|  |
|---|

<table>
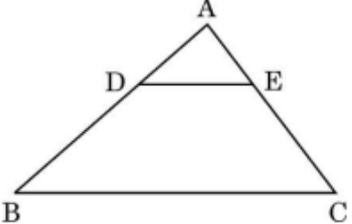<tr><td colspan="2" align="center"><b>Marking Scheme</b><br><b>Strictly Confidential</b><br><b>(For Internal and Restricted use only)</b><br><b>Secondary School Examination, 2024</b><br><b>MATHEMATICS PAPER CODE 30/5/2</b></td></tr>
<tr><td colspan="2"><u><b>General Instructions: -</b></u></td></tr>
<tr><td><b>1</b></td><td>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.</td></tr>
<tr><td><b>2</b></td><td><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></td></tr>
<tr><td><b>3</b></td><td>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></td></tr>
<tr><td><b>4</b></td><td>The Marking scheme carries only suggested value points for the answers.<br><br>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.</td></tr>
<tr><td><b>5</b></td><td>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.</td></tr>
<tr><td><b>6</b></td><td>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></td></tr>
<tr><td><b>7</b></td><td>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 totalled up and written on the left-hand margin and encircled. This may be followed strictly.</td></tr>
<tr><td><b>8</b></td><td>If a question does not have any parts, marks must be awarded on the left-hand margin and encircled. This may also be followed strictly.</td></tr>
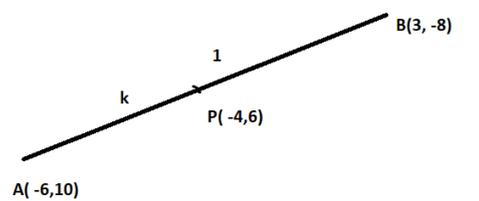</table>

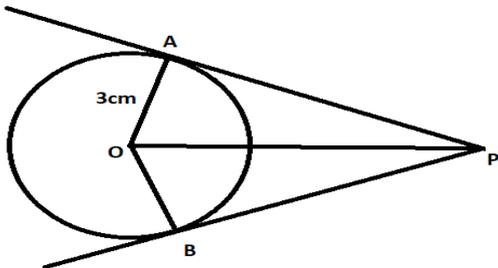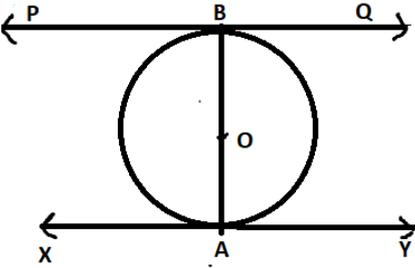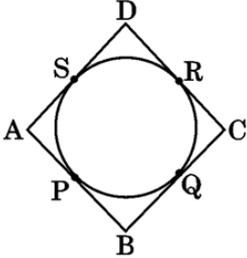| 9 | **In Q1-Q20, if a candidate attempts the question more than once (without cancelling the previous attempt), marks shall be awarded for the first attempt only and the other answer scored out with a note "Extra Question".** |
|---|---|
| 10 | **In Q21-Q38, if a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note "Extra Question".** |
| 11 | No marks to be deducted for the cumulative effect of an error. It should be penalized only once. |
| 12 | A full scale of marks _____ (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it. |
| 13 | Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper. |
| 14 | Ensure that you do not make the following common types of errors committed by the Examiner in the past:-<br><br>● Leaving answer or part thereof unassessed in an answer book.<br>● Giving more marks for an answer than assigned to it.<br>● Wrong totalling of marks awarded to an answer.<br>● Wrong transfer of marks from the inside pages of the answer book to the title page.<br>● Wrong question wise totalling on the title page.<br>● Wrong totalling of marks of the two columns on the title page.<br>● Wrong grand total.<br>● Marks in words and figures not tallying/not same.<br>● Wrong transfer of marks from the answer book to online award list.<br>● 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.)<br>● Half or a part of answer marked correct and the rest as wrong, but no marks awarded. |
| 15 | While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks. |
| 16 | Any un assessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously. |
| 17 | The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for spot Evaluation**" before starting the actual evaluation. |
| 18 | Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words. |
| 19 | The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme. |

| Q. No. | EXPECTED ANSWER / VALUE POINTS | Marks |
|---|---|---|
| | **SECTION-A**<br>**This section comprises Multiple Choice Questions (MCQs) of 1 mark each** | |
| 1. | If $\alpha$ and $\beta$ are the zeroes of the polynomial $p(x) = kx^2 - 30x + 45k$ and $\alpha + \beta = \alpha\beta$, then the value of k is :<br><br>(A) $-\dfrac{2}{3}$         (B) $-\dfrac{3}{2}$<br><br>(C) $\dfrac{3}{2}$         (D) $\dfrac{2}{3}$ | |
| Sol. | (D) $\dfrac{2}{3}$ | 1 |
| 2. | A chord of a circle of radius 10 cm subtends a right angle at its centre. The length of the chord (in cm) is :<br><br><br><br>(A) $5\sqrt{2}$         (B) $10\sqrt{2}$<br><br>(C) $\dfrac{5}{\sqrt{2}}$         (D) $5$ | |
| Sol. | (B) $10\sqrt{2}$ | 1 |
| 3. | The next (4$^{\text{th}}$) term of the A.P. $\sqrt{7}, \sqrt{28}, \sqrt{63}, \dots$ is :<br><br>(A) $\sqrt{70}$         (B) $\sqrt{84}$<br>(C) $\sqrt{97}$         (D) $\sqrt{112}$ | |
| Sol. | (D) $\sqrt{112}$ | 1 |
| 4. | If the product of two co-prime numbers is 553, then their HCF is :<br><br>(A) 1         (B) 553<br>(C) 7         (D) 79 | |
| Sol. | (A) 1 | 1 |
| 5. | If $x = a\cos\theta$ and $y = b\sin\theta$, then the value of $b^2x^2 + a^2y^2$ is :<br><br>(A) $a^2b^2$         (B) $ab$<br>(C) $a^4b^4$         (D) $a^2 + b^2$ | |
| Sol. | (A) $a^2b^2$ | 1 |

| | | |
|---|---|---|
| 6. | If the quadratic equation $ax^2 + bx + c = 0$ has real and equal roots, then the value of c is : <br><br> (A) $\dfrac{b}{2a}$        (B) $-\dfrac{b}{2a}$ <br><br> (C) $\dfrac{b^2}{4a}$        (D) $-\dfrac{b^2}{4a}$ | |
| Sol. | (C) $\dfrac{b^2}{4a}$ | 1 |
| 7. | In the given figure, in $\triangle$ ABC, DE $\parallel$ BC. If AD = 2·4 cm, DB = 4 cm and AE = 2 cm, then the length of AC is : <br><br>  <br><br> (A) $\dfrac{10}{3}$ cm        (B) $\dfrac{3}{10}$ cm <br><br> (C) $\dfrac{16}{3}$ cm        (D) 1·2 cm | |
| Sol. | (C) $\dfrac{16}{3}$ cm | 1 |
| 8. | The length of an arc of a circle with radius 12 cm is $10\pi$ cm. The angle subtended by the arc at the centre of the circle, is : <br><br> (A) 120°        (B) 6° <br> (C) 75°        (D) 150° | |
| Sol. | (D) $150^0$ | 1 |
| 9. | If $4 \sec \theta - 5 = 0$, then the value of $\cot \theta$ is : <br><br> (A) $\dfrac{3}{4}$        (B) $\dfrac{4}{5}$ <br><br> (C) $\dfrac{5}{3}$        (D) $\dfrac{4}{3}$ | |
| Sol. | (D) $\dfrac{4}{3}$ | 1 |
| 10. | The perimeter of the sector of a circle of radius 21 cm which subtends an angle of 60° at the centre of circle, is : <br><br> (A) 22 cm        (B) 43 cm <br> (C) 64 cm        (D) 462 cm | |
| Sol. | (C) 64 cm | 1 |

| | | |
|---|---|---|
| 11. | In the given figure, RJ and RL are two tangents to the circle. If $\angle RJL = 42°$, then the measure of $\angle JOL$ is :  (A) 42°        (B) 84° (C) 96°        (D) 138° | |
| Sol. | (B) $84^0$ | 1 |
| 12. | If the prime factorisation of 2520 is $2^3 \times 3^a \times b \times 7$, then the value of $a + 2b$ is : <br> (A) 12        (B) 10 <br> (C) 9        (D) 7 | |
| Sol. | (A) 12 | 1 |
| 13. | Which out of the following type of straight lines will be represented by the system of equations $3x + 4y = 5$ and $6x + 8y = 7$ ? <br> (A) Parallel <br> (B) Intersecting <br> (C) Coincident <br> (D) Perpendicular to each other | |
| Sol. | (A) Parallel | 1 |
| 14. | One ticket is drawn at random from a bag containing tickets numbered 1 to 40. The probability that the selected ticket has a number which is a multiple of 7 is : <br> (A) $\frac{1}{7}$        (B) $\frac{1}{8}$ <br> (C) $\frac{1}{5}$        (D) $\frac{7}{40}$ | |
| Sol. | (B) $\frac{1}{8}$ | 1 |
| 15. | The LCM of three numbers 28, 44, 132 is : <br> (A) 258        (B) 231 <br> (C) 462        (D) 924 | |
| Sol. | (D) 924 | 1 |

| | | |
|---|---|---|
| 16. | The number of terms in the A.P. 3, 6, 9, 12, ..., 111 is : <br> (A) 36       (B) 40 <br> (C) 37       (D) 30 | |
| Sol. | (C) 37 | 1 |
| 17. | The ratio of the length of a pole and its shadow on the ground is $1 : \sqrt{3}$. The angle of elevation of the Sun is : <br> (A) 90°       (B) 60° <br> (C) 45°       (D) 30° | |
| Sol. | (D) $30^0$ | 1 |
| 18. | If the mean and mode of a data are 24 and 12 respectively, then its median is : <br> (A) 25       (B) 18 <br> (C) 20       (D) 22 | |
| Sol. | (C) 20 | 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.* <br><br> (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). <br> (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of Assertion (A). <br> (C) Assertion (A) is true, but Reason (R) is false. <br> (D) Assertion (A) is false, but Reason (R) is true. | |
| 19. | *Assertion (A)* : ABCD is a trapezium with DC \|\| AB. E and F are points on AD and BC respectively, such that EF \|\| AB. Then $\dfrac{AE}{ED} = \dfrac{BF}{FC}$. <br><br> *Reason (R)* : Any line parallel to parallel sides of a trapezium divides the non-parallel sides proportionally. | |
| Sol. | (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). | 1 |

| 20. | *Assertion (A) :* Degree of a zero polynomial is not defined.  *Reason (R):* Degree of a non-zero constant polynomial is 0. | |
|---|---|---|
| Sol. | (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). | 1 |
| | **SECTION- B** **This section comprises Very Short Answer (VSA) type questions of 2 marks each** | |
| 21. | If α and β are zeroes of the quadratic polynomial $p(x) = x^2 - 5x + 4$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta$. | |
| Sol. | $\alpha + \beta = 5$  $\alpha\beta = 4$  $\frac{1}{\alpha} + \frac{1}{\beta} - 2\alpha\beta = \frac{\alpha+\beta}{\alpha\beta} - 2\alpha\beta$  $\qquad = \frac{5}{4} - 2 \times 4$  $\qquad = \frac{-27}{4}$ | ½  ½  ½  ½ |
| 22.(a) | Find the ratio in which the point P(– 4, 6) divides the line segment joining the points A(– 6, 10) and B(3, – 8). | |
| Sol. | Let the ratio be k:1  $-4 = \frac{3k-6}{k+1}$  $\Rightarrow k = \frac{2}{7}$  $\therefore$ required ratio is 2 : 7 | 1  ½  ½ |
| | OR | |
| 22.(b) | Prove that the points (3, 0), (6, 4) and (– 1, 3) are the vertices of an isosceles triangle. | |
| Sol. | Let  A(3,0) , B(6,4) , C(-1, 3)  $AB = \sqrt{(3-6)^2 + (0-4)^2} = 5$  $BC = \sqrt{(6+1)^2 + (4-3)^2} = \sqrt{50}$  $CA = \sqrt{(3+1)^2 + (0-3)^2} = 5$  $\qquad$ As, AB = AC  $\Rightarrow$ ABC is an isosceles triangle | ½  ½  ½  ½ |

| 23. | Evaluate : $$\dfrac{2 \tan 30°.\ \sec 60°.\ \tan 45°}{1 - \sin^2 60°}$$ | |
|---|---|---|
| Sol. | $$\dfrac{2 \times \frac{1}{\sqrt{3}} \times 2 \times 1}{1 - \frac{3}{4}}$$ | 1½ |
| | $$= \dfrac{16}{\sqrt{3}} \quad \text{or} \quad \dfrac{16\sqrt{3}}{3}$$ | ½ |
| 24. | A carton consists of 60 shirts of which 48 are good, 8 have major defects and 4 have minor defects. Nigam, a trader, will accept the shirts which are good but Anmol, another trader, will only reject the shirts which have major defects. One shirt is drawn at random from the carton. Find the probability that it is acceptable to Anmol. | |
| Sol. | Number of Shirts without major defects = 52 | ½ |
| | P( Anmol will accept the shirt) = $\dfrac{52}{60}$ or $\dfrac{13}{15}$ | 1½ |
| 25.(a) | If two tangents inclined at an angle of 60° are drawn to a circle of radius 3 cm, then find the length of each tangent. | |
| Sol. | Correct Figure  | ½ |
| | $\angle$ APO = $30^0$ | ½ |
| | $\tan 30^0 = \dfrac{1}{\sqrt{3}} = \dfrac{3}{AP}$ | ½ |
| | AP = $3\sqrt{3}$ cm | ½ |
| | OR | |

| 25.(b) | Prove that the tangents drawn at the ends of a diameter of a circle are parallel. | | |
|---|---|---|---|
| Sol. | | Correct Figure | ½ |
| |  ∠ OAY = ∠ OBP = 90⁰ | | ½ |
| | But they are forming alternate interior angles | | |
| | Therefore,  PQ ‖ XY | | 1 |

**SECTION- C**

**This section comprises Short Answer (SA) type questions of 3 marks each.**

| 26. | An arc of a circle of radius 10 cm subtends a right angle at the centre of the circle. Find the area of the corresponding major sector. (Use $\pi = 3 \cdot 14$) | |
|---|---|---|
| Sol. | Area of circle = $3.14 \times 10 \times 10 = 314$ cm$^2$ | 1 |
| | Area of minor sector  = $\frac{3.14 \times 10 \times 10 \times 90}{360} = \frac{157}{2}$ cm$^2$ or 78.5 cm$^2$ | 1 |
| | Area of major sector = $314 - 78.5 = 235.5$ cm$^2$ | 1 |
| 27. | Prove that the parallelogram circumscribing a circle is a rhombus. | |
| Sol. | | Correct |  ½ |
| | figure | | |
| |  ∴ AP = AS | | |
| | BP = BQ | | |
| | CR = CQ | | 1 |
| | DR = DS | | |

| | | |
|---|---|---|
| | Adding,<br><br>(AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)<br>$\Rightarrow$ AB + CD = AD + BC<br><br>Now AB = CD and AD = BC<br><br>$\Rightarrow$ 2 AB = 2 BC<br><br>$\Rightarrow$ AB = BC<br>$\Rightarrow$ ABCD is a rhombus | 1<br><br><br>½ |
| 28.(a) | Prove that $\sqrt{3}$ is an irrational number. | |
| Sol. | Let $\sqrt{3}$ be a rational number.<br><br>$\therefore \sqrt{3} = \dfrac{p}{q}$ , where q≠0 and p & q are coprime.<br><br>$3q^2 = p^2 \Longrightarrow p^2$ is divisible by 3<br><br>$\Longrightarrow$ p is divisible by 3----- (i)<br><br>$\Longrightarrow$ p = 3a, where 'a' is a postive integer<br><br>$9a^2 = 3q^2 \Longrightarrow q^2 = 3a^2 \Longrightarrow q^2$ is divisible by 3<br><br>$\Longrightarrow$ q is divisible by 3 ----- (ii)<br><br>(i) and (ii) leads to contradiction as 'p' and 'q' are coprime.<br><br>$\therefore \sqrt{3}$ is an irrational number. | ½<br><br>1<br><br><br>1<br>½ |
| | OR | |
| 28.(b) | Prove that $\left(\sqrt{2} + \sqrt{3}\right)^2$ is an irrational number, given that $\sqrt{6}$ is an irrational number. | |
| Sol. | $(\sqrt{2} + \sqrt{3})^2 = 2 + 3 + 2\sqrt{6} = 5 + 2\sqrt{6}$<br><br>Let us assume, to the contrary, that $5 + 2\sqrt{6}$ is rational<br><br>$\therefore 5 + 2\sqrt{6} = \dfrac{a}{b}$ ; a, b are integers, b ≠ 0<br><br>$\therefore \sqrt{6} = \dfrac{a-5b}{2b}$<br><br>RHS is a rational number, whereas LHS is an irrational number.<br><br>$\therefore$ Our assumption is wrong.<br><br>$\Rightarrow 5 + 2\sqrt{6} = (\sqrt{2} + \sqrt{3})^2$ is an irrational number | 1<br><br><br>½<br><br>½<br><br>½<br><br>½ |

| 29.(a) | If the sum of the first 14 terms of an A.P. is 1050 and the first term is 10, then find the $20^{th}$ term and the $n^{th}$ term. | |
|---|---|---|
| Sol. | $\frac{14}{2}(20 + 13d) = 1050$ | 1 |
| | $\Rightarrow$ d = 10 | 1 |
| | $\therefore$ $a_{20} = 10 + 19 \times 10 = 200$ | ½ |
| | $a_n = 10 + (n-1)\,10 = 10n$ | ½ |
| | OR | |
| 29. (b) | The first term of an A.P. is 5, the last term is 45 and the sum of all the terms is 400. Find the number of terms and the common difference of the A.P. | |
| Sol. | $a = 5,\ a_n = 45,\ S_n = 400$ | |
| | $\frac{n}{2}(5 + 45) = 400$ | 1 |
| | $\Rightarrow$ n = 16 | 1 |
| | $5 + 15d = 45$ | ½ |
| | $\Rightarrow d = \frac{40}{15}\ $ or $\ \frac{8}{3}$ | ½ |
| 30. | **Prove that :** $$\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2\,\text{cosec}\,\theta$$ | |
| Sol. | $\text{LHS} = \dfrac{sin^2\theta + 1 + cos^2\theta + 2cos\theta}{sin\theta\,(1+cos\theta)}$ | 1 |
| | $= \dfrac{2 + 2cos\theta}{sin\theta\,(1+cos\theta)}$ | 1 |
| | $= \dfrac{2}{sin\,\theta}$ | ½ |
| | $= 2\,\text{cosec}\theta = \text{RHS}$ | ½ |

| 31. | A jar contains 54 marbles, each of which is blue, green or white. The probability of selecting a blue marble at random from the jar is $\frac{1}{3}$, and the probability of selecting a green marble at random is $\frac{4}{9}$. How many white marbles does this jar contain ? | |
|---|---|---|
| Sol. | Let number of white marbles in the jar $= x$ | |
| | $\therefore$ P (white marbles) $= \dfrac{x}{54}$ | 1 |
| | $\dfrac{x}{54} = 1 - \dfrac{1}{3} - \dfrac{4}{9}$ | 1 |
| | $x = 12$ | 1 |
| | Hence, the number of white marbles $= 12$ | |

<div align="center">

**SECTION- D**

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

</div>

| 32. | From a point on a bridge across the river, the angles of depressions of the banks on opposite sides of the river are 30° and 60° respectively. If the bridge is at a height of 4 m from the banks, find the width of the river. | |
|---|---|---|
| Sol. | Correct Figure | 1 |
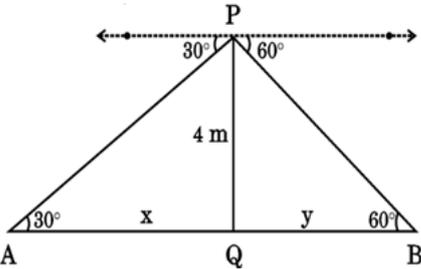


Let AB be the width of river

In right $\Delta$ PAQ,

$\tan 30° = \dfrac{1}{\sqrt{3}} = \dfrac{4}{x}$ — 1

$\Rightarrow 4\sqrt{3} = x$ — ½

In right $\Delta$ PBQ,

$\tan 60° = \sqrt{3} = \dfrac{4}{y}$ — 1

$\Rightarrow y = \dfrac{4}{\sqrt{3}}$ — ½

Width of river $= x + y = 4\sqrt{3} + \dfrac{4}{\sqrt{3}} = \dfrac{16}{3}\sqrt{3}$ m — 1

| 33.(a) | In the given figure, Δ FEC ≅ Δ GDB and ∠ 1 = ∠ 2. Prove that Δ ADE ~ Δ ABC.  | |
|---|---|---|
| Sol. | Δ FEC ≅ Δ GDB<br><br>Therefore, ∠3 = ∠4<br>In Δ ABC,<br><br>∠3 = ∠4<br><br>∴ AB = AC …………(i)<br><br>In Δ ADE, ∠1 = ∠2<br><br>AD = AE ………….(ii)<br><br>Dividing (ii) by (i)<br>$\dfrac{AD}{AB} = \dfrac{AE}{AC}$<br><br>⇒ DE ∥ BC<br>∠1 = ∠3 and ∠2 = ∠4<br><br>∴ Δ ADE ~ Δ ABC | 1<br><br><br>1<br><br><br>1<br><br><br>1<br>1 |
| | OR | |
| 33.(b) | Sides AB and AC and median AD of a Δ ABC are respectively proportional to sides PQ and PR and median PM of another Δ PQR. Show that Δ ABC ~ Δ PQR. | |
| Sol. | Correct figure<br><br> | 1 |

| | | | |
|---|---|---|---|
| | Produce AD to E such that AD = DE and join EC. | | ½ |
| | Produce PM to L such that PM = ML and join LR. | | |
| | $\therefore \Delta$ ABD $\cong \Delta$ ECD | | |
| | $\therefore$ AB = EC | | 1 |
| | Similarly, PQ = LR | | |
| | $\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM}$ | | |
| | $\frac{EC}{LR} = \frac{AC}{PR} = \frac{2AD}{2PM} = \frac{AE}{PL}$ | | 1 |
| | $\therefore \Delta$ AEC $\sim \Delta$ PLR | | |
| | $\Rightarrow \angle 2 = \angle 4$ | | ½ |
| | Similarly, $\angle 1 = \angle 3$ | | |
| | Adding both, $\angle$BAC = $\angle$QPR | | ½ |
| | $\therefore \Delta$ ABC $\sim \Delta$ PQR | | ½ |
| 34. | A tent is in the shape of a cylinder, surmounted by a conical top. If the height and diameter of the cylindrical part are 3·5 m and 6 m, and slant height of the top is 4·2 m, find the area of canvas used for making the tent. Also, find the cost of canvas of the tent at the rate of ₹ 500 per m². | | |
| Sol. | Radius ( r ) = 3m | | ½ |
| | CSA of cylinder = $2 \times \frac{22}{7} \times 3 \times 3.5$ | | 1 |
| | $= 66$ m² | | ½ |
| | CSA of cone = $\frac{22}{7} \times 3 \times 4.2$ | | 1 |
| | $= 39.6$ m² | | ½ |
| | Area of canvas = $66 + 39.6 = 105.6$ m² | | ½ |
| | Cost = $500 \times 105.6 = ₹ 52800$ | | 1 |
| 35(a) | A 2-digit number is such that the product of the digits is 14. When 45 is added to the number, the digits are reversed. Find the number. | | |
| Sol. | Let the two digit number be $10x + y$ | | |
| | $xy = 14$ ….. (i) | | 1 |
| | $10x + y + 45 = 10y + x$ | | |
| | $y - x = 5$ …..(ii) | | 1 |
| | from (i) and (ii) | | |

| | | |
|---|---|---|
| | $\dfrac{14}{x} - x = 5$ | |
| | | 1 |
| | $x^2 + 5x - 14 = 0$ | 1 |
| | (x+7) (x-2) = 0 | |
| | x ≠ -7 | ½ |
| | x = 2 | ½ |
| | Number = 27 | |

<div align="center">OR</div>

| | | |
|---|---|---|
| 35 (b) | The side of a square exceeds the side of another square by 4 cm and the sum of the areas of the two squares is 400 cm². Find the sides of the squares. | |
| Sol. | Let the side of first square = x cm | |
| | ∴ Side of second square = (x +4) cm | ½ |
| | $x^2 + (x+4)^2 = 400$ | 1½ |
| | $x^2 + 4x + 192 = 0$ | 1 |
| | (x + 16) ( x-12) = 0 | 1 |
| | x ≠ −16 | |
| | x = 12 | ½ |
| | Side of square = 12cm and 16cm | ½ |

**SECTION-E**

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

| | | |
|---|---|---|
| 36. | **Case Study – 1**

Activities like running or cycling reduce stress and the risk of mental disorders like depression. Running helps build endurance. Children develop stronger bones and muscles and are less prone to gain weight. The physical education teacher of a school has decided to conduct an inter school running tournament in his school premises. The time taken by a group of students to run 100 m, was noted as follows :

 | |

| Time (in seconds) | 0 – 20 | 20 – 40 | 40 – 60 | 60 – 80 | 80 – 100 |
|---|---|---|---|---|---|
| Number of students | 8 | 10 | 13 | 6 | 3 |

Based on the above, answer the following questions :

(i)   What is the median class of the above given data ?

(ii)   (a)   Find the mean time taken by the students to finish the race.

           **OR**

    (b)   Find the mode of the above given data.

(iii)   How many students took time less than 60 seconds ?

| Time (in sec) | Number of students (f) | $x_i$ | cf | $f_i x_i$ |
|---|---|---|---|---|
| 0 – 20 | 8 | 10 | 8 | 80 |
| 20 – 40 | 10 | 30 | 18 | 300 |
| 40 – 60 | 13 | 50 | 31 | 650 |
| 60 – 80 | 6 | 70 | 37 | 420 |
| 80 – 100 | 3 | 90 | 40 | 270 |
| Total | 40 | | | 1720 |

**Sol.**

(i)  Correct Cummulative Frequency         ½

    Median class = 40 – 60         ½

(ii) (a) Correct table for $x_i$ and $f_i x_i$         1½

    Mean = $\frac{1720}{40}$ = 43         ½

                    **OR**

  (b)  Modal class = 40-60         ½

    Mode = $40 + \frac{(13-10)}{(26-10-6)} \times 20$         1

     = 46         ½

(iii) 31 students took time less than 60 seconds         1

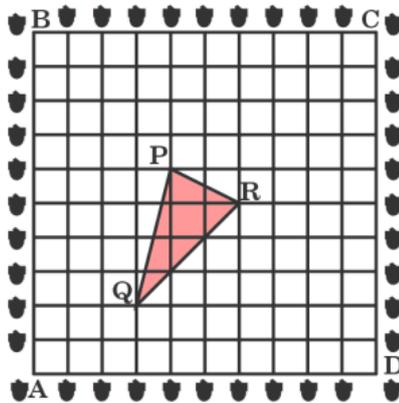| 37. | **Case Study – 2** | |
|---|---|---|
| | Essel World is one of India's largest amusement parks that offers a diverse range of thrilling rides, water attractions and entertainment options for visitors of all ages. The park is known for its iconic "Water Kingdom" section, making it a popular destination for family outings and fun-filled adventure. The ticket charges for the park are ₹ 150 per child and ₹ 250 per adult. | |
| | On a day, the cashier of the park found that 300 tickets were sold and an amount of ₹ 55,000 was collected. | |
| | Based on the above, answer the following questions : | |
| | (i) If the number of children visited be x and the number of adults visited be y, then write the given situation algebraically. | |
| | (ii) (a) How many children visited the amusement park that day ? | |
| | **OR** | |
| | (b) How many adults visited the amusement park that day ? | |
| | (iii) How much amount will be collected if 250 children and 100 adults visit the amusement park ? | |
| Sol. | i) $x + y = 300$ ……(i) | ½ |
| | $150x + 250y = 55000$…………..(ii) | ½ |
| | (ii) (a) Solving equation (i) and (ii) | |
| | Number of children visited park (x) = 200 | 2 |
| | OR | |
| | (b) Solving equation (i) and (ii) | |
| | Number of adults visited park (y) = 100 | 2 |
| | (iii) Amount collected $= 250 \times 150 + 100 \times 250 = $ ₹ 62500 | 1 |

| | | |
|---|---|---|
| 38. | **Case Study – 3**<br><br>A garden is in the shape of a square. The gardener grew saplings of Ashoka tree on the boundary of the garden at the distance of 1 m from each other. He wants to decorate the garden with rose plants. He chose a triangular region inside the garden to grow rose plants. In the above situation, the gardener took help from the students of class 10. They made a chart for it which looks like the given figure.<br><br><br><br>Based on the above, answer the following questions :<br><br>(i)    If A is taken as origin, what are the coordinates of the vertices of Δ PQR ?<br><br>(ii)  (a)   Find distances PQ and QR.<br><br>         **OR**<br><br>    (b)   Find the coordinates of the point which divides the line segment joining points P and R in the ratio 2 : 1 internally.<br><br>(iii)  Find out if Δ PQR is an isosceles triangle. | |
| Sol. | (i)   P (4, 6) , Q (3, 2), R (6, 5)<br><br>(ii) (a) $PQ = \sqrt{(4-3)^2 + (6-2)^2} = \sqrt{17}$<br><br>      $QR = \sqrt{(3-6)^2 + (2-5)^2} = \sqrt{18}$<br><br>                    OR<br><br>    (b)  The coordinate of required point are $\left(\frac{6\times2+1\times4}{3}, \frac{5\times2+1\times6}{3}\right)$<br><br>                        i.e.  $\left(\frac{16}{3}, \frac{16}{3}\right)$<br><br>(iii)  $PQ = \sqrt{(4-3)^2 + (6-2)^2} = \sqrt{17}$<br><br>      $QR = \sqrt{(3-6)^2 + (2-5)^2} = \sqrt{18}$<br><br>      $PR = \sqrt{(4-6)^2 + (6-5)^2} = \sqrt{5}$<br><br>      $PQ \neq QR \neq PR$<br><br>      Δ PQR is not isosceles | 1<br><br><br>1<br>1<br><br><br>1<br><br>1<br><br><br><br><br><br>½<br>½ |

\* \* \*