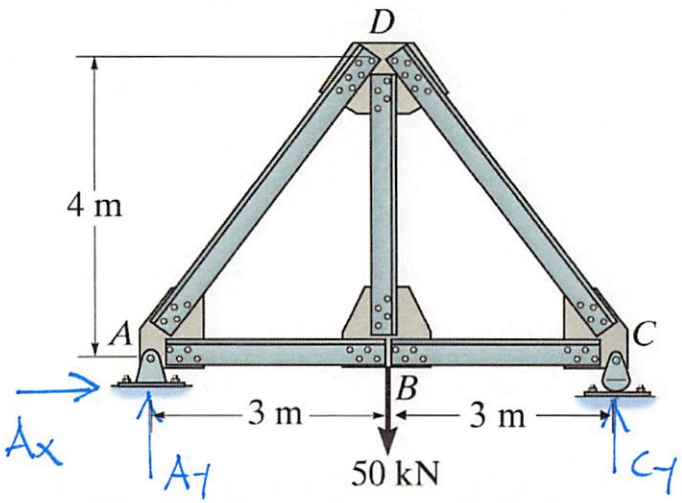
Example 8a-1: Determine the vertical displacement of joint *D*. Assume *AE* is constant.

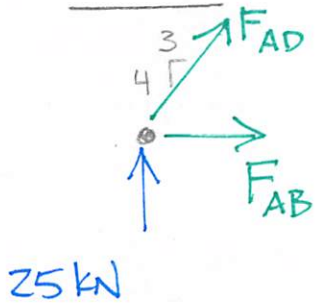


$\circlearrowleft + \sum M_A = 0 = -50\text{kN}(3\text{m}) + C_y(6\text{m})$ $\quad C_y = 25\text{kN}$

$+\uparrow \sum F_y = 0 = A_y + C_y - 50\text{kN}$ $\quad A_y = 25\text{kN}$

$\overset{+}{\rightarrow} \sum F_x = 0 = A_x$

JOINT A



$+\uparrow \sum F_y = 0$

$= \frac{4}{5} F_{AD} + 25\text{kN}$

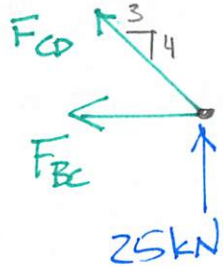
$F_{AD} = -31.25\text{kN}$

$\overset{+}{\rightarrow} \sum F_x = 0$

$= \frac{3}{5} F_{AD} + F_{AB}$

$F_{AB} = 18.75\text{kN}$

JOINT C



$+\uparrow \sum F_y = 0$

$= \frac{4}{5} F_{CD} + 25\text{kN}$

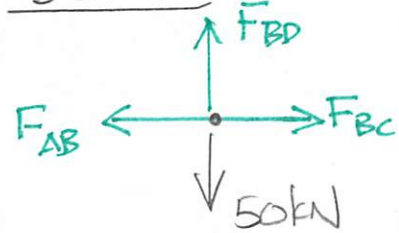
$F_{CD} = -31.25\text{kN}$

$\overset{+}{\rightarrow} \sum F_x = 0$

$= -\frac{3}{5} F_{CD} - F_{BC}$

$F_{BC} = 18.75\text{kN}$

JOINT B

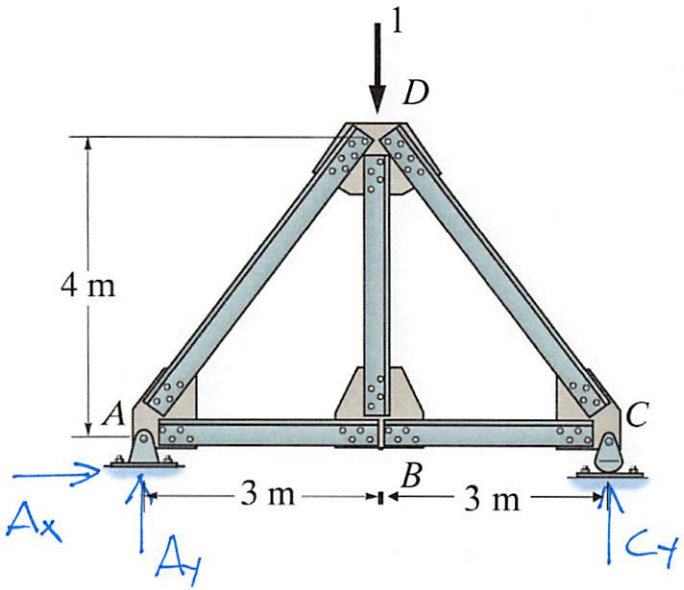


$+\uparrow \sum F_y = 0$

$= F_{BD} - 50\text{kN}$

$F_{BD} = 50\text{kN}$

Example 8a-1: Determine the vertical displacement of joint *D*. Assume *AE* is constant.

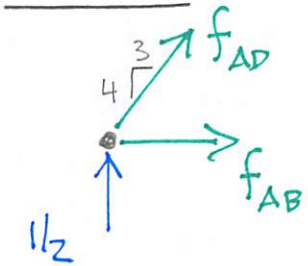


$$\circlearrowleft \sum M_A = 0 = -1(3m) + C_y(6m) \qquad C_y = 1/2$$

$$+\uparrow \sum F_y = 0 = A_y + C_y - 1 \qquad A_y = 1/2$$

$$\pm\rightarrow \sum F_x = 0 = A_x$$

JOINT A



$$+\uparrow \sum F_y = 0$$

$$= \frac{4}{5} f_{AD} + 1/2$$

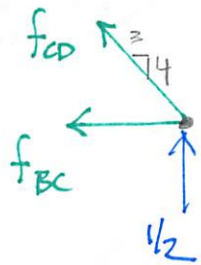
$$f_{AD} = -0.625$$

$$\pm\rightarrow \sum F_x = 0$$

$$= f_{AB} + \frac{3}{5} f_{AD}$$

$$f_{AB} = 0.375$$

JOINT C



$$+\uparrow \sum F_y = 0$$

$$= \frac{4}{5} f_{CD} + 1/2$$

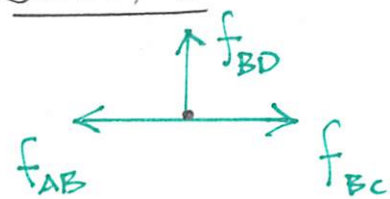
$$f_{CD} = -0.625$$

$$\pm\rightarrow \sum F_x = 0$$

$$= -f_{BC} - \frac{3}{5} f_{CD}$$

$$f_{BC} = 0.375$$

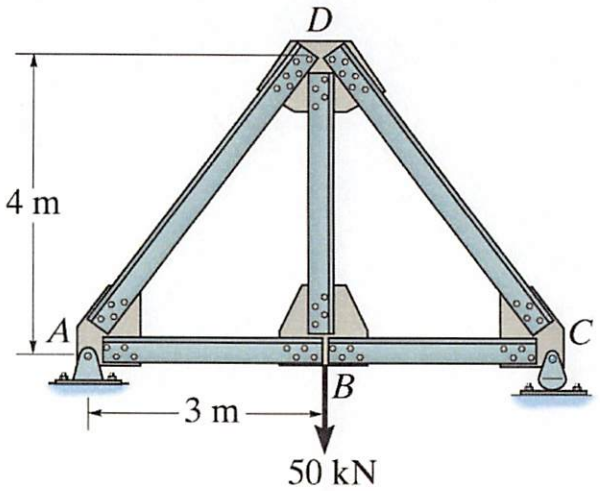
JOINT B



ZERO-FORCE MEMBER

$$f_{BD} = 0$$

Example 8a-1: Determine the vertical displacement of joint *D*. Assume *AE* is constant.



$$Y_{D_{VERTICAL}} = \frac{237.5\,kN\,m}{AE} \left[\frac{FfL}{L^2 \frac{F}{L^2}}\right]$$

Element	*F* (kN)	*f*	*L* (m)	*FfL* (kN m)
AB	18.75	0.375	3	21.094
BC	18.75	0.375	3	21.094
CD	-31.25	-0.625	5	97.656
DA	-31.25	-0.625	5	97.656
BD	50	0	4	0

$\sum$ 237.5 kN m