Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2026
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE/Set No. 241/430/2/1)

General Instructions: -

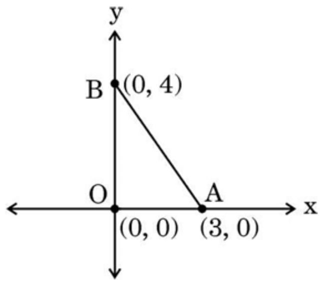
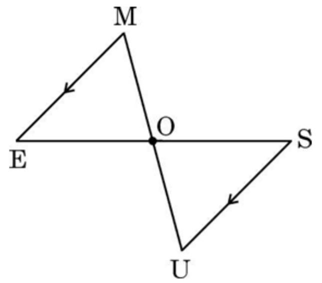
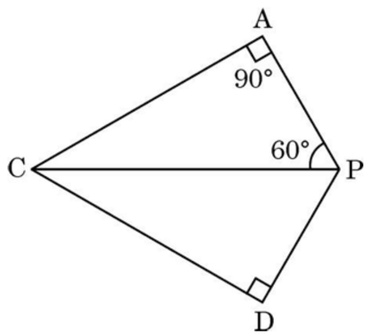
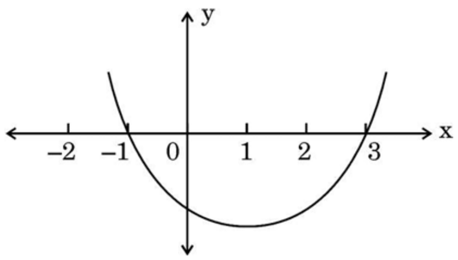
1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested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

Set 430/2/1

MARKING SCHEME
MATHEMATICS (Basic)

Q. No.	EXPECTED ANSWERS/VALUE POINTS	Marks
	SECTION A *This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each. 20×1=20*	
1.	The HCF of the smallest prime number and the smallest 3-digit number is $2^m 5^n$. The respective values of m and n are : (A) 0, 0 (B) 1, 0 (C) 0, 1 (D) 1, 1	
Ans. (B) 1, 0		1
2.	Which of the following statements is true for HCF and LCM of two distinct natural numbers a and b ? (i) HCF is always greater than LCM. (ii) HCF is a factor of LCM. (iii) LCM is a factor of HCF. (A) (i) only (B) (i) and (iii) (C) (i) and (ii) (D) (ii) only	
Ans. (D) (ii) only		1
3.	Which of the following system of equations has a unique solution ? (A) $x = 0, x = 1$ (B) $x + y = 0, 2x + 2y = 0$ (C) $x + y = 2, x - y = 3$ (D) $x + y = 5, x + y = 10$	
Ans. (C) $x + y = 2, x - y = 3$		1
4.	If the equation $qx^2 + px - r = 0$ $(q \neq 0)$ has real and equal roots, then which of the following is true ? (A) $p^2 = qr$ (B) $p^2 = -4qr$ (C) $q^2 = 4pr$ (D) $q^2 = -4pr$	
Ans. (B) $p^2 = -4qr$		1
5.	If $x = -1$ is a root of the equation $ax^2 - bx + 3 = 0$, then : (A) $-a + b - 3 = 0$ (B) $a - b - 3 = 0$ (C) $-a - b + 3 = 0$ (D) $a + b + 3 = 0$	
Ans. (D) $a + b + 3 = 0$		1

6. In the given figure, the length of hypotenuse of the right Δ AOB is :  (A) 3 units (B) 4 units (C) 5 units (D) 25 units	
Ans. (C) 5 units	1
7. In the given figure, if ME || SU, then which of the following statements is correct ?  (A) Δ MOE ~ Δ SOU (B) Δ MOE ~ Δ SUO (C) Δ OEM ~ Δ USO (D) Δ OEM ~ Δ OSU	
Ans. (D) ΔOEM ~ ΔOSU	1
8. In the given figure, if Δ ACP ~ Δ DCP, then :  (A) $\angle$ DCP = 60° (B) $\angle$ DCP = 30° (C) $\angle$ DCP = 90° (D) $\angle$ DPC = 30°	
Ans. (B) $\angle$DCP = 30°	1
9. The graph of a quadratic polynomial is shown in the figure. The sum and product of zeroes of the polynomial respectively are :  (A) 2 and 3 (B) 2 and – 3 (C) – 2 and 3 (D) – 2 and – 3	
Ans. (B) 2 and −3	1

10. The sum of the age (in years) of a father and three times the age of his daughter is 59. If the age of the father is x years and that of his daughter is y years, the equation representing the given information is :

(A) $3x + y = 59$ (B) $x + y = 59$

(C) $x + 3y = 59$ (D) $x + y = 56$

Ans. (C) $x + 3y = 59$ | 1

11. The 10^{th} term of the A.P. $\sqrt{2}, \sqrt{8}, \sqrt{18}, \ldots$ is :

(A) $\sqrt{162}$ (B) $\sqrt{200}$

(C) $\sqrt{54}$ (D) $\sqrt{94}$

Ans. (B) $\sqrt{200}$ | 1

12. The value of $(\cos 90° - \sin 90°)$ is :

(A) -1

(B) greater than 0

(C) equal to the value of $\tan 45°$

(D) 0

Ans. (A) -1 | 1

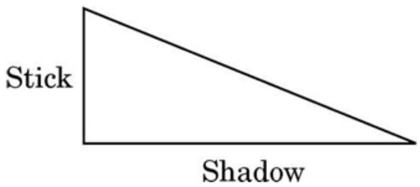
13. One of the possible values of A, for which $\cos 2A = \cos A$, is :

(A) $0°$ (B) $30°$

(C) $45°$ (D) $90°$

Ans. (A) $0°$ | 1

14. At an instant, the length of shadow of a stick is found to be $\sqrt{3}$ times the length of the stick as shown in the figure below. The Sun's altitude at that instant is :

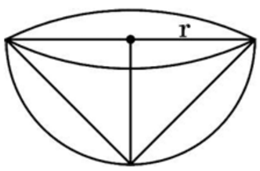


(A) $30°$ (B) $45°$

(C) $60°$ (D) $90°$

Ans. (A) $30°$ | 1

15. The largest possible right circular cone is carved out of a solid hemisphere of radius 'r' as shown in the figure below. The slant height of the cone is :



(A) r (B) 2r

(C) $\sqrt{2}\,r$ (D) $\sqrt{3}\,r$

Ans. (C) $\sqrt{2}r$ | 1

16. If for a frequency distribution, the mean is $\frac{3}{4}$ times the median, then mode is : (A) equal to median (B) $\frac{3}{2}$ times the median (C) equal to mean (D) 3 times the mean	
Ans. (B) $\frac{3}{2}$ times the median	1

17. Consider the given data :

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	15	30	50	63	35	32

The difference of lower limit of the median class and upper limit of the modal class is :

(A) 0 (B) 20

(C) 40 (D) 10

Ans. (B) 20	1

18. An unbiased die is thrown once. The probability of getting an even prime number greater than 2 is :

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

(C) $\frac{1}{6}$ (D) 0

Ans. (D) 0	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 probability of a certain event E is 1.

Reason (R) : The sum of probabilities of all elementary events of an experiment is 1.

Ans. (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). Note: "**The probability of a certain event E is 1**" because certain event consists of all the elementary events and "**The sum of probabilities of all elementary events of an experiment is 1**".	1

20. *Assertion (A) :* $(\sqrt{2} + \sqrt{3})$ is an irrational number.

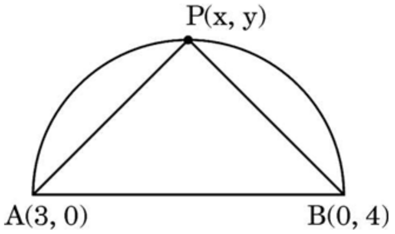
Reason (R) : The sum of two irrational numbers is always an irrational number.

Ans. (C) Assertion (A) is true, Reason (R) is false. — 1

SECTION B

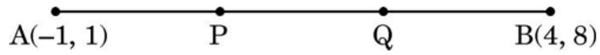
*This section has **5** Very Short Answer (VSA) type questions carrying **2** marks each.* *5×2=10*

21. (a) The point P(x, y) lies on a semi-circular arc having diameter AB as shown in the given figure. The coordinates of points A and B are (3, 0) and (0, 4) respectively. Find the relation between x and y, if $PA^2 + PB^2 = AB^2$.



OR

(b) Find the coordinates of the points of trisection P and Q of the line-segment AB as shown in the given figure.



Solution: (a) $PA^2 + PB^2 = AB^2$

$(x-3)^2 + y^2 + x^2 + (y-4)^2 = 25$ — 1

$2x^2 + 2y^2 - 6x - 8y = 0$ or $x^2 + y^2 - 3x - 4y = 0$ — 1

OR

Solution: (b) P divides AB in 1 : 2

Coordinates of P are $\left(\frac{1\times4+2\times(-1)}{1+2}, \frac{1\times8+2\times1}{1+2}\right) = \left(\frac{2}{3}, \frac{10}{3}\right)$ — ½+½

Q divides AB in 2 : 1

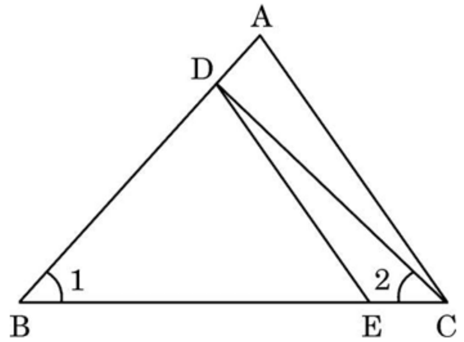
Coordinates of Q are $\left(\frac{2\times4+1\times(-1)}{1+2}, \frac{2\times8+1\times1}{1+2}\right) = \left(\frac{7}{3}, \frac{17}{3}\right)$ — ½+½

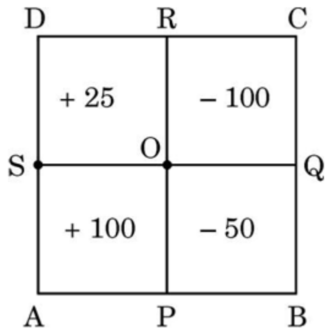
22. Verify the relation between the zeroes and the coefficients of the quadratic polynomial $4x^2 - 9$.

Solution: Zeroes of $4x^2 - 9$ are $\frac{3}{2}, \frac{-3}{2}$ — 1

Sum of zeroes $= \frac{3}{2} + \left(\frac{-3}{2}\right) = \frac{0}{4} = -\frac{\text{Coefficient of x}}{\text{Coefficient of } x^2}$ — ½

Product of zeroes $= \frac{3}{2} \times \left(\frac{-3}{2}\right) = \frac{-9}{4} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$ — ½

23. In the figure given below, $\angle 1 = \angle 2$ and $\frac{BE}{BC} = \frac{CD}{AB}$. Prove that $\Delta BDE \sim \Delta BAC$. 	
Solution: In ΔDBC, $\angle 1 = \angle 2$ $BD = CD$ In ΔBDE and ΔBAC, As $\frac{BE}{BC} = \frac{CD}{AB}$ $\therefore \frac{BE}{BC} = \frac{BD}{AB}$ $\angle B = \angle B$ (Common) $\therefore \Delta BDE \sim \Delta BAC$ (By SAS Similarity)	½ ½ ½ ½
24. (a) Triangle ABC is an isosceles right triangle, right angled at B. Find the value of $\sin^2 A + \cos^2 C$. **OR** (b) Evaluate : $\dfrac{2\sin^2 60^\circ + \cos^2 60^\circ}{\tan^2 30^\circ}$	
Solution: (a) ΔABC is an isosceles right triangle $\therefore \angle A = \angle C = 45^\circ$ $\sin^2 A + \cos^2 C = \sin^2 45^\circ + \cos^2 45^\circ$ $= \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2$ $= 1$ **OR** **Solution: (b)** $\dfrac{2\sin^2 60^\circ + \cos^2 60^\circ}{\tan^2 30^\circ} = \dfrac{2\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2}{\left(\frac{1}{\sqrt{3}}\right)^2}$ $= \frac{21}{4}$	½ ½ + ½ ½ 3×½ ½

25. A square dart board is divided into four equal squares as shown in the figure given below. If a dart hits square APOS, a player wins ₹ 100. If a dart hits square BPOQ, a player loses ₹ 50. If a dart hits square OQCR, a player loses ₹ 100 and if it hits square ORDS, the player will win ₹ 25. A player takes a turn and hits the dart board. What is the probability that  (i) the player loses money ? (ii) the player wins ₹ 100 ?	
Solution: (i) P(the player loses money) = $\frac{2}{4}$ or $\frac{1}{2}$ (ii) P(the player wins ₹ 100) = $\frac{1}{4}$	1 1

SECTION C

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

26. Neha claimed that there does not exist any irrational number between 1 and 2. Raunak claimed that $\sqrt{2}$ lies between 1 and 2 and $\sqrt{2}$ is an irrational number. Who do you think is correct ? Justify by proving either $\sqrt{2}$ as an irrational number or otherwise.	
Solution: Raunak is correct Let $\sqrt{2}$ be a rational number such that $\sqrt{2} = \frac{a}{b}$, where a and b are coprime and $b \neq 0$ $\sqrt{2}b = a$ $2b^2 = a^2$ 2 divides a^2 2 divides a as well Let $a = 2p$ (for some integer p) $a^2 = 4p^2$ $2b^2 = 4p^2$ $b^2 = 2p^2$ 2 divides b^2 2 divides b as well ∴ 2 is a common factor of a and b which is a contradiction as a and b are coprime. ∴ Our assumption is wrong. Hence, $\sqrt{2}$ is an irrational number.	½ ½ ½ 1 ½

27.	(a) Prove that the system of equations given as $2x - 3y = 7$ and $4x + ky = 9$, is inconsistent for $k = -6$. Also, obtain the solution of the system of equations, if $k = -1$. **OR** (b) Represent the following system of equations graphically and conclude whether the system is consistent or inconsistent. $2x + 3y = 6$ $4x + 6y = 24$	

Solution: (a) $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{-3}{k} = \frac{-3}{-6} = \frac{1}{2}, \frac{c_1}{c_2} = \frac{7}{9}$ — 1½

As $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

∴ system of equations is inconsistent — ½

For k = -1, the system of equations is

$2x - 3y = 7$

$4x - y = 9$

On solving, we get $x = 2$ and $y = -1$ — ½+½

OR

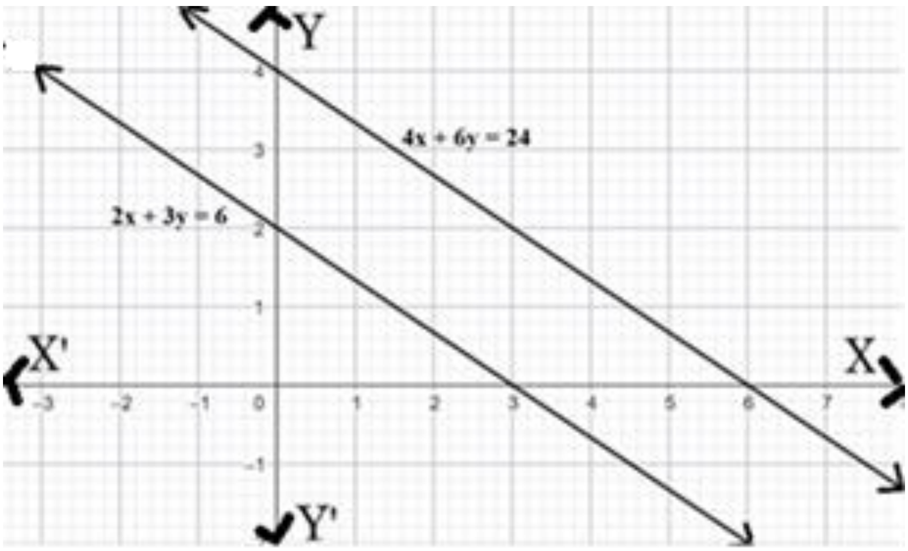
Solution: (b)

$2x + 3y = 6$

x	0	3
y	2	0

$4x + 6y = 24$

x	0	6
y	4	0



Correct Graph 2

As lines are parallel, hence the system is **inconsistent**. — 1

28.	Show that the quadrilateral ABCD with vertices A(0, 3), B(– 2, 0), C(0, – 5) and D(2, 0) is a kite. Also, find the length of each diagonal of the kite ABCD.

Solution: AB = $\sqrt{(0+2)^2 + (3-0)^2} = \sqrt{13}$ — ½

BC = $\sqrt{(-2-0)^2 + (0+5)^2} = \sqrt{29}$ — ½

CD = $\sqrt{(0-2)^2 + (-5-0)^2} = \sqrt{29}$ — ½

AD = $\sqrt{(2-0)^2 + (0-3)^2} = \sqrt{13}$ — ½

Since, AB = AD and BC = CD, so ABCD is a kite.

Length of diagonals

AC = $\sqrt{(0-0)^2 + (3+5)^2} = \sqrt{64} = 8$ — ½

BD = $\sqrt{(-2-2)^2 + (0-0)^2} = \sqrt{16} = 4$ — ½

29. (a) If $\sin A + \sin^2 A = 1$, find the value of $\cos^2 A + \cos^4 A$. Also, using the above, prove that $\tan^2 A \cdot \sec^2 A = 1$.

OR

(b) Prove that :

$$\frac{1+\operatorname{cosec}\theta}{\operatorname{cosec}\theta} = \frac{\cos^2\theta}{1-\sin\theta}$$

Solution: (a) $\sin A + \sin^2 A = 1$

$\Rightarrow \sin A = \cos^2 A$ ½

$\Rightarrow \sin^2 A = \cos^4 A$ (On squaring both sides) ½

$\Rightarrow 1 - \cos^2 A = \cos^4 A \Rightarrow \cos^2 A + \cos^4 A = 1$ 1

$\text{LHS} = \tan^2 A \cdot \sec^2 A = \frac{\sin^2 A}{\cos^2 A} \cdot \frac{1}{\cos^2 A} = \frac{\sin^2 A}{\sin^2 A} = 1 = \text{RHS}$ ($\because \cos^4 A = \sin^2 A$) 1

OR

Solution: (b) LHS $= \frac{1+\operatorname{cosec}\theta}{\operatorname{cosec}\theta}$

$= 1 + \sin\theta$ 1

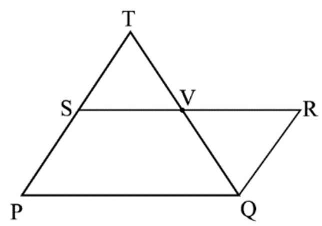
$= (1+\sin\theta) \times \frac{1-\sin\theta}{1-\sin\theta}$ 1

$= \frac{1-\sin^2\theta}{1-\sin\theta}$ ½

$= \frac{\cos^2\theta}{1-\sin\theta} = \text{RHS}$ ½

30. T is a point on the line PS produced of a parallelogram PQRS and QT intersects RS at V. Prove that Δ PQT ~ Δ RVQ.

Solution:



Correct Figure 1

In ΔPQT and ΔRVQ

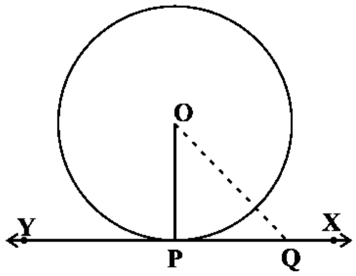
$\angle P = \angle R$ (opposite angles of a parallelogram) 1

$\angle T = \angle VQR$ (alternate interior angles) 1

$\Delta PQT \sim \Delta RVQ$ (By AA similarity criterion)

31. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

Solution:

	For Correct Figure ½
Given: A circle with centre O and tangent XY at a point P.	
To Prove: OP ⊥ XY	
Construction: Take a point Q on XY other than P. Join OQ.	½
Proof: Q must lie outside the circle (otherwise XY will become a secant)	
∴ OQ > Radius	
∴ OQ > OP	1
∴ OP is the shortest distance from O to XY	½
∴ OP ⊥ XY	½

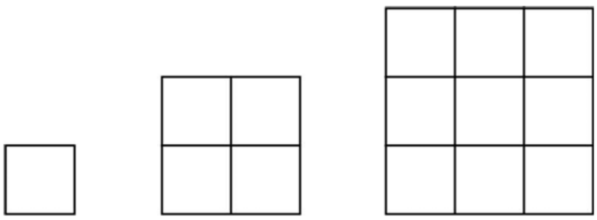
SECTION D

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

32. (a) Express $x - \frac{1}{x} = 3$ as a quadratic equation in standard form and hence find its roots. Also, find the value of 'a' for which the equation $x + \frac{1}{x} = a$, when expressed as a quadratic equation, has real and equal roots.

OR

(b) Observe the following pattern in which each small square represents a unit square (square of side 1 unit).

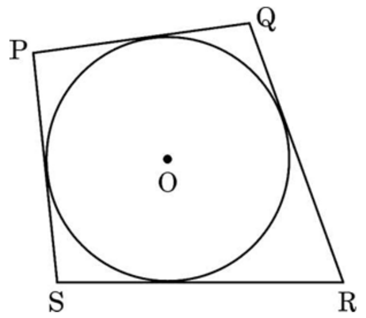
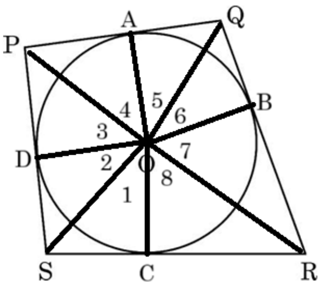


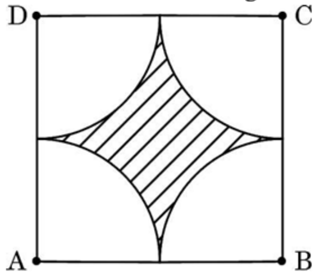
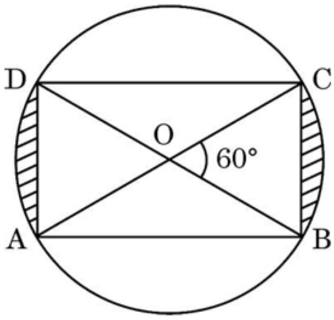
and so on

Fig (i) Fig (ii) Fig (iii)

If the sum of number of unit squares in the n^{th} figure and $(n + 2)^{th}$ figure is 290, find the value of n.

Solution: (a) $x - \frac{1}{x} = 3$	
$x^2 - 3x - 1 = 0$	1
$D = (-3)^2 - 4(1)(-1) = 13$	1
Roots are $\frac{3+\sqrt{13}}{2}, \frac{3-\sqrt{13}}{2}$	1
Now, $x + \frac{1}{x} = a$	
$x^2 - ax + 1 = 0$	½
Since roots are real and equal, $D = 0$	½
$a^2 - 4 = 0$	
$a = 2 \text{ or } -2$	½ + ½

OR	
Solution: (b) Number of unit squares in the n^{th} figure = n^2	½
Number of unit squares in the $(n+2)^{th}$ figure = $(n+2)^2$	½
$n^2 + (n+2)^2 = 290$	1
$n^2 + 2n - 143 = 0$	1
$(n+13)(n-11) = 0$	1
$n = 11\ ,\ -13$ (rejected)	1
33. In the given figure, quadrilateral PQRS circumscribes the circle with centre O. Prove that the opposite sides of the quadrilateral PQRS subtend supplementary angles at the centre O. 	
Solution: 	For Correct Figure 1
Let the circle touch the sides of the quadrilateral PQRS at A, B, C and D.	
Construction: Join OA, OB, OC, OD, OP, OQ, OR and OS	
$\Delta OCS \cong \Delta ODS$	
$\therefore \angle 1 = \angle 2$	1
Similarly, $\left.\begin{aligned}\angle 4 &= \angle 3\\ \angle 5 &= \angle 6\\ \angle 8 &= \angle 7\end{aligned}\right\}$	½
$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360°$	½
$2(\angle 1 + \angle 8 + \angle 4 + \angle 5) = 360°$	1
$\angle SOR + \angle POQ = 180°$	½
Similarly, $\angle POS + \angle ROQ = 180°$	½

34. (a) ABCD is a square. With centres A, B, C and D, four quadrants (each touching two of the remaining three) are drawn inside the square ABCD as shown in the figure. If the area of the shaded region is 42 cm^2, find the side of the square ABCD. Also, find the perimeter of the shaded region.  **OR** (b) A rectangle ABCD with diagonal 14 cm is inscribed in a circle with centre O as shown in the given figure. If the area of the shaded portion is expressed as $a + b\sqrt{3}$, find the values of a and b. Also, find the perimeter of the sector OABO. 	
Solution: (a) Let the side of the square be x cm	
Radius of each quadrant $= \frac{x}{2}$	½
Area of shaded region = $x^2 - 4 \times \frac{90}{360} \times \frac{22}{7} \times \left(\frac{x}{2}\right)^2$	1½
$\Rightarrow 42 = \frac{3}{14}x^2$	1
$\Rightarrow x = 14$	½
Perimeter of the shaded region = $4 \times \frac{90}{360} \times 2 \times \frac{22}{7} \times 7$	1
= 44 cm	½
OR	
Solution: (b) $r = \frac{14}{2} = 7$ cm	½
Area of shaded region $= 2 \times \left(\frac{60}{360} \times \frac{22}{7} \times 7 \times 7 - \frac{\sqrt{3}}{4} \times 7 \times 7\right)$	1
$= \frac{154}{3} - \frac{49\sqrt{3}}{2}$ cm^2	1
$a + b\sqrt{3} = \frac{154}{3} - \frac{49\sqrt{3}}{2}$	
$a = \frac{154}{3}$ and $b = -\frac{49}{2}$	1
Perimeter of the sector OABO $= 7 + 7 + \frac{120}{360} \times 2 \times \frac{22}{7} \times 7$	1
$= \frac{86}{3}$ cm or 28.67 cm	½

35. The median of the following data is 525. If the sum of all the frequencies is 100, find the values of p and q.

Class	*Frequency*
0 – 100	2
100 – 200	p
200 – 300	9
300 – 400	12
400 – 500	17
500 – 600	20
600 – 700	15
700 – 800	9
800 – 900	q
900 – 1000	4

Solution:

Class	**Frequency**	**Cumulative Frequency**
0-100	2	2
100-200	p	2 + p
200-300	9	11 + p
300-400	12	23 + p
400-500	17	40 + p
500-600	20	60 + p
600-700	15	75 + p
700-800	9	84 + p
800-900	q	84 + p + q
900-1000	4	88 + p + q

Correct cf 1

p + q = 12___________(i) 1

Median class = 500 – 600, N = 100

$$\text{Median} = 500 + \frac{50-(40+p)}{20} \times 100$$ 2

$$525 = 500 + 5(10 - p)$$

$$p = 5$$ ½

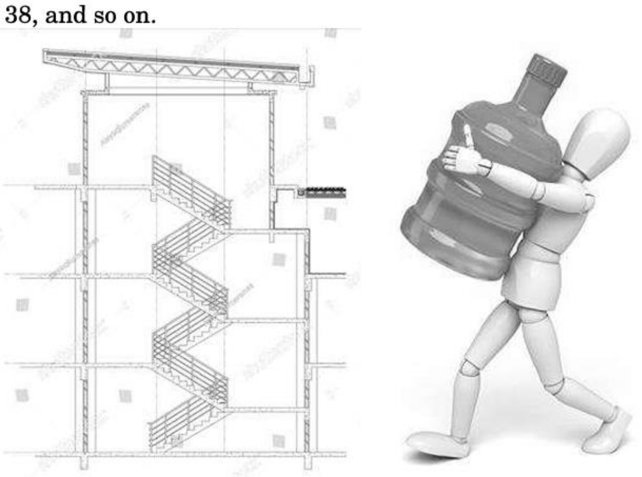
and $q = 7$ (From (i)) ½

SECTION E

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

Case Study – 1

36. A multistorey building is constructed with stilt parking. There is a provision of lift, as well as staircase from the ground floor to the top floor. The number of stairs from the ground floor to the first floor is 10, from the first floor to the second floor is 24, from the second floor to the third floor is 38, and so on.



Based on the above information, answer the following questions :

(i) Does 10, 24, 38, ... form an A.P. ? Justify your answer.

(ii) What will be the total number of stairs from the ground floor to the eleventh floor ?

(iii) A person supplies water cans to people living in the building. As water cans are heavy, he supplies water cans on each floor, carrying one at a time. He supplied the water can from the ground floor to the first floor, came back and supplied water can to the second floor, again came back then supplied water can to the third floor, and so on.

(a) Find the total number of stairs he climbed up and down to supply water till the sixth floor, using A.P.

OR

(b) The next day, following the same process, if a person climbed up and down a total of 380 stairs, till which floor did he supply water cans ?

Solution: (i) $24 - 10 = 14$ and $38 - 24 = 14$, so $d = 14$ ½

10, 24, 38, ….. form an A. P. ½

(ii) $S_{11} = \frac{11}{2}(2 \times 10 + 10 \times 14) = 880$ stairs 1

(iii) (a) Number of stairs to reach n^{th} floor = S_n

$= 7n^2 + 3n$ 1

∴ Total number of stairs he climbed up and down to supply water till the sixth floor

$= 2S_1 + 2S_2 + 2S_3 + 2S_4 + 2S_5 + 2S_6 = 20+68+144+248+380+540 = 1400$ 1

OR

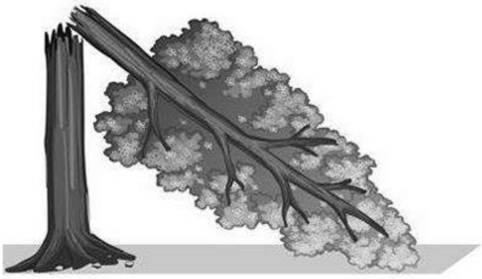
(b) As 20+68+144+248 > 380 2

He supplied water till 3rd floor

Case Study – 2

37. Climate change and global warming are influencing storm behaviour, particularly in terms of intensity and rainfall. Strong winds and storms often cause uprooting and/or breaking of trees, which damage the vehicles standing underneath the trees.

On a particular day, during a high intensity storm, a tree broke such that its broken part formed an angle of 30° with the ground. The distance between the base of the tree to the point where the top touches the ground is found to be 10 m.

Based on the above information, answer the following questions :

(i) Represent the given information with the help of a neat and well labelled diagram.

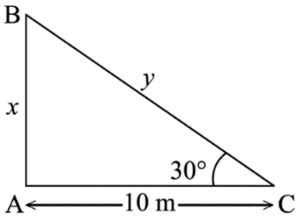
(ii) Find the height above the ground at which the tree is broken.

(iii) (a) Find the height of the tree before it broke. (Use $\sqrt{3} = 1{\cdot}732$)

OR

(iii) (b) If another tree broke from the same height as in part (ii), but the broken part made a 60° angle with the ground, find the total height of the tree.

Solution: (i) Let B be the point at which tree is broken.	For Correct Figure 1



(ii) In ΔBAC

$$\tan 30° = \frac{x}{10}$$

$$x = \frac{10}{\sqrt{3}}m \text{ or } \frac{10\sqrt{3}}{3}m \text{ or } 5.77\ m$$ 1

$\therefore$The height above the ground at which the tree is broken $= x = \frac{10}{\sqrt{3}}m$ or $\frac{10\sqrt{3}}{3}m$ or $5.77\ m$

(iii) (a) In ΔBAC

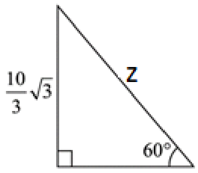
$$\cos 30° = \frac{10}{y}$$

$$y = \frac{20}{\sqrt{3}}m = \frac{20\sqrt{3}}{3}m$$ 1

$\therefore$The height of tree before it broke $= x + y = \frac{10\sqrt{3}}{3} + \frac{20\sqrt{3}}{3} = 10\sqrt{3} = 17.32$ m 1

OR

(iii) (b)



$$\sin 60° = \frac{\frac{10\sqrt{3}}{3}}{z}$$

$$z = \frac{20}{3}\ m$$ 1

$\therefore$The height of tree before it broke $= \left(z + \frac{10\sqrt{3}}{3}\right)$m $= \frac{10}{3}(2+\sqrt{3})m$ or 12.44 m 1

Case Study – 3

38. For a cricket tournament involving 8 countries, a special trophy, as shown below, is designed.

The height and diameter of the cylindrical part are 14 cm and 6 cm respectively and the diameter of the spherical ball on the top is 7 cm.

Based on the above information, answer the following questions :

(i) Find the total height of the trophy excluding the wooden part.

(ii) Find the difference between the radius of sphere and that of cylinder.

(iii) (a) If the cylindrical part and spherical part are separated and gold plated overall, find the total surface area to be gold plated.

OR

(iii) (b) Find the volume of the metal used in making the trophy, assuming that the metal is completely filled in it.

Solution: (i) Total height $= 14 + 7 = 21$ cm	1
(ii) Required difference $= 3.5 - 3 = 0.5$ cm	1
(iii) (a) Total surface area to be gold plated $= 2\pi(3 \times 14 + 3^2 + 2 \times 3.5^2)$	1
$= \frac{3322}{7}\text{ cm}^2$ *or* 474.57 cm^2	1
OR	
(iii) (b) Volume of the metal used $= \pi\left(3^2 \times 14 + \frac{4}{3} \times 3.5^3\right)$	1
$= \frac{1727}{3}\text{ cm}^3$ *or* 575.67 cm^3	1