Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2023
MATHEMATICS PAPER CODE 30/6/2

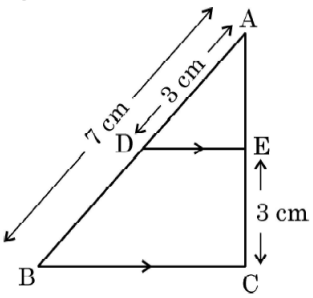
General Instructions: -

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. Its' 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.**
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 totaled up and written in the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.

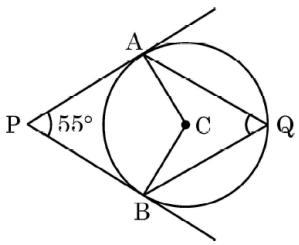
9	**In Q1-Q20, if a candidate attempts the question more than once (without canceling the previous attempt), marks shall be awarded for the first attempt only and the other answer scored out with a note "Extra Question".**
10	**In Q21-Q38, if a student has attempted an extra question, answer of the question 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 totaling 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 totaling on the title page. ● Wrong totaling 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 totaled 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.

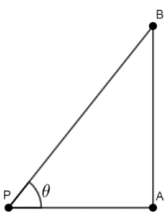
MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/6/2)

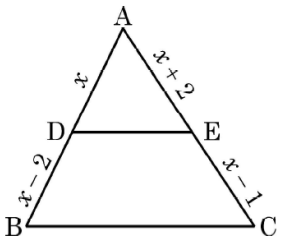
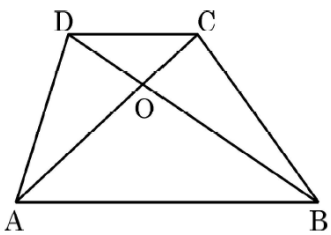
Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A Questions no. 1 to 18 are multiple choice questions (MCQs) and questions number 19 and 20 are Assertion-Reason based questions of 1 mark each	
1.	If the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and –3, then (A) $a = -7, b = -1$ (B) $a = 5, b = -1$ (C) $a = 2, b = -6$ (D) $a = 0, b = -6$	
Sol.	(D) $a = 0, b = -6$	1
2.	The number of quadratic polynomials having zeroes –5 and –3 is (A) 1 (B) 2 (C) 3 (D) more than 3	
Sol.	(D)more than 3	1
3.	If the sum of the first n terms of an A.P be $3n^2 + n$ and its common difference is 6, then its first term is (A) 2 (B) 3 (C) 1 (D) 4	
Sol.	(D) 4	1
4.	$\frac{\cos^2\theta}{\sin^2\theta} - \frac{1}{\sin^2\theta}$, in simplified form, is : (A) $\tan^2\theta$ (B) $\sec^2\theta$ (C) 1 (D) –1	
Sol.	(D) – 1	1

5.	In the given figure, DE‖BC. If AD = 3 cm, AB = 7 cm and EC = 3 cm, then the length of AE is  (A) 2 cm (B) 2.25 cm (C) 3.5 cm (D) 4 cm	
Sol.	(B) 2·25 cm	1
6.	The LCM of smallest 2-digit number and smallest composite number is (A) 12 (B) 4 (C) 20 (D) 40	
Sol.	(C) 20	1
7.	The distance of the point (– 4, 3) from y-axis is (A) – 4 (B) 4 (C) 3 (D) 5	
Sol.	(B) 4	1
8.	If one zero of the polynomial $x^2 + 3x + k$ is 2, then the value of k. (A) – 10 (B) 10 (C) 5 (D) – 5	
Sol.	(A) – 10	1
9.	The point of intersection of the line represented by $3x - y = 3$ and y-axis is given by (A) (0, –3) (B) (0, 3) (C) (2, 0) (D) (–2, 0)	
Sol.	(A) (0, – 3)	1

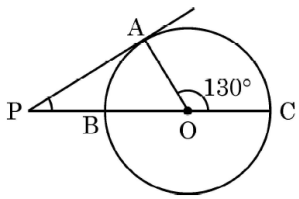
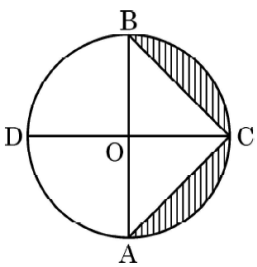
10.	If the quadratic equation $ax^2 + bx + c = 0$ has two real and equal roots, then 'c' is equal to (A) $\frac{-b}{2a}$ (B) $\frac{b}{2a}$ (C) $\frac{-b^2}{4a}$ (D) $\frac{b^2}{4a}$	
Sol.	(D) $\frac{b^2}{4a}$	1
11.	A card is drawn at random from a well shuffled deck of 52 playing cards. The probability of getting a face card is (A) $\frac{1}{2}$ (B) $\frac{3}{13}$ (C) $\frac{4}{13}$ (D) $\frac{1}{13}$	
Sol.	(B) $\frac{3}{13}$	1
12.	If $\Delta PQR \sim \Delta ABC$; PQ = 6 cm, AB = 8 cm and the perimeter of ΔABC is 36 cm, then the perimeter of ΔPQR is (A) 20.25 cm (B) 27 cm (C) 48 cm (D) 64 cm	
Sol.	(B) 27 cm	1
13.	The volume of a right circular cone whose area of the base is 156 cm^2 and the vertical height is 8 cm, is (A) 2496 cm^3 (B) 1248 cm^3 (C) 1664 cm^3 (D) 416 cm^3	
Sol.	(D) 416 cm^3	1
14.	The circumferences of two circles are in the ratio 4 : 5. What is the ratio of their radii ? (A) 16 : 25 (B) 25 : 16 (C) $2 : \sqrt{5}$ (D) 4 : 5	
Sol.	(D) 4 : 5	1

15.	In the given figure, PA and PB are tangents from external point P to a circle with centre C and Q is any point on the circle. Then the measure of ∠AQB is  (A) 62½° (B) 125° (C) 55° (D) 90°	
Sol.	(A) $62\frac{1}{2}^{\circ}$	1
16.	A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from the box, the probability that it bears a prime number less than 23 is (A) $\frac{7}{90}$ (B) $\frac{1}{9}$ (C) $\frac{4}{45}$ (D) $\frac{9}{89}$	
Sol.	(C) $\frac{4}{45}$	1
17.	The coordinates of the point where the line $2y = 4x + 5$ crosses x-axis is (A) $\left(0, \frac{-5}{4}\right)$ (B) $\left(0, \frac{5}{2}\right)$ (C) $\left(\frac{-5}{4}, 0\right)$ (D) $\left(\frac{-5}{2}, 0\right)$	
Sol.	(C) $(-\frac{5}{4}, 0)$	1
18.	$(\cos^4 A - \sin^4 A)$ on simplification, gives (A) $2\sin^2 A - 1$ (B) $2\sin^2 A + 1$ (C) $2\cos^2 A + 1$ (D) $2\cos^2 A - 1$	
Sol.	(D) $2\cos^2 A - 1$	1

	Assertion – Reason Based Questions : In question numbers **19** and **20**, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option out of the following : (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.	**Statement A (Assertion) :** For $0 < \theta \leq 90°$, cosec θ – cot θ and cosec θ + cot θ are reciprocal of each other. **Statement R (Reason) :** $\text{cosec}^2\theta - \cot^2\theta = 1$	
Sol.	(A)	1
20.	**Statement A (Assertion) :** If $5 + \sqrt{7}$ is a root of a quadratic equation with rational co-efficients, then its other root is $5 - \sqrt{7}$. **Statement R (Reason) :** Surd roots of a quadratic equation with rational co-efficients occur in conjugate pairs.	
Sol.	(A)	1
	SECTION – B Section – **B** consists of Very Short Answer (VSA) type of questions of **2** marks each.	
21.	Find the length of the shadow on the ground of a pole of height 18 m when angle of elevation θ of the sun is such that $\tan\theta = \frac{6}{7}$.	
Sol.	 Pole of height AB = 18 m AP = length of shadow In Δ APB, $\tan\theta = \frac{18}{AP}$ $\frac{6}{7} = \frac{18}{AP}$ $\Rightarrow$ AP = 21 m	1 $\frac{1}{2}$ $\frac{1}{2}$

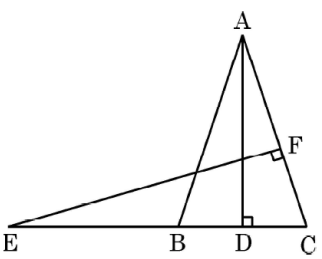
22(A).	In the given figure, ABC is a triangle in which DE‖BC. If AD = x, DB = $x-2$, AE = $x+2$ and EC = $x-1$, then find the value of x.  	
Sol.	In Δ ABC, DE ‖ BC $\frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$ $x(x-1) = (x+2)(x-2)$ $x^2 - x = x^2 - 4 \Rightarrow x = 4$	1 1
	OR	
22(B).	Diagonals AC and BD of trapezium ABCD with AB‖DC intersect each other at point O. Show that $\frac{OA}{OC} = \frac{OB}{OD}$.  	
Sol.	In Δ AOB and Δ COD, $\angle OAB = \angle OCD$ $\angle OBA = \angle ODC$ Therefore, Δ AOB ~ Δ COD $\therefore \frac{OA}{OC} = \frac{OB}{OD}$	$1\frac{1}{2}$ $\frac{1}{2}$
23(A).	Show that 6^n can not end with digit 0 for any natural number 'n'.	

Sol.	If 6^n ends with digit 0, it would be divisible by 5. So, prime factorization of 6^n would contain 5. But $6^n = (2 \times 3)^n$, the only prime factorization of 6^n are 2 and 3 as per fundamental theorem of Arithmetic. There is no other prime in the factorization of 6^n. So, there is no natural number n for which 6^n ends with digit zero.	2
	OR	
23(B).	Find the LCM and HCF of 72 and 120.	
Sol.	$72=2^3 \times 3^2$ $120=2^3 \times 3 \times 5$ HCF = 24 LCM=360	 1 1
24.	Find the points on the x-axis, each of which is at a distance of 10 units from the point A(11, – 8).	
Sol.	Let the point on x-axis be P(x, 0) $PA = 10 \Rightarrow PA^2 = 100$ $(x - 11)^2 + (0 + 8)^2 = 100$ $(x - 11)^2 = 100 - 64 = 36$ $x - 11 = 6, -6$ $x = 17, 5$	$\frac{1}{2}$ 1 $\frac{1}{2}$

25.	In the given figure, PA is a tangent to the circle drawn from the external point P and PBC is the secant to the circle with BC as diameter. If ∠AOC = 130°, then find the measure of ∠APB, where O is the centre of the circle.  	
Sol.	∠ AOB = 180° – 30° = 50° ∠ OAP = 90° ∴∠ APB = 180 – (50° + 90°) = 40°	$\frac{1}{2}$ $\frac{1}{2}$ 1
	SECTION C This section comprises of Short Answer (SA) type questions of 3 marks each.	
26.	In the given figure, AB and CD are diameters of a circle with centre O perpendicular to each other. If OA = 7 cm, find the area of shaded region.  	

Sol.	Area of quadrant BOC = $\frac{1}{4} \times \frac{22}{7} \times 7 \times 7$ $= \frac{77}{2}$ cm^2 Area of Δ BOC = $\frac{1}{2} \times$ OB $\times$ OC = $\frac{1}{2} \times 7 \times 7$ $= \frac{49}{2}$ cm^2 Area of shaded region = $2\left[\frac{77}{2} - \frac{49}{2}\right]$ = 28 cm^2	1 1 1
27.	If sin θ + cos θ = p and sec θ + cosec θ = q, then prove that q(p^2 – 1) = 2p.	
Sol.	sin θ + cos θ = p, sec θ + cosec θ = q LHS = q(p^2 – 1) = (sec θ + cosecθ)[$(\boldsymbol{sin}\,\theta + \cos\theta)^2 - 1$] = $\left[\frac{\mathbf{1}}{\boldsymbol{cos}\theta} + \frac{\mathbf{1}}{\boldsymbol{sin}\,\theta}\right]$ [$\boldsymbol{sin^2}\theta + cos^2\theta + 2\,sin\theta\cos\theta - 1$] = $\left(\frac{sin\ \theta + \cos\theta}{cos\ \theta \sin\theta}\right)$ [1 + 2 sin θ cos θ – 1] = $\frac{(sin\ \theta + \cos\theta)}{cos\ \theta \sin\theta}$ (2 sin θ cos θ) = 2(sinθ + cosθ) = 2p = RHS	1 1 1

28(A).	The sum of two numbers is 15. If the sum of their reciprocals is $\frac{3}{10}$, find the two numbers.	
Sol.	Let one number be x $\Rightarrow$ another number = 15 – x Therefore, $\frac{1}{x} + \frac{1}{15 - x} = \frac{3}{10}$ $\frac{15 - x + x}{x(15 - x)} = \frac{3}{10} \Rightarrow 150 = 3x(15 - x)$ $3x^2 - 45x + 150 = 0$ $x^2 - 15x + 50 = 0 \Rightarrow (x - 10)(x - 5) = 0$ $\Rightarrow x = 10, 5$ Numbers are 10, 5 or 5, 10	$\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	OR	
28(B).	If α and β are roots of the quadratic equation $x^2 - 7x + 10 = 0$, find the quadratic equation whose roots are α^2 and β^2.	

Sol.	$x^2 - 7x + 10 = 0$ $\alpha + \beta = 7, \alpha\beta = 10$ $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta = 49 - 20 = 29$ $\alpha^2\beta^2 = (10)^2 = 100$ Q.E. with roots α^2, β^2 is $\therefore x^2 - (\alpha^2 + \beta^2)x + \alpha^2\beta^2 = 0$ i.e. $x^2 - 29x + 100 = 0$	$\frac{1}{2}$ 1 $\frac{1}{2}$ 1
29.	Find the ratio in which the line segment joining the points A(6, 3) and B(–2, –5) is divided by x-axis.	
Sol.	Let P(x, 0) be the point on x axis which divides AB in the ratio k : 1 A(6, 3) — k : 1 — P — B(– 2, – 5) $\frac{-5k + 3}{k + 1} = 0 \Rightarrow k = \frac{3}{5}$ Ratio is 3 : 5	$\frac{1}{2}$ 2 $\frac{1}{2}$
30.	In the given figure, E is a point on the side CB produced of an isosceles triangle ABC with AB = AC. If AD ⊥ BC and EF ⊥ AC, then prove that ΔABD ~ ΔECF.  	

Sol.	Given ABC is an isosceles triangle, $\therefore AB = AC \Rightarrow \angle B = \angle C$ In Δ ABD and Δ ECF, $\angle$ ADB = $\angle$ EFC (90° each, given) $\angle$ ABD = $\angle$ ECF $\therefore \Delta$ ABD ~ Δ ECF	1 1 1
31(A).	Find the HCF and LCM of 26, 65 and 117, using prime factorisation.	
Sol.	26= 13 x 2 65= 13 x 5 117= 13 x 3 x 3 $\therefore$ HCF = 13 LCM = 13 x 2 x 3 x 5 x 3 = 1170	1 1 1
	OR	
31(B).	Prove that $\sqrt{2}$ is an irrational number.	
Sol.	Let $\sqrt{2}$ be a rational number. $\therefore \sqrt{2} = \frac{p}{q}$, where q≠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 $\Rightarrow$ p = 2a, where 'a' is some integer ----- (i) $4a^2 = 2q^2 \Rightarrow q^2 = 2a^2 \Rightarrow q^2$ is divisible by 2 $\Rightarrow$ q is divisible by 2 $\Rightarrow$ q = 2b, where 'b' is some integer ----- (ii) (i) and (ii) leads to contradiction as 'p' and 'q' are co-primes. $\therefore \sqrt{2}$ is an irrational number.	½ 1 ½ 1
	SECTION D This section comprises of Long Answer (LA) type questions of 5 marks each.	

32. 250 apples of a box were weighed and the distribution of masses of the apples is given in the following table :

Mass (in grams)	80 – 100	100 – 120	120 – 140	140 – 160	160 – 180
Number of apples	20	60	70	x	60

(i) Find the value of x and the mean mass of the apples. **3**

(ii) Find the modal mass of the apples **2**

Sol.

(i) $20 + 60 + 70 + x + 60 = 250$ 1

$x = 250 - 210 = 40$

Mass	80 – 100	100 – 120	120 – 140	140 – 160	160 – 180	Total
No. of apples f_i	20	60	70	x = 40	60	250
x_i	90	110	130	150	170	
$x_i f_i$	1800	6600	9100	6000	10200	33700

1

Mean mass $= \frac{33700}{250} = 134{\cdot}8$

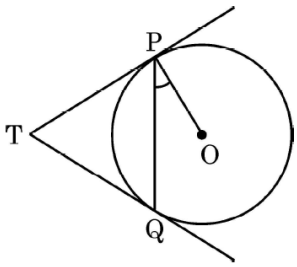
Mean mass = 134.8 g 1

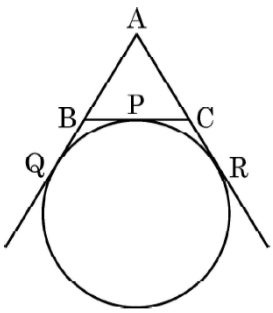
(ii) Modal class = 120-140 $\frac{1}{2}$

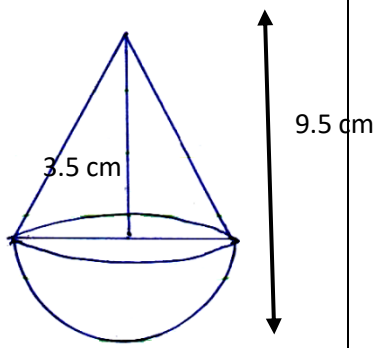
$$\text{Mode} = 120 + \frac{(70 - 60)}{(140 - 60 - 40)} \times 20$$ 1

$= 125$

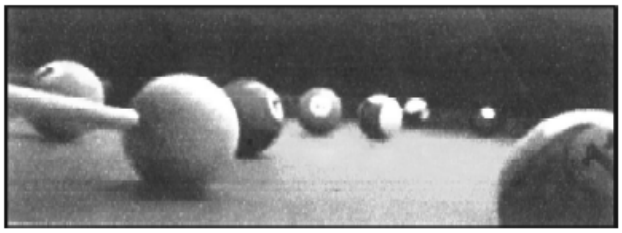
Hence modal mass = 125 g $\frac{1}{2}$

33(A).	Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.  	
Sol.	TP = TQ $\Rightarrow \angle$ TPQ = $\angle$ TQP Let $\angle$ PTQ be θ $\Rightarrow \angle$ TPQ = $\angle$ TQP = $\frac{180° - \theta}{2} = 90° - \frac{\theta}{2}$ Now $\angle$ OPT = 90° $\Rightarrow \angle OPQ = 90° - (90° - \frac{\theta}{2}) = \frac{\theta}{2}$ $\angle$ PTQ = 2 $\angle$ OPQ	1 $1\frac{1}{2}$ $1\frac{1}{2}$ 1
	OR	

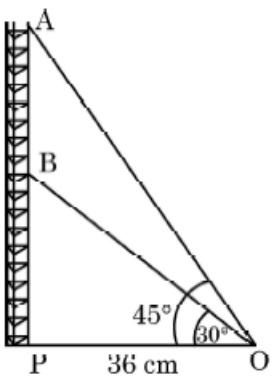
33(B).	A circle touches the side BC of a ΔABC at a point P and touches AB and AC when produced at Q and R respectively. Show that $AQ = \frac{1}{2}$ (Perimeter of ΔABC).  	
Sol.	$AQ = AR$ $2AQ = AQ + AR$ $= AB + BQ + AC + CR$ $= AB + AC + (BP + CP)$ $= AB + AC + BC$ $AQ = \frac{1}{2}(AB + AC + BC) = \frac{1}{2}(\text{Perimeter of } \Delta\, ABC)$	1 1 $\frac{1}{2}$ $\frac{1}{2}$ 1 1
34.	A solid is in the shape of a right-circular cone surmounted on a hemisphere, the radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid.	

Sol.	Radius of hemisphere = Radius of cone = 3·5 cm = $\frac{7}{2}$ cm Height of cone = 9·5 – 3·5 = 6 cm Volume of solid = volume of hemisphere + volume of cone $= \frac{2}{3} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^3 + \frac{1}{3} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^2 \times 6$ $= \frac{77}{6} \times 13 = \frac{1001}{6} = 166{\cdot}8 \text{ cm}^3$  	1 $1\frac{1}{2} + 1\frac{1}{2}$ 1
35(A)	(A) Find the sum of integers between 100 and 200 which are (i) divisible by 9 (ii) not divisible by 9.	
Sol.	(i) Integers divisible by 9 are 108, 117, 126, …., 198 a = 108, d = 9 a + (n – 1)d = 198 $\Rightarrow$108 + (n – 1)9 = 198 $\Rightarrow$ n = 11 $S_{11} = \frac{n}{2}(a + l) = \frac{11}{2}(108 + 198)$ = 1683 (ii) Integers are 101, 102, 103,……,199	$\frac{1}{2}$ 1 1 $\frac{1}{2}$ $\frac{1}{2}$

	Sum of all integers = $\frac{99}{2}$ (101 + 199) = $\frac{99}{2} \times 300 = 14850$ Sum of integers not divisible by 9 = 14850 – 1683 = 13167	1 $\frac{1}{2}$
	OR	
35(B)	(B) Solve the equation : $-4 + (-1) + 2 + 5 + \ldots\ldots + x = 437$.	
Sol.	– 4 + (– 1) + 2 + 5 + ….. + x = 437 Here a = – 4, d = 3 -4 + (n – 1)3 = x $\Rightarrow$ n = $\frac{x+7}{3}$ S_n = 437 $\Rightarrow \left(\frac{x+7}{3}\right) \cdot \frac{1}{2}$ (– 4 + x) = 437 $x^2 + 3x - 28 = 437 \times 6 = 2622$ $x^2 + 3x - 2650 = 0$ (x + 53)(x – 50) = 0 x ≠ – 53, x = 50	$\frac{1}{2}$ 1 1 1 $1\frac{1}{2}$

	SECTION E This section comprises of 3 case-study based questions of 4 marks each.	
36.	"Eight Ball" is a game played on a pool table with 15 balls numbered 1 to 15 and a "cue ball" that is solid and white. Of the 15 numbered balls, eight are solid (non-white) coloured and numbered 1 to 8 and seven are striped balls numbered 9 to 15.  The 15 numbered pool balls (no cue ball) are placed in a large bowl and mixed, then one ball is drawn out at random. Based on the above information, answer the following questions : (i) What is the probability that the drawn ball bears number 8 ? (ii) What is the probability that the drawn ball bears an even number ? **OR** What is the probability that the drawn ball bears a number, which is a multiple of 3 ? (iii) What is the probability that the drawn ball is a solid coloured and bears an even number ?	
Sol.	(i)P (drawing ball bearing number 8) = $\frac{1}{15}$ (ii)Even numbers = 2, 4, 6, 8, 10, 12, 14 No. of favourable outcomes = 7 P (even number ball) = $\frac{7}{15}$ **OR** (ii)Multiples of 3 are 3, 6, 9, 12, 15	1 $\frac{1}{2}$ $1\frac{1}{2}$ $\frac{1}{2}$

	No. of favourable outcomes = 5 $\therefore$ P(multiple of 3) = $\frac{5}{15} = \frac{1}{3}$ (iii) Solid colour and even number 2, 4, 6, 8 P(solid colour and bear an even no.) = $\frac{4}{15}$	$1\frac{1}{2}$ 1

37.	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 Sections A and B. Tower is supported by wires from a point O. Distance between the base of the tower and point O is 36 cm. From point O, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45°.  Based on the above information, answer the following questions : (i) Find the length of the wire from the point O to the top of Section B. (ii) Find the distance AB. **OR** Find the area of ΔOPB. (iii) Find the height of the Section A from the base of the tower.	
Sol.	(i) In Δ OBP, $\cos 30° = \frac{OP}{OB}$	$\frac{1}{2}$ $\frac{1}{2}$

	$\frac{\sqrt{3}}{2} = \frac{36}{OB} \Rightarrow OB = \frac{72}{\sqrt{3}}$ $= 24\sqrt{3}$ cm	
	(ii)In Δ OBP, $\tan 30° = \frac{PB}{36} \Rightarrow PB = \frac{36}{\sqrt{3}}$	1
	$PB = 12\sqrt{3}$	$\frac{1}{2}$
	In Δ OAP, $\tan 45° = \frac{AP}{36} \Rightarrow AP = 36$ cm	$\frac{1}{2}$
	$AB = AP - PB = 36 - 12\sqrt{3} = 12(3 - \sqrt{3})$ cm	
	OR	
	(ii)Area of $\Delta OPB = \frac{1}{2} \times OP \times PB$	1+1
	$= \frac{1}{2} \times 36 \times 12\sqrt{3} = 216\sqrt{3}$ cm^2	1
	(ii) AP = 36 cm	

38.	A coaching institute of Mathematics conducts classes in two batches I and II and fees for rich and poor children are different. In batch I, there are 20 poor and 5 rich children, whereas in batch II, there are 5 poor and 25 rich children. The total monthly collection of fees from batch I is ₹ 9000 and from batch II is ₹ 26,000. Assume that each poor child pays ₹ x per month and each rich child pays ₹ y per month.  Based on the above information, answer the following questions : (i) Represent the information given above in terms of x and y. (ii) Find the monthly fee paid by a poor child. **OR** Find the difference in the monthly fee paid by a poor child and a rich child. (iii) If there are 10 poor and 20 rich children in batch II, what is the total monthly collection of fees from batch II ?	
Sol.	(i)20x + 5y = 9000 5x + 25y = 26000 (ii)Solving the equations x = 200, y = 1000 Monthly fee paid by poor child = ₹200 **OR**	1 2

	(ii) getting x=200 and y= 1000 Difference in the fee = 1000 – 200 = ₹ 800 (iii)10x + 20y = 10(200) + 20(1000) = ₹ 22000	$1+\frac{1}{2}$ $\frac{1}{2}$ 1