Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2026 (X^{th})
SUBJECT NAME: MATHEMATICS BASIC (Q.P. CODE /Set No. 241/430/3/1)

General Instructions : -

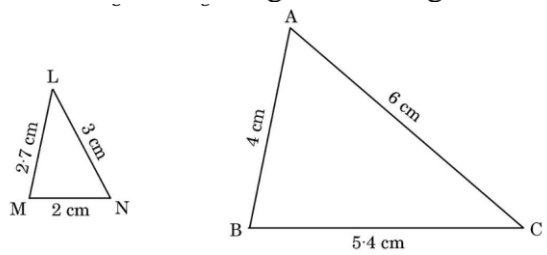
1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested 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. 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 Newspaper/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 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	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note **"Extra Question"**.
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks _____ (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.

12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).This is in view of the reduced syllabus and number of questions in question paper.
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong 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.
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 -430/3/1
MATHEMATICS BASIC (Subject Code-241)

Q.No.	EXPECTED ANSWER /VALUE POINTS	Marks
	SECTION A	
	*This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each. 20×1=20*	
1.	The HCF of 2^3 and 3^2 is : (A) $2^0 . 3^0$ (B) $2^1 . 3^1$ (C) $2^3 . 3^2$ (D) $2^2 . 3^3$	
Ans.	(A) $2^0 . 3^0$	1
2.	The LCM of two consecutive natural numbers p and p + 1 is : (A) p (B) $p^2 + p$ (C) 1 (D) 2p + 1	
Ans.	(B) $p^2 + p$	1
3.	The system of equations 2x + ky = 4 and 3x – 6y = 6 has infinitely many solutions, if : (A) $k \neq 4$ (B) $k = 4$ (C) $k = -4$ (D) No value of k	
Ans.	(C) $k = -4$	1
4.	The value of 'm' for which the quadratic equation $x^2 - 2x + m = 0$ has real and equal roots is : (A) – 1 (B) 0 (C) 4 (D) 1	
Ans.	(D) 1	1
5.	Which of the following statements is true for the quadratic equation $ax^2 + x + a = 0$ $(a \neq 0)$? (A) The roots of the given equation are reciprocal of each other. (B) The roots of the given equation are always real. (C) The roots of the given equation are always positive. (D) The sum of roots of the given equation is 0.	
Ans.	(A) The roots of the given equation are reciprocal of each other.	1
6.	The co-ordinates of the mid-point of the line segment joining points A(p – 1, q + 1) and B(p + 1, q – 1) are given by : (A) (p, q) (B) (2p, 2q) (C) $\left(\frac{p+1}{2}, \frac{q+1}{2}\right)$ (D) $\left(\frac{p-1}{2}, \frac{q-1}{2}\right)$	
Ans.	(A) (p, q)	1

7. Observe the given triangles :



Which of the following statements is true ?

(A) Δ LMN ~ Δ ABC (B) Δ LMN ~ Δ ACB

(C) Δ NML ~ Δ ABC (D) Δ NML ~ Δ ACB

Ans.	(C) $\Delta NML \sim \Delta ABC$	1

8. Two isosceles triangles :

(A) are always similar, but not congruent.

(B) are always congruent, but not similar.

(C) may or may not be similar.

(D) are always similar and congruent.

Ans.	(C) may or may not be similar.	1

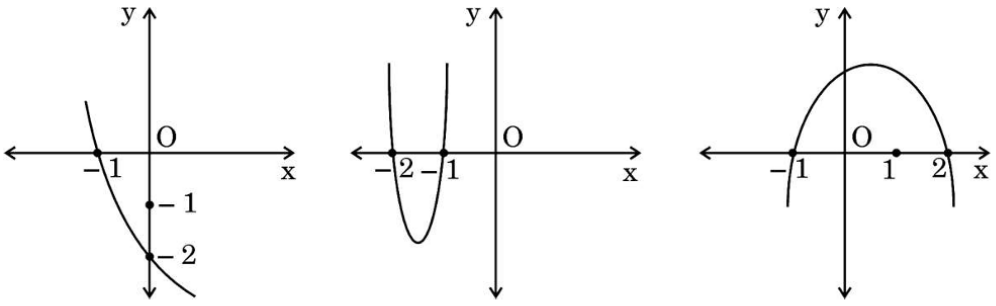
9. The number of solutions of the system of equations given by $x = -2$ and $y = 2$ is :

(A) 0 (B) 1

(C) 2 (D) infinite

Ans.	(B) 1	1

10. In which of the following graphs of the polynomials is one of the zeroes twice the other ?



(A) (i) only (B) (i) and (ii)

(C) (ii) and (iii) (D) (ii) only

Ans.	(D) (ii) only	1

11. If a, b and c are in A.P., then :

(A) 2a, 3b and 4c are also in A.P.

(B) $a - 2$, $b - 2$ and $c - 2$ are also in A.P.

(C) $\frac{a}{2}, \frac{b}{3}$ and $\frac{c}{4}$ are also in A.P.

(D) $a + 2$, $b + 3$ and $c + 4$ are also in A.P.

Ans.	(B) $a - 2$, $b - 2$ and $c - 2$ are also in A.P.	1

12. The value of $\frac{\tan^2 60^\circ - 1}{\tan^2 60^\circ + 1}$ is equal to the value of which of the following ?

(A) tan 60° (B) cos 60°

(C) sec 60° (D) sin 60°

Ans.	(B) cos 60°	1

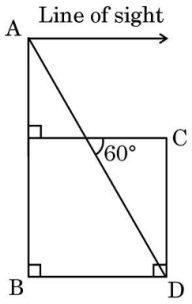
13. Which of the following is ***not*** defined for x = 90° ?

(A) cot x (B) cosec x

(C) $\tan\left(\frac{x}{2}\right)$ (D) sec x

Ans.	(D) sec x	1

14. In the given figure, the angle of depression of the foot of building CD from the top of tower AB is :



(A) 60° (B) 30°

(C) 45° (D) 90°

Ans.	(A) 60°	1

15. The radius of the largest sphere that can be carved out from a solid cube of side 14 cm is :

(A) 7 cm (B) 14 cm

(C) $14\sqrt{2}$ cm (D) $7\sqrt{2}$ cm

Ans.	(A) 7 cm	1

16. Let 'a' be the assumed mean and 'h' be the class size for a grouped data. Which of the following is ***not*** the correct formula to find the mean of the grouped data ?

(A) $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$

(B) $\bar{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$, where $d_i = x_i - a$

(C) $\bar{x} = a + \frac{\Sigma f_i u_i}{\Sigma f_i}$, where $u_i = \frac{x_i - a}{h}$

(D) $\bar{x} = a + \frac{\Sigma f_i y_i}{\Sigma f_i} \times h$, where $y_i = \frac{x_i - a}{h}$

Ans.	(C) $\bar{x} = a + \frac{\sum f_i u_i}{\sum f_i}$, where $u_i = \frac{x_i - a}{h}$	1

17. Which of the following is affected by the extreme values in a given data ?

(A) Mean only (B) Median only

(C) Mode only (D) Mean and Mode both

Ans.	(A) Mean only	1

18. From a bag containing yellow, red and green balls, the probability of drawing a yellow or red ball is equal to that of drawing a green ball. The probability of drawing a green ball from the bag is :

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$

(C) 1 (D) Not possible to find

Ans.	(B) $\frac{1}{2}$	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) :* The events "getting 2" and "not getting 2" in a single throw of an unbiased die are not equally likely events.

Reason (R) : The probability of getting 2 in a single throw of an unbiased die is $\frac{1}{6}$.

Ans.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).	1

20. *Assertion (A) :* $(\sqrt{3}+1)^2$ is a rational number.

Reason (R) : $(\sqrt{3})^2 = 3$ is a rational number.

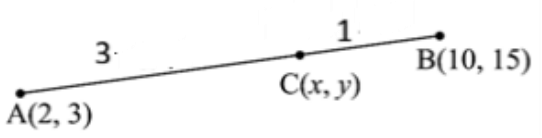
Ans.	(D) Assertion (A) is false but Reason (R) is true.	1

SECTION B

*This section has **5** Very Short Answer (VSA) type questions carrying **2** marks each.* *5×2=10*

21. An ant started moving from the point A(2, 3) and moved along the line segment AB. It covered three-fourth of the distance AB and reached at a point C(x, y). If the coordinates of the point B are (10, 15), find the coordinates of the point C.

Solution



Point C divides AB in the ratio 3: 1 ½

$x = \frac{3(10)+1(2)}{3+1} = 8$ ½

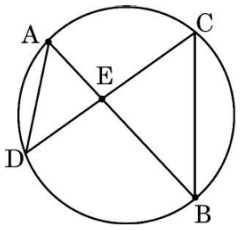
$y = \frac{3(15)+1(3)}{3+1} = 12$ ½

coordinates of the point C are (8,12) ½

22. Verify the relationship between the zeroes and the coefficients of the polynomial $p(x) = 3x^2 - 5x$.

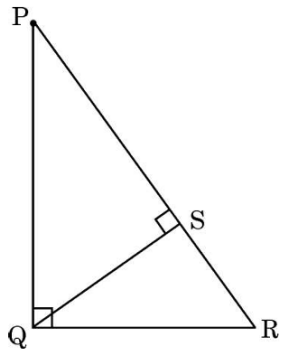
Solution		
	Zeroes are $0, \frac{5}{3}$	½+½
	Sum of zeroes $= 0 + \frac{5}{3} = \frac{5}{3} = \frac{-\text{ coefficient of } x}{\text{coefficient of } x^2}$	½
	Product of zeroes $= 0 \times \left(\frac{5}{3}\right) = \frac{0}{3} = \frac{\text{constant term}}{\text{coefficient of } x^2}$	½

23. (a) Two chords AB and CD intersect each other at the point E as shown in the given figure. Prove that Δ AED ~ Δ CEB.



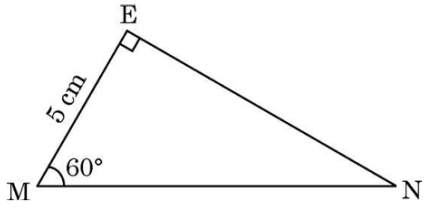
OR

(b) In the given figure, Δ PQR is a right triangle, right-angled at Q and QS ⊥ PR. Prove that Δ PQS ~ Δ QRS.



Solution (a)	In ΔAED and ΔCEB,	
	$\angle DAB = \angle DCB$ (angles in same segment of a circle)	1
	$\angle AED = \angle CEB$ (vertically opposite angles)	1
	ΔAED ~ ΔCEB (by AA similarity)	
	OR	
(b)	In ΔPQS and ΔQRS	
	$\angle PSQ = \angle QSR$ (each 90°)	1
	$\angle PQS = \angle QRS$ $\left(\text{each } (90^\circ - \angle \text{SQR})\right)$	1
	ΔPQS ~ ΔQRS (by AA similarity)	

24. (a) In the given figure, Δ MEN is a right triangle, right-angled at E. If ∠ EMN = 60° and ME = 5 cm, find the length of MN. Also, find the value of $\sin^2$ N.



OR

(b) It is given that sin(A – B) = sin A cos B – cos A sin B. Use it to evaluate sin 15°.

Solution (a)	In ΔMEN,	
	$\frac{EM}{MN} = \cos 60^\circ$	½
	$\frac{5}{MN} = \frac{1}{2} \quad \Rightarrow \quad MN = 10$ cm	½
	$\angle MNE = 30^\circ$	½
	$\sin^2 N = \sin^2 30^\circ = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$	½
	OR	
(b)	$\sin 15^\circ = \sin(45^\circ - 30^\circ)$	½
	$= \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ$	
	$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$	1
	$= \frac{\sqrt{3}-1}{2\sqrt{2}}$ or $\frac{\sqrt{6}-\sqrt{2}}{4}$	½

25. A game of chance consists of spinning an arrow which comes to rest in one of the six equal sectors as shown in the given figure.

A person spins an arrow once. What is the probability that the person

(i) wins a laptop ?

(ii) does not get a chance to spin again ?

Solution	(i) P (the person wins a laptop) = $\frac{1}{6}$	1
	(ii) P (the person does not get a chance to spin again) = $\frac{5}{6}$	1

SECTION C

*This section has **6** Short Answer (SA) type questions carrying **3** marks each.* 6×3=18

26. Prove that $\sqrt{5}$ is an irrational number.

Solution

Let $\sqrt{5}$ be a rational number such that $\sqrt{5} = \frac{a}{b}$ where a and b are coprime, $b \neq 0$ — ½

$\sqrt{5}b = a$

$5b^2 = a^2$

5 divides $a^2 \Rightarrow$ 5 divides a as well — 1

$a = 5c$ for some integer c

$a^2 = 25c^2$

$5b^2 = 25c^2$

$b^2 = 5c^2$

5 divides b^2 and therefore 5 divides b as well — 1

i.e. 5 is a common factor of a and b which is a contradiction as a and b are coprime — ½

$\therefore$ Our assumption is wrong, hence $\sqrt{5}$ is an irrational number.

27. Each root of a quadratic equation $ax^2 + bx + c = 0$ is 2 more than each of the roots of the equation $3x^2 - 2x = 1$. Find the roots of the quadratic equation $ax^2 + bx + c = 0$.

Solution

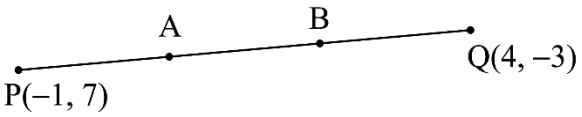
Roots of $3x^2 - 2x - 1 = 0$ are $\frac{-1}{3}, 1$ — 1+1

Roots of the quadratic equation $ax^2 + bx + c = 0$ are $\frac{5}{3}$ and 3 — ½+½

28. (a) Show that the quadrilateral ABCD formed by joining the points A(– 2, – 1), B(1, – 1), C(1, 2) and D(– 2, 2) in order is a square.

OR

(b) Find the coordinates of the points which divide the line segment joining points P(– 1, 7) and Q(4, – 3) into three equal parts.

Solution (a)	$AB=\sqrt{3^2+0^2}=3$; $BC=\sqrt{0^2+3^2}=3$ $CD=\sqrt{3^2+0^2}=3$; $AD=\sqrt{0^2+3^2}=3$ $AC=\sqrt{3^2+3^2}=\sqrt{18}$ or $3\sqrt{2}$ $BD=\sqrt{3^2+3^2}=\sqrt{18}$ or $3\sqrt{2}$ All sides are equal and diagonals are equal, hence ABCD is a square.	½×4=2 ½×2=1
	OR	
(b)	 Let A and B be required points such that PA = AB = BQ A divides PQ in the ratio 1 : 2 Coordinates of A are $\left(\frac{1\times4+2\times(-1)}{1+2},\ \frac{1\times(-3)+2\times7}{1+2}\right)=\left(\frac{2}{3},\ \frac{11}{3}\right)$ B divides PQ in the ratio 2 : 1 Coordinates of B are $\left(\frac{2\times4+1\times(-1)}{2+1},\ \frac{2\times(-3)+1\times7}{2+1}\right)=\left(\frac{7}{3},\ \frac{1}{3}\right)$	½ 1 ½ 1

29. (a) Prove that :

$(\sin A - \operatorname{cosec} A)^2 + (\cos A - \sec A)^2 = \tan^2 A + \cot^2 A - 1$

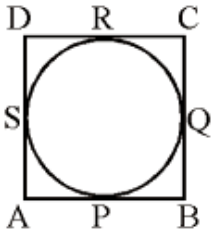
OR

(b) If $\sin(A + 2B) = 1$ and $\cos(2A + B) = \frac{1}{2}$, find the values of A and B.

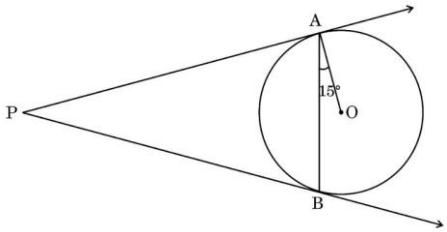
Hence, find the value of $\tan (B - A)$.

Solution (a)	LHS $= \sin^2A + \operatorname{cosec}^2A - 2\sin A.\operatorname{cosec}A + \cos^2A + \sec^2A - 2\cos A.\sec A$ $= (\sin^2A + \cos^2A) + 1 + \cot^2A + 1 + \tan^2A - 2 - 2$ $= 1 + \cot^2A + \tan^2A + 2 - 4$ $= \tan^2A + \cot^2A - 1 = RHS$	1 1 ½ ½
	OR	
(b)	$\sin(A + 2B) = 1 \Rightarrow A + 2B = 90^\circ$ --------(i)	½
	$\cos(2A + B) = \frac{1}{2} \Rightarrow 2A + B = 60^\circ$ --------(ii)	½
	Solving (i) and (ii) we get $A = 10^\circ$ and $B = 40^\circ$	1
	$\tan(B - A) = \tan(40^\circ - 10^\circ) = \tan 30^\circ = \frac{1}{\sqrt{3}}$	1

30. Prove that a rectangle circumscribing a circle is a square.

Solution	 Let ABCD be a rectangle circumscribing a circle with centre O. To prove: ABCD is a square AP = AS BP = BQ CR = CQ DR = DS } (Lengths of tangents from exterior point to a circle are equal) Adding all above equations $\Rightarrow$ AP + BP + CR + DR = AS + BQ + CQ + DS $\Rightarrow$ AB + CD = AD + CB But AB = CD and AD = CB $\therefore$ AB = AD Hence, ABCD is a square.	For correct figure ½ 1 ½ 1

31. Two tangents PA and PB are drawn from an external point P to a circle with centre O as shown in the given figure. If $\angle$ OAB = 15°, find the measures of each angle of Δ PAB.



Solution	$\angle PAO = 90^\circ$ (the tangent at any point of a circle is perpendicular to the radius through the point of contact) $\angle PAB = 90^\circ - 15^\circ = 75^\circ$ As PA = PB $\therefore \angle PAB = \angle PBA = 75^\circ$ $\angle PAB + \angle PBA + \angle APB = 180^\circ$ $\angle APB = 180^\circ - 150^\circ = 30^\circ$	½ ½ 1 1

SECTION D

*This section has **4** Long Answer (LA) type questions carrying **5** marks each.* *4×5=20*

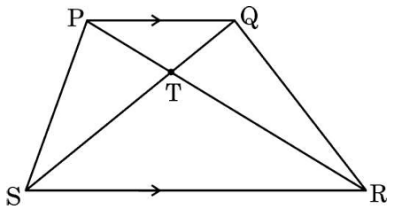
32. A fraction becomes $\frac{5}{6}$ when 3 is added to both the numerator and the denominator. If 2 is added to both the numerator and the denominator, the fraction becomes $\frac{9}{11}$. Express the given information algebraically as a system of linear equations in two variables. Hence, find the original fraction.

Solution	Let numerator be x and denominator be y	
	$\therefore$ fraction is $\frac{x}{y}$	½
	$\frac{x+3}{y+3}=\frac{5}{6}$	1
	$\Rightarrow 6x-5y=-3$ ---------- (i)	½
	Also $\frac{x+2}{y+2}=\frac{9}{11}$	1
	$\Rightarrow 11x-9y=-4$ ---------- (ii)	½
	Solving (i) and (ii) we get	
	$x=7$ and $y=9$	½+½
	Fraction is $\frac{7}{9}$	½

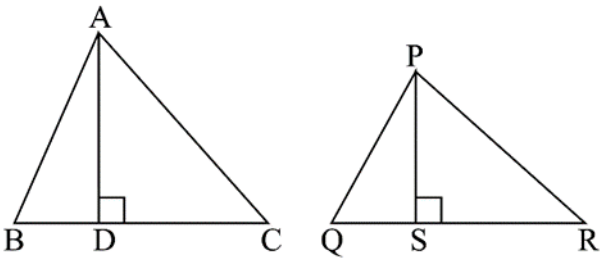
33. (a) Sides AB, AC and altitude AD of Δ ABC are proportional to sides PQ, PR and altitude PS of another triangle PQR. Prove that Δ ABC ~ Δ PQR.

OR

(b) In the given figure, PQRS is a trapezium with PQ || SR. Diagonals PR and QS intersect each other at a point T. Prove that $\frac{PT}{TR}=\frac{QT}{TS}$. Further, if TS = TR, prove that Δ PTS ~ Δ QTR.



Solution (a)



For correct figure 1

In ΔABD and ΔPQS, $\frac{AB}{PQ} = \frac{AD}{PS}$ (given)

$\Rightarrow \frac{AD}{AB} = \frac{PS}{PQ}$

$\sin B = \sin Q$

$\angle B = \angle Q$ 1

$\angle D = \angle S$ (*each* 90°)

$\Delta ABD \sim \Delta PQS$ (by AA similarity) 1½

$\angle BAD = \angle QPS$ -------(i) ½

Similarly, $\angle DAC = \angle SPR$ -----(ii)

Adding (i) and (ii) we get $\angle BAC = \angle QPR$

Also $\frac{AB}{PQ} = \frac{AC}{PR}$ 1

$\Delta ABC \sim \Delta PQR$ (by SAS similarity)

OR

(b)

In ΔPQT and ΔRST,

$\angle TPQ = \angle TRS$ (alternate interior angles)

$\angle PQT = \angle TSR$ (alternate interior angles) 1½

$\Delta PQT \sim \Delta RST$ (by AA similarity)

So $\frac{PT}{RT} = \frac{QT}{ST}$ ½

$\Rightarrow PT = QT$ $(RT = ST)$ ½

which gives $\frac{PT}{QT} = 1$ and $\frac{ST}{RT} = 1$ 1

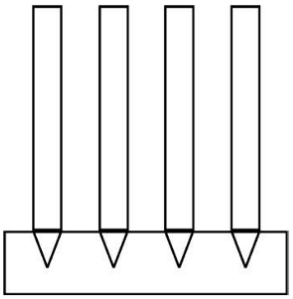
Now In ΔPTS and ΔQTR

$\frac{PT}{QT} = \frac{ST}{RT}$ ½

$\angle PTS = \angle QTR$ (vertically opposite angles) ½

$\Delta PTS \sim \Delta QTR$ (by SAS similarity) ½

34. (a) A pen stand is made up of wood and is in the shape of a cuboid with four conical depressions and cylindrical extensions to hold pens. The depressions are hollowed out from the wooden cuboidal stand and cylindrical extensions are made up of metal attached separately as shown in the figure given below :



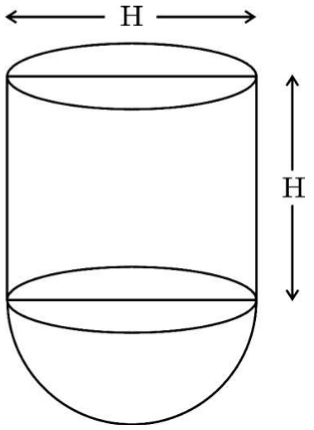
The dimensions of the cuboidal block of wood are 15 cm × 10 cm × 3·5 cm. The radius of each conical depression is 0·5 cm and depth is 1·4 cm. The radius and height of each cylindrical metal extension are 0·5 cm and 4·9 cm respectively.

(i) Find the volume of wood in the entire stand.

(ii) Find the inner surface area of a conical depression along with that of the cylindrical extension. (Use $\sqrt{221} = 14{\cdot}8$)

OR

(b) A solid is in the shape of a cylinder with a solid hemisphere attached to one of its ends as shown in the figure.



Let the height and diameter of the cylinder be same (say H). Prove that the volume of the solid shown in the figure is same as the volume of a cone of height H and diameter '2H'. Also find the total surface area of the solid in terms of H.

Solution(a)	(i) Volume of wood = volume of cuboid $-$ 4 $\times$ volume of cone	
	$=15 \times 10 \times 3.5 - 4\left(\frac{1}{3} \times \frac{22}{7} \times 0.5 \times 0.5 \times 1.4\right)$	2
	$= \frac{7853}{15}$ cm^3 or 523.53 cm^3	½
	(ii) $l = \sqrt{(1.4)^2 + (0.5)^2} = \sqrt{2.21} = 1.48$	1
	Required surface area = C.S.A. of cone + C.S.A. of cylinder	
	$= \frac{22}{7} \times 0.5 \times 1.48 + 2 \times \frac{22}{7} \times 0.5 \times 4.9$	1
	$= \frac{12408}{700}$ cm^2 or 17.72 cm^2	½
	OR	
(b)	Radius of cylinder/hemisphere $= R = \frac{H}{2}$	½
	Volume of the solid = Volume of cylinder + Volume of hemisphere	
	$= \pi R^2 H + \frac{2}{3}\pi R^3$	
	$= \pi\left(\frac{H}{2}\right)^2 H + \frac{2}{3}\pi\left(\frac{H}{2}\right)^3$	1
	$= \frac{\pi H^3}{3}$	½
	Volume of cone of height H and diameter 2H	
	$= \frac{1}{3}\pi \times H^2 \times H$	½
	$= \frac{\pi H^3}{3}$	½
	T.S.A. of the solid = C.S.A of cylinder + Area of circle +C.S.A of hemisphere	
	$= 2\pi \frac{H}{2} \times H + \pi \frac{H^2}{4} + 2\pi \frac{H^2}{4}$	1½
	$= \frac{7\pi}{4} H^2$	½

35. The following table shows the weight (in kg) of 40 students of class X :

Weight (in kg)	*Number of students*
40 – 45	3
45 – 50	4
50 – 55	10
55 – 60	8
60 – 65	8
65 – 70	4
70 – 75	3

Find the mean weight and median weight.

Solution

C.I.	f	cf	x_i	u_i	f_iu_i
40-45	3	3	42.5	– 3	– 9
45-50	4	7	47.5	– 2	– 8
50-55	10	17	52.5	– 1	– 10
55-60	8	25	A 57.5	0	0
60-65	8	33	62.5	1	8
65-70	4	37	67.5	2	8
70-75	3	40	72.5	3	9
Total	**40**				**– 2**

For Correct Table 2

$$\text{Mean} = A + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$= 57.5 + \frac{(-2)}{40} \times 5 \quad \text{1}$$

$$= 57.25 \quad \text{½}$$

∴ The mean weight is 57.25 kg

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h$$

$$= 55 + \frac{20 - 17}{8} \times 5 \quad \text{1}$$

$$= 56.87 \quad \text{½}$$

∴ The median weight is 56.87 kg

SECTION E

*This section has **3** case study based questions carrying **4** marks each.* *3×4=12*

Case Study – 1

36. A city based NGO is organising a competition to break 'Dahi Handi' by forming a human pyramid on the occasion of Janmashtami. One troop with 400 members decided to participate in the competition. They planned to build eleven level pyramid with level one being at the bottom and level eleven being at the top. Level one has 41 members, level two has 37 members, level three has 33 members and so on.

Based on the above information, answer the following questions :

(i) What is the number of members at level eleven ? *1*

(ii) Find the number of members at the third level from the top. *1*

(iii) (a) Find the total number of members who formed the human pyramid. *2*

OR

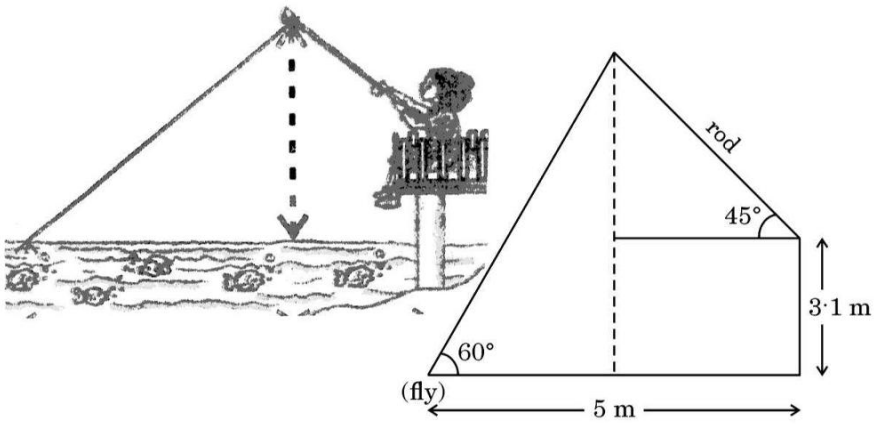
(iii) (b) At which level is the number of members 5 times the number of members at level ten ? *2*

Solution	(i) The number of members at the level eleven = a_{11} $= 1$	1
	(ii) The number of members at the third level from the top = a_3 $= 9$	1
	(iii) (a) The total number of members who formed the human pyramid $S_{11} = \frac{11}{2}[41 + 1]$	1½
	$= 231$	½
	OR	
	(iii) (b) Let n^{th} level be the required level	
	$a_n = 5\, a_{10}$	½
	$41 + (n - 1)(-4) = 5\,[41 + 9(-4)]$	1
	$n = 5$	½
	At 5^{th} level the number of members is 5 times the number of members at level ten	

Case Study – 2

37. Jigyasa is fly fishing in a stream sitting at the height of 3·1 m above the surface of water. The fishing rod is $2\sqrt{2}$ m long and the fly at the end of the string resting on the surface of water is 5 m away from the base of the platform on which Jigyasa is sitting.

The fishing rod makes an angle of 45° with the horizontal and the string which is fully taut makes an angle of 60° with the horizontal as shown in the given figure.



Based on the above information, answer the following questions : (Use $\sqrt{3}$ = 1·7)

(i) What is the height of the top of the fishing rod above the surface of water ? *1*

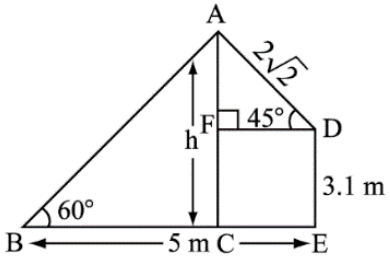
(ii) How far is the fly from the point on the surface of water directly below the top of the fishing rod ? *1*

(iii) (a) Find the length of the string when it is fully taut. *2*

OR

(iii) (b) A fish pulled the string such that it makes 30° angle with the horizontal now. What is the length of the string in this case ? *2*

Solution



(i) In ΔAFD,

$\sin 45° = \frac{h - 3.1}{2\sqrt{2}}$ gives $h = 5.1$ m 1

(ii) In ΔACB,

$\tan 60° = \frac{h}{BC}$ gives $BC = \frac{5.1}{1.7} = 3$ m 1

(iii) (a) Let AB be the length of the string

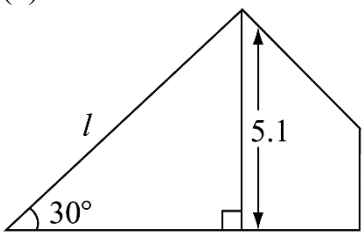
In ΔACB, $\sin 60° = \frac{h}{AB}$

$\frac{\sqrt{3}}{2} = \frac{5.1}{AB}$ 1

$\Rightarrow$ AB = 6 m 1

OR

(iii) (b)



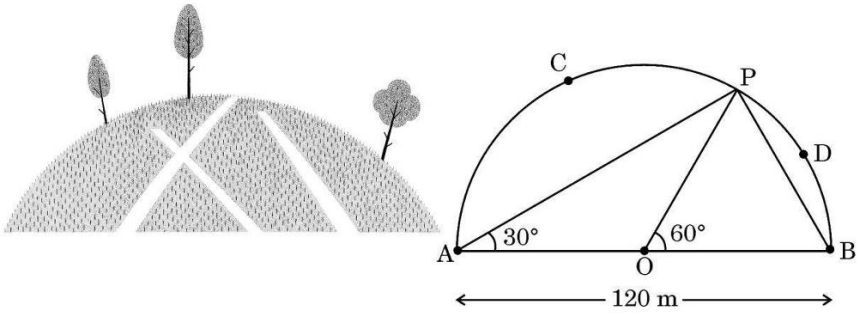
$\sin 30° = \frac{5.1}{l}$

$\frac{1}{2} = \frac{5.1}{l}$ 1

$l = 10.2$ m 1

Case Study – 3

38. A farmer has a semicircular field as shown in the figure given below :



In segment ACPA, he grows rice. In the triangular region APB, he grows vegetables. He allows his cows to graze in the segment BDPB. The diameter of the semicircular field with centre O is 120 m, $\angle$ PAO = 30° and $\angle$ POB = 60°.

Based on the above information, answer the following questions :

(i) Find the radius of the field and the measure of $\angle$ ABP. *1*

(ii) Find the area of sector AOP in terms of π. *1*

(iii) (a) Find the area of the region in which cows are allowed to graze. (Use $\pi = 3{\cdot}14$) *2*

OR

(iii) (b) Find the area of the region in which vegetables are grown. *2*

Solution

(i) Radius of the field $= 60$ m ½

$\angle ABP = 60°$ ½

(ii) Area of sector $AOP = \frac{120}{360} \times \pi \times 60 \times 60$ ½

$= 1200\ \pi\ m^2$ ½

(iii) (a) Area of the region in which cows are allowed to graze

= Area of segment BDPB

$= \frac{60}{360} \times 3.14 \times (60)^2 - \frac{\sqrt{3}}{4} \times (60)^2$ 1

$= \left(1884 - 900\sqrt{3}\right) m^2$ 1

OR

(iii) (b) As ΔOPB is an equilateral Δ

$\therefore$ PB = 60 m

In right ΔAPB, $AP = \sqrt{(120)^2 - (60)^2} = 60\sqrt{3}$ m 1

Area of the region in which vegetables are grown

$= \text{Area of } \Delta APB = \frac{1}{2} \times 60 \times 60\sqrt{3} = 1800\sqrt{3}\ m^2$ 1