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

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	**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".**
10	**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".**
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 on 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 totalling 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(B))

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A This section comprises Multiple Choice Questions (MCQs) 1 mark each.	
1.	The LCM of 24, 36 and 60 in terms of their prime factors is : (A) $2^2 \times 3 \times 5$ (B) $2^3 \times 3^2$ (C) $2^3 \times 3^2 \times 5$ (D) $2^3 \times 3^3 \times 5$	
Sol.	(C) $2^3 \times 3^2 \times 5$	1
2.	The graph of a polynomial intersects the y-axis at one point and the x-axis at two points. The number of zeroes of this polynomial are : (A) 1 (B) 2 (C) 3 (D) 0	
Sol.	(B) 2	1
3.	The solution of the pair of linear equations $\frac{2x}{3} - \frac{y}{2} = -\frac{1}{6}$ and $\frac{x}{2} + \frac{2y}{3} = 3$ is : (A) $x = 2, y = -3$ (B) $x = -2, y = 3$ (C) $x = 2, y = 3$ (D) $x = -2, y = -3$	
Sol.	(C) $x = 2, y = 3$	1
4.	The roots of the quadratic equation $x^2 + x - p(p + 1) = 0$ are : (A) $p, p + 1$ (B) $-p, p + 1$ (C) $-p, -(p + 1)$ (D) $p, -(p + 1)$	
Sol.	(D) $p, -(p + 1)$	1

5.	The sum of the first three terms of an AP is 30 and the sum of the last three terms is 36. If the first term is 9, then the number of terms is : (A) 10 (B) 5 (C) 6 (D) 13	
Sol.	(B) 5	1
6.	The probability of getting a sum of 8, when two dice are thrown simultaneously, is : (A) $\frac{1}{12}$ (B) $\frac{1}{9}$ (C) $\frac{1}{6}$ (D) $\frac{5}{36}$	
Sol.	(D) $\frac{5}{36}$	1
7.	The perpendicular bisector of the line segment joining the points A(–1, 3) and B(2, 4) cuts the y-axis at : (A) (0, 5) (B) (0, – 5) (C) (0, 4) (D) (0, – 4)	
Sol.	(A) (0, 5)	1
8.	If in triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR}$, then they will be similar, when : (A) $\angle B = \angle Q$ (B) $\angle A = \angle R$ (C) $\angle B = \angle R$ (D) $\angle C = \angle Q$	
Sol.	(C) $\angle B = \angle R$	1
9.	A line l intersects the sides PQ and PR of a Δ PQR at L and M respectively such that LM $\|\|$ QR. If PL = 5·7 cm, PQ = 15·2 cm and MR = 5·5 cm, then the length of PM (in cm) is : (A) 3 (B) 1·8 (C) 2·5 (D) 3·3	
Sol.	(D) 3.3	1

10.	If two tangents inclined at an angle of 60° are drawn to a circle of radius 5 cm, then the length of each tangent is : (A) $\frac{5\sqrt{3}}{2}$ cm (B) 10 cm (C) $\frac{5}{\sqrt{3}}$ cm (D) $5\sqrt{3}$ cm	
Sol.	(D) $5\sqrt{3}$ cm	1
11.	If $\tan A = 3 \cot A$, then the measure of the angle A is : (A) 15° (B) 30° (C) 45° (D) 60°	
Sol.	(D) 60°	1
12.	$(\sec \theta + \tan \theta)(1 - \sin \theta)$ is equal to : (A) $\sec \theta$ (B) $\sin \theta$ (C) $\text{cosec } \theta$ (D) $\cos \theta$	
Sol.	(D) $\cos \theta$	1
13.	A ladder 14 m long just reaches the top of a vertical wall. If the ladder makes an angle of 60° with the wall, then the height of the wall is : (A) $14\sqrt{3}$ m (B) 7 m (C) 14 m (D) $7\sqrt{3}$ m	
Sol.	(B) 7 m	1
14.	If the area of a sector is one-twelfth that of a complete circle, then the angle of the sector is : (A) 36° (B) 30° (C) 60° (D) 45°	
Sol.	(B) 30°	1

15.	The minute hand of a clock is 21 cm long. The area swept by it in 10 minutes is : (A) $121\ cm^2$ (B) $131\ cm^2$ (C) $231\ cm^2$ (D) $172{\cdot}5\ cm^2$	
Sol.	(C) $231\ cm^2$	1
16.	A box contains cards numbered 6 to 50. A card is drawn at random from the box. The probability that the drawn card has a number which is a perfect square, is : (A) $\frac{5}{44}$ (B) $\frac{1}{9}$ (C) $\frac{1}{11}$ (D) $\frac{7}{45}$	
Sol.	(B) $\frac{1}{9}$	1
17.	Two friends were born in the year 2000. The probability that they have the same birthday is : (A) $\frac{1}{365}$ (B) $\frac{364}{365}$ (C) $\frac{1}{366}$ (D) $\frac{365}{366}$	
Sol.	(C) $\frac{1}{366}$	1
18.		

Marks :	Below 10	Below 20	Below 30	Below 40	Below 50
Number of Students :	3	12	27	57	75

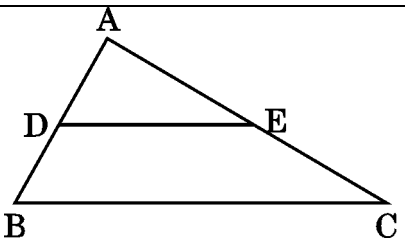
For the above distribution, the modal class is :

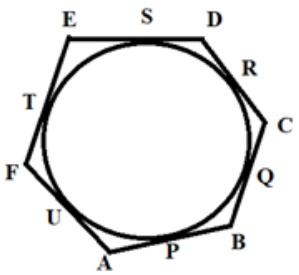
(A) 10 – 20 (B) 20 – 30

(C) 30 – 40 (D) 40 – 50

Sol.	(C) 30 – 40	1

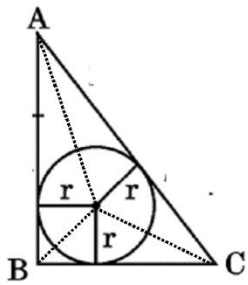
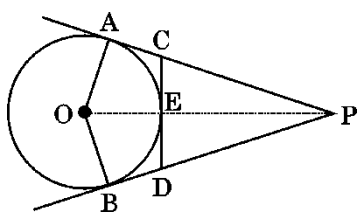
	*Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.* (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of 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) :* The area of canvas cloth required to just cover a heap of rice in the form of a cone of diameter 14 m and height 24 m is 175π sq.m. *Reason (R) :* The curved surface area of a cone of radius r and slant height l is $\pi r l$.	
Sol.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1
20.	*Assertion (A) :* The sum of the first fifteen terms of the AP 21, 18, 15, 12, … is zero. *Reason (R) :* The sum of the first n terms of an AP with first term 'a' and common difference 'd' is given by $S_n = \frac{n}{2}[a + (n-1)d]$.	
Sol.	(C) Assertion (A) is true, but Reason (R) is false.	1
	SECTION B This section comprises of Very Short Answer (VSA) type questions of 2 marks each.	
21.	Find the smallest number that is divisible by each of 8, 9 and 10.	
Sol.	$8 = 2^3$ $9 = 3^2$ $10 = 2 \times 5$ LCM (8, 9, 10) = $2^3 \times 3^2 \times 5 = 360$ ∴ smallest number divisible by each 8, 9 and 10 is 360.	1 1

22. (a)	In a Δ ABC, D and E are points on the sides AB and AC respectively such that BD = CE. If $\angle$ B = $\angle$ C, then show that DE $\|\|$ BC.	
Sol.	In ΔABC, $\angle$B = $\angle$C $\Rightarrow$ AC = AB ---- (1) Given, BD = CE ---- (2) Subtract (2) from (1), we have AD = AE ----(3) (3) $\div$ (2), we have $\frac{AD}{BD} = \frac{AE}{CE}$ Therefore, DE $\|$ BC. 	½ ½ ½ ½
	OR	
22. (b)	If Δ ABC ~ Δ DEF and AB = 4 cm, DE = 6 cm, EF = 9 cm and FD = 12 cm, find the perimeter of Δ ABC.	
Sol.	Given, ΔABC ~ ΔDEF $\therefore \frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{DF}$ $\Rightarrow \frac{4}{6} = \frac{BC}{9} = \frac{CA}{12}$ $\therefore$ BC = 6 cm and CA = 8 cm Perimeter of ΔABC = 4 + 6 + 8 = 18 cm	½ ½ + ½ ½

23.	If a hexagon ABCDEF circumscribes a circle, show that AB + CD + EF = BC + DE + FA.	
Sol.	PB = BQ ----① RC = QC ----② RD = DS ----③ ET = SE ----④ TF = FU ----⑤ AP = AU ----⑥  Adding ①, ②, ③, ④, ⑤ and ⑥, we get (AP+ PB)+(RC + RD)+(ET + TF) = (BQ + QC)+(DS + SE)+(FU + AU) ⟹ AB + CD + EF = BC + DE + FA	1½ ½
24(a).	If $\tan\theta + \sec\theta = m$, then prove that $\sec\theta = \frac{m^2+1}{2m}$.	
Sol.	$\tan\theta + \sec\theta = m$ ---- (i) Therefore, $\sec\theta - \tan\theta = \frac{1}{m}$ ---- (ii) Adding (i) and (ii) to get $2\sec\theta = m + \frac{1}{m}$ $\Rightarrow \sec\theta = \frac{m^2+1}{2m}$	1 ½ ½
	OR	

24(b).	If $\sin A = \frac{3}{5}$ and $\cos B = \frac{12}{13}$, then find the value of $(\tan A + \tan B)$.	
Sol.	$\sin A = \frac{3}{5} \Rightarrow \tan A = \frac{3}{4}$ $\cos B = \frac{12}{13} \Rightarrow \tan B = \frac{5}{12}$ $tanA + tanB = \frac{3}{4} + \frac{5}{12} = \frac{14}{12}$ or $\frac{7}{6}$	1 ½ ½
25.	A horse, a cow and a goat are tied, each by ropes of length 14 m, at the corners A, B and C respectively, of a grassy triangular field ABC with sides of lengths 35 m, 40 m and 50 m. Find the total area of grass field that can be grazed by them.	
Sol.	Required Area = $\frac{22}{7} \times 14 \times 14 \times \frac{180}{360}$ = 308 m^2	1 1
	SECTION C This section comprises of Short Answer (SA) type questions of 3 marks each.	
26.	Prove that $\sqrt{3}$ is an irrational number.	
Sol.	Let $\sqrt{3}$ be a rational number. $\therefore \sqrt{3} = \frac{p}{q}$, where q≠0 and p & q are coprime. $3q^2 = p^2 \Longrightarrow p^2$ is divisible by 3 $\Longrightarrow$ p is divisible by 3 ----- (i) $\Longrightarrow$ p = 3a, where 'a' is some integer $9a^2 = 3q^2 \Longrightarrow q^2 = 3a^2 \Longrightarrow q^2$ is divisible by 3 $\Longrightarrow$ q is divisible by 3 ----- (ii) (i) and (ii) leads to contradiction as 'p' and 'q' are coprime. $\therefore \sqrt{3}$ is an irrational number.	½ 1 1 ½

27. (a)	If α and β are the zeroes of the quadratic polynomial $f(x) = 6x^2 + 11x - 10$, find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.	
Sol.	Here $\alpha+\beta = \frac{-11}{6}$ and $\alpha\beta = \frac{-10}{6}$	1
	$\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2+\beta^2}{\alpha\beta} = \frac{(\alpha+\beta)^2 - 2\alpha\beta}{\alpha\beta}$	1
	$= \frac{\left(\frac{-11}{6}\right)^2 - 2\times\left(\frac{-10}{6}\right)}{\frac{-10}{6}} = \frac{-241}{60}$	1
	OR	
27. (b)	Find the zeroes of the polynomial $f(t) = t^2 + 4\sqrt{3}\,t - 15$ and verify the relationship between the zeroes and the coefficients of the polynomial.	
Sol.	$f(t) = t^2 + 4\sqrt{3}\,t - 15 = t^2 + 5\sqrt{3}\,t - \sqrt{3}\,t - 15$	
	$= (t - \sqrt{3})(t + 5\sqrt{3})$	1
	$\therefore$ Zeroes of given polynomial are $-5\sqrt{3}, \sqrt{3}$	1
	Sum of the zeroes $= (-5\sqrt{3} + \sqrt{3}) = \frac{-4\sqrt{3}}{1} = \frac{-(coefficient\ of\ t)}{coefficient\ of\ t^2}$	½
	Product of the zeroes $= (-5\sqrt{3}) \times \sqrt{3}) = \frac{-15}{1} = \frac{constant\ term}{coefficient\ of\ t^2}$	½
28.	The monthly incomes of A and B are in the ratio 8 : 7 and their expenditures are in the ratio 19 : 16. If each saves ₹ 2500 per month, find the monthly income of each.	
Sol.	Let the monthly incomes of A and B be ₹ 8x and ₹ 7x respectively and the expenditures of A and B be ₹ 19y and ₹ 16y respectively.	½
	A.T.Q.	
	$8x - 19y = 2500$ ---- ①	½
	$7x - 16y = 2500$ ---- ②	½

	Solving ① and ②, we have x = 1500 ∴ Monthly income of A = 8 × 1500 = 12000 and monthly income of B = 7 × 1500 = 10500 ∴ monthly incomes of A and B are ₹12000 and ₹ 10500 respectively.	½ ½ ½
29(a).	A circle is inscribed in a right-angled triangle ABC, right-angled at B. If BC = 7 cm and AB = 24 cm, find the radius of the circle.	
Sol.	$AC = \sqrt{24^2 + 7^2} = 25$ cm Let the radius of the circle be 'r' cm $\frac{1}{2} \times 24 \times 7 = \frac{1}{2} \times r \times 7 + \frac{1}{2} \times r \times 24 + \frac{1}{2} \times r \times 25$ $\Rightarrow r = 3$ ∴ radius of circle is 3 cm.  	1 1 1
	OR	
29(b).	From an external point P, two tangents PA and PB are drawn to a circle with centre O. At a point E on the circle, a tangent is drawn which intersects PA and PB at C and D respectively. If PA = 10 cm, find the perimeter of Δ PCD.	
Sol.	Perimeter of ΔPCD = PC + CD + DP = PC + CE + ED + DP = PC + CA + DB + DP = PA + PB = PA + PA = 2 PA = 2 × 10 = 20 cm  	1 ½ ½ ½ ½

30. **Prove that :** $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \tan\theta + \cot\theta$

Sol.

$$\text{LHS} = \frac{\tan\theta}{1 - \frac{1}{\tan\theta}} + \frac{\frac{1}{\tan\theta}}{1 - \tan\theta}$$ ½

$$= \frac{\tan^2\theta}{\tan\theta - 1} - \frac{1}{\tan\theta(\tan\theta - 1)}$$ ½

$$= \frac{\tan^3\theta - 1}{\tan\theta(\tan\theta - 1)}$$ ½

$$= \frac{(\tan\theta - 1)(\tan^2\theta + \tan\theta + 1)}{\tan\theta(\tan\theta - 1)}$$ 1

$$= \tan\theta + 1 + \cot\theta = \text{RHS}$$ ½

31. **Calculate the mean of the following data :**

Class :	4 – 6	7 – 9	10 – 12	13 – 15
Frequency :	5	4	9	10

Sol.

Class	4 – 6	7 – 9	10 – 12	13 – 15	**Total**
f_i	5	4	9	10	28
x_i	5	8	11	14	
$f_i x_i$	25	32	99	140	296

Correct table 1½

Mean = $\frac{296}{28}$ 1

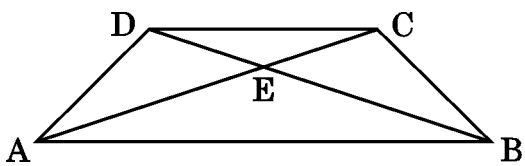
$= \frac{74}{7}$ or 10.57 approx. ½

SECTION D

This section comprises of Long Answer (LA) type questions of 5 marks each.

32(a). **The sum of two numbers is 18 and the sum of their reciprocals is $\frac{1}{4}$. Find the numbers.**

Sol. Let two numbers be x and (18 – x) 1

	A.T.Q. $\frac{1}{x} + \frac{1}{18-x} = \frac{1}{4}$ $\Rightarrow x^2 - 18x + 72 = 0$ $\Rightarrow (x - 12)(x - 6) = 0$ $\Rightarrow x = 12, x = 6$ $\therefore$ two numbers are 12 and 6.	1 1 ½ 1 ½
	OR	
32(b).	Solve for x : $\frac{4}{x} - \frac{5}{2x+3} = 3$	
Sol.	$4(2x + 3) - 5x = 3x(2x + 3)$ $\Rightarrow 6x^2 + 6x - 12 = 0$ or $x^2 + x - 2 = 0$ $\Rightarrow (x - 1)(x + 2) = 0$ $\Rightarrow x = 1, x = -2$	2 1 1 1
33.	ABCD is a trapezium with AB || DC. AC and BD intersect at E. If Δ AED ~ Δ BEC, then prove that AD = BC.	
Sol.	 Given Δ AED ~ Δ BEC $\therefore \frac{AE}{BE} = \frac{DE}{CE} = \frac{AD}{BC}$ ----① Also AB || DC $\Rightarrow$ Δ AEB ~ Δ CED $\therefore \frac{AE}{CE} = \frac{BE}{DE}$ *or* $\frac{AE}{BE} = \frac{CE}{DE}$ ---- ②	1 1

	From ① and ②, we get $\frac{DE}{CE} = \frac{CE}{DE}$ $\Rightarrow DE^2 = CE^2 \Rightarrow DE = CE$ $\therefore$ From ① $\frac{AD}{BC} = 1 \Rightarrow AD = BC$	1 1 1
34(a).	The interior of a building is in the form of a cylinder of base radius 12 m and height 3·5 m surmounted by a cone of equal base and slant height 14 m. Find the internal curved surface area of the building.	
Sol.	Internal CSA of the building = $2 \times \frac{22}{7} \times 12 \times 3.5 + \frac{22}{7} \times 12 \times 14$ = 792 m^2	2 + 2 1
	OR	
34(b).	Determine the ratio of the volume of a cube to that of the sphere which will exactly fit inside the cube.	
Sol.	Let the side of the cube be 'x' units $\therefore$ Radius of the sphere = $\frac{x}{2}$ units $\frac{Volume\ of\ cube}{Volume\ of\ sphere} = \frac{x^3}{\frac{4}{3} \times \pi \times \left(\frac{x}{2}\right)^3}$ $= \frac{6}{\pi}$ $\therefore$ required ratio is 6 : π	1 2 1½ ½
35.	The vertices of a quadrilateral ABCD are A(6, – 2), B(9, 2), C(5, –1) and D(2, –5). Prove that ABCD is a rhombus, and not a square.	
Sol.	$AB = \sqrt{(9-6)^2 + (2+2)^2} = 5$ $BC = \sqrt{(9-5)^2 + (2+1)^2} = 5$	½ ½

	$CD = \sqrt{(5-2)^2 + (-1+5)^2} = 5$ $AD = \sqrt{(6-2)^2 + (-2+5)^2} = 5$ $AC = \sqrt{(6-5)^2 + (-2+1)^2} = \sqrt{2}$ $BD = \sqrt{(9-2)^2 + (2+5)^2} = 7\sqrt{2}$ As AB = BC = CD = DA and AC ≠ BD ∴ ABCD is a rhombus and not a square.	½ ½ ½ ½ 1+1
	SECTION E This section comprises of 3 case study based questions of 4 marks each.	
36.	**Case Study – 1** Student-teacher ratio expresses the relationship between the number of students enrolled in a school and the number of teachers employed by the school. This ratio is important for a number of reasons. It can be used as a tool to measure teachers' workload as well as the allocation of resources. A survey was conducted in 100 secondary schools of a state and the following frequency distribution table was prepared :	

Number of students per Teacher	*Number of Schools*
20 – 25	5
25 – 30	15
30 – 35	25
35 – 40	30
40 – 45	15
45 – 50	10

Based on the above, answer the following questions :

(i) What is the lower limit of the median class ?

(ii) What is the upper limit of the modal class ?

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

OR

(b) Find the modal of the data.

Sol.

No. of Students per teacher	No. of School	c.f.
20 – 25	5	5
25 – 30	15	20
30 – 35	25	45
35 – 40	30	75
40 – 45	15	90
45 – 50	10	100

(i) Median class is 35 – 40

Lower limit of median class = 35 — 1

(ii) Modal class is 35 – 40

Upper limit of modal class = 40 — 1

(iii) (a)

Median class is 35 – 40

$$\text{Median} = 35 + \frac{\left(\frac{100}{2} - 45\right)}{30} \times 5$$ — 1½

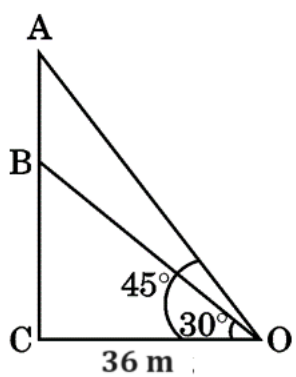
$$= \frac{215}{6} \text{ or } 35.83 \text{ approx.}$$ — ½

OR

(iii) (b) Modal class is 35 – 40

$$\text{Mode} = 35 + \frac{30 - 25}{2 \times 30 - 25 - 15} \times 5$$ — 1

$$= 36.25$$ — 1

37.	**Case Study – 2** Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two stations A and B (B vertically below A). The tower is supported by wires AO and BO from a point O on the ground. Distance between the base C of the tower and the point O is 36 m. From O, the angles of elevation of the tops of station B and station A are 30° and 45° respectively. Based on the above, answer the following questions : (i) Find the height of station B. (ii) Find the height of station A. (iii) (a) Find the length of the wire OA. **OR** (b) Find the length of the wire OB.	
Sol.	(i) $tan\ 30° = \frac{1}{\sqrt{3}} = \frac{BC}{36}$ $\Rightarrow$ BC = 12 $\sqrt{3}$ m (ii) $tan\ 45° = 1 = \frac{AC}{36}$ $\Rightarrow$ AC = 36 m (iii) (a) $\sec 45° = \sqrt{2} = \frac{OA}{36}$ $\Rightarrow$ OA = 36$\sqrt{2}$ m  OR (iii) (b) $\sec 30° = \frac{2}{\sqrt{3}} = \frac{OB}{36}$ $\Rightarrow$ OB = 24$\sqrt{3}$ m	½ ½ ½ ½ 1 1 1 1

38.	**Case Study – 3** A road roller is a compactor-type engineering vehicle, used to compact soil, gravel, concrete, etc, in the construction of roads and foundations. They are also used at landfills or in agriculture. A company started making road rollers 10 years ago and increased its production uniformly by a fixed number every year. The company produces 800 rollers in the 6^{th} year and 1130 rollers in the 9^{th} year. Based on the above information, answer the following questions : (i) What is the company's production in the first year ? (ii) What was the increase in the company's production every year ? (iii) (a) What was the company's production in the 8^{th} year ? **OR** (b) What was the company's total production in the first 6 years ?	
Sol.	(i) $(a + 8d) - (a + 5d) = 330 \Longrightarrow d = 110$ $a + 5 \times 110 = 800 \Longrightarrow a = 250$ (ii) $d = 110$ (iii) (a) $a_8 = 250 + 7 \times 110$ $= 1020$ OR (iii) (b) $S_6 = \frac{6}{2}[2 \times 250 + 5 \times 110]$ $= 3150$	½ ½ 1 1 1 1 1