

**Marking Scheme**  
**Strictly Confidential**  
**(For Internal and Restricted use only)**  
**Secondary School Examination, 2024**  
**SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/4/3)**

**General Instructions: -**

<b>1</b>	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.
<b>2</b>	<b>“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.”</b>
<b>3</b>	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. <b>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.</b>
<b>4</b>	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.
<b>5</b>	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.
<b>6</b>	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. <b>This is most common mistake which evaluators are committing.</b>
<b>7</b>	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.
<b>8</b>	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.
<b>9</b>	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 <b>“Extra Question”</b> .

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	<p>Ensure that you do not make the following common types of errors committed by the Examiner in the past:-</p> <ul style="list-style-type: none"> <li>● Leaving answer or part thereof unassessed in an answer book.</li> <li>● Giving more marks for an answer than assigned to it.</li> <li>● Wrong totaling of marks awarded on an answer.</li> <li>● Wrong transfer of marks from the inside pages of the answer book to the title page.</li> <li>● Wrong question wise totaling on the title page.</li> <li>● Wrong totaling of marks of the two columns on the title page.</li> <li>● Wrong grand total.</li> <li>● Marks in words and figures not tallying/not same.</li> <li>● Wrong transfer of marks from the answer book to online award list.</li> <li>● 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.)</li> <li>● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.</li> </ul>
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 “ <b>Guidelines for spot Evaluation</b> ” 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.

# MARKING SCHEME MATHEMATICS (BASIC) 430/4/3

## SECTION A

This section comprises Multiple Choice Questions (MCQs) of 1 mark each.  $20 \times 1 = 20$

1. A lamp post 9 m high casts a shadow  $3\sqrt{3}$  m long on the ground. The Sun's elevation at this moment is :

- (A)  $60^\circ$  (B)  $90^\circ$   
(C)  $45^\circ$  (D)  $30^\circ$

Answer (A)  $60^\circ$  1

2. The region between a chord and either of the two arcs of a circle is called :

- (A) an arc (B) a sector  
(C) a segment (D) a semicircle

Answer (C) a segment 1

3. The area of the sector of a circle with radius 6 cm which subtends an angle of  $60^\circ$  at the centre of the circle is :

- (A)  $\frac{142}{7} \text{ cm}^2$  (B)  $\frac{152}{7} \text{ cm}^2$   
(C)  $\frac{132}{7} \text{ cm}^2$  (D)  $\frac{122}{7} \text{ cm}^2$

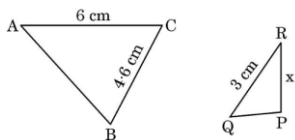
Answer (C)  $\frac{132}{7} \text{ cm}^2$  1

4. The roots of the quadratic equation  $x^2 - 4 = 0$  is/are :

- (A) 2 only (B) -2, 2  
(C) 4 only (D) -4, 4

Answer (B) -2, 2 1

5. In the given figure, if  $\triangle ABC \sim \triangle QPR$ , then the value of x is :



- (A) 5.3 cm (B) 4.6 cm  
(C) 2.3 cm (D) 4 cm

Answer (C) 2.3 cm 1

6. A fair die is thrown once. The probability of getting a composite number less than 5 is :

- (A)  $\frac{1}{3}$  (B)  $\frac{2}{3}$   
(C) 0 (D)  $\frac{1}{6}$

Answer (D)  $\frac{1}{6}$  1

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7. What should be added to the polynomial  $x^2 - 5x + 4$ , so that 3 is a zero of the resulting polynomial ?

- (A) 1 (B) 2  
(C) 4 (D) 5

Answer (B) 2 1

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8. A tangent to a circle is a line that touches the circle at :

- (A) one point only (B) two points  
(C) three points (D) infinite number of points

Answer (A) one point only 1

---

9. The distance between the points  $(2, -1)$  and  $(-1, -5)$  is :

- (A) 15 units (B) 5 units  
(C) 25 units (D) 41 units

Answer (B) 5 units 1

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10. If  $1080 = 2^x \times 3^y \times 5$ , then  $(x - y)$  is equal to :

- (A) 6 (B) -1  
(C) 1 (D) 0

Answer (D) 0 1

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11. Which of the following is **not** a quadratic equation ?

- (A)  $(x - 2)^2 + 1 = 2x - 3$   
(B)  $(2x - 1)(x - 3) = (x + 5)(x - 1)$   
(C)  $x(x + 1) + 8 = (x + 2)(x - 2)$   
(D)  $2x + \frac{3}{x} = 5$

Answer (C)  $x(x + 1) + 8 = (x + 2)(x - 2)$  1

---

12. The number of quadratic polynomials having zeroes  $-1$  and  $3$  is :

- (A) 1 (B) 2  
(C) 3 (D) more than 3

Answer (D) more than 3

1

13. The following distribution gives the daily income of 50 workers of a factory :

Income (in ₹)	400 – 424	425 – 449	450 – 474	475 – 499	500 – 524
Number of workers	12	14	8	6	10

The lower limit of the modal class is :

- (A) 425 (B) 449  
(C) 424.5 (D) 425.5

Answer (C) 424.5

1

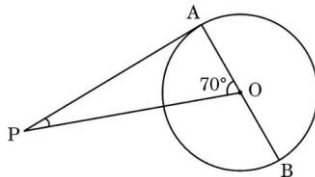
14. The common difference of an A.P., if  $a_{23} - a_{19} = 32$ , is :

- (A) 8 (B)  $-8$   
(C)  $-4$  (D) 4

Answer (A) 8

1

15. In the given figure, PA is a tangent from an external point P to a circle with centre O. If  $\angle AOP = 70^\circ$ , then the measure of  $\angle APO$  is :



- (A)  $70^\circ$  (B)  $90^\circ$   
(C)  $110^\circ$  (D)  $20^\circ$

Answer (D)  $20^\circ$

1

16. If  $5 \tan A = 3$ , then the value of  $\cot A$  is :

- (A)  $\frac{3}{5}$  (B)  $\frac{5}{3}$   
(C)  $\frac{3}{4}$  (D)  $\frac{4}{5}$

Answer (B)  $\frac{5}{3}$

1

17. The midpoint of the line segment joining the points  $(-6, -4)$  and  $(0, 4)$  is :

- (A)  $(-6, 0)$  (B)  $(-3, 0)$   
(C)  $(-6, 8)$  (D)  $(-6, 4)$

Answer (B)  $(-3, 0)$

1

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18. The mode and mean of a data are 7 and 8 respectively. Then, the median of the data is :

- (A)  $\frac{23}{3}$  (B)  $\frac{13}{3}$   
(C)  $\frac{1}{13}$  (D) 33

Answer (A)  $\frac{23}{3}$

1

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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 pair of linear equations  $5x + 2y + 6 = 0$  and  $7x + 6y + 18 = 0$  have infinitely many solutions.

Reason (R) : The pair of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$  have infinitely many solutions, if  $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ .

Answer (D) Assertion (A) is false, but Reason (R) is true.

1

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20. Assertion (A) : The probability of getting number 8 on rolling a die is zero (0).

Reason (R) : The probability of an impossible event is zero (0).

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

1

## SECTION B

This section comprises Very Short Answer (VSA) type questions of 2 marks each. 5×2=10

21. Evaluate :

$$5 \sin^2 60^\circ + 3 \cos^2 30^\circ - \sec^2 45^\circ$$

Solution:  $5 \sin^2 60^\circ + 3 \cos^2 30^\circ - \sec^2 45^\circ$

$$= 5 \left( \frac{\sqrt{3}}{2} \right)^2 + 3 \left( \frac{\sqrt{3}}{2} \right)^2 - (\sqrt{2})^2 \quad \frac{1}{2}$$

$$= 4 \quad \frac{1}{2}$$


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22. (a) If  $\alpha, \beta$  are zeroes of the polynomial  $8x^2 + 14x + 3$ , then find the value of  $\left( \frac{1}{\alpha} + \frac{1}{\beta} \right)$ .

OR

(b) Find a quadratic polynomial whose zeroes are  $-9$  and  $6$ .

Solution: (a) As  $\alpha, \beta$  are zeroes of the polynomial

$$\therefore \alpha + \beta = \frac{-14}{8} \quad \frac{1}{2}$$

$$\alpha\beta = \frac{3}{8} \quad \frac{1}{2}$$

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha\beta} = \frac{-14}{3} \quad \frac{1}{2} + \frac{1}{2}$$

OR

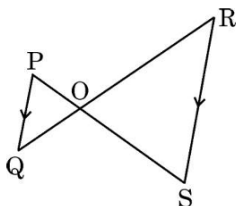
(b) Sum of zeroes =  $-3$  1/2

Product of zeroes =  $-54$  1/2

Quadratic polynomial is :  $k(x^2 + 3x - 54)$  or  $x^2 + 3x - 54$  1

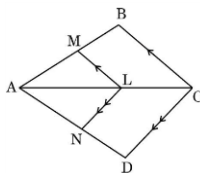
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23. (a) In the given figure,  $PQ \parallel RS$ . Prove that  $OP \times OR = OQ \times OS$ .



OR

(b) In the given figure,  $LM \parallel CB$  and  $LN \parallel CD$ . Prove that  $\frac{AM}{AN} = \frac{AB}{AD}$ .



Solution: (a) In  $\Delta POQ$  and  $\Delta SOR$

$$\angle POQ = \angle SOR \quad (\text{vertically opposite angles})$$

$$\angle OPQ = \angle OSR \quad (\text{alternate interior angles as } PQ \parallel SR)$$

$$\therefore \Delta POQ \sim \Delta SOR \quad (\text{AA criteria})$$

$$\Rightarrow \frac{OP}{OS} = \frac{OQ}{OR} \quad \text{or} \quad OP \times OR = OQ \times OS$$

**OR**

(b) In  $\Delta ABC$ ,  $LM \parallel CB$

$$\therefore \frac{AM}{AB} = \frac{AL}{AC} \quad \text{_____ (i)}$$

In  $\Delta ADC$ ,  $LN \parallel CD$

$$\therefore \frac{AN}{AD} = \frac{AL}{AC} \quad \text{_____ (ii)}$$

$$\text{from (i) and (ii) } \frac{AM}{AB} = \frac{AN}{AD} \quad \text{or} \quad \frac{AM}{AN} = \frac{AB}{AD}$$

$\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$   
 $\frac{1}{2}$

$1 \frac{1}{2}$

$\frac{1}{2}$

**24.** Given that  $HCF(306, 1314) = 18$ , find  $LCM$  of  $(306, 1314)$ .

$$\text{Solution: } LCM \times 18 = 306 \times 1314$$

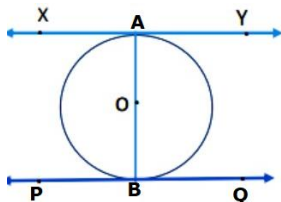
$$LCM = \frac{306 \times 1314}{18} = 22,338$$

1

1

**25.**  $XY$  and  $PQ$  are two tangents drawn at the end points of the diameter  $AB$  of a circle. Prove that  $XY \parallel PQ$ .

Solution:



Given:  $XY$  &  $PQ$  are tangents,  $AB$  is the diameter

To prove:  $XY \parallel PQ$

$\frac{1}{2}$  For figure

Proof:  $XY \perp OA$  (Tangent is perpendicular to radius)

$$\therefore \angle OAY = 90^\circ$$

$\frac{1}{2}$

$PQ \perp OB$  (Tangent is perpendicular to radius)

$$\therefore \angle OBP = 90^\circ$$

$\frac{1}{2}$

But  $\angle OAY$  and  $\angle OBP$  are alternate interior angles

$$\therefore XY \parallel PQ$$

$\frac{1}{2}$

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### SECTION C

This section comprises Short Answer (SA) type questions of 3 marks each.  $6 \times 3 = 18$

**26.** Prove that  $2 + 5\sqrt{3}$  is an irrational number, if it is given that  $\sqrt{3}$  is an irrational number.

Solution: Let us assume that  $x = 2 + 5\sqrt{3}$  is a rational number

1

$$\Rightarrow \sqrt{3} = \frac{x-2}{5}$$

1

Now RHS is rational number but LHS is an irrational number

$\therefore$  our assumption is wrong

1

Hence  $2 + 5\sqrt{3}$  is an irrational number

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**27.** (a) Using quadratic formula, find the real roots of the equation  $2x^2 + 2x + 9 = 0$ , if they exist.

**OR**

(b) Find the values of 'k' for which the quadratic equation  $kx^2 - 2kx + 6 = 0$  has real and equal roots. Also, find the roots.

Solution (a)  $D = -68$

2

since  $D < 0$ , the equation does not have real roots.

1

**OR**

(b)  $kx^2 - 2kx + 6 = 0$

Quadratic Equation has equal roots (given)

$$\therefore D = 0 \Rightarrow 4k^2 - 24k = 0$$

1

$$4k(k - 6) = 0$$

$$\Rightarrow k = 6 \quad (k \neq 0)$$

1

Putting  $k = 6$  we get

$$6x^2 - 12x + 6 = 0 \text{ or } x^2 - 2x + 1 = 0$$

$$\Rightarrow (x - 1)^2 = 0 \Rightarrow x = 1$$

1

28. Prove that :

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

Solution: LHS =  $\frac{1 + \sec \theta}{\sec \theta} = \frac{1 + \frac{1}{\cos \theta}}{\frac{1}{\cos \theta}} = \frac{\frac{\cos \theta + 1}{\cos \theta}}{\frac{1}{\cos \theta}} = 1 + \cos \theta$  1

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

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

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

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29. From a well-shuffled deck of 52 playing cards, all black queens and red kings are removed. One card is selected at random from the remaining cards. Find the probability that the selected card is :

- (i) an ace.
- (ii) a jack of red colour.
- (iii) a king of spade.

Solution:

(i)  $P(\text{an ace}) = \frac{4}{48}$  or  $\frac{1}{12}$  1

(ii)  $P(\text{jack of red colour}) = \frac{2}{48}$  or  $\frac{1}{24}$  1

(iii)  $P(\text{king of spade}) = \frac{1}{48}$  1

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30. A chord of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding (i) minor sector (ii) major sector. (Use  $\pi = 3.14$ )

Solution

(i) Area of minor sector =  $\frac{\pi r^2 \theta}{360^\circ} = \frac{3.14 \times 10 \times 10 \times 90}{360} = \frac{314}{4} \text{ cm}^2$  or  $\frac{157}{2} \text{ cm}^2$  or  $78.5 \text{ cm}^2$  1

(ii) Area of circle =  $\pi r^2 = 3.14 \times 10 \times 10 = 314 \text{ cm}^2$  1

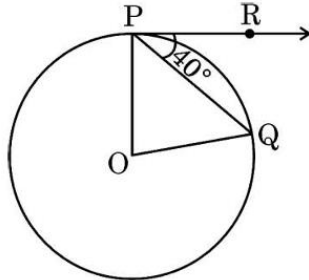
$\therefore$  Area of major sector =  $314 - 78.5 = 235.5 \text{ cm}^2$   $\frac{1}{2}$

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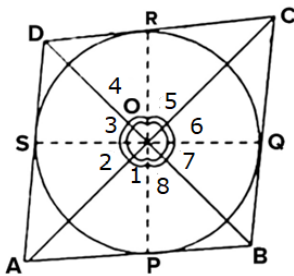
31. (a) Prove that opposite sides of a quadrilateral circumscribing a circle subtends supplementary angles at the centre of the circle.

**OR**

- (b) If O is the centre of a circle, PQ is a chord and the tangent PR at P makes an angle of  $40^\circ$  with PQ, then find the measure of  $\angle POQ$ .



Solution: (a) Given: A quadrilateral ABCD circumscribes a circle with centre O



$\frac{1}{2}$  for fig.

To Prove:  $\angle AOB + \angle COD = 180^\circ$  and  $\angle BOC + \angle AOD = 180^\circ$

Proof: In  $\triangle AOP$  and  $\triangle AOS$

- $OA = OA$  (common)  
 $OP = OS$  (radii)  
 $AP = AS$  (tangents from an external point)

$\therefore \triangle AOP \cong \triangle AOS$  (SSS criteria)

1

$\therefore \angle 1 = \angle 2$

$\parallel y,$   $\angle 3 = \angle 4, \angle 5 = \angle 6$  and  $\angle 7 = \angle 8$

$\frac{1}{2}$

Now  $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360^\circ$

$$\Rightarrow 2(\angle 1 + \angle 4 + \angle 5 + \angle 8) = 360^\circ$$

$$\Rightarrow (\angle 1 + \angle 8) + (\angle 4 + \angle 5) = 180^\circ$$

$\frac{1}{2}$

$$\Rightarrow \angle AOB + \angle COD = 180^\circ$$

$\parallel y,$   $\angle BOC + \angle AOD = 180^\circ$

$\frac{1}{2}$

**OR**

(b)  $\angle RPQ = 40^\circ$  (given)

$\angle OPR = 90^\circ$  (radius  $\perp$  tangent)

$$\therefore \angle OPQ = 90^\circ - 40^\circ = 50^\circ$$

1

In  $\triangle POQ$ ,  $OP = OQ$  (radii of same circle)  
 $\therefore \angle OPQ = \angle OQP = 50^\circ$  (angles opposite to equal sides) 1  
 Now,  $\angle OPQ + \angle OQP + \angle POQ = 180^\circ$   
 $50^\circ + 50^\circ + \angle POQ = 180^\circ$   
 $\angle POQ = 80^\circ$  1

**SECTION D**

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

**32.** (a) If  $BD$  and  $QM$  are medians of triangles  $ABC$  and  $PQR$ , respectively, where  $\triangle ABC \sim \triangle PQR$ , prove that  $\frac{AB}{PQ} = \frac{BD}{QM}$ .

**OR**

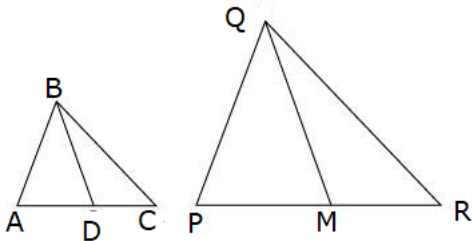
(b)  $CD$  and  $GH$  are respectively the bisectors of  $\angle ACB$  and  $\angle EGF$  such that  $D$  and  $H$  lie on sides  $AB$  and  $FE$  of  $\triangle ABC$  and  $\triangle FEG$  respectively. If  $\triangle ABC \sim \triangle FEG$ , show that :

(i)  $\frac{CD}{GH} = \frac{AC}{FG}$

(ii)  $\triangle DCB \sim \triangle HGE$

Solution (a)

1 for figure



Given :  $\triangle ABC \sim \triangle PQR$  and  $BD, QM$  are medians

To prove :  $\frac{AB}{PQ} = \frac{BD}{QM}$

Proof :  $\triangle ABC \sim \triangle PQR$  (given)

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

$\Rightarrow \frac{AB}{PQ} = \frac{2AD}{2PM}$  (BD and QM are medians)

$$\Rightarrow \frac{AB}{PQ} = \frac{AD}{PM} \quad 1$$

In  $\triangle ABD$  and  $\triangle PQM$

$$\frac{AB}{PQ} = \frac{AD}{PM} \quad (\text{proved above})$$

$$\angle A = \angle P \quad (\triangle ABC \sim \triangle PQR)$$

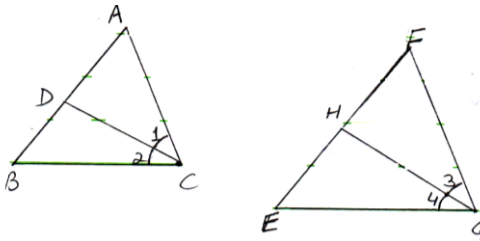
$$\therefore \triangle ABD \sim \triangle PQM \quad (\text{SAS criteria}) \quad 1\frac{1}{2}$$

$$\therefore \frac{AB}{PQ} = \frac{BD}{QM} \quad (\text{C.P.S.T.}) \quad \frac{1}{2}$$

**OR**

(b) Given:  $\triangle ABC \sim \triangle FEG$  and  $CD, GH$  are bisectors of  $\angle ACB$  and  $\angle EGF$  respectively.

To Prove (i)  $\frac{CD}{GH} = \frac{AC}{FG}$  (ii)  $\triangle DCB \sim \triangle HGE$



1 for figure

Proof : (i)  $\angle ACB = \angle FGE$  ( $\triangle ABC \sim \triangle FEG$ )  $\frac{1}{2}$

$$\Rightarrow \frac{1}{2} \angle ACB = \frac{1}{2} \angle FGE \quad (\text{CD and GH are bisectors of } \angle ACB \text{ and } \angle EGF)$$

$$\Rightarrow \angle 1 = \angle 3 \text{ and } \angle 2 = \angle 4 \quad \frac{1}{2} + \frac{1}{2}$$

In  $\triangle ACD$  and  $\triangle FGH$

$$\angle A = \angle F \quad (\triangle ABC \sim \triangle FEG)$$

$$\angle 1 = \angle 3 \quad (\text{proved above})$$

$$\Rightarrow \triangle ACD \sim \triangle FGH \quad (\text{AA criteria}) \quad 1$$

$$\Rightarrow \frac{CD}{GH} = \frac{AC}{FG} \quad \frac{1}{2}$$

(ii) In  $\triangle DCB$  and  $\triangle HGE$

$$\angle B = \angle E \quad (\triangle ABC \sim \triangle FEG)$$

$$\angle 2 = \angle 4 \quad (\text{proved above})$$

$$\therefore \triangle DCB \sim \triangle HGE \quad (\text{AA criteria}) \quad 1$$

33. (a) Two cubes each of volume  $125 \text{ cm}^3$  are joined end to end. Find the volume and the surface area of the resulting cuboid.

**OR**

- (b) A solid is in the shape of a cone surmounted on a hemisphere with both their diameters being equal to 7 cm and the height of the cone is equal to its radius. Find the volume of the solid.

Solution: (a) Volume of one cube =  $125 \text{ cm}^3$

$$\therefore \text{side of the cube} = 5 \text{ cm}$$

$$\text{Volume of the resulting cuboid} = \text{volume of 2 cubes} = 250 \text{ cm}^3$$

$$\therefore \text{Length of new cuboid} = 5 + 5 = 10 \text{ cm}$$

$$\text{Breadth of new cuboid} = 5 \text{ cm}$$

$$\text{Height of new cuboid} = 5 \text{ cm}$$

$$\begin{aligned} \text{Surface area of the resulting cuboid} &= 2(lb + bh + hl) \\ &= 2(10 \times 5 + 5 \times 5 + 5 \times 10) \\ &= 250 \text{ cm}^2 \end{aligned}$$

**OR**

$$(b) \text{Radius of hemisphere} = \text{radius of cone} = \frac{7}{2} \text{ cm}$$

$$\text{Height of cone} = \frac{7}{2} \text{ cm}$$

$$\text{Volume of the solid} = \text{Volume of hemisphere} + \text{Volume of cone}$$

$$= \frac{2}{3} \pi r^3 + \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \left( 2 \times \frac{7}{2} + \frac{7}{2} \right)$$

$$= \frac{539}{4} \text{ cm}^3 \text{ or } 134.75 \text{ cm}^3$$

34. If the sum of the first 7 terms of an A.P. is 91 and that of the first 17 terms is 561, then find the sum of the first n terms and hence find the  $n^{\text{th}}$  term.

$$\text{Solution } S_7 = 91 \Rightarrow \frac{7}{2} [2a + 6d] = 91$$

$$a + 3d = 13 \text{ _____ (i)}$$

$$S_{17} = 561 \Rightarrow \frac{17}{2} (2a + 16d) = 561$$

$$a + 8d = 33 \text{ _____ (ii)}$$

$$\text{Solving (i) and (ii) } d = 4 \text{ and } a = 1$$

$$\therefore S_n = \frac{n}{2} [2a + (n - 1)d]$$

$$= \frac{n}{2} [2(1) + (n - 1) 4]$$

$$= 2n^2 - n$$

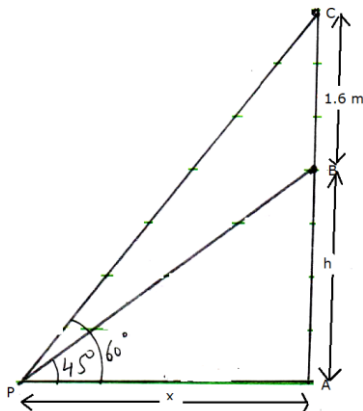
$$\text{Getting } a_n = 4n - 3$$

1

1

- 35.** A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is  $60^\circ$  and from the same point, the angle of elevation of the top of the pedestal is  $45^\circ$ . Find the height of the pedestal. (Use  $\sqrt{3} = 1.732$ )

Solution:



1 for fig.

Let AB = Height of pedestal = h

Let AP = x

In right  $\triangle APB$ ,  $\tan 45^\circ = \frac{h}{x} \Rightarrow h = x$  \_\_\_\_\_ (i)

1

In right  $\triangle APC$ ,  $\tan 60^\circ = \frac{AC}{AP} \Rightarrow \sqrt{3} = \frac{1.6 + h}{x}$

1

$$\sqrt{3} h = 1.6 + h \quad (\text{using (i)})$$

$\frac{1}{2}$

$$h = \frac{1.6}{\sqrt{3} - 1}$$

1

$$= \frac{4.37}{2} \text{ or } 2.1856$$

$\frac{1}{2}$

$$\therefore \text{Height of pedestal} = \frac{4.37}{2} \text{ m or } 2.19 \text{ m}$$

## SECTION E

This section comprises 3 case study based questions of 4 marks each.

3×4=12

### Case Study - 1

36. Deepankar bought 3 notebooks and 2 pens for ₹ 80 and his friend Suryansh bought 4 notebooks and 3 pens for ₹ 110 from the school bookshop.



Based on the above information, answer the following questions.

- (i) If the price of one notebook be ₹  $x$  and the price of one pen be ₹  $y$ , write the given situation algebraically. 1
- (ii) (a) What is the price of one notebook? 2
- OR**
- (b) What is the price of one pen? 2
- (iii) What is the total amount to be paid by Suryansh, if he purchases 6 notebooks and 3 pens? 1

Solution: (i)  $3x + 2y = 80$  -----(1)  $\frac{1}{2}$

$4x + 3y = 110$  -----(2)  $\frac{1}{2}$

- (ii) (a) Solving (1) and (2) to get  $x=20$  2

**OR**

- (b) Solving (1) and (2) to get  $y=10$  2

(iii) Total amount paid =  $6 \times 20 + 3 \times 10 = ₹ 150$  1

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### Case Study - 2

37. **Mutual Fund** : A mutual fund is a type of investment vehicle that pools money from multiple investors to invest in securities like stocks, bonds or other securities. Mutual funds are operated by professional money managers, who allocate the fund's assets and attempt to produce capital gains or income for the fund's investors.



Net Asset Value (NAV) represents a fund's per share market value. It is the price at which the investors buy fund shares from a fund company and sell them to a fund company.

The following table shows the Net Asset Value (NAV) per unit of mutual fund of ICICI mutual funds :

NAV (in ₹)	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Number of mutual funds	13	16	22	18	11

Based on the above information, answer the following questions :

- (i) What is the upper limit of modal class of the data ? 1
- (ii) What is the median class of the data ? 1
- (iii) (a) What is the mode NAV of mutual funds ? 2

**OR**

- (b) What is the median NAV of mutual funds ? 2

Solution: (i) Upper limit of modal class = 15 1

(ii) Median class = 10 – 15 1

(iii)(a)  $l = 10, f_0 = 6, f_1 = 22, f_2 = 18, h = 5$

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h = 10 + \left( \frac{22 - 16}{44 - 16 - 18} \right) \times 5 \quad 1\frac{1}{2}$$

$$= 13 \quad \frac{1}{2}$$

**OR**

(iii) (b)

NAV (in ₹)	f	cf
0 – 5	13	13
5 – 10	16	29
10 – 15	22	51
15 – 20	18	69
20 – 25	11	80

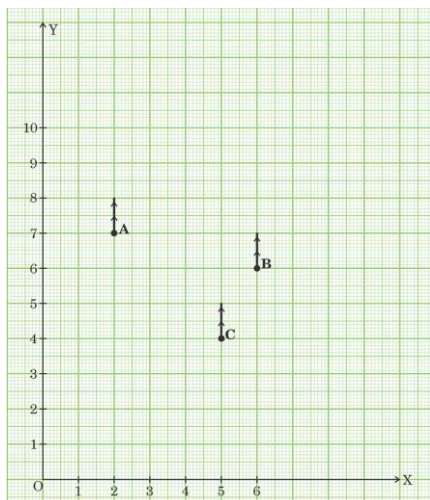
$\frac{1}{2}$  for table

$$\text{Median} = l + \left( \frac{\frac{N}{2} - cf}{f} \right) \times h = 10 + \left( \frac{40 - 29}{22} \right) \times 5 \quad 1$$

$$= 12.5 \quad \frac{1}{2}$$

### Case Study – 3

38. Resident Welfare Association (RWA) of Gulmohar Society in Delhi, have installed three electric poles A, B and C in the society's common park. Despite these three poles, some parts of the park are still in the dark. So, RWA decides to have one more electric pole D in the park. The park can be modelled as a coordinate system given below.



On the basis of the above information, answer the following questions :

- (i) What is the position of the pole C ? 1
- (ii) What is the distance of the pole B from the corner O of the park ? 1
- (iii) (a) Find the position of the fourth pole D so that the four points A, B, C and D form a parallelogram ABCD. 2

**OR**

- (b) Find the distance between poles A and C. 2

Solution: (i) Position of the pole C(5, 4)

(ii) B(6, 6)

$$\therefore BO = \sqrt{(6 - 0)^2 + (6 - 0)^2} = \sqrt{36 + 36} = \sqrt{72} \text{ or } 6\sqrt{2}$$

(iii)(a) A(2, 7), B(6, 6), C(5, 4)

Let D(x, y)

ABCD forms a parallelogram

$\therefore$  Mid-point of AC = Mid-point of BD

$$\left(\frac{2+5}{2}, \frac{7+4}{2}\right) = \left(\frac{6+x}{2}, \frac{6+y}{2}\right)$$

$$\frac{7}{2} = \frac{6+x}{2} \Rightarrow x = 1$$

$$\frac{11}{2} = \frac{6+y}{2} \Rightarrow y = 5$$

Position of the fourth pole D is (1, 5)

**OR**

(iii) (b) AC =  $\sqrt{(5 - 2)^2 + (4 - 7)^2} = \sqrt{9 + 9}$

$$= \sqrt{18} \text{ or } 3\sqrt{2}$$

1  
1/2  
1/2

1  
1/2  
1/2

1 1/2  
1/2