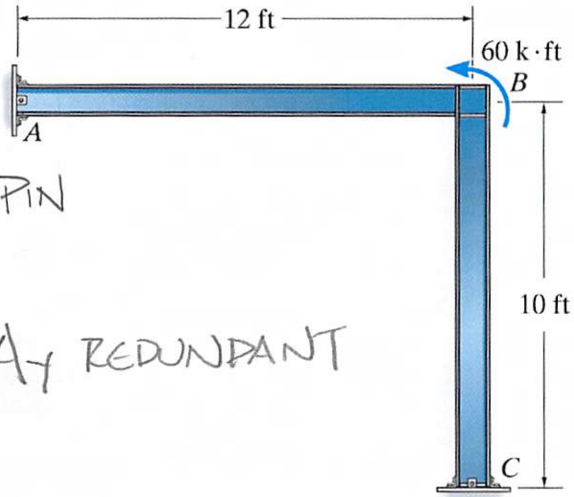
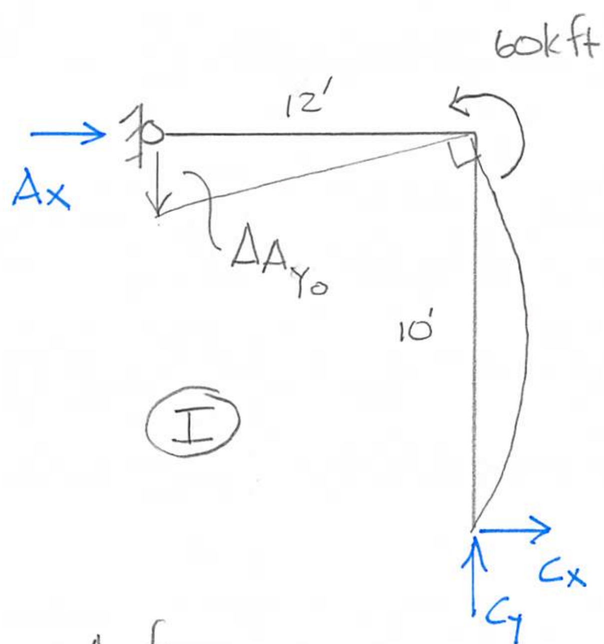
Problem 9b-1 – Compute the reactions for the following frame. Assume A_y is the redundant force.



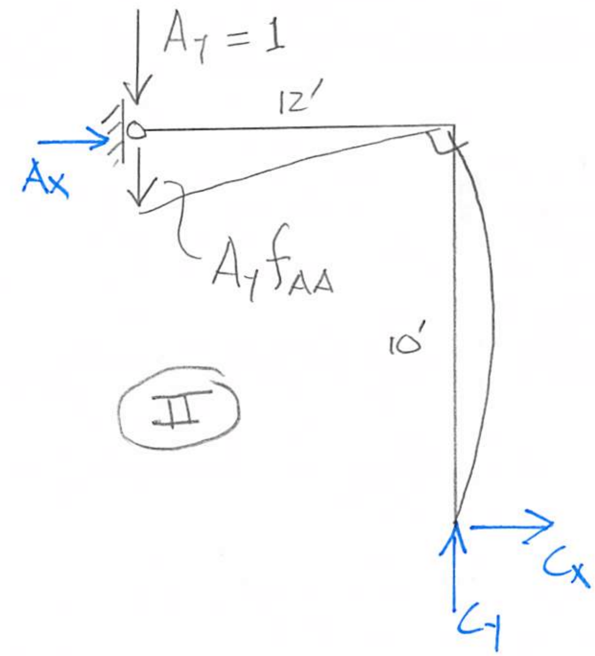
PIN

PIN

A_y REDUNDANT



+



$$\Delta A_y = 0 = \Delta A_{y_0} + A_y f_{AA}$$

(I) $\circlearrowleft + \sum M_C = 0 = 60\text{ kft} - A_x(10')$ $\quad \underline{A_x = 6k}$

$+\uparrow \sum F_y = \underline{0 = C_y}$

$\overset{+}{\rightarrow} \sum F_x = 0 = C_x + A_x$ $\quad \underline{C_x = -6k}$

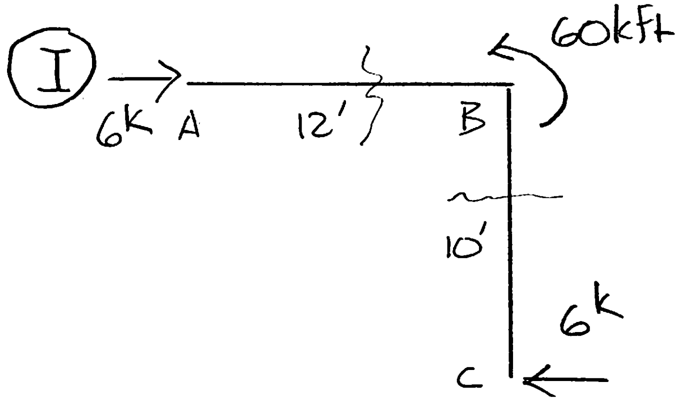
(II) $\circlearrowleft + \sum M_C = 0 = 1(12') - A_x(10')$ $\quad \underline{A_x = 6/5}$

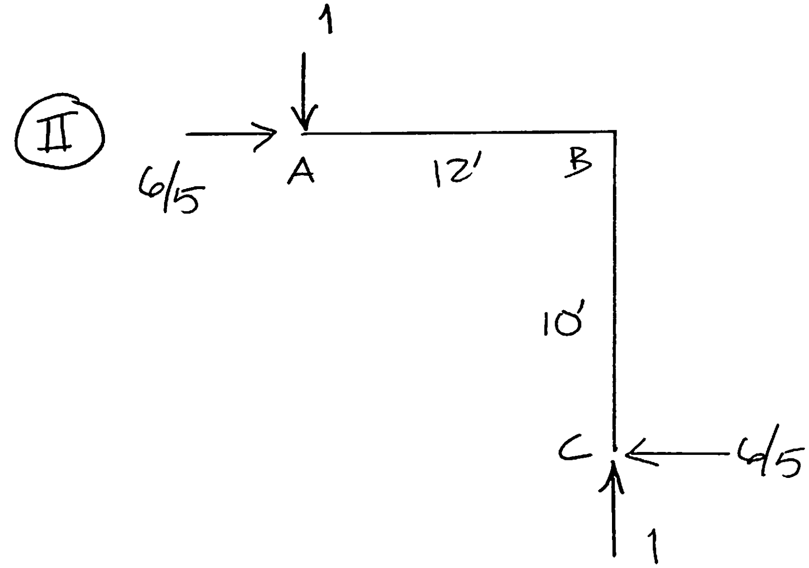
$+\uparrow \sum F_y = 0 = C_y - 1$ $\quad \underline{C_y = 1}$

$\overset{+}{\rightarrow} \sum F_x = 0 = C_x + A_x$ $\quad \underline{C_x = -6/5}$

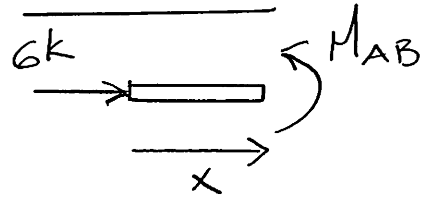
Problem 9b-1 – Compute the reactions for the following frame.

Find displacement at *A* in the y-direction.





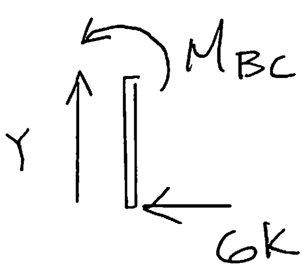
SECTION AB



$\circlearrowleft^{+} \sum M_{CUT} = 0$

$= M_{AB} = 0$

SECTION BC

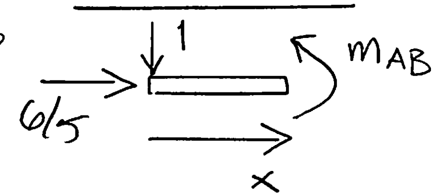


$\circlearrowleft^{+} \sum M_{CUT} = 0$

$= M_{BC} - 6^{k}(Y)$

$M_{BC} = [6Y]\ kft$

SECTION AB

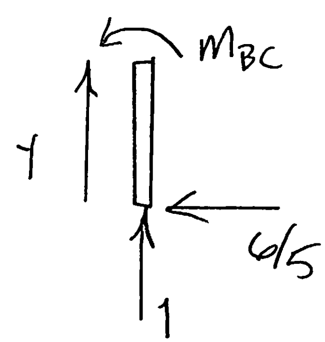


$\circlearrowleft^{+} \sum M_{CUT} = 0$

$= m_{AB} + 1x$

$m_{AB} = -x$

SECTION BC



$\circlearrowleft^{+} \sum M_{CUT} = 0$

$= m_{BC} - 6/5\,Y$

$m_{BC} = 6/5\,Y$

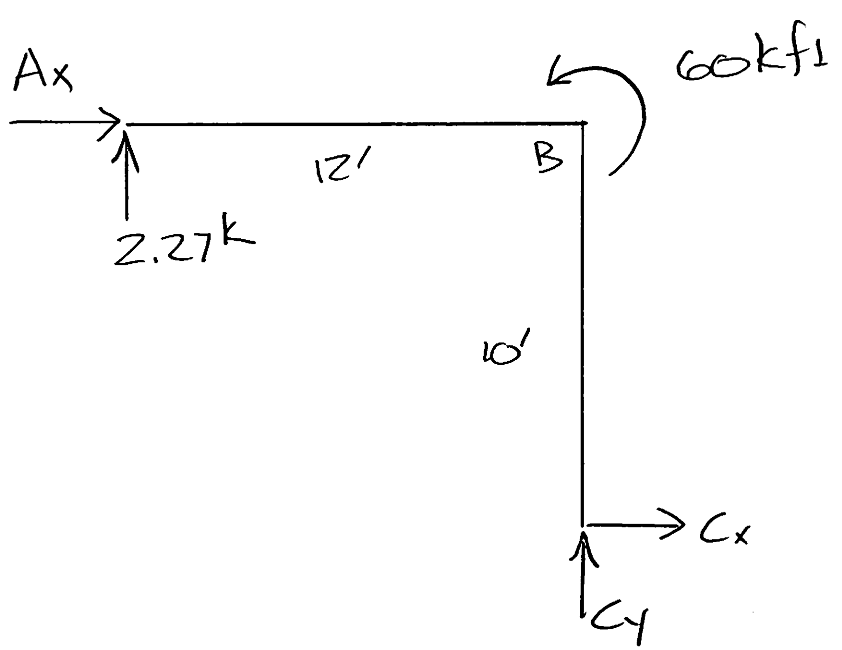
Problem 9b-1 – Compute the reactions for the following frame.

Find displacement at *A* in the y-direction due to A_y.

$$EI\Delta A_{y_0} = \int_0^{10} (6y)\frac{6}{5}y\,dy = \frac{36y^3}{15}\Big|_0^{10} = 2{,}400\,k\,ft^3$$

$$EI f_{AA} = \int_0^{12} (-x)^2 dx + \int_0^{10} \left(\frac{6}{5}y\right)^2 dy = \frac{x^3}{3}\Big|_0^{12} + \frac{36y^3}{75}\Big|_0^{10} = 1{,}056\,ft^3$$

$$A_y = \frac{-\Delta A_{y_0}}{f_{AA}} = -\frac{2{,}400\,k\,ft^3}{1{,}056\,ft^3} = -2.27^k$$



$$\circlearrowleft + \sum M_c = 0 = 60kft - 2.27k(12') - A_x(10')$$

$$A_x = 3.27^k$$

$$+\uparrow \sum F_y = 0 = C_y + 2.27^k \qquad C_y = -2.27^k$$

$$\overset{+}{\rightarrow} \sum F_x = 0 = A_x + C_x \qquad C_x = -3.27^k$$