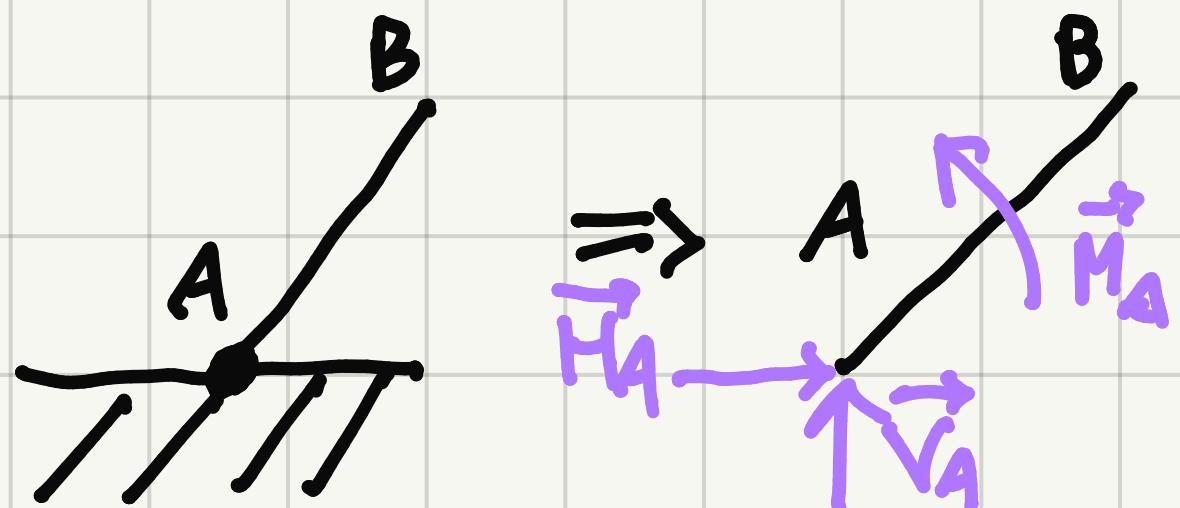


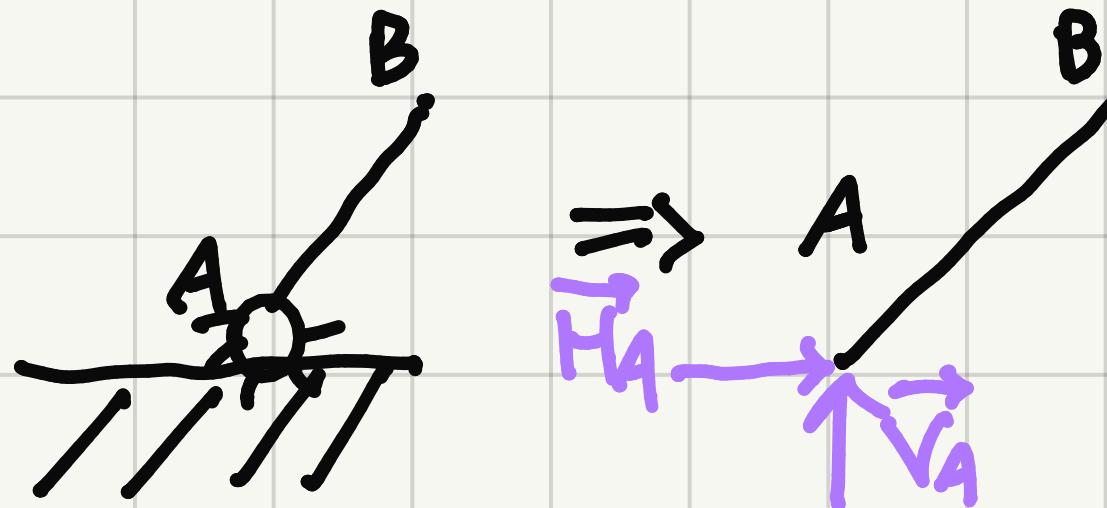
RICHIAMI CONCETTUALI

TRADUZIONE VINCOLI → FORZE REATTIVE

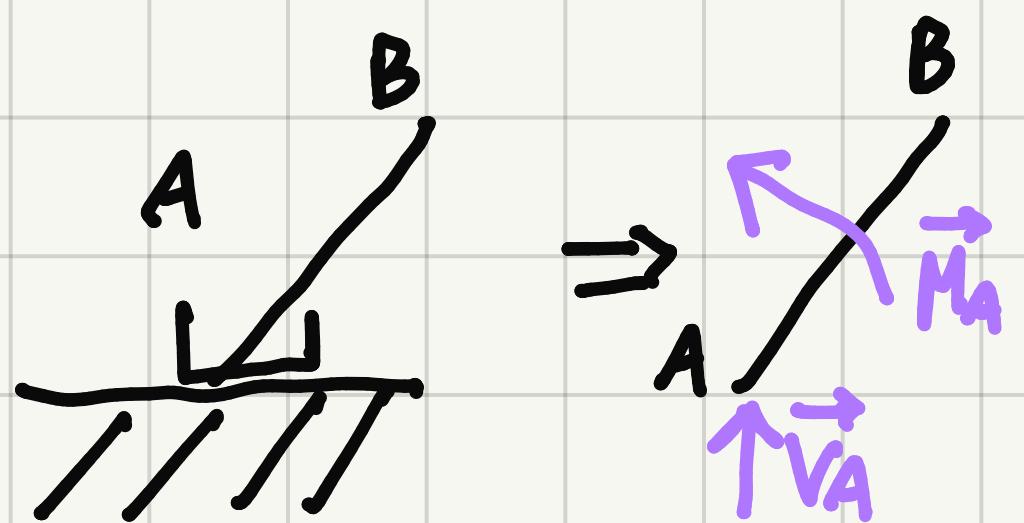
INCASTRO



CERNIERA



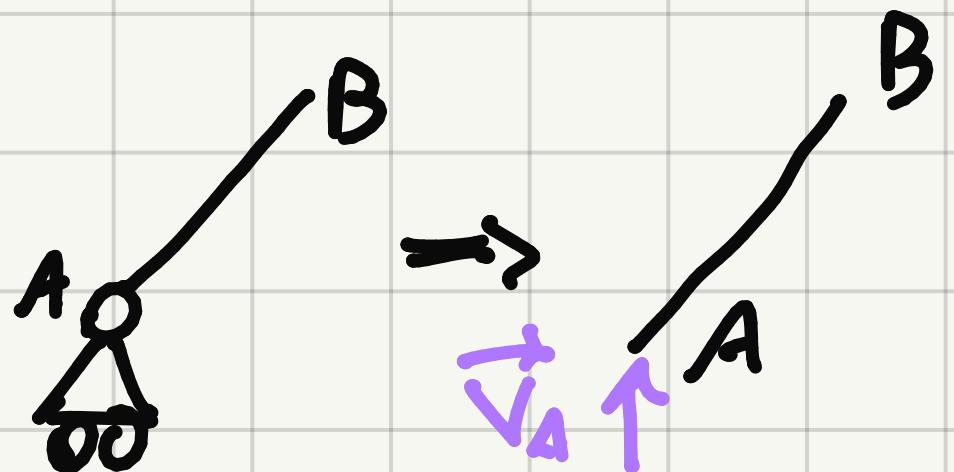
PATINO



MANICOITO



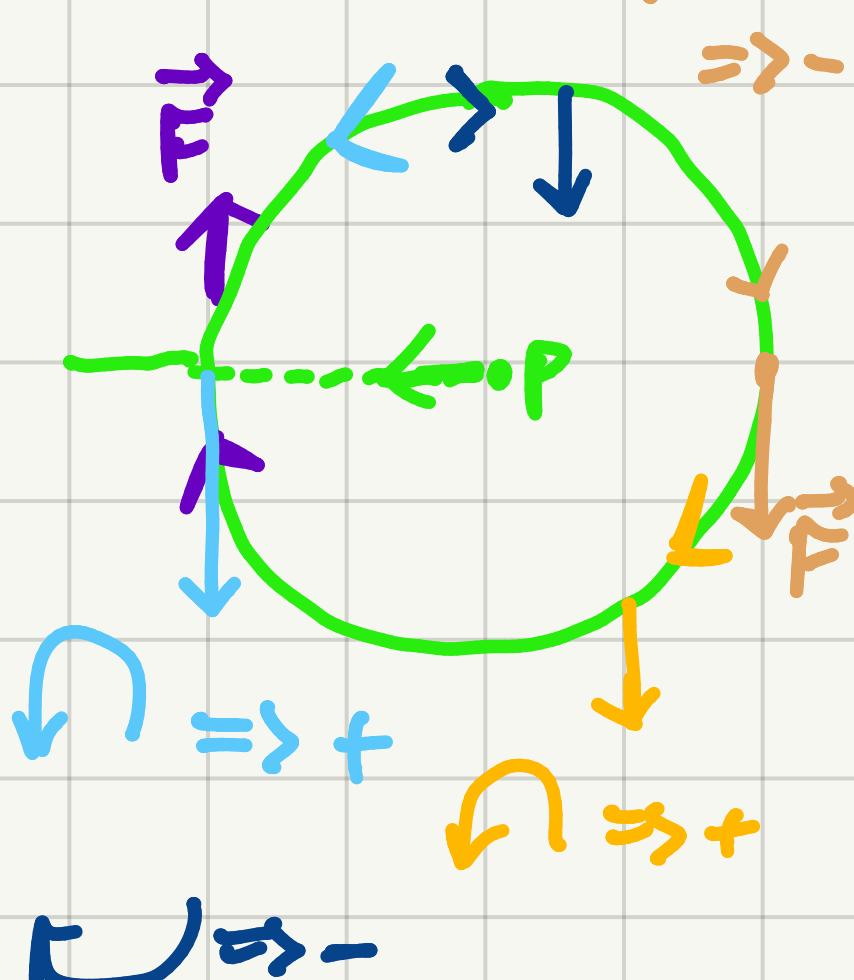
CARRELLO



$$\tau \Rightarrow -$$

$$M_p$$

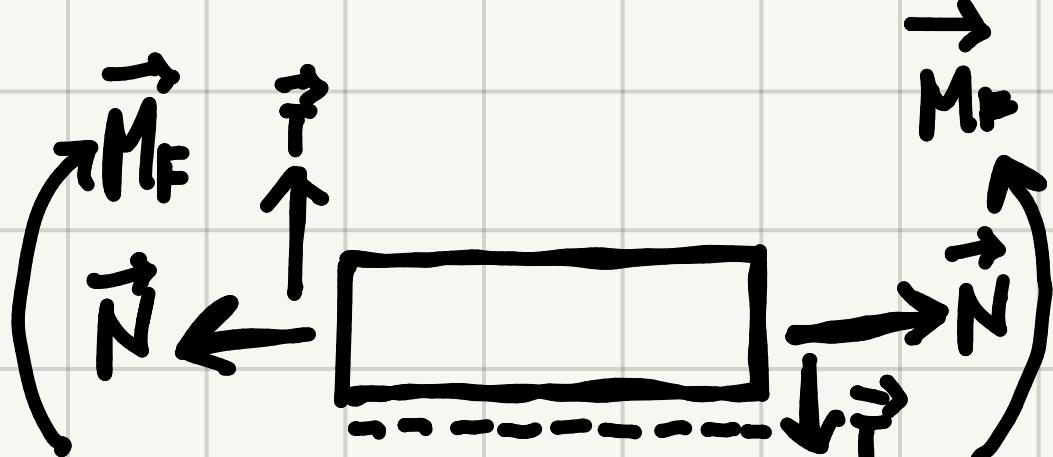
DISEGNA UNA CIRCONFERENZA IMMAGINARIA

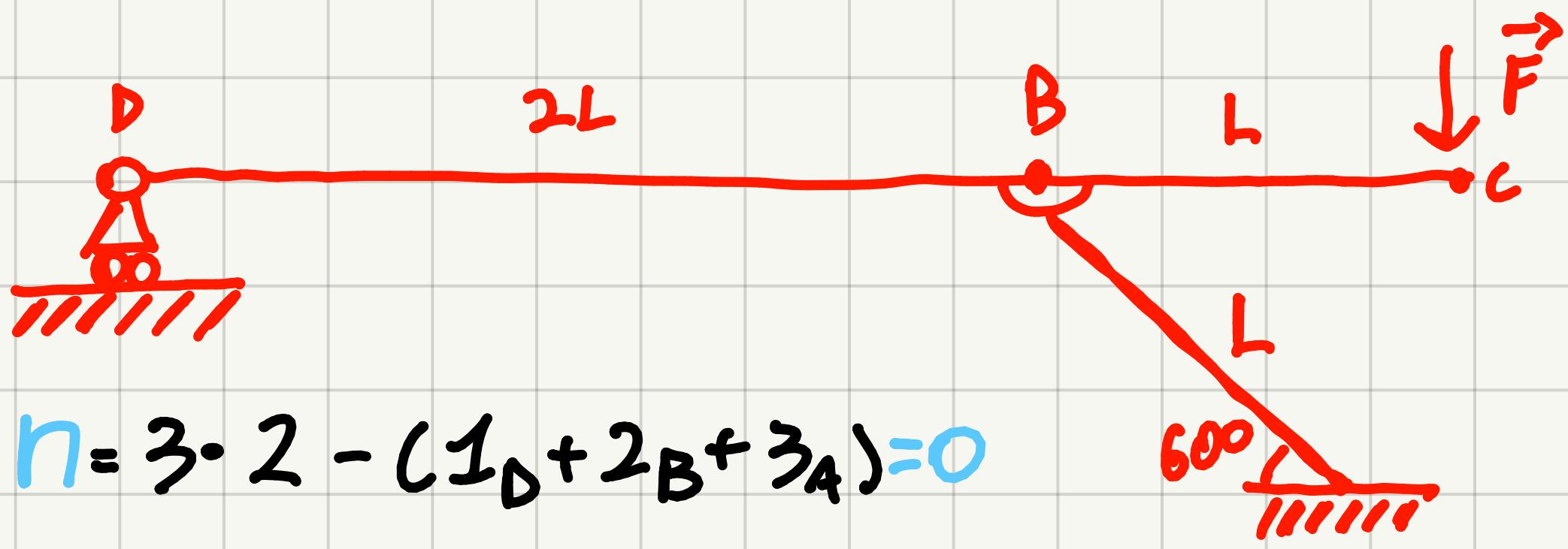


CENTRATA IN P ED \vec{F} ALL'ESIGUIO OPPONUTO. PER

FAR COINCIDERE IL SENSO DELLA PRECIA MI MUOVO
IN SENSO ORARIO O ANTOARIO
TANNO

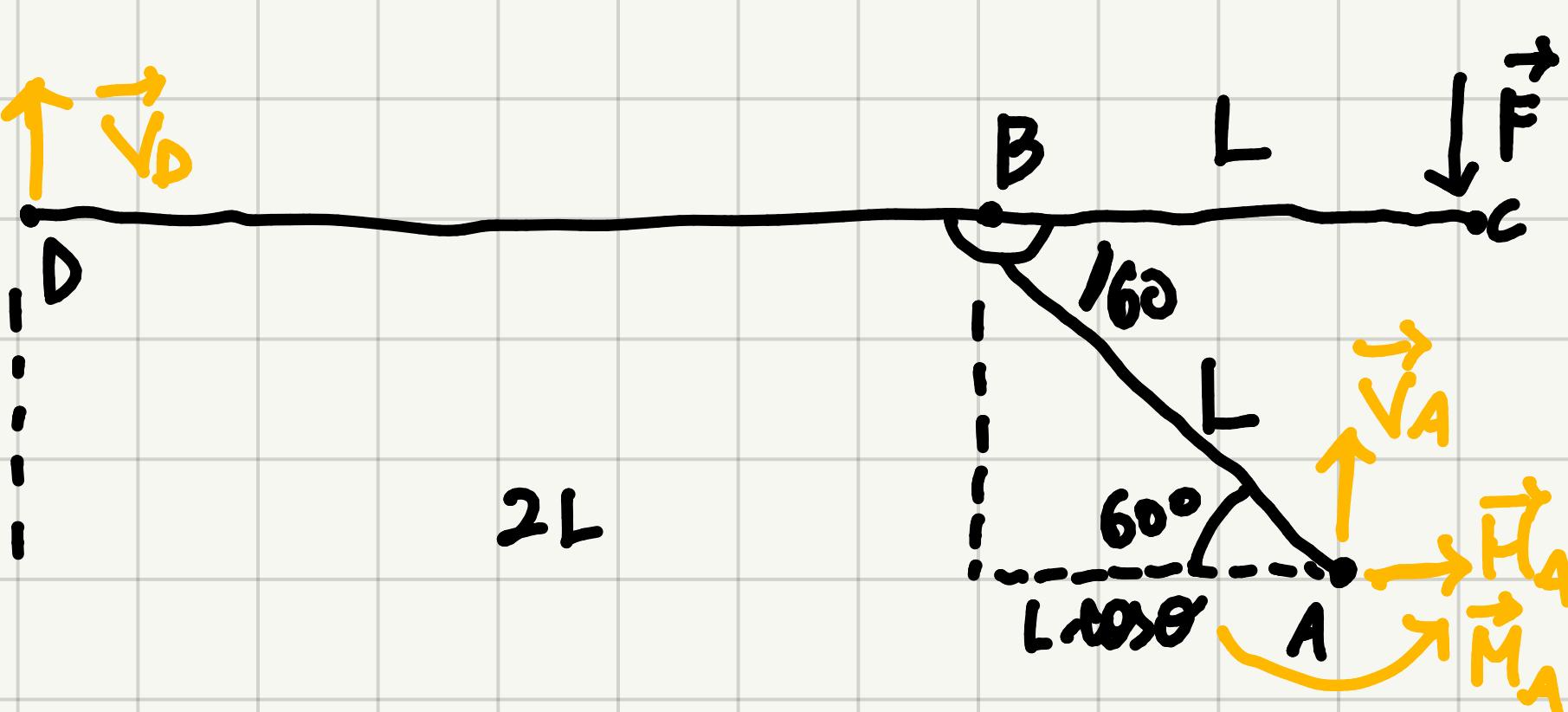
FIBRE TESE SOTTO AL CORPO RISPETTO ALLO SPOSTAMENTO





- REAZIONI VINCOLARI A TERRA?
- AZIONI INTERNE IN DC

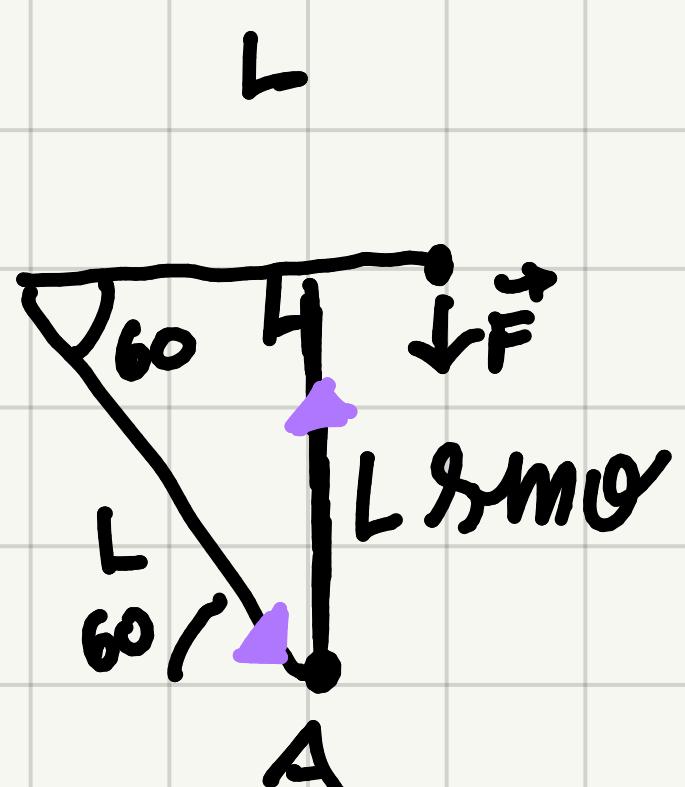
! NEL SISTEMA GLOBALE, NON RIPORTO LE FORZE IN B



$$\begin{cases} H_A = 0 \\ V_D - F + V_A = 0 \end{cases}$$

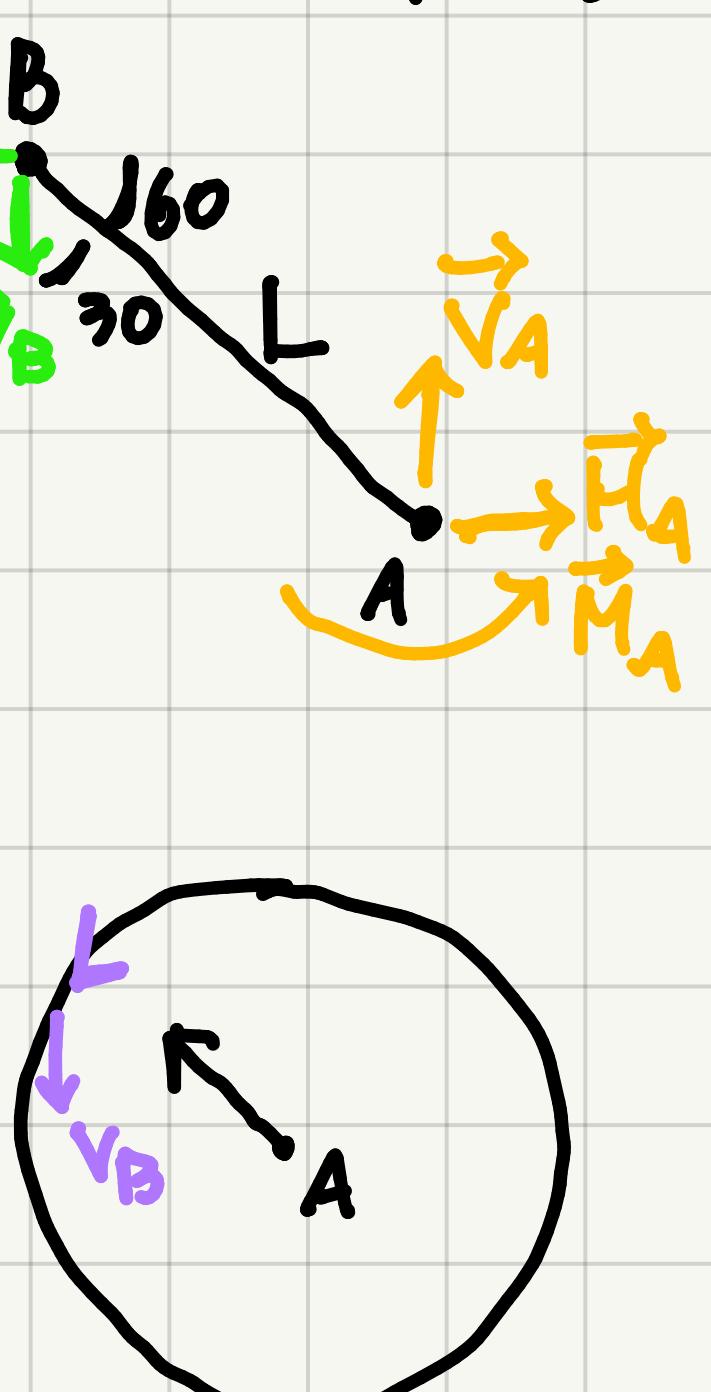
$$A [M_A - V_D(2L + L \cos 60^\circ) - F(L - L \sin 60^\circ) = 0]$$

4 INCognITE, 3 EQUAZIONI
⇒ SPEZZATO

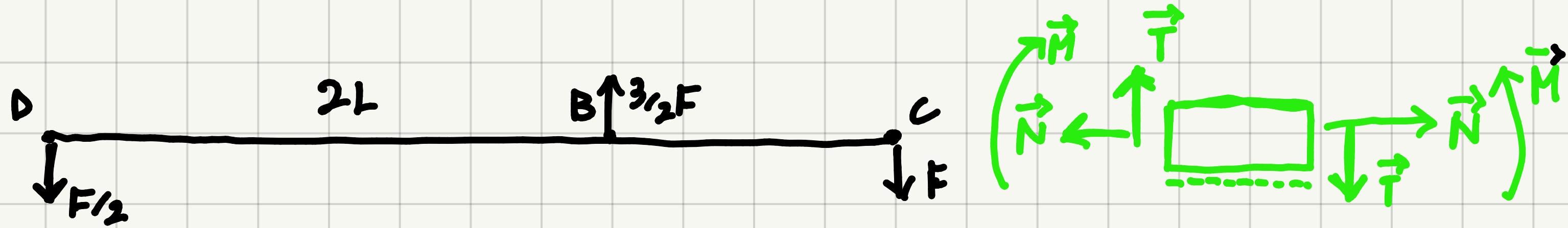


$$\begin{cases} H_B = 0 \\ V_D + V_B - F = 0 \\ 2L V_B - 3LF = 0 \end{cases}$$

$$\begin{cases} H_A - H_B = 0 \\ V_A - V_B = 0 \\ M_A + V_B L \sin 30^\circ = 0 \end{cases}$$



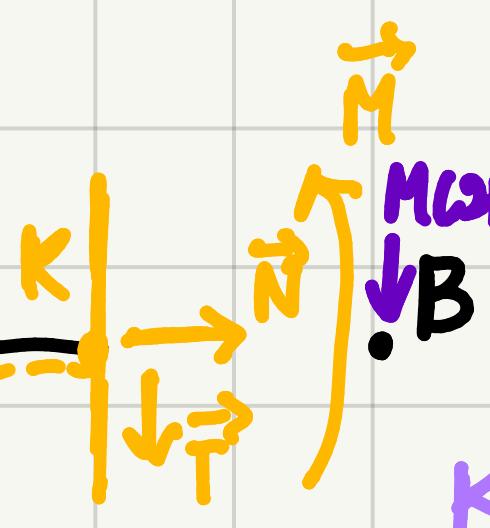
$$\begin{cases} H_B = 0 \\ V_D = -\frac{1}{2}F \\ V_B = \frac{3}{2}F \\ H_A = 0 \\ V_A = \frac{3}{2}F \\ M_A = -\frac{3}{4}FL \end{cases}$$



ASTA DB

$$M(0)$$

$$0 \leq x \leq 2L$$



$$\begin{cases} N=0 \\ T=-F/2 \\ M+F_x x=0 \end{cases}$$

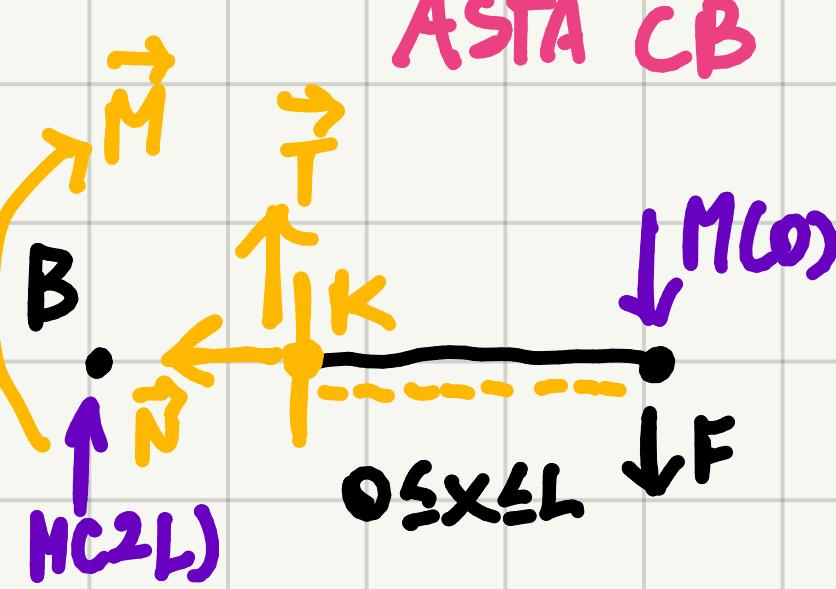
$$M(0)=0 \quad M(2L)=-FL$$

DA NOTARE

UN BISOGNO DI

IN B

ASTA CB



$$\begin{cases} N=0 \\ T=F \\ M-Fx=0 \end{cases} \quad M(0)=0$$

$$M(L)=-FL$$

T



$$-F/2$$

N

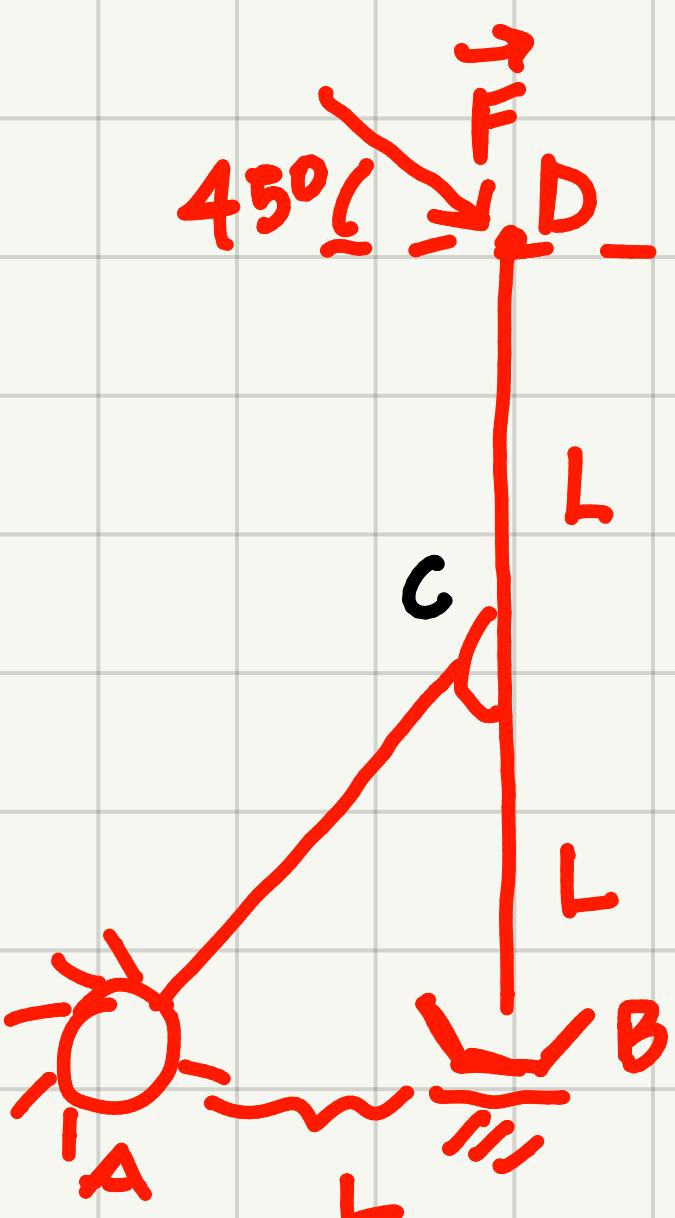
D



M

B

$-FL \Rightarrow$ OPPOSIZIONE ALLE FIBRE TESSE

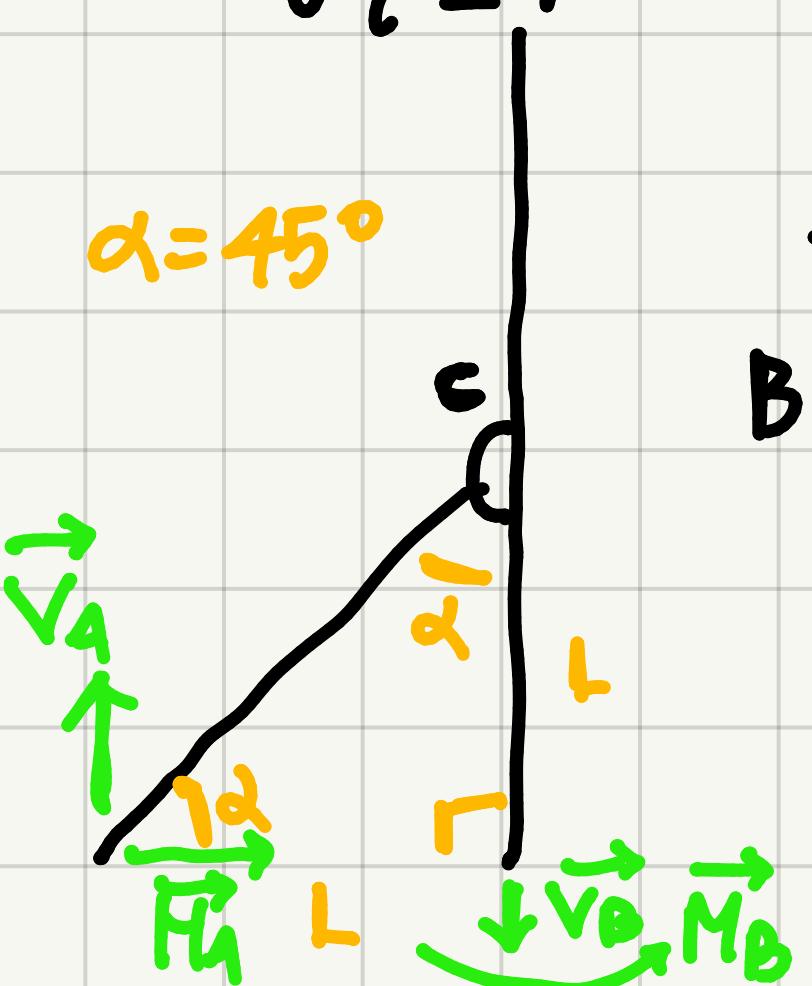


• REAZIONI VINCOLARI?

• AZIONI INTERNE IN DB

$$n = 6 - (2_A + 2_B + 2_C) = 0$$

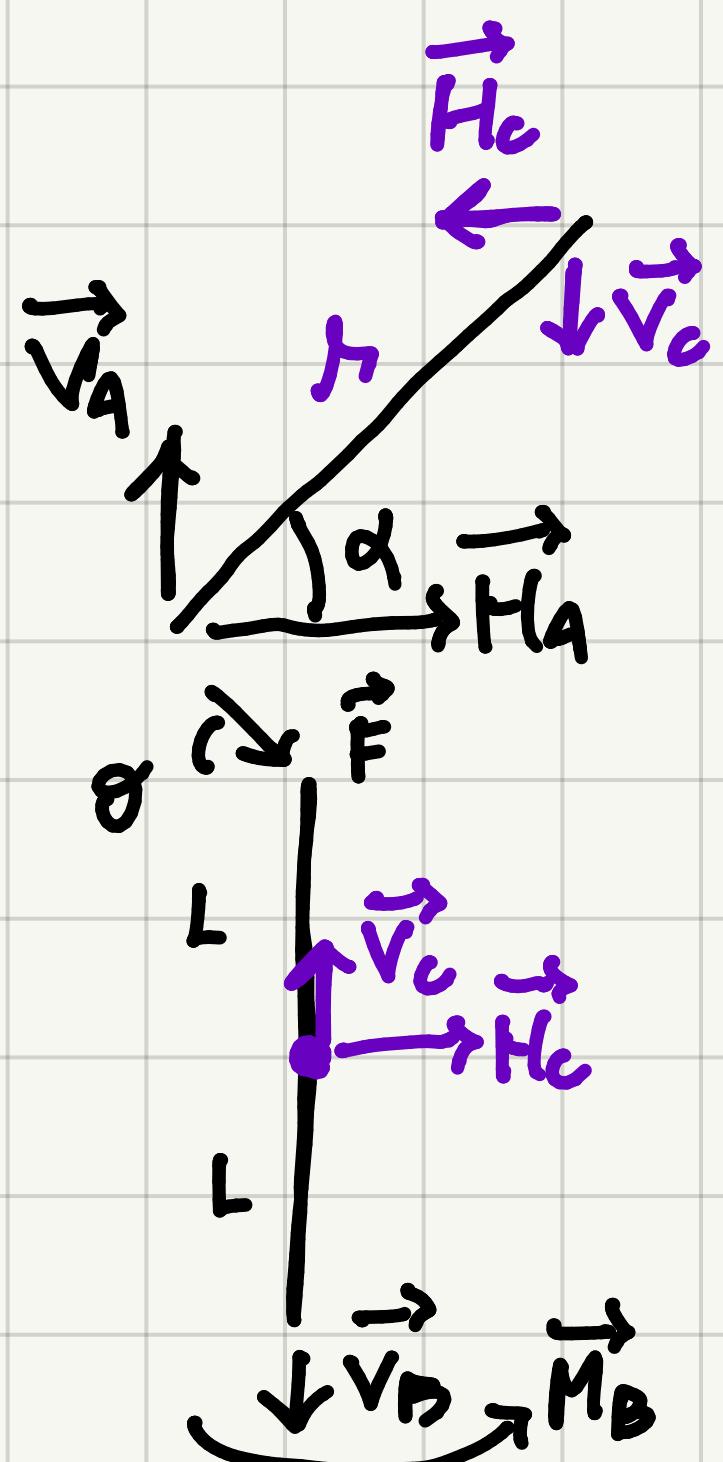
$$\theta \leftarrow \vec{F}$$



$$\begin{cases} F_A \cos \theta + H_A = 0 \\ -F_A \sin \theta + V_A - V_B = 0 \\ M_B - L V_A - 2FL \sin \theta = 0 \end{cases}$$

! 4 INCognITE =>

SPEZZATO I CORPI



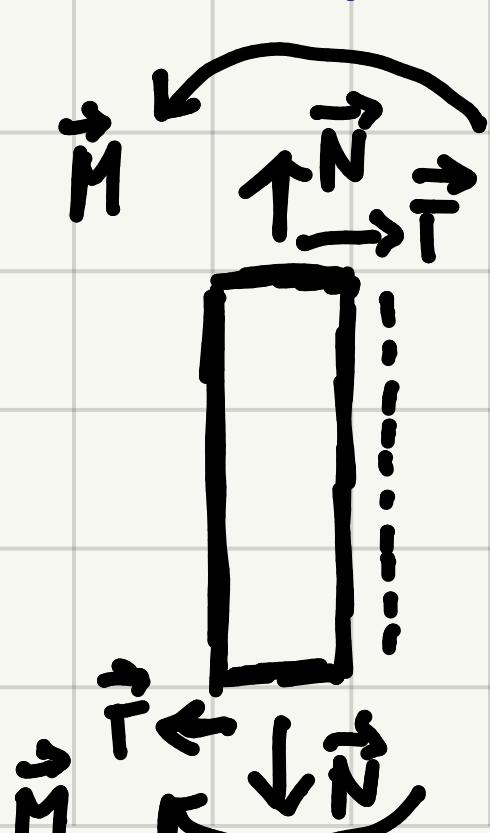
$$\begin{cases} H_A - H_C = 0 \\ V_A - V_C = 0 \\ -\gamma_2 V_C \sin \alpha + \gamma_2 H_C \sin(\alpha - \alpha) = 0 \end{cases}$$

$$\begin{cases} F_A \cos \theta + H_C = 0 \\ -F_A \sin \theta + V_C - V_B = 0 \\ -H_C L + M_B = 0 \end{cases}$$

$$\begin{cases} H_A = H_C \\ V_A = V_C \\ V_C = H_C \\ H_C = -\sqrt{2}/2 F \\ V_B = \sqrt{2} F \\ M_B = \sqrt{2}/2 F L \end{cases}$$

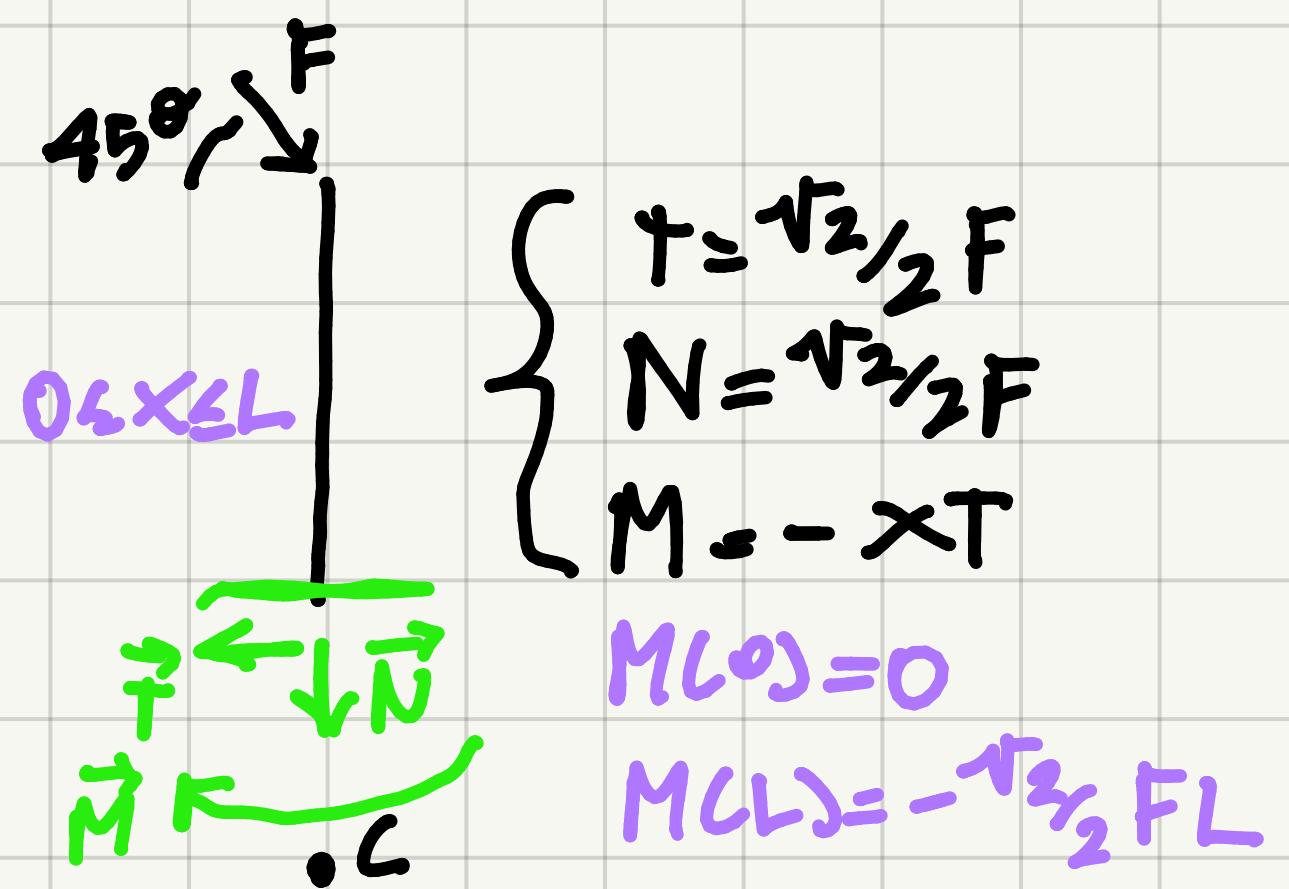
$$H_A = -\sqrt{2}/2 F \quad V_A = -\sqrt{2}/2 F$$

$$V_B = \sqrt{2} F \quad M_B = -\sqrt{2}/2 F L$$

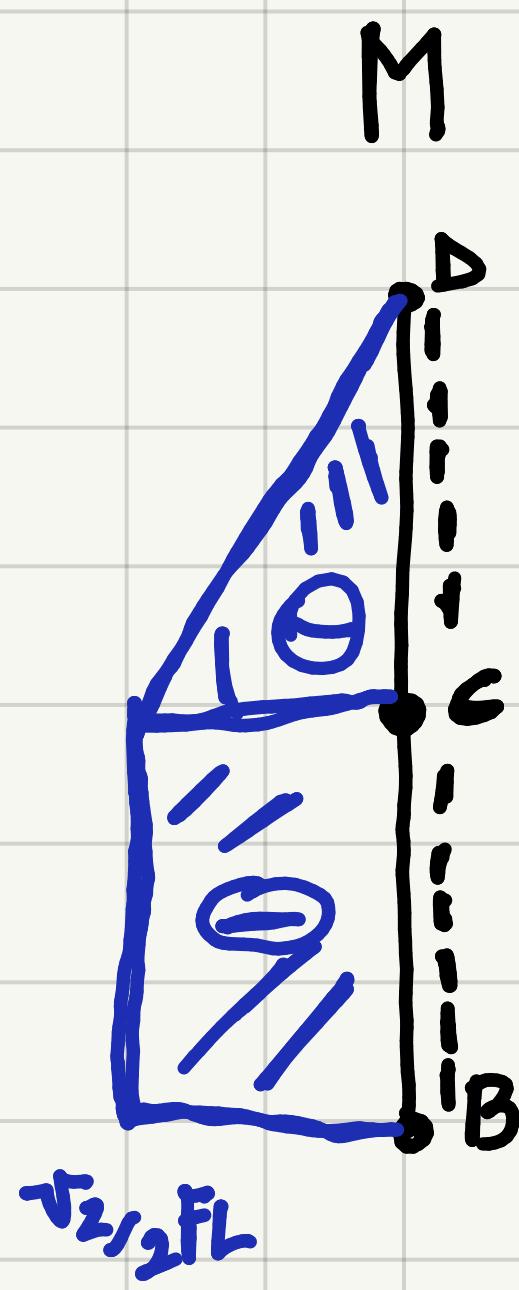
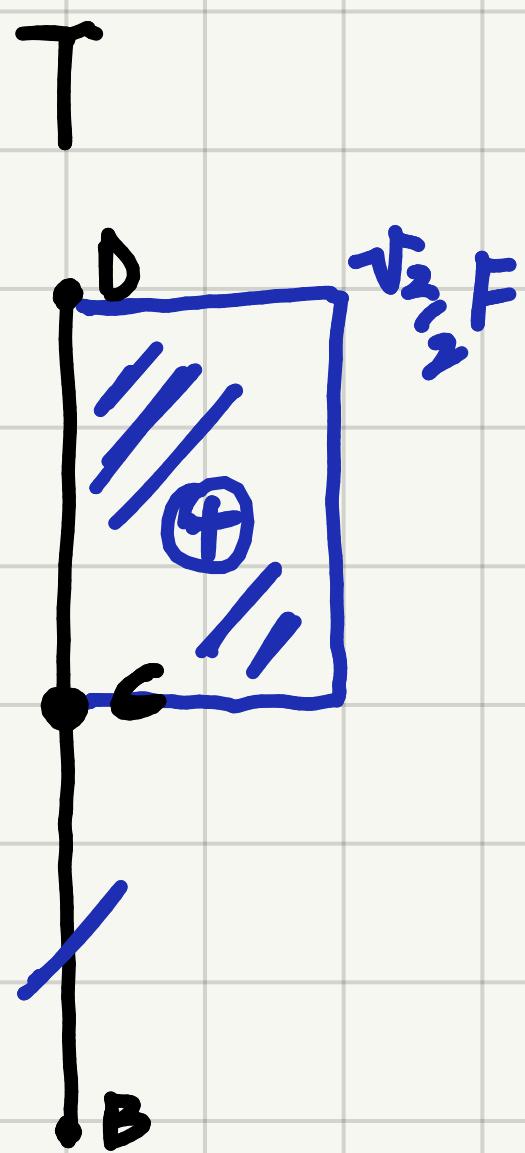
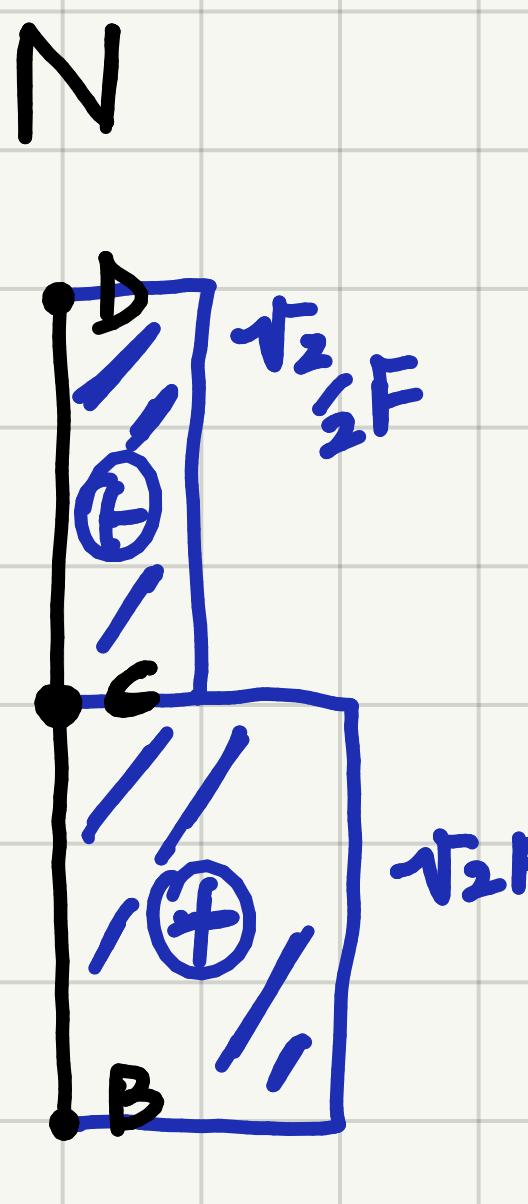


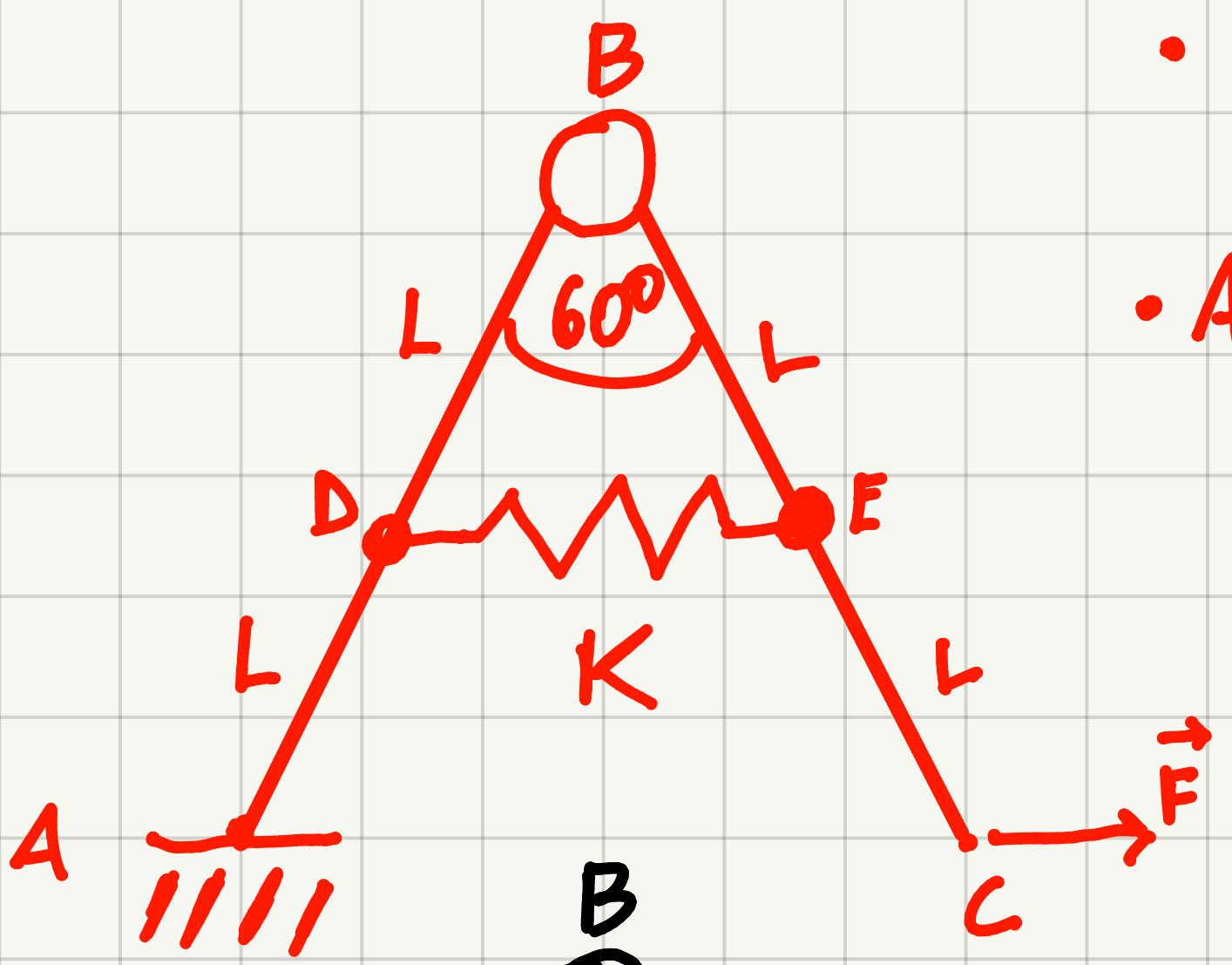


$$\left\{ \begin{array}{l} T = 0 \\ N = \sqrt{2}/2 F \\ M = -\sqrt{2}/2 F L \end{array} \right.$$



$$\left\{ \begin{array}{l} T = \sqrt{2}/2 F \\ N = \sqrt{2}/2 F \\ M = -\sqrt{2}/2 F L \end{array} \right.$$



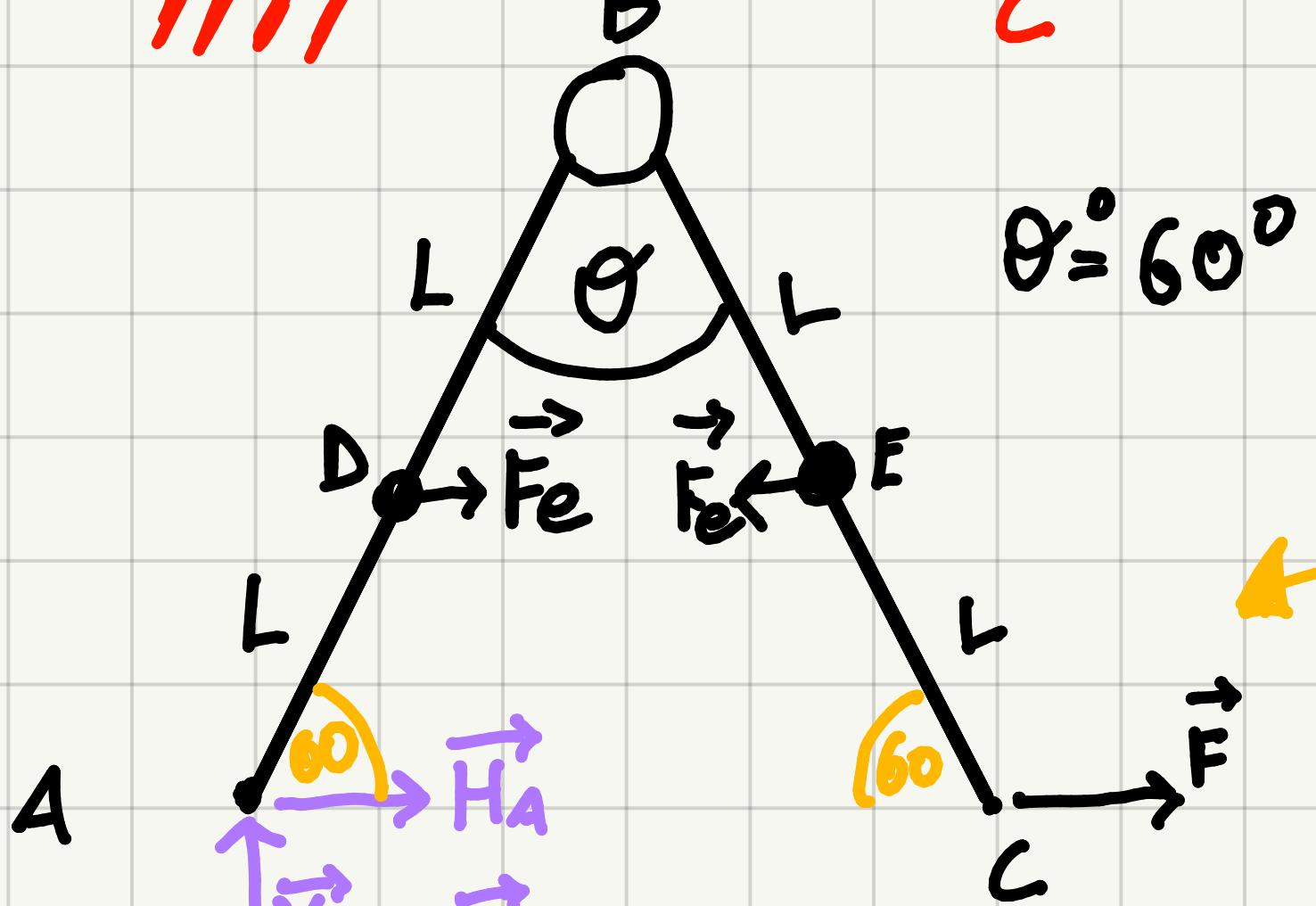


• K? $\ell_0 = L/2$

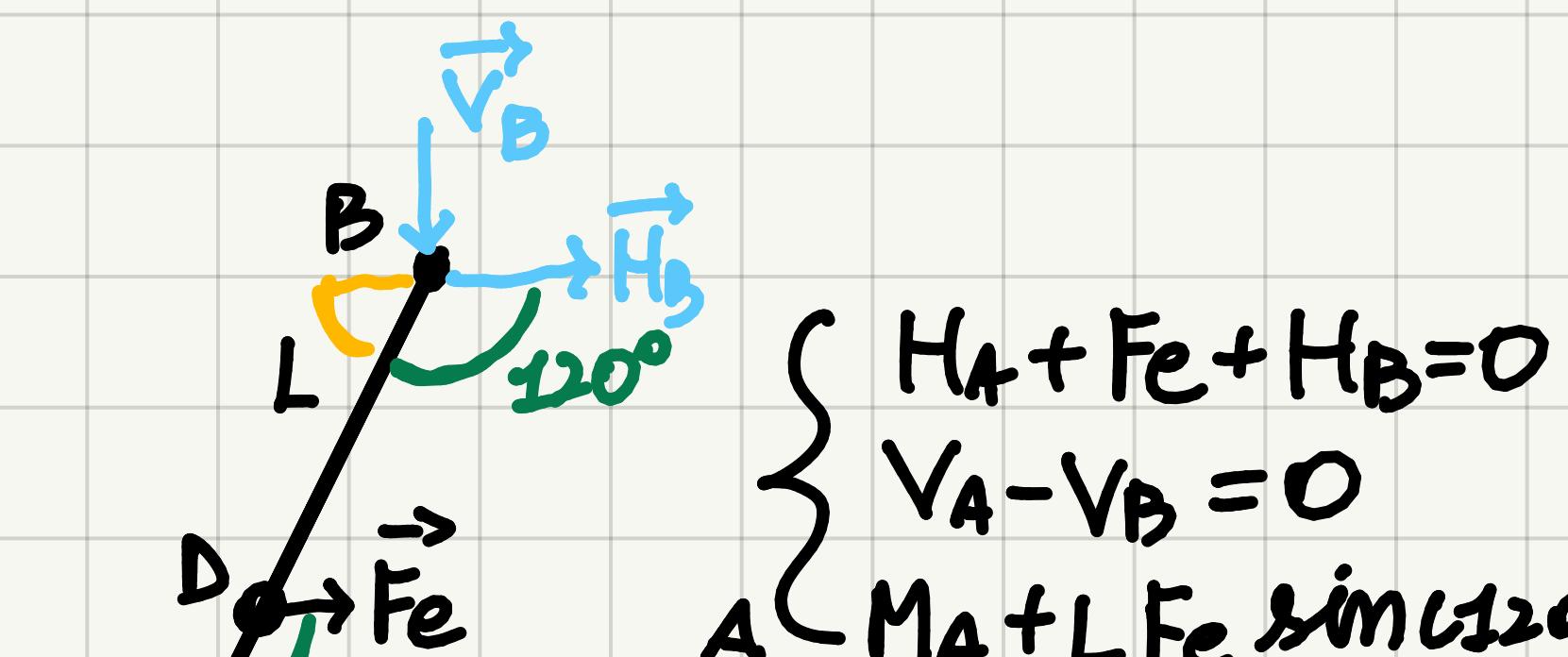
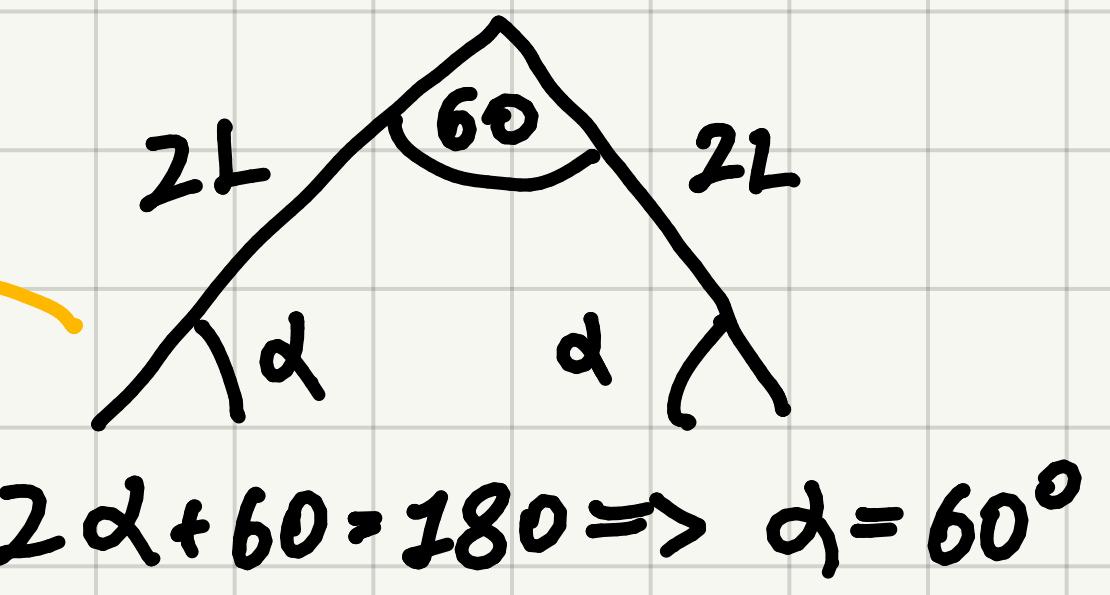
• AZIONI INTERNE IN AB?

$$n = 3 \cdot 2 \cdot (3_A + 2_C + 1_{M_{AB}}) = 0$$

$$F_e = K(L - \ell_0) = KL/2$$



$$\theta = 60^\circ$$

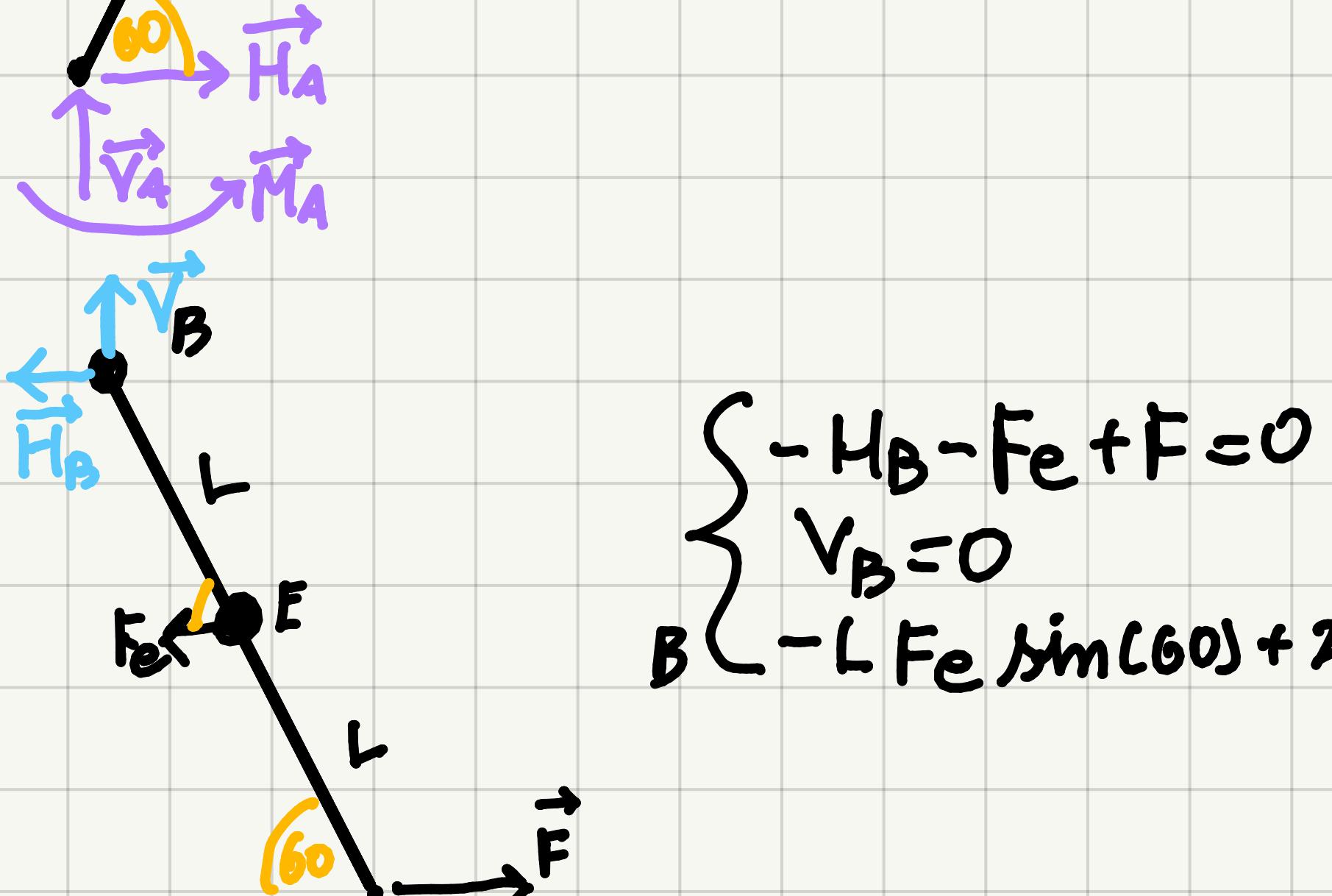


$$30 + 90$$

$$= 0$$

$$\left. \begin{array}{l} H_A + F_e + H_B = 0 \\ V_A - V_B = 0 \end{array} \right\}$$

$$M_A + L F_e \sin(120) + 2L H_B \sin(120) - 2L V_B \sin(150) = 0$$

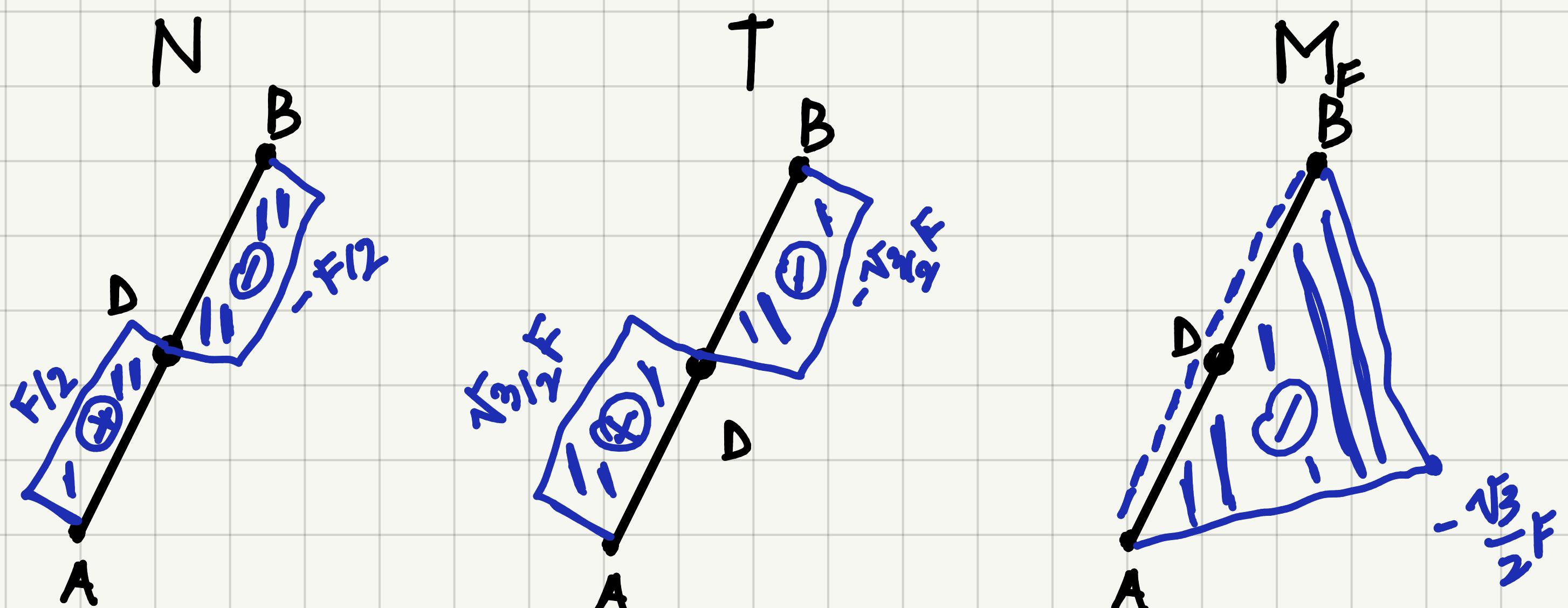
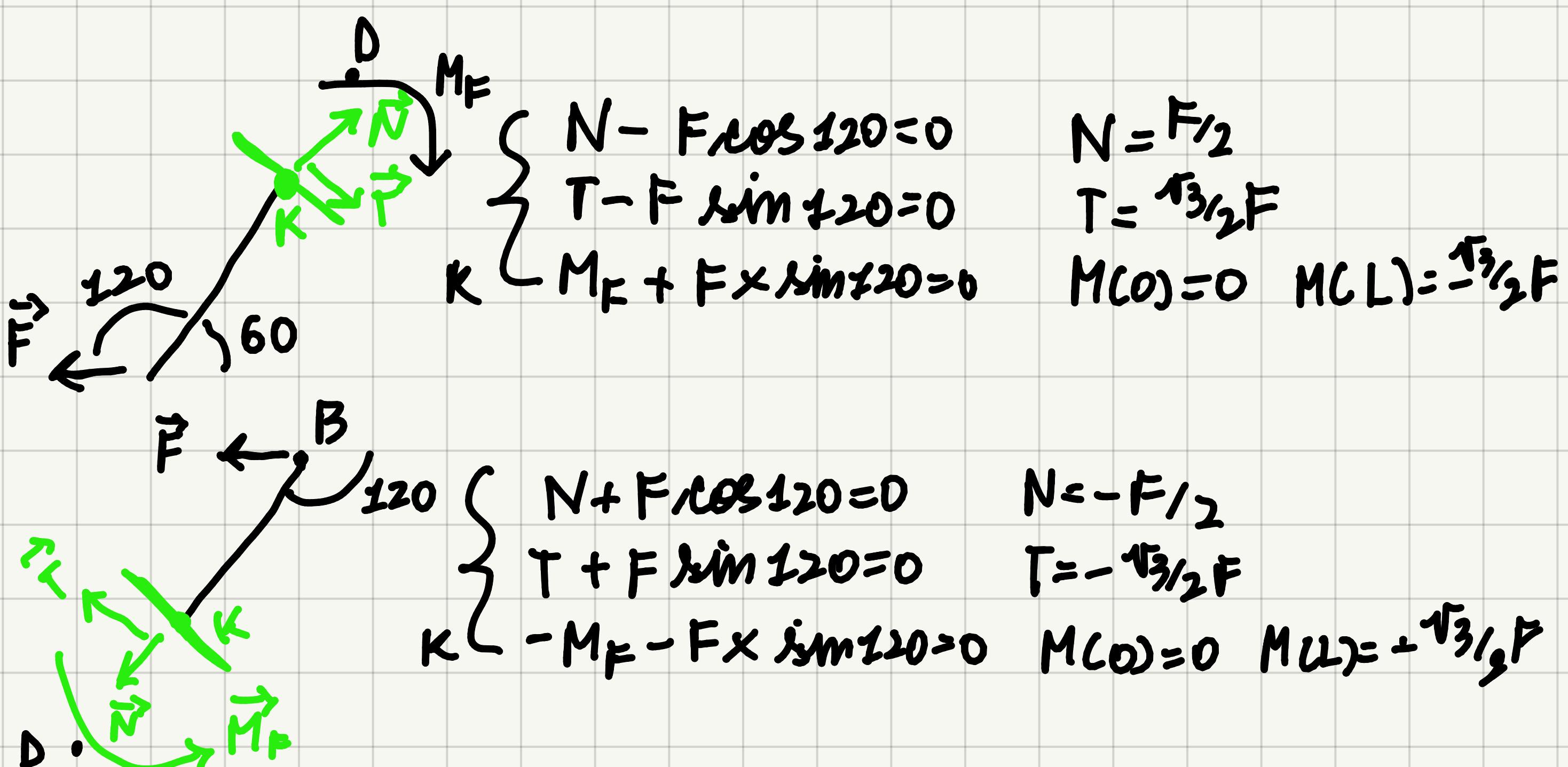
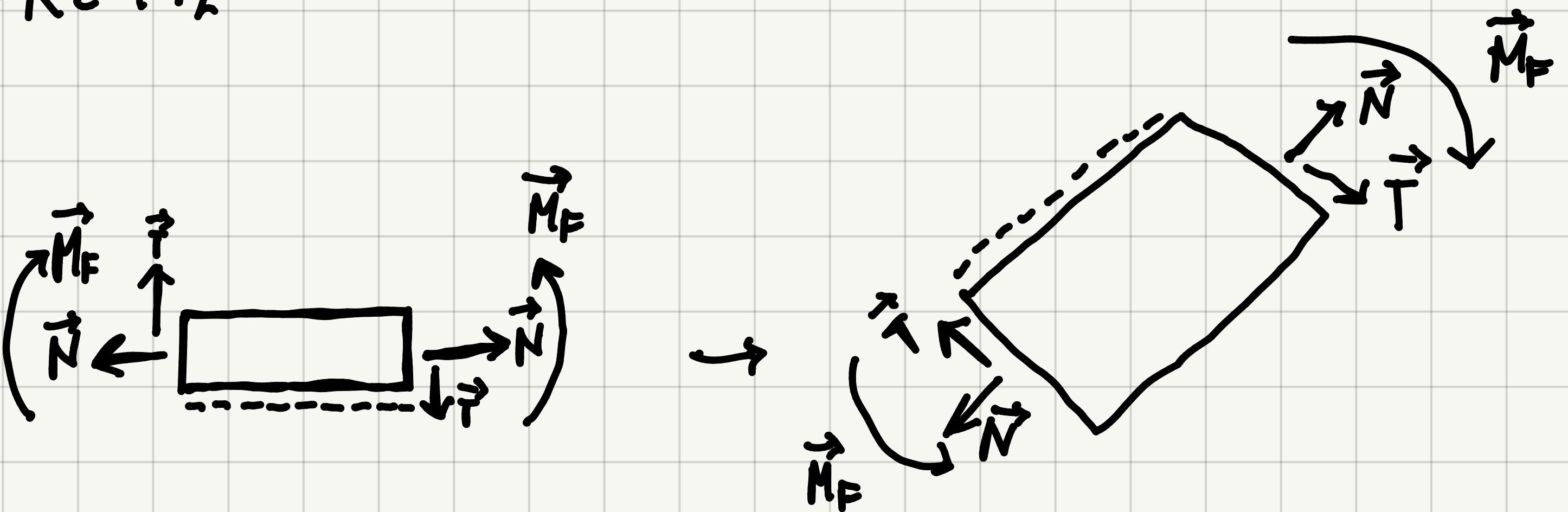


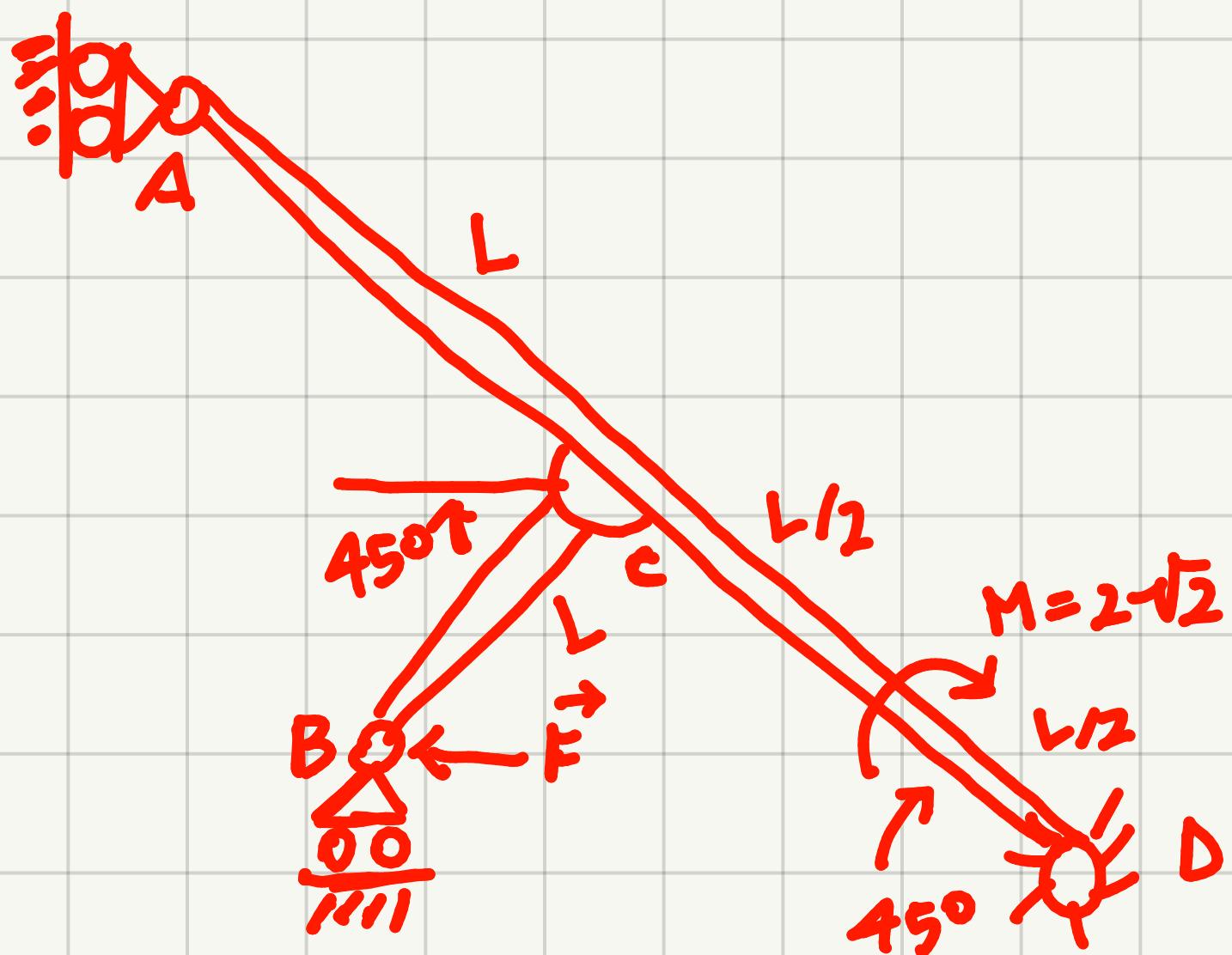
$$\left. \begin{array}{l} -H_B - F_e + F = 0 \\ V_B = 0 \end{array} \right\}$$

$$-L F_e \sin(60) + 2L F \sin(60) = 0 *$$

$$\Rightarrow -L \cdot K L/2 + 2L F = 0 \Rightarrow K = \frac{4F}{L}$$

$$\left\{ \begin{array}{l} H_A = -F \\ V_A = 0 \\ M_A = \sqrt{3}/2 (2L \cdot F - L \cdot \frac{4F}{L} \cdot \frac{\sqrt{3}}{2}) = 0 \\ H_B = -F \\ V_B = 0 \\ K = 4F/L \end{array} \right.$$

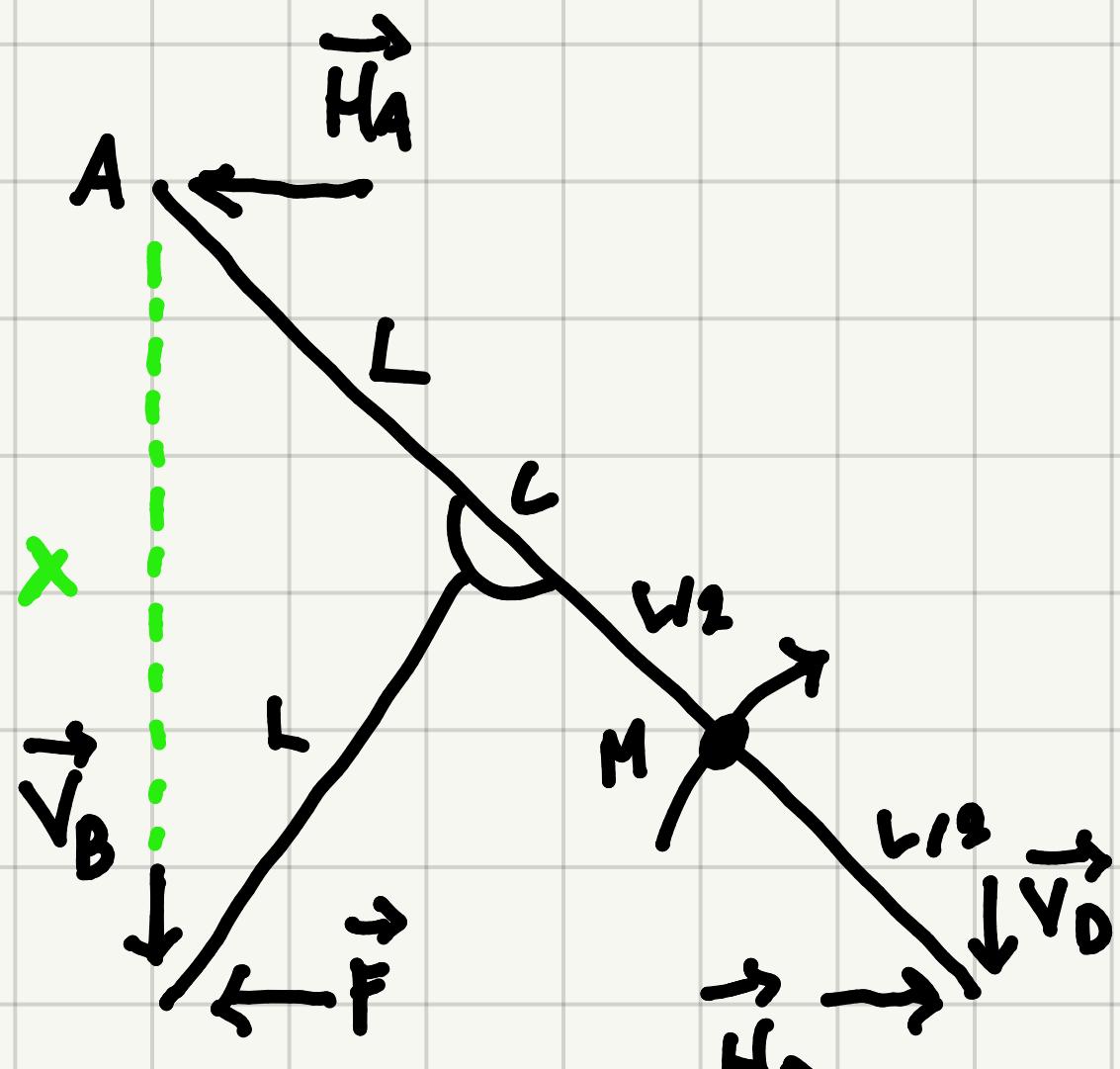




• REAZIONI VINCOLARI IN
A, B, C, D

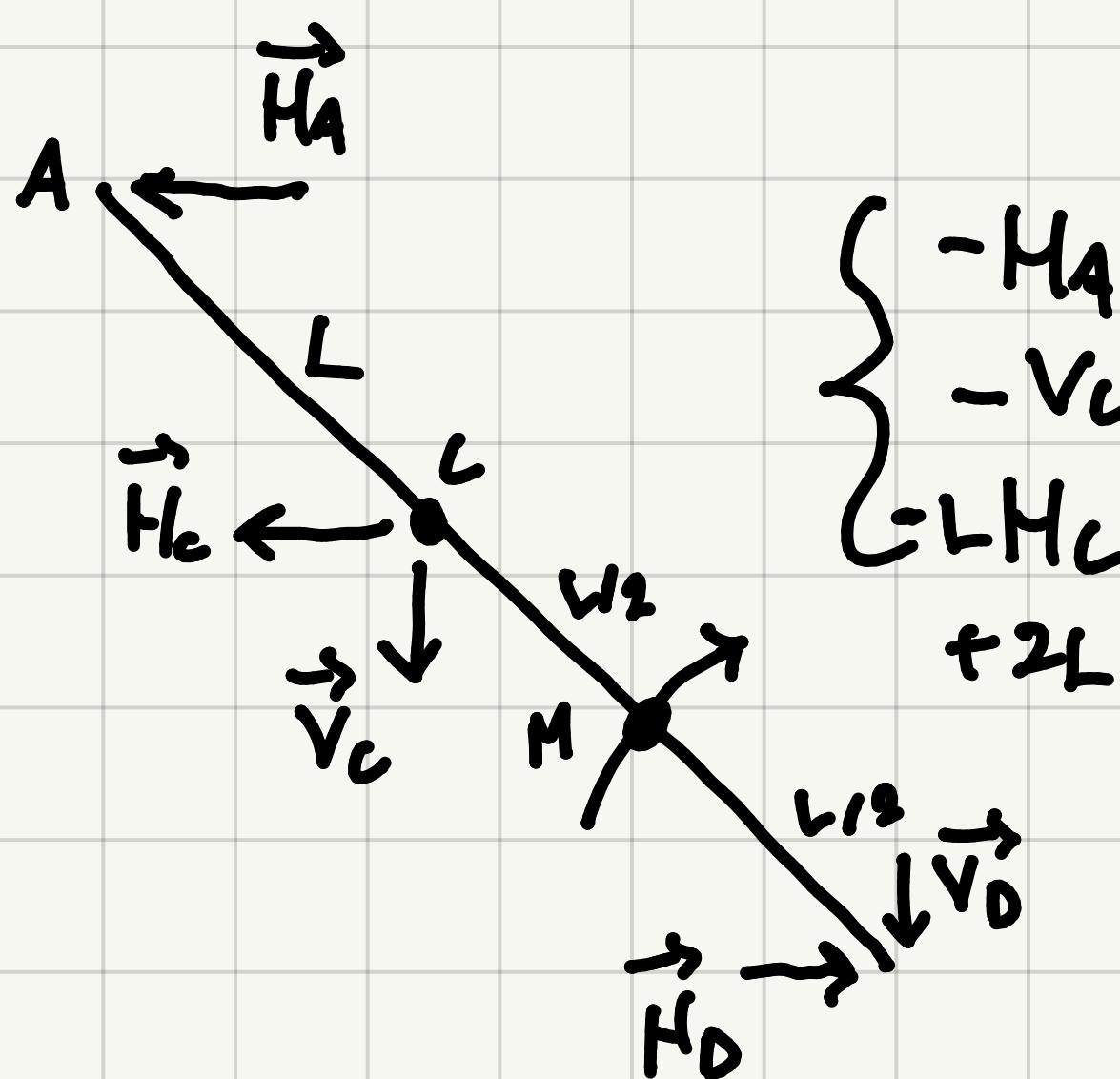
• AZIONI INTERNE AD

$$n = 3 \cdot 2 - (2d + 2c + I_A + I_B) = 0$$

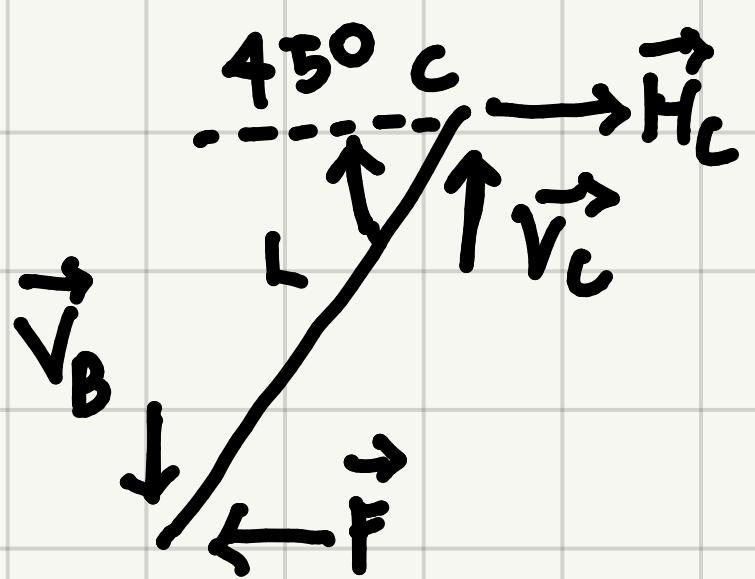


$$\begin{cases} -H_A + H_D - F = 0 \\ -V_B - V_D = 0 \\ -F_x - M - 2L V_D \sin(45^\circ) + 2L H_D \sin(45^\circ) = 0 \end{cases}$$

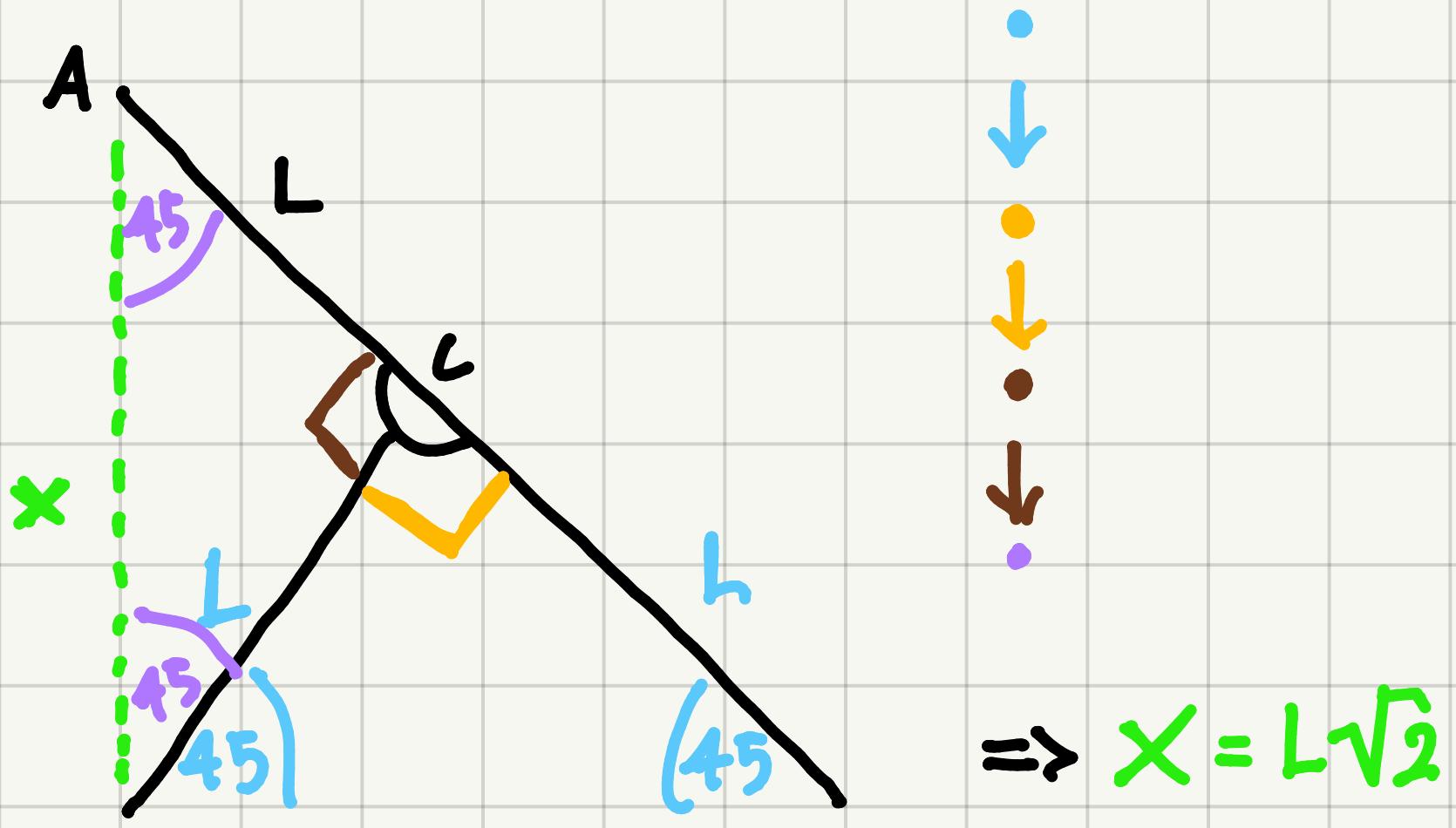
4 INCognITE



$$\begin{cases} -H_A - H_C + H_D = 0 \\ -V_C - V_D = 0 \\ -L H_C \sin(45^\circ) - L V_C \sin(45^\circ) - M - 2L V_D \sin(45^\circ) + 2L H_D \sin(45^\circ) = 0 \end{cases}$$

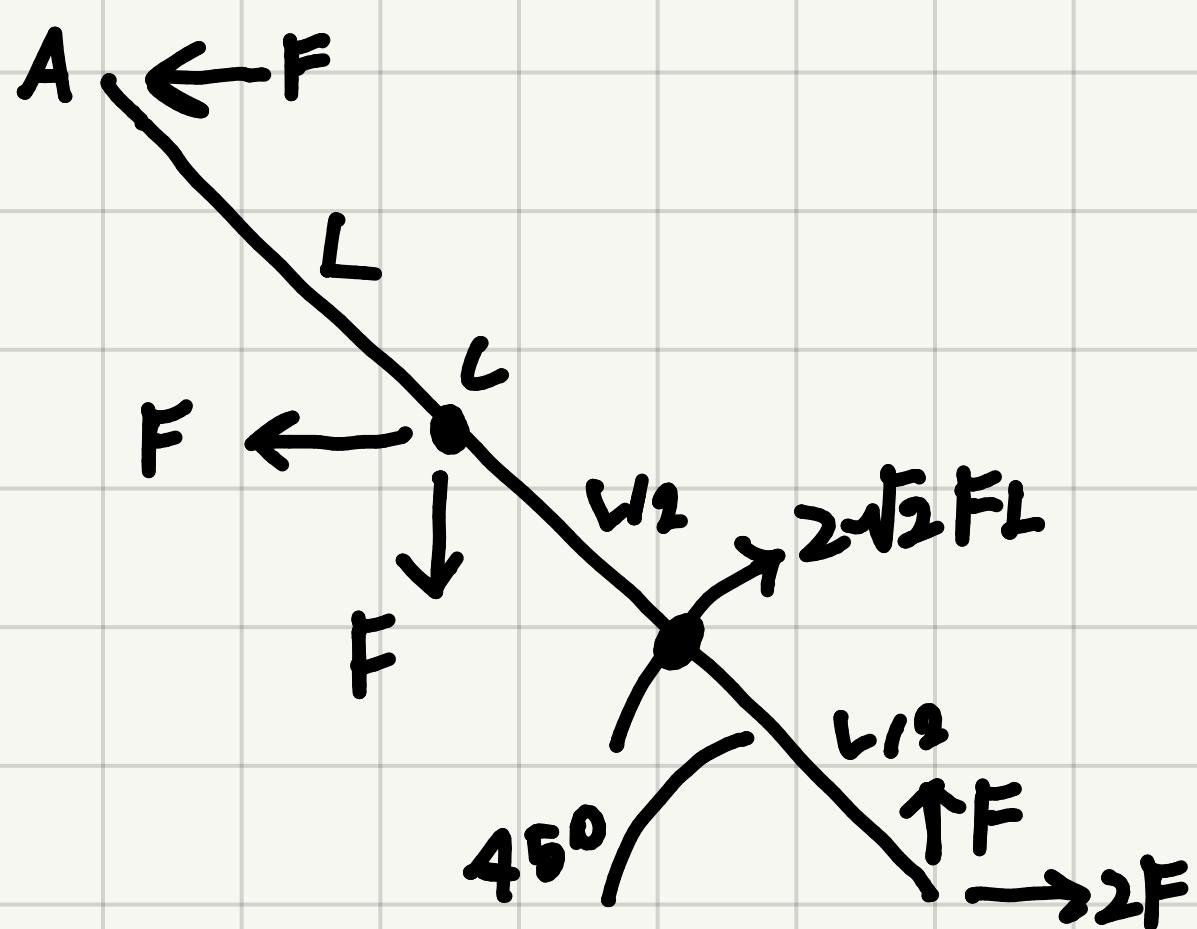


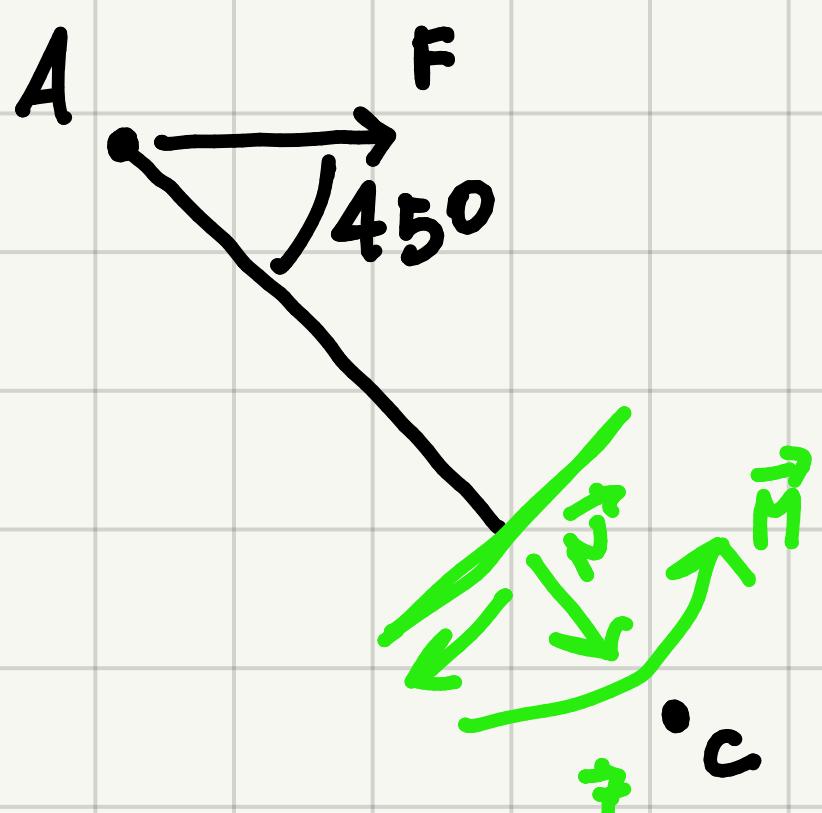
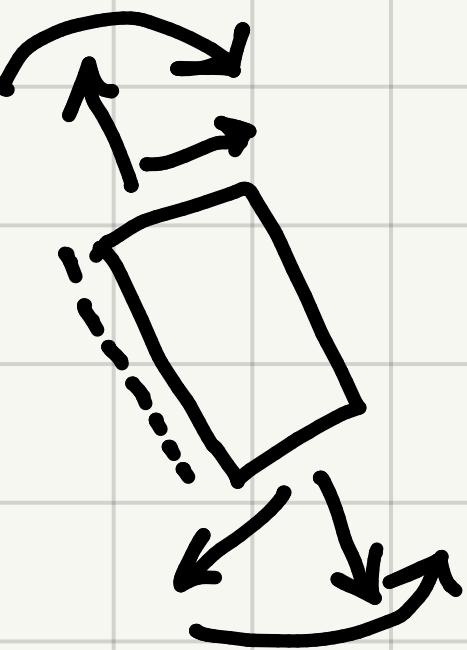
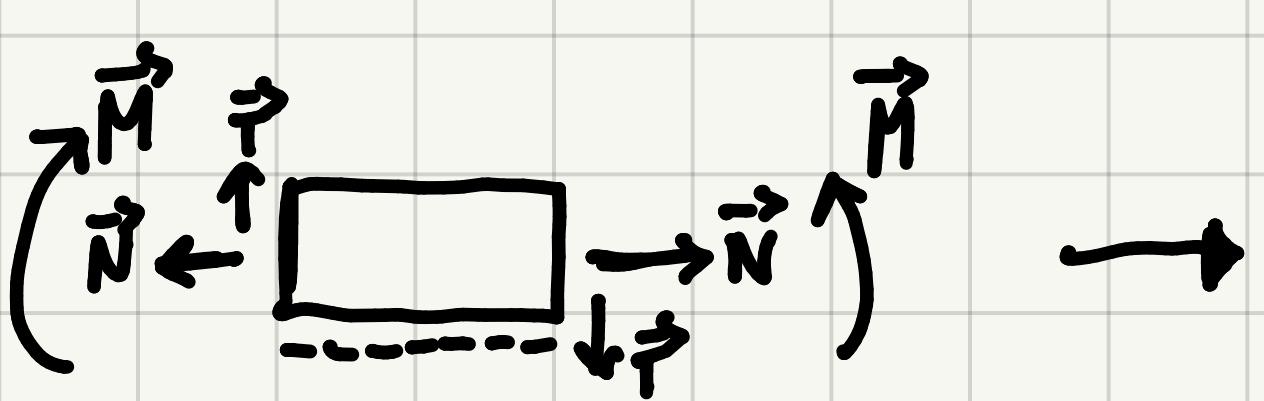
$$\begin{cases} H_C - F = 0 \\ -V_B + V_C = 0 \\ L V_C \sin(45^\circ) - L H_C \sin(135^\circ) = 0 \end{cases}$$



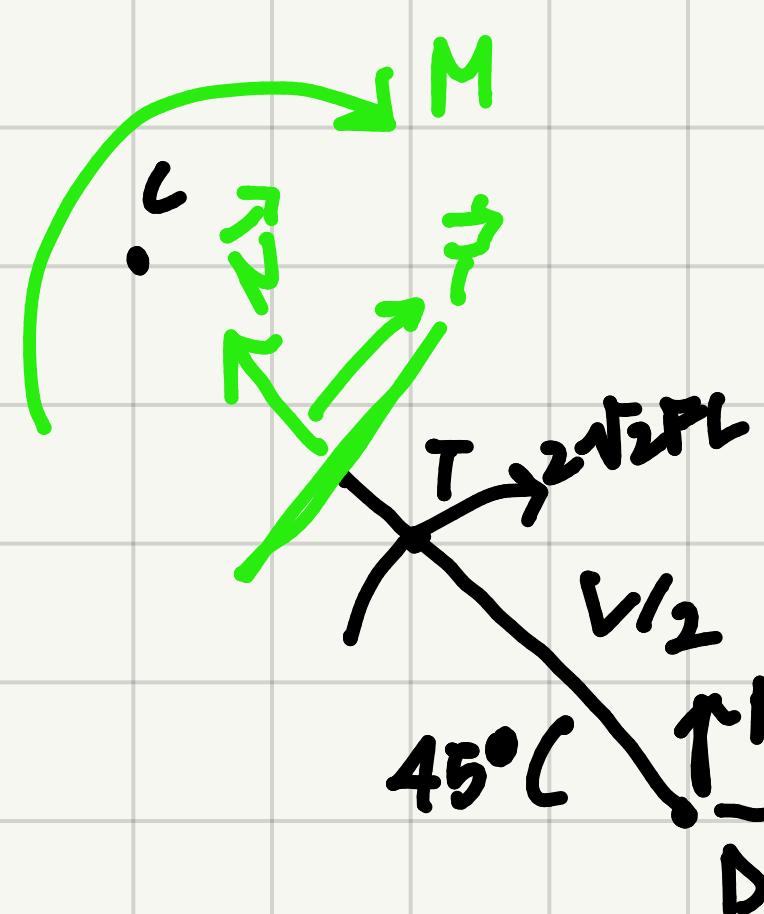
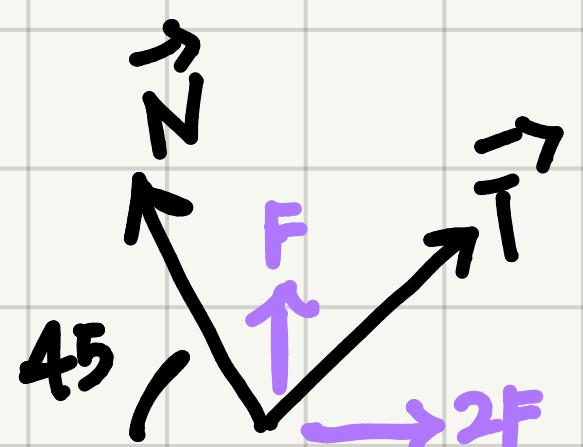
$$\left\{ \begin{array}{l} -H_A - H_C + H_D = 0 \\ -V_C - V_D = 0 \\ -T_{2/2} L H_C - T_{2/2} L V_C - 2 T_2 F_L - T_2 L V_D + T_2 L H_D = 0 \\ H_C - F = 0 \\ -V_A + V_C = 0 \\ T_{2/2} L V_C - T_{2/2} L H_C = 0 \end{array} \right.$$

$$\left\{ \begin{array}{l} H_A = F \\ V_D = -V_C \Rightarrow V_D = -F \\ -\gamma_{212} F - \gamma_{222} F - 2\gamma_{21} F + \gamma_2 F + \gamma_2 H_D = 0 \Rightarrow H_D = 2F \\ H_C = F \\ V_B = V_C \Rightarrow V_B = F \\ V_C = H_C \Rightarrow V_C = F \end{array} \right.$$





$$\begin{cases} N - F \sin(45) = 0 \\ -T - F \cos(45) = 0 \\ M - Fx \sin(45) = 0 \end{cases} \quad \begin{aligned} N &= \frac{\sqrt{2}}{2} F \\ T &= -\frac{\sqrt{2}}{2} F \\ M(0) &= 0 \quad M(L) = -\frac{\sqrt{2}}{2} FL \end{aligned}$$

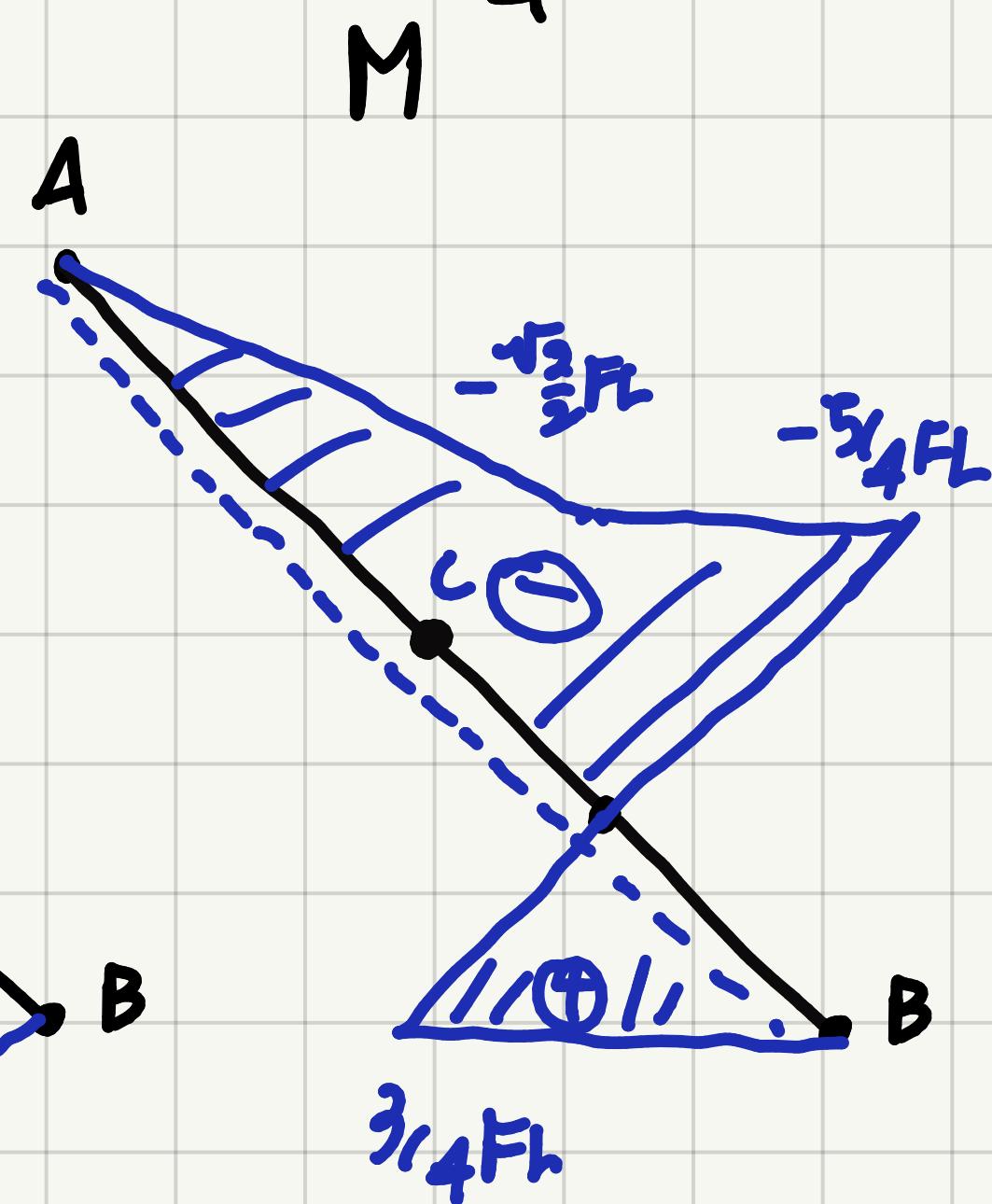
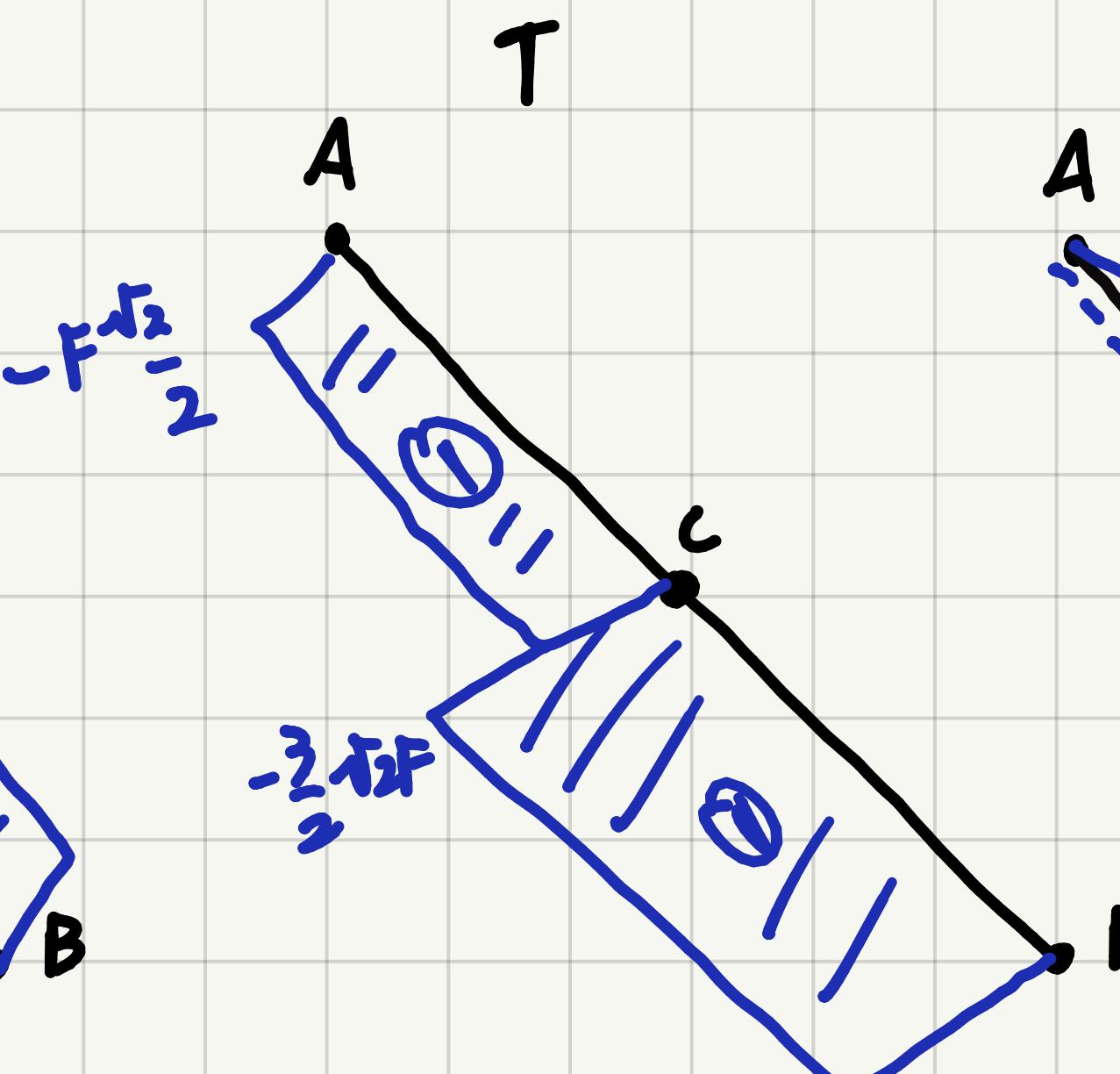
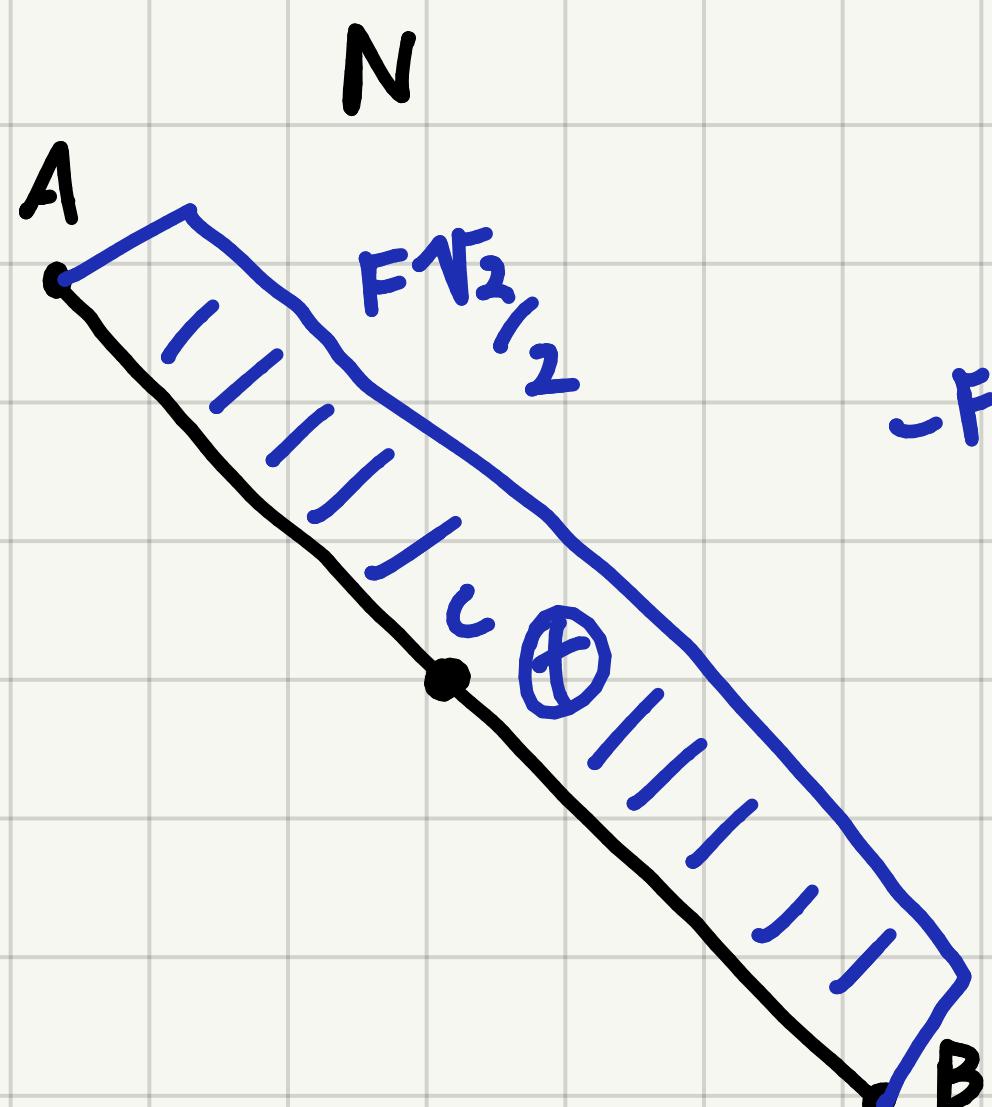


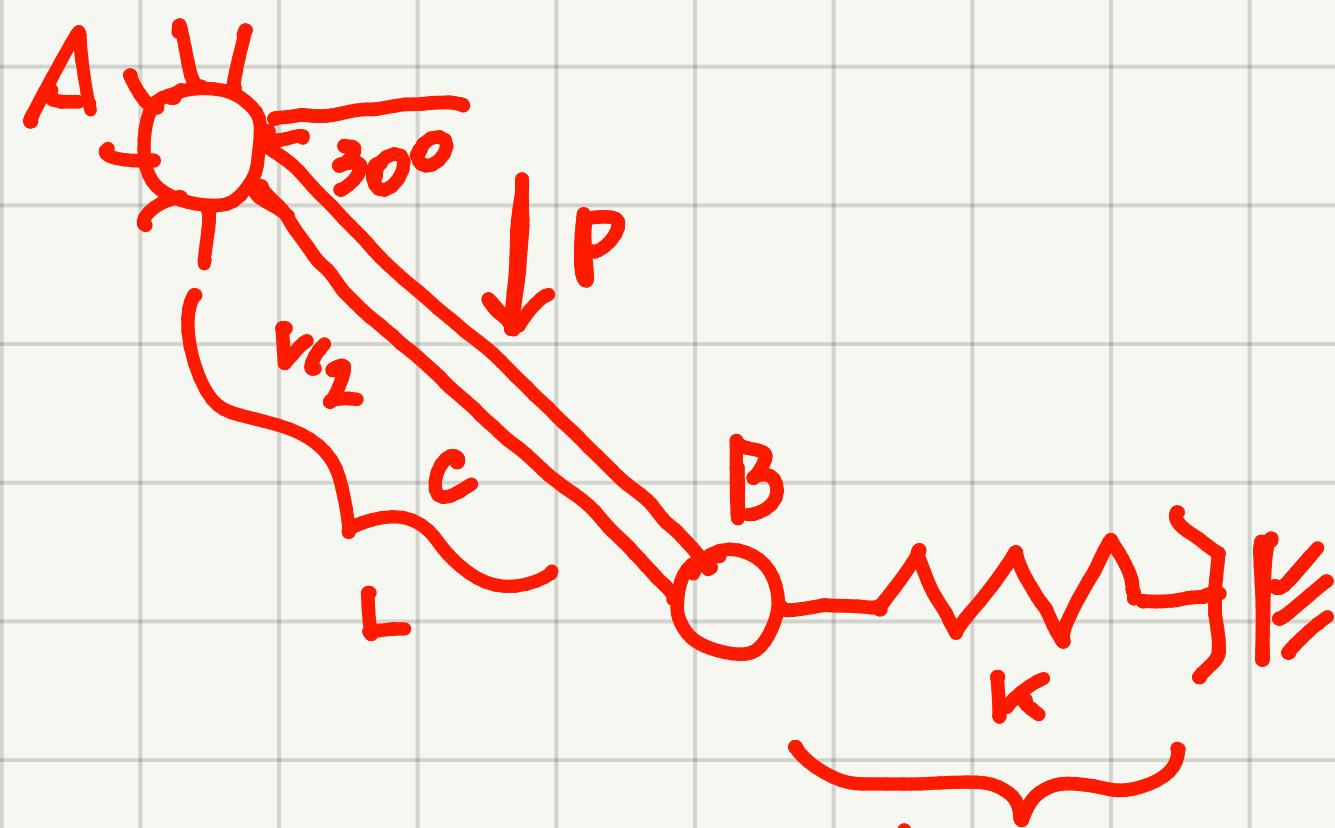
$$\begin{cases} N + 2F \sin(180-45) + F \sin(90+45) = 0 \\ T + 2F \sin(180-45) + F \sin(90+45) = 0 \\ -M - 2\sqrt{2}FL + Fx \sin(45) + 2Fx \sin(90+45) = 0 \end{cases}$$

SOLO PER L X L

$$N = \frac{\sqrt{2}}{2} F \quad T = -3\frac{\sqrt{2}}{2} F \quad M(0) = 0 \quad M(L) = -\frac{3\sqrt{2}}{4} FL$$

$$M(L) = -\frac{5\sqrt{2}}{4} FL$$



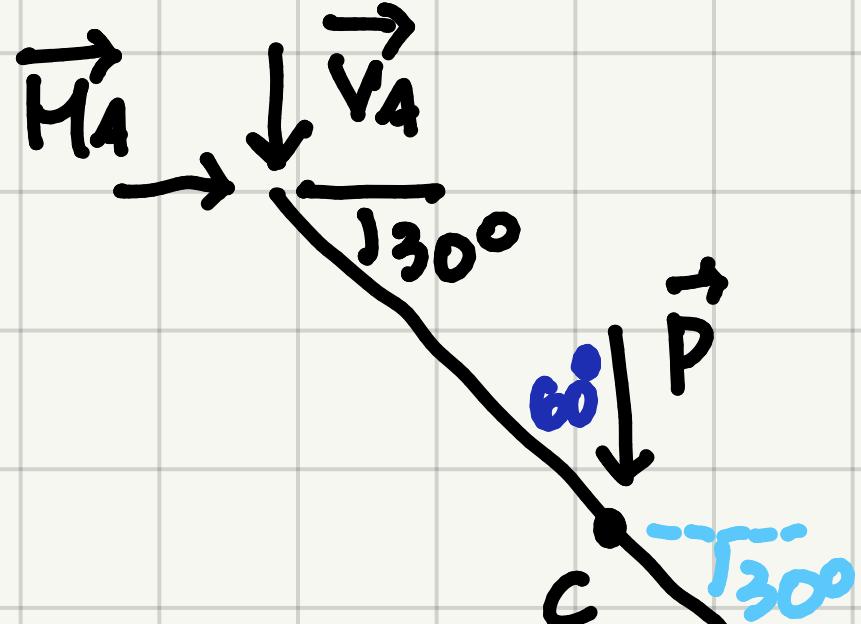


$$l_0 = 0$$

P(k)? AZIONI INTERNE AB?

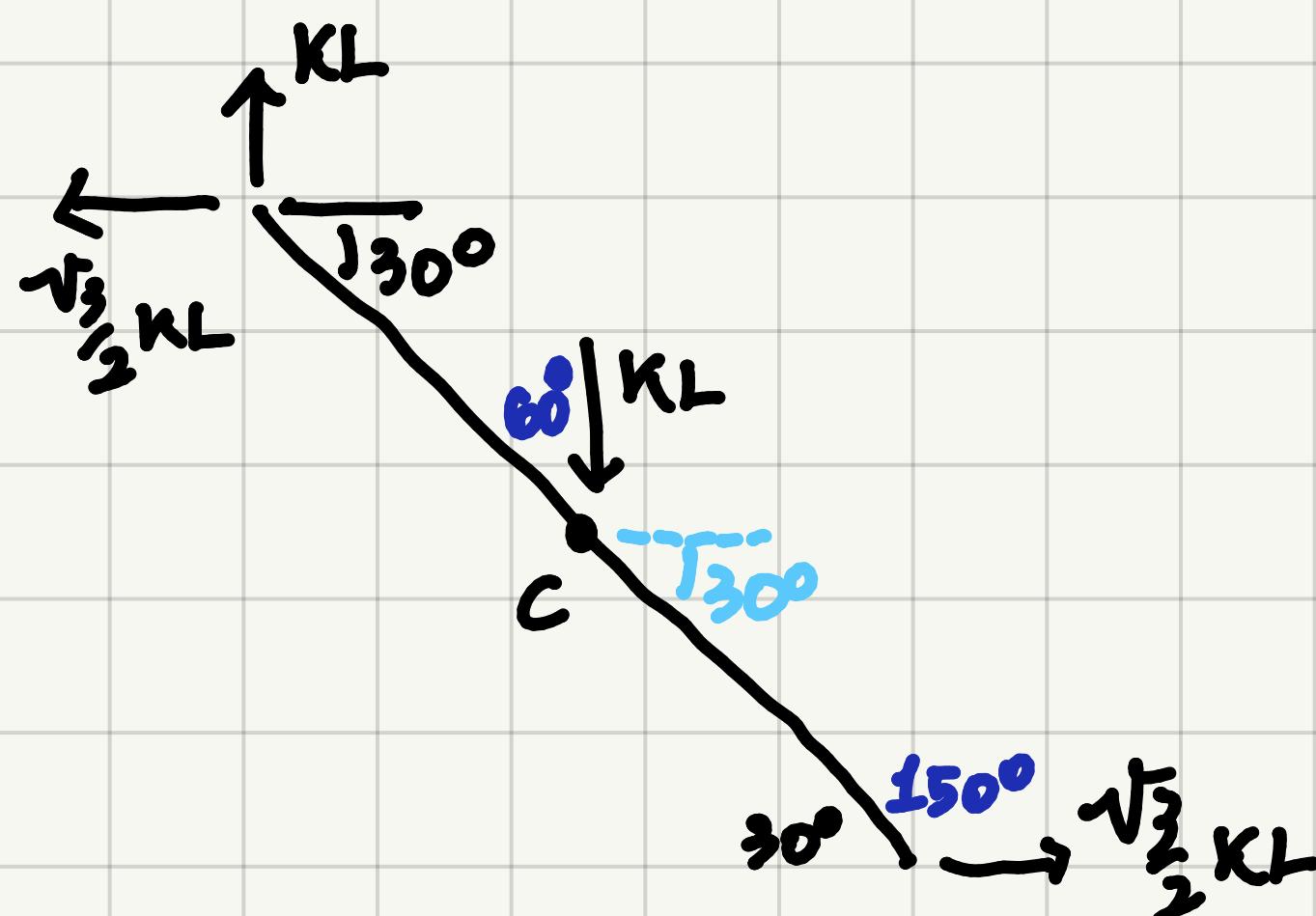
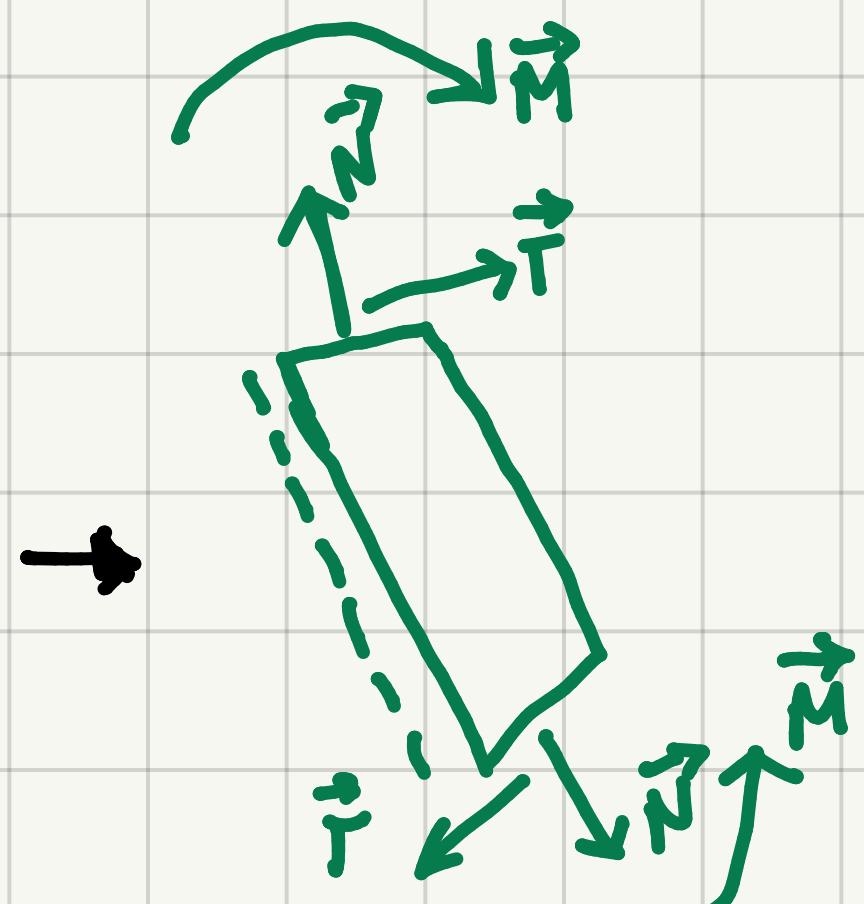
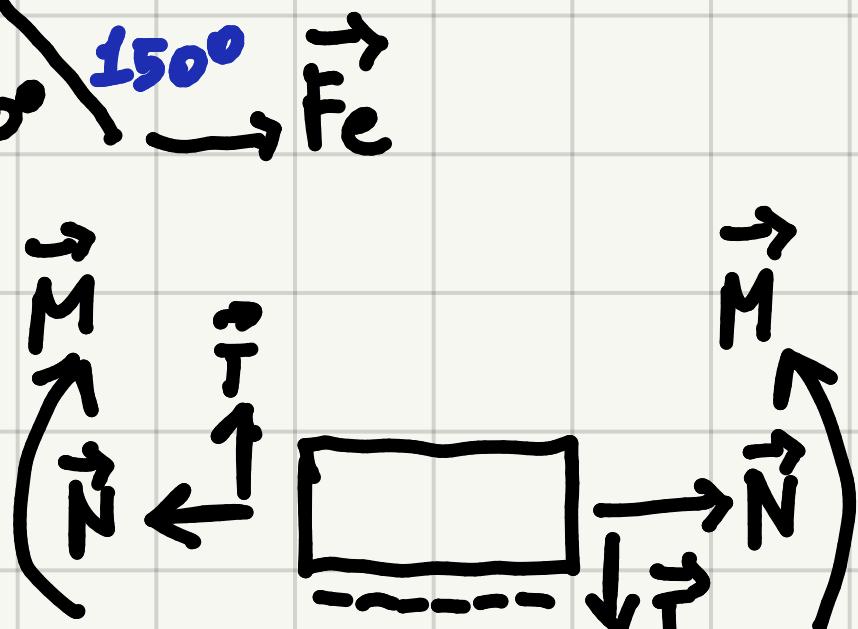
$$n = 3 - (2_A + I_{MOLLA}) = 0$$

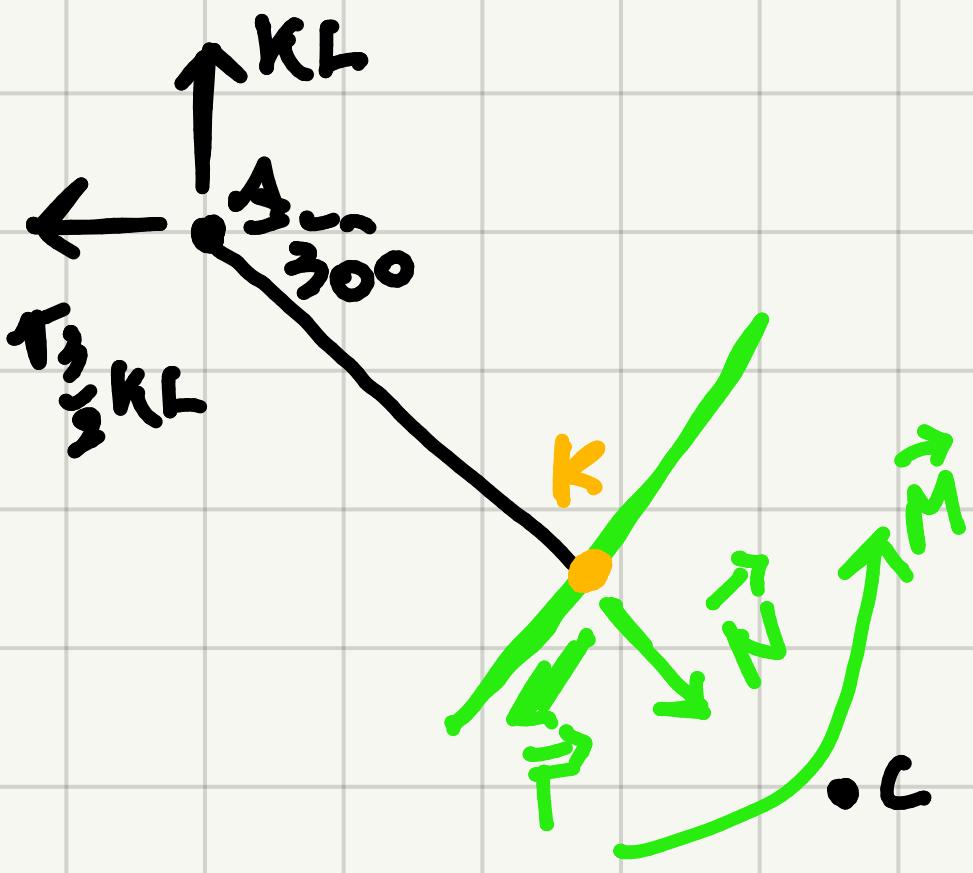
$$F_e = K(\sqrt{3}/2 L - l_0)$$



$$\begin{cases} \sum F_x \\ \sum F_y \\ \sum M_A \end{cases} \quad \left\{ \begin{array}{l} H_A + F_e = 0 \\ -V_A - P = 0 \\ -\frac{L}{2} P \sin(60) + L F_e \sin(150) = 0 \end{array} \right.$$

$$\begin{cases} H_A = -K\sqrt{3}/2 L \\ V_A = -KL \\ P = KL \end{cases}$$

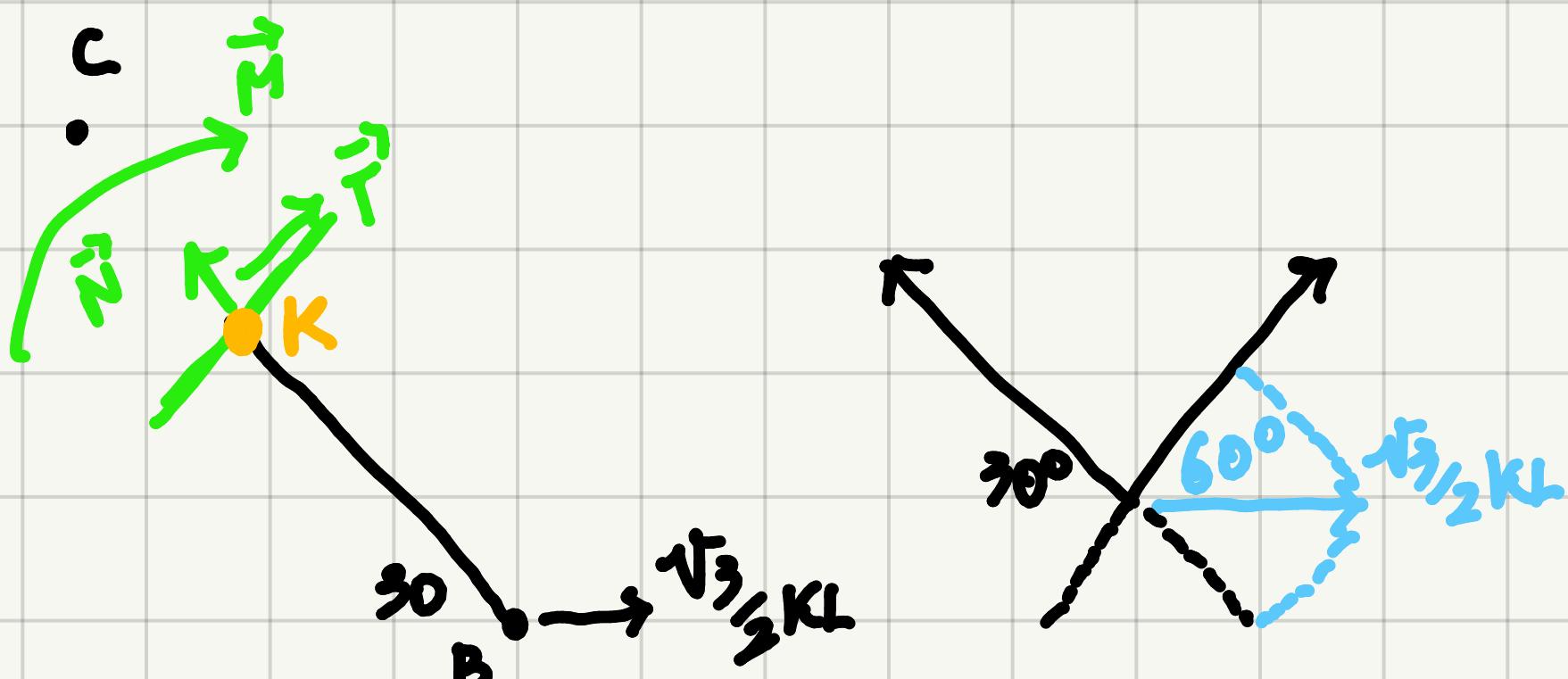




K:

$$\begin{cases} N - KL \cos(60^\circ) - \sqrt{3}/2 KL \cos(30^\circ) = 0 \\ T - KL \sin(60^\circ) - \sqrt{3}/2 KL \sin(30^\circ) = 0 \\ M - KL \times \sin(120^\circ) + \sqrt{3}/2 KL \times \sin(210^\circ) = 0 \end{cases}$$

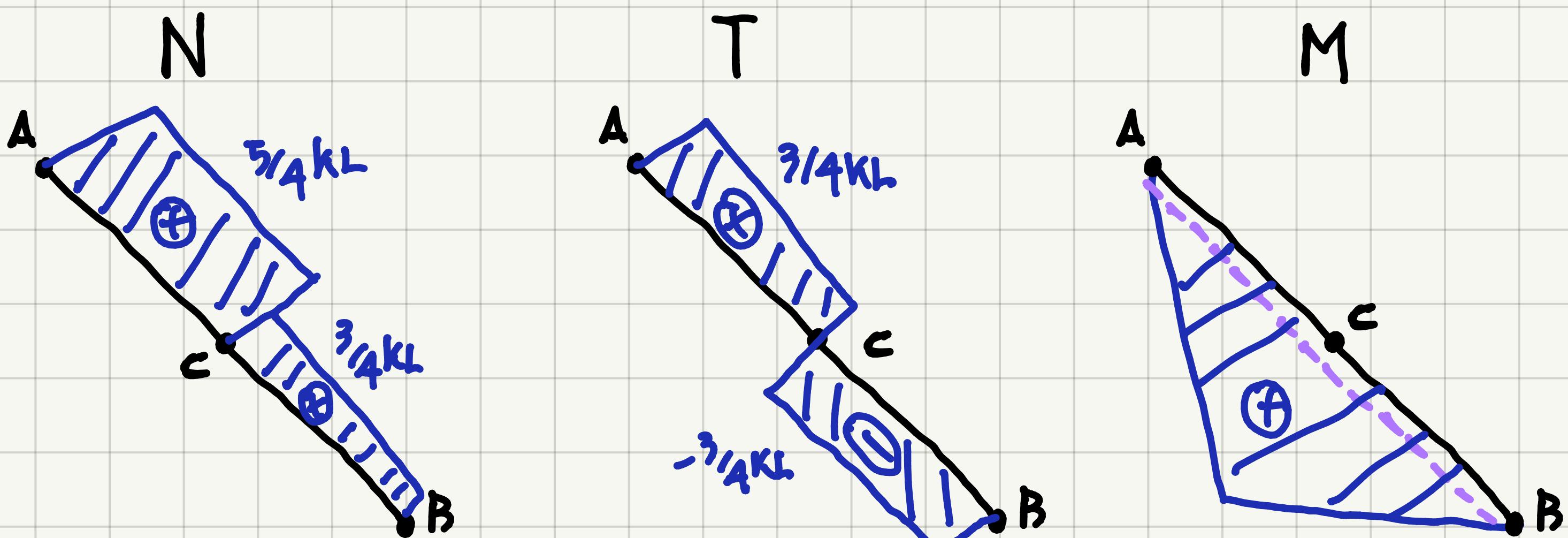
$$\begin{aligned} N &= \frac{\sqrt{3}}{4} KL \\ T &= -\frac{\sqrt{3}}{4} KL \\ M(0) &= 0 \quad M(L/2) = \frac{\sqrt{3}}{8} KL^2 \end{aligned}$$

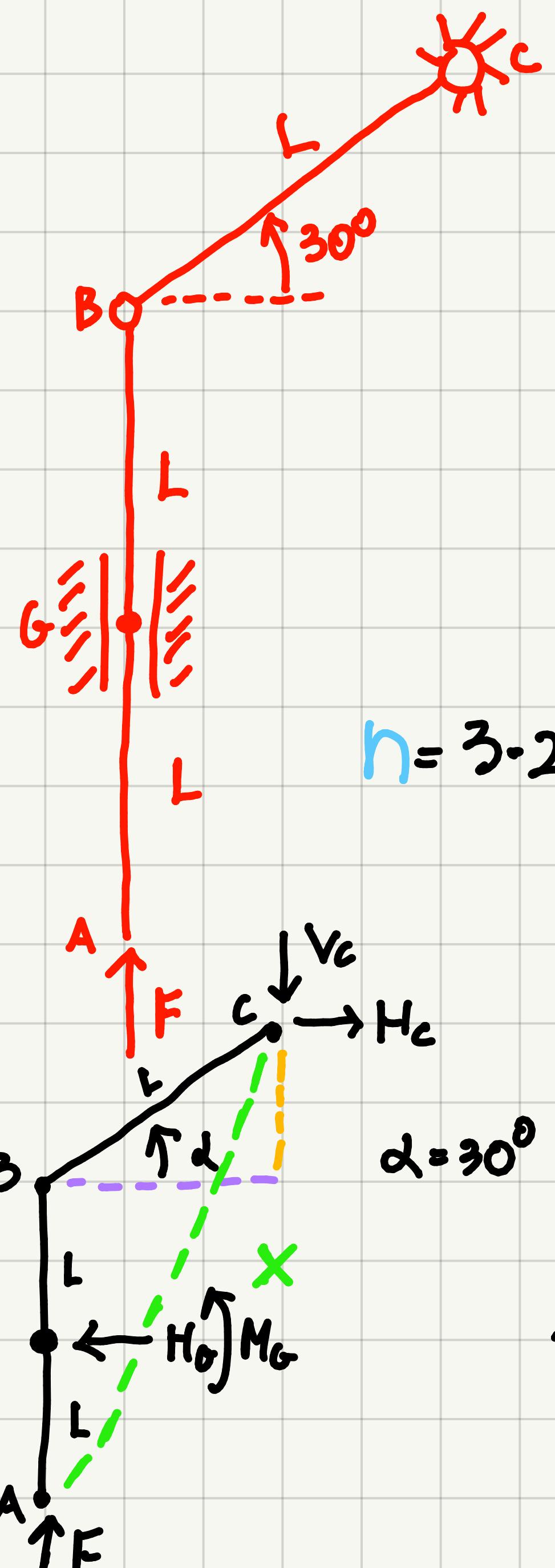


K:

$$\begin{cases} N - \sqrt{3}/2 KL \sin(60^\circ) = 0 \\ T + \sqrt{3}/2 KL \cos(60^\circ) = 0 \\ -M + \sqrt{3}/2 KL \times \sin(120^\circ) = 0 \end{cases}$$

$$\begin{aligned} N &= \frac{3}{4} KL \\ T &= -\frac{\sqrt{3}}{4} KL \\ M(0) &= 0 \quad M(L/2) = \frac{\sqrt{3}}{8} KL^2 \end{aligned}$$





• REAZIONI VINCOLARI A TERRA

• REAZIONI VINCOLARI INTERNE

• AZIONI INTERNE AB

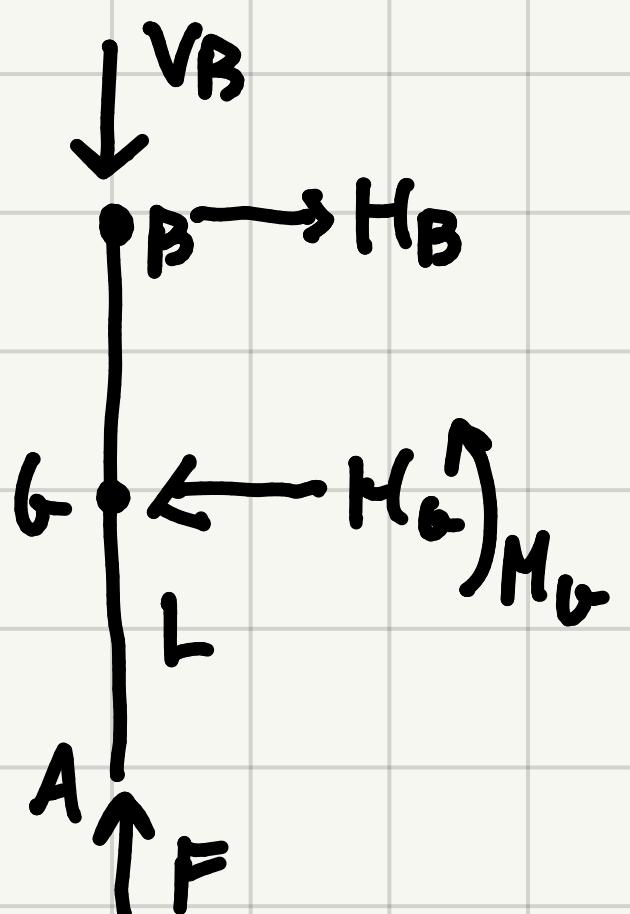
$$n = 3 \cdot 2 - (2_B + 2_C + 2_G) = 0$$

$$\begin{aligned} & X = \sqrt{(2L)^2 + L^2} - \\ & - 2 \cdot 2L \cdot L \cdot \cos(120^\circ) = \\ & = \sqrt{7}L \end{aligned}$$

$$\begin{cases} H_C - H_G = 0 \\ F - V_C = 0 \end{cases}$$

$$A \quad M_G - LH_G + \sqrt{7}LH_C \cos\alpha - \sqrt{7}LV_C \sin\alpha = 0$$

4 INCognITE \Rightarrow SPEZZO 1 corso



$$\begin{cases} -H_G + H_B = 0 \\ F - V_B = 0 \end{cases}$$

$$A \quad LH_G + M_G - 2LH_B = 0$$

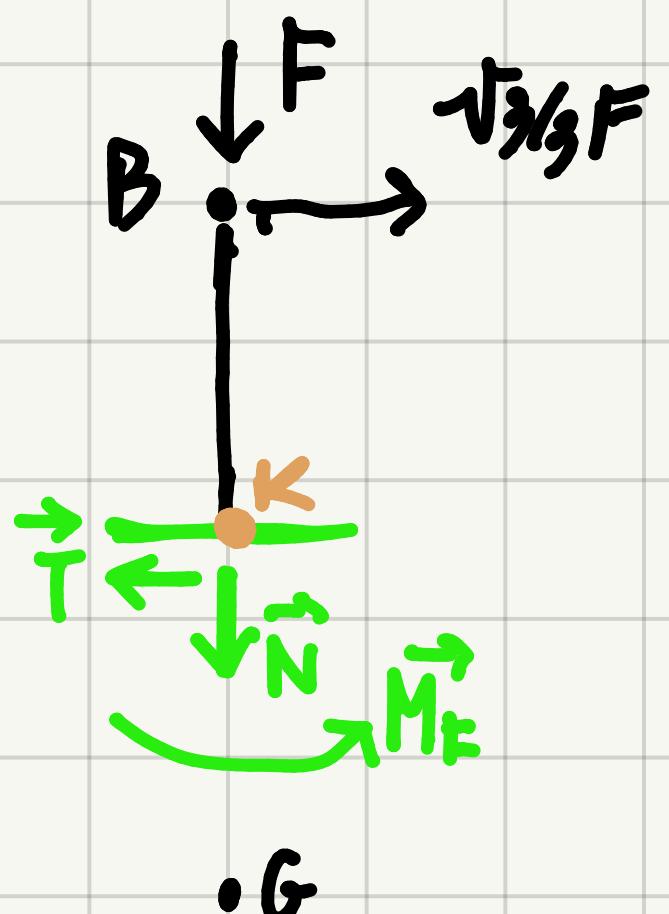
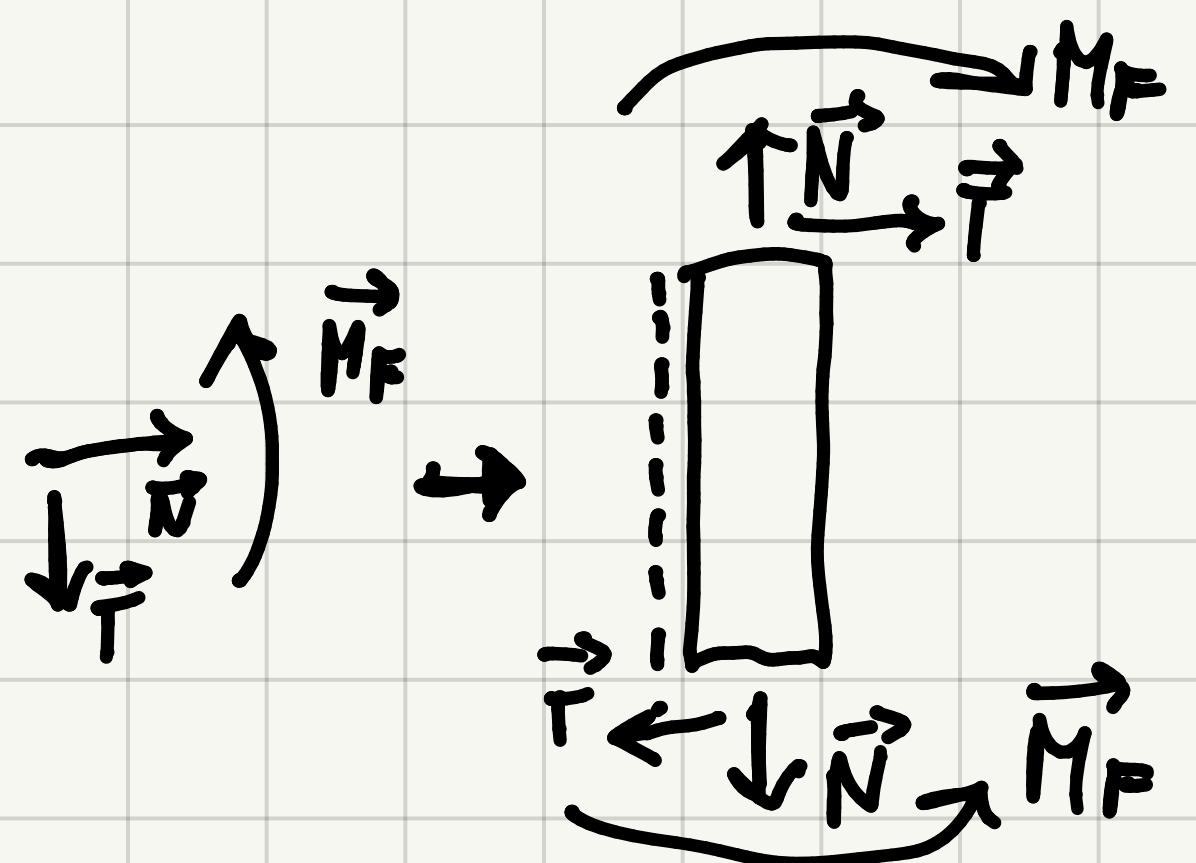
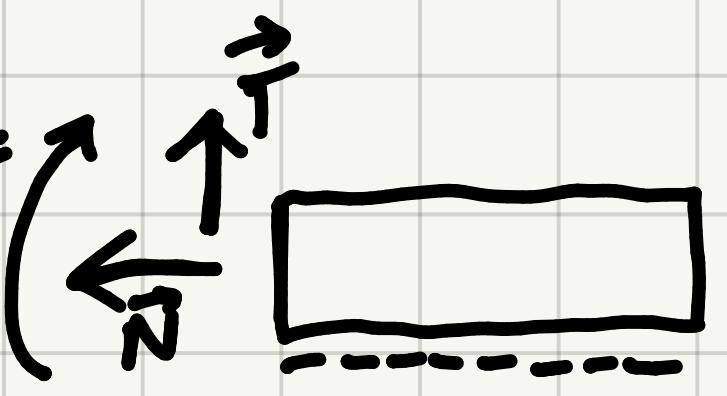
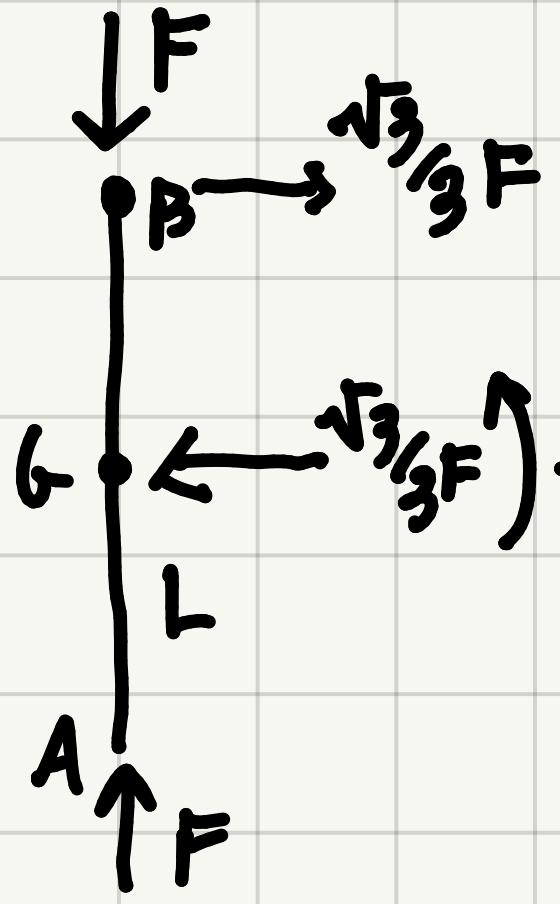
$$\begin{cases} H_C - H_B = 0 \\ V_B - V_C = 0 \end{cases}$$

$$B \quad H_C L \cos\alpha - V_C L \sin\alpha = 0$$

6 EQUAZIONI, 6 INCognITE ✓

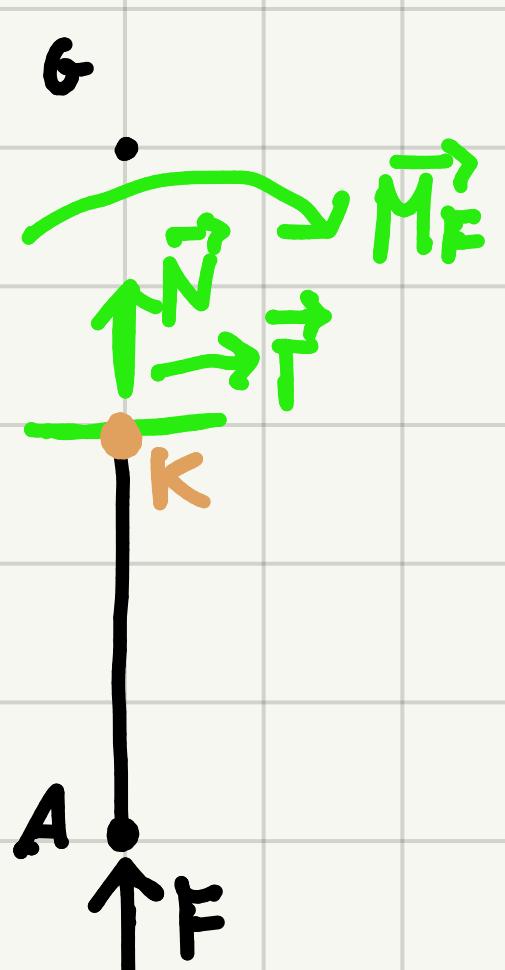
$$\begin{cases} H_B = H_G \\ V_B = F \\ LH_G + M_G - 2LH_B = 0 \\ H_B = H_C \\ V_C = F \\ H_C L \cos\alpha - FL \sin\alpha = 0 \end{cases}$$

$$\begin{cases} H_G = \frac{\sqrt{3}}{3}F \\ V_B = F \\ M_G = \frac{\sqrt{3}}{3}FL \\ H_B = \frac{\sqrt{3}}{3}F \\ V_C = F \\ H_C = L \cos\alpha = \frac{\sqrt{3}}{3}F \end{cases}$$



$$\begin{cases} \sqrt{3}/3 F - T = 0 \\ F + N = 0 \\ M_F + \sqrt{3}/3 F \times L = 0 \end{cases}$$

$$\begin{aligned} T &= \sqrt{3}/3 F \\ N &= -F \\ M_C(O) &= 0 \quad M_C(L) = -\sqrt{3}/3 F L \end{aligned}$$



$$\begin{cases} T = 0 \\ N + F = 0 \\ M_F = 0 \end{cases} \quad N = -F$$

