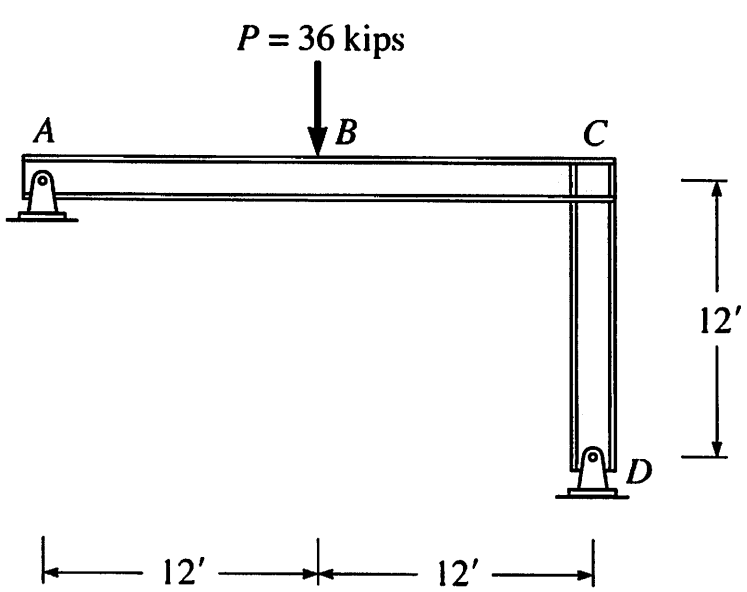
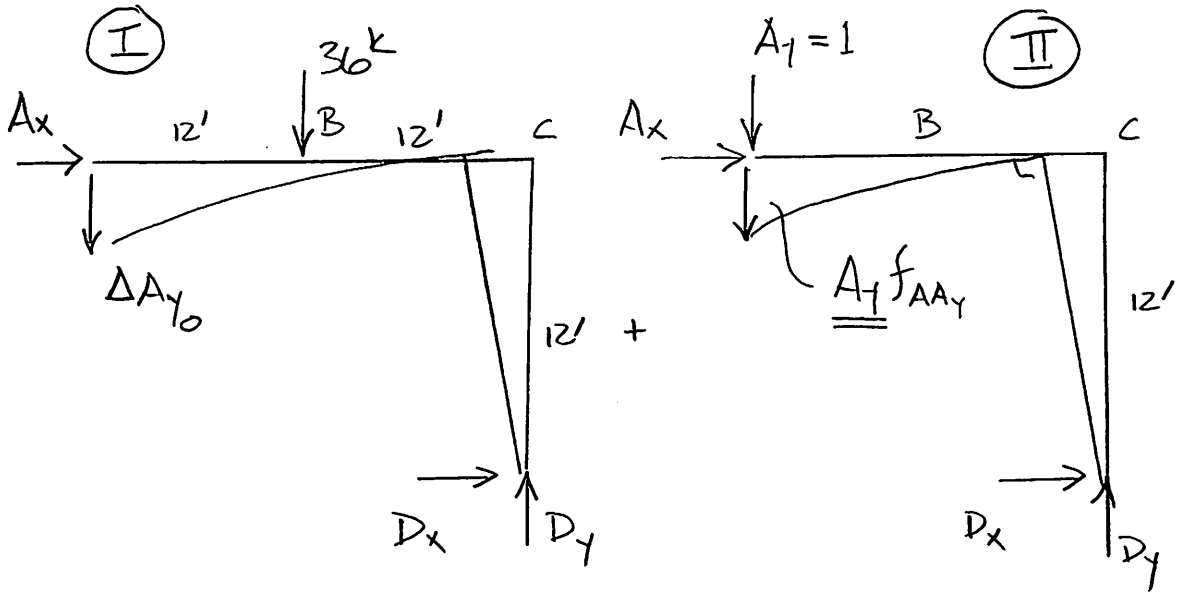
Problem 9b-2 – Compute the reactions for the following frame. Assume A_y is the redundant force.





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

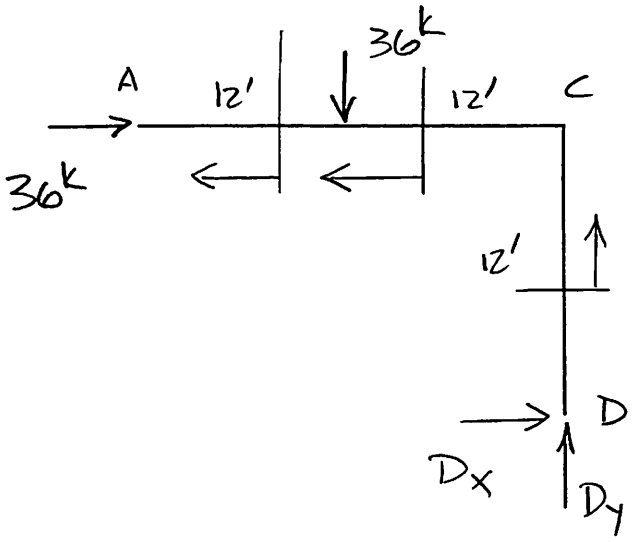
(I) $\circlearrowleft + \sum M_D = 0 = 36^k(12') - A_x(12')$

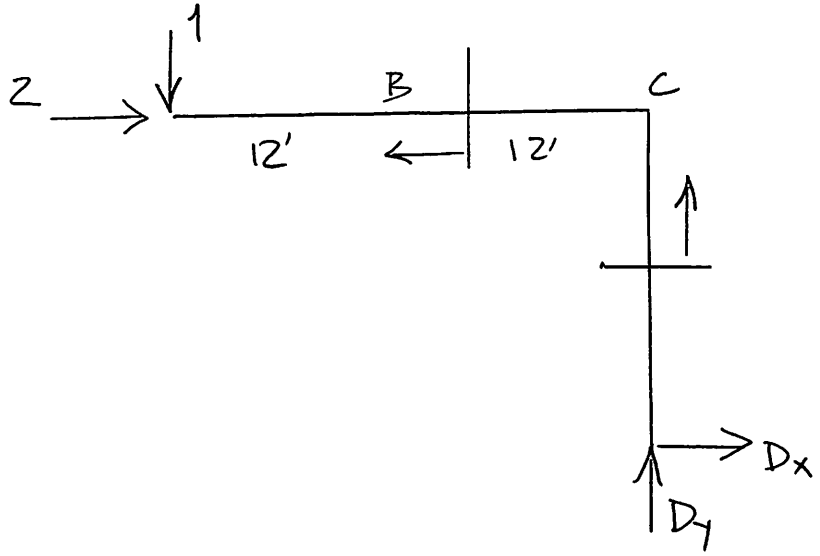
$$A_x = 36^k$$

(II) $\circlearrowleft + \sum M_D = 0 = 1(24') - A_x(12')$

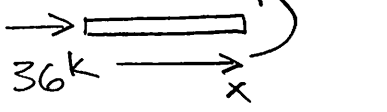
$$A_x = 2$$

Problem 9b-2 – Compute the reactions for the following beam.





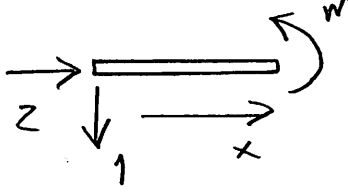
SECTION AB



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

$= M_{AB} = 0$

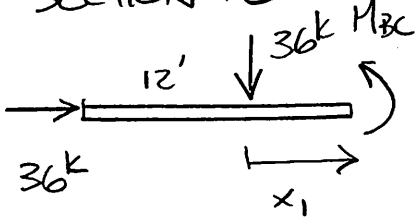
SECTION AB



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

$= M_{AB} + 1(x)$ $\quad M_{AB} = -x$

SECTION BC

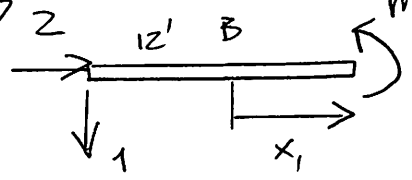


$\circlearrowleft + \sum M_{CUT} = 0$

$= M_{BC} + 36(x_1)$

$M_{BC} = -36x_1$

SECTION BC

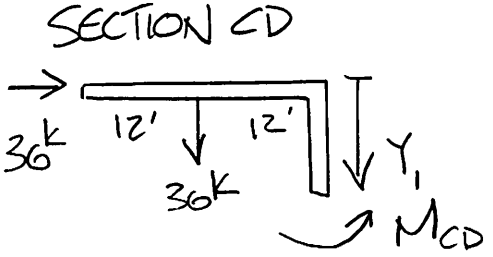


$\circlearrowleft + \sum M_{CUT} = 0$

$= M_{BC} + 1(x_1 + 12)$

$M_{BC} - (12 + x_1)$

SECTION CD

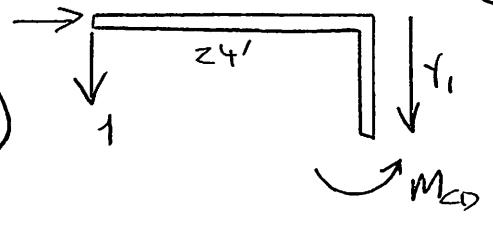


$\circlearrowleft + \sum M_{CUT} = 0$

$= M_{CD} + 36(12') - 36(Y_1)$

$M_{CD} = 36(Y_1 - 12)$

SECTION CD



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

$= M_{CD} + 1(24') - 2(Y_1)$

$M_{CD} = 2Y_1 - 24$

$= 2(Y_1 - 12)$

Problem 9b-2 – Compute the reactions for the following beam.

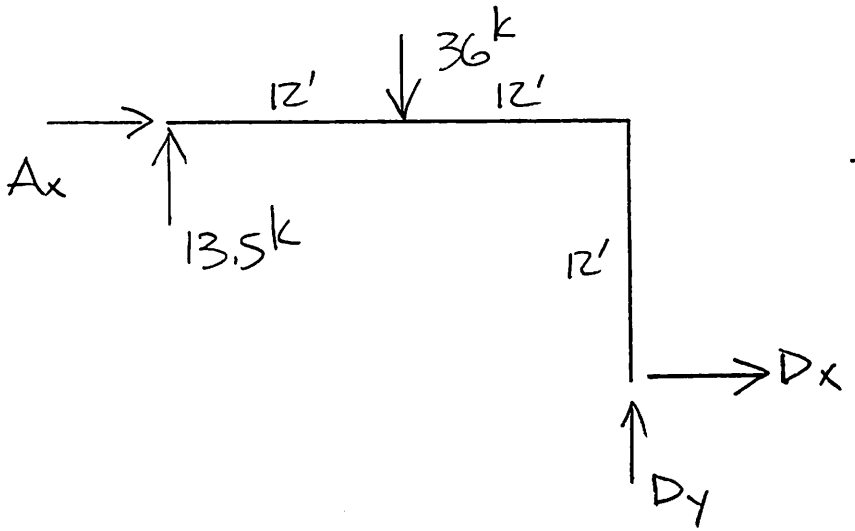
$$EI\Delta A_{y_6} = \int_0^{12} (-36x_1)(12+x_1)\,dx_1 + \int_0^{12} 72(y_1-12)^2\,dy_1$$

$$= \left[216x_1^2 + 12x_1^3\right]_0^{12} + 72\left[\frac{y_1^3}{3} - 12y_1^2 + 144y_1\right]_0^{12} = \underline{93{,}312\ k\,ft^3}$$

$$EIf_{AA_y} = \int_0^{12} (-x)^2\,dx + \int_0^{12} (12+x_1)^2\,dx_1 + \int_0^{12} 4(y_1-12)^2\,dy_1$$

$$= \frac{x_1^3}{3}\Big|_0^{12} + \left[144x_1 + 12x_1^2 + \frac{x_1^3}{3}\right]_0^{12} + 4\left[\frac{y_1^3}{3} - 12y_1^2 + 144y_1\right]_0^{12} = \underline{6{,}912\ ft^3}$$

$$A_y = \frac{\Delta A_{y_6}}{f_{AA}} = \underline{13.5^k}$$



$$\text{5)}\ \sum M_D = 0 = 36^k(12') - 13.5k(24') - A_x(12')$$

$$\underline{A_x = 9^k}$$

$$+\uparrow \sum F_y = 0 = D_y + 13.5^k - 36^k \qquad \underline{D_y = 22.5^k}$$

$$\pm\rightarrow \sum F_x = 0 = A_x + D_x \qquad \underline{D_x = -9^k}$$