

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2026 (2nd Board Examination)
MATHEMATICS (STANDARD)
MATHEMATICS (STANDARD) (041) (PAPER CODE 30/7/3)

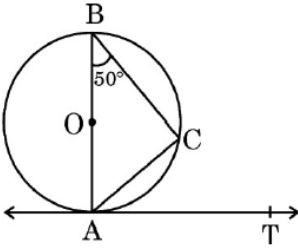
General Instructions: -

1.	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the Spot Evaluation Guidelines carefully.
2.	“Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. It’s leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc. may invite action under various rules of the Board and BNS.”
3.	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one’s own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In Class-X, while evaluating the Competency-based questions, please try to understand given answer and even if reply is not from Marking Scheme but correct competency is enumerated by the candidate, due marks should be awarded.
4.	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5.	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
6.	Evaluators will mark (✓) wherever answer is correct. For wrong answer CROSS ‘X’ be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. This is most common mistake which evaluators are committing.
7.	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totalled up and written on the left-hand margin and encircled. This may be followed strictly.
8.	If a question does not have any parts, marks must be awarded on the left-hand margin and encircled. This may also be followed strictly.
9.	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note “Extra Question” .

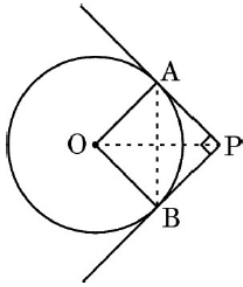
10.	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11.	A full scale of 0 to marks as given in Question Paper has to be used. Please do not hesitate to award full marks if the answer deserves it.
12.	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
13.	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong totalling of marks awarded to an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. ● Wrong question wise totalling on the title page. ● Wrong totalling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to Online Award List. ● Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) ● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14.	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15.	Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16.	The Examiners should acquaint themselves with the guidelines given in the “ Guidelines for spot Evaluation ” before starting the actual evaluation.
17.	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
18.	The candidates are entitled to obtain Photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

MARKING SCHEME
MATHEMATICS (Subject Code-041)
(PAPER CODE: 30/7/3)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION – A	
	This section has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.	
1.	A rational number between $\sqrt{2}$ and $\sqrt{3}$ is : (A) $\frac{\sqrt{2} + \sqrt{3}}{2}$ (B) $\frac{\sqrt{2} - \sqrt{3}}{2}$ (C) $1 \cdot 3$ (D) $1 \cdot 8$	
Sol.	As correct option is not there, so 1 mark to be given to all.	1
2.	The zeroes of the polynomial $p(x) = x^2 - x - 6$ are : (A) 3, 2 (B) - 3, 2 (C) 3, - 2 (D) - 3, - 2	
Sol.	(C) 3, -2	1
3.	The pair of equations $5x - 15y = 8$ and $3x - 9y = \frac{24}{5}$ has : (A) one solution (B) two solutions (C) infinitely many solutions (D) no solution	
Sol.	(C) infinitely many solutions	1
4.	In ΔABC, DE is parallel to BC, with D on AB and E on AC. If $\frac{AD}{DB} = \frac{3}{4}$, then the value of $\frac{BC}{DE}$ is : (A) 2 : 5 (B) 3 : 7 (C) 7 : 3 (D) 5 : 3	
Sol.	(C) 7:3	1

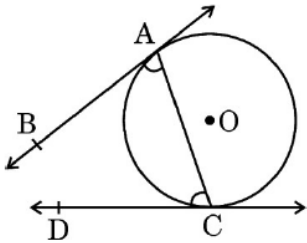
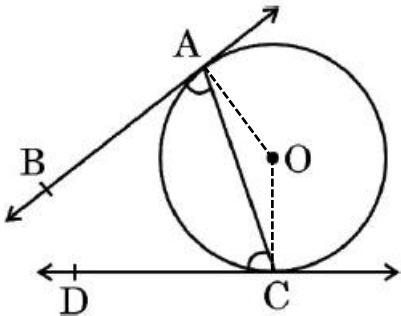
5.	If $p \left[\frac{2 \sin 30^\circ}{1 - \sin^2 30^\circ} \right] = q \left[\frac{2 \sin 30^\circ}{1 + \sin^2 30^\circ} \right]$, then $p : q$ is equal to : (A) 1 : 1 (B) 4 : 3 (C) 3 : 5 (D) 4 : 5	
Sol.	(C) 3 : 5	1
6.	If a pole is 6 m high and it casts a shadow of length $2\sqrt{3}$ m on the ground, then the Sun's elevation is : (A) 60° (B) 45° (C) 120° (D) 90°	
Sol.	(A) 60°	1
7.	In the given figure, AT is a tangent to a circle centred at O. If $\angle ABC = 50^\circ$, then $\angle CAT$ is equal to :  (A) 70° (B) 50° (C) 65° (D) 40°	
Sol.	(B) 50°	1
8.	A cap is cylindrical in shape and is surmounted by a hemispherical top. If the volume of the cylindrical part is equal to that of the hemispherical part, then the ratio of the height of the cylindrical part to the height of the hemispherical part is : (A) 2 : 3 (B) 1 : 3 (C) 2 : 1 (D) 3 : 1	
Sol.	(A) 2 : 3	1

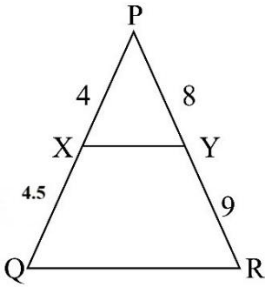
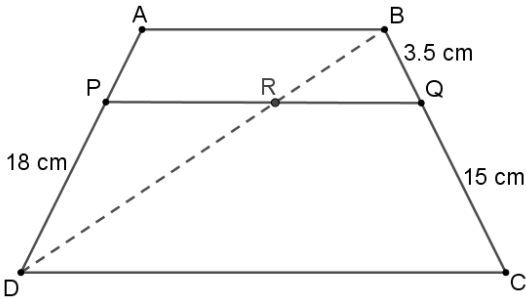
9.	If the probability of a player winning a game is 0.21, then the probability of him losing the same game is : (A) 1.79 (B) 0.81 (C) 0.79% (D) 0.79	
Sol.	(D) 0.79	1
10.	If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$, where x and y are prime numbers, then LCM (a, b) is : (A) xy (B) xy^2 (C) x^3y^3 (D) x^2y^2	
Sol.	(C) x^3y^3	1
11.	If α and β are the zeroes of a polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta - \alpha\beta = 0$, then the value of p is : (A) $-\frac{2}{3}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) $-\frac{1}{3}$	
Sol.	(B) $\frac{2}{3}$	1
12.	Which of the following sequences is an AP ? (A) 2, 4, 8, 16 (B) $3, 3 + \sqrt{2}, 3 + 2\sqrt{2}, \dots$ (C) 1, 3, 9, 27, (D) $\sqrt{3}, \sqrt{6}, \sqrt{9}, \dots$	
Sol.	(B) $3, 3 + \sqrt{2}, 3 + 2\sqrt{2}, \dots$	1

13.	If the point C(k, 4) divides the join of the points A(2, 6) and B(5, 1) in the ratio 2 : 3, then the value of k is : (A) 16 (B) $\frac{28}{5}$ (C) $\frac{16}{5}$ (D) $\frac{8}{5}$	
Sol.	(C) $\frac{16}{5}$	1
14.	In a right triangle ABC, right-angled at A, if $\cos B = \frac{1}{4}$, then the value of $\cot B$ is : (A) $\frac{1}{4}$ (B) $\frac{1}{\sqrt{15}}$ (C) $\frac{\sqrt{15}}{1}$ (D) $\frac{4}{\sqrt{15}}$	
Sol.	(B) $\frac{1}{\sqrt{15}}$	1
15.	In the given figure, tangents PA and PB to the circle centred at O, from an external point P are perpendicular to each other. If $AB = 5\sqrt{2}$ cm, then the length of PA is equal to :  (A) 5 cm (B) $5\sqrt{2}$ cm (C) $2\sqrt{5}$ cm (D) 10 cm	
Sol.	(A) 5 cm	1

16.	A sector of a circle with area $\frac{264}{7} \text{ cm}^2$ is cut from a circle of radius 6 cm. The central angle of the sector is : (A) 30° (B) 60° (C) 90° (D) 120°	
Sol.	(D) 120°	1
17.	If a and b are any two positive integers, then : (A) $\text{HCF}(a, b) + \text{LCM}(a, b) = a + b$ (B) $\text{HCF}(a, b) + \text{LCM}(a, b) = a \times b$ (C) $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$ (D) $\text{HCF}(a, b) = \text{LCM}(a, b)$	
Sol.	(C) $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$	1
18.	A solid right circular cone of radius r and height h is placed over a solid cylinder of same height and radius. The total surface area of the shape so formed is : (A) $4\pi rh + 4\pi r^2$ (B) $4\pi rh + \pi r^2$ (C) $\pi r(\sqrt{r^2 + h^2} + 2h + r)$ (D) $\pi r^2(\sqrt{r^2 + h^2} + 2h + r)$	
Sol.	(C) $\pi r(\sqrt{r^2 + h^2} + 2h + r)$	1
	<i>Questions number 19 and 20 are Assertion and Reason based questions. Two statements are given, one is labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the options (A), (B), (C) and (D), as given below.</i> (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false. (D) Assertion (A) is false, but Reason (R) is true.	

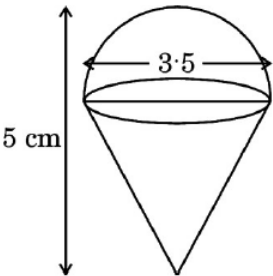
19.	<i>Assertion (A) :</i> Consider the following data : <table><tr><td><i>Class</i></td><td><i>Frequency</i></td></tr><tr><td>65 – 85</td><td>4</td></tr><tr><td>85 – 105</td><td>5</td></tr><tr><td>105 – 125</td><td>13</td></tr><tr><td>125 – 145</td><td>20</td></tr><tr><td>145 – 165</td><td>14</td></tr><tr><td>165 – 185</td><td>7</td></tr><tr><td>185 – 205</td><td>4</td></tr></table> The difference of the upper limit of the median class and the lower limit of the modal class is 20. <i>Reason (R) :</i> The median class and modal class of grouped data are always different.	<i>Class</i>	<i>Frequency</i>	65 – 85	4	85 – 105	5	105 – 125	13	125 – 145	20	145 – 165	14	165 – 185	7	185 – 205	4	
<i>Class</i>	<i>Frequency</i>																	
65 – 85	4																	
85 – 105	5																	
105 – 125	13																	
125 – 145	20																	
145 – 165	14																	
165 – 185	7																	
185 – 205	4																	
Sol.	(C) Assertion (A) is true, but Reason (R) is false.	1																
20.	<i>Assertion (A) :</i> The probability that a number selected at random from the numbers 1, 2, 3,, 15 is a multiple of 4, is $\frac{1}{3}$. <i>Reason (R) :</i> Two different coins are tossed simultaneously. The probability of getting at least one head is $\frac{3}{4}$.																	
Sol.	(D) Assertion (A) is false, but Reason (R) is true.	1																
	SECTION – B This section has 5 Very Short Answer (VSA) type questions carrying 2 marks each.																	
21.	Find the coordinates of a point P on x-axis equidistant from the points A(– 1, 0) and B(5, 0), using distance formula.																	
Sol.	Let the coordinates of point P be (x, 0) Here PA = PB $\Rightarrow$ PA ² = PB ² $\Rightarrow$ (–1 – x) ² + 0 = (5 – x) ² + 0	$\frac{1}{2}$ $\frac{1}{2}$																

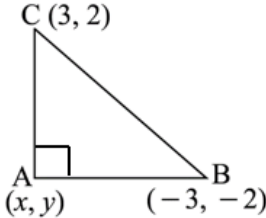
	Solving, we get $x = 2$ $\therefore$ Coordinates of point P are (2,0)	$\frac{1}{2}$ $\frac{1}{2}$
22.	In the given figure, AB and CD are tangents to a circle centred at O. Is $\angle BAC = \angle DCA$? Justify your answer. 	
Sol.	 Join OA and OC Since $OA = OC$ $\therefore \angle OAC = \angle OCA$ (i) Since tangent is perpendicular to radius $\Rightarrow \angle BAC = 90^\circ - \angle CAO = 90^\circ - \angle ACO$ (using (i)) $= \angle DCA$	$\frac{1}{2}$ $\frac{1}{2}$ 1
23.	If α and β are two zeroes of the polynomial $25p^2 - 15p + 2$, find a quadratic polynomial where zeroes are $\frac{1}{3\alpha}$ and $\frac{1}{3\beta}$.	
Sol.	Here, $\alpha + \beta = \frac{15}{25}, \alpha\beta = \frac{2}{25}$ Let the required polynomial be $x^2 - Sx + P$ $S = \frac{1}{3\alpha} + \frac{1}{3\beta} = \frac{1}{3} \left(\frac{\alpha + \beta}{\alpha\beta} \right) = \frac{5}{2}$	$\frac{1}{2}$ $\frac{1}{2}$

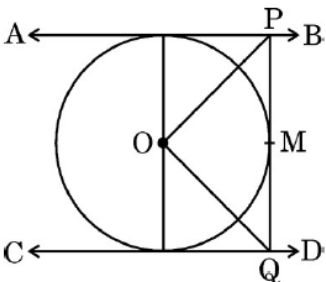
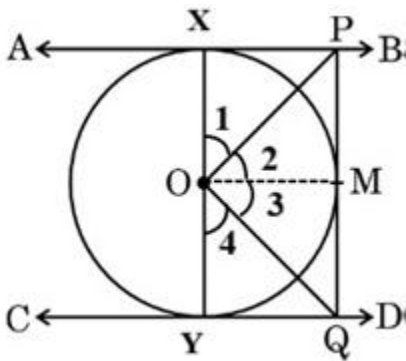
	$P = \frac{1}{3\alpha} \times \frac{1}{3\beta} = \frac{1}{9} \left(\frac{1}{\alpha\beta} \right) = \frac{25}{18}$	$\frac{1}{2}$
	$\therefore$ Required polynomial is $x^2 - \frac{5}{2}x + \frac{25}{18}$ or $18x^2 - 45x + 25$	$\frac{1}{2}$
24 (a).	X and Y are points on the sides PQ and PR respectively, of a ΔPQR. If the lengths of PX, QX, PY and YR (in cm) are 4, 4.5, 8 and 9 respectively, then show that $XY \parallel QR$.	
Sol.	 Here, $\frac{PX}{XQ} = \frac{4}{4.5} = \frac{8}{9}$ and $\frac{PY}{YR} = \frac{8}{9}$ Therefore, $\frac{PX}{XQ} = \frac{PY}{YR}$ $\Rightarrow XY \parallel QR$	1 $\frac{1}{2}$ $\frac{1}{2}$
	OR	
24 (b).	ABCD is a trapezium in which $AB \parallel DC$ and P and Q are points on AD and BC respectively, such that $PQ \parallel DC$. If $PD = 18$ cm, $BQ = 3.5$ cm and $QC = 15$ cm, then find the length of AD.	
Sol.	 Join BD	$\frac{1}{2}$

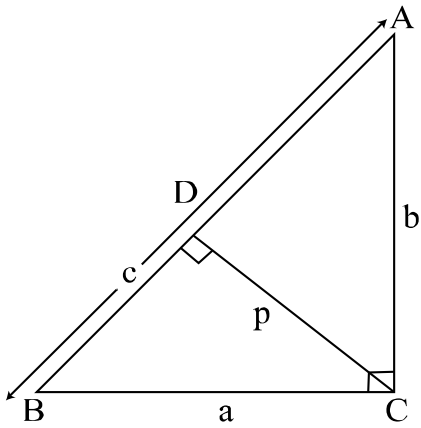
	In $\triangle BDC$, $RQ \parallel DC$ $\therefore \frac{BR}{RD} = \frac{BQ}{QC} \quad (i)$ In $\triangle DAB$, $PR \parallel AB$ $\therefore \frac{BR}{RD} = \frac{AP}{PD} \quad (ii)$ Using (i) and (ii), $\frac{BQ}{QC} = \frac{AP}{PD}$ $\Rightarrow \frac{3.5}{15} = \frac{AP}{18}$ $\Rightarrow AP = 4.2 \text{ cm}$ Hence, $AD = 4.2 + 18 = 22.2 \text{ cm}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
25 (a) .	Find the value of x, if : $2 \operatorname{cosec}^2 30^\circ + x \sin^2 60^\circ - \frac{3}{4} \tan^2 30^\circ = 10$	
Sol.	$2 \operatorname{cosec}^2 30^\circ + x \sin^2 60^\circ - \frac{3}{4} \tan^2 30^\circ = 10$ $\Rightarrow 2 \times (2)^2 + x \times \left(\frac{\sqrt{3}}{2}\right)^2 - \frac{3}{4} \times \left(\frac{1}{\sqrt{3}}\right)^2 = 10$ $\Rightarrow 8 + \frac{3x}{4} - \frac{1}{4} = 10$ $\Rightarrow x = 3$	1 $\frac{1}{2}$ $\frac{1}{2}$
	OR	
25 (b).	If $\cos A = \frac{2}{5}$, then find the value of $4 + 4 \tan^2 A$.	
Sol.	$4 + 4 \tan^2 A = 4(1 + \tan^2 A) = 4 \sec^2 A = \frac{4}{\cos^2 A}$ $= 4 \times \left(\frac{25}{4}\right) = 25$	1 1

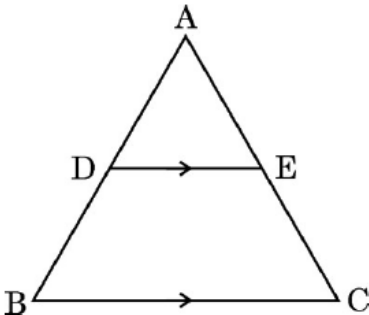
	SECTION – C This section has 6 Short Answer (SA) type questions carrying 3 marks each.	
26 (a).	If $\sin \theta + \cos \theta = \sqrt{3}$, then prove that : $\tan \theta + \cot \theta = 1$	
Sol.	$(\sin \theta + \cos \theta)^2 = 3$ $\Rightarrow \sin^2 \theta + \cos^2 \theta + 2 \sin \theta \cos \theta = 3$ $\Rightarrow 2 \sin \theta \cos \theta = 2$ $\Rightarrow \sin \theta \cos \theta = 1 \quad (i)$ LHS = $\tan \theta + \cot \theta$ $= \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}$ $= \frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta \cos \theta}$ $= \frac{1}{1} = 1 = \text{RHS} \quad (\text{using (i)})$	1 1 $\frac{1}{2}$ $\frac{1}{2}$
	OR	
26(b).	Prove that : $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$	
Sol.	LHS = $\sin^2 \theta + \operatorname{cosec}^2 \theta + 2 \sin \theta \operatorname{cosec} \theta + \cos^2 \theta + \sec^2 \theta + 2 \cos \theta \sec \theta$ $= (\sin^2 \theta + \cos^2 \theta) + (1 + \cot^2 \theta) + 2 \sin \theta \times \frac{1}{\sin \theta} + (1 + \tan^2 \theta) + 2 \cos \theta \times \frac{1}{\cos \theta}$ $= 3 + 2 + 2 + \tan^2 \theta + \cot^2 \theta$ $= 7 + \tan^2 \theta + \cot^2 \theta = \text{RHS}$	1 1 $\frac{1}{2}$ $\frac{1}{2}$

27.	Kajal got a playing top (lattu) as her birthday gift, which surprisingly had no colour on it. She wanted to colour it with her crayons. The top is shaped like a cone, surmounted by a hemisphere. The entire top is 5 cm in height and the diameter of the top is 3.5 cm. Find the area she has to colour. [Use $\pi = \frac{22}{7}$] 	
Sol.	Here $r = \frac{3.5}{2} \text{ cm} = \frac{7}{4} \text{ cm}$ and height of the cone (h) = $5 - \frac{7}{4} = \frac{13}{4} \text{ cm}$ Hence $l = \sqrt{\left(\frac{7}{4}\right)^2 + \left(\frac{13}{4}\right)^2} = \frac{\sqrt{218}}{4} \text{ cm}$ Area to be coloured = $2\pi r^2 + \pi r l$ $= 2 \times \frac{22}{7} \times \left(\frac{7}{4}\right)^2 + \frac{22}{7} \times \frac{7}{4} \times \frac{\sqrt{218}}{4}$ $= \left(\frac{77}{4} + \frac{11}{8}\sqrt{218}\right) \text{ cm}^2 = 39.46 \text{ cm}^2 \text{ (approx.)}$	$\frac{1}{2}$ $\frac{1}{2}$ 1 1
28 (a).	Prove that $\sqrt{5}$ is an irrational number.	
Sol.	Let $\sqrt{5}$ be a rational number. $\therefore \sqrt{5} = \frac{p}{q}$, where $q \neq 0$ and let p & q be coprime. $5q^2 = p^2 \Rightarrow p^2$ is divisible by 5 $\Rightarrow p$ is divisible by 5 ----- (i) Let $p = 5a$, where 'a' is some integer $25a^2 = 5q^2 \Rightarrow q^2 = 5a^2 \Rightarrow q^2$ is divisible by 5 $\Rightarrow q$ is divisible by 5 ----- (ii) (i) and (ii) leads to a contradiction as 'p' and 'q' are coprime.	$\frac{1}{2}$ 1 1 $\frac{1}{2}$

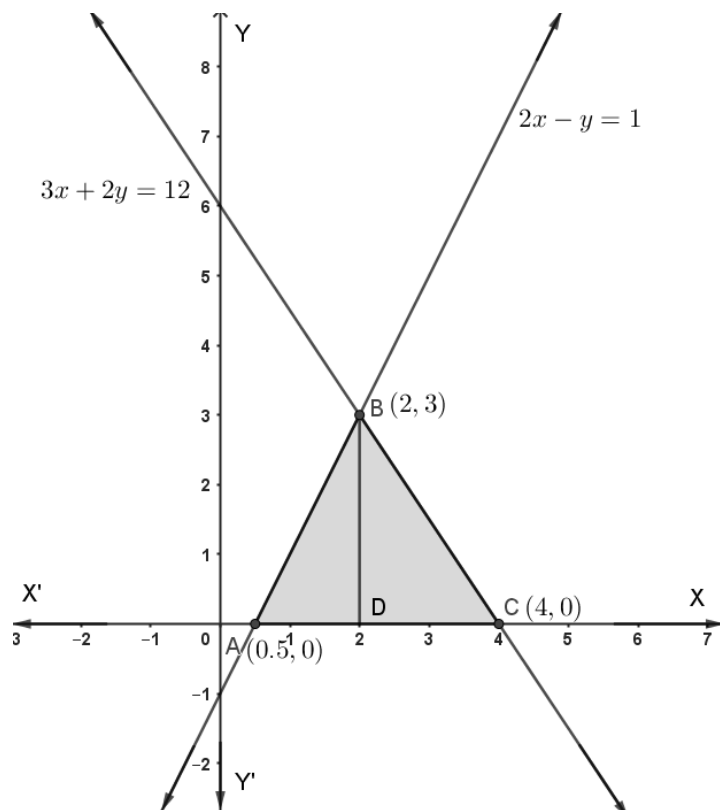
	$\therefore \sqrt{5}$ is an irrational number.	
	OR	
28 (b).	Show that $\frac{2+3\sqrt{2}}{5}$ is an irrational number.	
Sol.	Let $\frac{2+3\sqrt{2}}{5}$ be a rational number m $\therefore \frac{2+3\sqrt{2}}{5} = m$ $\Rightarrow \sqrt{2} = \frac{5m-2}{3}$ As m is rational $\Rightarrow \frac{5m-2}{3}$ is rational, But $\sqrt{2}$ is an irrational number $\therefore \text{LHS} \neq \text{RHS}$ $\therefore \frac{2+3\sqrt{2}}{5}$ is an irrational number.	$\frac{1}{2}$ 1 1 $\frac{1}{2}$
29.	A(x, y), B(-3, -2) and C(3, 2) are the vertices of a right triangle ABC, right-angled at A. Find the relationship between x and y. Hence, find all the possible values of y for which x = 3.	
Sol.	 $BC^2 = AC^2 + AB^2$ $\therefore (3+3)^2 + (2+2)^2 = (x-3)^2 + (y-2)^2 + (x+3)^2 + (y+2)^2$ $\Rightarrow 52 = 2(x^2 + y^2) + 26$ $\Rightarrow x^2 + y^2 = 13$ At $x = 3, y^2 = 4 \Rightarrow y = 2, -2$	1 1 1

30.	Kaushik throws two dice once and computes the product of the numbers appearing on the dice. Rishit throws one die and squares the number that appears on it. Find who has the better chance of getting the number 36.	
Sol.	When Kaushik throws two dice, Total number of outcomes = 36 Favourable outcome is (6,6) i.e., one $\therefore P(\text{getting the number 36}) = \frac{1}{36}$ When Rishit throws a die, Total number of outcomes = 6 Favourable outcome is 6 i.e., one $\therefore P(\text{getting the number 36}) = \frac{1}{6}$ Since $\frac{1}{6} > \frac{1}{36}$ So, Rishit has the better chance of getting the number 36.	1 1 $\frac{1}{2}$ $\frac{1}{2}$
31.	In the figure, AB and CD are two parallel tangents to a circle with centre O and another tangent PQ with point of contact M, intersecting AB at P and CD at Q. Prove that $\angle POQ = 90^\circ$. 	
Sol.		

	Join OM $\Delta PXO \cong \Delta PMO$ $\Rightarrow \angle 1 = \angle 2$ (i) $\Delta QYO \cong \Delta QMO$ $\Rightarrow \angle 4 = \angle 3$ (ii) Since XOY is a line $\therefore \angle 1 + \angle 2 + \angle 3 + \angle 4 = 180^\circ$ $\Rightarrow \angle 2 + \angle 3 = 90^\circ$ (using (i) and (ii)) or $\angle POQ = 90^\circ$	$\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	SECTION – D This section has 4 Long Answer (LA) type questions carrying 5 marks each.	
32 (a).	ΔABC is a right triangle right-angled at C. Let $BC = a$, $CA = b$, $AB = c$, and let p be the length of perpendicular from C on AB. Prove that : (i) $cp = ab$ (ii) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$	
Sol.	 (i) $\Delta ADC \sim \Delta ACB$ $\Rightarrow \frac{AC}{AB} = \frac{DC}{BC}$	1 1

	$\Rightarrow \frac{b}{c} = \frac{p}{a} \Rightarrow cp = ab$	$\frac{1}{2}$
	(ii) From part (i), $p = \frac{ab}{c}$ or $p^2 = \frac{a^2b^2}{c^2}$	$\frac{1}{2}$
	$\Rightarrow p^2 = \frac{a^2b^2}{a^2+b^2}$	1
	$\Rightarrow \frac{1}{p^2} = \frac{a^2+b^2}{a^2b^2} = \frac{1}{a^2} + \frac{1}{b^2}$	1
	OR	
32 (b).	In ΔABC, $DE \parallel BC$. Prove that : $\frac{AD}{DB} = \frac{AE}{EC}$ 	
Sol.	Correct Given, To prove, figure and construction Correct Proof	2 3
	OR	
33.	Draw the graphs of the following equations : $2x - y = 1 \text{ and } 3x + 2y = 12$ Determine the vertices of the triangle formed by the lines representing these equations and the x-axis. Shade the triangular region so formed and find its area.	

Sol.



Drawing correct graph

Coordinates of vertices of ΔABC are A (0.5, 0), B (2, 3), C (4, 0)

Correct shading

$$\text{Area of } \Delta ABC = \frac{1}{2} \times AC \times BD$$

$$= \frac{1}{2} \times 3.5 \times 3 = \frac{21}{4} \text{ or } 5.25 \text{ sq units}$$

1 + 1

1½

½

1

34.

Daily wages of 110 workers, obtained in a survey, are tabulated below :

<i>Daily wages (in ₹)</i>	<i>Number of workers</i>
100 – 120	10
120 – 140	15
140 – 160	20
160 – 180	22
180 – 200	18
200 – 220	12
220 – 240	13

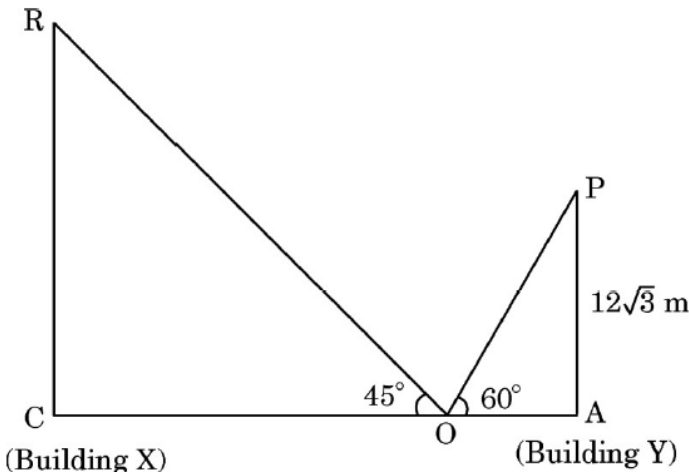
Compute the mean daily wages and modal daily wages of these workers.

Sol.	Daily Wages	x	f	$u = \frac{x - 170}{20}$	fu		
	100 – 120	110	10	–3	–30		
	120 – 140	130	15	–2	–30		
	140 – 160	150	20	–1	–20		
	160 – 180	170	22	0	0		
	180 – 200	190	18	1	18		
	200 – 220	210	12	2	24		
	220 – 240	230	13	3	39		
	Total		110		1		
	Correct Table						2
	Mean = $170 + 20 \times \frac{1}{110}$ = ₹ 170.18 (approx.) Modal class is 160 – 180 $\therefore$ Mode = $160 + \frac{22-20}{2 \times 22 - 20 - 18} \times 20$ = ₹ 166.67 (approx.)						1 $\frac{1}{2}$ 1 $\frac{1}{2}$
35 (a).	A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. Find the original speed of the train.						
Sol.	Let the original speed of the train be x km/h $\therefore \frac{480}{x-8} - \frac{480}{x} = 3$						2

	$\Rightarrow x^2 - 8x - 1280 = 0$ $\Rightarrow (x - 40)(x + 32) = 0$ $x \neq -32$ $\therefore x = 40$ So, the original speed of train is 40 km/h	1 1 1
	OR	
35 (b).	Himakshi can row her boat at a speed of 5 km/h in still water. If she takes 1 hour more to row the boat 5.25 km upstream than to return downstream, find the speed of the boat in upstream.	
Sol.	Let the speed of the stream be x km/h $\therefore \frac{5.25}{5-x} - \frac{5.25}{5+x} = 1$ $\Rightarrow 2x^2 + 21x - 50 = 0$ $\Rightarrow (2x + 25)(x - 2) = 0$ $x \neq \frac{-25}{2}$ $\therefore x = 2$ Speed of the boat upstream = $5 - 2 = 3$ km/h	2 1 1 $\frac{1}{2}$ $\frac{1}{2}$

	SECTION – E	
	This section has 3 case study based questions carrying 4 marks each.	
36.	Vaibhav installed a fence around a circular field, with the total cost amounting to ₹ 6,000 at a rate of ₹ 30 per m. He now plans to plough the field. Based on the information given above, answer the following questions : (i) What is the perimeter of the field ? 1 (ii) What is the radius of the field ? 1 (iii) (a) What is the area of the field ? 2 OR (iii) (b) Find the cost of ploughing the field at the rate of ₹ 0.50 per m². 2	
Sol.	(i) Perimeter of the field = $\frac{6000}{30} = 200$ m 1 (ii) Let r be the radius of the field $2\pi r = 200$ m $\Rightarrow r = \frac{200 \times 7}{2 \times 22} = \frac{350}{11} = 31.8$ m (approx.) 1 (iii) (a) Area of the field = $\frac{22}{7} \times \frac{350}{11} \times \frac{350}{11}$ 1 = 3181.8 m² (approx.) 1 OR (iii) (b) Area of the field = $\frac{22}{7} \times \frac{350}{11} \times \frac{350}{11}$ 1 = 3181.8 m² (approx.) ½ Cost of ploughing the field = 3181.8×0.50 = ₹1590.90 (approx.) ½	

37.	A road roller, often called a roller compactor or just a roller, is an engineering vehicle used to compact soil, gravel, concrete, or asphalt in the construction of roads and foundations. Similar machines are also used in landfills or agriculture. Past records of a road roller manufacturing company show that the number of products produced each year forms an Arithmetic Progression (AP). The company produced 270 road rollers in the 4th year and 510 in the 10th year. Based on the information given above, answer the following questions : (i) What was the company's production in the 1st year ? 1 (ii) What was the company's production in the 8th year ? 1 (iii) (a) What was the company's total production of the first 6 years ? 2 OR (iii) (b) Find the ratio of 2nd year's production to 8th year's production. 2	
Sol.	(i) $a + 3d = 270$ (I) $a + 9d = 510$ (II) Solving equations (I) and (II) $a = 150$ $\therefore$ production in first year = 150 (ii) $a + 3d = 270$ (I) $a + 9d = 510$ (II) Solving equations (I) and (II) $d = 40$ $\therefore a_8 = 150 + 280 = 430$ (iii) (a) $S_6 = \frac{6}{2} [2 \times 150 + 5 \times 40]$ $= 1500$ OR (iii) (b) $a_2 = 150 + 40 = 190$ $\therefore a_2 : a_8 = 190 : 430 = 19 : 43$ }	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 1 1 1

38.	A ladder inclined at an angle of 60° to the horizontal is leaning against the vertical wall of the terrace (top) of the building Y. The foot of the ladder is kept fixed at point 'O'. After some time, keeping the same foot fixed, it is made to lean against the terrace (top) of the opposite building X, at an angle of 45° with the ground. Both buildings along with the foot of the ladder, fixed at 'O' are in a straight line.  Based on the information given above, answer the following questions : (i) Find the length of the ladder. 1 (ii) Find the distance of the building X from point 'O', i.e. OC. 1 (iii) (a) Find the horizontal distance between the two buildings. 2 OR (iii) (b) Find the height of the building X. 2	
Sol.	(i) $\frac{12\sqrt{3}}{OP} = \sin 60^\circ = \frac{\sqrt{3}}{2}$ $\Rightarrow$ length of ladder = $OP = 24$ m (ii) $OR = OP = 24$ $\therefore \frac{OC}{24} = \cos 45^\circ = \frac{1}{\sqrt{2}}$ $\Rightarrow OC = 12\sqrt{2}$ m (iii) (a) In $\triangle PAO$, $\frac{12\sqrt{3}}{OA} = \tan 60^\circ = \sqrt{3}$ $\Rightarrow OA = 12$ m	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

	Horizontal distance = $AO + OC = 12(\sqrt{2} + 1)$ m	1
	OR	
	(iii) In $\triangle OCR$, $\frac{CR}{OC} = \tan 45^\circ = 1$	1
	$\Rightarrow CR = OC = 12\sqrt{2}$ m	1