (equal lengths) and use the Distance Formula. B. Use the Distance Formula to make $AB = BC$ before proceeding. C. Recognise that the condition is a ratio 1:2, not equal lengths, and apply the Section Formula after discussion. D. Ignore the ratio and calculate distances only.	1
8.	In a right-angled triangle $\triangle PQR$, $\angle Q = 90^\circ$. Using standard trigonometric identities and complementary angle relationships, identify which of the following expressions is always equal to 0. A. $\cos P - \sec R$ B. $\tan P - \cot R$	1

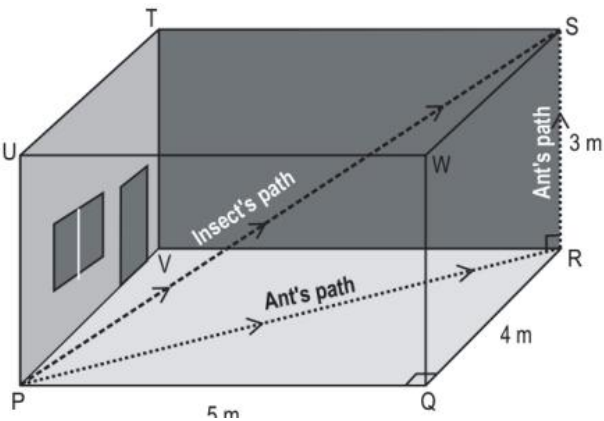
	C. $\sin P - \operatorname{cosec} R$ D. Cannot be determined without knowing the value of P	
9.	While finding the value of $\sin 30^\circ$, - Student A draws an equilateral triangle and derives the value. - Student B recalls the standard table value directly. Which group decision best reflects productive teamwork? A. Use only the table value without explanation. B. Ignore the geometric reasoning. C. Compare both approaches and confirm they give $\frac{1}{2}$. D. Choose randomly to save time.	1
10.	A circle is inscribed in quadrilateral $WXYZ$. Raghav writes: i) $ZW + WX = XY + YZ$ ii) $ZY + WX = ZW + YX$ During group discussion: - Student A recalls that in a tangential quadrilateral, the sums of opposite sides are equal. - Student B is unsure and wants to verify both statements carefully.  (Note: The figure is not to scale.) Which group response best supports effective teamwork? A. Accept Student A's statement immediately without checking. B. Ignore Student B's concern and move ahead. C. Discuss the property together, verify both relationships logically, and agree on the correct conclusion. D. Divide the statements randomly and choose an answer without reasoning.	1
11.	A semicircular sheet of paper is folded in half. A square of side 5 units is cut from the folded shape such that one corner of the square touches the curved boundary of the semicircle. Student A assumes the radius of the semicircle is 5 units because the side of the square is 5 units. Student B argues that since the top corner of the square lies on the semicircle, the radius must satisfy	1

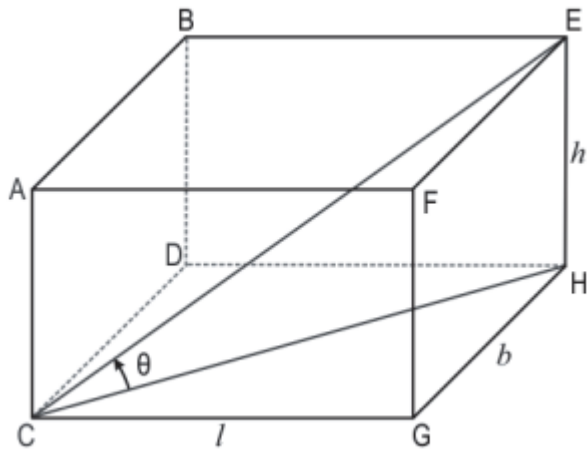
	$r^2 = 5^2 + 5^2.$  (Note: The figures are not to scale.) Which approach is mathematically justified? - Assume $r = 5$ since the side of the square is 5 units. - Assume the radius and the side of the square are equal in length. - Use $r^2 = 5^2 + 5^2$ to determine the radius before finding the remaining area. - Take $r = 10$ without geometric reasoning.	
12.	Two students disagree about which number line correctly represents the median of a data set (Representation i or ii). Which response best resolves the disagreement constructively? i) Data set 1:  ii) Data set 2:  Minimum - Smallest data point Maximum - Largest data point - Compare the positions of minimum, maximum, and median in both diagrams and select the one consistent with the definition of median. - Accept Representation (i) because the median is drawn closer to the centre of the number line. - Accept Representation (ii) because the median lies between the minimum and maximum. - Decide by checking which diagram has evenly spaced tick marks.	1
13.	After adding new ducks to a trough, the probability of picking a duck marked L becomes double. Which approach best explores whether this claim is true? - Assume adding more ducks automatically doubles the probability. - Compare the ratio of marked ducks to total ducks before and after the addition. - Look only at the increase in total ducks. - Choose the option with the largest number of new ducks.	1

Section B

14.	A student says: “If two numbers are irrational, their product must also be irrational.” Provide a counterexample and state your conclusion.	2
15.	During a cleanliness drive, a team collected plastic and paper waste. The total number of items collected was 60. The number of plastic items was 10 more than twice the number of paper items. Let plastic items = x, paper items = y. Question: Form the equations and solve using elimination method. State how many plastic and paper items were collected.	2
16.	The sides of two triangles are in the ratio $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ State any two conclusions about the relationship between the triangles.	2
17.	Preeti and Arun start from the same home. Preeti drives east (30 km/h for 12 min) then south (60 km/h for 3 min). Arun drives west (30 km/h for 4 min) then north (45 km/h for 4 min). Find the straight-line distance between their offices using two different methods (e.g., coordinate geometry, vectors, or geometric reasoning). Show how both methods lead to the same result.	2
18.	During a math lesson, Mr. Kumar asked students to simplify: $\frac{\cos A}{1 - \sin A} + \frac{1 - \sin A}{\cos A}$ Salma’s solution was: $ \begin{aligned} &= \frac{\cos A}{1 - \sin A} + \frac{1 - \sin A}{\cos A} \\ &= \frac{\cos^2 A + (1 - \sin A)^2}{(1 - \sin A)\cos A} \text{ (Step 1)} \\ &= \frac{\cos^2 A + \cos^2 A}{(1 - \sin A)\cos A} \text{ (Step 2)} \\ &= \frac{2\cos^2 A}{(1 - \sin A)\cos A} \text{ (Step 3)} \\ &= \frac{2\cos A}{1 - \sin A} \text{ (Step 4)} \end{aligned} $ Some students agree with Salma’s reasoning, while others think there is an error in Step 2. As a group member: Identify whether a conflict exists in the reasoning and explain clearly where and why it occurs.	2

	Resolve the disagreement by correcting the mistake (if any) and providing the correct simplified result so that the group reaches a shared conclusion.											
19.	A rectangular tub contains water of depth 34 cm. An object O lies at the bottom. Due to refraction at the water–air surface, an observer at Q sees its image at I. The angle in water is 30° and the angle in air is 45°. (Take $\sqrt{2} = 1.4$, $\sqrt{3} = 1.7$) Explore how the change of medium alters the apparent position of the object and determine the distance by which the object appears shifted. Show reasoning.	2										
20.	A lampshade consists of a frustum (top diameter 10 in, bottom diameter 16 in, height 4 in) and a cylinder (diameter 16 in, height 5 in). Each cane sheet has area 44 sq in. Find the minimum number of sheets required to cover the curved surface area. Show quick calculations. 	2										
21.	The frequency distribution of daily rainfall (in mm) is: <table><thead><tr><th>Rainfall (mm)</th><th>Number of days</th></tr></thead><tbody><tr><td>0–20</td><td>7</td></tr><tr><td>20–40</td><td>x</td></tr><tr><td>40–60</td><td>10</td></tr><tr><td>60–80</td><td>4</td></tr></tbody></table> Due to a data-entry error, the frequency for 20–40 mm is missing. The mean rainfall for the period is 35 mm. In a group discussion, students suggest different methods to find x: - One proposes using the mean formula for grouped data. - Another suggests estimating from neighbouring frequencies. As a team, decide on the appropriate method and determine the correct value of x, showing shared reasoning.	Rainfall (mm)	Number of days	0–20	7	20–40	x	40–60	10	60–80	4	2
Rainfall (mm)	Number of days											
0–20	7											
20–40	x											
40–60	10											
60–80	4											
Section C												
22.	Prove that $\sqrt{6}$ is irrational. Present your reasoning in 6–8 clear steps.	3										
23.	A polynomial has zeroes 2 and 5. - Student A constructs the polynomial as $x^2 - 7x + 10$. - Student B constructs it as $x^2 + 7x + 10$. Later, they are told the sum of zeroes must equal 7.	3										

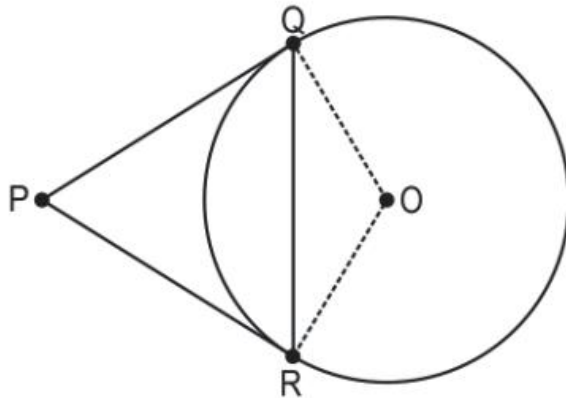
	Identify the source of disagreement using coefficient relationships. Verify algebraically and conclude which polynomial correctly models the situation.	
24.	“The square of a number, increased by 6 times the number, equals 16.” Question: Translate this into a quadratic equation and solve it using Brahmagupta’s quadratic formula. State the roots. $x = 2, -8$	3
25.	An insect flies directly from corner P to S of a rectangular room, while an ant moves from P to S along the surfaces via PR and then RS (as shown). A student claims that the insect’s path is shorter because it looks more direct. Examine this claim by calculating both distances using appropriate geometric reasoning. Compare the results and explain whether the assumption is justified. Clearly state how considering both approaches leads to a fair conclusion. 	3
26.	A cuboid has length l, breadth b, and height h. Angle θ is formed between the base diagonal and the space diagonal from the same vertex. Describe the step-by-step procedure to: - Derive $\cos \theta$ in terms of l, b, h. - Find $\cos \theta$ when the cuboid is a cube. Clearly indicate the formulas and substitutions used.	3



27.

In the given figure, a circle has centre O and tangents PQ and PR are drawn from an external point P , touching the circle at Q and R respectively. Prove that $PQ=PR$

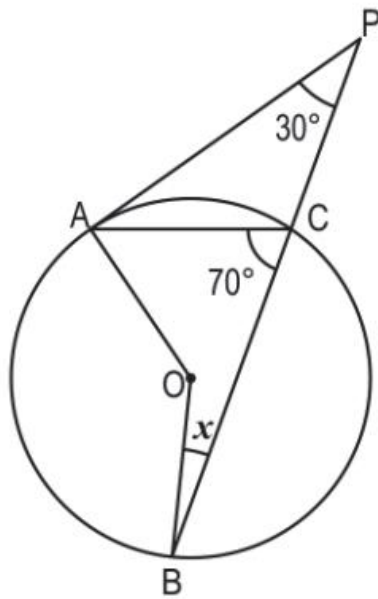
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28.

In the given figure, PA is a tangent to the circle with centre O , and PCB is a straight line. The angle between PA and PC is 30° , and $\angle ACB = 70^\circ$. Describe and sequence the steps required to determine the measure of $\angle OBC$.

3



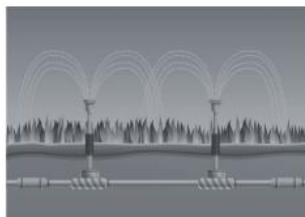
(Note: The figure is not to scale.)

29.

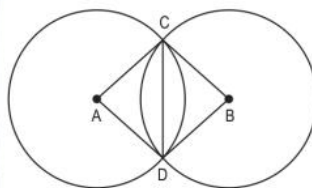
Two high-power sprinklers are placed at points A and B such that they spray water over equal circular regions. The circles intersect at points C and D . It is given that $CD = 400\text{m}$ and $\angle CAD = \angle CBD = 90^\circ$.

Using the geometric relationships in intersecting circles:

1. Explain how the given right angles help determine the radius of each circular region.
2. Interpret the structure of the overlapping region and calculate its area. ($\pi = 3.14$)



Side view of the sprinklers



Top view of the region sprayed

(Note: The figures are not to scale.)

3

30.

In a game, three spinners are attached to Rooms 1, 2, and 3. If any spinner lands on the grey region, that room opens. A player loses the treasure if the chosen room opens.

Zaira keeps her treasure in the room that is least likely to open.

Describe and sequence the steps required to:

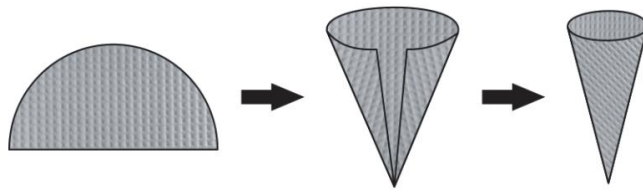
1. Determine the probability of each room opening based on the grey regions of the respective spinners.
2. Compare these probabilities.
3. Identify the room in which Zaira kept her treasure.

Clearly show how each step leads to the final decision.

3

Section D		
31.	At a metro station, the parking fee for four-wheelers is charged in two parts: • A fixed charge of ₹x for parking up to 2 hours, and • An additional charge of ₹y per hour for every hour beyond the first 2 hours. (i) Murli parked his car for 6 hours and paid ₹110. Aparna parked her car for 13 hours and paid ₹250. Form a pair of linear equations to represent this situation and determine the values of x and y. (ii) Amish parked his car from 8:00 AM to 3:00 PM on the same day. Using the values obtained above, calculate the total parking charges he must pay. Show all steps clearly.	4
32.	A learning platform awards points per module in an AP. The first module gives 40 points. The 15th module gives 180 points. Form the AP and calculate the total points earned after 15 modules. If the platform wants the total points after 15 modules to increase by 450 without changing the first term, determine the new common difference. Justify mathematically.	4
33.	In the given figure, $\triangle XYZ$ is a right-angled triangle right-angled at Y. Points A, B and C divide YZ into four equal parts. Describe and sequence the steps required to prove that: $3XA^2 + XB^2 + XC^2 - XZ^2 = 4XY^2$	4

34.	In a giant wheel, Gagan is seated 12 m above the platform. Jyoti and Karan are in the lowest and highest cabins respectively. From Gagan: • Angle of depression of Jyoti = 30° • Angle of elevation of Karan = 60° Using a suitable diagram, combine the concepts of angles of elevation/depression and trigonometric ratios to: 1. Determine the angle of elevation of Gagan from Jyoti and the angle of depression of Gagan from Karan. 2. Find the diameter of the giant wheel. Show clear reasoning. <i>(Note: The figure is not to scale.)</i>	4
35.	A semicircular waffle sheet of radius 5 cm is folded to form a cone. Due to overlap during folding, the radius of the base of the cone becomes 80% of what it would have been without overlap. (Take $\pi = \frac{22}{7}$) Describe and sequence the complete procedure to: 1. Determine the base radius of the cone after accounting for overlap. 2. Establish the slant height of the cone. 3. Calculate the height of the cone using an appropriate relation. 4. Find the approximate volume of the cone. Clearly show each step and explain how one result leads to the next.	4



(Note: The figures are not to scale.)

36.

TRP (Television Rating Point) reflects the popularity of a TV channel based on viewership data. The table shows the screen-time distribution (in hours) of viewers for Channel 1 and Channel 2 from 25,000 televisions.

	Screen time (in hours)	0 – 2	2 – 4	4 – 6	6 – 8	8 – 10	10 – 12
Number of Viewers	Channel 1	5500	10000	6000	2000	1000	500
	Channel 2	9000	6000	6500	1500	1700	300

Using the given grouped data:

1. Analyse the distribution to determine the average viewing time for Channel 1.
2. Construct a less-than type ogive for Channel 2.
3. Interpret what the graph reveals about viewer engagement for Channel 2 in comparison to Channel 1.

(Round the mean to two decimal places.)

Your answer should clearly explain how measures of central tendency and cumulative frequency graphs help in understanding viewer behaviour.

4