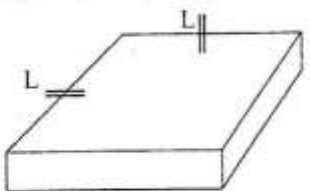


MATHEMATICS

PAPER 1 OCT/NOV. 2007 2½Hours

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| <p>1. $\frac{0.0084 \times 1.23 \times 3.5}{2.87 \times 0.056} = \frac{84 \times 123 \times 35 \times 10^{-7}}{28 \times 56 \times 10^{-7}}$ $= 0.225$</p> | <p>M₁ A₁</p> |
| <p>2. $3x^0 + (x-20)^0 = 180^0$ $4x^0 - 20 = 180^0$ $4x^0 = 160^0$ $X = 40^0$</p> <p>Let n = no of sides $\frac{360^0}{n} = 40^0$ $40^0 n = 360^0$ $n = 9$</p> | <p>M_{1/2} M₁ A₁</p> |
| <p>3. $(x^2 - y^2)(x^2 + y^2)(x^4 - y^4) = (x+y)(x-y)(x^2+y^2)(x^2-y^2)$ $x^4 + x^2y^2 - y^4 - x^2y^2 \Rightarrow (x^4 - y^4)(x^4 - y^4)$ $x^8 - x^4y^4 - x^4y^4 + y^8$ $x^8 - 2x^4y^4 + y^8$</p> | <p>M₁ A₁</p> |
| <p>4. 118 yens = Kshs.76 $\therefore 2,950,000 \text{ yens} = \frac{2,950,000 \times 76}{118} = \text{Kshs.}1,900,000$ The duty paid = $\frac{20}{100} \times 1,900,000 = \text{Kshs.}380,000$</p> | <p>M₁ M₁ A₁</p> |
| <p>5. $\frac{dy}{dx} = 3ax^2 + b = -5$</p> <p>When x = 1 and y = 1 $3a + b = -5$ (i) $Y = ax^3 + bx \Rightarrow a + b = 1$ (ii) Solving (i) – (ii); a = -3 and b = 4</p> | <p>M₁ M₂ A₁</p> |
| <p>6. $\frac{15a^2b - 10ab^2}{3a^2 - 5ab + 2b^2} = \frac{5ab(3a-2b)}{3a^2 - 3ab - 2ab + 2b^2} = \frac{5ab(3a-2b)}{(a-b)(3a-2b)} = \frac{5ab}{a-b}$</p> | <p>M₁ M₁ A₁</p> |
| <p>7. Volume = $\frac{\text{Mass}}{\text{Density}}$ $= \frac{1050 \text{ cm}^3}{8.4} = 125 \text{ cm}^3$</p> <p>$\therefore L \times L \times 0.2 \text{ cm} = 125 \text{ cm}^3$ $L^2 = \frac{125 \text{ cm}}{0.2} = 625$ $L = \sqrt{625} = 25 \text{ cm}$</p>  | <p>M₁ M₁ A₁</p> |

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| | |
|--|---|
| <p>8. $\cos x = \frac{\text{Adjacent}}{\text{Hypo}}$</p> $= \frac{2\sqrt{5}}{5}$ <p>Pythagoras':</p> $AB = \sqrt{5^2 - (2\sqrt{5})^2} = \sqrt{5}$ <p>$\tan(90^\circ - x) = \frac{\text{Opp}}{\text{Adj}}$ $\frac{2\sqrt{5}}{\sqrt{5}} = 2$</p> | <p>M₁</p> <p>A₁</p> |
| <p>9. $x - \text{Area} = \pi DL$ $X - \text{Area in Contract} = 377.04 \times \frac{2.5}{10}$</p> $= 3.142 \times 10 \times 12 = 377.04 \text{ cm}^2$ $= 94.26 \text{ cm}^2$ | <p>B₁</p> <p>M₁</p> <p>A₁</p> |
| <p>10. $\angle ACB = 180^\circ - (62^\circ + 41^\circ)$</p> $= 77^\circ$ $\therefore x = \frac{77^\circ}{2} = 38.5^\circ$ <p>$\angle CNB = 180^\circ - (41^\circ + 38.5^\circ)$</p> $= 100.5^\circ$ <p>$\frac{8.4}{\sin 100.5} = \frac{CN}{\sin 41^\circ}$</p> $\therefore CN = \frac{8.4 \sin 41^\circ}{\sin 100.5^\circ} = 5.6 \text{ cm}$ | <p>M₁</p> <p>A₁</p> <p>M₁</p> <p>A₁</p> |
| <p>11. Let Mother's years be x and son's be y now:</p> $x + 14 = 2(y + 14) \dots\dots\dots (i)$ $x + 14 = 2y + 28$ $x - 2y = 14 \dots\dots\dots (ii)$ $(x - 4) + (y - 4) = 30$ $X + y = 38 \dots\dots\dots (iii)$ <p>(iii) - (ii)</p> $\begin{array}{r} x + y = 38 \\ -x + 2y = -14 \\ \hline 3y = 24 \\ y = 8 \\ x = 30 \end{array}$ <p>At son's birth; mother's age = $30 - 8 = 22$ years</p> | <p>M₁</p> <p>M₁</p> <p>M₁</p> <p>A₁</p> |

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| <p>12.</p> | | <p>(i). Construct $\angle 108^\circ$, sides 4cm (ii). Bisect two angles to produce centre O. (iii). Draw a circle touching the vertices</p> | <p>Drawing M_1 Accuracy M_1 Explanation A_1</p> |
| <p>13. $x + y = 40$ $y = 40 - x$</p> | $x^2 + (40-x)^2$ $x^2 - 80x + x^2 + 1600$ $2x^2 - 80x + 1600$ <p>for min. value</p> $\frac{dy}{dx} = 4x - 80$ $\frac{dy}{dx} = 0$ $\therefore 4x - 80 = 0$ $X = 20$ <p>Subst. $y = 20$</p> $X^2 + y^2 = 400 + 400$ $= 800$ | <p>M_1 M_1 M_1 A_1</p> | |
| <p>14. Area of Sector QPR = $\frac{60}{360} \times 6 \times 6 \times 3.142 = 18.852 \text{ cm}^2$</p> <p>Area of triangle QPR = $\frac{6 \times 6 \sin 60^\circ}{2} = 15.559 \text{ cm}^2$</p> <p>Area of Segment = $18.852 - 15.559 = 3.2935 \text{ cm}^2$</p> <p>Area of Shaded region = $2 \times 3.2935 + 15.559 = 22.15 \text{ cm}^2$</p> | <p>$M_1$ M_1 M_1 A_1</p> | | |
| <p>15. ΔLKM IS Isosceles $KL = KM$ (Given)</p> <p>$\angle LKM = 50^\circ + 60^\circ = 110^\circ$ (Construction)</p> <p>$\angle KML = \angle KLM$ (Base \angles) $= 35^\circ$</p> <p>Bearing of m from L: $= 90^\circ + 60^\circ + 35^\circ = 185^\circ$</p> | | <p>M_1 B_1 A_1</p> | |
| <p>16. $2\text{h } 40\text{min} = \frac{2}{3}$ $= \frac{8}{3}\text{h}$</p> <p>$1\text{h} = 120\text{km}$ $\therefore \frac{8}{3}\text{h} = \frac{8}{3} \times 120 = 320\text{km}$ $4\text{Km cost} = \text{Kshs. } 59$</p> <p>$\therefore 320\text{Km would cost} = \frac{320 \times 59}{4} = \text{Kshs. } 4,720$</p> | <p>$B_1$ M_1 A_1</p> | | |

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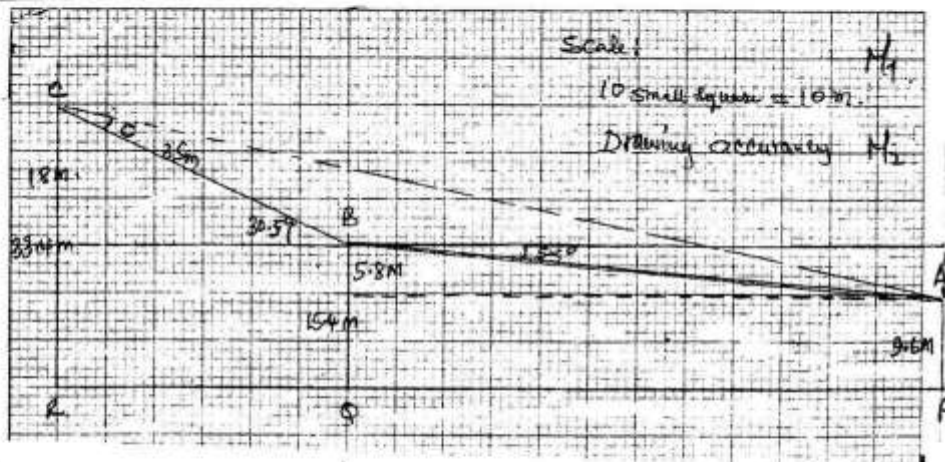
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| | | | |
|------|---|--|-------------------------------|
| 17a. | Retained profit = $225,000 \times \frac{25}{100}$ | = <u>Kshs.56,250</u> | M ₁ |
| | Remaining after retained | = $225,000 - 56,250$ | = <u>Shs.168,750/=</u> |
| | Taxes and insurance | = $168,750 \times \frac{40}{100}$ | M ₁ |
| | | = <u>Shs.67,500</u> | |
| | Remaining | = $168,750 - 67,500$ | = <u>Shs.101,250</u> |
| | Cherop's share of profit | = $\frac{105,000}{250,000} \times 101,250$ | A ₁ |
| | | = <u>Kshs.42,525</u> | |
| | Nangila's share of profit | = $\frac{85,000}{250,000} \times 101,250$ | |
| | | = <u>Kshs.34,425</u> | |
| | Asha's Share of Profit | = $\frac{60,000}{250,000} \times 101,250$ | M ₁ |
| | | = <u>Kshs.24,300</u> | |
| | Cherop's - Asha's | = $42,525 - 24,300$ | A ₁ |
| | | = <u>Kshs.18,225</u> | |
| (b). | Profit 2 nd Year | = $\frac{10}{9} \times 225,000$ | B ₁ |
| | | = <u>Kshs.250,000</u> | M ₁ |
| | Nangila's share of Profit | = $\frac{110,000}{275,000} \times 250,000$ | M ₂ |
| | | = <u>Kshs.100,000</u> | A ₁ |



| | | | | | | |
|-------|--|---|--|--|-------------------|----------------|
| 18. a | $\frac{5.8}{\sin 5.5^\circ} = \frac{x}{\sin 84.5^\circ}$ | $x = \frac{5.8 \sin 84.5^\circ}{\sin 5.5^\circ} = 60.2m$ | $\frac{105.8}{\sin 149.5^\circ} = \frac{60.2}{\sin C}$ | $\sin C = \frac{60.2 \sin 149.5^\circ}{105.8}$ | $C = 149.5^\circ$ | M ₁ |
| | (b)(i). $60mm = 33.4m$ | $\therefore 190mm = \frac{190 \times 33.4}{60} = 105.77m$ | $\therefore \angle BCA = 16.8^\circ$ | | | A ₁ |
| | (iii). $\angle CBA$ | = $180^\circ - 30.5^\circ$ | | | | N ₁ |
| | | | | | | A ₁ |

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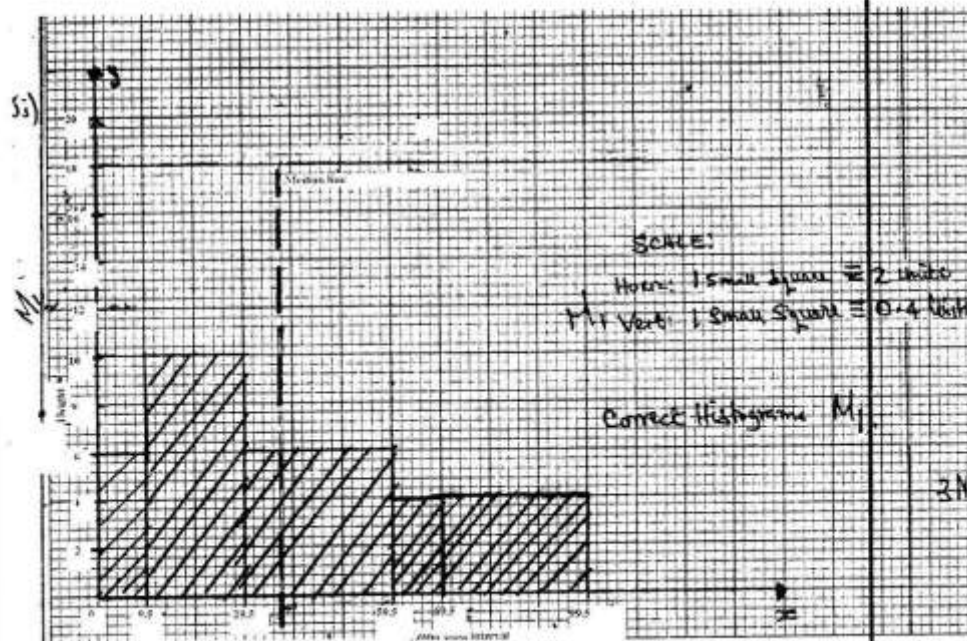
19. (i)

| | | | | | |
|---------------------|------|-------|-------|-------|--------|
| Marks | 0-10 | 10-30 | 30-60 | 60-70 | 70-100 |
| Frequency | 12 | 40 | 36 | 8 | 24 |
| Area of rectangle | 60 | 200 | 130 | 40 | 120 |
| Height of rectangle | 6 | 10 | 6 | 4 | 4 |

(i) NB: Area (A) = $\frac{C.I}{2} \times F$ when C.I is double the frequency. (F) is halved

4mks

ii) Height (H) = $\frac{\text{Area}}{C.I}$



b) Median mark = 30 - 60
or = 29.5-59.6

M1

$$\text{ii) } \frac{(35.5)}{2} + \frac{(39.5)}{2} = 17.5 + 19.75 = 37.5$$

M1

A1

3mks

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| | |
|--|---|
| <p>20. Let the no. of computers be x Price per unit = $\frac{1,800,000}{x}$</p> <p>After reduction: Price per unit = $\frac{1,800,000}{x} - 4000$ New no. of units purchased = $(x + 5)$</p> $(x + 5) \left(\frac{1,800,000}{x} - 4000 \right) = 1,800,000$ $1,800,000x - 4000x^2 + 9,000,000 - 20,000x = 1,800,000x$ $-4000x^2 + 20,000x - 9,000,000 = 0$ $x^2 + 5x - 2250 = 0$ $x^2 + 50x - 2250 = 0$ $x(x+50) - 45(x+50) = 0$ $(x+50)(x-45) = 0$ $x = 45 \text{ or } x = -50$ <p>He bought $45 + 5 = 50 = 50$ computers</p> | <p>M_1</p> <p>M_1</p> <p>B_1</p> <p>M_2</p> <p>A_1</p> |
| <p>(b). Remaining computers = $50 - 2 = 48$ Total Profit = $\frac{215}{100} \times 1,800,000$ $= \text{Kshs.} 2,700,000$ Profit per computer = $\frac{2,700,000}{48} = \text{Kshs.} 5,625$</p> | <p>M_1</p> <p>M_1</p> <p>A_1</p> <p>A_1</p> |
| <p>21. (a)i) $\vec{XR} = \vec{OX} + \vec{OR}$ $\vec{XR} = r - \frac{1}{3}q$</p> <p>(ii) $\vec{YQ} = q - \frac{3}{7}r$</p> <p>(bi) $\vec{XE} = m \left(r - \frac{1}{3}q \right)$</p> <p>(ii) $\vec{YE} = n \left(q - \frac{3}{7}r \right)$</p> <p>ci) $\vec{OE} = \vec{OX} + \vec{XE}$ $= \frac{1}{3}q + m \left(r - \frac{1}{3}q \right)$ $= \frac{(1-m)q}{3} + mr$</p> <p>(cii). Also $\vec{OE} = \vec{OY} + \vec{YE}$ $= \frac{3}{7}r - \frac{3}{7}nr + nq$ $= \frac{1-m}{3}q = n \dots \dots \dots (i)$ $M = 1-3n \dots \dots \dots (ii)$</p> <p>Subst. and solving $n = \frac{2}{4}$ and $m = \frac{1}{3}$</p> | <p>M_1</p> <p>M_1</p> <p>M_1</p> <p>M_1</p> <p>M_1</p> <p>A_1</p> <p>M_1</p> <p>M_1</p> <p>M_1</p> <p>A_1</p> |

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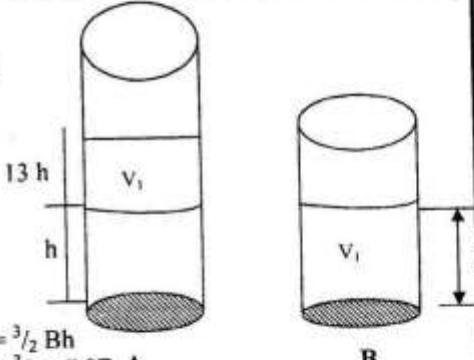


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|--|--|---------|--|--|--|-------|----|----|--|--|----|----|----------------------|
| <p>22a. (A.S.F.)^{1/2} = (L → S.F.)</p> $\text{L.S.F.} = \left(\frac{45}{20}\right)^{1/2} = 1.5$ <p>(L.S.F.)³ = (V.S.F.) $\therefore \text{V.S.F.} = (1.5)^3 = 3.375$</p> $\frac{0.945}{y} = 3.375$ $\therefore y = \frac{0.945}{3.375} = 0.28 \text{ Litres}$ | <p>M₁</p> <p>M₁</p> <p>M₁</p> <p>A₁</p> | | | | | | | | | | | | |
| <p>b. From A.S.F. $A = \sqrt[3]{2}B$ Both volumes are equal $\therefore \sqrt[3]{2}B(13-h) = Bh$</p> $2 \times \sqrt[3]{2}(13-h) = h \times 2$ $39 - 3h = 2h$ $5h = 39$ $h = \frac{39}{5} = 7.8 \text{ cm}$  <p>(c). Volume in larger cylinder = $\sqrt[3]{2}Bh$ $= \sqrt[3]{2} \times 7.8B$ $= 11.7B \text{ cm}^3$</p> <p>(iii). $\frac{1}{5}$ of $11.7B = 2.34B \text{ cm}^3$ Total volume of juice in smaller container = $2.34B + Bh$ $= 2.34B + 7.8B$ $= 10.14B$</p> <p>$10.14B = h_1B$ where $h_1 =$ new height $\therefore h_1 = 10.14 \text{ cm}$</p> | <p>B₁</p> <p>M₁</p> <p>A₁</p> <p>M₁</p> <p>A₁</p> <p>M₁</p> <p>A₁</p> | | | | | | | | | | | | |
| <p>23a. $\begin{pmatrix} 9 & 8 \\ 7 & 6 \end{pmatrix}$ det. = $(9 \times 6) - (8 \times 7)$ $= 54 - 56$ $= -2$</p> $A^{-1} = \begin{pmatrix} 6 & -8 \\ -7 & 9 \end{pmatrix}^{-1/2} = \begin{pmatrix} -3 & 4 \\ 3.5 & -4.5 \end{pmatrix}$ | <p>M₁</p> <p>A₁</p> | | | | | | | | | | | | |
| <p>b. Let price of bicycle be x and radio be y</p> <table border="0" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">Bicycle</td> <td style="text-align: center;">Radio</td> <td></td> <td></td> </tr> <tr> <td rowspan="2" style="vertical-align: middle;">$A =$</td> <td style="border: 1px solid black; padding: 5px;">36</td> <td style="border: 1px solid black; padding: 5px;">32</td> <td rowspan="2" style="border: 1px solid black; padding: 5px;">$\begin{pmatrix} x \\ y \end{pmatrix}$</td> <td rowspan="2" style="border: 1px solid black; padding: 5px;">$= \begin{pmatrix} 227,280 \\ 174,960 \end{pmatrix}$</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">28</td> <td style="border: 1px solid black; padding: 5px;">24</td> </tr> </table> <p>Det = $(36 \times 24) - (32 \times 28) = 864 - 896 = -32$</p> | | Bicycle | Radio | | | $A =$ | 36 | 32 | $\begin{pmatrix} x \\ y \end{pmatrix}$ | $= \begin{pmatrix} 227,280 \\ 174,960 \end{pmatrix}$ | 28 | 24 | <p>M₁</p> |
| | Bicycle | Radio | | | | | | | | | | | |
| $A =$ | 36 | 32 | $\begin{pmatrix} x \\ y \end{pmatrix}$ | $= \begin{pmatrix} 227,280 \\ 174,960 \end{pmatrix}$ | | | | | | | | | |
| | 28 | 24 | | | | | | | | | | | |

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| $A^{-1} = \frac{1}{32} \begin{pmatrix} 24 & 32 \\ -28 & 36 \end{pmatrix} = \begin{pmatrix} -0.75 & +1 \\ +0.875 & -1.125 \end{pmatrix}$ $A^{-1}A \begin{pmatrix} x \\ y \end{pmatrix} = A^{-1} \begin{pmatrix} 227,280 \\ 174,960 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -0.75 & 1 \\ 0.875 & -1.125 \end{pmatrix} \begin{pmatrix} 227,280 \\ 174,960 \end{pmatrix}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4,500 \\ 2,040 \end{pmatrix}$ | <p>M₁</p> <p>M₁</p> <p>A₁</p> |
| <p>c. New Costs:</p> <p>Bicycle $\frac{90 \times 4,500}{100} = 4050 \text{ /-}$</p> <p>Radio $\frac{110 \times 2040}{100} = 2244 \text{ /-}$</p> $\begin{pmatrix} 36 & 28 \\ 30 & 24 \end{pmatrix} \begin{pmatrix} 4050 & 2244 \\ 4050 & 2244 \end{pmatrix} = \begin{pmatrix} 145800 + 1133,400 \\ 71.808 + 53.856 \end{pmatrix}$ <p>Total for Bicycles $259,200$</p> <p>Total for Radios $125,664$</p> | <p>M₁</p> <p>A₁</p> <p>W₁</p> <p>A₁</p> |
| <p>24.</p> | |

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| <p>(bi). $A_1 = \frac{1}{2} (1 \times 0.2) + \frac{1}{2} (0.2 + 0.6) + \frac{1}{2} (0.6 + 1.3) + \frac{1}{2} (1.3 + 2.4) + \frac{1}{2} (2.4 + 3.7)$ $+ \frac{1}{2} (3.7 + 5.3) + \frac{1}{2} (5.3 + 7.3) + \frac{1}{2} (7.3 + 9.5) + \frac{1}{2} (9.5 + 12)$</p> <p style="text-align: center;">$= 36.30 \text{ sq Units}$</p> <p>$A_2 = \left(\frac{1}{2} \times 4 \times 1 \right) + \frac{1}{2} (4 + 5.7) + \frac{1}{2} (5.7 + 6.9) + \frac{1}{2} (6.9 + 8) + \frac{1}{2} (8 + 9) + \frac{1}{2} (9 + 9.8)$ $+ \frac{1}{2} (9.8 + 1.06) + \frac{1}{2} (10.6 + 11.3) + \frac{1}{2} (11.3 + 2)$</p> <p style="text-align: center;">$= 59.65 \text{ sq units}$</p> <p>Disputed land = $59.65 - 36.30$</p> <p style="text-align: center;">$= 23.35 \text{ sq units}$</p> | <p>M₁</p> <p>A₁</p> <p>M₁</p> <p>M₁</p> <p>A₁</p> |
| <p>(i) $10,000 \text{ m}^2 = 1 \text{ hectare}$</p> <p>1 unit = 20m</p> <p>$\therefore 1 \times 1 \text{ unit square} = 20 \times 20 \text{ m}^2$</p> <p style="text-align: center;">$= 400 \text{ m}^2$</p> <p>Hence 23.35 unit squared = 23.35×400</p> <p style="text-align: center;">$= 9,340 \text{ m}^2$</p> <p>But $10,000 \text{ m}^2 = 1 \text{ hectare}$</p> <p>$\therefore 9,340 \text{ m}^2 = \frac{9,340 \times 1}{10,000}$</p> <p style="text-align: center;">$= 0.934 \text{ hectares}$</p> | <p>M₁</p> <p>M₁</p> <p>A₁</p> |
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