
Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2024
MATHEMATICS PAPER CODE 30/1/1

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 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.**
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.

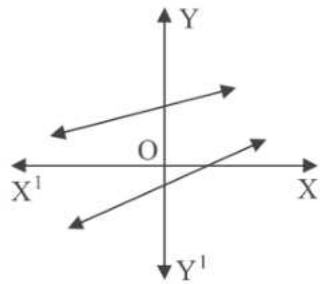
9	<u>**In Q1-Q20, if a candidate attempts the question more than once (without cancelling the previous attempt), marks shall be awarded for the first attempt only and the other answer scored out with a note "Extra Question".**</u>
10	<u>**In Q21-Q38, if a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note "Extra Question".**</u>
11	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
12	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.
13	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.
14	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.
15	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.
16	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.
17	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for spot Evaluation**" before starting the actual evaluation.
18	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.
19	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: 30/1/1)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A This section consists of 20 questions of 1 mark each.	
1.	If the sum of zeroes of the polynomial $p(x) = 2x^2 - k\sqrt{2}x + 1$ is $\sqrt{2}$, then value of k is : (a) $\sqrt{2}$ (b) 2 (c) $2\sqrt{2}$ (d) $\frac{1}{2}$	
Sol.	(b) 2	1
2.	If the probability of a player winning a game is 0.79, then the probability of his losing the same game is : (a) 1.79 (b) 0.31 (c) 0.21% (d) 0.21	
Sol.	(d) 0.21	1
3.	If the roots of equation $ax^2 + bx + c = 0$, $a \neq 0$ are real and equal, then which of the following relation is true ? (a) $a = \frac{b^2}{c}$ (b) $b^2 = ac$ (c) $ac = \frac{b^2}{4}$ (d) $c = \frac{b^2}{a}$	
Sol.	(c) ac = $\frac{b^2}{4}$	1
4.	In an A.P., if the first term $a = 7$, nth term $a_n = 84$ and the sum of first n terms $s_n = \frac{2093}{2}$, then n is equal to : (a) 22 (b) 24 (c) 23 (d) 26	
Sol.	(c) 23	1
5.	If two positive integers p and q can be expressed as $p = 18\ a^2b^4$ and $q = 20\ a^3b^2$, where a and b are prime numbers, then LCM (p, q) is : (a) $2\ a^2b^2$ (b) $180\ a^2b^2$ (c) $12\ a^2b^2$ (d) $180\ a^3b^4$	
Sol.	(d) 180 a^3b^4	1

6.	AD is a median of ΔABC with vertices A(5, – 6), B(6, 4) and C(0, 0). Length AD is equal to : (a) $\sqrt{68}$ units (b) $2\sqrt{15}$ units (c) $\sqrt{101}$ units (d) 10 units	
Sol.	(a) $\sqrt{68}$ units	1
7.	If $\sec\theta - \tan\theta = m$, then the value of $\sec\theta + \tan\theta$ is : (a) $1-\frac{1}{m}$ (b) m^2-1 (c) $\frac{1}{m}$ (d) $-m$	
Sol.	(c) $\frac{1}{m}$	1
8.	From the data 1, 4, 7, 9, 16, 21, 25, if all the even numbers are removed, then the probability of getting at random a prime number from the remaining is : (a) $\frac{2}{5}$ (b) $\frac{1}{5}$ (c) $\frac{1}{7}$ (d) $\frac{2}{7}$	
Sol.	(b) $\frac{1}{5}$	1
9.	For some data $x_1, x_2, \ldots\ldots x_n$ with respective frequencies $f_1, f_2, \ldots\ldots f_n$, the value of $\sum_{1}^{n} f_i\left(x_i - \bar{x}\right)$ is equal to : (a) $n\bar{x}$ (b) 1 (c) $\sum f_i$ (d) 0	
Sol.	(d) 0	1
10.	The zeroes of a polynomial $x^2 + px + q$ are twice the zeroes of the polynomial $4x^2 - 5x - 6$. The value of p is : (a) $-\frac{5}{2}$ (b) $\frac{5}{2}$ (c) -5 (d) 10	
Sol.	(a) $-\frac{5}{2}$	1
11.	If the distance between the points (3, – 5) and (x, – 5) is 15 units, then the values of x are : (a) 12, – 18 (b) – 12, 18 (c) 18, 5 (d) – 9, – 12	
Sol.	(b) – 12, 18	1

12.	If $\cos(\alpha+\beta)=0$, then value of $\cos\left(\frac{\alpha+\beta}{2}\right)$ is equal to : (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{2}$ (c) 0 (d) $\sqrt{2}$	
Sol.	(a) $\frac{1}{\sqrt{2}}$	1
13.	A solid sphere is cut into two hemispheres. The ratio of the surface areas of sphere to that of two hemispheres taken together, is : (a) 1 : 1 (b) 1 : 4 (c) 2 : 3 (d) 3 : 2	
Sol.	(c) 2 : 3	1
14.	The middle most observation of every data arranged in order is called : (a) mode (b) median (c) mean (d) deviation	
Sol.	(b) median	1
15.	The volume of the largest right circular cone that can be carved out from a solid cube of edge 2 cm is : (a) $\frac{4\pi}{3}$ cu cm (b) $\frac{5\pi}{3}$ cu cm (c) $\frac{8\pi}{3}$ cu cm (d) $\frac{2\pi}{3}$ cu cm	
Sol.	(d) $\frac{2\pi}{3}$ cu cm	1
16.	Two dice are rolled together. The probability of getting sum of numbers on the two dice as 2, 3 or 5, is : (a) $\frac{7}{36}$ (b) $\frac{11}{36}$ (c) $\frac{5}{36}$ (d) $\frac{4}{9}$	
Sol.	(a) $\frac{7}{36}$	1
17.	The centre of a circle is at (2, 0). If one end of a diameter is at (6, 0), then the other end is at : (a) (0, 0) (b) (4, 0) (c) (– 2, 0) (d) (– 6, 0)	
Sol.	(c) (– 2, 0)	1

18.	In the given figure, graphs of two linear equations are shown. The pair of these linear equations is : (a) consistent with unique solution. (b) consistent with infinitely many solutions. (c) inconsistent. (d) inconsistent but can be made consistent by extending these lines. 	
Sol.	(a) consistent with unique solution	1
	Directions : **In Q. No. 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 correct explanation for 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) :** The tangents drawn at the end points of a diameter of a circle, are parallel. **Reason (R) :** Diameter of a circle is the longest chord.	
Sol.	(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation for Assertion (A).	1
20.	**Assertion (A) :** If the graph of a polynomial touches x-axis at only one point, then the polynomial cannot be a quadratic polynomial. **Reason (R) :** A polynomial of degree $n(n>1)$ can have at most n zeroes.	
Sol.	(d) Assertion (A) is false but Reason (R) is true.	1

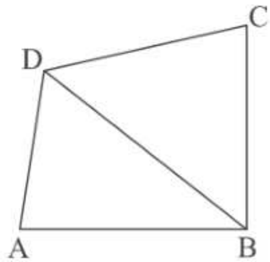
	SECTION B This section consists of 5 questions of 2 marks each.	
21.	Solve the following system of linear equations $7x - 2y = 5$ and $8x + 7y = 15$ and verify your answer.	
Sol.	$7x - 2y = 5$ ----- (i) $8x + 7y = 15$ ----- (ii) Solving equation (i) and (ii), we get $x = 1$, $y = 1$ Verification of answer	 1 + ½ ½
22.	In a pack of 52 playing cards one card is lost. From the remaining cards, a card is drawn at random. Find the probability that the drawn card is queen of heart, if the lost card is a black card.	
Sol.	Total number of remaining cards = 51 P (getting queen of heart) = $\frac{1}{51}$	1 1
23. (A)	Evaluate : $2\sqrt{2}\ \cos 45^\circ \sin 30^\circ + 2\sqrt{3}\ \cos 30^\circ$	
Sol.	$2\sqrt{2} \times \frac{1}{\sqrt{2}} \times \frac{1}{2} + 2\sqrt{3} \times \frac{\sqrt{3}}{2}$ $= 4$	½+½ + ½ ½
	OR	
23. (B)	If $A = 60^\circ$ and $B = 30^\circ$, verify that : $\sin (A + B) = \sin A \cos B + \cos A \sin B$	
Sol.	LHS = $\sin (60^\circ + 30^\circ) = \sin 90^\circ = 1$ RHS = $\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$ $= \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times \frac{1}{2} = 1$ $\therefore$ LHS = RHS	1 1

24. In the given figure, ABCD is a quadrilateral. Diagonal BD bisects $\angle B$ and $\angle D$ both.

Prove that :

(i) $\Delta ABD \sim \Delta CBD$

(ii) $AB = BC$

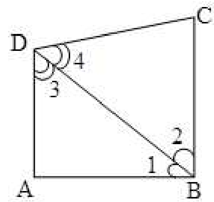


Sol. (i) In ΔABD & ΔCBD

$\angle 3 = \angle 4$

$\angle 1 = \angle 2$

$\therefore \Delta ABD \sim \Delta CBD$ — 1



(ii) $\Delta ABD \cong \Delta CBD$

$\therefore AB = BC$ — 1

25. (A) Prove that $5-2\sqrt{3}$ is an irrational number. It is given that $\sqrt{3}$ is an irrational number.

Sol. Assuming $5 - 2\sqrt{3}$ to be a rational number.

Let $5 - 2\sqrt{3} = \frac{a}{b}$ where a and b are integers & $b \neq 0$ — ½

$\Rightarrow \sqrt{3} = \frac{5b-a}{2b}$ — ½

Here RHS is rational but LHS is irrational.

Therefore our assumption is wrong. — ½

Hence, $5 - 2\sqrt{3}$ is an irrational number. — ½

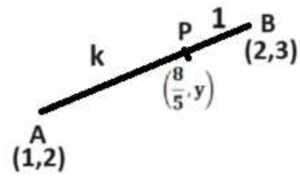
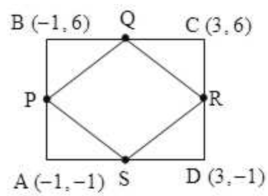
OR

25. (B) Show that the number $5\times11\times17+3\times11$ is a composite number.

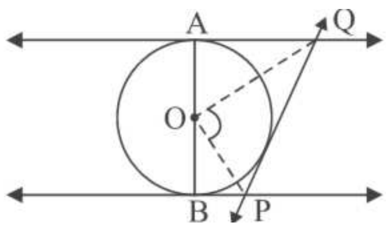
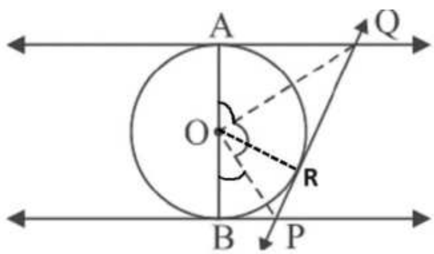
Sol. $5 \times 11 \times 17 + 3 \times 11 = 11 \times (5 \times 17 + 3)$ — 1

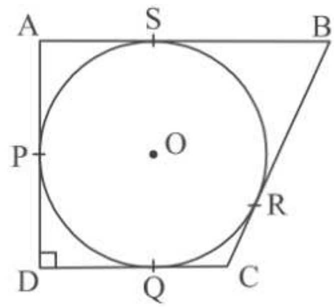
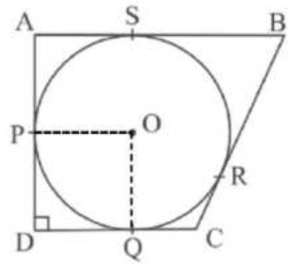
$= 11 \times 88$ or $11 \times 11 \times 2^3$ — ½

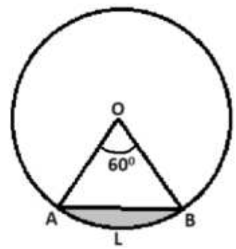
It means the number can be expressed as a product of two factors other than 1, therefore the given number is a composite number. — ½

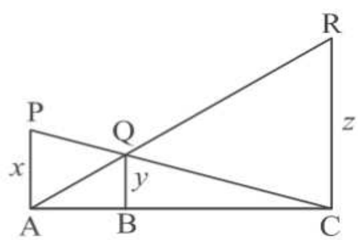
	SECTION C This section consists of 6 questions of 3 marks each.	
26. (A)	Find the ratio in which the point $\left(\frac{8}{5}, y\right)$ divides the line segment joining the points (1, 2) and (2, 3). Also, find the value of y.	
Sol.	Let AP: PB = k : 1  $\therefore \frac{2k+1}{k+1} = \frac{8}{5}$ $\Rightarrow k = \frac{3}{2}$ $\therefore$ required ratio is 3: 2. $y = \frac{3\times3+2\times2}{3+2} = \frac{13}{5}$	1 ½ ½ 1
	OR	
26. (B)	ABCD is a rectangle formed by the points A (–1, –1), B (–1, 6), C (3, 6) and D (3, –1). P, Q, R and S are mid–points of sides AB, BC, CD and DA respectively. Show that diagonals of the quadrilateral PQRS bisect each other.	
Sol.	 Co-ordinates of point P are $\left(\frac{-1-1}{2}, \frac{-1+6}{2}\right)$ i.e. $\left(-1, \frac{5}{2}\right)$ Co-ordinates of point Q are $\left(\frac{-1+3}{2}, \frac{6+6}{2}\right)$ i.e. $(1, 6)$ Co-ordinates of point R are $\left(\frac{3+3}{2}, \frac{6-1}{2}\right)$ i.e. $\left(3, \frac{5}{2}\right)$ Co-ordinates of point S are $\left(\frac{-1+3}{2}, \frac{-1-1}{2}\right)$ i.e. $(1, -1)$ Co-ordinates of mid point of diagonal QS are $\left(\frac{1+1}{2}, \frac{6-1}{2}\right)$ i.e. $\left(1, \frac{5}{2}\right)$ Co-ordinates of mid point of diagonal PR are $\left(\frac{-1+3}{2}, \frac{\frac{5}{2}+\frac{5}{2}}{2}\right)$ i.e. $\left(1, \frac{5}{2}\right)$ Since coordinates of mid point of QS = coordinates of mid point of PR Therefore, diagonals PR and QS bisect each other.	½ ½ ½ ½ ½ ½

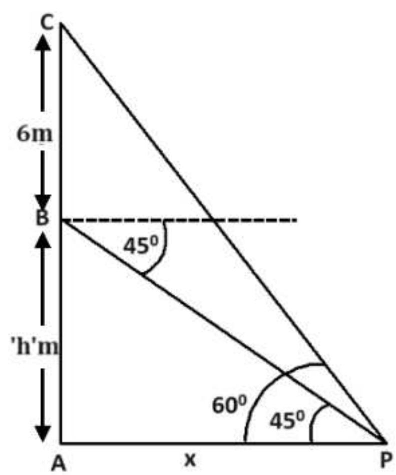
27.	In a teachers' workshop, the number of teachers teaching French, Hindi and English are 48, 80 and 144 respectively. Find the minimum number of rooms required if in each room the same number of teachers are seated and all of them are of the same subject.	
Sol.	Minimum number of rooms required means there should be maximum number of teachers in a room. We have to find HCF of 48, 80 and 144. $48 = 2^4 \times 3$ $80 = 2^4 \times 5$ $144 = 2^4 \times 3^2$ HCF (48, 80, 144) $= 2^4 = 16$ Therefore, total number of rooms required $= \frac{48}{16} + \frac{80}{16} + \frac{144}{16} = 17$	 ½ ½ ½ ½ 1
28.	Prove that : $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \operatorname{cosec}\theta$	
Sol.	LHS $= \frac{\frac{\sin\theta}{\cos\theta}}{\frac{(\sin\theta - \cos\theta)}{\sin\theta}} + \frac{\frac{\cos\theta}{\sin\theta}}{\frac{(\cos\theta - \sin\theta)}{\cos\theta}}$ $= \frac{1}{(\sin\theta - \cos\theta)}\left[\frac{\sin^2\theta}{\cos\theta} - \frac{\cos^2\theta}{\sin\theta}\right]$ $= \frac{1}{(\sin\theta - \cos\theta)} \times \frac{(\sin\theta - \cos\theta)(\sin^2\theta + \cos^2\theta + \sin\theta\cos\theta)}{\sin\theta\cos\theta}$ $= \frac{1}{\sin\theta\cos\theta} + 1$ $= 1 + \sec\theta \operatorname{cosec}\theta$ = RHS	½ 1 1 ½

29.	Three years ago, Rashmi was thrice as old as Nazma. Ten years later, Rashmi will be twice as old as Nazma. How old are Rashmi and Nazma now ?	
Sol.	Let present age of Rashmi and Nazma be x years and y years respectively. Therefore, $x - 3 = 3\ (y - 3)$ or $x - 3y + 6 = 0$ and $x + 10 = 2\ (y + 10)$ or $x - 2y - 10 = 0$ Solving equations to get $x = 42$, $y = 16$ ∴ Present age of Rashmi is 42 years and that of Nazma is 16 years.	 1 1 1
30. (A)	In the given figure, AB is a diameter of the circle with centre O. AQ, BP and PQ are tangents to the circle. Prove that $\angle POQ = 90^\circ$.  	
Sol.	 Join OR. $\Delta AOQ \cong \Delta ROQ \Rightarrow \angle AOQ = \angle ROQ$ ----- (i) $\Delta BOP \cong \Delta ROP \Rightarrow \angle BOP = \angle ROP$ ----- (ii) Since $\angle AOR + \angle ROB = 180^\circ$ $\Rightarrow 2\angle QOR + 2\angle ROP = 180^\circ$ $\Rightarrow \angle QOR + \angle ROP = \angle POQ = 90^\circ$	 ½ 1 ½ ½ ½
	OR	

30. (B)	A circle with centre O and radius 8 cm is inscribed in a quadrilateral ABCD in which P, Q, R, S are the points of contact as shown. If AD is perpendicular to DC, BC = 30 cm and BS = 24 cm, then find the length DC. 	
Sol.	Join OP and OQ. 	
	BR = BS = 24 cm	½
	∴ CR = 6 cm	½
	$\Rightarrow$ CQ = 6 cm	½
	Also, DQ = OP = 8 cm	½
	Hence, DC = 8 + 6 = 14 cm	1
31.	The difference between the outer and inner radii of a hollow right circular cylinder of length 14 cm is 1 cm. If the volume of the metal used in making the cylinder is 176 cm^3, find the outer and inner radii of the cylinder.	
Sol.	Let outer radius be r_2 cm and inner radius be r_1 cm.	
	$\therefore r_2 - r_1 = 1$ ---- (i)	½
	Volume of metal used = 176 cm^3	
	$\Rightarrow \frac{22}{7} \times 14 \times (r_2^2 - r_1^2) = 176$	1
	$\Rightarrow r_2 + r_1 = 4$ ---- (ii)	½
	Solving (i) and (ii), we get	
	$r_2 = \frac{5}{2}$ or 2.5 , $r_1 = \frac{3}{2}$ or 1.5	1
	Therefore, outer radius = 2.5 cm and inner radius = 1.5 cm	

	SECTION D This section consists of 4 questions of 5 marks each.	
32.	An arc of a circle of radius 21 cm subtends an angle of 60° at the centre. Find : (i) the length of the arc. (ii) the area of the minor segment of the circle made by the corresponding chord.	
Sol.	 (i) Length of the arc AB $= 2 \times \frac{22}{7} \times 21 \times \frac{60}{360}$ $= 22$ cm (ii) Area of sector OALB $= \frac{22}{7} \times 21 \times 21 \times \frac{60}{360} = 231$ cm^2 Area of ΔOAB $= \frac{\sqrt{3}}{4} \times 21 \times 21 = \frac{441\sqrt{3}}{4}$ cm^2 Area of minor segment $= \left(231 - \frac{441\sqrt{3}}{4}\right)$ cm^2 or $(231 - 190.95) = 40.05$ cm^2	 1½ ½ 1 1½ ½
33. (A)	The sum of first and eighth terms of an A.P. is 32 and their product is 60. Find the first term and common difference of the A.P. Hence, also find the sum of its first 20 terms.	
Sol.	$a + a_8 = 32 \Rightarrow 2a + 7d = 32$ ----- (i) $a \times a_8 = 60 \Rightarrow a(a + 7d) = 60$ ----- (ii) Solving (i) & (ii), we get $a = 2$ or $a = 30$ and $d = 4$ or $d = -4$ First term and common difference of A.P. are 2 and 4 or 30 and -4 respectively.	1 1 } 2

	Now, for a = 2 & d = 4 S_{20} = 10 (4 + 76) = 800 and for a = 30 & d = – 4 S_{20} = 10 (60 – 76) = – 160	½ ½
	OR	
33. (B)	In an A.P. of 40 terms, the sum of first 9 terms is 153 and the sum of last 6 terms is 687. Determine the first term and common difference of A.P. Also, find the sum of all the terms of the A.P.	
Sol.	Here n = 40, $S_9 = \frac{9}{2}[2a + 8d] = 153 \Rightarrow a + 4d = 17$ ---- (i) and $S_{40} - S_{34} = 687$ or $a_{35} + a_{36} + a_{37} + a_{38} + a_{39} + a_{40} = 687$ $\Rightarrow 6a + 219d = 687$ or $2a + 73d = 229$ ---- (ii) solving (i) and (ii) to get a = 5, d = 3 Also, $S_{40} = \frac{40}{2}(10 + 39 \times 3) = 2540$	1 2 1 1
34.(A)	If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.	
Sol.	Correct figure, given, to prove and construction Correct proof	4×½ = 2 3
	OR	
34. (B)	In the given figure PA, QB and RC are each perpendicular to AC. If AP = x, BQ = y and CR = z, then prove that $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$ 	
Sol.	$\Delta PAC \sim \Delta QBC$ $\therefore \frac{x}{y} = \frac{AC}{BC}$ or $\frac{y}{x} = \frac{BC}{AC}$ ---- (i)	1 1

	$\Delta RCA \sim \Delta QBA$ $\therefore \frac{z}{y} = \frac{AC}{AB}$ or $\frac{y}{z} = \frac{AB}{AC}$ ---- (ii) Adding (i) and (ii) $\frac{y}{x} + \frac{y}{z} = \frac{BC+AB}{AC}$ $\Rightarrow \frac{1}{x} + \frac{1}{z} = \frac{1}{y}$	1 1 ½ ½
35.	A pole 6m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point P on the ground is 60° and the angle of depression of the point P from the top of the tower is 45°. Find the height of the tower and the distance of point P from the foot of the tower. (Use $\sqrt{3} = 1.73$)	
Sol.	Correct figure  Let BC be the pole and AB be the tower of height 'h' m. $\tan 45^\circ = 1 = \frac{h}{x}$ $\Rightarrow h = x$ ---- (i) $\tan 60^\circ = \sqrt{3} = \frac{h+6}{x}$ $\Rightarrow h + 6 = x\sqrt{3}$ ---- (ii)	1 1 ½ 1 ½

	Solving (i) & (ii) to get h = 3 ($\sqrt{3}$ + 1) = 8.19 and x = 8.19 Therefore, the height of tower is 8.19 m and the distance of point P from the foot of the tower is 8.19 m	 ½ ½
	SECTION E This section consists of 3 Case-Study Based Questions of 4 marks each.	
36.	A rectangular floor area can be completely tiled with 200 square tiles. If the side length of each tile is increased by 1 unit, it would take only 128 tiles to cover the floor.  (i) Assuming the original length of each side of a tile be x units, make a quadratic equation from the above information. (ii) Write the corresponding quadratic equation in standard form. (iii) (a) Find the value of x, the length of side of a tile by factorisation. **OR** (b) Solve the quadratic equation for x, using quadratic formula.	
Sol.	(i) $200\,x^2 = 128\,(x + 1)^2$ (ii) $25x^2 = 16x^2 + 32x + 16$ $\Longrightarrow 9x^2 - 32x - 16 = 0$ (iii) (a) $9x^2 - 32x - 16 = 0$ $\Longrightarrow (9x + 4)\,(x - 4) = 0$ $x \neq \frac{-4}{9}$ so, $x = 4$ OR (iii) (b) $x = \frac{32 \pm \sqrt{1024+576}}{18} = \frac{32 \pm 40}{18}$ $x \neq \frac{-4}{9}$ so, $x = 4$	1 1 1 1 1 1

37.

BINGO is game of chance. The host has 75 balls numbered 1 through 75. Each player has a BINGO card with some numbers written on it. The participant cancels the number on the card when called out a number written on the ball selected at random. Whosoever cancels all the numbers on his/her card, says BINGO and wins the game.

The table given below, shows the data of one such game where 48 balls were used before Tara said 'BINGO'.

Numbers announced	Number of times
0-15	8
15-30	9
30-45	10
45-60	12
60-75	9

Based on the above information, answer the following :

(i) Write the median class.

(ii) When first ball was picked up, what was the probability of calling out an even number ?

(iii) (a) Find median of the given data.

OR

(b) Find mode of the given data.

Sol.

Number announced	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75
Number of times (f)	8	9	10	12	9
cf	8	17	27	39	48=N

(i) $\frac{N}{2} = 24$

$\therefore$ median class is 30 – 45 — 1

(ii) P (picking up an even number) = $\frac{37}{75}$ — 1

(iii) (a) Median = $30 + \frac{\left(\frac{48}{2} - 17\right)}{10} \times 15$ — 1

= 40.5 — 1

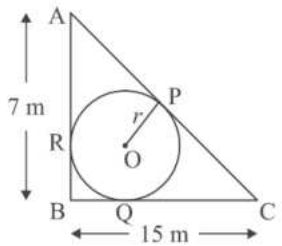
OR

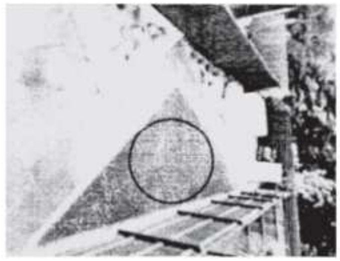
(iii) (b) Modal class is 45 – 60 — ½

Mode = $45 + \frac{12-10}{2\times12-10-9} \times 15$ — 1

= 51 — ½

38. A backyard is in the shape of a triangle ABC with right angle at B. AB = 7 m and BC = 15 m. A circular pit was dug inside it such that it touches the walls AC, BC and AB at P, Q and R respectively such that AP = x m.





Based on the above information, answer the following questions :

(i) Find the length of AR in terms of x.

(ii) Write the type of quadrilateral BQOR.

(iii) (a) Find the length PC in terms of x and hence find the value of x.

OR

(b) Find x and hence find the radius r of circle.

Sol.

(i) AR = x m — 1

(ii) Quad. ORBQ is a square. — 1

(iii) (a) PC = $8 + x$ — ½

$AC^2 = (8 + 2x)^2 = 49 + 225 = 274$ — 1

$\Rightarrow\ 8 + 2x = \sqrt{274}$

$\Rightarrow x = \frac{-8+\sqrt{274}}{2}$ or 4.28 approx. — ½

OR

(iii) (b) $AC^2 = (8 + 2x)^2 = 49 + 225 = 274$ — 1

$\Rightarrow\ 8 + 2x = \sqrt{274}$

$\Rightarrow x = \frac{-8+\sqrt{274}}{2}$ or 4.28 approx. — ½

Hence, radius $r = 7 - x = 7 - \left(-4 + \frac{\sqrt{274}}{2}\right)$

$= \left(11 - \frac{\sqrt{274}}{2}\right)$ or 2.72 approx. — ½

Therefore, radius of the circle is $\left(11 - \frac{\sqrt{274}}{2}\right)$ m or 2.72 m approx.