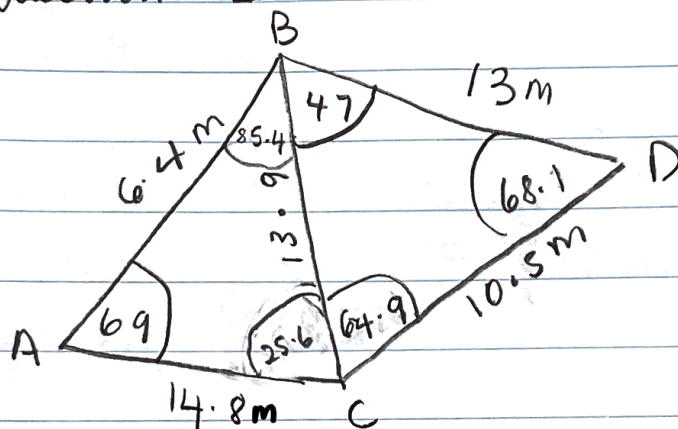


Question 1



$$\frac{b}{\sin B} = \frac{c}{\sin C}$$

$\sin B$

$\sin C$

$$\frac{10.5}{\sin 47} = \frac{13}{\sin C}$$

$$10.5 \sin C = 13 \sin 47$$

$$\sin C = \frac{\sin^{-1} 9.5}{10.5}$$

$$C = 64.9^\circ$$

$$\frac{d}{\sin 68.1} = \frac{10.5}{\sin 47}$$

$$\sin 68.1 \times 10.5 = d \sin 47$$

$$9.7 = d 0.7$$

$$\frac{9.7}{0.7} = d$$

$$13.9 \text{ m} = d$$

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$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

$$\frac{13.9}{\sin 69} = \frac{6.4}{\sin C}$$

$$\sin 69 \times 6.4 = 13.9 \sin C$$

$$\sin^{-1} \frac{6.4}{13.9} = C$$

$$25.6^\circ = C$$

$$\frac{6.4}{\sin 25.6} = \frac{b}{\sin 85.4}$$

$$6.4 = b \sin 25.6$$

$$\frac{6.4}{\sin 25.6} = b$$

$$14.8 \text{ m} = b$$

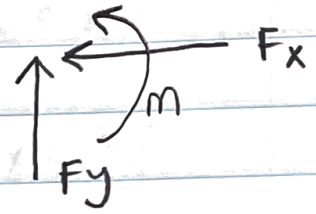
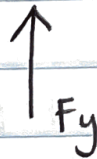
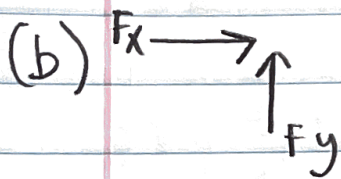
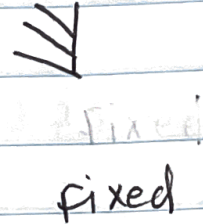
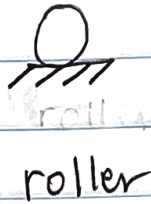
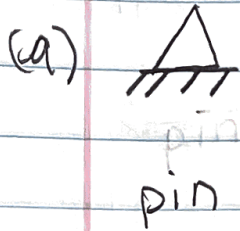
$$\frac{1}{2} ab \sin C$$

$$\frac{1}{2} \times 13.9 \times 14.8 \times \sin 25.6$$

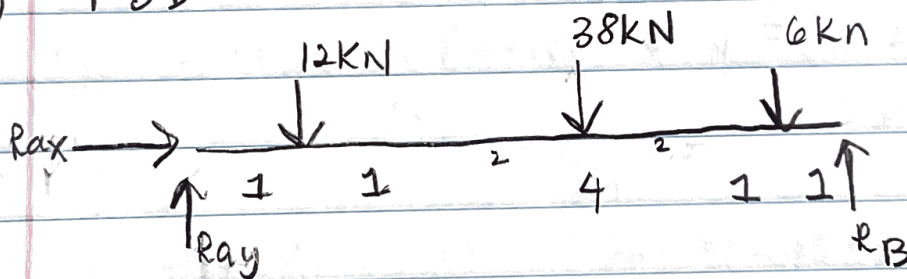
$$= 44.444 \text{ m}^2$$

Section B

Question 2



(c) FBD



$$\sum H = 0 \therefore R_{Ax} = 0$$

$$\sum V = 0 \therefore R_{Ay} - 12 - 38 - 6 + R_B = 0$$

$$R_{Ax} + R_B = 56 \text{ kN}$$

$\sum M_B$

$$(R_{Ay} \times 8) + (-12 \times 7) + (-38 \times 4) + (-6 \times 1)$$

$$8R_{Ay} = 84 + 152 + 6$$

$$R_{Ay} = \frac{242}{8} = 30.25$$

25.5

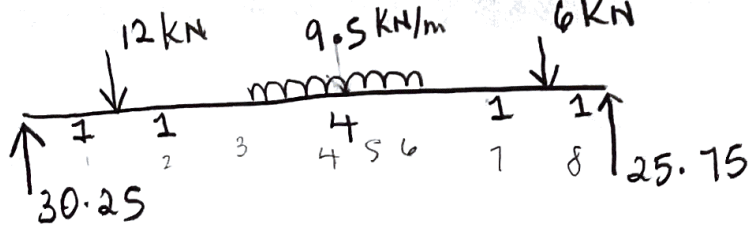
$\sum M_A$

$$(R_B \times 8) + (-6 \times 7) + (-38 \times 4) + (12 \times 1)$$

$$R_B = \frac{206}{8} = 25.75$$

+ = 56

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SF

$$SF_0 = 0 \text{ or } 30.25$$

$$SF_1 = 30.25 \text{ or } 18.25$$

$$SF_2 = 18.25$$

$$SF_3 = 30.25 + (-12) + (-9.5 \times 1) = 8.75$$

$$SF_4 = 30.25 + (-12) + (-9.5 \times 2) = -0.75$$

$$SF_5 = 30.25 + (-12) + (-9.5 \times 3) = -10.25$$

$$SF_6 = 30.25 + (-12) + (-9.5 \times 4) = -19.75$$

$$SF_7 = -19.75 \text{ or } -25.75$$

$$SF_8 = -25.75 \text{ or } 0$$

BM

$$BM_0 = 0$$

$$BM_1 = 30.25 \times 1$$

$$BM_2 = (30.25 \times 2) - 12 = 48.5$$

$$BM_3 = (30.25 \times 3) + (-12 \times 2) + (-9.5 \times 0.5) = 62$$

$$BM_4 = (30.25 \times 4) + (-12 \times 3) + (-19 \times 1) = 66$$

$$BM_5 = (30.25 \times 5) + (-12 \times 4) + (-28.5 \times 1.5) = 60.5$$

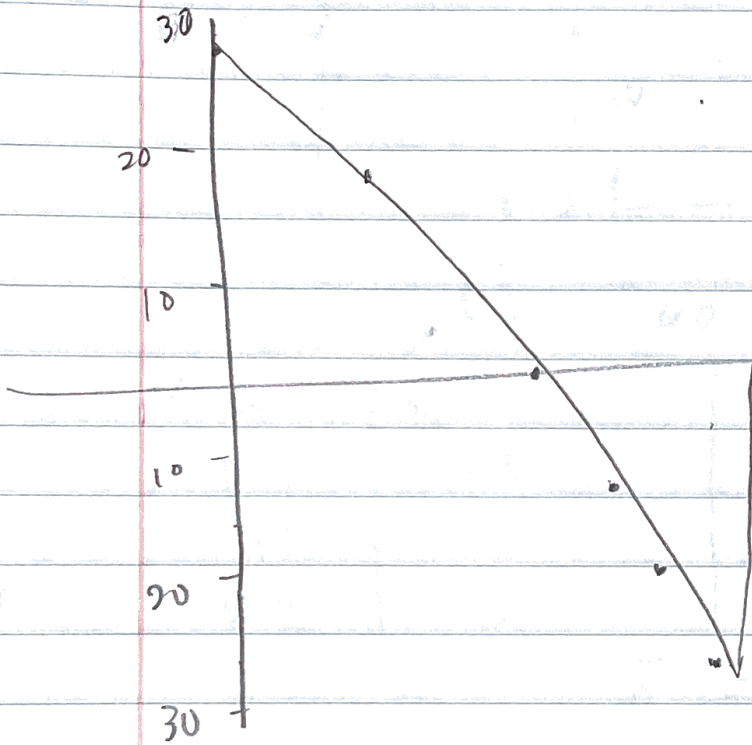
$$BM_6 = (30.25 \times 6) + (-12 \times 5) + (-38 \times 2) = 45.5$$

$$BM_7 = (30.25 \times 7) + (-12 \times 6) + (-38 \times 2) = 63.75$$

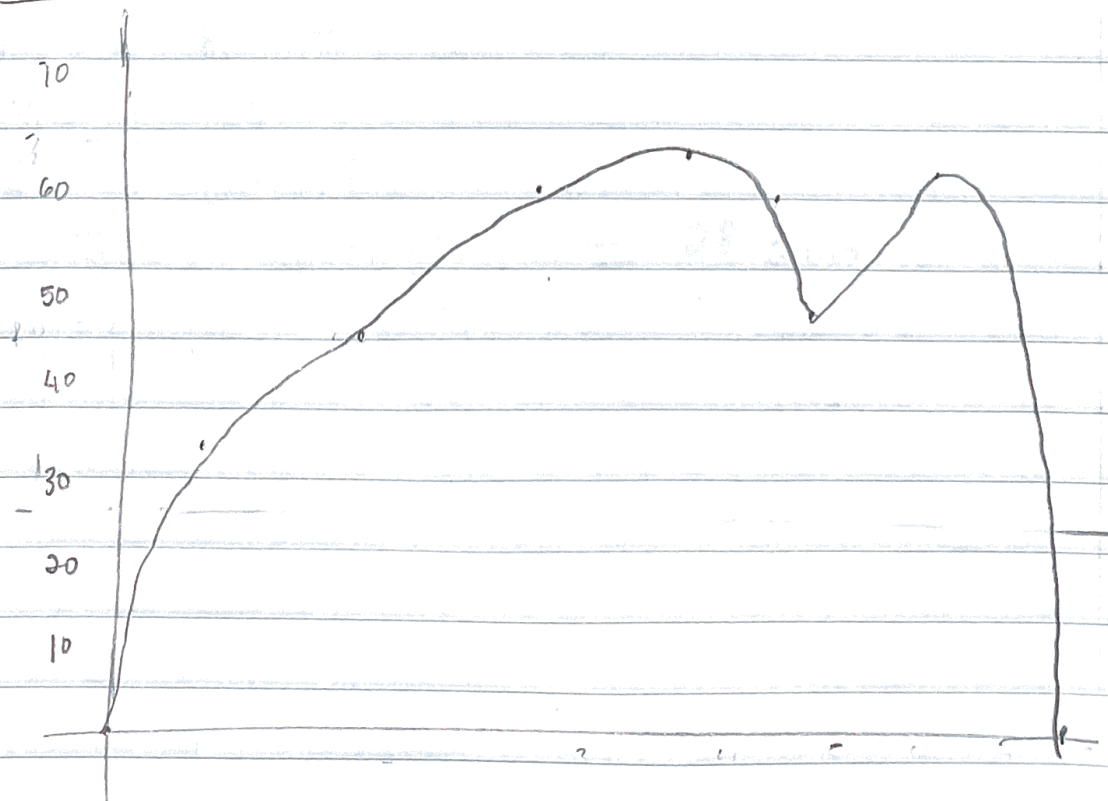
$$BM_8 = 0$$

2114 20 9

SF

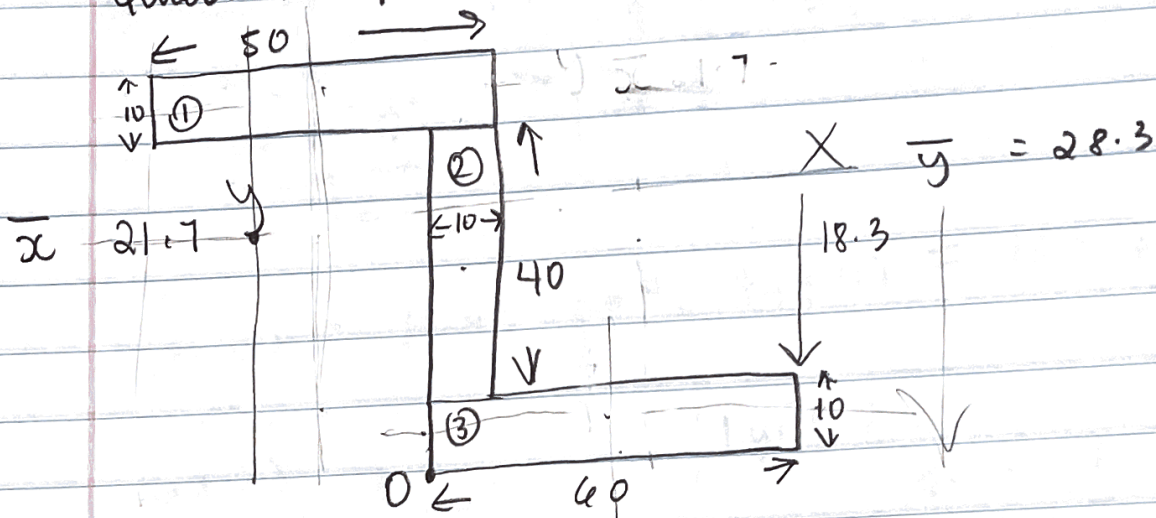


Bm



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Question 4



(a)

Part ID	Area	X_1	$A \times X_1$
1	500	25	12 500
2	400	5	2 000
3	600	30	18 000

$$\bar{X} = \frac{32500}{1500} = 21.7 \text{ mm}$$

Part ID	y_1	$A \times y_1$
1	55	27 500
2	30	12 000
3	5	3 000

$$\bar{y} = \frac{42500}{1500} = 28.3 \text{ mm}$$

Question 4

(b)

 $I_{xx} (1)$

$$\frac{50 \times (10)^3}{12}$$

$$I_{xx} (1) = 4166.7 \text{ mm}^4$$

 $I_{xx} (2)$

$$\frac{10 \times (40)^3}{12}$$

$$I_{xx} (2) = 53333.3 \text{ mm}^4$$

 $I_{xx} (3)$

$$\frac{60 \times (10)^3}{12}$$

$$I_{xx} (3) = 5000 \text{ mm}^4$$

$$I_{xxT} = 62500 \text{ mm}^4$$

$$\frac{bd^3}{12}$$

 $I_{yy} (1)$

$$\frac{10 \times (50)^3}{12}$$

$$I_{yy} (1) = 104166.7 \text{ mm}^4$$

 $I_{yy} (2)$

$$\frac{40 \times (10)^3}{12}$$

$$I_{yy} (2) = 3333.3 \text{ mm}^4$$

 $I_{yy} (3)$

$$\frac{10 \times (60)^3}{12}$$

$$I_{yy} = 180000 \text{ mm}^4$$

$$I_{yyT} = 287500 \text{ mm}^4$$

$$I_x = I_{xx} + A(\bar{y})^2$$

	$\bar{y}$	$A \times (\bar{y})^2$
1	26.7	1356445
2	1.7	21156
3	23.3	325734
		<u>62500 + 683335</u>

$$I_x = 4745835$$

$$I_y = I_{yy} + A(\bar{x})^2$$

	$\bar{x}$	$A \times (\bar{x})^2$
1	3.3	5445
2	33.3	443556
3	58.3	2039334
		<u>287500 + 2488335</u>

$$I_y = 2775835$$