Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2025
MATHEMATICS (Standard) (Q.P. CODE 30/2/3)

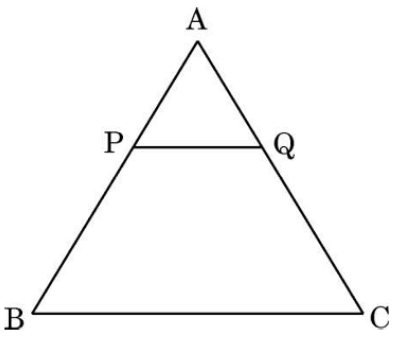
General Instructions: -

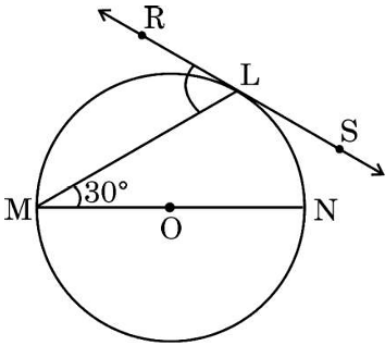
1.	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested 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 IPC."**
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 marks _____80___ (example 0 to 80/70/60/50/40/30 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 un assessed 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.

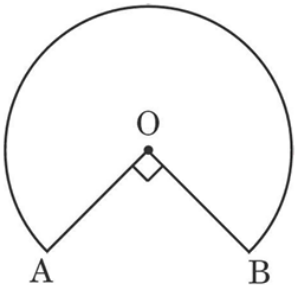
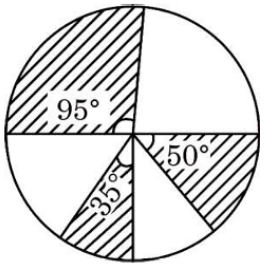
MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/2/3)

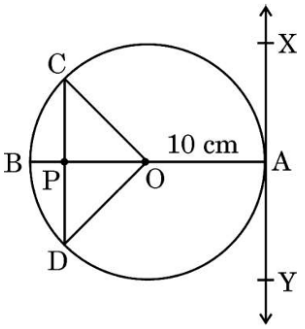
Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A This section has **20** Multiple Choice Questions (MCQs) carrying 1 mark each.	
1.	If for any event E, $P(E) + P(\overline{E}) = q$, then the value of $q^2 - 3$ is : (A) 0 (B) -2 (C) 2 (D) 1	
Sol.	(B) -2	**1**
2.	If $\sin\theta = \cos\theta\ (0° < \theta < 90°)$, then the value of $\sec\theta \cdot \sin\theta$ is : (A) $\frac{1}{\sqrt{2}}$ (B) $\sqrt{2}$ (C) 0 (D) 1	
Sol.	(D) 1	**1**
3.	If an arc of a circle of diameter 10 cm subtends an angle of 144° at the centre of the circle, then the length of the arc is : (A) 2π cm (B) 4π cm (C) 5π cm (D) 6π cm	
Sol.	(B) 4π cm	**1**
4.	If $a^b = 32$, where 'a' and 'b' are positive integers, then the value of b^{ab} is : (A) 72 (B) 5^{10} (C) 2^{10} (D) 5^{12}	
Sol.	(B) 5^{10}	**1**
5.	If one zero of the polynomial $q(x) = (p^2 + 4)x^2 + 65x + 4p$ is reciprocal of the other, then the value of 'p' is : (A) -1 (B) 1 (C) -2 (D) 2	
Sol.	(D) 2	**1**
6.	The equation of a line parallel to y-axis and at a distance of 5 units to the right of y-axis is : (A) $x = 5$ (B) $x = -5$ (C) $y = 5$ (D) $y = -5$	
Sol.	(A) $x = 5$	**1**

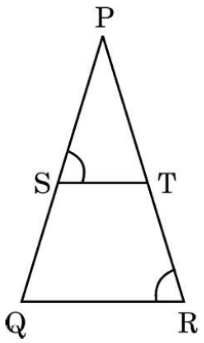
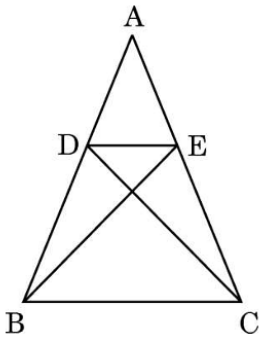
7.	The sum of the exponents of prime factors in the prime factorisation of 4004 is : (A) 5 (B) 4 (C) 3 (D) 2	
Sol.	(A) 5	**1**
8.	The probability of drawing an even prime number out of numbers from 1 to 30 is : (A) $\frac{1}{30}$ (B) $\frac{4}{15}$ (C) $\frac{7}{30}$ (D) 0	
Sol.	(A) $\frac{1}{30}$	**1**
9.	In the given figure, PQ $\|\|$ BC. If $\frac{AP}{PB} = \frac{4}{13}$ and AC = 20·4 cm, then the length of AQ is :  (A) 2·8 cm (B) 5·8 cm (C) 3·8 cm (D) 4·8 cm	
Sol.	(D) 4.8 cm	**1**
10.	The line represented by the equation $x - y = 0$ is : (A) parallel to x-axis (B) parallel to y-axis (C) passing through the origin (D) passing through the point (3, 2)	
Sol.	(C) passing through the origin.	**1**

11.	The points (– 5, 0), (5, 0) and (0, 4) are the vertices of a triangle which is a/an : (A) right-angled triangle (B) isosceles triangle (C) equilateral triangle (D) scalene triangle	
Sol.	(B) isosceles triangle	**1**
12.	The 10^{th} term of the AP $5, \frac{19}{4}, \frac{9}{2}, \frac{17}{4}, \ldots$ is : (A) $\frac{11}{4}$ (B) $\frac{4}{11}$ (C) $\frac{13}{4}$ (D) $\frac{4}{13}$	
Sol.	(A) $\frac{11}{4}$	**1**
13.	In the given figure, RS is the tangent to the circle at the point L and MN is the diameter. If $\angle$ NML = 30°, then $\angle$ RLM is :  (A) 30° (B) 60° (C) 90° (D) 120°	
Sol.	(B) 60°	**1**
14.	The coordinates of the end points of a diameter of a circle are (5, – 2) and (5, 2). The length of the radius of the circle is : (A) ± 2 (B) ± 4 (C) 4 (D) 2	
Sol.	(D) 2	**1**

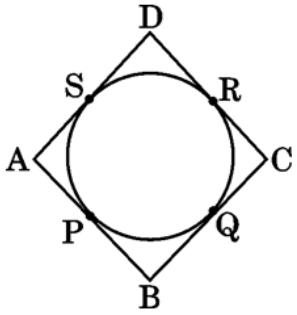
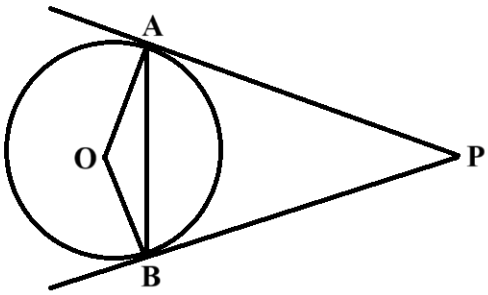
15.	Which of the following statements is ***incorrect*** ? (A) Two congruent figures are always similar. (B) A square and a rhombus of the same area are always similar. (C) Two equilateral triangles are always similar. (D) Two similar triangles need not be congruent.	
Sol.	(B) A square and a rhombus of the same area are always similar.	**1**
16.	The least number which is a perfect square and is divisible by each of 16, 20 and 50, is : (A) 1200 (B) 100 (C) 3600 (D) 2400	
Sol.	The correct option is not available in the given options. Full marks may be awarded to every attempt.	**1**
17.	If $\sin 30° \tan 45° = \frac{\sec 60°}{k}$, then the value of k is : (A) 4 (B) 3 (C) 2 (D) 1	
Sol.	(A) 4	**1**
18.	The quadratic equation whose roots are 7 and $\frac{1}{7}$ is : (A) $7x^2 - 50x + 7 = 0$ (B) $7x^2 - 50x + 1 = 0$ (C) $7x^2 + 50x - 7 = 0$ (D) $7x^2 + 50x - 1 = 0$	
Sol.	(A) $7x^2 - 50x + 7 = 0$	**1**
	*Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (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 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.	*Assertion (A) :* Common difference of the AP : 5, 1, – 3, – 7, … is 4. *Reason (R):* Common difference of the AP : $a_1, a_2, a_3, \ldots, a_n$ is obtained by $d = a_n - a_{n-1}$.	
Sol.	(D) Assertion (A) is false, but Reason (R) is true.	**1**

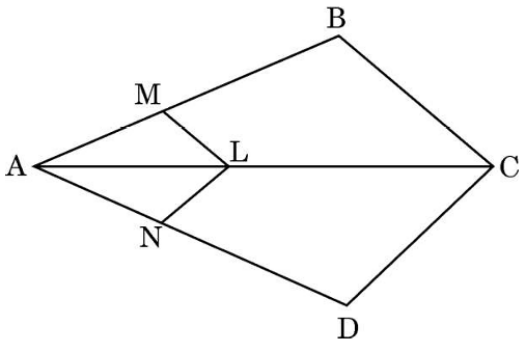
20	*Assertion (A) :* The pair of linear equations $px + 3y + 59 = 0$ and $2x + 6y + 118 = 0$ will have infinitely many solutions if $p = 1$. *Reason (R):* If the pair of linear equations $px + 3y + 19 = 0$ and $2x + 6y + 157 = 0$ has a unique solution, then $p \neq 1$.	
Sol.	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).	**1**
	SECTION B This section has **5** Very Short Answer (VSA) type questions carrying 2 marks each.	
21 (a)	In the given figure, the shape of the top of a table is that of a sector of a circle with centre O and $\angle AOB = 90°$. If AO = OB = 42 cm, then find the perimeter of the top of the table. 	
Sol.	Reflex $\angle AOB = 360° - 90° = 270°$ Perimeter of the top of table = length of major arc + 2 × radius $= \frac{270}{360} \times 2 \times \frac{22}{7} \times 42 + 2 \times 42$ $= 282$ cm	½ **1** ½
	OR	
21 (b)	In the given figure, three sectors of a circle of radius 5 cm, making angles 35°, 50° and 95° at the centre are shaded. Find the area of the shaded region. [Use $\pi = \frac{22}{7}$] 	
Sol.	Area of shaded region $= \frac{95}{360} \times \frac{22}{7} \times (5)^2 + \frac{50}{360} \times \frac{22}{7} \times (5)^2 + \frac{35}{360} \times \frac{22}{7} \times (5)^2$ $= \frac{(95 + 50 + 35)}{360} \times \frac{22}{7} \times (5)^2$ $= \frac{180}{360} \times \frac{22}{7} \times (5)^2$ $= \frac{275}{7}$ cm^2 or 39.29 cm^2 approx.	**1** ½ ½

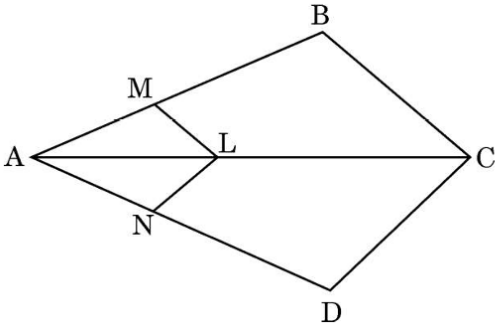
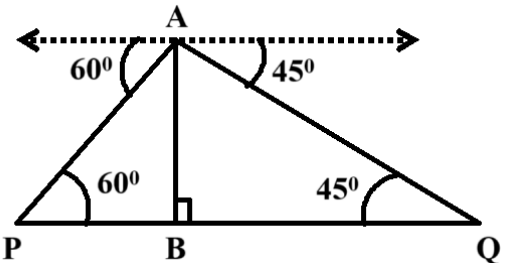
22.	At point A on the diameter AB of a circle of radius 10 cm, tangent XAY is drawn to the circle. Find the length of the chord CD parallel to XY at a distance of 16 cm from A.  	
Sol.	AP = 16 cm ∴ OP = 16 – 10 = 6 cm XY ‖ CD ∴ ∠ CPO = 90° In right Δ OPC, CP = $\sqrt{(10)^2 - (6)^2}$ = 8 cm CD = 2 × CP = 2 × 8 = 16 cm	½ **1** ½
23.	If p and q are zeroes of the polynomial $p(y) = 21y^2 - y - 2$, then find the value of $(1 - p) \cdot (1 - q)$.	
Sol.	p + q = $\frac{1}{21}$ p.q = $\frac{-2}{21}$ (1 – p)(1 – q) = 1 – (p + q) + pq = $1 - \frac{1}{21} - \frac{2}{21}$ = $\frac{18}{21}$ or $\frac{6}{7}$	½ ½ ½ ½
24.	If $\tan A = \sqrt{3}$; where A is an acute angle, then find the value of $\frac{\sin^2 A}{1 + \cos^2 A}$.	
Sol.	$\tan A = \sqrt{3} = \tan 60°$ $\Longrightarrow A = 60°$ $\frac{\sin^2 A}{1+\cos^2 A} = \frac{\sin^2 60°}{1+\cos^2 60°}$ $= \frac{\left(\frac{\sqrt{3}}{2}\right)^2}{1+\left(\frac{1}{2}\right)^2}$ $= \frac{3}{5}$	½ **1** ½

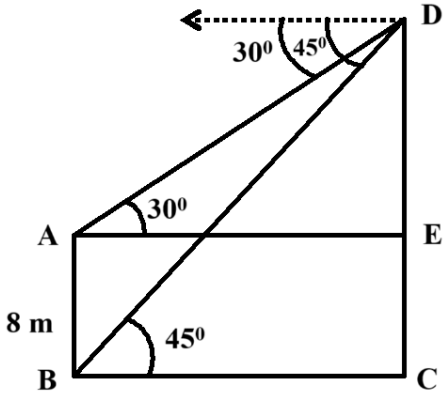
25 (a)	In the given figure, $\frac{PS}{SQ}=\frac{PT}{TR}$ and $\angle$ PST = $\angle$ PRQ. Prove that Δ PQR is an isosceles triangle.  	
Sol.	Given $\frac{PS}{SQ}=\frac{PT}{TR}$ $\Longrightarrow$ ST $\parallel$ QR $\therefore \angle$ PST = $\angle$ PQR and given, $\angle$ PST = $\angle$ PRQ So, $\angle$ PQR = $\angle$ PRQ $\therefore$ ΔPQR is an isosceles triangle.	**1** ½ ½
	OR	
25 (b)	In the given figure, Δ ABE $\cong$ Δ ACD. Prove that Δ ADE ~ Δ ABC.  	
Sol.	Given Δ ABE $\cong$ Δ ACD $\therefore$ AE = AD or AD = AE ---- ① and AB = AC ---- ② Dividing ① by ②, we have $\frac{AD}{AB}=\frac{AE}{AC}$ and $\angle$ DAE = $\angle$ BAC $\therefore$ Δ ADE ~ Δ ABC	½ ½ ½ ½
	SECTION C This section has **6** Short Answer (SA) type questions carrying 3 marks each.	
26 (a)	Prove that : $\sqrt{\sec^2\theta+\operatorname{cosec}^2\theta}=\tan\theta+\cot\theta$	
Sol.	LHS = $\sqrt{\frac{1}{\cos^2\theta}+\frac{1}{\sin^2\theta}}$	½

	$= \frac{1}{\sin\theta.\cos\theta}$ $= \frac{\sin^2\theta + \cos^2\theta}{\sin\theta.\cos\theta}$ $= \frac{\sin^2\theta}{\sin\theta.\cos\theta} + \frac{\cos^2\theta}{\sin\theta.\cos\theta}$ $= \tan\theta + \cot\theta = \text{RHS}$	**1** ½ ½ ½
	OR	
26 (b)	If $\text{cosec}\,\theta = x + \frac{1}{4x}$, prove that $\text{cosec}\,\theta + \cot\theta = 2x$ or $\frac{1}{2x}$.	
Sol.	$\cot^2\theta = \text{cosec}^2\theta - 1 = \left(x + \frac{1}{4x}\right)^2 - 1$ $= \left(x - \frac{1}{4x}\right)^2$ $\Rightarrow \cot\theta = \left(x - \frac{1}{4x}\right)$ or $\left(\frac{1}{4x} - x\right)$ $\text{cosec}\,\theta + \cot\theta = \left(x + \frac{1}{4x}\right) + \left(x - \frac{1}{4x}\right)$ or $\left(x + \frac{1}{4x}\right) + \left(\frac{1}{4x} - x\right)$ $= 2x$ or $\frac{1}{2x}$	**1** ½ ½ ½ + ½
27.	Find the sum of all 3-digit natural numbers which are divisible by 11.	
Sol.	3 – digit natural numbers divisible by 11 are 110, 121, … , 990 Here first term = 110 and common difference = 11 $a_n = 990$ $\Rightarrow 110 + (n-1) \times 11 = 990$ $\Rightarrow n = 81$ $S_{81} = \frac{81}{2} \times [110 + 990]$ $= 44550$	 ½ **1** ½ ½ ½
28.	The length of the hour hand of a clock is 10 cm. Find the area of the minor sector swept by the hour hand of the clock between 5 a.m. to 8 a.m. Also, find the area of the major sector.	
Sol.	Central angle subtended by hour hand between 5 am to 8 am $= \frac{360^\circ}{12} \times 3 = 90^\circ$ Area of minor segment $= \frac{90}{360} \times \frac{22}{7} \times (10)^2$ $= \frac{550}{7}$ or 78.57 cm^2 approx. Area of circle $= \frac{22}{7} \times (10)^2 = \frac{2200}{7}\ \text{cm}^2$ Area of major segment $= \frac{2200}{7} - \frac{550}{7}$ $= \frac{1650}{7}$ or 235.71 cm^2 approx.	½ **1** ½ ½ ½

29 (a)	Prove that the parallelogram circumscribing a circle is a rhombus.	
Sol.	Correct figure  We know that lengths of tangents drawn from an external point to a circle are equal ∴ AP = AS --- ① BP = BQ --- ② CR = CQ --- ③ DR = DS --- ④ Adding ①, ②, ③ and ④, we have (AP + BP) + (CR + DR) = AS + (BQ + CQ) + DS $\Rightarrow$ AB + CD = BC + AD ∵ AB = CD and BC = AD ∴ AB = BC = CD = AD Therefore, ABCD is a rhombus.	½ **1** ½ ½ ½
	OR	
29 (b)	Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.	
Sol.	PA and PB are tangents from the external point P to the circle with centre O. Correct figure  ∠ OAP = ∠ OBP = 90° In quadrilateral OAPB, ∠ APB + ∠ OAP + ∠ OBP + ∠ AOB = 360° $\Rightarrow$ ∠ APB + 90° + 90° + ∠ AOB = 360° $\Rightarrow$ ∠ APB + ∠ AOB = 180° ∴ ∠ APB and ∠ AOB are supplementary.	**1** **1** ½ ½

30.	If the mid-point of the line segment joining the points A(3, 4) and B(k, 6) is P(x, y) and $x + y - 10 = 0$, then find the value of k.	
Sol.	$x = \frac{3+k}{2}$ and $y = \frac{4+6}{2} = 5$ $\therefore \left(\frac{3+k}{2}\right) + 5 - 10 = 0$ $\Longrightarrow k = 7$	½ ½ **1** **1**
31.	Prove that $\sqrt{3}$ is an irrational number.	
Sol.	Let $\sqrt{3}$ be a rational number. $\therefore \sqrt{3} = \frac{p}{q}$, where $q \neq 0$ and let p & q be coprimes. $\Longrightarrow 3q^2 = p^2$ $\Longrightarrow p^2$ is divisible by 3. $\Longrightarrow$ p is divisible by 3. ----- ① Let $p = 3a$, where 'a' is some integer $\therefore 9a^2 = 3q^2$ $\Longrightarrow q^2 = 3a^2$ $\Longrightarrow q^2$ is divisible by 3 $\Longrightarrow$ q is divisible by 3 ----- ② $\therefore$ 3 divides both p & q. ① and ② leads to contradiction as p and q are coprimes. Hence, $\sqrt{3}$ is an irrational number.	½ **1** **1** ½
	SECTION D This section has **4** Long Answer (LA) type questions carrying 5 marks each.	
32.	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. Hence, in the figure given below, prove that $\frac{AM}{MB} = \frac{AN}{ND}$ where LM || CB and LN || CD.  	
Sol.	Correct figure, given, to prove and construction Correct proof	**1½** **1½**

	 In Δ ABC, LM ‖ CB $\frac{AM}{MB} = \frac{AL}{LC}$ --- ① In Δ ADC, LN ‖ CD $\frac{AN}{ND} = \frac{AL}{LC}$ --- ② from ① and ②, we have $\frac{AM}{MB} = \frac{AN}{ND}$	**1** ½ ½
33 (a)	Two ships are sailing in the sea on either side of a lighthouse. The angles of depression to the two ships as observed from the top of the lighthouse are 60° and 45°, respectively. If the distance between the ships is $100\left(\frac{1+\sqrt{3}}{\sqrt{3}}\right)$ m, then find the height of the lighthouse.	
Sol.	Correct figure  Here, AB represents the height of the lighthouse. In right Δ ABP $\frac{AB}{PB} = \tan 60° = \sqrt{3}$ $\Rightarrow PB = \frac{AB}{\sqrt{3}}$ --- ① In right Δ ABQ $\frac{AB}{BQ} = \tan 45° = 1$ $\Rightarrow BQ = AB$ --- ② Adding ① and ②, we have $PB + BQ = \frac{AB}{\sqrt{3}} + AB$ $\Rightarrow PQ = AB\left(\frac{1+\sqrt{3}}{\sqrt{3}}\right)$ $\Rightarrow 100\left(\frac{1+\sqrt{3}}{\sqrt{3}}\right) = AB\left(\frac{1+\sqrt{3}}{\sqrt{3}}\right)$ $\Rightarrow AB = 100$ m	**1** **1** ½ ½ ½ **1** ½
	OR	

33 (b)	The angles of depression of the top and the bottom of an 8 m tall building from the top of another multistoried building are 30° and 45°, respectively. Find the height of the multistoried building and the distance between the two buildings.	
Sol.	Correct figure  Here, CD represents the multistoried building. In right Δ DEA $\frac{DE}{AE} = \tan 30° = \frac{1}{\sqrt{3}}$ $\Rightarrow$ AE = $\sqrt{3}$ DE --- ① In right Δ DCB $\frac{DC}{BC} = \tan 45° = 1$ $\Rightarrow$ BC = DC --- ② From figure, AE = BC $\therefore \sqrt{3}$ DE = DC $\Rightarrow \sqrt{3}$ (DC – 8) = DC $\Rightarrow$ DC = $\frac{8\sqrt{3}}{\sqrt{3}-1}$ = $\frac{8\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$ = (12 + 4$\sqrt{3}$) m From ②, BC = (12 + 4$\sqrt{3}$) m	**1** **1** ½ ½ ½ ½ ½ ½

34. Find the Mean and Mode of the following data :

Class	*Frequency*
4 – 8	2
8 – 12	12
12 – 16	15
16 – 20	25
20 – 24	18
24 – 28	12
28 – 32	13
32 – 36	3

Sol.

Class	frequency (f_i)	x_i	$u_i = \frac{x_i - 22}{4}$	$f_i u_i$
4 – 8	2	6	– 4	– 8
8 – 12	12	10	– 3	– 36
12 – 16	15	14	– 2	– 30
16 – 20	25	18	– 1	– 25
20 – 24	18	22 = a	0	0
24 – 28	12	26	1	12
28 – 32	13	30	2	26
32 – 36	3	34	3	9
Total	100			– 52

Correct table **1½**

Mean = $22 + \frac{(-52)}{100} \times 4$ **1**

= 19.92 **½**

Modal Class is 16 – 20 **½**

Mode = $16 + \left(\frac{25-15}{2\times25-15-18}\right) \times 4$ **1**

= $\frac{312}{17}$ or 18.35 approx. **½**

35 (a) The numerator of a fraction is 3 less than its denominator. If 2 is added to both numerator and denominator, then the sum of the new fraction and the original fraction is $1\frac{9}{20}$. Find the original fraction.

Sol.

Let denominator be x

∴ Numerator = (x – 3)

Therefore, fraction = $\frac{x-3}{x}$ **1**

ATQ

$\frac{x-3}{x} + \frac{x-3+2}{x+2} = \frac{29}{20}$ **1**

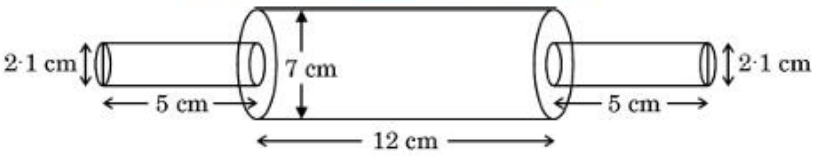
$\Rightarrow 11x^2 - 98x - 120 = 0$ **1**

$\Rightarrow (x - 10)(11x + 12) = 0$ **½**

So, x = 10 **½**

∴ Fraction = $\frac{7}{10}$ **1**

OR

35 (b)	A train travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same distance if its speed were 5 km/h more. Find the original speed of the train.	
Sol.	Let the original speed of train be 'x' km/h ATQ $\frac{360}{x} - \frac{360}{x+5} = \frac{48}{60}$ $\Rightarrow x^2 + 5x - 2250 = 0$ $\Rightarrow (x + 50)(x - 45) = 0$ So, $x = 45$ $\therefore$ Original speed of the train is 45 km/h.	**2** **1** **1** **1**
	SECTION E This section has **3** case study based questions carrying 4 marks each.	
36.	**Case Study – 1** A skilled carpenter decided to craft a special rolling pin for the local baker. He carefully joined three cylindrical pieces of wood – two small ones on the ends and one larger in the centre to create a perfect tool. The baker loved the rolling pin, as it rolled out the smoothest dough for breads and pastries.   The length of the bigger cylindrical part is 12 cm and diameter is 7 cm and the length of each smaller cylindrical part is 5 cm and diameter is 2·1 cm. Based on the above information, answer the following questions : (i) Find the volume of the bigger cylindrical part. (ii) Find the curved surface area of the bigger cylindrical part. (iii) (a) Find the ratio of the volume of the bigger cylindrical part to the total volume of the two smaller (identical) cylindrical parts. **OR** (b) Find the sum of the curved surface areas of the two identical smaller cylindrical parts.	
Sol.	(i) Volume of the bigger cylindrical part $= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$ $= 462\ cm^3$ (ii) The Curved Surface Area of bigger cylindrical part $= 2 \times \frac{22}{7} \times \frac{7}{2} \times 12$ $= 264\ cm^2$	½ ½ ½ ½

	(iii) (a) Total volume of the two smaller cylindrical parts = $2 \times \frac{22}{7} \times \frac{2.1}{2} \times \frac{2.1}{2} \times 5$ $= 34.65\ cm^3$ Required ratio = $\frac{462}{34.65} = \frac{3080}{231}$ ∴ Required ratio is 3080:231 **OR** (b) The Sum of Curved Surface Area of two smaller cylindrical parts = $2 \times 2 \times \frac{22}{7} \times \frac{2.1}{2} \times 5$ $= 66\ cm^2$	½ ½ **1** **1** **1**
37.	**Case Study – 2** A school is organizing a grand cultural event to show the talent of its students. To accommodate the guests, the school plans to rent chairs and tables from a local supplier. It finds that rent for each chair is ₹ 50 and for each table is ₹ 200. The school spends ₹ 30,000 for renting the chairs and tables. Also, the total number of items (chairs and tables) rented are 300.  **If the school rents 'x' chairs and 'y' tables, answer the following questions :** (i) Write down the pair of linear equations representing the given information. (ii) (a) Find the number of chairs and number of tables rented by the school. **OR** (b) If the school wants to spend a maximum of ₹ 27,000 on 300 items (tables and chairs), then find the number of chairs and tables it can rent.	
Sol.	(i) $x + y = 300$ and $50x + 200y = 30000$ or $x + 4y = 600$ (ii) (a) $x + y = 300$ and $x + 4y = 600$ Solving the equations, we get $x = 200$ and $y = 100$ ∴ Number of chairs and tables rented by the school are 200 and 100 respectively. **OR**	½ ½ **1 + 1**

	(b) $x + y = 300$ and $50x + 200y = 27000$ or $x + 4y = 540$ Solving the equations, we get $x = 220$ and $y = 80$ ∴ Number of chairs and tables rented by the school are 220 and 80 respectively. (iii) Number of tables = $\frac{30000}{200} = 150$ ∴ Maximum number of tables that can be rented is 150 if no chairs are rented.	**1** **½ + ½** **1**
38.	**Case Study – 3** Rahul is a lucky charm for his cricket team. He has a jar of cards with numbers from 10 to 74. Before each match, he draws a card from the jar. If the card bears an even number, the team wins. If the number is even and divisible by 5, they win by a big margin. If the number is an odd number less than 30, they win by a small margin. And if the number is a prime number between 50 and 74, they lose.  Answer the following questions if Rahul draws a card today : (i) What is the probability that Rahul draws a card with an even number ? (ii) What is the probability that Rahul draws a card with an odd number less than 30 ? (iii) (a) What is the probability that Rahul draws a card with a prime number between 50 and 74 ? **OR** (b) What is the probability that Rahul draws a card with an even number divisible by 5 ?	
Sol.	(i) Total possible outcomes = 74 – 10 + 1 = 65 P (even number) = $\frac{33}{65}$ (ii) P (odd number less than 30) = $\frac{10}{65}$ or $\frac{2}{13}$ (iii) (a) Favourable outcomes are 53, 59, 61, 67, 71, 73 Number of favourable = 6 P (prime number between 50 and 74) = $\frac{6}{65}$ **OR**	**½** **½** **1** **1** **1**

	(b) Favourable outcomes are 10, 20, 30, 40, 50, 60, 70 Number of favourble outcomes = 7 P (even number divisble by 5) = $\frac{7}{65}$	 **1** **1**