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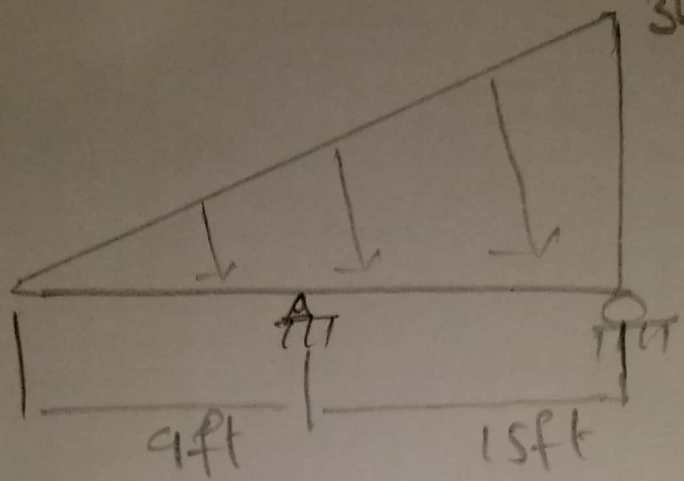
Section :- B

Submitted TO :- Engr-Saqib Khan

Paper :- Structure 1

Q No1 Draw the Shear and Bending moment

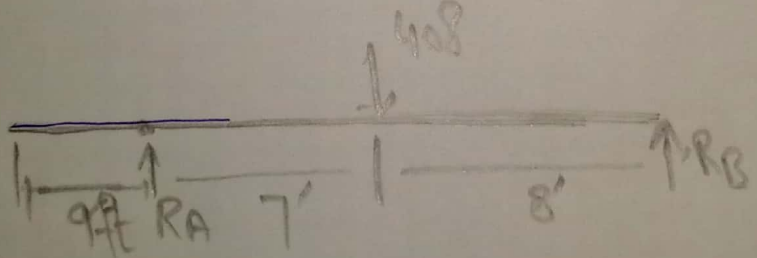


Sol

Converting UUL into point Load = $\frac{1}{2}(34 \times 24)$

$= \boxed{408\ lb}$

Thus the point load acts of Beam length from left side $= \frac{2}{3} \times 24 = 16ft$



$\Sigma M_B = 0$ ↺

$\Rightarrow 408 \times \frac{1}{3}(24) = R_A \times 15$

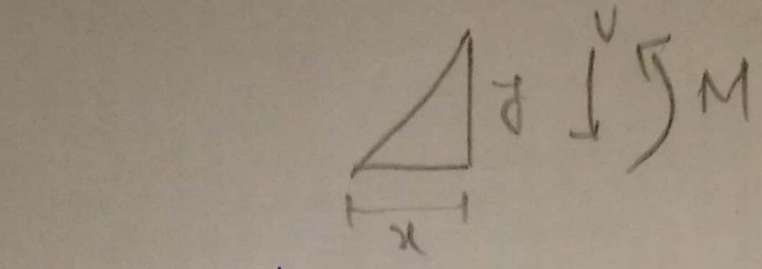
$\boxed{R_A = 217.6\ lb}$

$\Sigma F_y = 0$ ↑

$R_A + R_B = 408\ lb$

$R_B = 408 - 217.6\ lb = \boxed{190.4\ lb}$

Now Section (1)



For y

$$\frac{y}{x} = \frac{34}{24}$$

$$y = \left(\frac{34}{24}\right)x$$

So $\Sigma F_y = 0 \quad \uparrow +$

$$\Rightarrow -\frac{1}{2} \times x \times \left(\frac{34}{24}\right)x - V_c = 0$$

$$\Rightarrow V_c = -\left(\frac{34}{48}\right)x^2$$

at $x = 0$

$V_c = 0$

and at $x = 9$

$$V_c = -\left(\frac{34}{48}\right)9^2 = 57.37 \text{ lb}$$

$$\boxed{V_c = 57.37 \text{ lb}}$$

$$\Rightarrow M = \frac{1}{2} \times x \times x \left(\frac{34}{24}\right) \times \frac{1}{3} \times x$$

$$M = \frac{34x^3}{144}$$

At $x = 0$

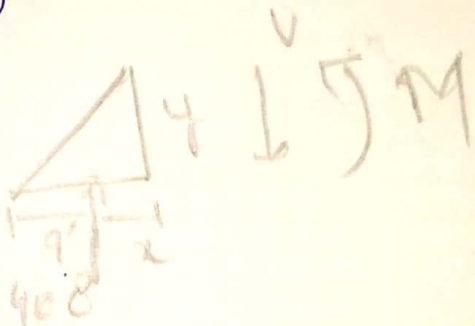
$M = 0$

Now for $x = 9$

$$M = \frac{-34x^3}{144}$$

$$= \frac{-34(9)^3}{144} = -172.125 \text{ lb.ft}$$

Now for section (2)



For y

$$\frac{y}{(x+9)} = \frac{34}{24}$$

$$y = \frac{34(x+9)}{24}$$

So $\Sigma F_y = 0 \uparrow +$

$$408 - \frac{1}{2} x (x+9)\left(\frac{34}{24}\right)(x+9) - V_c = 0$$

$$V_c = 408 - \frac{34}{48}(x+9)^2$$

at $x = 0$

$$\boxed{V_c = 350.625}$$

at $x = 15$

$$V_c = 408 - \frac{34}{48}(15+9)^2$$

$$\boxed{V_c = 408 - 408 = 0}$$

$$M + \frac{1}{2}(x+9)\left(\frac{34}{24}(x+9) \times \frac{1}{3} \times (x+9) - 408x\right)$$

$$M = 408x - \frac{34}{144}(x-9)^3$$

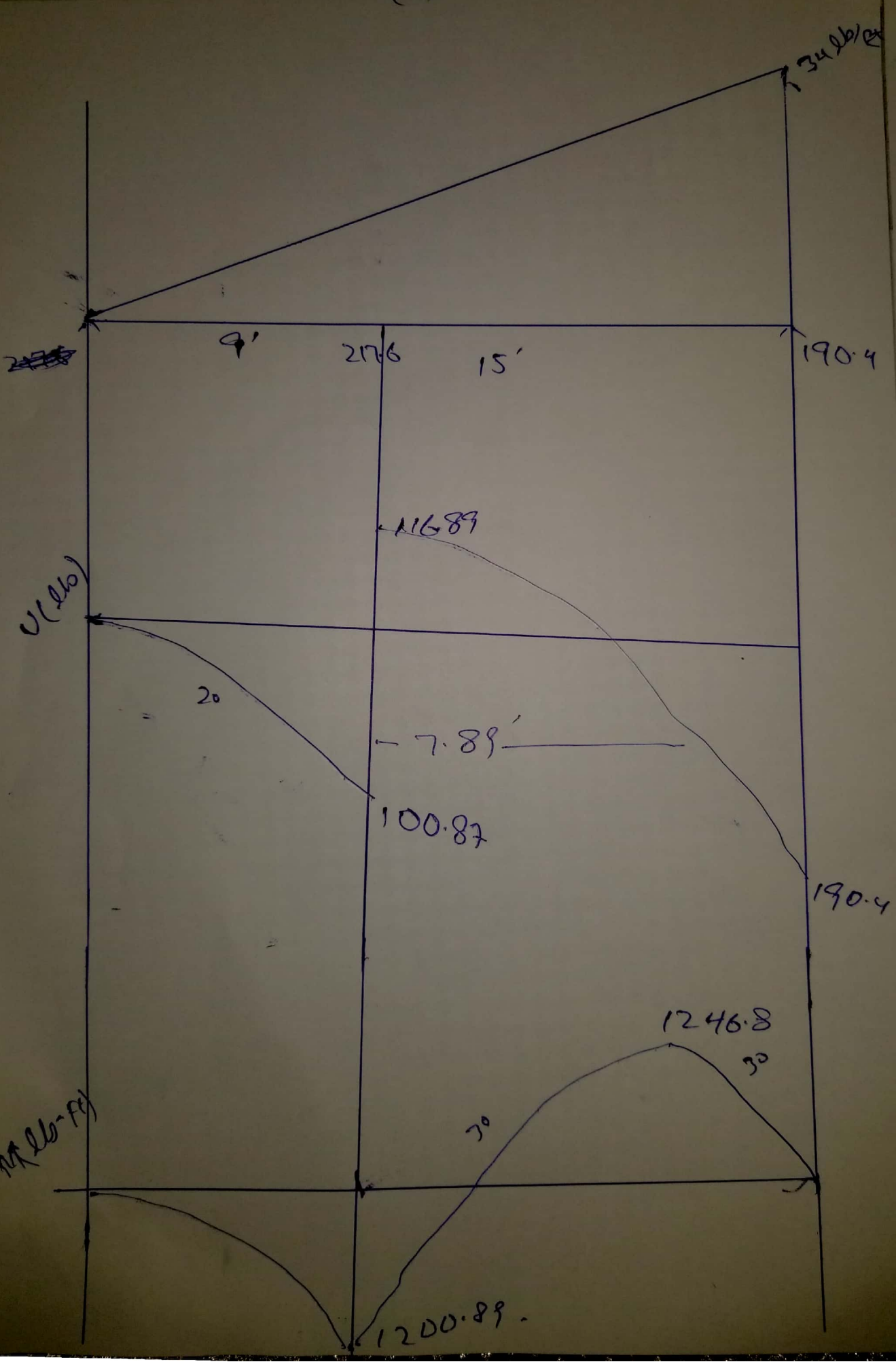
at $x = 0$

$M = 1179.875$ lb-ft

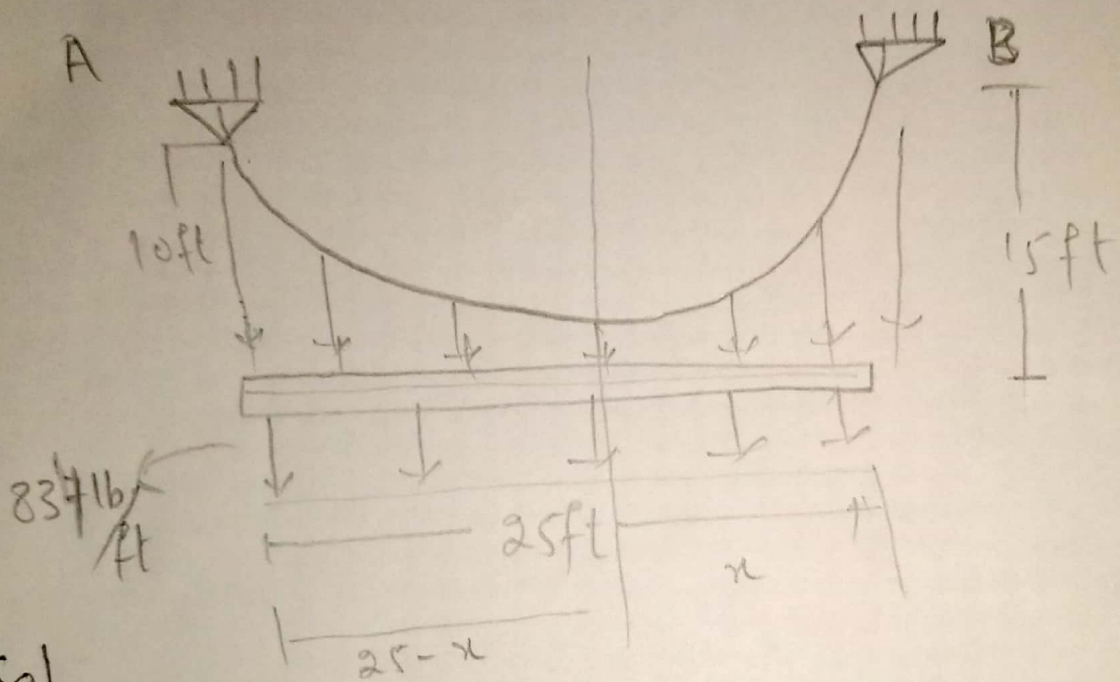
at $x = 15$

$M = 606.9$ lb-ft

(5)



Q No 2 :- The cable supports the uniform load of P lb/ft . Determine the tension in the cable at each support A and B. where P is your last three digits of your registration number.



Sol

$$F_H = \frac{wl^2}{2h}$$

$$F_{H_1} = \frac{834 \times (25-x)^2}{2 \times 10} = \frac{834(25-x)^2}{20}$$

$$F_{H_2} = \frac{834 \times (x)^2}{2 \times 15} = \frac{834 x^2}{30}$$

Therefore we know that Right support F_{H_2} will be equal F_{H_1}

$$\frac{834(25-x)^2}{2\times10} = \frac{834x^2}{2\times15}$$

$$\Rightarrow \frac{(25-x)^2}{10} = \frac{x^2}{15}$$

$\Rightarrow$ Further simplfying

$$\sqrt{(25-x)^2} = \sqrt{x^2\left(\frac{10}{15}\right)}$$

$$25-x = x(0.8167)$$

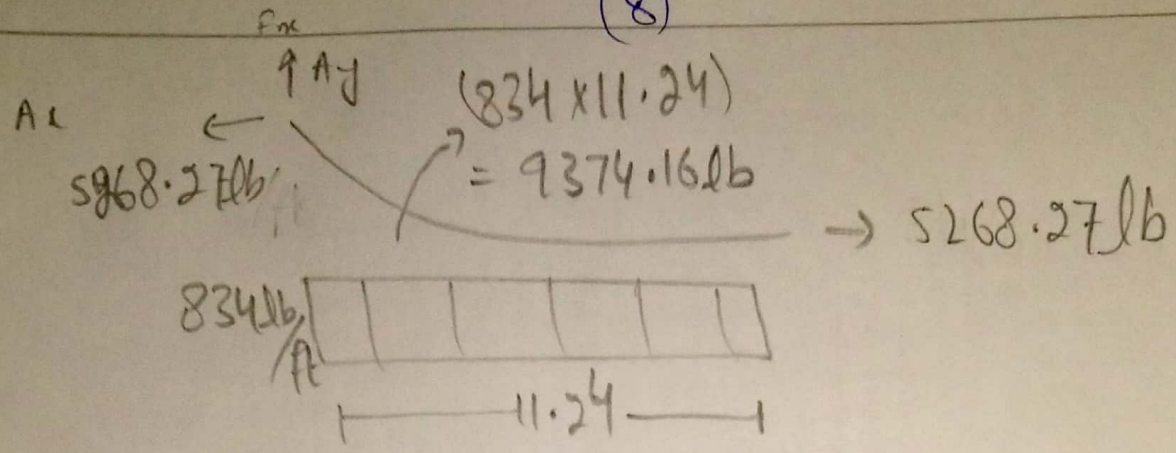
$$\frac{25}{1.8167} = \frac{1.8167x}{1.8167}$$

$$\boxed{x = 13.761}$$

$\Rightarrow$ $$F_H = \frac{834(11.24)^2}{2\times10}$$

$$F_H = Ax = Bx = 5268.27$$

$$\boxed{F_H = Ax = Bx = 5268.27 \text{ lb}}$$



$$\Sigma F_y = 0$$

$$A_y = 9374.16 \text{ lb}$$

$$T_A = \sqrt{A_x^2 + A_y^2}$$

$$T_A = \sqrt{(5268.27)^2 + (9374.16)^2}$$

$$\boxed{T_A = 10753.11 \text{ lb}}$$

$$B_y + 9374.16 - 25 \times 834 = 0$$

$$\boxed{B_y = 11475.84}$$

$$T_B = \sqrt{B_x^2 + B_y^2}$$

$$T_B = \sqrt{(5268.27)^2 + (11475.84)^2}$$

$$\boxed{T_B = 12627.33 \text{ lb}}$$

For Another Method Q4 have calculate

→ At point B:

$$y = \frac{w_0}{2F_H} x^2 = \frac{834}{2(5268.27)} x^2$$

$$\frac{dy}{dx} = \tan\theta_B = 0.10790 \Big|_{x=13.76}$$

$$= 2.179$$

$$\theta_B = 65.30^\circ$$

Now $T_B = \frac{F_H}{\cos\theta_B} = \frac{5268.27}{\cos 65.30}$

$T_B = 12460.108 \approx 13.01kp$

⇒ AT point A

$$y = \frac{w_0}{2F_H} x^2 = \frac{834}{2(5268.27)} x^2$$

$$\frac{dy}{dx} = \tan\theta_A = 0.15838 \Big|_{x=25-13.7}$$

$$x = 11.24 = 1.780$$

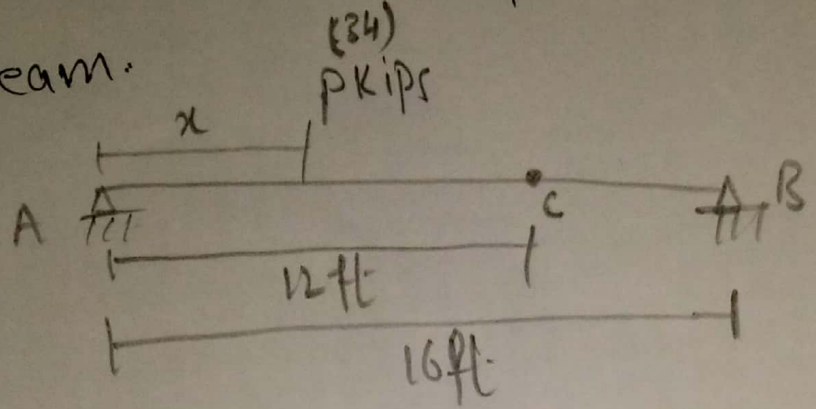
$$\theta_A = 60.675^\circ$$

$$T_A \frac{F_H}{\cos\theta_A} = \frac{5268.27}{\cos(60.675^\circ)}$$

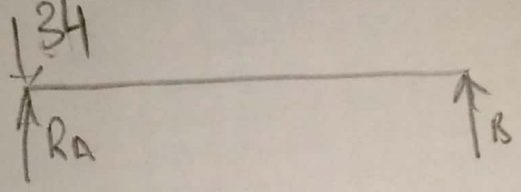
$$= 11105.047 \text{ lb}$$

$$= 11.105 \text{ Kip}$$

Q No3 Shear Force influence line for the Beam.



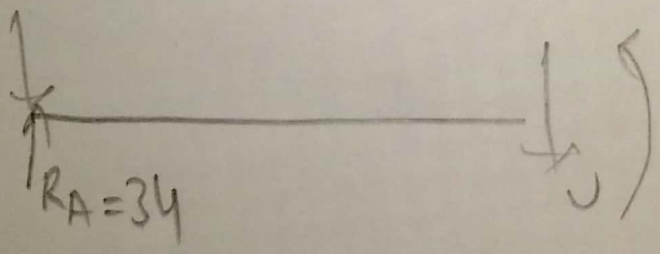
$x = 0 \quad V_c = ?$



$\Sigma M_B = 0$

$$-R_A(16) + (34)(16) = 0$$

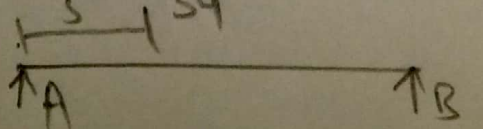
$$R_A = 34$$



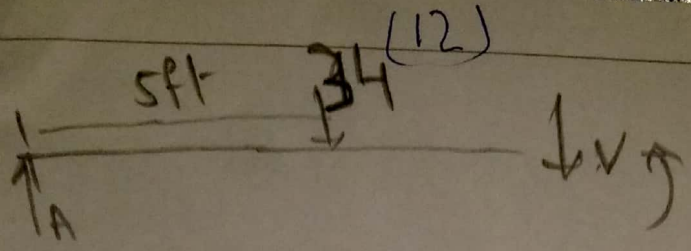
$$34 - 34 - V_c = 0$$

$$V_c = 0$$

$x = 5$



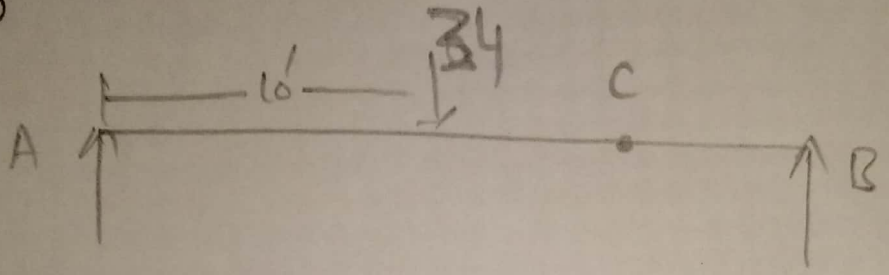
$\circlearrowleft M_B = 0 \quad -R_A(16) + 34(11) = 0 \Rightarrow \boxed{R_A = 23.375}$



$23.375 - 34 - V_c = 0$

$V_c = -10.625$

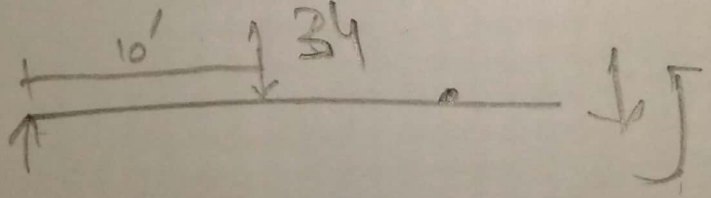
$x = 10$



$(+\circlearrowleft) \Sigma M_b = 0$

$-R_A(16) + 34 \times 6 = 0$

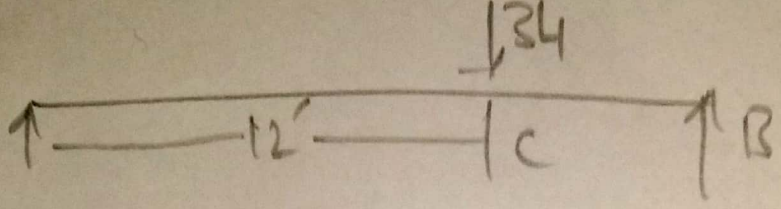
$R_A = 12.75K$



$12.75K - 34 - V_c = 0$

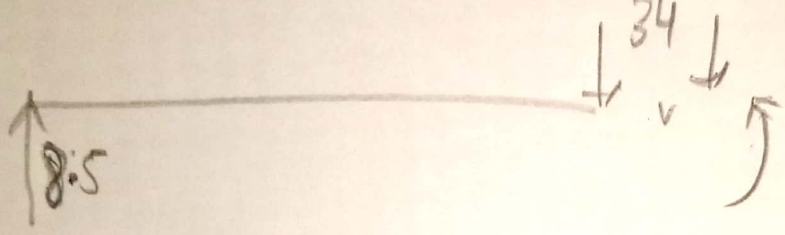
$V_c = -21.25$

$x = 12$



$$34(4) - R_A(16) = 0$$

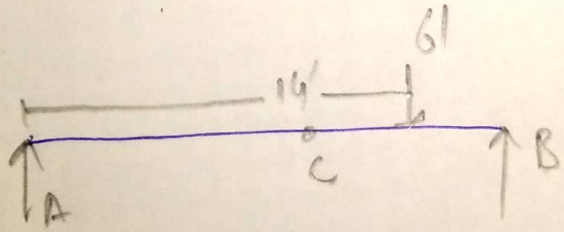
$$\boxed{R_A = 8.5}$$



$$8.5 - 34 - V_c = 0$$

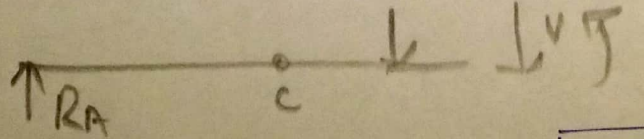
$$V_c = -25.5$$

$x = 14$



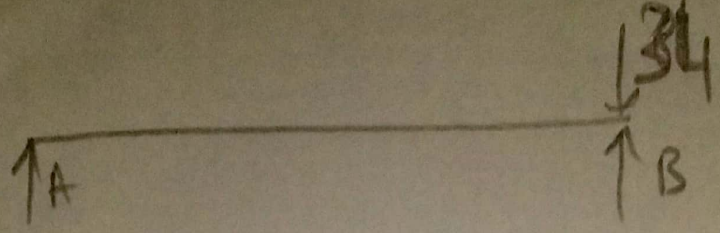
$$-R_A(16) + 34(2) = 0$$

$$R_A = 4.25$$



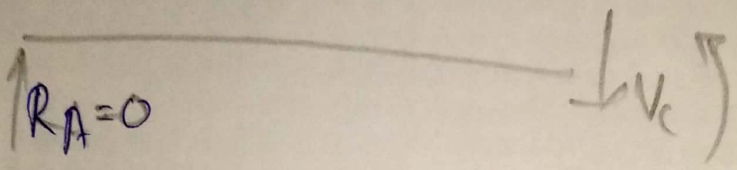
$$4.25 - V_c = 0 \Rightarrow \boxed{V_c = 4.25}$$

$x = 16$



$$-R_A(16) + 34(0) = 0$$

$$R_A = 0$$



$$0 - V_c = 0$$

$$V_c = 0$$

x	V_c
0	0
5	-10.625
10	-21.25
12	-25.5
14	4.25
16	0