Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2025
MATHEMATICS (Standard) (Q.P. CODE 30/4/1)

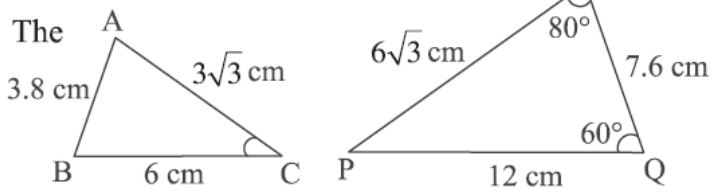
General Instructions: -

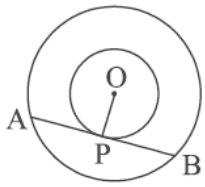
1.	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested 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.

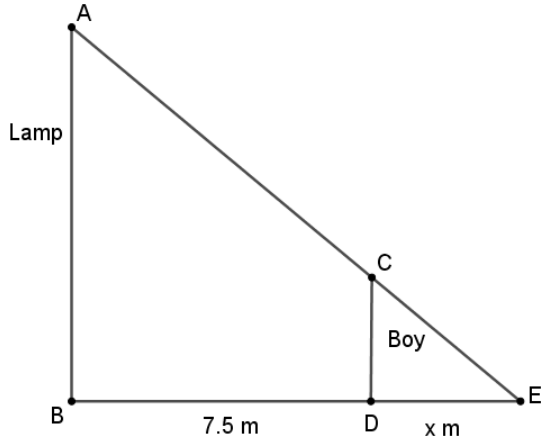
9.	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note "Extra Question".
10.	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11.	A full scale of marks _____ (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.

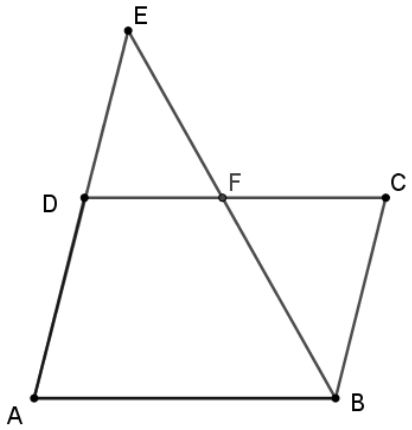
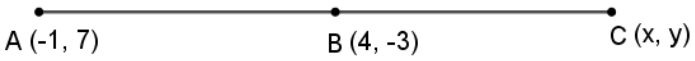
MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/4/1)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION - A **This section consists of 20 questions of 1 mark each.**	
1.	If $x = ab^3$ and $y = a^3b$, where a and b are prime numbers, then [HCF (x, y) – LCM (x, y)] is equal to : (a) $1 - a^3b^3$ (b) $ab\,(1 - ab)$ (c) $ab - a^4b^4$ (d) $ab\,(1 - ab)\,(1 + ab)$	
Sol.	(d) $ab(1 - ab)(1 + ab)$	**1**
2.	$\left(1+\sqrt{3}\right)^2 - \left(1-\sqrt{3}\right)^2$ is : (a) a positive rational number. (b) a negative integer. (c) a positive irrational number. (d) a negative irrational number.	
Sol.	(c) a positive irrational number	**1**
3.	The value of 'a' for which $ax^2 + x + a = 0$ has equal and positive roots is : (a) 2 (b) -2 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$	
Sol.	(d) $-\frac{1}{2}$	**1**
4.	The distance of a point A from x-axis is 3 units. Which of the following cannot be coordinates of the point A ? (a) (1, 3) (b) (– 3, – 3) (c) (– 3, 3) (d) (3, 1)	
Sol.	(d) (3, 1)	**1**
5.	The number of red balls in a bag is 10 more than the number of black balls. If the probability of drawing a red ball at random from this bag is $\frac{3}{5}$, then the total number of balls in the bag is : (a) 50 (b) 60 (c) 80 (d) 40	
Sol.	(a) 50	**1**
6.	The value of 'p' for which the equations $px + 3y = p - 3$, $12x + py = p$ has infinitely many solutions is : (a) – 6 only (b) 6 only (c) ± 6 (d) Any real number except ± 6	
Sol.	(b) 6 only	**1**

7.	ΔABC and ΔPQR are shown in the adjoining figures. The measure of $\angle C$ is : (a) 140° (b) 80° (c) 60° (d) 40° 	
Sol.	(d) 40°	**1**
8.	tan 2A = 3 tan A is true, when the measure of $\angle$ A is : (a) 90° (b) 60° (c) 45° (d) 30°	
Sol.	(d) 30°	**1**
9.	Which of the following statements is true ? (a) sin 20° > sin 70° (b) sin 20° > cos 20° (c) cos 20° > cos 70° (d) tan 20° > tan 70°	
Sol.	(c) $\cos 20° > \cos 70°$	**1**
10.	A 30 m long rope is tightly stretched and tied from the top of pole to the ground. If the rope makes an angle of 60° with the ground, the height of the pole is : (a) $10\sqrt{3}$ m (b) $30\sqrt{3}$ m (c) 15 m (d) $15\sqrt{3}$ m	
Sol.	(d) 15 $\sqrt{3}$ m	**1**
11.	On the top face of the wooden cube of side 7 cm, hemispherical depressions of radius 0.35 cm are to be formed by taking out the wood. The maximum number of depressions that can be formed is : (a) 400 (b) 100 (c) 20 (d) 10	
Sol.	(b) 100	**1**
12.	The cumulative frequency for calculating median is obtained by adding the frequencies of all the : (a) classes up to the median class (b) classes following the median class (c) classes preceding the median class (d) all classes	
Sol.	(c) classes preceding the median class	**1**
13.	If mean and median of given set of observations are 10 and 11 respectively, then the value of mode is : (a) 10.5 (b) 8 (c) 13 (d) 21	
Sol.	(c) 13	**1**

14.	In the adjoining figure, AB is the chord of the larger circle touching the smaller circle. The centre of both the circles is O. If AB = 2 r and OP = r, then the radius of larger circle is : (a) 2 r (b) 3 r (c) $2\sqrt{2}\ r$ (d) $\sqrt{2}\,r$ 	
Sol.	(d) $\sqrt{2}\,r$	**1**
15.	A parallelogram having one of its sides 5 cm circumscribes a circle. The perimeter of parallelogram is : (a) 20 cm (b) less than 20 cm (c) more than 20 cm but less than 40 cm (d) 40 cm	
Sol.	(a) 20 cm	**1**
16.	E and F are points on the sides AB and AC respectively of a ΔABC such that $\frac{AE}{EB} = \frac{AF}{FC} = \frac{1}{2}$. Which of the following relation is true ? (a) EF = 2BC (b) BC = 2EF (c) EF = 3BC (d) BC = 3 EF	
Sol.	(d) BC = 3 EF	**1**
17.	Which of the following statements is true for a polynomial $p(x)$ of degree 3? (a) $p(x)$ has at most two distinct zeroes. (b) $p(x)$ has at least two distinct zeroes. (c) $p(x)$ has exactly three distinct zeroes. (d) $p(x)$ has at most three distinct zeroes.	
Sol.	(d) $p(x)$ has at most three distinct zeroes.	**1**
18.	A pair of dice is thrown. The probability that sum of numbers appearing on top faces is at most 10 is : (a) $\frac{1}{11}$ (b) $\frac{10}{11}$ (c) $\frac{5}{6}$ (d) $\frac{11}{12}$	
Sol.	(d) $\frac{11}{12}$	**1**
	Directions : **In question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option :** (a) Both, Assertion (A) and Reason (R) are true and Reason (R) is 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) :** 4^n ends with digit 0 for some natural number n. **Reason (R) :** For a number 'x' having 2 and 5 as its prime factors, x^n always ends with digit 0 for every natural number n.	
Sol.	(d) Assertion (A) is false but Reason (R) is true	**1**

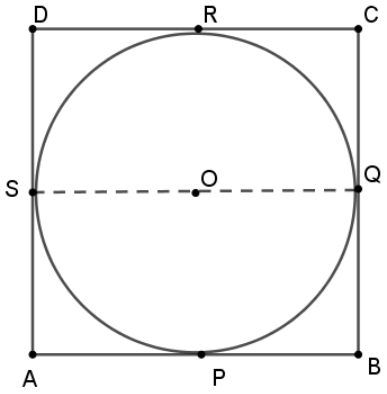
20	**Assertion (A) :** Tangents drawn at the end points of a diameter of a circle are always parallel to each other. **Reason (R) :** The lengths of tangents drawn to a circle from a point outside the circle are always equal.	
Sol.	(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).	**1**
	SECTION - B **This section consists of 5 questions of 2 marks each.**	
21.	Solve the following system of equations algebraically : $30x + 44y = 10;\ 40x + 55y = 13$	
Sol.	Given equations can be rewritten as $120\,x + 176\,y = 40$ …(i) $120\,x + 165\,y = 39$ …(ii) Subtracting to get $y = \frac{1}{11}$ Substituting to get $x = \frac{1}{5}$	**1** ½ ½
22 (A).	A 1.5 m tall boy is walking away from the base of a lamp post which is 12 m high, at the speed of 2.5 m/sec. Find the length of his shadow after 3 seconds.	
Sol.	Let AB be the lamp post and CD be the boy 1.5 m tall.  For correct figure Let the length of shadow be x m Speed of boy = 2.5 m/sec ∴ Distance covered in 3 seconds = 7.5 m Now, Δ ABE~Δ CDE $\Rightarrow \frac{CD}{AB} = \frac{DE}{BE}$	½ ½ ½

	$\Rightarrow \frac{1.5}{12} = \frac{x}{7.5+x}$ Solving, we get $x = \frac{15}{14}$ or 1.07 approx. Hence length of shadow is 1.07 m	½
	OR	
22 (B).	In parallelogram ABCD, side AD is produced to a point E and BE intersects CD at F. Prove that $\Delta ABE \sim \Delta CFB$	
Sol.	 For correct figure In Δ ABE and Δ CFB, $\angle AEB = \angle CBF$ $\angle A = \angle C$ $\therefore \Delta ABE \sim \Delta CFB$	½ **1** ½
23.	Find the coordinates of the point C which lies on the line AB produced such that AC = 2BC, where coordinates of points A and B are (– 1, 7) and (4, – 3) respectively.	
Sol.	 Let coordinates of point C be (x, y) $AC = 2\,BC$ $\Rightarrow$ B is mid-point of AC $\Rightarrow \frac{-1+x}{2} = 4 \Rightarrow x = 9$ $\frac{7+y}{2} = -3 \Rightarrow y = -13$ $\therefore$ Coordinates of C are $(9, -13)$	½ ½ ½ ½

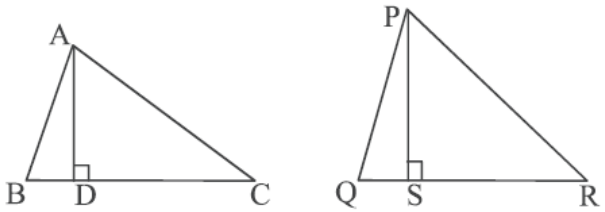
24 (A).	Find the value of x for which $(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2 = x + \tan^2 A + \cot^2 A$	
Sol.	$(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2 = x + \tan^2 A + \cot^2 A$ $\Rightarrow \sin^2 A + \text{cosec}^2 A + 2 + \cos^2 A + \sec^2 A + 2 = x + \tan^2 A + \cot^2 A$ $\Rightarrow 1 + 2 + 2 + 1 + \cot^2 A + 1 + \tan^2 A = x + \tan^2 A + \cot^2 A$ $\therefore x = 7$	½ **1** ½
	OR	
24 (B).	Evaluate the following : $\frac{3 \sin 30° - 4 \sin^3 30°}{2 \sin^2 50° + 2 \cos^2 50°}$	
Sol.	$\frac{3 \sin 30° - 4 \sin^3 30°}{2 \sin^2 50° + 2 \cos^2 50°}$ $= \frac{3 \times \frac{1}{2} - 4 \times \frac{1}{8}}{2 (\sin^2 50° + \cos^2 50°)}$ $= \frac{\frac{3}{2} - \frac{1}{2}}{2 \times 1}$ $= \frac{1}{2}$	**1** ½ ½
25.	Two friends Anil and Ashraf were born in the December month in the year 2010. Find the probability that : (i) they share same date of birth. (ii) they have different dates of birth.	
Sol.	Number of days in December 2010 = 31 (i) P (same date of birth) $= \frac{1}{31}$ (ii) P (different dates of birth) $= \frac{30}{31}$	**1** **1**
	SECTION - C **This section consists of 6 questions of 3 marks each.**	
26 (A).	Prove that $\sqrt{2}$ is an irrational number.	
Sol.	Let $\sqrt{2}$ be a rational number. $\therefore \sqrt{2} = \frac{p}{q}$, where $q \neq 0$ and let p & q be co-primes. $2q^2 = p^2 \Rightarrow p^2$ is divisible by $2 \Rightarrow p$ is divisible by 2 ----- (i)	½ **1**

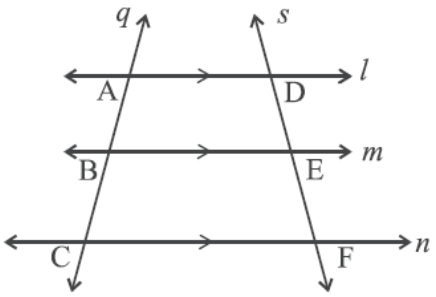
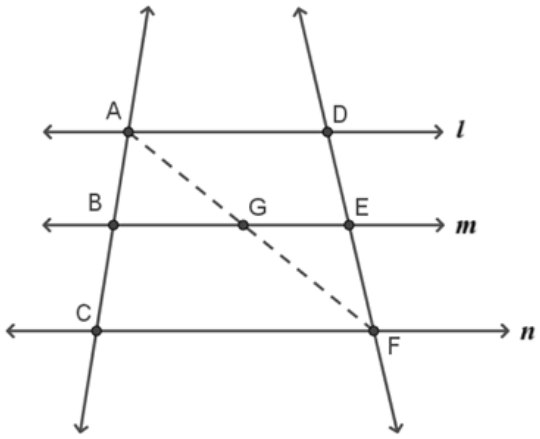
	$\Rightarrow p = 2a$, where 'a' is some integer $4a^2 = 2q^2 \Rightarrow q^2 = 2a^2 \Rightarrow q^2$ is divisible by $2 \Rightarrow q$ is divisible by 2 ----- (ii) (i) and (ii) leads to contradiction as 'p' and 'q' are co-primes. $\therefore \sqrt{2}$ is an irrational number.	**1** ½
	OR	
26 (B).	Let x and y be two distinct prime numbers and $p = x^2y^3$, $q = xy^4$, $r = x^5y^2$. Find the HCF and LCM of p, q and r. Further check if HCF $(p, q, r) \times$ LCM $(p, q, r) = p \times q \times r$ or not.	
Sol.	$p = x^2y^3, q = xy^4, r = x^5y^2$ HCF $(p, q, r) = xy^2$ LCM $(p, q, r) = x^5y^4$ HCF $\times$ LCM $= x^6y^6$ $p \times q \times r = x^8y^9$ $\Rightarrow$ HCF $(p, q, r) \times$ LCM $(p, q, r) \neq p \times q \times r$	**1** **1** **1**
27.	The monthly incomes of two persons are in the ratio 9 : 7 and their monthly expenditures are in the ratio 4 : 3. If each saved ₹ 5,000, express the given situation algebraically as a system of linear equations in two variables. Hence, find their respective monthly incomes.	
Sol.	Let us assume that income of two persons be ₹ $9x$ and ₹ $7x$ and their expenitures be ₹ $4y$ and ₹ $3y$ ATQ $9x - 4y = 5000$ and $7x - 3y = 5000$ Solving the two equations, we get $x = 5000$ $\therefore$ Monthly incomes of two persons are ₹ 45000 and ₹ 35000 respectively.	**1** **1** ½ ½
28.	P (x, y), Q $(-2, -3)$ and R $(2, 3)$ are the vertices of a right triangle PQR right angled at P. Find the relationship between x and y. Hence, find all possible values of x for which $y = 2$.	
Sol.	In Δ PQR, $\angle P = 90°$ $PQ^2 + PR^2 = QR^2$ $\Rightarrow (x+2)^2 + (y+3)^2 + (x-2)^2 + (y-3)^2 = 4^2 + 6^2$ $\Rightarrow x^2 + 4x + 4 + y^2 + 6y + 9 + x^2 - 4x + 4 + y^2 - 6y + 9 = 52$	**1**

	gives, $x^2 + y^2 = 13$ Now for $y = 2, x = \pm 3$	**1** **1**
29 (A).	Prove that $\frac{\cos A + \sin A - 1}{\cos A - \sin A + 1} = \text{cosec } A - \cot A$	
Sol.	LHS $= \frac{\cos A + \sin A - 1}{\cos A - \sin A + 1}$ $= \frac{\cot A + 1 - \text{cosec } A}{\cot A - 1 + \text{cosec } A}$ $= \frac{\cot A - \text{cosec } A + \text{cosec}^2 A - \cot^2 A}{\cot A - 1 + \text{cosec } A}$ $= \frac{(\text{cosec } A - \cot A)(-1 + \text{cosec } A + \cot A)}{\cot A - 1 + \text{cosec } A}$ $= \text{cosec } A - \cot A = \text{RHS}$	 **1** **1** ½ ½
	OR	
29 (B).	If $\cot\theta + \cos\theta = p$ and $\cot\theta - \cos\theta = q$, prove that $p^2 - q^2 = 4\sqrt{pq}$	
Sol.	LHS $= p^2 - q^2$ $= (\cot\theta + \cos\theta)^2 - (\cot\theta - \cos\theta)^2$ $= [(\cot\theta + \cos\theta) + (\cot\theta - \cos\theta)][(\cot\theta + \cos\theta) - (\cot\theta - \cos\theta)]$ $= 2\cot\theta \times 2\cos\theta = 4\cot\theta\cos\theta$ RHS $= 4\sqrt{pq}$ $= 4\sqrt{(\cot\theta + \cos\theta)(\cot\theta - \cos\theta)}$ $= 4\sqrt{cot^2\theta - cos^2\theta}$ $= 4\sqrt{cos^2\theta(cosec^2\theta - 1)}$ $= 4\sqrt{cos^2\theta \times cot^2\theta}$ $= 4\cot\theta\cos\theta$ $\therefore$ LHS = RHS	 **1** ½ ½ ½ ½
30.	α and β are zeroes of a quadratic polynomial $px^2 + qx + 1$. Form a quadratic polynomial whose zeroes are $\frac{2}{\alpha}$ and $\frac{2}{\beta}$.	
Sol.	$\alpha + \beta = -\frac{q}{p}, \alpha\beta = \frac{1}{p}$	½

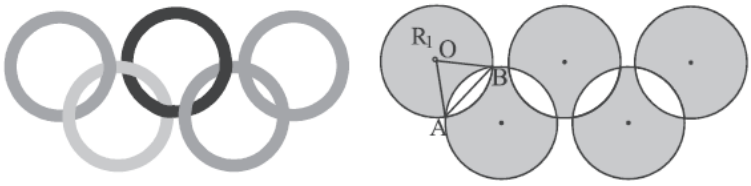
	Sum of zeroes of the required polynomial $= \frac{2}{\alpha} + \frac{2}{\beta} = 2\frac{(\beta+\alpha)}{\alpha\beta} = -2q$	**1**
	Product of zeroes of the required polynomial $= \frac{2}{\alpha} \times \frac{2}{\beta} = \frac{4}{\alpha\beta} = 4p$	**1**
	$\therefore$ required polynomial is $x^2 + 2qx + 4p$	½
31.	Rectangle ABCD circumscribes the circle of radius 10 cm. Prove that ABCD is a square. Hence, find the perimeter of ABCD.	
Sol.	 For correct figure	½
	AP = AS BP = BQ CR = CQ DR = DS	**1**
	Adding the above four equations, AP + BP + CR + DR = AS + BQ + CQ + DS $\Longrightarrow$ AB + CD = AD + CB --- (i)	½
	Since ABCD is a rectangle $\therefore$ AB = CD and BC = AD $\Longrightarrow$ from (i), 2 AB = 2 AD or AB = AD	½
	Hence ABCD is a square Clearly side of square = diameter of circle = 20 cm $\therefore$ Perimeter of square $= 4 \times 20$ cm $= 80$ cm	½

	SECTION - D **This section consists of 4 questions of 5 marks each.**	
32 (A).	The sides of a right triangle are such that the longest side is 4 m more than the shortest side and the third side is 2 m less than the longest side. Find the length of each side of the triangle. Also, find the difference between the numerical values of the area and the perimeter of the given triangle.	
Sol.	Let the length of shortest side be x m $\therefore$ length of longest side $= (x + 4)$ m and length of third side $= (x + 2)$ m Now, $(x + 4)^2 = x^2 + (x + 2)^2$ $\Rightarrow\ x^2 - 4x - 12 = 0$ $\Rightarrow (x - 6)(x + 2) = 0$ $\Rightarrow x = 6$ $\therefore$ sides are 6 m, 8 m and 10 m Area $= \frac{1}{2} \times 6 \times 8 = 24$ m^2 Perimeter $= 6 + 8 + 10 = 24$ m Difference $= 0$	**1** **1** **1** ½ ½ ½ ½
	OR	
32 (B).	Express the equation $\frac{x-2}{x-3}+\frac{x-4}{x-5}=\frac{10}{3}$; $(x \neq 3, 5)$ as a quadratic equation in standard form. Hence, find the roots of the equation so formed.	
Sol.	$\frac{x-2}{x-3} + \frac{x-4}{x-5} = \frac{10}{3}$ $\Rightarrow \frac{(x-2)(x-5)+(x-4)(x-3)}{(x-3)(x-5)} = \frac{10}{3}$ Simplifying, we get $2x^2 - 19x + 42 = 0$ $\Rightarrow (x - 6)(2x - 7) = 0$ $\Rightarrow x = 6$ or $x = \frac{7}{2}$	 **1½** **1½** **1** **1**

33 (A).	The corresponding sides of ΔABC and ΔPQR are in the ratio 3 : 5. $AD \perp BC$ and $PS \perp QR$ as shown in the following figures :  (i) Prove that $\Delta ADC \sim \Delta PSR$ (ii) If AD = 4 cm, find the length of PS. (iii) Using (ii) find ar (ΔABC) : ar (ΔPQR)	
Sol.	As, $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR} = \frac{3}{5}$ $\Rightarrow \Delta ABC \sim \Delta PQR$ $\Rightarrow \angle C = \angle R$ (i) In ΔADC and ΔPSR, $\angle ADC = \angle PSR$ and $\angle C = \angle R$ $\therefore \Delta ADC \sim \Delta PSR$ (ii) $\frac{AD}{PS} = \frac{AC}{PR} = \frac{3}{5}$ $\Rightarrow \frac{4}{PS} = \frac{3}{5}$ $\Rightarrow PS = \frac{20}{3}$ cm (iii) $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{\frac{1}{2} \times BC \times AD}{\frac{1}{2} \times QR \times PS}$ $= \frac{3}{5} \times \frac{3}{5} = \frac{9}{25}$ $\therefore$ ar (ΔABC): ar (ΔPQR) = 9 : 25	½ **1** ½ ½ ½ ½ **1** ½
	OR	

33 (B).	State basic proportionality theorem. Use it to prove the following : If three parallel lines l, m, n are intersected by transversals q and s as shown in the adjoining figure, then $\frac{AB}{BC} = \frac{DE}{EF}$.  	
Sol.	Correct statement  Join AF intersecting line m at G In Δ ACF, BG $\parallel$ CF $\Rightarrow \frac{AB}{BC} = \frac{AG}{GF}$ … (i) In Δ FDA, GE $\parallel$ AD $\Rightarrow \frac{EF}{DE} = \frac{GF}{AG}$ or $\frac{DE}{EF} = \frac{AG}{GF}$ … (ii) From, (i) and (ii), we get $\frac{AB}{BC} = \frac{DE}{EF}$	**1** **1** **1** **1** **1**
34.	A wooden cubical die is formed by forming hemispherical depressions on each face of the cube such that face 1 has one depression, face 2 has two depressions and so on. The sum of number of hemispherical depressions on opposite faces is always 7. If the edge of the cubical die measures 5 cm and each hemispherical depression is of diameter 1.4 cm, find the total surface area of the die so formed.	
Sol.	Number of hemispherical depressions $= 21$ Total surface area of the die formed = TSA of cube + CSA of 21 hemispheres – Base area of 21 hemispherical depressions	**1**

	$= 6 \times 5^2 + 21 \times 2 \times \frac{22}{7} \times (0.7)^2 - 21 \times \frac{22}{7} \times (0.7)^2$ $= 182.34 \text{ cm}^2$	**1+1+1** **1**
35.	The following table shows the number of patients of different age group who were discharged from the hospital in a particular month : **Age (in years) / Number of Patients Discharged** 5-15: 6 15-25: 11 25-35: 21 35-45: 23 45-55: 14 55-65: 5 **Total: 80** Find the 'mean' and the 'mode' of the above data.	
Sol.	Age (in years) / Number of patients (f_i) / Class Mark (x_i) / $f_i\, x_i$ 5-15 / 6 / 10 / 60 15-25 / 11 / 20 / 220 25-35 / 21 / 30 / 630 35-45 / 23 / 40 / 920 45-55 / 14 / 50 / 700 55-65 / 5 / 60 / 300 Total / $\sum f_i = 80$ / / $\sum f_i x_i = 2830$ Mean $= \frac{2830}{80}$ $= \frac{283}{8}$ or 35.38 years Modal class is 35 - 45 Mode $= 35 + \frac{23-21}{2\times23-21-14} \times 10$ $= \frac{405}{11}$ or 36.82 years (approx.)	**1½ for correct table** **1** **½** **½** **1** **½**

	SECTION - E **This section consists of 3 case-study based questions of 4 marks each.**	
36.	The Olympic symbol comprising five interlocking rings represents the union of the five continents of the world and the meeting of athletes from all over the world at the Olympic games. In order to spread awareness about Olympic games, students of Class-X took part in various activities organised by the school. One such group of students made 5 circular rings in the school lawn with the help of ropes. Each circular ring required 44 m of rope. Also, in the shaded regions as shown in the figure, students made rangoli showcasing various sports and games. It is given that ΔOAB is an equilateral triangle and all unshaded regions are congruent.  Based on above information, answer the following questions : (i) Find the radius of each circular ring. (ii) What is the measure of $\angle AOB$? (iii) (a) Find the area of shaded region R_1. **OR** (iii) (b) Find the length of rope around the unshaded regions.	
Sol.	(i) $2 \times \frac{22}{7} \times r = 44$ $\Rightarrow r = 7$ m (ii) $\angle AOB = 60°$ (iii) (a) Area of shaded region R_1 = area of circle – area of 2 segments $= \frac{22}{7} \times 7 \times 7 - 2 \times \left(\frac{60}{360} \times \frac{22}{7} \times 7 \times 7 - \frac{\sqrt{3}}{4} \times 7 \times 7\right)$ $= \left(\frac{308}{3} + \frac{49\sqrt{3}}{2}\right)$ m^2 or 145.05 m^2 (approx.) **OR** (iii) (b) Length of rope around unshaded regions $= 8 \times$ length of arc $= 8 \times \frac{60}{360} \times 2 \times \frac{22}{7} \times 7$ $= \frac{176}{3}$ m or 58.66 m (approx.)	½ ½ **1** **1** **1** ½ **1** ½

37.

Cable cars at hill stations are one of the major tourist attractions. On a hill station, the length of cable car ride from base point to top most point on the hill is 5000 m. Poles are installed at equal intervals on the way to provide support to the cables on which car moves.

The distance of first pole from base point is 200 m and subsequent poles are installed at equal interval of 150 m. Further, the distance of last pole from the top is 300 m.

Based on above information, answer the following questions using Arithmetic Progression :

(i) Find the distance of 10^{th} pole from the base.

(ii) Find the distance between 15^{th} pole and 25^{th} pole.

(iii) (a) Find the time taken by cable car to reach 15^{th} pole from the top if it is moving at the speed of 5m/sec and coming from top.

OR

(iii) (b) Find the total number of poles installed along the entire journey.

Sol.

AP formed is $200, 350, 500, ...$

(i) Distance of 10^{th} pole from base $= a_{10}$

$= 200 + 9 \times 150$

$= 1550$ m **1**

(ii) Distance between 15^{th} pole and 25^{th} pole $= a_{25} - a_{15}$

$= 10 \times 150 = 1500$ m **1**

(iii) (a) Distance of 15^{th} pole from the top $= 300 + 14 \times 150$

$= 2400$ m **1**

Time taken by cable car $= \frac{2400}{5} = 480$ seconds or 8 minutes **1**

OR

(iii) (b) Distance of last pole from the base $= (5000 - 300)$ m $= 4700$ m ½

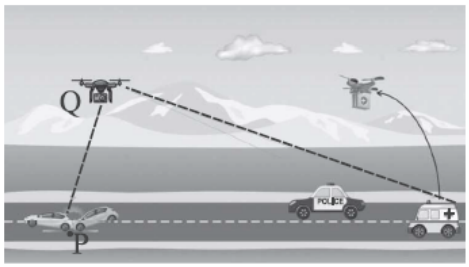
$\therefore\ a_n = 4700$

$\Rightarrow 200 + (n - 1)150 = 4700$ **1**

Solving, we get $n = 31$ ½

38.

A drone was used to facilitate movement of an ambulance on the straight highway to a point P on the ground where there was an accident.



The ambulance was travelling at the speed of 60 km/h. The drone stopped at a point Q, 100 m vertically above the point P. The angle of depression of the ambulance was found to be 30° at a particular instant.

Based on above information, answer the following questions :

(i) Represent the above situation with the help of a diagram.

(ii) Find the distance between the ambulance and the site of accident (P) at the particular instant. (Use $\sqrt{3} = 1.73$)

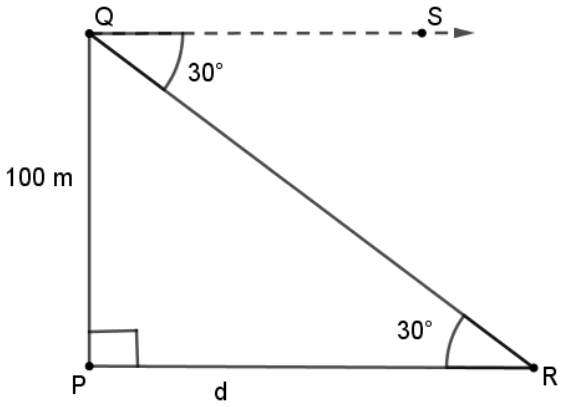
(iii) (a) Find the time (in seconds) in which the angle of depression changes from 30° to 45°.

OR

(iii) (b) How long (in seconds) will the ambulance take to reach point P from a point T on the highway such that angle of depression of the ambulance at T is 60° from the drone ?

Sol.

(i)

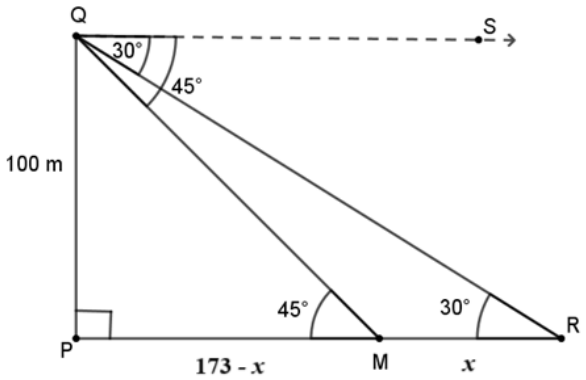


For correct figure **1**

(ii) In Δ PQR, $\frac{100}{d} = \tan 30° = \frac{1}{\sqrt{3}}$ ½

$\Rightarrow d = 100\sqrt{3} = 173$ m ½

(iii) (a)



For correct figure ½

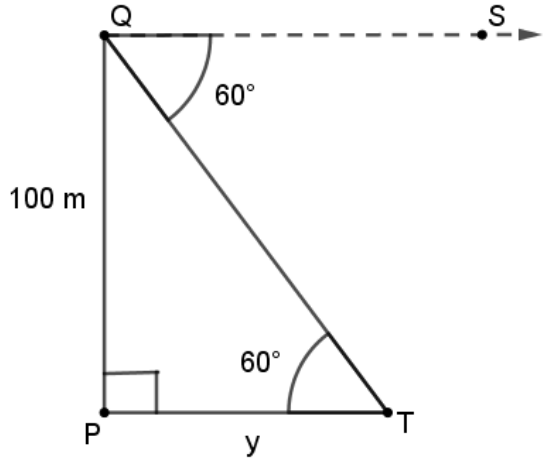
In Δ PQM, $\frac{100}{173-x} = \tan 45° = 1$ ½

$\Rightarrow x = 73$ m ½

Time taken $= \frac{73\times18}{60\times5} = \frac{219}{50}$ or 4.4 seconds (approx.) ½

OR

(iii) (b)



For correct figure ½

In Δ PQT, $\frac{100}{y} = \tan 60° = \sqrt{3}$ ½

$\Rightarrow$ y = $\frac{100}{\sqrt{3}} = \frac{100\sqrt{3}}{3}$ or $\frac{173}{3}$ m ½

Time taken $= \frac{100\sqrt{3}\times18}{3\times60\times5} = 2\sqrt{3}$ or 3.5 seconds (approx.) ½