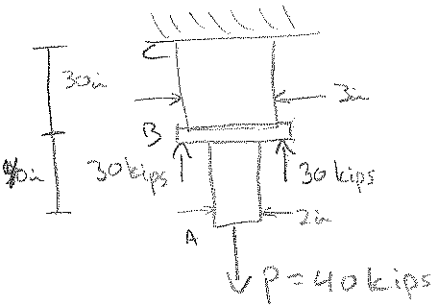
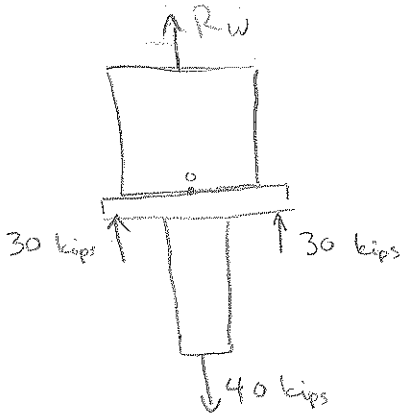
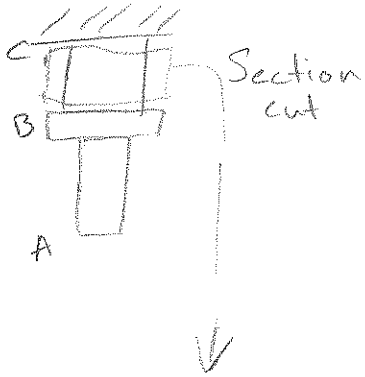
9.16 1 of 2



FBD whole system



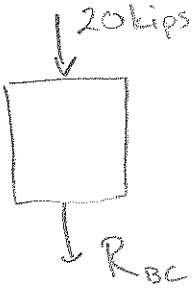
a)



$$\{\sum \vec{F}\} \cdot \hat{j} = 0 = R_W - 40\text{kips} + 30\text{ kips} + 30\text{kips}$$

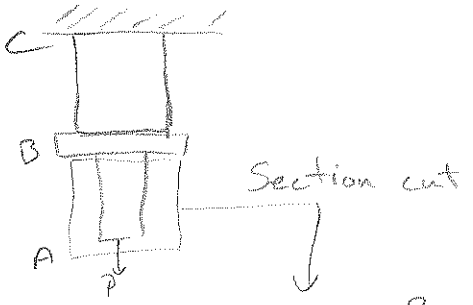
$$\Rightarrow R_W = -20\text{ kips}$$

FBD of rod BC



$$\{\sum \vec{F}\} \cdot \hat{j} = 0 = -R_{BC} - 20\text{ kips}$$

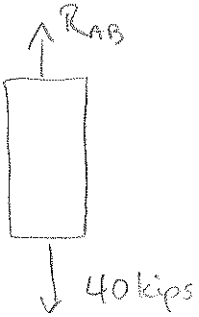
$$R_{BC} = -20\text{ kips}$$



$$\delta_{BC} = \frac{F_1 L_1}{A_1 E_1} = \frac{(-20\text{ kips})(30\text{ in})}{\frac{1}{4}\pi(3\text{ in})^2(15\times10^6\text{ psi})}$$

$$= -0.00566\text{ in}$$

FBD of rod AB



$$\{\sum \vec{F}\} \cdot \hat{j} = 0 = R_{AB} - 40\text{ kips}$$

$$R_{AB} = 40\text{ kips}$$

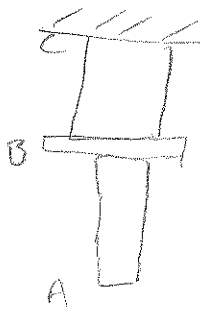
$$\delta_{AB} = \frac{F_2 L_2}{A_2 E_2} = \frac{(40\text{ kips})(40\text{ in})}{\frac{1}{4}(\pi)(2\text{ in})^2(29\times10^6\text{ psi})} = 0.0176$$

9.16 2 of 2

$\delta_{total} = \delta_{BC} + \delta_{AB} = -0.00566 \text{ in} + 0.0176 \text{ in}$

$\boxed{\delta_{total} = 0.0119 \text{ in}}$

b)



Point C is fixed

Point B moves relative to C only by the compression of rod BC.

$\delta_{BC} = \boxed{-0.00566 \text{ in}}$