Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2026
MATHEMATICS (STANDARD) (041) (PAPER CODE 30/4/1)

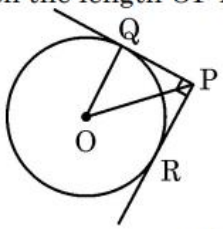
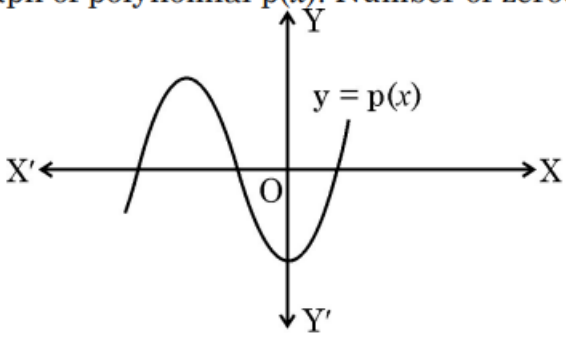
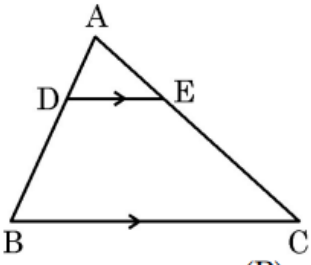
General Instructions: -

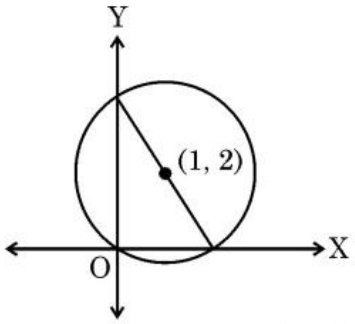
1.	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested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

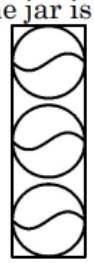
9.	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note **"Extra Question"**.
10.	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11.	A full scale of marks 0 to 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 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.

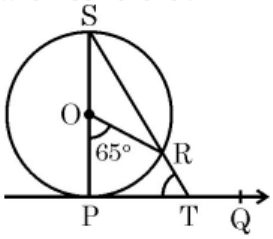
MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/4/1)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Step	Marks
	SECTION – A **Q. Number 1 to 20 are multiple choice questions of 1 mark each.**		
1.	If the quadratic equation $9x^2 + 8kx + 16 = 0$ has real and equal roots, then the value of k is (A) 3 (B) –3 (C) –4 (D) $\frac{3}{2}$		
Sol.	(A) 3 **OR** (B) −3		**1**
2.	It is given that $\Delta ABC \sim \Delta EDF$. Which of the following is not true ? (A) $\frac{\text{Perimeter of } \Delta ABC}{\text{Perimeter of } \Delta EDF} = \frac{AB}{ED}$ (B) $\frac{AB}{ED} = \frac{AC}{EF}$ (C) $\angle A = \angle D, \angle C = \angle F$ (D) $\frac{AB + BC}{AC} = \frac{DE + DF}{EF}$		
Sol.	(C) $\angle A = \angle D, \angle C = \angle F$		**1**
3.	The n^{th} term of an A.P. is $\sqrt{2}\,n + 1$. Its common difference is (A) $\sqrt{2}$ (B) $\sqrt{2}\,n$ (C) 1 (D) $\sqrt{2} + 1$		
Sol.	(A) $\sqrt{2}$		**1**

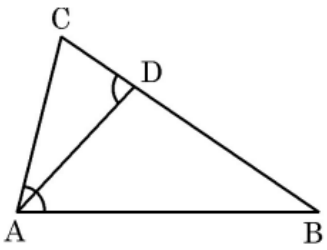
4.	If PQ and PR are tangents to the circle with centre O and radius 4 cm such that $\angle QPR = 90^\circ$, then the length OP is  (A) 4 cm (B) $4\sqrt{2}$ cm (C) 8 cm (D) $2\sqrt{2}$ cm		
Sol.	(B) $4\sqrt{2}$ cm		**1**
5.	Observe the graph of polynomial p(x). Number of zeroes of p(x) is  (A) 5 (B) 4 (C) 6 (D) 3		
Sol.	(D) 3		**1**
6.	In the given figure, DE $\parallel$ BC. If $\frac{AD}{DB} = \frac{1}{3}$ and AC = 6 cm, then length AE is  (A) 1.5 cm (B) 1 cm (C) 2 cm (D) 3 cm		
Sol.	(A) 1.5 cm		**1**

7.	In the given figure, a circle is centred at (1, 2). The diameter of the circle is  (A) 4 (B) $2\sqrt{2}$ (C) $\sqrt{5}$ (D) $2\sqrt{5}$		
Sol.	(D) $2\sqrt{5}$		**1**
8.	The value of k for which the system of linear equations $\frac{x}{2}+\frac{y}{3}=5$ and $2x + ky = 7$ is inconsistent, is (A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $\frac{1}{3}$ (D) 3		
Sol.	(B) $\frac{4}{3}$		**1**
9.	A circle is divided into 16 identical sectors. If radius of the circle is 7 cm, area of each sector is (A) $\frac{77}{4}$ cm^2 (B) 77 cm^2 (C) 154 cm^2 (D) $\frac{77}{8}$ cm^2		
Sol.	(D) $\frac{77}{8}$ cm^2		**1**

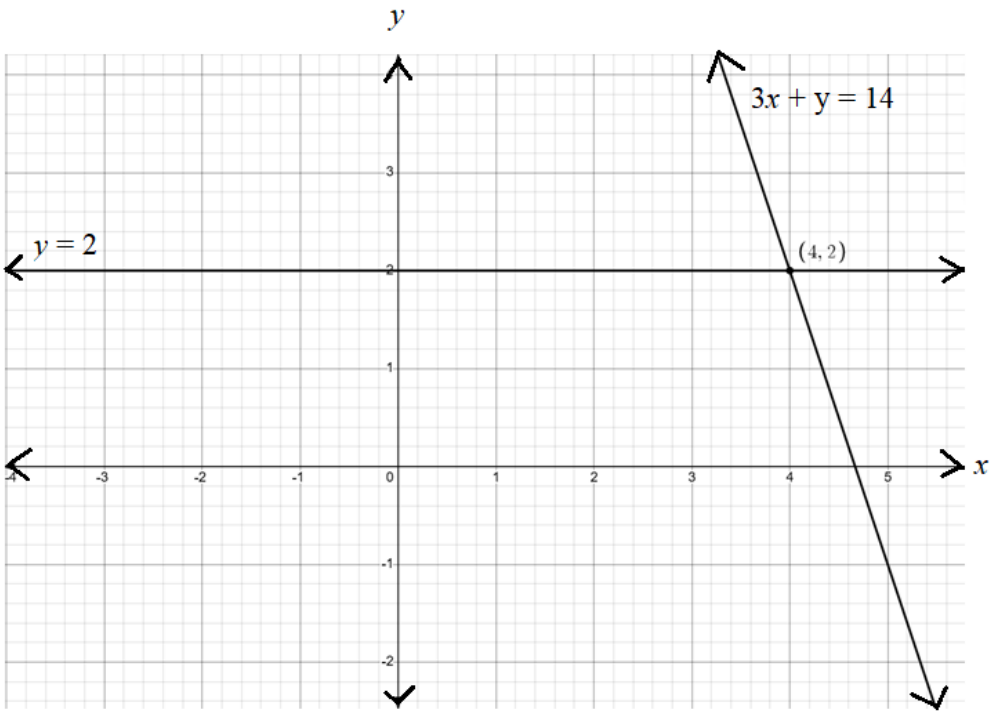
10.	Two different dice are rolled together. The probability that both the obtained numbers are less than 4, is (A) $\frac{2}{9}$ (B) $\frac{7}{36}$ (C) $\frac{1}{4}$ (D) $\frac{2}{3}$		
Sol.	(C) $\frac{1}{4}$		**1**
11.	When $\sin A = \frac{1}{3}$, the value of cot A is (A) $\frac{2\sqrt{2}}{3}$ (B) $2\sqrt{2}$ (C) $\frac{1}{2\sqrt{2}}$ (D) 3		
Sol.	(B) $2\sqrt{2}$		**1**
12.	$\frac{1+\tan^2 A}{1+\cot^2 A}$ equals to : (A) $\tan^2 A$ (B) -1 (C) $-\tan^2 A$ (D) $\cot^2 A$		
Sol.	(A) $\tan^2 A$		**1**
13.	Three tennis balls are just packed in a cylindrical jar. If radius of each ball is r, volume of air inside the jar is  (A) $2\pi r^3$ (B) $3\pi r^3$ (C) $5\pi r^3$ (D) $4\pi r^3$		
Sol.	(A) $2\pi r^3$		**1**

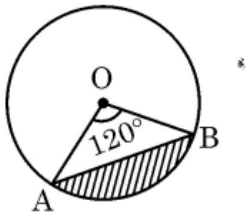
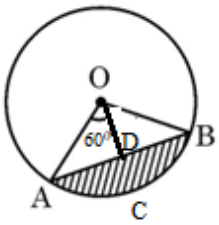
14.	PQ is tangent to a circle with centre O. If ∠POR = 65°, then m∠PTR is  (A) 65° (B) 58.5° (C) 57.5° (D) 45°		
Sol.	(C) 57.5°		**1**
15.	The distance between the points (a cos θ + b sin θ, 0) and (0, a sin θ – b cos θ) is (A) $\sqrt{a^2+b^2}$ (B) a^2-b^2 (C) $\sqrt{a^2-b^2}$ (D) a^2+b^2		
Sol.	(A) $\sqrt{a^2+b^2}$		**1**
16.	An ice-cream cone of radius r and height h is completely filled by two spherical scoopes of ice-cream. If radius of each spherical scoop is $\frac{r}{2}$, then h : 2r equals (A) 1 : 8 (B) 1 : 2 (C) 1 : 1 (D) 2 : 1		
Sol.	(B) 1 : 2		**1**
17.	Arc PQ subtends an angle θ at the centre of the circle with radius 6.3 cm. If $\overset{\frown}{PQ}$ = 11 cm, then the value of θ is (A) 10° (B) 60° (C) 45° (D) 100°		
Sol.	(D) 100°		**1**
18.	Mean and Median of a frequency distribution are 43 and 40 respectively. The value of mode is (A) 34 (B) 43 (C) 38.5 (D) 41.5		

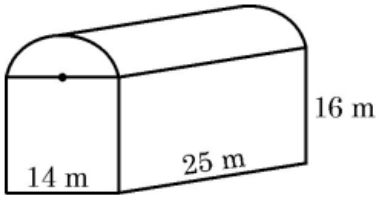
Sol.	(A) 34		**1**
	*Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.* (A) Both 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 probability of happening of an event is 0.2p, p > 0, then p can't be more than 5. **Reason (R) :** $P(\overline{E}) = 1 - P(E)$ for an event E.		
Sol.	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).		**1**
20.	**Assertion (A) :** $(\sqrt{3} + \sqrt{5})$ is an irrational number. **Reason (R) :** Sum of the any two irrational numbers is always irrational.		
Sol.	(C) Assertion (A) is true, but Reason (R) is false.		**1**
	SECTION B **Q. Numbers 21 to 25 are very short answer type questions of 2 marks each.**		
21.	Verify that roots of the quadratic equation $(p - q)x^2 + (q - r)x + (r - p) = 0$ are equal when $q + r = 2p$.		
Sol.	Discriminant (D) $= (q - r)^2 - 4(p - q)(r - p)$ $= (q + r - 2p)^2$ Substituting, $q + r = 2p$ $\Rightarrow D = (2p - 2p)^2 = 0$	**I** **II** **III**	½ ½ ½

	∴ Roots of the given equation are equal.	**IV**	**½**
22.	D is a point on the side BC of ΔABC such that ∠CAB = ∠CDA. Show that $CA^2 = CB \times CD$.  		
Sol.	ΔADC ~ ΔBAC $\Rightarrow \frac{DC}{AC} = \frac{AC}{BC}$ $\Rightarrow AC^2 = DC \times BC$ or $CA^2 = CB \times CD$	**I** **II** **III**	**1** **½** **½**
23 (a)	Prove that : $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$		
Sol.	L.H.S. $= \sqrt{\frac{1+\sin A}{1-\sin A} \times \frac{1+\sin A}{1+\sin A}}$ $= \frac{1+\sin A}{\sqrt{1-\sin^2 A}}$ $= \frac{1+\sin A}{\cos A}$ $= \sec A + \tan A$ = R.H.S.	**I** **II** **III** **IV**	**½** **½** **½** **½**
	OR		
23 (b)	Evaluate : $\frac{3\cos^2 30^\circ - 6\,\text{cosec}^2 30^\circ}{\tan^2 60^\circ}$		
Sol.	$\frac{3 \times \left(\frac{\sqrt{3}}{2}\right)^2 - 6 \times (2)^2}{(\sqrt{3})^2}$ $= -\frac{87}{12}$ or $-\frac{29}{4}$	**I** **II**	**1½** **½**

24 (a)	Prove that $2 + 3\sqrt{5}$ is an irrational number given that $\sqrt{5}$ is irrational number.		
Sol.	Let $2 + 3\sqrt{5}$ be a rational number. $\therefore 2 + 3\sqrt{5} = \frac{p}{q}$, where $q \neq 0$ and p and q are integers. $\Rightarrow \sqrt{5} = \frac{p-2q}{3q}$ As $\frac{p-2q}{3q}$ is a rational number, so $\sqrt{5}$ is rational. But we know that $\sqrt{5}$ is irrational. $\therefore$ Our assumption is wrong. Hence, $2 + 3\sqrt{5}$ is an irrational number.	**I** **II** **III**	½ ½ **1**
	OR		
24 (b)	If the HCF of 210 and 55 is expressed as $210 \times 5 + 55m$, then find the value of m.		
Sol.	$210 = 2 \times 3 \times 5 \times 7$ $55 = 5 \times 11$ H.C.F. $(210, 55) = 5$ $\therefore 5 = 210 \times 5 + 55m$ $\Rightarrow m = -19$	**I** **II** **III**	**1** ½ ½
25.	α and β are the zeroes of the polynomial $5x^2 - 16x - 10$. Find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.		
Sol.	$\alpha + \beta = \frac{16}{5}$, $\alpha\beta = -2$ $\therefore \frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{(\alpha+\beta)^2 - 2\alpha\beta}{\alpha\beta} = \frac{\left(\frac{16}{5}\right)^2 + 4}{-2}$ $= -\frac{356}{50}$ or $-\frac{178}{25}$	**I** **II** **III**	**1** ½ ½

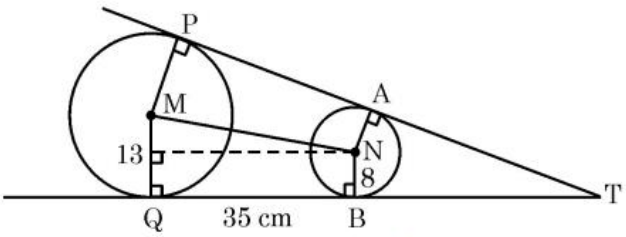
	SECTION – C **Q. Numbers 26 to 31 are short answer type questions of 3 marks each.**		
26 (a)	In a class test, Veer scored 6 more than twice as many marks as Kevin scored. If one of them had scored 4 more marks, their total score would have been 40. Find the marks obtained by Veer and Kevin.		
Sol.	Let the marks obtained by Veer and Kevin be V and K respectively. According to the question, V = 2K + 6 …. (i) V + K + 4 = 40 …. (ii) Solving (i) and (ii) we get, V = 26 and K = 10 ∴ Veer obtained 26 marks and Kevin obtained 10 marks.	**I** **II** **III**	**1** **1** **½+ ½**
	OR		
26 (b)	Solve the linear equations $3x + y = 14$ and $y = 2$ graphically.		
Sol.			

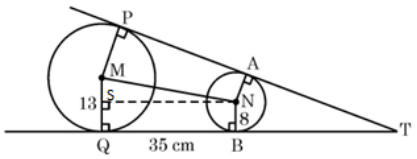
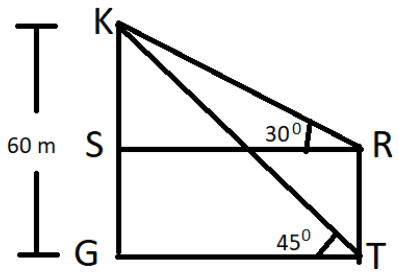
	Correct graph of $3x + y = 14$ Correct graph of $y = 2$ Correct solution: $x = 4, y = 2$	**I** **II** **III**	**1½** **½** **1**
27.	Chord AB of a circle with centre O and radius 21 mm subtends an angle of 120^0 at the centre. Find the perimeters of the shaded region. (Use $\sqrt{3} = 1.73$) 		
Sol.	 Draw OC ⊥ AB ∴ ∠ AOC = 60^0 $\Rightarrow \sin 60^0 = \frac{\sqrt{3}}{2} = \frac{AC}{21}$ $\Rightarrow AC = \frac{21\sqrt{3}}{2}$ $\Rightarrow$ AB = 2 (AD) = $21\sqrt{3}$ mm Also, length of minor arc AB = $\frac{120}{360} \times 2 \times \frac{22}{7} \times 21 = 44$ mm ∴ Perimeter of shaded region = $(44 + 21\sqrt{3}) = 80.33$ mm	**I** **II** **III** **IV**	**1** **½** **1** **½**
28.	Prove that : $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$		
Sol.	L.H.S. = $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1}$		

	Dividing Numerator and denominator by cos θ, we get $= \frac{\tan\theta - 1 + \sec\theta}{\tan\theta + 1 - \sec\theta}$ $= \frac{(\sec\theta + \tan\theta) - (\sec^2\theta - \tan^2\theta)}{\tan\theta + 1 - \sec\theta}$ $= \frac{(\sec\theta + \tan\theta)(1 - \sec\theta + \tan\theta)}{\tan\theta + 1 - \sec\theta}$ $= \sec\theta + \tan\theta$ $= (\sec\theta + \tan\theta) \times \frac{(\sec\theta - \tan\theta)}{(\sec\theta - \tan\theta)}$ $= \frac{(\sec^2\theta - \tan^2\theta)}{(\sec\theta - \tan\theta)}$ $= \frac{1}{\sec\theta - \tan\theta}$ = R.H.S.	I II III IV V	1 ½ ½ ½ ½
29 (a)	To protect plants from heat, a shed of iron rods covered with green cloth is made. The lower part of the shed is a cuboid mounted by semi-cylinder as shown in the figure. Find the area of the cloth required to make this shed, if dimensions of the cuboid are 14 m × 25 m × 16 m  		
Sol.	Area of cloth required to cover four walls = $2(14 \times 16 + 25 \times 16)$ $= 1248 \text{ m}^2$ Radius = $\frac{14}{2} = 7$ m Area of cloth required to cover cylindrical part = $\frac{22}{7} \times 7 \times 25 + \frac{22}{7} \times 7^2$ $= 704 \text{ m}^2$ ∴ Area of total cloth required = 1248 + 704 = 1952 m^2	I II III IV	1 1 ½ ½
	OR		

29 (b)	The internal and external radii of a hollow hemisphere are $5\sqrt{2}$ cm and 10 cm respectively. A cone of height $5\sqrt{7}$ cm and radius $5\sqrt{2}$ cm is surmounted on the hemisphere as shown in the figure. Find the total surface area of the object in terms of π. (Use $\sqrt{2}$ = 1.4) 		
Sol.	Let internal and external radii be $r_1 = 5\sqrt{2}$ cm and r_2 = 10 cm respectively. ∴ Slant height (l) of the cone = $\sqrt{(5\sqrt{2})^2 + (5\sqrt{7})^2}$ = 15 cm Now, the total surface area of the object = $2\pi r_2^2 + \pi r_1 l + \pi(r_2^2 - r_1^2)$ $= \pi(2\times 10^2 + 5\sqrt{2} \times 15 + 10^2 - (5\sqrt{2})^2)$ $= 355\ \pi$ cm^2	**I** **II** **III**	**1** **1** **1**
30.	A bag contains 30 balls out of which 'm' number of balls are blue in colour. (i) Find the probability that a ball drawn at random from the bag is not blue. (ii) If 6 more blue balls are added in the bag, then the probability of drawing a blue ball will be $\frac{5}{4}$ times the probability of drawing a blue ball in the first case. Find the value of m.		
Sol.	(i) P(ball drawn is not blue) = $\frac{30-m}{30}$ or $1 - \frac{m}{30}$ (ii) Total number of balls now = 36 Number of blue balls now = m + 6 P(ball drawn is blue) = $\frac{m+6}{36}$ According to question, $\frac{m+6}{36} = \frac{5}{4} \times \frac{m}{30}$ $\Rightarrow$ m = 12	**I** **II** **III** **IV**	**1** **1** **½** **½**

31.	Find the greatest number less than 10,000 which is exactly divisible by 48, 60 and 65.		
Sol.	$48 = 2^4 \times 3$, $60 = 2^2 \times 3 \times 5$, $65 = 5 \times 13$ L.C.M. $(48,60,65) = 2^4 \times 3 \times 5 \times 13 = 3120$ $\therefore$ Highest multiple of 3120, less than 10,000 $= 3120 \times 3 = 9360$	**I** **II** **III**	**1 ½** **1** **½**
	SECTION – D **Q. Numbers 32 to 35 are long answer type questions of 5 marks each.**		
32 (a)	A person on tour has ₹ 5,400 for his expenses. If he extends his tour by 5 days, he has to cut down his daily expenses by ₹ 180. Find the original duration of the tour and daily expense.		
Sol.	Let original duration of the tour be x days. $\therefore$ Daily expense is ₹ $\frac{5400}{x}$ According to the question, $\frac{5400}{x} - \frac{5400}{x+5} = 180$ $\Rightarrow x^2 + 5x - 150 = 0$ $\Rightarrow (x + 15)(x - 10) = 0$ $\Rightarrow x = -15, 10$ $\because x \neq -15$ $\therefore x = 10$ $\therefore$ Original duration of tour is 10 days and daily expense is ₹ 540.	**I** **II** **III** **IV** **V**	**2** **1** **1** **½** **½**
	OR		

32 (b)	The total cost of certain piece of cloth was ₹ 2,100. During special sale time, the shopkeeper offered 2 m extra cloth for free thus reducing the price of cloth per metre by ₹ 120. What was the original per metre price of cloth and its length ?		
Sol.	Let the original length of cloth be x metre. ∴ Original cost is ₹ $\frac{2100}{x}$ per metre. According to the question, $\frac{2100}{x} - \frac{2100}{x+2} = 120$ $\Rightarrow x^2 + 2x - 35 = 0$ $\Rightarrow (x+7)(x-5) = 0$ $\Rightarrow x = -7, 5$ $\because x \neq -7$ $\therefore x = 5$ ∴ The original price of cloth per metre is ₹420 and original length is 5 m.	**I** **II** **III** **IV** **V**	**2** **1** **1** **½** **½**
33.	 In the given figure, TP and TQ are tangents to a circle with centre M, touching another circle with centre N at A and B respectively. It is given that MQ = 13 cm, NB = 8 cm, BQ = 35 cm and TP = 80 cm. (i) Name the quadrilateral MQBN. (ii) Is MN parallel to PA ? Justify your answer. (iii) Find length TB. (iv) Find length MN.		

Sol.	(i) BN ∥ QM and QB ∦ MN The quadrilateral MQBN is a trapezium.  	**I**	**1**
	(ii) No, as AN ≠ PM	**II**	**1**
	(iii) TQ = TP = 80 cm ∴ TB = 80 − 35 = 45 cm **Note**: If MNT is considered a straight line and similarity of triangles is used to find TB then TB = 56 cm may be considered as correct answer.	**III**	**1**
	(iv) $MN^2 = NS^2 + MS^2$ $= 35^2 + (13 - 8)^2$	**IV**	**1**
	$= 1225 + 25$ $= 1250$	**V**	**½**
	∴ MN = $25\sqrt{2}$ cm	**VI**	**½**
34.	A kite is flying at a height of 60 m above the ground level. Ravi, standing at the roof of the house is holding the string straight and observes the angle of elevation of kite as 30°. From the bottom of the same building, the angle of elevation of kite is 45°. Find the length of the string and height of roof from the ground. (Use $\sqrt{3}$ = 1.73)		
Sol.	 Let K be the position of kite and TR is the height of building. Correct figure	**I**	**1**

	$\therefore \tan 45^0 = 1 = \frac{60}{GT}$	**II**	**1**
	$\Longrightarrow$ GT = 60 m		
	Also, $\tan 30^0 = \frac{1}{\sqrt{3}} = \frac{KS}{SR}$	**III**	**1**
	$\Longrightarrow$ KS = $20\sqrt{3}$ m or 34.6 m	**IV**	**½**
	Hence, TR = $(60 - 20\sqrt{3})$ m = 60 – 34.6 = 25.4 m	**V**	**½**
	Also, $\sin 30^0 = \frac{1}{2} = \frac{KS}{KR} = \frac{20\sqrt{3}}{KR}$	**VI**	**½**
	$\Longrightarrow$ KR = $40\sqrt{3}$ = 69.2 m	**VII**	**½**
	$\therefore$ Length of the string = 69.2 m and height of roof from the ground = 25.4 m		
35 (a)	The median of the following data is 50 and sum of all frequencies is 90 :		

Class :	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequency :	p	15	25	20	q	8	10

Find the values of p and q.

Sol.

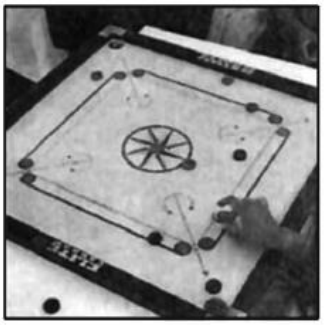
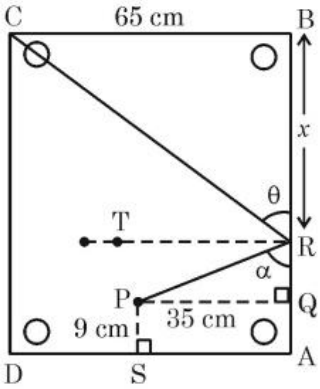
Class	Frequency	cf
20 - 30	p	p
30 – 40	15	p + 15
40 – 50	25	p + 40
50 – 60	20	p + 60
60 – 70	q	p + q + 60
70 – 80	8	p + q + 68
80 – 90	10	p + q + 78

Correct table — **I** — **1½**

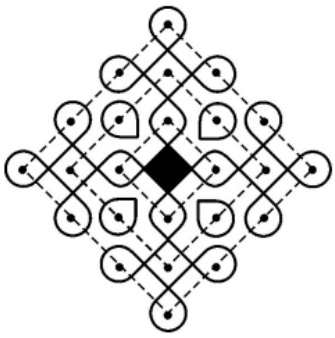
	Median Class = 50 – 60	**II**	**½**
	$\therefore 50 = 50 + \frac{10}{20}\left(\frac{90}{2} - p - 40\right)$	**III**	**1**
	$\Longrightarrow p = 5$	**IV**	**½**
	As, $p + q + 78 = 90$	**V**	**1**
	$\Longrightarrow 5 + q = 12$		
	$\therefore q = 7$	**VI**	**½**
	OR		
35 (b)	Find mean and mode of the following distribution : **Class :** 0 – 15 | 15 – 30 | 30 – 45 | 45 – 60 | 60 – 75 | 75 – 90 | 90 – 105 **Frequency :** 4 | 8 | 11 | 14 | 10 | 7 | 6		
Sol.			

Class	Frequency	x_i	$u_i = \frac{x_i - 52.5}{15}$	$f_i u_i$
0 – 15	4	7.5	-3	-12
15 – 30	8	22.5	-2	-16
30 – 45	11	37.5	-1	-11
45 – 60	14	52.5	0	0
60 – 75	10	67.5	1	10
75 – 90	7	82.5	2	14
90 – 105	6	97.5	3	18
Total	60			3

Correct table — **I** — **2**

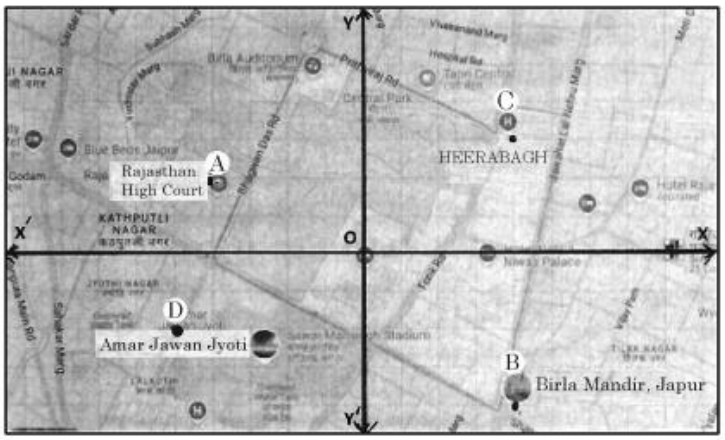
	$\therefore$ Mean = $\bar{x} = 52.5 + 15 \times \frac{3}{60}$	**II**	½
	$= 53.25$	**III**	½
	Modal Class = 45 – 60	**IV**	½
	$\therefore$ Mode = $45 + \frac{14-11}{28-11-10} \times 15$	**V**	**1**
	$= 45 + \frac{3 \times 15}{7}$		
	= 51.4 (approx.)	**VI**	½
	SECTION – E **Q. Numbers 36 to 38 are case based questions of 4 marks each.**		
36.	  Carom board is a very popular game. The board is a square of side length 65 cm. It has circular pockets in each corner. Ansh strikes a disc, kept at position P with a striker. The disc, hits the boundary of the board at R and goes straight to pocket at corner C. It is given that PS = 9 cm, PQ = 35 cm, BR = x, $\angle PRQ = \alpha$ and $\angle CRB = \theta$. Based on the above information, answer the following questions : (i) Using law of reflection i.e. $\angle PRT = \angle CRT$, prove that $\theta = \alpha$. (ii) Prove that $\Delta PQR \sim \Delta CBR$ given that PQ is perpendicular to AB. (iii) (a) Find the value of x using similarity of triangles. **OR** (b) If $\frac{\text{Area } \Delta PQR}{\text{Area } \Delta CBR} = \frac{PQ^2}{CB^2}$, then find the value of x.		
Sol.	(i) TR $\perp$ AB		

	$\therefore \alpha + \angle PRT = \theta + \angle TRC$		
	As $\angle PRT = \angle TRC$, so $\alpha = \theta$	**I**	**1**
	(ii) As $\theta = \alpha$, so $\angle PRQ = \angle CRB$		
	and $\angle PQR = \angle CBR = 90^0$		
	$\therefore \Delta PQR \sim \Delta CBR$	**I**	**1**
	(iii) (a) $\Delta PQR \sim \Delta CBR$		
	$\therefore \frac{PQ}{CB} = \frac{QR}{BR}$	**I**	**½**
	$\Longrightarrow \frac{35}{65} = \frac{65 - 9 - x}{x}$	**II**	**1**
	$\Longrightarrow 35x = 65\,(56 - x)$		
	$\Longrightarrow x = 36.4$ cm	**III**	**½**
	OR		
	(b) $\frac{Ar.\,\Delta PQR}{Ar.\,\Delta CBR} = \frac{PQ^2}{BC^2}$		
	$\Longrightarrow \frac{\frac{1}{2} \times 35 \times (65 - x - 9)}{\frac{1}{2} \times 65 \times x} = \frac{35 \times 35}{65 \times 65}$	**I**	**1**
	$\Longrightarrow \frac{56 - x}{x} = \frac{35}{65}$	**II**	**½**
	$\Longrightarrow$ x = 36.4 cm	**III**	**½**

37.	'Kolam' is a decorative art which is made with rice flour in South Indian States. It is drawn on grid pattern of dots. One such art work is shown below.  Observe the given figure carefully. There are 4 dots in first square, 8 dots in second square, 12 dots in third square and so on. Based on the above, answer the following questions : (i) Show that number of dots given above form an A.P. Write the first term and common difference. (ii) Write n^{th} term of the A.P. formed. (iii) (a) The pattern is expanded on a large ground. If total 220 dots are used, then find the number of squares formed. **OR** (b) Is it possible to complete n number of squares using 100 dots ? If yes, then find the value of n.		
Sol.	(i) Number of dots formed in each square are 4, 8, 12, … $\because 12 - 8 = 8 - 4 = 4$ $\therefore$ Numbers of dots form an A.P. Here, $a = 4, d = 4$ (ii) $a_n = 4 + (n - 1)\,4 = 4n$ (iii) (a) Here, $a = 4, d = 4, S_n = 220$ $\therefore 220 = \frac{n}{2}(2 \times 4 + (n-1)4)$ $\Rightarrow (n + 1)\,n = 110$ $\Rightarrow n^2 + n - 110 = 0$ $\Rightarrow (n + 11)(n - 10) = 0$ $\Rightarrow n = -11, 10$	**I** **II** **I** **I** **II**	½ ½ **1** ½ ½

	$n \neq -11$ $\Rightarrow n = 10$ $\therefore$ The number of squares formed = 10	**III**	**1**
	OR		
	(b) Here $S_n = 100$, $a = 4$, $d = 4$ $\therefore 100 = \frac{n}{2}(2 \times 4 + (n-1)4)$	**I**	**½**
	$\Rightarrow 100 = \frac{4n}{2}(n+1)$ $\Rightarrow n(n+1) = 50$ $\Rightarrow n^2 + n - 50 = 0$	**II**	**½**
	$\Rightarrow n = \frac{-1 \pm \sqrt{1+200}}{2} = \frac{-1 \pm \sqrt{201}}{2}$ $\because$ n is not a natural number. $\therefore$ It is not possible to draw complete squares using 100 dots.	**III**	**1**

38.



Observe the map of Jaipur city placed on a Cartesian plane. Taking Rambagh Palace as origin, the location of some places are given below :

Point A : (–4, 2) Rajasthan High Court

Point B : (4, –4) Birla Mandir

Point C : (4, 3) Heera Bagh

Point D : (–5, –2) Amar Jawan Jyoti

Based on the above, answer the following questions :

(i) Advocate Rehana stays at Heera Bagh. How much distance she has to cover daily to go to the court and coming back home ?

(ii) There is a crossing on X-axis which divides AD in a certain ratio. Find the ratio.

(iii) (a) Is Birla Mandir equidistant from Heera Bagh and Amar Jawan Jyoti ? Justify your answer.

OR

(b) Using section formula, show that points A, O and B are not collinear.

Sol. (i) Distance travelled = 2 AC

$= 2\sqrt{(-4-4)^2 + (2-3)^2}$ **I** ½

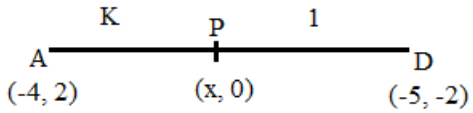
$= 2\sqrt{64+1}$

$= 2\sqrt{65}$ **II** ½

Hence, required distance is $2\sqrt{65}$ units.

(ii) Let the point P(x, 0) divides AD in the ratio K : 1

$\therefore$ AP : PD = K : 1



Here, $0 = \frac{-2K+2}{K+1}$ | I | ½

$\Rightarrow K = 1$ | II | ½

$\therefore$ The required ratio is 1 : 1

(iii) (a) BC = $\sqrt{(4-4)^2 + (-4-3)^2}$ = 7 units | I | 1

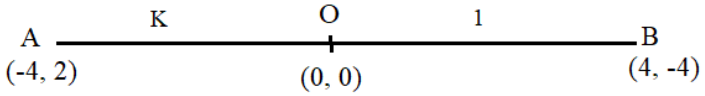
BD = $\sqrt{(4+5)^2 + (-4+2)^2} = \sqrt{85}$ units | II | 1

$\therefore BC \neq BD$

$\Rightarrow$ Birla Mandir is not equidistant from Heera Bagh and Amar Jawan Jyoti.

OR

(b) Let us assume that points A, O, B are collinear and AO : OB = K : 1 | I | ½



Here, $0 = \frac{4K-4}{K+1}$

$\Rightarrow K = 1$ | II | ½

Also, $0 = \frac{-4K+2}{K+1}$ | III | ½

$\Rightarrow K = \frac{1}{2}$ | IV | ½

Since the value of K is different in the above two cases, so points A, O and B are not collinear.