

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2024
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/5/1)

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 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 <u>(0-80)</u> (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"> ● 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.

This section comprises Multiple Choice Questions (MCQ) of one mark each.

SECTION A

20×1=20

1. HCF × LCM for the numbers 40 and 30 is :

- (A) 12 (B) 120
(C) 1200 (D) 40

Ans1. (C)1200 1

2. The roots of the quadratic equation $x^2 + 3x - 10 = 0$ are :

- (A) 5, 2 (B) -5, 2
(C) 5, -2 (D) -5, -2

Ans2. (B) -5, 2 1

3. The pair of linear equations $2kx + 5y = 7$, $6x + 5y = 11$ have a unique solution, if

- (A) $k \neq 3$ (B) $k \neq -3$
(C) $k \neq \frac{1}{3}$ (D) $k \neq -\frac{1}{3}$

Ans 3. (A) $k \neq 3$ 1

4. If the mean and mode of a frequency distribution are 28 and 16 respectively, then its median is :

- (A) 22 (B) 23.5
(C) 24 (D) 24.5

Ans 4. (C) 24 1

5. A die is rolled once. What is the probability of getting an odd prime number ?

- (A) $\frac{1}{6}$ (B) $\frac{1}{3}$
(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

Ans5. (B) $\frac{1}{3}$ 1

6. If the area of a sector of a circle is $\frac{1}{8}$ of the area of the circle, then the central angle of the sector is :

- (A) 30° (B) 45°
(C) 60° (D) 90°

Ans6. (B) 45° 1

7. Prime factorisation of 424 is :

- (A) $2 \times 53 \times 4$ (B) $2 \times 53 \times 2$
(C) $2^3 \times 53$ (D) $2^4 \times 53$

Ans7. (C) $2^3 \times 53$ 1

8. If x is a whole number, then 8^x ends with an even digit, except for which value of x ?

- (A) 6 (B) 4
(C) 2 (D) 0

Ans8. (D) 0 1

9. A tree casts a shadow 7 m long on the ground, when the angle of elevation of the Sun is 45° . The height of the tree is :

- (A) $7\sqrt{3}$ m (B) $\frac{7}{3}\sqrt{3}$ m
(C) 7 m (D) 3.5 m

Ans9. (C) 7m 1

10. $\left(\frac{5}{\cot^2 \theta} - \frac{5}{\cos^2 \theta} \right)$ is equal to :

- (A) 1 (B) 5
(C) -5 (D) 0

Ans10. (C) -5 1

11. If $\tan^2 \theta = 3$, where θ is an acute angle, then the value of θ is :

- (A) 30° (B) 60°
(C) 0° (D) 45°

Ans11. (B) 60°

1

12. The length of an arc of a circle with radius 12 cm is 10π cm. The central angle subtended by this arc at the centre, is :

- (A) 120° (B) 6°
(C) 75° (D) 150°

Ans12. (D) 150°

1

13. If the angle between the two radii of a circle is 130° , then the angle between the tangents at the ends of these radii, is :

- (A) 50° (B) 60°
(C) 90° (D) 130°

Ans13. (A) 50°

1

14. The discriminant of the quadratic equation $x^2 - 4x + 3 = 0$ is :

- (A) 28 (B) -8
(C) 4 (D) 2

Ans 14. (C) 4

1

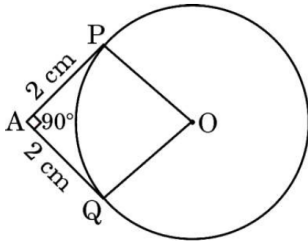
15. The mid-point of the line segment AB joining A(-2, 8) and B(-6, 4) is :

- (A) (2, 6) (B) (-4, 12)
(C) (-4, 6) (D) (4, -6)

Ans15. (C) (-4, 6)

1

16. AP and AQ are tangents drawn from an external point A to a circle with centre O and inclined to each other at an angle of 90° . If the length of each tangent is 2 cm, then the radius of the circle is :



- (A) 4 cm (B) 2 cm
(C) $2\sqrt{2}$ cm (D) 1 cm

Ans16. (B) 2 cm

1

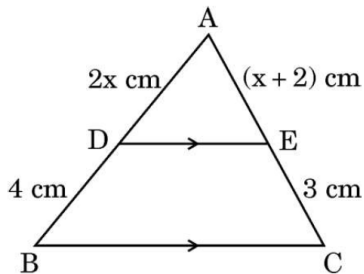
17. It is given that $\triangle ABC \sim \triangle DEF$. If $\angle A = 55^\circ$, $\angle E = 45^\circ$, then $\angle C$ is :

- (A) 80° (B) 90°
(C) 55° (D) 45°

Ans17. (A) 80°

1

18. In the given figure, in $\triangle ABC$, $DE \parallel BC$. If $AD = 2x$ cm, $AE = (x + 2)$ cm, $DB = 4$ cm, $EC = 3$ cm, then the value of x is :



- (A) 3 (B) 2
(C) 6 (D) 4

Ans18. (D) 4

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 getting number 8 on rolling a die is zero (0).

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

Ans19. (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). 1

20. Assertion (A) : Common difference of the A.P. 5, 1, - 3, - 7 is 4.

Reason (R) : Common difference of the A.P. $a_1, a_2, a_3, \dots, a_n$ is obtained by $d = a_n - a_{n-1}$.

Ans20. (D) Assertion (A) is false, but Reason (R) is true. 1

SECTION B

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

21. Evaluate : $\sin^2 30^\circ + \cos^2 45^\circ - \cos 0^\circ \cdot \tan 45^\circ$

Sol.21. $\sin^2 30^\circ + \cos^2 45^\circ - \cos 0^\circ \cdot \tan 45^\circ$

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

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

22. (a) Find the ratio in which the point $(3, y)$, divides the line segment joining the points $(-2, -5)$ and $(6, 3)$. Also, find the value of y .

OR

- (b) Find a point on y -axis which is equidistant from the points $A(6, 5)$ and $B(-4, 3)$.

Sol.22. (a) Let $P(3, y)$ divides the given line segment in the ratio $k : 1$

$$\therefore 3 = \frac{6k+(1)(-2)}{k+1}, y = \frac{k(3)+1(-5)}{k+1} \quad 1$$

$$3k + 3 = 6k - 2 \Rightarrow 5 = 3k$$

$$k = \frac{5}{3} \Rightarrow y = 0 \quad \frac{1}{2} + \frac{1}{2}$$

$$\therefore \text{ratio is } 5 : 3$$

OR

- (b) Let the point on y -axis be $P(0, y)$ $\frac{1}{2}$

$$PA = PB \Rightarrow PA^2 = PB^2$$

$$(0 - 6)^2 + (y - 5)^2 = (0 + 4)^2 + (y - 3)^2 \quad 1$$

$$36 + y^2 - 10y + 25 = 16 + y^2 - 6y + 9$$

$$y = 9 \quad \frac{1}{2}$$

$$\therefore \text{point } P(0, 9)$$

23. If $\frac{2}{3}$ is a root of the quadratic equation $kx^2 - x - 2 = 0$, then find the

value of k .

Sol.23. $\frac{2}{3}$ is a root of the quadratic equation $kx^2 - x - 2 = 0$

$$\therefore k\left(\frac{2}{3}\right)^2 - \frac{2}{3} - 2 = 0 \quad \frac{1}{2}$$

$$\Rightarrow \frac{4}{9}k = \frac{8}{3} \quad 1$$

$$k = 6 \quad \frac{1}{2}$$

24. The length of a tangent drawn to a circle from a point A , at a distance of 10 cm from the centre of the circle, is 6 cm. Find the radius of the circle.

Sol.24. Radius of circle

$$= \sqrt{10^2 - 6^2}$$

$$= 8 \text{ cm}$$

1

1

25. (a) If α, β are zeroes of the quadratic polynomial $2x^2 + 7x + 5$, then find the value of $\alpha^2 + \beta^2 + \alpha\beta$.

OR

- (b) If one zero of the quadratic polynomial $6x^2 + 37x - (p - 2)$ is reciprocal of the other, then find the value of p .

Sol.25. (a) α, β are zeroes of $2x^2 + 7x + 5$

$$\therefore \alpha + \beta = \frac{-7}{2}, \quad \alpha\beta = \frac{5}{2}$$

1

$$\alpha^2 + \beta^2 + \alpha\beta = (\alpha + \beta)^2 - \alpha\beta$$

$$= \left(\frac{-7}{2}\right)^2 - \frac{5}{2} = \frac{39}{4}$$

1

OR

- (b) Let $p(x) = 6x^2 + 37x - (p - 2)$, $a = 6$, $b = 37$, $c = -(p - 2)$

$\alpha, \frac{1}{\alpha}$ be zeroes of $p(x)$

$\frac{1}{2}$

$$\therefore \alpha \times \frac{1}{\alpha} = \frac{c}{a} = \frac{-(p-2)}{6}$$

1

$$1 = \frac{-p+2}{6}$$

$$p = -4$$

$\frac{1}{2}$

SECTION C

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

26. Prove that $6 + 3\sqrt{2}$ is an irrational number, given that $\sqrt{2}$ is an irrational number.

Sol.26. Let us assume that $6 + 3\sqrt{2}$ is a rational number

$$\therefore 6 + 3\sqrt{2} = x \text{ say}$$

1

$$\Rightarrow \sqrt{2} = \frac{x-6}{3}$$

1

Now $\frac{x-6}{3}$ is a rational number

$\Rightarrow \sqrt{2}$ is a rational number

But this contradicts the given fact that $\sqrt{2}$ is an irrational number

\therefore our assumption is wrong

$\Rightarrow 6 + 3\sqrt{2}$ is an irrational number.

1

27. Find the zeroes of the quadratic polynomial $6x^2 - 7x - 3$ and verify the relationship between the zeroes and the coefficients of the polynomial.

Sol.27. Let $p(x) = 6x^2 - 7x - 3$

$$= (2x - 3)(3x + 1)$$

\therefore zeroes of $p(x)$ are $\frac{3}{2}, \frac{-1}{3}$

$$\text{Sum of zeroes} = \frac{3}{2} - \frac{1}{3} = \frac{7}{6} = \frac{-\text{Coeff. of } x}{\text{Coeff. of } x^2}$$

$$\text{Product of zeroes} = \left(\frac{3}{2}\right)\left(\frac{-1}{3}\right) = \frac{-1}{2} = \frac{-3}{6} = \frac{\text{constant term}}{\text{Coeff. of } x^2}$$

Hence verified.

1

1

$\frac{1}{2}$

$\frac{1}{2}$

28. Prove that : $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$.

Sol.28. LHS = $\sin^2 \theta + \operatorname{cosec}^2 \theta + 2 \sin \theta \operatorname{cosec} \theta + \cos^2 \theta + \sec^2 \theta + 2 \cos \theta \sec \theta$

$$= (\sin^2 \theta + \cos^2 \theta) + \operatorname{cosec}^2 \theta + \sec^2 \theta + 2 \sin \theta \frac{1}{\sin \theta} + 2 \cos \theta \frac{1}{\cos \theta}$$

$$= (1) + (1 + \cot^2 \theta) + (1 + \tan^2 \theta) + 2 + 2$$

$$= 7 + \tan^2 \theta + \cot^2 \theta = \text{RHS}$$

1

$\frac{1}{2}$

1

$\frac{1}{2}$

29. (a) Prove that the parallelogram circumscribing a circle is a rhombus.

OR

(b) Prove that the lengths of the tangents drawn from an external point to a circle are equal.

Sol.29. (a) Let ABCD be a parallelogram touching the circle at P, Q, R and S

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

To prove: ABCD is a rhombus.

Proof: We know that tangents drawn from the external point to the circle are equal.

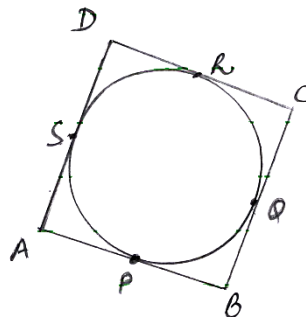
$$\therefore AP = AS \quad \text{--- (i)}$$

$$PB = BQ \quad \text{--- (ii)}$$

$$CR = CQ \quad \text{--- (iii)}$$

$$DR = DS \quad \text{--- (iv)}$$

Adding (i), (ii), (iii) and (iv)



1

$AP + PB + CR + DR = AS + BQ + CQ + DS$ $\frac{1}{2}$
 $\Rightarrow AB + CD = AD + BC$ (v)
 Now $AB = CD$ and $AD = BC$ (Opposite sides of parallelogram)
 From (v), we get $AB + AB = AD + AD$ $\frac{1}{2}$
 $\Rightarrow 2 AB = 2 AD$
 $\Rightarrow AB = AD$ $\frac{1}{2}$
 Hence, ABCD is a rhombus.

OR

(b) Given PA and PB are tangents drawn from the external point P to the circle with centre O.

To prove: $PA = PB$

Construction: Join OA, OB and OP

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

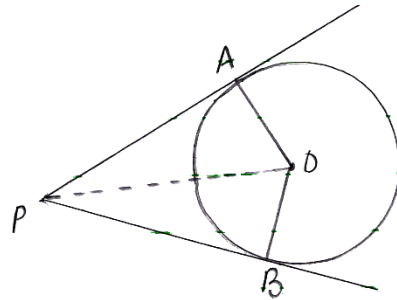
$OA = OB$ (radii)

$OP = OP$ (common)

$\angle OAP = \angle OBP$ (each 90° as radius \perp tangent)

$\therefore \triangle AOP \cong \triangle BOP$ (RHS cong.)

$\Rightarrow PA = PB$ (c.p.c.t.)



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

$\frac{1}{2}$

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

30. (a) A horse is tied with a 14 m long rope at one corner of an equilateral triangular field having side 20 m. Find the area of the field where the horse cannot graze.

OR

- (b) The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand between 8:00 am and 8:05 am.

Sol.30.

(a) Side of equilateral triangle = 20 m

Length of rope = 14 m

$$\theta = 60^\circ$$

$$\text{Area grazed by horse} = \frac{\pi r^2 \theta}{360^\circ}$$

$$= \frac{60^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14 = \frac{308}{3} \text{ m}^2 \text{ or } 102.67 \text{ m}^2$$

$$\text{Area of } \Delta = \frac{\sqrt{3} \times 400}{4} = 100\sqrt{3} \text{ or } 173 \text{ m}^2$$

$\frac{1}{2}$

1

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

$$\text{Required area} = (100\sqrt{3} - 102.67) \text{ m}^2 \text{ or } 70.33 \text{ m}^2$$

 $\frac{1}{2}$

OR

(b) Angle swept by minute hand in 60 minutes = 360°

Angle swept by minute hand in 5 minutes = 30°

 1

$$r = 14 \text{ cm}$$

$$\begin{aligned} \text{Area swept} &= \frac{\pi r^2 \theta}{360^\circ} = \frac{30^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14 \\ &= \frac{154}{3} \text{ cm}^2 \text{ or } 51.33 \text{ cm}^2 \end{aligned}$$

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

31. Find the coordinates of the points of trisection of the line segment joining the points A(5, -3) and B(-4, 3).

Sol. 31. Let P and Q divide the line segment joining A(5, -3) and B(-4, 3) in three equal parts such that AP : PB = 1 : 2

$$P\left(\frac{1 \times -4 + 2 \times 5}{1+2}, \frac{1 \times 3 + 2 \times -3}{1+2}\right)$$

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

i.e., P(2, -1)

AQ : QB = 2 : 1

$$Q\left(\frac{2 \times -4 + 1 \times 5}{2+1}, \frac{2 \times 3 + 1 \times -3}{2+1}\right)$$

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

i.e., Q(-1, 1)

SECTION D

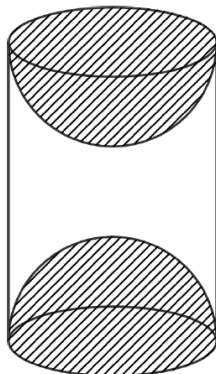
This section comprises Long Answer (LA) type questions of 5 marks each.

4 × 5 = 20

32. (a) A toy is in the form of a cone of radius 7 cm mounted on a hemisphere of same radius. The total height of the toy is 31 cm. Find the surface area of the toy.

OR

- (b) A wooden article was made by scooping out a hemisphere from each end of a solid cylinder. If the height of the cylinder is 15 cm and its base is of radius 4.2 cm, then find the total surface area of the article.



Sol.32. (a) Radius of cone = Radius of hemisphere 'r' = 7 cm

Total height of toy = 31 cm

$$\therefore \text{height of cone} = 31 - 7 = 24 \text{ cm} \quad 1$$

$$\begin{aligned} \text{Slant height } l &= \sqrt{r^2 + h^2} \\ &= \sqrt{(7)^2 + (24)^2} \\ &= 25 \text{ cm} \end{aligned} \quad \begin{array}{l} 1 \\ \frac{1}{2} \end{array}$$

Total surface area of toy = CSA of hemisphere + CSA of cone

$$\begin{aligned} &= 2\pi r^2 + \pi r l = \pi r(2r + l) \\ &= \frac{22}{7} \times 7 \times (14 + 25) \\ &= 22 \times 39 \\ &= 858 \text{ cm}^2 \end{aligned} \quad \begin{array}{l} 2 \\ \frac{1}{2} \end{array}$$

OR

(b) Height of cylinder = 15 cm

Radius of cylinder = Radius of hemisphere = 4.2 cm

Total surface area = CSA of cylinder + CSA of 2 hemispheres

$$\begin{aligned} &= 2\pi r h + 4\pi r^2 \\ &= 2 \times \frac{22}{7} \times 4.2 \times (15 + 2 \times 4.2) \\ &= 2 \times \frac{22}{7} \times 4.2 \times 23.4 = 617.76 \text{ cm}^2 \end{aligned} \quad \begin{array}{l} 1 \\ 1 \\ 2 \\ 1 \end{array}$$

33. The ratio of monthly incomes of two persons is 9 : 7 and the ratio of their expenditures is 4 : 3. If each of them manages to save ₹ 2,000 per month, then find their monthly incomes.

Sol.33. Let the monthly incomes of two persons be $9x$ and $7x$ }
 Let the expenditures be $4y$ and $3y$ }

1

ATQ. $9x - 4y = 2000$ (i) 1
 $7x - 3y = 2000$ (ii) 1
solving to get
 $x = 2000$ 1

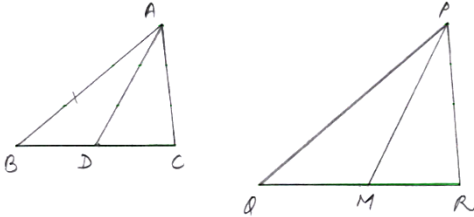
∴ monthly incomes of the persons are ₹18000 and ₹14000 respectively. 1

34. (a) Sides AB, BC and median AD of $\triangle ABC$ are respectively proportional to sides PQ, QR and median PM of $\triangle PQR$. Show that $\triangle ABC \sim \triangle PQR$.

OR

- (b) Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then the other two sides are divided in the same ratio.

Sol.34.



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

- (a) Given: In $\triangle ABC$ and $\triangle PQR$

$$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM} \text{ where AD, PM are medians.} \quad 1$$

To prove: $\triangle ABC \sim \triangle PQR$

Proof: In $\triangle ABC$ and $\triangle PQR$

$$\frac{AB}{PQ} = \frac{\frac{1}{2}BC}{\frac{1}{2}QR} = \frac{AD}{PM}$$

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

$$\Rightarrow \triangle ABD \sim \triangle PQM \text{ (SSS similarity)} \quad \frac{1}{2}$$

$$\Rightarrow \angle B = \angle Q \quad \frac{1}{2}$$

In $\triangle ABC$ and $\triangle PQR$,

$$\frac{AB}{PQ} = \frac{BC}{QR} \text{ (given)}$$

$$\angle B = \angle Q \text{ (Proved above)}$$

$$\therefore \triangle ABC \sim \triangle PQR \text{ (SAS similarity)}$$

OR

$\frac{1}{2}$

- (b) Given: In $\triangle ABC$, $DE \parallel BC$

$$\text{To Prove: } \frac{AD}{DB} = \frac{AE}{EC}$$

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

Construction: Join BE, DC
 Draw $DM \perp AC$ and $EN \perp AB$
 Proof:

$$\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle BDE)} = \frac{\frac{1}{2} \times AD \times EN}{\frac{1}{2} \times DB \times EN}$$

$$\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle BDE)} = \frac{AD}{DB} \quad \text{(i)}$$

and $\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle CDE)} = \frac{\frac{1}{2} \times AE \times DM}{\frac{1}{2} \times EC \times DM}$

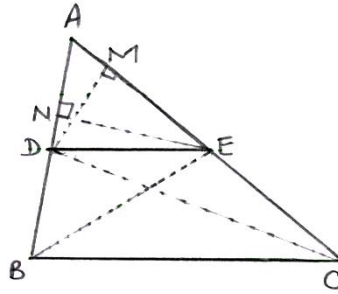
$$\frac{\text{ar}(\triangle ADE)}{\text{ar}(\triangle CDE)} = \frac{AE}{EC} \quad \text{(ii)}$$

$\triangle BDE$ and $\triangle CDE$ are on the same base DE and between the same parallels DE and BC .

$$\therefore \text{ar}(\triangle BDE) = \text{ar}(\triangle CDE) \quad \text{(iii)}$$

From (i), (ii) and (iii)

$$\frac{AD}{DB} = \frac{AE}{EC} \quad \frac{1}{2}$$



35. The following frequency distribution table gives the monthly consumption of electricity of 70 consumers of a locality. Find the median of the data.

Monthly consumption (in units)	Number of consumers
65 – 85	7
85 – 105	8
105 – 125	7
125 – 145	20
145 – 165	14
165 – 185	9
185 – 205	5

Sol.35.

Monthly consumption	Number of consumers	cf
65 – 85	7	7
85 – 105	8	15
105 – 125	7	22
125 – 145	20	42
145 – 165	14	56
165 – 185	9	65
185 – 205	5	70

2 for table

$$\frac{N}{2} = \frac{70}{2} = 35$$

$$l = 125, \text{c.f.} = 22, f = 20, h = 20$$

1

$$\text{Median} = l + \left(\frac{\frac{N}{2} - \text{c.f.}}{f} \right) \times h$$

$$= 125 + \frac{(35 - 22)}{20} \times 20$$

$$= 125 + 13 = 138$$

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

Note: No marks to be deducted in case student substitutes the values correctly in the formula without writing values of l , cf, etc.

SECTION E

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

$3 \times 4 = 12$

Case Study - 1

36. **Family structure** : In a recent survey of this year, 51% of the families in the United States of America had no children, 20% had one child, 19% had two children, 7% had three children and 3% had four or more



A family is selected at random.

Based on the above information, answer the following questions :

- (i) Find the probability that the selected family has two or three children. 1
- (ii) Find the probability that the selected family has more than one child. 1
- (iii) (a) Find the probability that the selected family has less than three children. 2

OR

- (b) Find the probability that the selected family has more than two children. 2

Sol.36. (i) $P(2 \text{ or } 3 \text{ children}) = \frac{19+7}{100}$ $\frac{1}{2}$
 $= \frac{26}{100}$ or $\frac{13}{50}$ $\frac{1}{2}$

(ii) $P(\text{more than one child}) = \frac{19+7+3}{100}$ $\frac{1}{2}$
 $= \frac{29}{100}$ $\frac{1}{2}$

(iii)(a) $P(\text{less than 3 children}) = \frac{51+20+19}{100}$ $1\frac{1}{2}$
 $= \frac{90}{100}$ or $\frac{9}{10}$ $\frac{1}{2}$

OR

(iii)(b) $P(\text{more than 2 children}) = \frac{7+3}{100}$ $1\frac{1}{2}$
 $= \frac{1}{10}$ $\frac{1}{2}$

37. Sumant's mother started a new shoe shop. To display the shoes, she put 3 pairs of shoes in the 1st row, 5 pairs in the 2nd row, 7 pairs in the 3rd row and so on.



Based on the above information, answer the following questions :

- (i) How many pairs of shoes are displayed in the 6th row ? 1
- (ii) What is the difference of pairs of shoes in the 1st row and the 6th row ? 1
- (iii) (a) Find the total number of pairs of shoes displayed in the first 15 rows. 2
- OR**
- (b) If the pairs of shoes displayed in the 4th row are 'on sale' at price of ₹ 500 for each pair, then find the total amount (money) earned by Sumant's mother if all shoes displayed in the 4th row are sold out. 2

Sol.37. (i)

$$a = 3, d = 2$$

$$\text{Pair of shoes in } 6^{\text{th}} \text{ row} = 3 + (5)2 = 13$$

$$\text{(ii) Difference of pair of shoes in } 6^{\text{th}} \text{ and } 1^{\text{st}} \text{ row} = 13 - 3 = 10$$

$$\text{(iii)(a) } n = 15$$

$$\begin{aligned} \text{Total pair of shoes in 15 rows} &= \frac{n}{2} [2a + (n - 1)d] \\ &= \frac{15}{2} [2 \times 3 + 14 \times 2] \\ &= \frac{15}{2} \times 34 = 255 \end{aligned}$$

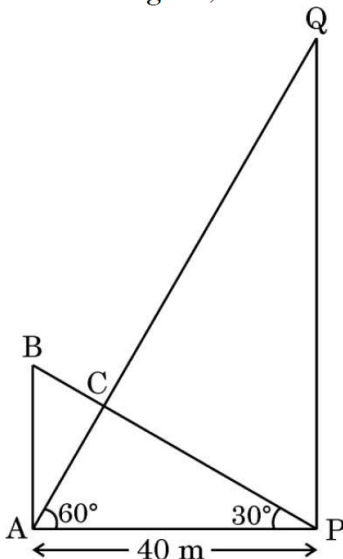
OR

$$\text{(iii) (b) Pair of shoes in } 4^{\text{th}} \text{ row} = 3 + (3)2 = 9$$

$$\text{Money earned} = 500 \times 9 = ₹ 4500$$

1

38. Two poles of different heights stand on level ground and at a distance of 40 m. Both poles are supported by wires attached from the top of each pole to the bottom of the other. A coupling is placed at point C, where the two wires cross (as shown in the figure).



Based on the above information, answer the following questions :

- (i) Find the height of pole AB. 1
- (ii) Find the height of pole PQ. 1
- (iii) (a) If the angle of elevation of the top of the pole PQ from the top of the pole AB is 30° , find the distance BQ. 2

OR

- (b) If the coupling is at a height of 20 m from the ground, how far down the wire from the smaller pole AB is the coupling ? 2

Sol.38. (i) In right $\triangle ABP$,

$$\tan 30^\circ = \frac{AB}{AP}$$

$$\frac{1}{\sqrt{3}} = \frac{AB}{40} \Rightarrow AB = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3} \text{ m}$$

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

(ii) In right $\triangle APQ$,

$$\tan 60^\circ = \frac{PQ}{AP}$$

$$\sqrt{3} = \frac{PQ}{40} \Rightarrow PQ = 40\sqrt{3} \text{ m}$$

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

(iii)(a) In ΔBQM ,

$$\cos 30^\circ = \frac{BM}{BQ}$$

$$\frac{\sqrt{3}}{2} = \frac{40}{BQ}$$

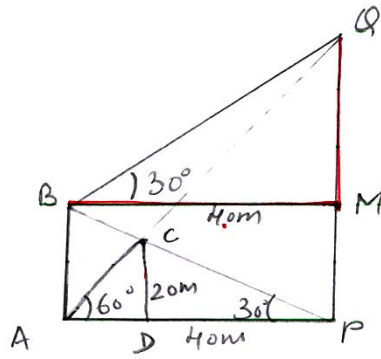
$$BQ = \frac{80}{\sqrt{3}} = \frac{80\sqrt{3}}{3}$$

(iii) (b) $CD = 20$ m

In right ΔACD , $\sin 60^\circ = \frac{CD}{AC}$

$$\frac{\sqrt{3}}{2} = \frac{20}{AC} \Rightarrow AC = \frac{40}{\sqrt{3}} = \frac{40\sqrt{3}}{3} \text{ m}$$

OR



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

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

$$1$$

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

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

$$1$$

Note: In case students find BC correctly, full marks may be awarded.