SUBJECT: MATHEMATICS STANDARD (041)
SAMPLE QUESTION PAPER
CLASS – X (2026 – 27)

Maximum Marks: 80 **Time Allowed: 3 hours**

General Instructions:

Read the following instructions very carefully and strictly follow them:

(i) This Question paper contains 38 questions. All questions are compulsory.

(ii) This Question paper is divided into five Sections – A, B, C, D and E.

(iii) In Section A, Question number 1 to 18 are Multiple Choice Questions (MCQs) and Question number 19 and 20 are Assertion - Reason based questions of 1 mark each.

(iv) In Section B, Question number 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.

(v) In Section C, Question number 26 to 31 are Short Answer (SA)-type questions carrying 3 marks each.

(vi) In Section D, Question number 32 to 35 are Long Answer (LA)-type questions carrying 5 marks each.

(vii) In Section E, Question number 36 to 38 are case study-based questions carrying 4 marks each.

(viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C and 2 questions in Section D. An internal choice has been provided in all the sub parts having 2 marks of questions in section E.

(ix) Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.

(x) Use of calculators is not allowed.

SECTION – A **(20 x 1 = 20)**

This section comprises of 18 multiple choice questions and two questions of assertion and reasoning type of 1 mark each.

Q. No.	Questions	Marks
1.	The greatest number which divides both 134 and 188, leaving remainders 4 and 6 respectively, is: (A) 13 (B) 26 (C) 39 (D) 65	**1**
2.	If $f(x) = px^2 + qx + r$, $p \neq 0$ and $p + r = q$, then one of the zeroes of $f(x)$ is: (A) $\frac{q}{p}$ (B) $\frac{r}{p}$ (C) $-\frac{r}{p}$ (D) $-\frac{q}{p}$	**1**
3.	Tarun correctly solved a pair of linear equations in two variables and found their only point of intersection as (5, – 1). One of the lines was $x – y = 6$. Which of the following could have been the other line? I: $3x – 3y = 18$ II: $2x – 3y = 13$ III: $2x – 3y = 16$ (A) I only (B) II only (C) I and II (D) II and III	**1**
4.	If $(1 – p)$ is a root of the quadratic equation $x^2 + px + 1 – p = 0$, then its roots are: (A) 0, 1 (B) – 1, 1 (C) 0, – 1 (D) – 1, 2	**1**

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5.	The middle term of the A.P.: 10, 7, 4, …, – 62 is: (A) – 26 (B) – 29 (C) – 32 (D) – 35	**1**
6.	The perimeters of two similar triangles are 56 cm and 70 cm respectively. If one side of the first triangle is 14 cm, then the corresponding side of the second triangle (in cm) is: (A) 5 (B) 7.5 (C) 10 (D) 17.5	**1**
7.	The point which lies on the perpendicular bisector of the line segment joining the points A (– 3, – 4) and B (3, 4) is: (A) (0, 0) (B) (0, 3) (C) (3, 0) (D) (0, 4)	**1**
8.	If tan (A + B) = $\sqrt{3}$ and tan (A – B) = $\frac{1}{\sqrt{3}}$, 0° < A + B < 90°, A > B, then the value of A and B respectively are: (A) 60°, 30° (B) 60°, 45° (C) 45°, 15° (D) 60°,15°	**1**
9.	T-shirts marked with numbers 4 to 99 are placed in a box. Gunika is fond of numbers. She randomly takes out a T-shirt from this box. The probability that she gets a T-shirt marked with a number that is either a perfect square or a perfect cube is: (A) $\frac{1}{12}$ (B) $\frac{1}{32}$ (C) $\frac{11}{96}$ (D) $\frac{5}{48}$	**1**
10.	The diameter of a car wheel is 21 cm. The number of complete revolutions it will make in moving 66 km is: (A) 10^4 (B) 10^5 (C) 10^6 (D) 10^7	**1**
11.	Two cubes each of volume 64 cm^3 are joined end to end to form a solid. The surface area of the resultant cuboid is: (A) 192 cm^2 (B) 160 cm^2 (C) 96 cm^2 (D) 80 cm^2	**1**
12.	The mean age of a combined group of men and women is 35 years. If the mean ages of the men and women are 38 years and 30 years respectively, then the percentage of women in the group is: (A) 15 (B) 25.5 (C) 35 (D) 37.5	**1**
13.	Two dice are rolled simultaneously. The probability of getting number less than 4 on each die is: (A) $\frac{1}{4}$ (B) $\frac{1}{9}$ (C) $\frac{1}{36}$ (D) $\frac{1}{6}$	**1**
14.	PM is a median of Δ PQR with vertices P (5, – 6), Q (6, 4) and R (0, 0). The length of PM is: (A) $2\sqrt{17}$ units (B) $2\sqrt{15}$ units (C) $\sqrt{101}$ units (D) 10 units	**1**
15.	The arc of a circle is of length 6π cm and the sector it bound has an area of 24π cm^2. The radius of the circle is: (A) 4 cm (B) 8 cm (C) 16 cm (D) 18 cm	**1**
16.	The mean and median of the data are 35.5 and 32 respectively. The value of mode for this data is: (A) 23 (B) 26 (C) 25 (D) 30	**1**
17.	A flying kite is tied to a point on the ground with the help of a string. The string makes an angle θ with the ground level such that tan θ = $\frac{12}{5}$. If the length of the string is 52 m, then the height of the kite above the ground is: (A) 40 m (B) 45.5 m (C) 48 m (D) 50 m	**1**

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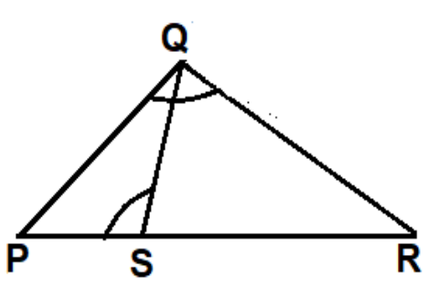
18.	2 cards of diamonds and 4 cards of spades are missing from a pack of 52 cards. A card is drawn at random from this pack. The probability of getting a card of heart is: (A) $\frac{13}{52}$ (B) $\frac{13}{46}$ (C) $\frac{11}{52}$ (D) $\frac{11}{46}$	**1**
	Assertion-Reason Based Questions **Directions: Questions number 19 and 20 are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R).** **Select the correct answer from the options (A), (B), (C) and (D) as given below:** **(A)** Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). **(B)** Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). **(C)** Assertion (A) is true but Reason (R) is false. **(D)** Assertion (A) is false but Reason (R) is true.	
19.	**Assertion (A)**: If three vertices of a parallelogram taken in order are (–1, –6), (2, –5) and (7, 2), then its fourth vertex is (4,1). **Reason (R)**: Diagonals of a parallelogram bisect each other.	**1**
20.	**Assertion (A)**: If zeroes of the polynomial $(2k-1)x^2 + 4x - 3$ are reciprocal of each other, then $k = -1$. **Reason (R)**: If a = c, then zeroes of the polynomial $ax^2 + bx + c$, $a \neq 0$ are reciprocal of each other.	**1**
	SECTION – B **(5 x 2 = 10)** **This section comprises of 5 Very Short Answer (VSA) type questions of 2 marks each**.	
21(A).	A hall has a length of 9.75 m, breadth of 6.75 m and height of 5.25 m. What is the length of the longest unmarked ruler that can exactly measure the dimensions of the hall?	**2**
	OR	
21(B).	There are three bells placed at different swings in a park, which toll at intervals of 5, 6 and 8 minutes, respectively. They all toll together when the park opens for the visitors at 10:00 a.m.. How many more times do they all toll together till the park is closed at 7:00 p.m.?	
22(A).	ABCD is a trapezium in which AB is parallel to DC and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.	**2**
	OR	
22(B).	In the given figure, if ∠PQR = ∠QSP, PQ = 6 cm and PS = 3 cm, then find the length of PR.  **<u>For visually Impaired Candidates:</u>** In a right-angled triangle ABC, right-angled at B, a perpendicular BD is drawn to the hypotenuse AC. Prove that the triangle BCD is similar to the triangle ACB.	

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23.	If $\tan\theta = \frac{1}{\sqrt{5}}$, then find the value of $\frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta}$.	**2**
24.	Find the area of a sector of a circle with diameter 28 cm, If the length of the corresponding arc is 22 cm.	**2**
25.	Two dice are thrown simultaneously. Find the probability that the product of the numbers appearing on them is a prime number.	**2**
	SECTION – C (6 x 3 = 18) **This section comprises of 6 Short Answer (SA) type questions of 3 marks each**.	
26.	Given that $\sqrt{3}$ is irrational number, prove that $(2 + 3\sqrt{3})$ is an irrational number.	**3**
27.	If α and β are the zeroes of the quadratic polynomial $2x^2 - 8x + 5$, then find the value of $(\alpha + \frac{1}{\beta}) \times (\beta + \frac{1}{\alpha})$.	**3**
28(A).	Ridhi drew a polygon with n sides. The smallest exterior angle is 8° and each subsequent exterior angle is 4° more than the previous exterior angle. Find the number of sides of the polygon that Ridhi had drawn.	**3**
	OR	
28(B).	Find the sum of integers between 1 and 400 that are multiples of 4 as well as of 5.	
29.	Prove that the parallelogram circumscribing a circle is a rhombus.	**3**
30.	In what ratio does the x–axis divide the line segment joining the points (– 4, – 6) and (–1, 7)? Also, find the coordinates of the point of division.	**3**
31(A).	During a math class, Ms. Isha wrote the expression given below on the board and asked the students to simplify it. $\frac{\cos\theta}{1-\sin\theta} + \frac{1-\sin\theta}{\cos\theta}$ Jyoti solved it in her note book as follows: $\frac{\cos\theta}{1-\sin\theta} + \frac{1-\sin\theta}{\cos\theta}$ $= \frac{\cos^2\theta + (1-\sin\theta)^2}{(1-\sin\theta)\times\cos\theta}$ **…. (step 1)** $= \frac{\cos^2\theta + \cos^2\theta}{(1-\sin\theta)\times\cos\theta}$ **…. (step 2)** $= \frac{2\cos^2\theta}{(1-\sin\theta)\times\cos\theta}$ **…. (step 3)** $= \frac{2\cos\theta}{(1-\sin\theta)}$ **…. (step 4)** Identify the step in which Jyoti has made error(s), if any. Rectify the same and find the correct answer.	**3**
	OR	
31(B).	If $\frac{1}{\sin x - \cos x} = \frac{\text{cosec}\, x}{\sqrt{2}}$, then prove that $\left(\frac{1}{\sin x + \cos x}\right)^2 = \frac{\sec^2 x}{2}$	

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SECTION – D (4 x 5= 20)

This section comprises of 4 Long Answer (LA) type questions of 5 marks each.

32.	In a rectangular park measuring 50 m × 40 m, the gram panchayat plans to construct a rectangular swimming pool in the middle, surrounded by a uniform-width grass strip throughout the park. Find the dimensions of the swimming pool, if the area of the grassy strip is 1184 m².	**5**
33.	Prove that a line drawn parallel to one side of a triangle to intersect the other two sides in distinct points, divides the other two sides in the same ratio. Using the above theorem solve the following: PQRS is a trapezium with PQ || SR. X and Y are points on non-parallel sides PS and QR respectively such that XY || PQ. Show that $\frac{PX}{XS} = \frac{QY}{YR}$.	**5**
34(A).	A tent is in the shape of a cylinder surmounted by a conical top. If the height and radius of the cylindrical part are 3 m and 14 m respectively, and the total height of the tent is 13.5 m, then find the area of the canvas required for making the tent, keeping a provision of 26 m^2 of canvas for stitching and wastage. Also, find the cost of the canvas to be purchased at the rate of ₹ 250 per m^2.	**5**
	OR	
34(B).	A solid wooden toy is in the form of a hemisphere surmounted by a cone of the same radius. The radius of hemisphere is 3.5 cm and the total wood used in making the toy is $166\frac{5}{6}$ cm^3. Find the height of the conical part. Also, find the cost of painting the hemispherical part of the toy at the rate of ₹ 15 per cm^2.	
35(A).	Manish is standing on level ground and observes a kite flying 200 m away from him at an angle of elevation of 30^0. Mahesh, standing on the roof of a 50 m high building on the opposite side of the kite, observes the same kite at an angle of elevation of 45^0. Find the distance between the kite and Mahesh.	**5**
	OR	
35(B).	The angles of depression of two ships from the top of a lighthouse and on the same side of it are found to be 45^0 and 30^0. If the ships are 200m apart and one ship is exactly behind the other then find the height of lighthouse.	

SECTION – E (3 x 4 = 12)

This section comprises of 3 case-study-based questions of 4 marks each with sub parts. Each case study questions has three sub parts (i), (ii), (iii) of marks 1, 1, 2 respectively.

36.	A student entrepreneur started a company that manufactures sanitizers in two sizes – small and large. The cost of a small bottle of sanitizer is ₹10 and that of a large bottle is ₹15. In June, the company sold 1000 bottles and recorded a total sale of ₹12,750. Seeing the increased demand, the company decided to increase the price of both sanitizer bottles by ₹2 each. In the next month, the company sold 2500 bottles and recorded a total sale of ₹34,250. Based on the above information, answer the following questions:	
	(i) Form a linear equation in two variables representing the sale for June.	**1**
	(ii) Form a linear equation in two variables representing the sale for July.	**1**
	(iii) **(A)** How many sanitizer bottles of each type were actually sold in June?	**2**
	OR	
	(iii) **(B)** How many sanitizer bottles of each type were sold in July?	**2**

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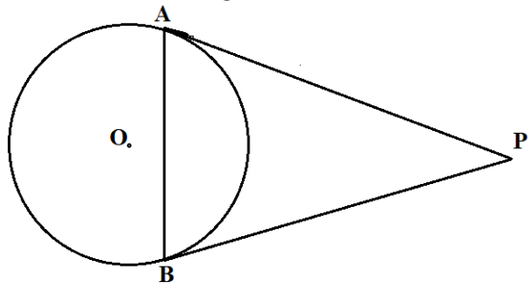
37. In a technology park in Hyderabad, a company installed a circular meditation garden for its employees as shown in the figure.



Arjun, a designer, stood at a point P outside the garden and drew two tangents PA and PB to the circular boundary. The radius of the garden is 9 m, and the distance of point P from the centre O is 18 m. For preparing safety guidelines, Arjun needed the lengths of the tangents. During a demonstration to interns, he asked them to compute the angle formed between the two tangents using the properties of circle.

Based on the above information, answer the following questions:

(i) What is the measure of ∠OAP? **1**

(ii) Calculate the length of the tangent PA. **1**

(iii) **(A)** Calculate the measure of ∠AOB. **2**

OR

(iii) **(B)** In the above design, if PA and PB were inclined at 60°, then what would be their length? **2**

38. A school conducted a weekly test for Class X students, before the commencement of the pre-board examination and recorded their scores (out of 50). To analyse performance patterns, the academic coordinator grouped the marks into intervals. The grouped frequency distribution is as below:

Marks Obtained	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Number of students	3	6	12	15	14

The academic coordinator computed the central tendencies to judge overall learning level, the most common performance range and to understand consistency across the batch for planning the remedial sessions.

Based on the above information, answer the following questions:

(i) Identify the class with the most common performance range. **1**

(ii) Find the class interval containing the median. **1**

(iii) **(A)** What is the average performance of the students? **2**

OR

(iii) **(B)** Find the mode of the data. **2**

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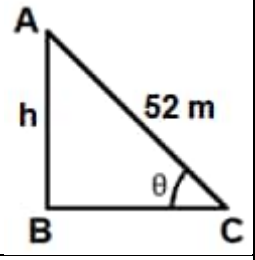
MATHEMATICS STANDARD – Code No. (041)

MARKING SCHEME

CLASS X (2026 - 27)

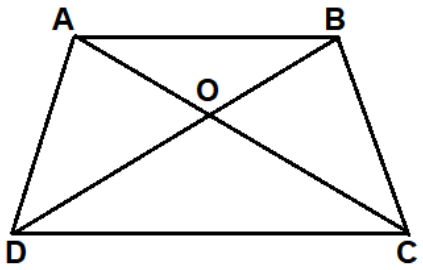
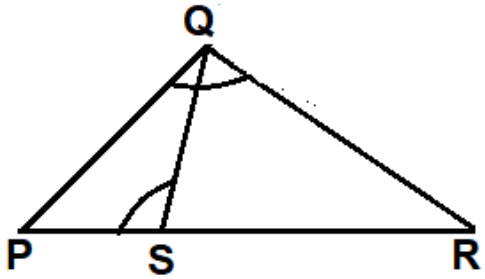
SECTION: A (Solution of MCQs of 1 Mark each, no part marks)

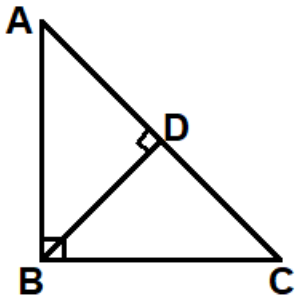
Q. No.	Ans.	Hints/Solution	Marks
1.	**(B)** 26	134 – 4 = 130 and 188 – 6 = 182 HCF (130, 182) = 26	**1**
2.	**(C)** $-\frac{r}{p}$	Substituting q = p + r in f(x) $f(x) = px^2 + (p + r)x + r$ $= (x + 1)(px + r)$ Zeroes are – 1 or $-\frac{r}{p}$.	**1**
3.	**(B)** II only	(5, – 1) is a solution of I: 3x – 3y = 18 also. But this will make the system of equations as consistent and dependent. Only II: 2x – 3y = 13 fulfills the given condition of having only one point of intersection.	**1**
4.	**(C)** 0, – 1	As (1 – p) is a root of the quadratic equation $x^2 + px + 1 – p = 0$, $\therefore (1 – p)^2 + p(1 – p) + 1 – p = 0$, $\Rightarrow p = 1$ Now quadratic equation will be: $x^2 + x = 0$ $x(x+1) = 0$ So the roots are 0, -1	**1**
5.	**(A)** – 26	– 62 = 10 + (n – 1) (– 3) ⇒ n = 25. Thus $\frac{25+1}{2}$ = 13th term is the middle term. $\therefore a_{13} = 10 + 12 (– 3) = – 26$	**1**
6.	**(D)** 17.5	Ratio of perimeters of similar triangles = ratio of their corresponding sides $\therefore \frac{56}{70} = \frac{14}{\text{corresponding side}}$ corresponding side = 17.5	**1**
7.	**(A)** (0, 0)	Mid-point of AB will lie on the perpendicular bisector of the line segment joining the points A (– 3, – 4) and B (3, 4). $\therefore$ Coordinates of mid-point of A and B are $\left(\frac{-3+3}{2}, \frac{-4+4}{2}\right)$ = (0, 0)	**1**
8.	**(C)** 45°, 15°	$\tan (A + B) = \sqrt{3}$ $\Rightarrow (A + B) = 60°$ …. (i) $\tan (A – B) = \frac{1}{\sqrt{3}}$ $\Rightarrow (A – B) = 30°$ …. (ii) Solving equation (i) and (ii), we get A = 45° and B = 15°.	**1**
9.	**(D)** $\frac{5}{48}$	Total outcomes = 96 Perfect square numbers – 4, 9, 16, 25, 36, 49, 64, 81 perfect cubes are 8, 27, 64, common number is 64 Number of favourable outcomes = 10 P(either a perfect square or a perfect cube) = $\frac{10}{96} = \frac{5}{48}$	**1**

10.	**(B)** 10^5	Total revolutions = $\frac{66 \times 10^5 \times 7}{22 \times 21} = 10^5$	**1**
11.	**(B)** 160 cm^2	Side of cube = 4 cm Dimensions of resulting cuboid: length = 8 cm, breadth = 4 cm, height = 4 cm. Total surface area = 2 (8 × 4 + 4 × 4 + 8 × 4) = 160 cm^2	**1**
12.	**(D)** 37.5	Let number of men be x and number of women be y $\frac{38x + 30y}{x + y} = 35$ ⇒ 38x + 30y = 35x + 35y ⇒ 3x = 5y $\therefore \frac{x}{y} = \frac{5}{3}$ % age of women = $\frac{3}{8} \times 100 = 37.5$	**1**
13.	**(A)** $\frac{1}{4}$	Total outcomes = 36 Favourable outcomes = (1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3) P (E) = $\frac{9}{36} = \frac{1}{4}$	**1**
14.	**(A)** 2 $\sqrt{17}$ units	Coordinates of midpoint of QR i.e. M are $\left(\frac{6+0}{2}, \frac{4+0}{2}\right) = (3,2)$ Median PM $= \sqrt{(5-3)^2 + (-6-2)^2} = \sqrt{68} = 2\sqrt{17}$ units	**1**
15.	**(B)** 8 cm	A = $\frac{1}{2} l \times r$ ⇒ $24\pi = \frac{1}{2} \times 6\pi \times r$ ⇒ r = 8 cm.	**1**
16.	**(C)** 25	Mode = 3 Median – 2 Mean = 3 (32) – 2 (35.5) = 25	**1**
17.	**(C)** 48 m	tan θ = $\frac{12}{5}$ $\therefore$ sin θ = $\frac{12}{13}$ ⇒ $\frac{h}{52} = \frac{12}{13}$ ⇒ h = 48 m 	**1**
18.	**(B)** $\frac{13}{46}$	Total remaining cards = 52 – (2 + 4) = 46 P(a heart card) = $\frac{13}{46}$	**1**
19.	**(A)**	Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is the correct explanation of **Assertion (A).**	**1**
20.	**(A)**	Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is the correct explanation of **Assertion (A).**	**1**

Section –B

[This section comprises of solution of very short answer type questions (VSA) of 2 marks each]

Q. No.	HINTS/SOLUTION	Marks
21. (A)	Length = 9.75 m = 975 cm Breadth = 6.75 m = 675 cm Height = 5.25 m = 525 cm Length of longest unmarked ruler = HCF (975, 675, 525) $975 = 3 \times 5^2 \times 13$ $675 = 3^3 \times 5^2$ $525 = 3 \times 5^2 \times 7$ $\therefore$ HCF (975, 675, 525) $= 3 \times 5^2 = 75$ Hence, the length of longest unmarked ruler is 75 cm or 0.75 m	½ 1 ½
	OR	
21. (B)	LCM of 5, 6 and 8 is 120 i.e., all the bells toll together after an interval of 120 minutes or 2 hours. Thus, all the bells will again toll together at 12:00 noon, 2:00 pm, 4:00 pm and 6 p.m. i.e., 4 times So, the bells will toll together 4 more times, till the park is closed at 7:00 p.m.	1 1
22. (A)	 In Δ AOB and Δ COD ∠ OAB = ∠ OCD ∠ OBA = ∠ ODC (Alternate interior angles) $\therefore$ Δ AOB ~ Δ COD (AA criterion) $\Rightarrow \frac{AO}{CO} = \frac{BO}{DO}$ or $\frac{AO}{BO} = \frac{CO}{DO}$	 1 ½ ½
	OR	
22. (B)	 In Δ PRQ and Δ PQS ∠ PQR = ∠ QSP (Given) ∠ QPR = ∠ QPS (Common) $\therefore$ Δ PRQ ~ Δ PQS (AA criterion)	 1

	$\Rightarrow \frac{PQ}{PS} = \frac{PR}{PQ} \Rightarrow \frac{6}{3} = \frac{PR}{6}$ $\therefore$ PR = 12 cm **For visually Impaired Candidates:**  In triangle BCD and triangle ACB Angle BDC = Angle ABC (each 90 degree) Angle BCD = Angle ACB (common) $\therefore$ Triangle BCD is similar to Triangle ACB (AA criterion)	½ ½ ½ ½ 1
23.	$\tan\theta = \frac{1}{\sqrt{5}} \Rightarrow \cot\theta = \sqrt{5}$ $\sec^2\theta = 1 + \tan^2\theta = 1 + \left(\frac{1}{\sqrt{5}}\right)^2 = \frac{6}{5}$ and $\text{cosec}^2\theta = 1 + \cot^2\theta = 1 + \left(\sqrt{5}\right)^2 = 6$ $\therefore \frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta} = \frac{6 - \frac{6}{5}}{6 + \frac{6}{5}} = \frac{2}{3}$	 ½ ½ 1
24.	Radius = $\frac{28}{2}$ = 14 cm Area of sector = $\frac{1}{2} \times l \times r$ $= \frac{1}{2} \times 22 \times 14$ = 154 cm^2	½ 1 ½
25.	Total number of outcomes = 36 Favourable outcomes = 6 {(1,2), (1,3), (1,5), (2,1), (3,1), (5,1)} P (Prime Product) = $\frac{6}{36} = \frac{1}{6}$	½ ½ 1

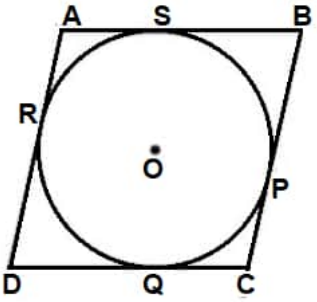
Section – C

[This section comprises of solution short answer type questions (SA) of 3 marks each]

Q. No.	HINTS/SOLUTION	Marks
26.	Let us assume that $2 + 3\sqrt{3}$ be rational number. Then $2 + 3\sqrt{3} = \frac{a}{b}$, where 'a' and 'b' are integers & b ≠ 0 $\Rightarrow \sqrt{3} = \frac{a - 2b}{3b}$	 1

	Since 'a' and 'b' are integers. $\therefore \frac{a-2b}{3b}$ is rational number. So, $\sqrt{3}$ is rational number which contradicts the given fact that $\sqrt{3}$ is irrational number. Hence, our assumption is wrong. Therefore $2 + 3\sqrt{3}$ is irrational number.	**1** **1**
27.	$\alpha + \beta = 4$ and $\alpha\beta = \frac{5}{2}$ $(\alpha + \frac{1}{\beta}) \times (\beta + \frac{1}{\alpha}) = (\frac{\alpha\beta+1}{\beta}) \times (\frac{\alpha\beta+1}{\alpha}) = \frac{(\alpha\beta+1)^2}{\alpha\beta}$ $= \frac{\left(\frac{5}{2}+1\right)^2}{\frac{5}{2}}$ $= \frac{49}{10}$	**1** **½** **1** **½**
28. (A)	Number of the sides of the given polygon is 'n'. The exterior angles of the given polygon are in A.P. Here a = 8 and d = 4 As sum of all the exterior angles of a polygon is 360° $\therefore S_n = 360$ $\Rightarrow \frac{n}{2}[2 \times 8 + (n-1) \times 4] = 360$ $\Rightarrow n^2 + 3n - 180 = 0$ $\Rightarrow (n + 15)(n - 12) = 0$ $\therefore n = -15$ or 12 Angle is always positive. $\therefore n = 12$ So, the number of sides in the given polygon is 12.	 **1** **1** **½** **½**
	OR	
28. (B)	Required A.P. is 20, 40, 60, …, 380 Here a = 20 and d = 20 Let $a_n = 380$ $\Rightarrow 20 + (n-1) \times 20 = 380$ $\Rightarrow n = 19$ $\therefore S_{19} = \frac{19}{2}[20 + 380]$ $= 3800$	**1** **½** **½** **½** **½**

29.



Given, ABCD is a parallelogram circumscribing a circle.

AS = AR --- (i)
BS = BP --- (ii)
CQ = CP --- (iii)
DQ = DR --- (iv)

(Length of tangents drawn from an external point to a circle are equal) **1**

Adding (i), (ii), (iii) and (iv), we get

AS + BS + CQ + DQ = AR + BP + CP + DR **1**

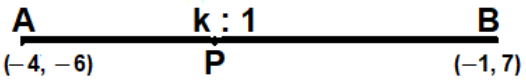
⇒ AB + CD = AD + BC

⇒ 2 AB = 2 AD

⇒ AB = AD **1**

Since adjacent sides of parallelogram ABCD are equal. Therefore, ABCD is a rhombus.

30.



Let x-axis divides the line segment joining the points A (– 4, – 6) and B (–1, 7) at P (x, 0) in the ratio k:1.

Coordinates of P are $\left[\frac{k(-1)+1(-4)}{k+1}, \frac{k(7)+1(-6)}{k+1}\right]$ or $\left[\frac{-k-4}{k+1}, \frac{7k-6}{k+1}\right]$ **1**

Since point P lies on x – axis

$\therefore \frac{7k-6}{k+1} = 0 \Rightarrow k = \frac{6}{7}$ **½**

So, point P divides AB in the ratio 6:7 **½**

Coordinates of P, are $(\frac{-34}{13}, 0)$. **1**

31. (A) Jyoti made error in step 2. **1**

The correct solution is as under:

$$\frac{\cos\theta}{1-\sin\theta} + \frac{1-\sin\theta}{\cos\theta}$$

$$= \frac{\cos^2\theta + (1-\sin\theta)^2}{(1-\sin\theta)\times\cos\theta}$$

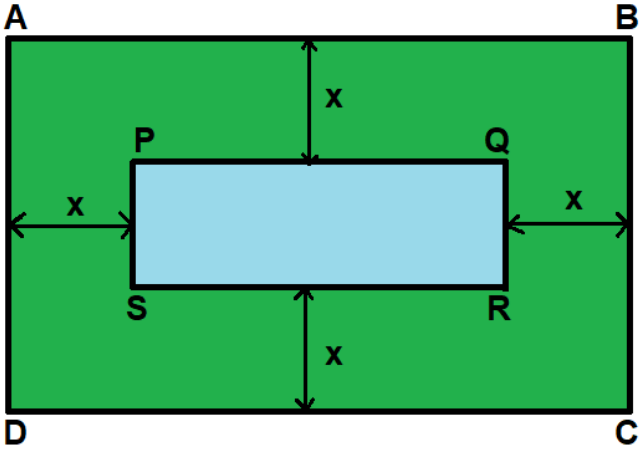
$$= \frac{\cos^2\theta + 1 + \sin^2\theta - 2\sin\theta}{(1-\sin\theta)\times\cos\theta}$$ **1**

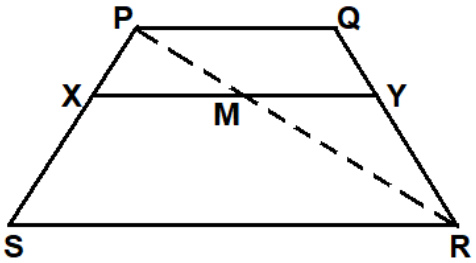
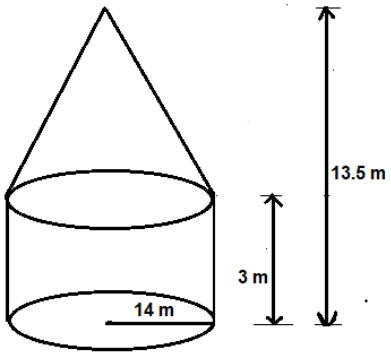
$$= \frac{2-2\sin\theta}{(1-\sin\theta)\times\cos\theta}$$ **½**

	$= \frac{2 \times (1 - \sin\theta)}{(1 - \sin\theta) \times \cos\theta}$ $= \frac{2}{\cos\theta} = 2 \sec\theta$	½
	OR	
31. (B)	Given: $\frac{1}{\sin x - \cos x} = \frac{\text{cosec } x}{\sqrt{2}}$ $\Rightarrow \sin x - \cos x = \sqrt{2} \sin x$ Squaring both sides, we get $2 \sin x \cos x = 1 - 2 \sin^2 x$ --- (i) Now, LHS = $\left(\frac{1}{\sin x + \cos x}\right)^2 = \frac{1}{1 + 2 \sin x \cos x}$ $= \frac{1}{1 + (1 - 2sin^2 x)} = \frac{1}{2cos^2 x}$ $= \frac{\sec^2 x}{2}$ = RHS	½ **1** ½ ½ ½

Section –D

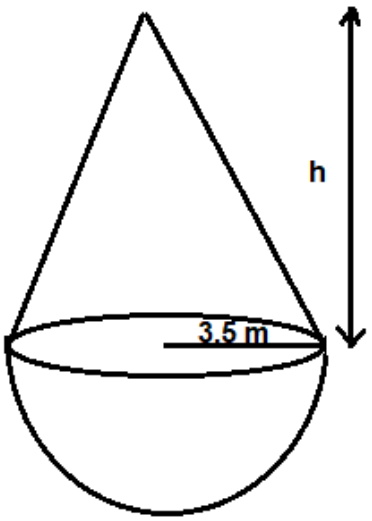
[This section comprises of solution of long answer type questions (LA) of 5 marks each]

Q. No.	HINTS/SOLUTION	Marks
32.	 ABCD is the rectangular park and PQRS is the swimming pool. Let 'x' be the uniform width of the grass strip. Then, length of the swimming pool, PQ = (50 – 2x) m and breadth of the swimming pool, QR = (40 – 2x) m Area of rectangular park – Area of swimming pool = Area of grass strip. $50 \times 40 - (50 - 2x)(40 - 2x) = 1184$ $\Rightarrow x^2 - 45x + 296 = 0$ $\Rightarrow (x - 8)(x - 37) = 0$ $\Rightarrow x = 8, 37$ Rejecting x = 37, as length and breadth cannot be negative integers.	½ **1** **1** ½

	$\therefore x = 8$	**1**
	Thus, length of the swimming pool = (50 – 2x) = 50 – 16 = 34 m.	½
	and breadth of the swimming pool = (40 – 2x) = 40 – 16 = 24 m	½
33.	Correct figure, given, to prove, construction	**1**
	Correct proof 	**2**
	Join PR intersecting XY at M.	½
	In Δ PSR, XM ‖ SR	
	$\therefore \frac{PX}{XS} = \frac{PM}{MR}$ --- (i)	½
	In Δ PQR, MY ‖ PQ	
	$\therefore \frac{QY}{YR} = \frac{PM}{MR}$ --- (ii)	½
	From (i) and (ii), we get	
	$\frac{PX}{XS} = \frac{QY}{YR}$	½
34. (A)		
	Height of Conical part = 13.5 – 3 = 10.5 m	½
	Slant height (l) = $\sqrt{(14)^2 + (10.5)^2}$ = 17.5 m	**1**
	CSA of Conical part = $\pi rl = \frac{22}{7} \times 14 \times 17.5 = 770$ m^2	**1**
	CSA of Cylindrical part = $2\pi rh = 2 \times \frac{22}{7} \times 14 \times 3 = 264$ m^2	**1**
	Total area of canvas required = CSA of conical part + CSA of cylindrical part + Wastage	
	= 770 + 264 + 26 = 1060 m^2	½
	Cost of canvas to be purchased @ ₹ 250 / m^2 = 250 × 1060 = ₹ 265000	**1**
	OR	

34. (B)

Let 'h' cm be the height of conical part.



Volume of wood in the toy = Volume of conical part + Volume of hemispherical part

$$166\frac{5}{6} = \frac{1}{3} \times \pi \times r^2 \times h + \frac{2}{3} \times \pi \times r^3$$

$$\Rightarrow \frac{1001}{6} = \frac{1}{3} \times \frac{22}{7} \times (3.5)^2 \times h + \frac{2}{3} \times \frac{22}{7} \times (3.5)^3$$ — **2**

$\Rightarrow$ h = 6 cm — **1**

CSA of hemispherical part = $2 \times \pi \times r^2$

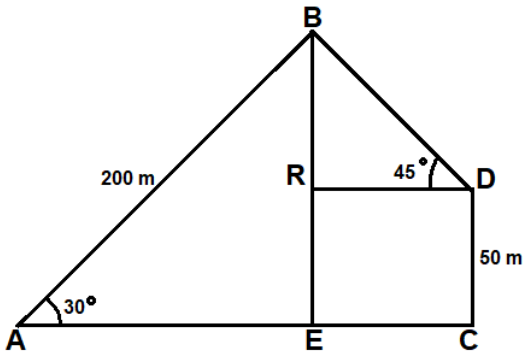
$= 2 \times \frac{22}{7} \times (3.5)^2$

$= 77\ cm^2$ — **1**

Cost of painting hemispherical part @ ₹ 15 / cm^2 = 15 × 77

= ₹ 1155 — **1**

35. (A)



Correct figure — **1**

Let Manish is standing at point 'A' and Mahesh is standing at point 'D'.

Distance of kite from Manish = 200 m

In rt. angled Δ AEB

$\frac{BE}{200} = \sin 30° = \frac{1}{2}$ — **1**

$\Rightarrow$ BE = 100 m — **½**

BR = BE – RE = BE – DC = 100 – 50 = 50 m — **1**

In rt. angled Δ BRD

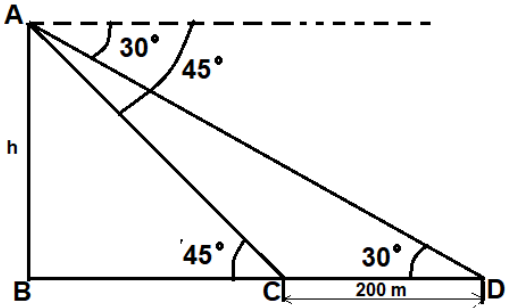
$\frac{50}{BD} = \sin 45° = \frac{1}{\sqrt{2}}$ — **1**

$\Rightarrow$ BD = $50\sqrt{2}$ m — **½**

∴ Distance of kite from Mahesh is $50\sqrt{2}$ m

OR

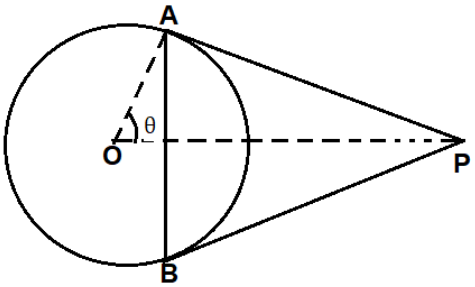
35. (B)



	Correct figure Let the height of the lighthouse be 'h' m. In rt. angled Δ ABC $\frac{h}{BC}$ = tan 45° = 1 ⇒ BC = h --- (i) In rt. angled Δ ABD $\frac{h}{h+200} = \tan 30° = \frac{1}{\sqrt{3}}$ ⇒ h = $\frac{200}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$ ⇒ h = 100 $(\sqrt{3}+1)$ ∴ height of the lighthouse is 100 $(\sqrt{3}+1)$ m.	**1** **1** **½** **1** **½** **1**

Section –E

[This section comprises solution of 3 case- study/passage-based questions of 4 marks]

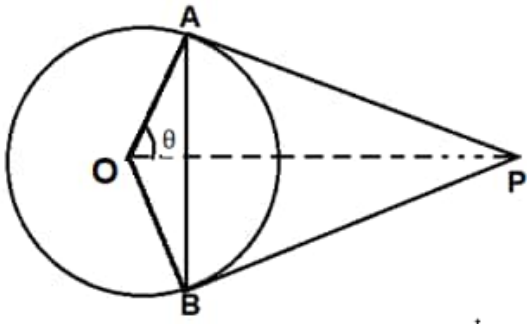
Q. No.	HINTS/SOLUTION	Marks
36.	Let the number of small bottles and large bottles be 'x' and 'y' respectively.	
	(i) 10x + 15y = 12750 or 2x + 3y = 2550	**1**
	(ii) 12x + 17y = 34250	**1**
	(iii) **(A)** According to the question, x + y = 1000 --- (i) 10x + 15y = 12750 --- (ii)	**1**
	Solving (i) and (ii), we get x = 450 & y = 550	**1**
	Number of small and large bottles sold are 450 and 550 respectively.	
	OR	
	(iii) **(B)** According to the question, x + y = 2500 --- (i) 12x + 17y = 34250 --- (ii)	**1**
	Solving (i) and (ii), we get x = 1650 & y = 850	**1**
	Number of small and large bottles sold are 1650 and 850 respectively.	
37.	 (i) ∠OAP = 90° (Radius is perpendicular to tangent at the point of contact)	**1**

(ii) In right angled Δ OAP, $OP^2 = OA^2 + AP^2$

$\Rightarrow (18)^2 = (9)^2 + AP^2$ ½

$\Rightarrow AP = \sqrt{243} = 9\sqrt{3}$ m ½

(iii) **(A)**



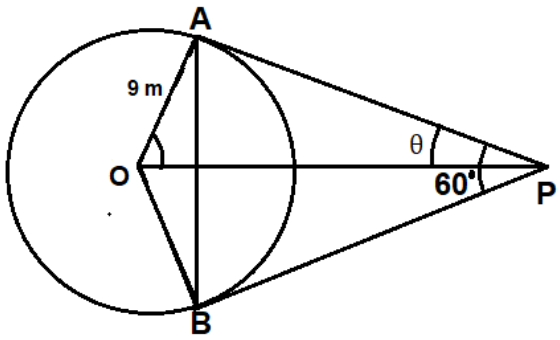
In right angled Δ OAP, $\cos\theta = \frac{9}{18} = \frac{1}{2} = \cos 60°$ **1**

$\Rightarrow \theta = 60°$ ½

$\therefore \angle AOB = 2\theta = 120°$ ½

OR

(iii) **(B)**



If tangent inclined at 60°, then $\angle OPA = \frac{1}{2} \times 60° = 30°$ ½

In right angled Δ OPA, $\frac{9}{AP} = \tan 30° = \frac{1}{\sqrt{3}}$ **1**

$\Rightarrow AP = 9\sqrt{3}$ m ½

38. (i) 30 – 40 **1**

(ii)

Marks	Number of students (*f*)	*cf*
0 – 10	3	3
10 – 20	6	9
20 – 30	12	21
30 – 40	15	36
40 – 50	14	50

Since $\frac{N}{2} = 25$. ∴ Median class is 30 – 40. **1**

(iii) **(A)**

C.I.	f_i	x_i	$f_i x_i$
0 – 10	3	5	15
10 – 20	6	15	90
20 – 30	12	25	300
30 – 40	15	35	525
40 – 50	14	45	630
Total	50		1560

Correct Table **1**

Average performance i.e. mean = $\frac{1560}{50}$ = 31.2 **1**

OR

(iii) **(B)** Here, modal class is 30 – 40, f_0 = 12, f_1 = 15, f_2 = 14 **½**

Mode = $30 + \left(\frac{15 - 12}{2 \times 15 - 12 - 14}\right) \times 10$ **1**

= 37.5 **½**