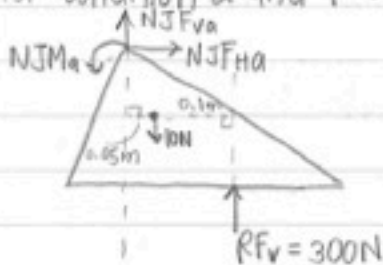


10-11

- based off of literature, might need to calculate with different levels

for condition 2 and 4  $\rightarrow$  change CoP location to 0.1m instead of 0.2m



no H force

$$\sum F_v = ma_v^{\circ} \rightarrow 0 = W_f + R_{Fv} + NJF_{va}$$

$$NJF_{va} = -(-10N) - 300N = -290N$$

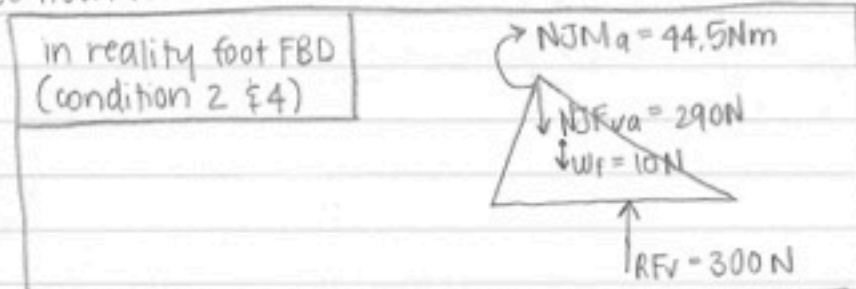
$$\sum M_{cm} = I_{cm} \alpha^{\circ}$$

$$0 = NJM_a + (R_{Fv} \cdot l_d) + (NJF_{va} \cdot l_d)$$

$$-NJM_{va} = (300N \cdot 0.1m) + (290N \cdot 0.05m)$$

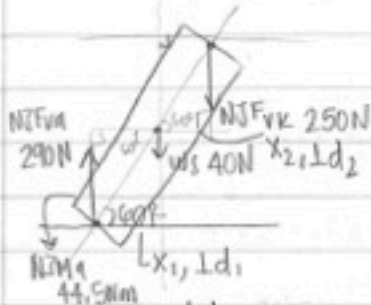
$$NJM_{va} = -30Nm + -14.5Nm = -44.5Nm$$

so now...



$\leftarrow$  originally -74.5Nm when the  $l_d = 0.2m$

$\sim$  since we changed the  $l_d \Rightarrow$  changes the knee moment too



$$\sum M_{cm} = I_{cm} \alpha^{\circ}$$

$$0 = NJM_k + NJM_a + (NJF_{va} \cdot l_{d1}) + (NJF_{vk} \cdot l_{d2})$$

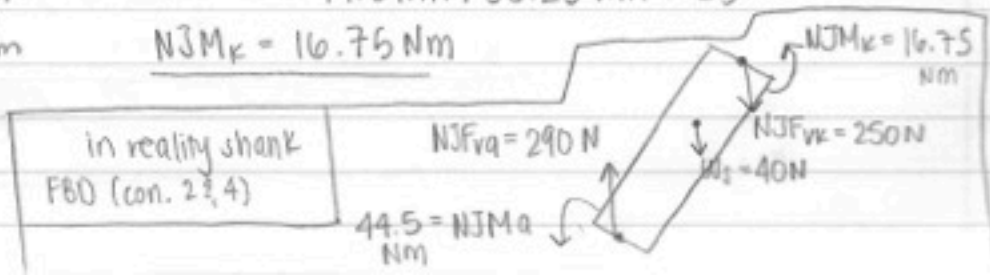
$$+NJM_k = -(44.5Nm) + (290N \cdot \sin 30^\circ \cdot 0.25m) + (250N \cdot \sin 30^\circ \cdot 0.2m)$$

$$= -44.5Nm + 36.25Nm + 25$$

$$NJM_k = 16.75Nm$$

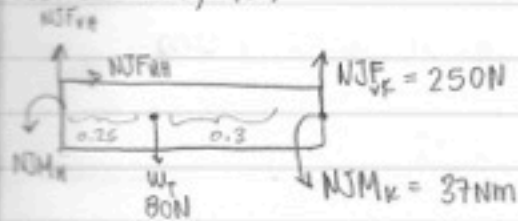
$$\sin 30^\circ = l_{d1} / H = 0.25m$$

$$\sin 30^\circ = l_{d2} / l = 0.2m$$



now apply this to the thighs

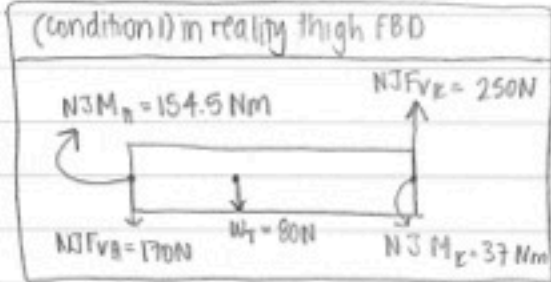
(condition 1, 90°)



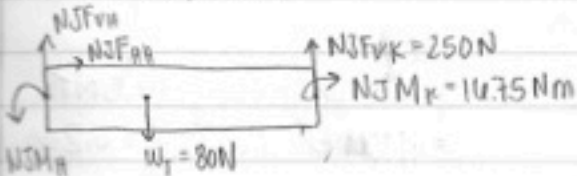
$$\begin{aligned} \sum F_H = ma_H = 0 &\rightarrow 0 = N_JF_{HH} \\ \sum F_V = ma_V = 0 &\rightarrow 0 = N_JF_{VK} + N_JF_{VH} + \bar{W}_T \\ -N_JF_{VH} &= 250N - 80N \\ &= -(170N) \\ N_JF_{VH} &= -170N \end{aligned}$$

$$\sum M_{CM} = I_{CM} \alpha = 0$$

$$\begin{aligned} 0 = N_JM_K + N_JM_H + (N_JF_{VK} \cdot l_d) + (N_JF_{VH} \cdot l_d) \\ -N_JM_H = (37Nm) + (250N \cdot 0.3m) + (170N \cdot 0.25m) \\ \Rightarrow = -37Nm - 75Nm - 42.5Nm \\ N_JM_H = -154.5Nm \end{aligned}$$



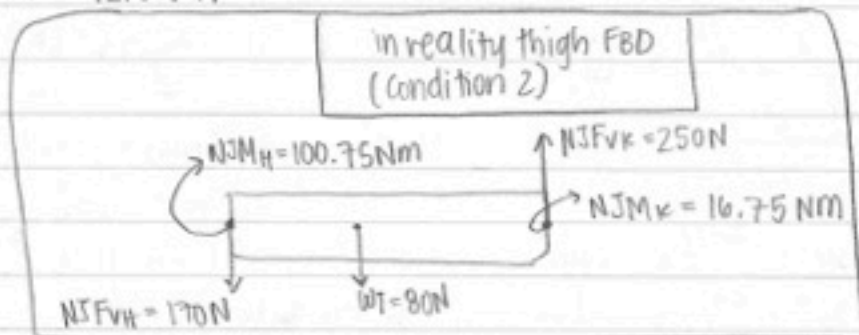
(condition 2, 90°)



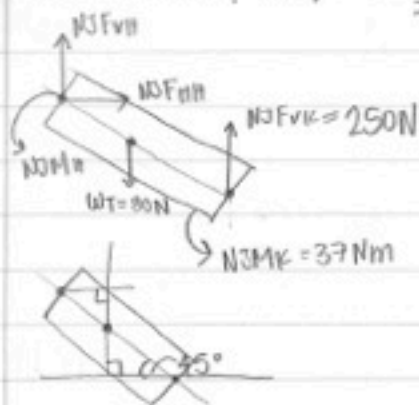
$$\begin{aligned} \sum F_H \rightarrow 0 & \text{ same as above} \\ \sum F_V \rightarrow N_JF_{VH} = -170N \end{aligned}$$

$$\sum M_{CM} = I_{CM} \alpha = 0$$

$$\begin{aligned} 0 = N_JM_H + N_JM_K + (N_JF_{VK} \cdot l_d) + (N_JF_{VH} \cdot l_d) \\ -N_JM_H = -16.75Nm + (250N \cdot 0.3m) + (170N \cdot 0.25m) \\ \Rightarrow = 16.75Nm - 75Nm - 42.5Nm \\ N_JM_H = -100.75Nm \end{aligned}$$

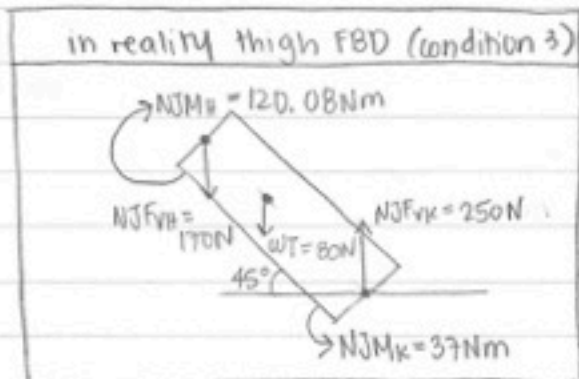


(condition 3, 45°) → work on this for HW

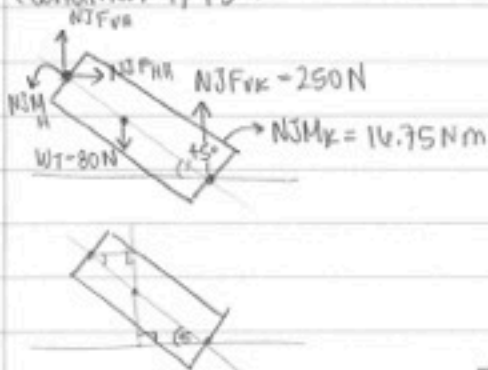


$$\begin{aligned} \sum F_H = ma_H = 0 &\rightarrow NJF_{HH} = 0 \\ \sum F_V = ma_V = 0 &\rightarrow 0 = NJF_{VK} + W_T + NJF_{VH} \\ -NJF_{VH} &= 250\text{N} - 80\text{N} \\ \hookrightarrow &= -(170\text{N}) \\ NJF_{VH} &= \underline{-170\text{N}} \end{aligned}$$

$$\begin{aligned} \sum M_{CM} = I_{CM}\alpha = 0 \\ 0 = NJM_H + NJM_K + (NJF_{VK} \cdot l_d) + (NJF_{VH} \cdot l_d) \\ -NJM_H &= 37\text{Nm} + (250\text{N} \cdot 0.3\text{m} \cdot \cos 45^\circ) + \\ \hookrightarrow & (170\text{N} \cdot 0.25\text{m} \cdot \cos 45^\circ) \\ &= -37\text{Nm} - 53.03\text{Nm} - 30.05\text{Nm} \\ NJM_H &= \underline{-120.08\text{Nm}} \end{aligned}$$



(condition 4, 45°)



$$\begin{aligned} \sum F_H = ma_H = 0 &\rightarrow 0 = NJF_{HH} \\ \sum F_V = ma_V = 0 &\rightarrow 0 = W_T + NJF_{VK} + NJF_{VH} \\ 0 &= -80\text{N} + 250\text{N} + NJF_{VH} \\ NJF_{VH} &= \underline{-170\text{N}} \end{aligned}$$

$$\begin{aligned} \sum M_{CM} = I_{CM}\alpha = 0 &\rightarrow 0 = NJM_K + NJM_H + (NJF_{VK} \cdot l_d) + \\ & (NJF_{VH} \cdot l_d) \\ -NJM_H &= -16.75\text{Nm} + (250\text{N} \cdot \cos 45^\circ \cdot 0.3\text{m}) + (170\text{N} \\ \hookrightarrow & \cdot \cos 45^\circ \cdot 0.25\text{m}) \\ &= 16.75\text{Nm} - 53.03\text{Nm} - 30.05\text{Nm} \\ NJM_H &= \underline{-63.33\text{Nm}} \end{aligned}$$

