

Name

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ID NO

7878

Section

"A"

Exame

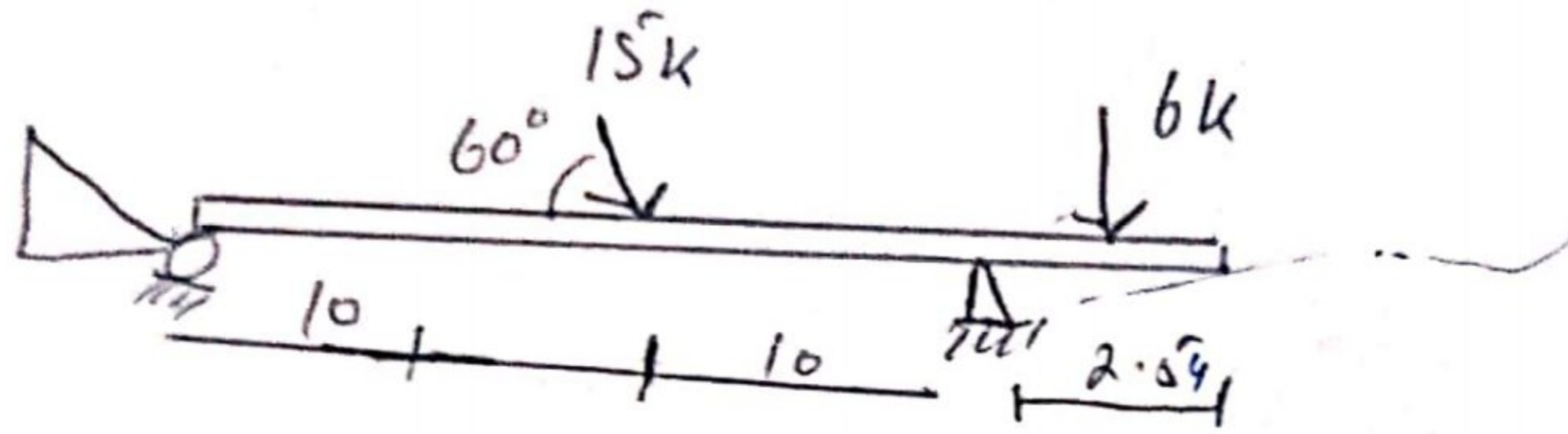
Summer

Subject

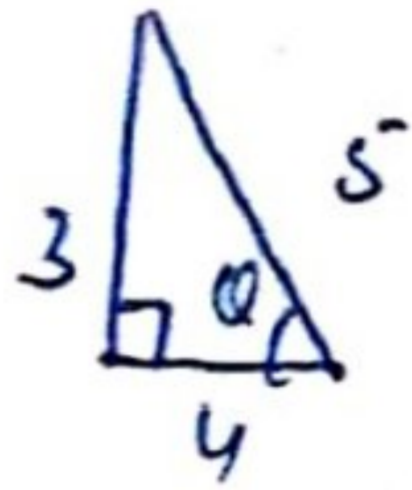
Structure I

Q1

Sol:-



First of all we have to find the angle for the roller support



using Trigonometry

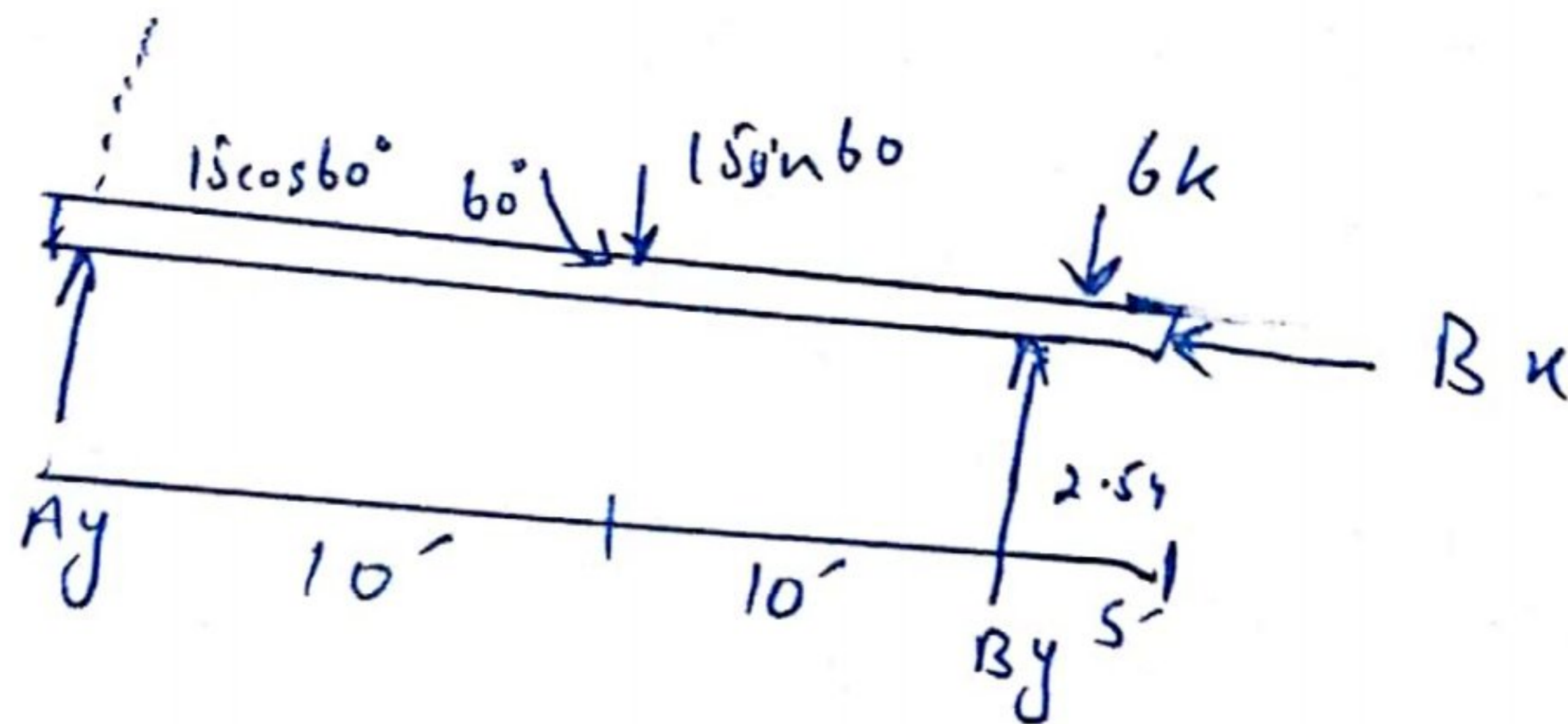
$$\sin \theta = P/H$$

$$\sin \theta = 3/5$$

$$\theta = \sin^{-1}(3/5)$$

$$\theta = 36.86^\circ$$

So now



$$1) \quad \sum F_x = 0 \quad \begin{matrix} + \\ \rightarrow \\ - \end{matrix}$$

$$15 \cos 60^\circ - B_x - A_y \sin 36.86^\circ = 0$$

$$7.5 - B_x - 0.599 A_y = 0 \quad \text{--- (1)}$$

Q₁ Page 2

$$2) \sum F_y = 0 \uparrow + \downarrow -$$

$$A_y \cos 36.86^\circ + B_y - 6k - 15 \sin 60^\circ = 0$$

$$0.80 A_y + B_y - 18.99 = 0$$

$$0.80 A_y + B_y = 18.99 \quad \text{--- (2)}$$

$$3) \sum M_B = 0 \curvearrowright + \curvearrowleft -$$

$$(A_y \cos 36.86^\circ \times 20) - (15 \sin 60^\circ \times 10) + 6 \times 2.5 = 0$$

$$16 A_y - 190 + 15 = 0$$

$$16 A_y - 175 = 0$$

$$A_y = 175/16$$

$$\boxed{A_y = 10.9375k}$$

put the value in eq (2)

$$0.80 (10.9375) + B_y = 18.99$$

$$8.75 + B_y = 18.99$$

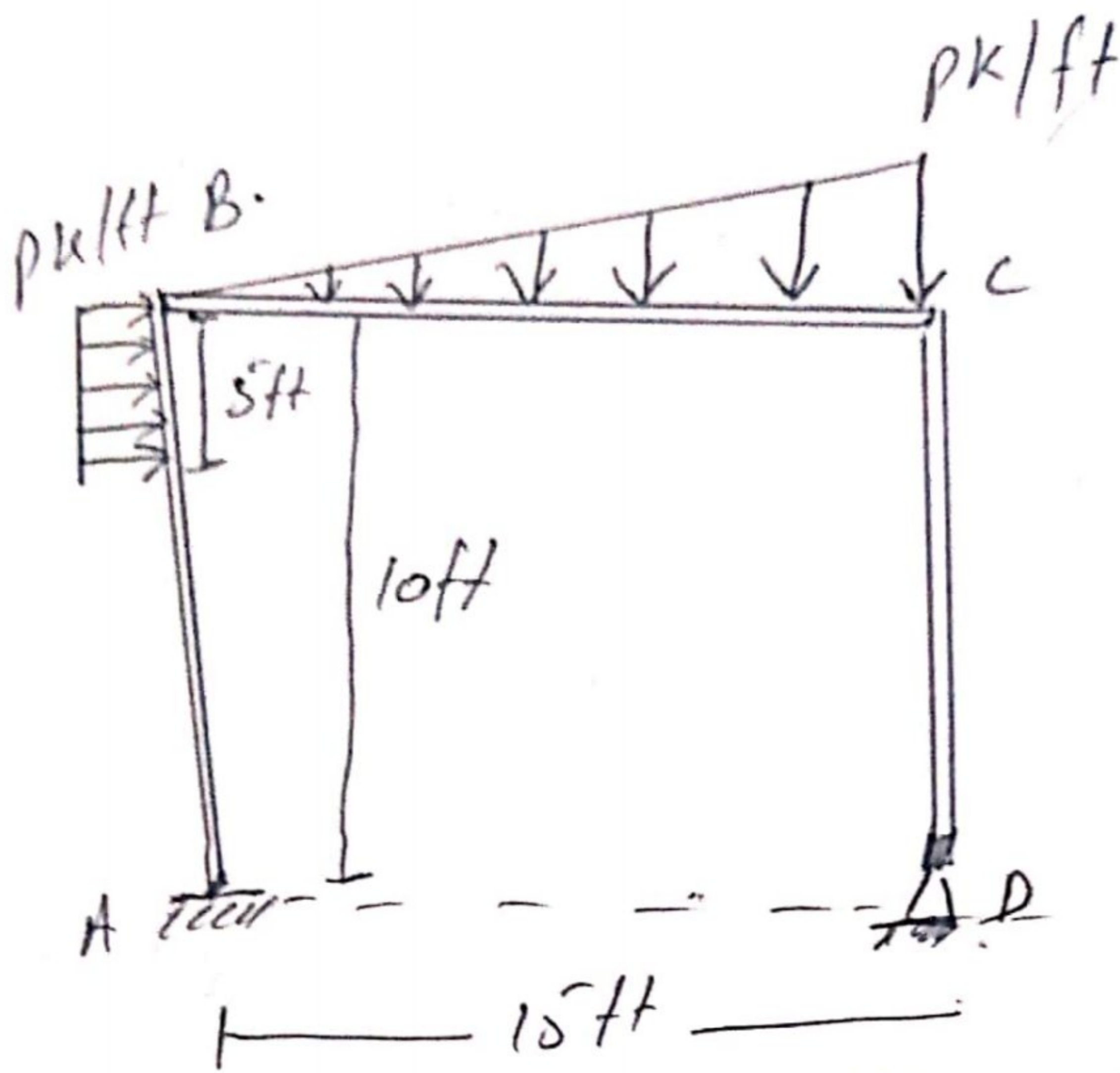
$$B_y = 18.99 - 8.75$$

$$\boxed{B_y = 10.25k}$$

put the value of A_y in eq (1)

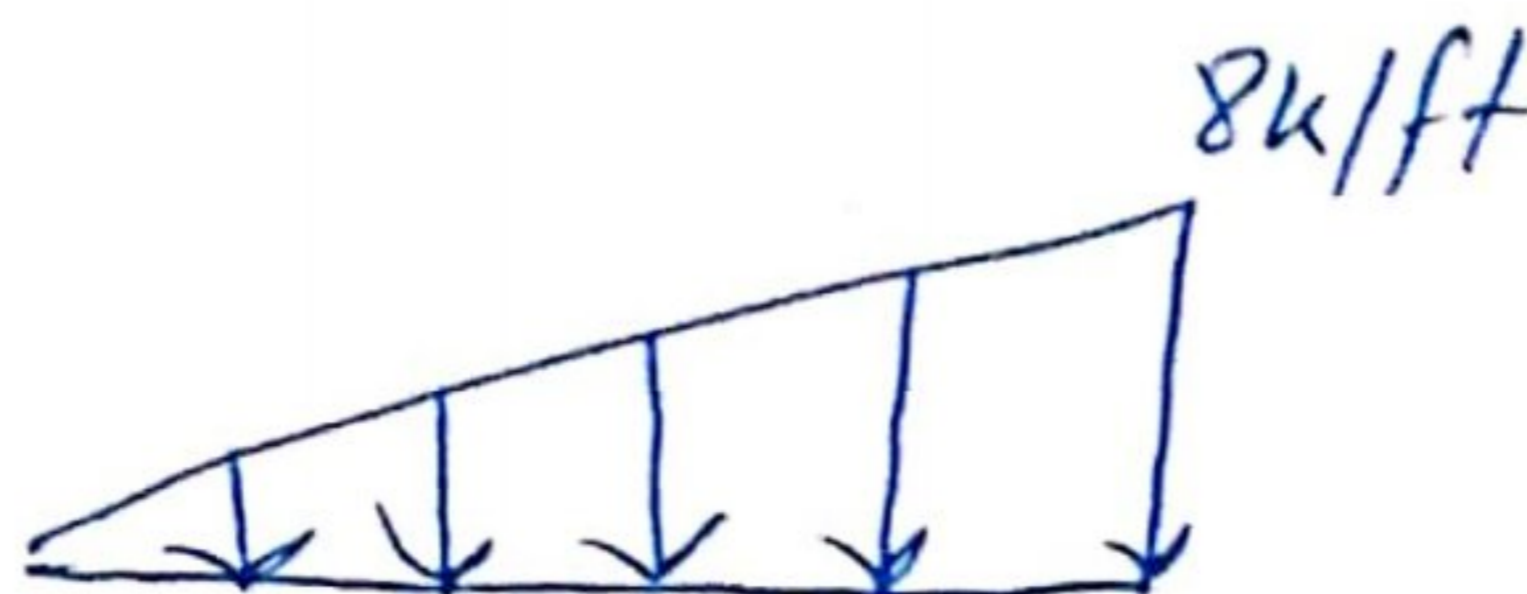
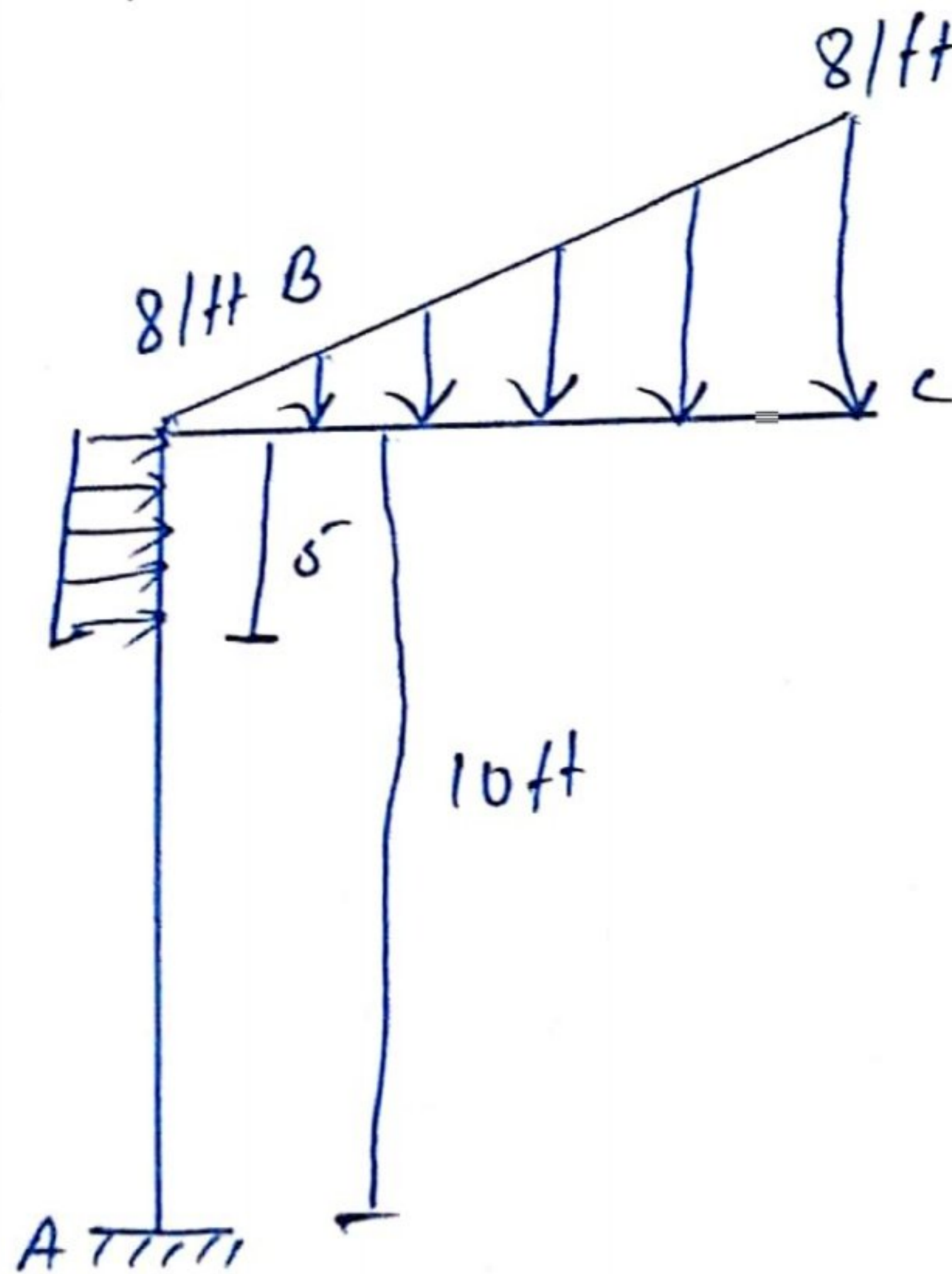
$$7.5 - B_x - 0.599 (10.9375) = 0$$

$$\boxed{B_x = 0.9375k} \text{ Ans.}$$



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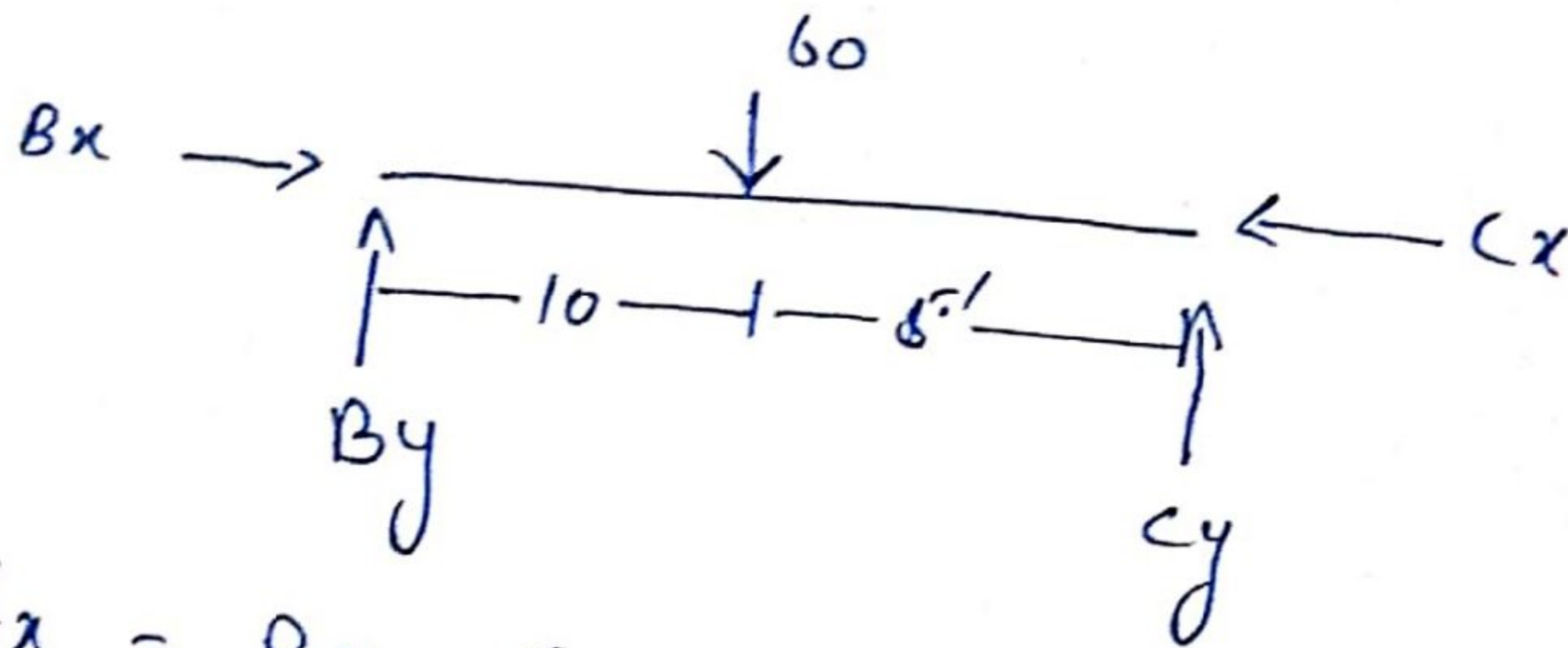
Sol.:



$$\begin{aligned} \text{Area} &= \frac{1}{2} bL \\ &= \frac{1}{2} \times 15 \times 8 = \boxed{60} \end{aligned}$$

$$\text{Distance} = \frac{1}{3}(b) = \frac{1}{3} \times 15$$

$$= 5$$



$$\sum F_x = B_x - C_x = 0$$

$$\sum F_y = 0 \uparrow +$$

$$B_y + c_y - 60 = 0$$

$$B_y + c_y = 60$$

$$\sum M_R = \uparrow) \quad 60 \times 10 - c_y \times 15$$

$$600 - c_y \times 15 = 0$$

$$c_y = \frac{600}{15}$$

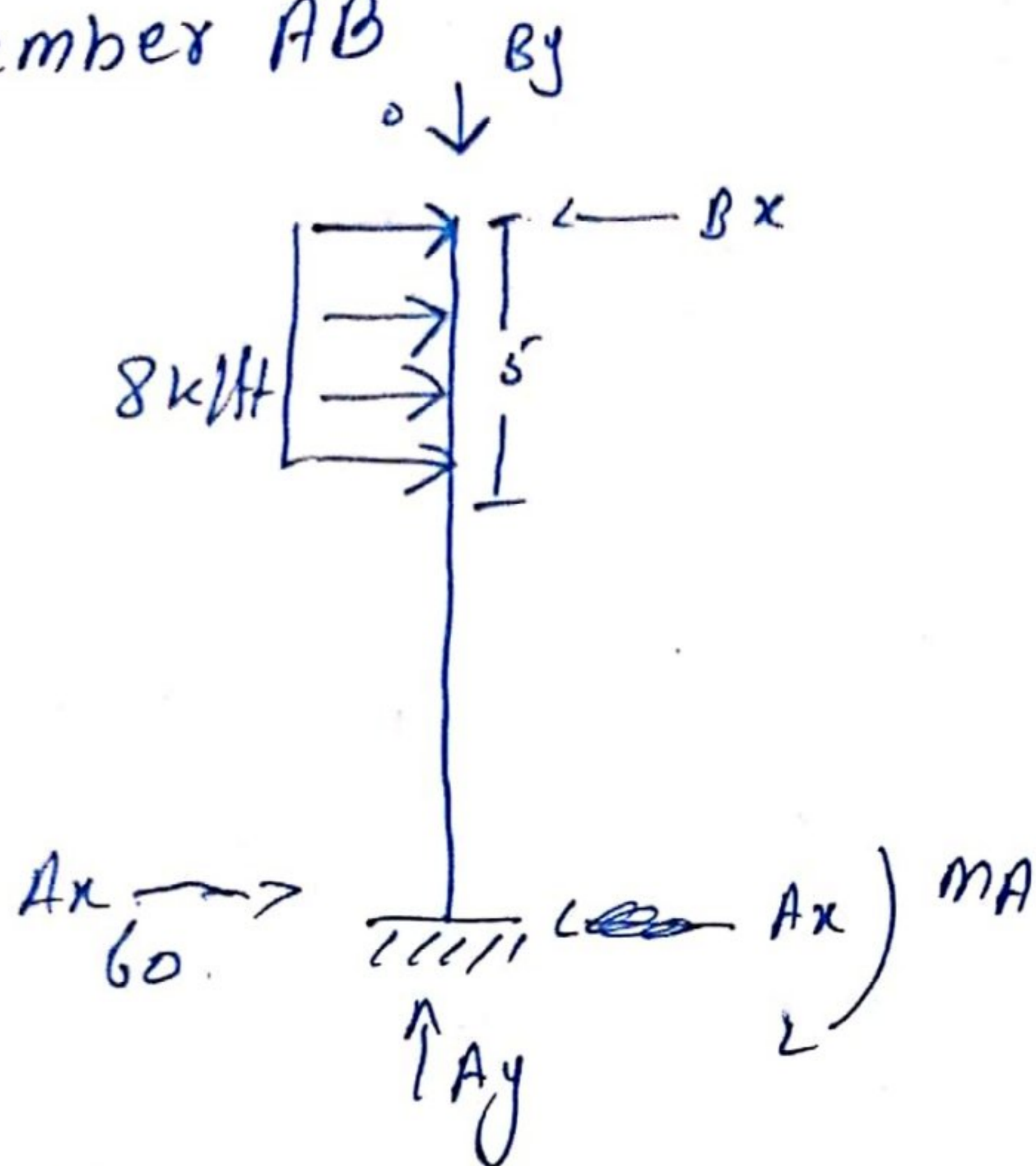
$$c_y = 40$$

$$B_y + c_y = 60$$

$$B_y = 60 - 40$$

$$B_y = 20$$

member AB



$$\sum F_x = 0$$

$$B_x + A_x - 40 = 0$$

$$A_x + B_x = 40$$

$$\sum F_y = 0 \uparrow +$$

$$A_y - B_y = 0$$

$$A_y - B_y = 0$$

$$A_y - 20 = 0$$

$$A_y = 20$$

$$\sum M_A = \uparrow$$

$$- B_x \times 10 + 40 \times 7.5 = 0$$

$$- 10 B_x = \frac{300}{10}$$

$$B_x = 100$$

Q2 page 4

$$Ax + Bx = 40$$

$$Ax = 40 - 100$$

$$Ax = -60$$

$$Ax = 60 \xrightarrow{+}$$

$$\sum MA = 0 \xrightarrow{+}$$

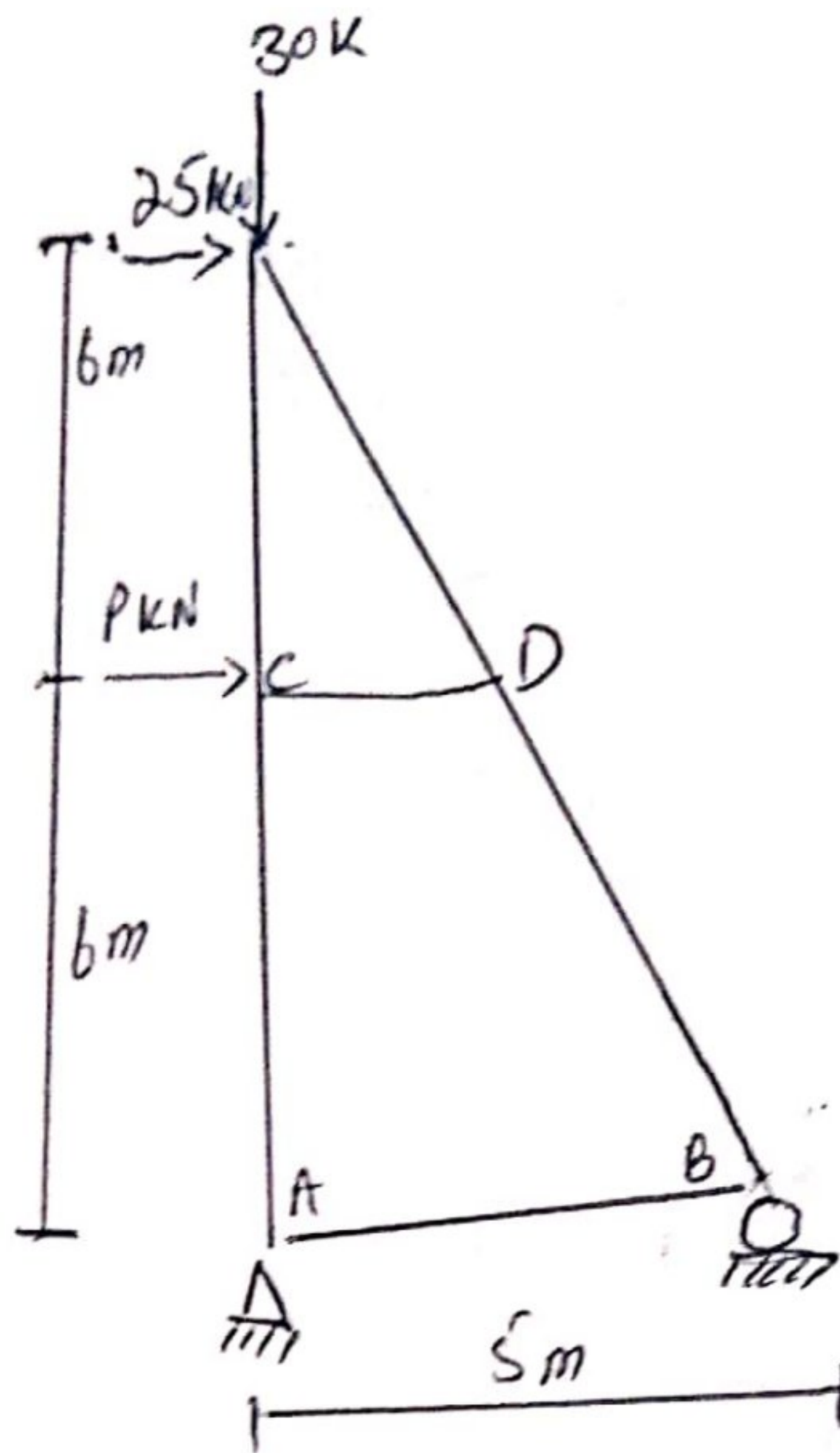
$$MA - 100 \times 10 + 40 \times 7.5 = 0$$

$$MA = 100 - 300$$

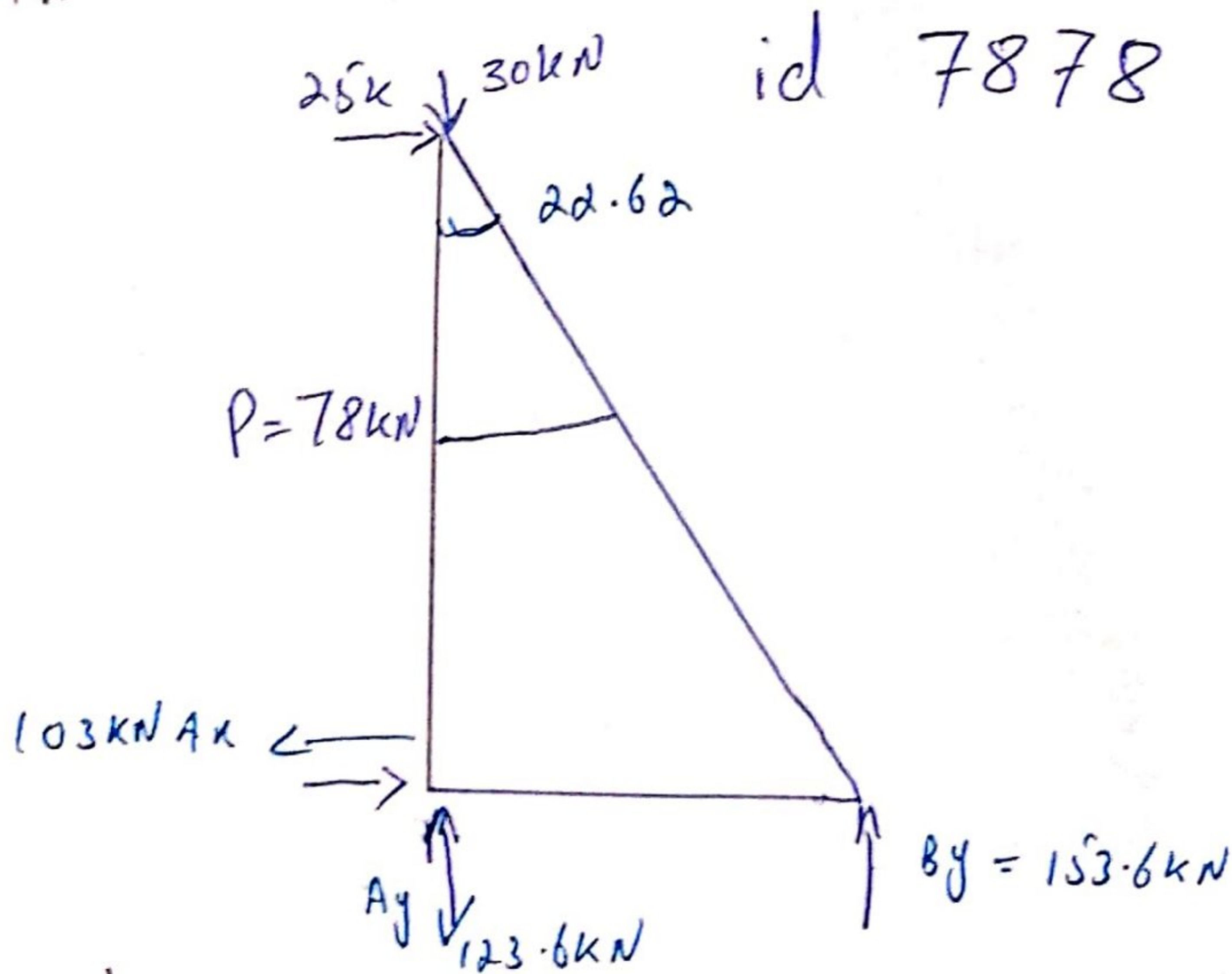
$$MA = \underline{700 \text{ Nm}}$$

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Q No 3:- Page 1



Sol:-



Reactions:-

$$\begin{aligned}\sum F_x &= 0 \rightarrow + \\ 25 + Ax + P &= 0 \\ Ax &= -25 - 78 \\ \boxed{Ax} &= \boxed{-103 \text{ kN}}\end{aligned}$$

$$\sum F_y = 0 \uparrow^+$$

$$A_y - 30 + B_y = 0$$

$$A_y + B_y = 30 \quad \text{--- (1)}$$

$$\sum M_A = 0 \quad \curvearrowright$$

$$-(B_y \times 5) + (25 \times 12) + (78 \times 6) = 0$$

$$+ 5B_y = 300 + 488$$

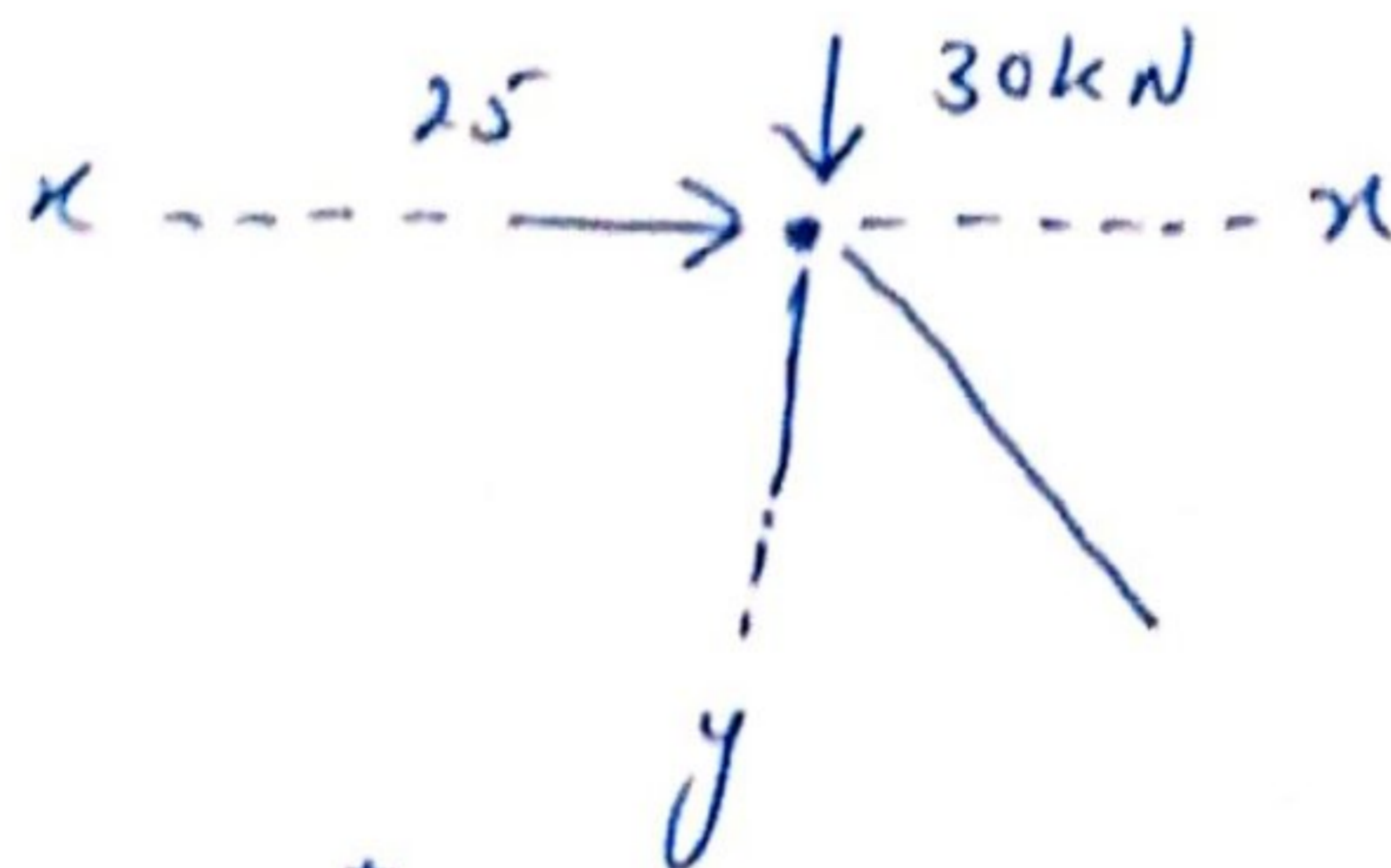
$$B_y = \frac{788}{5}$$

$$B_y = 153.6 \text{ kN}$$

$$\text{U} \Rightarrow A_y = 30 - 153.6$$

$$A_y = -123.6 \text{ kN}$$

Joint E



$$\sum F_x = 0 \quad \rightarrow^+ \leftarrow^-$$

$$25 - \sin(67.38) \cdot F_{ED} = 0$$

$$F_{ED} = \frac{25}{\sin 22.62} = 65.4$$



$$\tan \theta = \frac{p}{b}$$

$$\theta = \tan^{-1} \frac{p}{b}$$

$$= \tan^{-1} \frac{12}{15}$$

$$= 67.38^\circ$$

$$\sum F_y = 0 \uparrow +$$

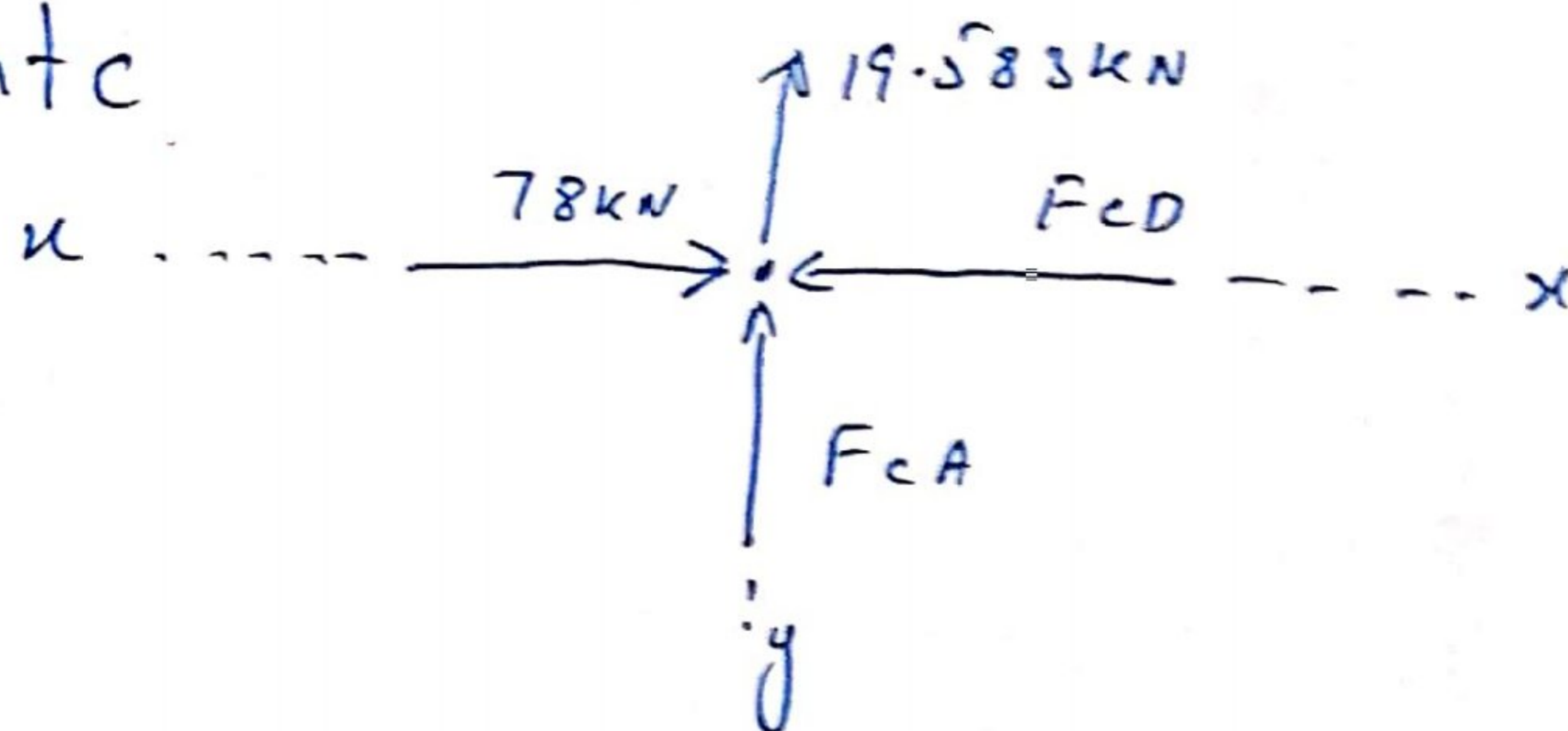
$$-30 + F_{EC} + F_{ED} \cos(67.38) = 0$$

$$F_{EC} + 65(0.385) = 30$$

$$F_{EC} = 30 - 25 \cdot 0.385$$

$$F_{EC} = 4.975 \text{ kN}$$

Joint c



$$\sum F_x = 0 \rightarrow +$$

$$78 - F_{cD} = 0$$

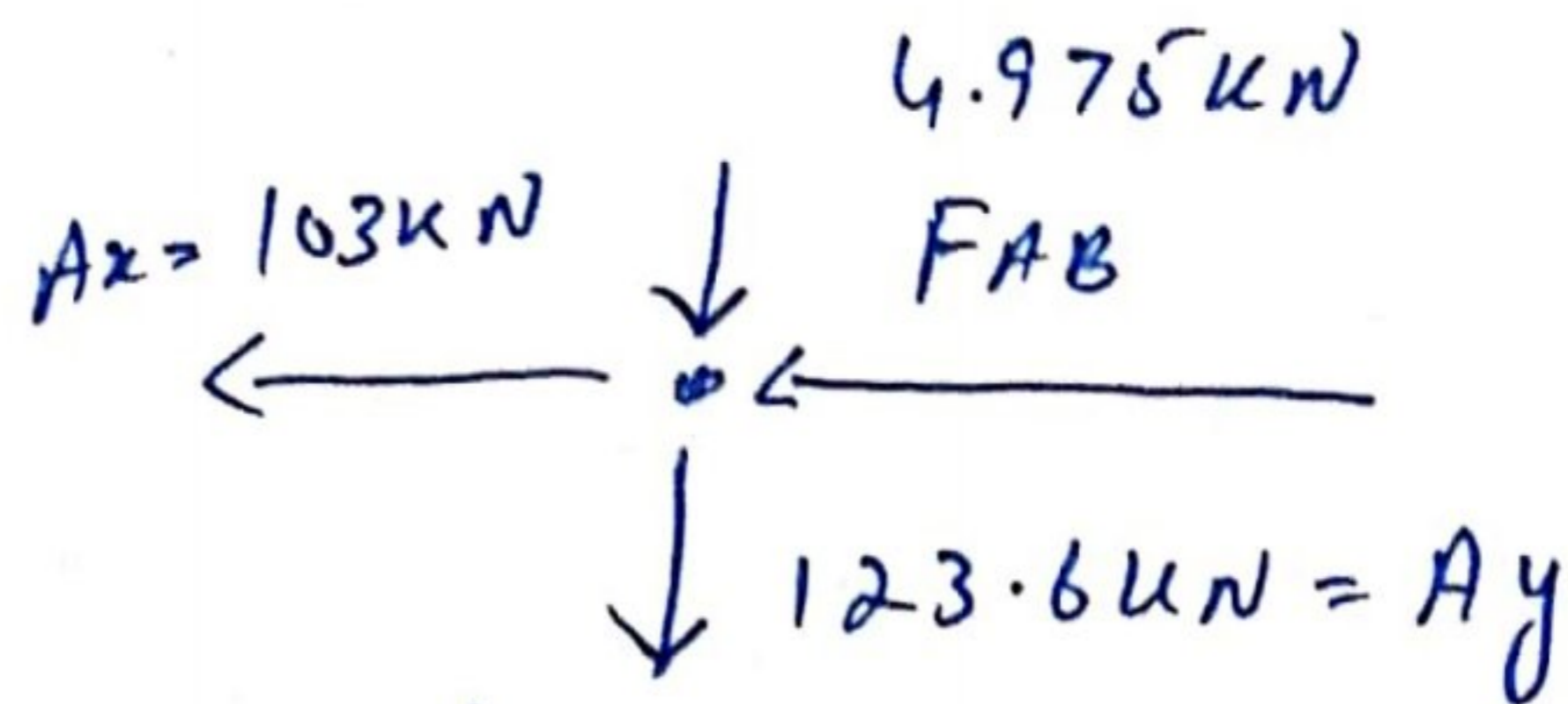
$$F_{cD} = 78 \text{ kN}$$

$$\sum F_y = 0 \uparrow +$$

$$F_{cA} = 4.975$$

$$F_{cA} = -4.975$$

Joint A



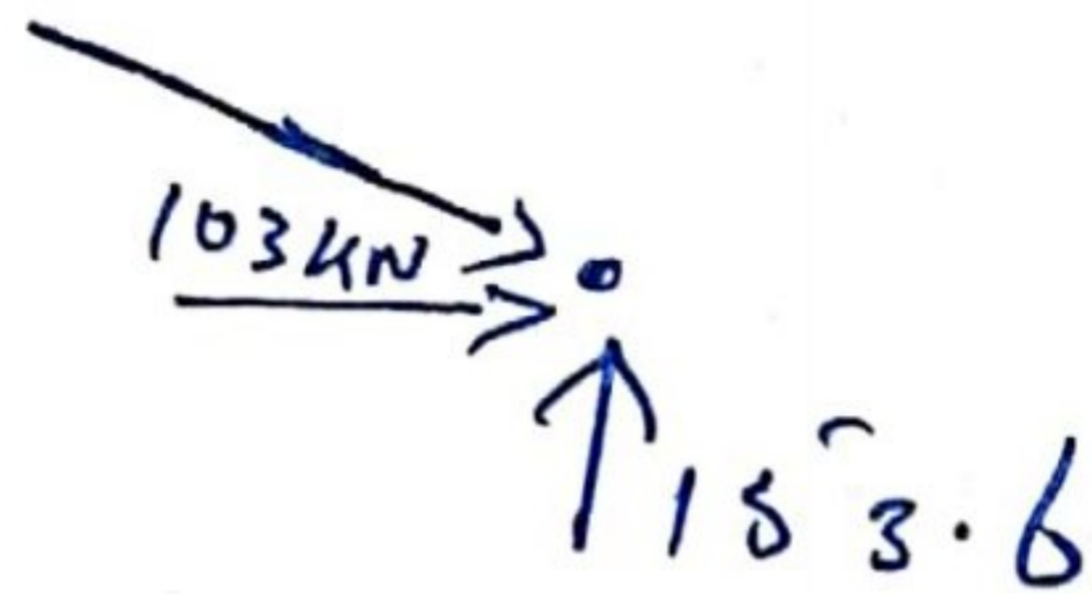
$$\sum F_x = 0 \longrightarrow +$$

$$-103 - FAB = 0$$

$$\boxed{FAB = -103 \text{ kN}} \longrightarrow$$

(4)

Joint B :-



$$\sum F_y = 0 \uparrow +$$

$$153.6 - FBD \sin 67.38$$

$$FBD = \frac{153.6}{\sin 67.38}$$

$$\boxed{FBD = 166.4}$$