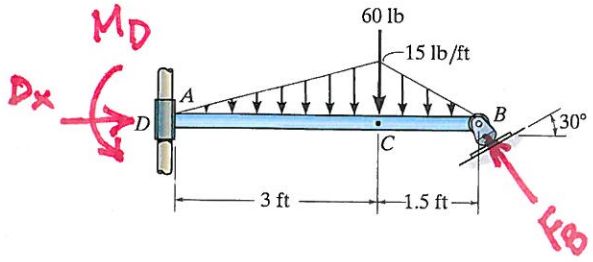
*7–20.

Rod AB is fixed to a smooth collar D, which slides freely along the vertical guide. Determine the internal normal force, shear force, and moment at point C. which is located just to the left of the 60-lb concentrated load.

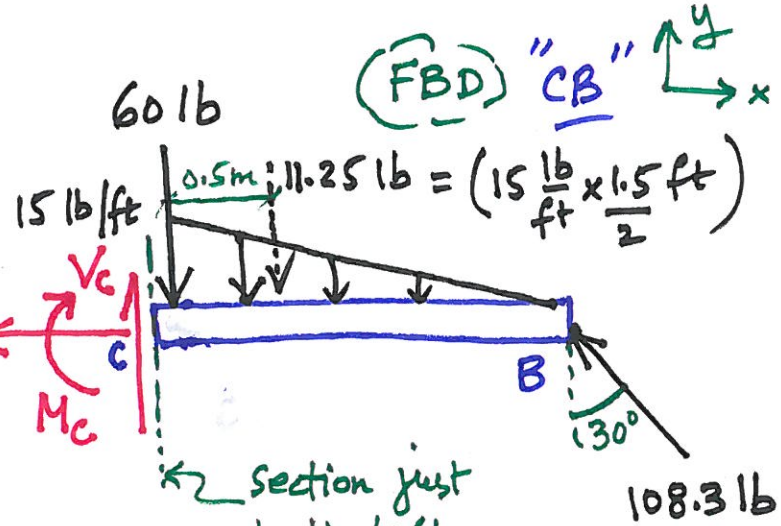


From FBD of Whole Structure

$$\uparrow \Sigma F_y = 0 = -22.5 - 60 - 11.25 + F_B \cos 30$$

$$F_B = 108.3 \text{ lb} \nwarrow 30°$$

From FBD of CB



$$\rightarrow \Sigma F_x = 0$$

$$0 = -N_C - 108.3 \text{ lb} (\sin 30)$$

$$N_C = -54.2 \text{ lb}$$

$$N_C = 54.2 \text{ lb} \rightarrow \text{ on CB}$$

$$\uparrow \Sigma F_y = 0 = V_C - 60 - 11.25 + 108.3 \cos 30$$

$$V_C = -22.5 \text{ lb}$$

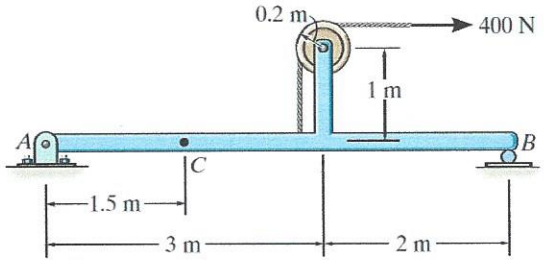
$$V_C = 22.5 \text{ lb} \downarrow \text{ on CB}$$

$$\circlearrowleft \Sigma M_C = 0 = -M_C - 11.25 \text{ lb} (0.5\text{m}) + 108.3 \text{ lb} (\cos 30)(1.5 \text{ ft})$$

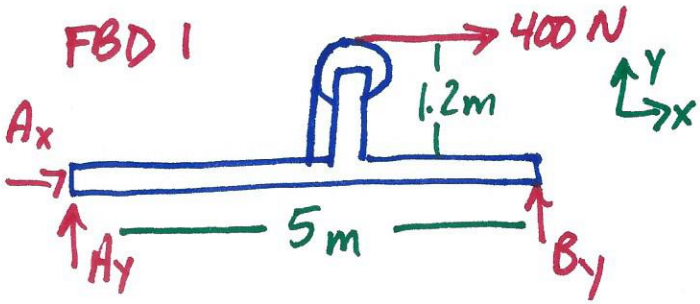
$$M_C = 135.1 \text{ lb.ft} \circlearrowleft \text{ on CB}$$

7–23.

Determine the internal normal force, shear force, and moment at point C.



FBD 1

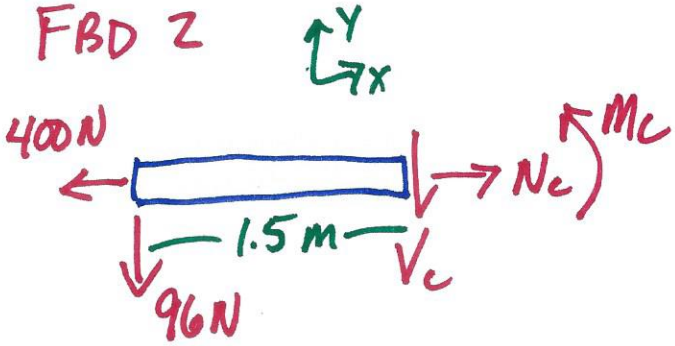


$\rightarrow \Sigma F_x = 0 \quad A_x + 400 = 0 \quad A_x = 400\ N \leftarrow$

$\circlearrowright \Sigma M_B = 0 \quad 5A_y + 1.2(400) = 0$

$A_y = -96 = 96\ N \downarrow$

FBD 2



$\rightarrow \Sigma F_x = 0 \quad -400 + N_c = 0 \quad N_c = 400\ N \rightarrow$ on AC

$\uparrow \Sigma F_y = 0 \quad -96 - V_c = 0 \quad V_c = -96 = 96\ N \uparrow$ on AC

$\circlearrowright \Sigma M_c = 0 \quad -96(1.5) - M_c = 0 \quad M_c = -144 = 144\ N \cdot m \circlearrowright$ on AC