<table>
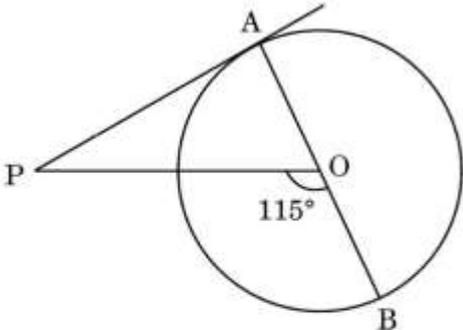<tr><td colspan="2" align="center">Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2025
MATHEMATICS (Standard) (Q.P. CODE 30/1/2)</td></tr>
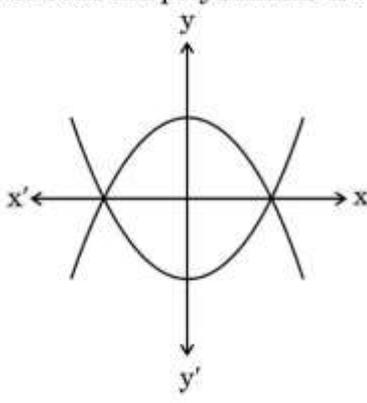<tr><td colspan="2"><u>General Instructions: -</u></td></tr>
<tr><td>1.</td><td>You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, 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.</td></tr>
<tr><td>2.</td><td>"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."</td></tr>
<tr><td>3.</td><td>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 two 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.</td></tr>
<tr><td>4.</td><td>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.</td></tr>
<tr><td>5.</td><td>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.</td></tr>
<tr><td>6.</td><td>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.</td></tr>
<tr><td>7.</td><td>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.</td></tr>
<tr><td>8.</td><td>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.</td></tr>
</table>

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.

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A	
	This section has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.	
1.	In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle$ POB = 115°, then $\angle$ APO is equal to : (A) 25° (B) 65° (C) 90° (D) 35°	
Sol.	(A) 25°	**1**
2.	A piece of wire 20 cm long is bent into the form of an arc of a circle of radius $\frac{60}{\pi}$ cm. The angle subtended by the arc at the centre of the circle is : (A) 30° (B) 60° (C) 90° (D) 50°	
Sol.	(B) 60°	**1**
3.	Three numbers in AP have the sum 30. What is its middle term ? (A) 4 (B) 10 (C) 16 (D) 8	
Sol.	(B) 10	**1**

4.	An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm^2. Its radius is : (A) 10 cm (B) 1 cm (C) 5 cm (D) 8 cm	
Sol.	(D) 8 cm	**1**
5.	If x = 1 and y = 2 is a solution of the pair of linear equations $2x - 3y + a = 0$ and $2x + 3y - b = 0$, then : (A) a = 2b (B) 2a = b (C) a + 2b = 0 (D) 2a + b = 0	
Sol.	(B) 2a = b	**1**
6.	Two polynomials are shown in the graph below. The number of distinct zeroes of both the polynomials is : (A) 3 (B) 5 (C) 2 (D) 4	
Sol.	(C) 2	**1**
7.	If $\alpha + \beta = 90°$ and $\alpha = 2\beta$, then $\cos^2\alpha + \sin^2\beta$ is equal to : (A) 0 (B) $\dfrac{1}{2}$ (C) 1 (D) 2	
Sol.	(B) $\dfrac{1}{2}$	**1**

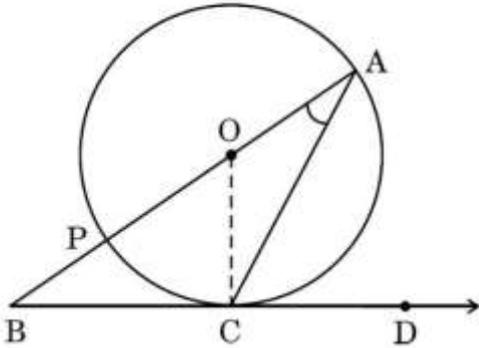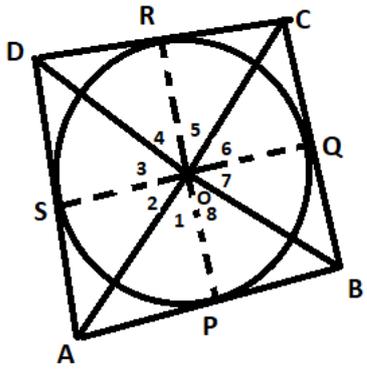|		
8.	A card is selected at random from a deck of 52 playing cards. The probability of it being a red face card is : (A) $\dfrac{3}{13}$ (B) $\dfrac{2}{13}$ (C) $\dfrac{1}{2}$ (D) $\dfrac{3}{26}$	
Sol.	(D) $\dfrac{3}{26}$	**1**
9.	If α and β are the zeroes of polynomial $3x^2 + 6x + k$ such that $\alpha + \beta + \alpha\beta = -\dfrac{2}{3}$, then the value of k is : (A) -8 (B) 8 (C) -4 (D) 4	
Sol.	(D) 4	**1**
10.	The value of $\tan^2 \theta - \left(\dfrac{1}{\cos \theta} \times \sec \theta \right)$ is : (A) 1 (B) 0 (C) -1 (D) 2	
Sol.	(C) -1	**1**
11.	Which of the following is a rational number between $\sqrt{3}$ and $\sqrt{5}$? (A) $1\cdot4142387954012\ldots.$ (B) $2\cdot32\overline{6}$ (C) π (D) $1\cdot857142$	
Sol.	(D) 1.857142	**1**
12.	If HCF(98, 28) = m and LCM(98, 28) = n, then the value of $n - 7m$ is : (A) 0 (B) 28 (C) 98 (D) 198	
Sol.	(C) 98	**1**

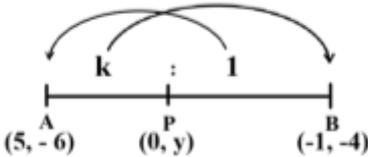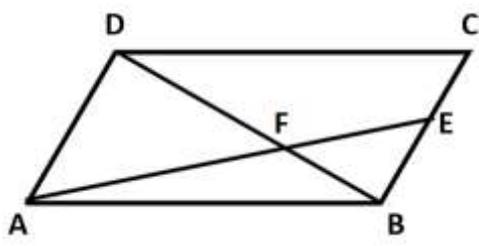|		
13.	If the length of a chord of a circle is equal to its radius, then the angle subtended by chord at the centre is : (A) 60° (B) 30° (C) 120° (D) 90°	
Sol.	(A) 60°	**1**
14.	The greatest number which divides 70 and 125, leaving remainders 5 and 8 respectively, is : (A) 13 (B) 65 (C) 875 (D) 1750	
Sol.	(A) 13	**1**
15.	A ladder 14 m long leans against a wall. If the foot of the ladder is 7 m from the wall, then the angle of elevation of the top of the wall is : (A) 15° (B) 30° (C) 45° (D) 60°	
Sol.	(D) 60°	**1**
16.	In triangles ABC and DEF, $\angle$ B = $\angle$ E, $\angle$ F = $\angle$ C and AB = 3 DE. Then, the two triangles are : (A) congruent but not similar (B) congruent as well as similar (C) neither congruent nor similar (D) similar but not congruent	
Sol.	(D) similar but not congruent	**1**
17.	The mid-point of the line segment joining the points P(– 4, 5) and Q(4, 6) lies on : (A) x-axis (B) y-axis (C) origin (D) neither x-axis nor y-axis	
Sol.	(B) y – axis	**1**

18.	Mode and Mean of a data are 15x and 18x, respectively. Then the median of the data is :	
	(A) x	
	(B) 11x	
	(C) 17x	
	(D) 34x	
Sol.	(C) 17x	**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) : If we join two hemispheres of same radius along their bases, then we get a sphere.	
	Reason (R): Total Surface Area of a sphere of radius r is $3\pi r^2$.	
Sol.	(C) Assertion (A) is true, but Reason (R) is false.	**1**
20.	Assertion (A) : The probability of selecting a number at random from the numbers 1 to 20 is 1.	
	Reason (R): For any event E, if $P(E) = 1$, then E is called a sure event.	
Sol.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	**1**

SECTION B

This section has **5** Very Short Answer (VSA) type questions carrying **2** marks each.

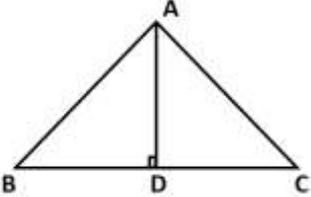| 21.	If the zeroes of the polynomial $x^2 + ax + b$ are in the ratio $3 : 4$, then prove that $12a^2 = 49b$.	
Sol.	Let the zeroes are 3α and 4α	
	$3\alpha + 4\alpha = -a$	
	$\Rightarrow 7\alpha = -a$	½
	Also, $12\alpha^2 = b$	½
	$LHS = 12a^2 = 12(-7\alpha)^2 = 49 \times 12(\alpha)^2 = 49b = RHS$	1

22.	A person is standing at P outside a circular ground at a distance of 26 m from the centre of the ground. He found that his distances from the points A and B on the ground are 10 m (PA and PB are tangents to the circle). Find the radius of the circular ground.	
Sol.	$\angle$ OAP = 90°	½
	In right Δ OAP,	
	$(26)^2 = OA^2 + (10)^2$	**1**
	$\Rightarrow OA = \sqrt{576}= 24$	½
	$\therefore$ radius = 24 m	
23 (a)	If Δ ABC $\sim$ Δ PQR in which AB = 6 cm, BC = 4 cm, AC = 8 cm and PR = 6 cm, then find the length of (PQ + QR).	
Sol.	$\dfrac{6}{PQ} = \dfrac{4}{QR} = \dfrac{8}{6}$	½
	$\Rightarrow PQ = \dfrac{9}{2}$ cm or 4.5 cm	½
	and QR = 3 cm	½
	$\therefore$ PQ + QR = 7.5cm	½
	OR	
23 (b)	In the given figure, $\dfrac{QR}{QS} = \dfrac{QT}{PR}$ and $\angle 1 = \angle 2$, show that Δ PQS $\sim$ Δ TQR.	
Sol.	In Δ PQR, $\angle 1 = \angle 2 \therefore$ PR = PQ	½
	$\therefore \dfrac{QR}{QS} = \dfrac{QT}{PR} \Rightarrow \dfrac{QR}{QS} = \dfrac{QT}{PQ}$	½
	Also, $\angle 1 = \angle 1$	½
	$\therefore \Delta$ PQS $\sim$ Δ TQR	½
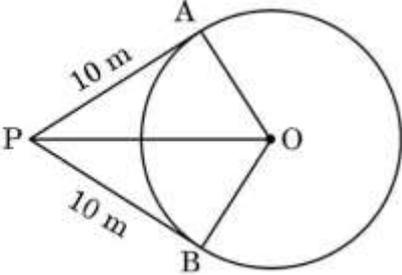
24 (a)	If $x \cos 60° + y \cos 0° + \sin 30° - \cot 45° = 5$, then find the value of $x + 2y$.	
Sol.	$x\left(\dfrac{1}{2}\right) + y(1) + \dfrac{1}{2} - 1 = 5$	1½
	$\implies x + 2y = 11$	½
	OR	
24 (b)	Evaluate : $\dfrac{\tan^2 60°}{\sin^2 60° + \cos^2 30°}$	
Sol.	$\dfrac{\left(\sqrt{3}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2}$	1½
	$= 2$	½
25.	The coordinates of the centre of a circle are $(2a, a - 7)$. Find the value(s) of 'a' if the circle passes through the point $(11, -9)$ and has diameter $10\sqrt{2}$ units.	
Sol.	radius $= 5\sqrt{2}$ units	½
	$(2a - 11)^2 + (a - 7 + 9)^2 = 50$	½
	$\implies a^2 - 8a + 15 = 0$	½
	$\implies (a - 5)(a - 3) = 0$	
	$\implies a = 5, 3$	½

SECTION C
This section has **6** Short Answer (SA) type questions carrying **3** marks each.

26.	If the radii of the bases of a cylinder and a cone are in the ratio 3 : 4 and their heights are in the ratio 2 : 3, find the ratio of their volumes.	
Sol.	Let radius of cylinder $= r_1$ & height of cylinder $= h_1$ Let radius of cone $= r_2$ & height of cone $= h_2$ $\dfrac{r_1}{r_2} = \dfrac{3}{4}, \quad \dfrac{h_1}{h_2} = \dfrac{2}{3}$ $\dfrac{volume\ of\ cylinder}{volume\ of\ cone} = \dfrac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = 3 \times \left(\dfrac{r_1}{r_2}\right)^2 \times \left(\dfrac{h_1}{h_2}\right)$	1
	$\qquad\qquad = 3 \times \left(\dfrac{3}{4}\right)^2 \times \left(\dfrac{2}{3}\right)$	1
	$\qquad\qquad = \dfrac{9}{8}$	1
	Hence, required ratio is 9:8	

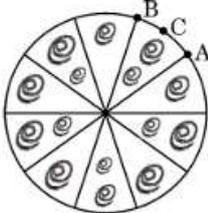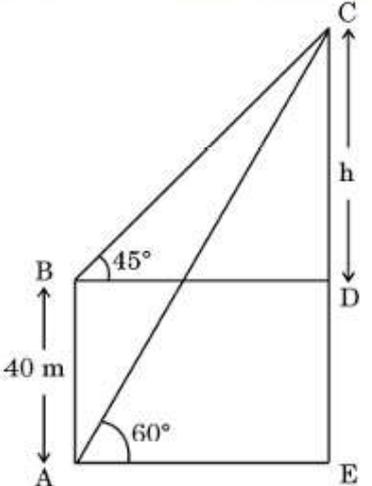|		
27.	Three sets of Physics, Chemistry and Mathematics books have to be stacked in such a way that all the books are stored subject-wise and the height of each stack is the same. The number of Physics books is 144, the number of Chemistry books is 180 and the number of Mathematics books is 192. Assuming that the books are of same thickness, determine the number of stacks of Physics, Chemistry and Mathematics books.	
Sol.	$144 = 2^4 \times 3^2$ $180 = 2^2 \times 3^2 \times 5$ $192 = 2^6 \times 3$ HCF $= 2^2 \times 3 = 12$ Number of stacks of Physics Books $= \dfrac{144}{12} = 12$ Number of stacks of Chemistry Books $= \dfrac{180}{12} = 15$ Number of stacks of Mathematics Books $= \dfrac{192}{12} = 16$	1½ ½ 1
28	Two dice are thrown at the same time. Determine the probability that the difference of the numbers on the two dice is 2.	
Sol.	Total outcomes = 36 Number of Outcomes with difference of the numbers on the two dice is 2 = 8 (1,3) (3,1) (4,2) (2,4) (5,3) (3,5) (4,6) (6,4) P (difference of the numbers on the two dice is 2) $= \dfrac{8}{36}$ or $\dfrac{2}{9}$	1 1 1
29 (a)	Prove that : $\dfrac{\tan \theta}{1 - \cot \theta} + \dfrac{\cot \theta}{1 - \tan \theta} = 1 + \sec \theta \, \mathrm{cosec}\, \theta$	
Sol.	LHS $= \dfrac{\tan \theta}{1 - \cot \theta} + \dfrac{\cot \theta}{1 - \tan \theta}$ $= \dfrac{\dfrac{\sin \theta}{\cos \theta}}{1 - \dfrac{\cos \theta}{\sin \theta}} + \dfrac{\dfrac{\cos \theta}{\sin \theta}}{1 - \dfrac{\sin \theta}{\cos \theta}}$ $= \dfrac{\sin^2 \theta}{\cos \theta (\sin \theta - \cos \theta)} - \dfrac{\cos^2 \theta}{\sin \theta (\sin \theta - \cos \theta)}$ $= \dfrac{1}{(\sin \theta - \cos \theta)} \left[\dfrac{\sin^3 \theta - \cos^3 \theta}{\sin \theta \cos \theta} \right]$ $= \dfrac{(\sin \theta - \cos \theta)(\sin^2 \theta + \sin \theta \cos \theta + \cos^2 \theta)}{(\sin \theta - \cos \theta) \sin \theta \cos \theta}$ $= \dfrac{(1 + \sin \theta \cos \theta)}{\sin \theta \cos \theta}$ $= 1 + \sec \theta \, \mathrm{cosec}\, \theta = $ RHS	½ 1 ½ ½ ½
	OR	
29 (b)	Prove that : $\dfrac{\sin A + \cos A}{\sin A - \cos A} + \dfrac{\sin A - \cos A}{\sin A + \cos A} = \dfrac{2}{2 \sin^2 A - 1}$	
Sol.	LHS $= \dfrac{\sin A + \cos A}{\sin A - \cos A} + \dfrac{\sin A - \cos A}{\sin A + \cos A}$	

	$= \dfrac{(\sin A + \cos A)^2 + (\sin A - \cos A)^2}{(\sin A - \cos A)(\sin A + \cos A)}$		1
	$= \dfrac{\sin^2 A + \cos^2 A + 2\sin A \cos A + \sin^2 A + \cos^2 A - 2\sin A \cos A}{\sin^2 A - \cos^2 A}$		1
	$= \dfrac{1+1}{\sin^2 A - (1 - \sin^2 A)}$		½
	$= \dfrac{2}{2\sin^2 A - 1} = \text{RHS}$		½
30 (a)	In the given figure, O is the centre of the circle and BCD is tangent to it at C. Prove that ∠ BAC + ∠ ACD = 90°.		
Sol.	In Δ OAC, OA = OC ⟹ ∠ OCA = ∠ OAC Now, ∠ OCD = 90° ⟹ ∠ OCA + ∠ ACD = 90° ⟹ ∠ OAC + ∠ ACD = 90° or ∠ BAC + ∠ ACD = 90°		1 1 ½ ½
	OR		
30 (b)	Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.		
Sol.	Correct Figure Δ OAP ≅ Δ OAS ∴ ∠ 1 = ∠ 2 Similarly, ∠ 3 = ∠ 4 , ∠ 5 = ∠ 6 , ∠ 7 = ∠ 8 Also, ∠ 1 + ∠ 2 + ∠ 3 + ∠ 4 + ∠ 5 + ∠ 6 + ∠ 7 + ∠ 8 = 360°		½ 1 ½

	$\Rightarrow 2(\angle 1 + \angle 4 + \angle 5 + \angle 8) = 360°$	½
	$\Rightarrow \angle AOB + \angle COD = 180°$	½
	Similarly, $\angle BOC + \angle AOD = 180°$	
31.	Find the ratio in which the y-axis divides the line segment joining the points $(5, -6)$ and $(-1, -4)$. Also find the point of intersection.	
Sol.	Let the ratio be k:1 and point on y- axis be P(0, y)	½
	$0 = \dfrac{-k+5}{k+1}$	
	$k = 5$	1
	Hence, ratio is 5:1	½
	$y = \dfrac{-4(5)-6}{5+1} = \dfrac{-26}{6} = \dfrac{-13}{3}$	½
	Coordinates of point of intersection are $P\left(0, -\dfrac{13}{3}\right)$	½
	SECTION D This section has **4** Long Answer (LA) type questions carrying **5** marks each.	
32 (a)	The diagonal BD of a parallelogram ABCD intersects the line segment AE at the point F, where E is any point on the side BC. Prove that DF × EF = FB × FA.	
Sol.	Correct figure	1
	In Δ ADF and Δ EBF, $\angle DFA = \angle EFB$ $\angle ADF = \angle FBE$ ∴ Δ ADF ~ Δ EBF	2
	∴ $\dfrac{DF}{FB} = \dfrac{FA}{EF}$	1
	$\Rightarrow DF \times EF = FB \times FA$	1
	OR	

32 (b)	In $\triangle$ ABC, if AD $\perp$ BC and AD^2 = BD $\times$ DC, then prove that $\angle$ BAC = 90°.		
Sol.			
		Correct figure	**1**
	AD^2 = BD $\times$ DC		
	$\dfrac{AD}{DC} = \dfrac{BD}{AD}$		**1**
	Also, $\angle$ ADB = $\angle$ ADC		
	$\therefore$ $\triangle$ DBA ~ $\triangle$ DAC		**1**
	$\angle$ DBA = $\angle$ DAC		
	$\angle$ BAD = $\angle$ DCA		**1**
	Adding both		
	$\angle$ DBA + $\angle$ DCA = $\angle$ DAC + $\angle$ BAD		
	$\therefore$ $\angle$ BAC = 90°		**1**
33.	The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the mean and mode of the data :		

Monthly Consumption (in units)	Number of Consumers
65 – 85	4
85 – 105	5
105 – 125	13
125 – 145	20
145 – 165	14
165 – 185	8
185 – 205	4

Sol.

Monthly Consumption (in units)	f_i	x_i	$u_i = \dfrac{x_i - 135}{h}$	$f_i u_i$
65-85	4	75	-3	-12
85-105	5	95	-2	-10
105-125	13	115	-1	-13
125-145	20	135=a	0	0
145-165	14	155	1	14
165-185	8	175	2	16
185-205	4	195	3	12
Total	68			7

	Correct Table	**1½**

	Mean $= 135 + \frac{7}{68} \times 20$	**1**
	$\quad = 137.06$	½
	Modal Class is 125-145	½
	Mode $= 125 + \left(\frac{20-13}{40-13-14}\right) \times 20$	**1**
	$\quad = 135.77$	½
	Hence, Mean = 137.06 units and Mode = 135.77 units	
34.	Vijay invested certain amounts of money in two schemes A and B, which offer interest at the rate of 8% per annum and 9% per annum, respectively. He received ₹ 1,860 as the total annual interest. However, had he interchanged the amounts of investments in the two schemes, he would have received ₹ 20 more as annual interest. How much money did he invest in each scheme ?	
Sol.	Let Vijay invested ₹ x at 8% rate of interest & ₹ y at 9% rate of interest ATQ,	
	$\frac{8x}{100} + \frac{9y}{100} = 1860$	**1½**
	or $\quad 8x + 9y = 186000$ …………..(i)	
	$\frac{9x}{100} + \frac{8y}{100} = 1880$	**1½**
	or $\quad 9x + 8y = 188000$ …………..(ii) On solving (i) and (ii), we get	
	x = 12000	**1**
	y = 10000	**1**
	Hence, money invested in scheme A is ₹ 12000 and scheme B is ₹ 10000.	
35 (a)	A two-digit number is such that the product of its digits is 12. When 36 is added to this number, the digits interchange their places. Find the number.	
Sol.	Let unit digit be y and ten's digit = x hence, the two digit number = 10x + y,	½
	ATQ	
	xy = 12 ….. (i)	½
	$10x + y + 36 = 10y + x$	**1**
	$x - y + 4 = 0$ ……. (ii)	
	From (i) and (ii)	
	$x^2 + 4x - 12 = 0$	**1**
	$(x + 6)(x - 2) = 0$	½
	Hence, $x = 2$	½
	and $y = 6$	½
	∴ Number = 26	½
	OR	

35 (b)	A student scored a total of 32 marks in class tests in Mathematics and Science. Had he scored 2 marks less in Science and 4 marks more in Mathematics, the product of his marks would have been 253. Find his marks in the two subjects.	
Sol.	Let marks scored in Mathematics be x and marks scored in Science be y ATQ, $x + y = 32$ …… (i) $and\ (x + 4)(y - 2) = 253$ ….. (ii) from (i) and (ii) $x^2 - 26x + 133 = 0$ $(x - 19)(x - 7) = 0$ $x = 19, 7$ $x = 19 \Longrightarrow y = 13$ ⎤ $x = 7 \Longrightarrow y = 25$ ⎦ Hence, marks in Mathematics and Science are 19, 13 or 7, 25	**1** **1** **1** **1** **½** **½**

<div align="center">

SECTION E

This section has **3** case study based carrying **4** marks each.

</div>

36.	**Case Study – 1** A brooch is a decorative piece often worn on clothing like jackets, blouses or dresses to add elegance. Made from precious metals and decorated with gemstones, brooches come in many shapes and designs. One such brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in the figure. Based on the above given information, answer the following questions : (i) Find the central angle of each sector. (ii) Find the length of the arc ACB. (iii) (a) Find the area of each sector of the brooch. **OR** (iii) (b) Find the total length of the silver wire used.	
Sol.	(i) central angle $= \dfrac{360^0}{10} = 36°$	**1**

	(ii) length of arc ACB $= \frac{1}{10} \times 2 \times \frac{22}{7} \times \frac{35}{2} = 11$ mm		**1**
	(iii)(a) Area of each sector of the brooch $= \frac{1}{10} \times \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2}$		**1**
	$= \frac{385}{4}$ mm^2 or 96.25 mm^2		**1**
	OR		
	(iii) (b) length of silver wire used $= 2 \times \frac{22}{7} \times \frac{35}{2} + 5 \times 35$		**1**
	$= 285$ mm		**1**
37.	**Case Study – 2** Amrita stood near the base of a lighthouse, gazing up at its towering height. She measured the angle of elevation to the top and found it to be 60°. Then, she climbed a nearby observation deck, 40 metres higher than her original position and noticed the angle of elevation to the top of lighthouse to be 45°. Based on the above given information, answer the following questions : (i) If CD is h metres, find the distance BD in terms of 'h'. (ii) Find distance BC in terms of 'h'. (iii) (a) Find the height CE of the lighthouse [Use $\sqrt{3} = 1.73$] **OR** (iii) (b) Find distance AE, if AC = 100 m.		
Sol.	(i) $\frac{h}{BD} = \tan 45° = 1$		**½**
	$\implies$ BD = h m		**½**
	(ii) $\frac{h}{BC} = \sin 45° = \frac{1}{\sqrt{2}}$		**½**
	$\implies$ BC = $\sqrt{2}$h m		**½**

	(iii)(a) $\tan 60° = \dfrac{EC}{AE}$		
	$\Rightarrow \sqrt{3} = \dfrac{h+40}{h}$		1
	$\Rightarrow$ h = 20 ($\sqrt{3}$ + 1) = 20 × 2.73 = 54.6 m		½
	$\therefore$ CE = 54.6 + 40 = 94.6 m		½
	OR		
	(iii)(b) $\cos 60° = \dfrac{AE}{AC}$		
	$\Rightarrow \dfrac{1}{2} = \dfrac{AE}{100}$		1
	$\therefore$ AE = 50 m		1

38.	**Case Study – 3**	
	A school is organizing a charity run to raise funds for a local hospital. The run is planned as a series of rounds around a track, with each round being 300 metres. To make the event more challenging and engaging, the organizers decide to increase the distance of each subsequent round by 50 metres. For example, the second round will be 350 metres, the third round will be 400 metres and so on. The total number of rounds planned is 10.	
	Based on the information given above, answer the following questions :	
	(i) Write the fourth, fifth and sixth term of the Arithmetic Progression so formed.	
	(ii) Determine the distance of the 8th round.	
	(iii) (a) Find the total distance run after completing all 10 rounds.	
	OR	
	(iii) (b) If a runner completes only the first 6 rounds, what is the total distance run by the runner ?	
Sol.	A.P formed is 300, 350, 400……	
	(i) $a_4 = 450$	
	$a_5 = 500$	1
	$a_6 = 550$	
	(ii) $a_8 = 300 + 7 × 50$	½
	= 650 m	½

	(iii) (a) $S_{10} = \frac{10}{2} \times (2 \times 300 + 9 \times 50)$	**1**
	$\qquad = 5250$ m	**1**
	OR	
	(iii) (b) $S_6 = \frac{6}{2} \times (2 \times 300 + 5 \times 50)$	**1**
	$\qquad = 2250$ m	**1**