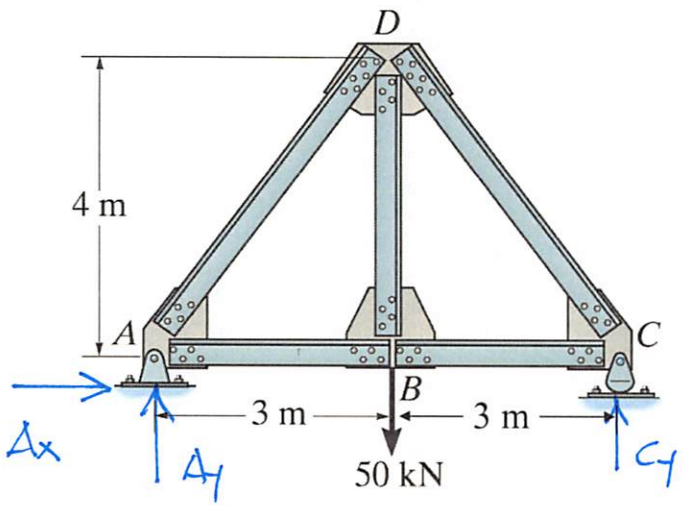
Example 8a-1: Determine the vertical displacement of joint *D*. Assume *AE* is constant.

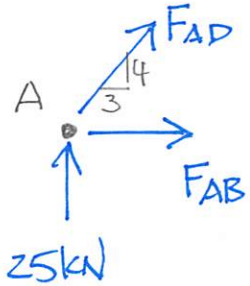


$$\circlearrowleft \sum M_A = 0 = -50\,kN(3m) + C_y(6m) \qquad C_y = 25\,kN$$

$$+\uparrow \sum F_y = 0 = A_y + C_y - 50\,kN \qquad A_y = 25\,kN$$

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

JOINT A



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

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

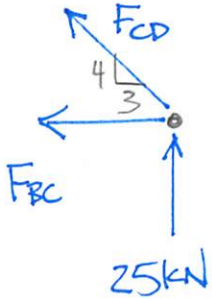
$$F_{AD} = -31.25\,kN$$

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

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

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

JOINT C



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

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

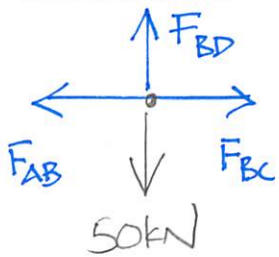
$$F_{CD} = -31.25\,kN$$

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

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

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

JOINT B

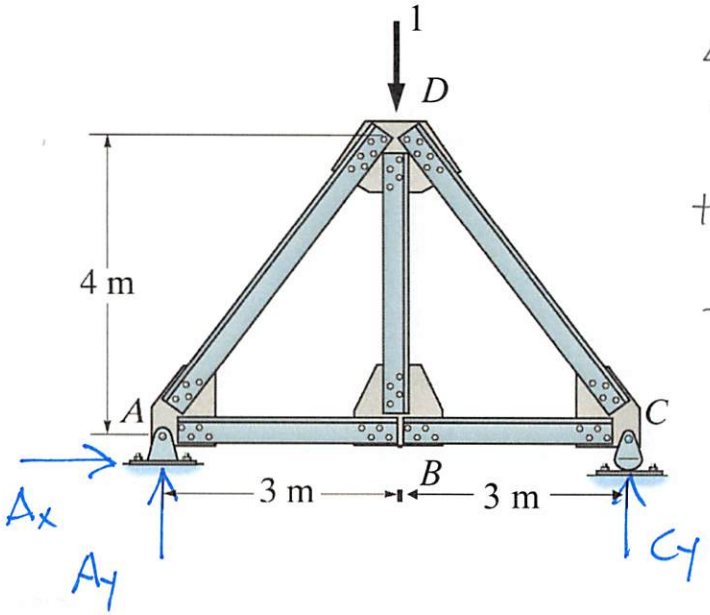


$$+\uparrow \sum F_y = 0$$

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

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

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

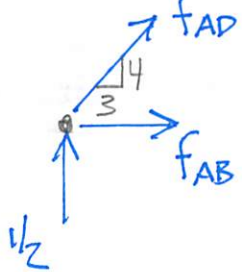


$$\circlearrowleft + \sum M_A = 0 = -1(3m) + C_y(6m) \qquad C_y = 1/2$$

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

$$\xrightarrow{+} \sum F_x = 0 = A_x$$

JOINT A



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

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

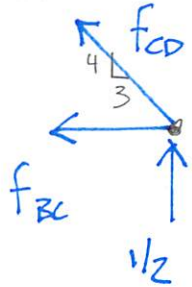
$$f_{AD} = -5/8$$

$$\xrightarrow{+} \sum F_x = 0$$

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

$$f_{AB} = 3/8$$

JOINT C



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

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

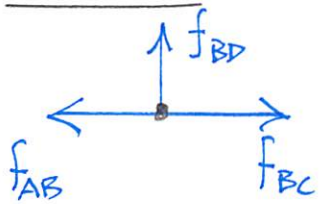
$$f_{CD} = -5/8$$

$$\xrightarrow{+} \sum F_x = 0$$

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

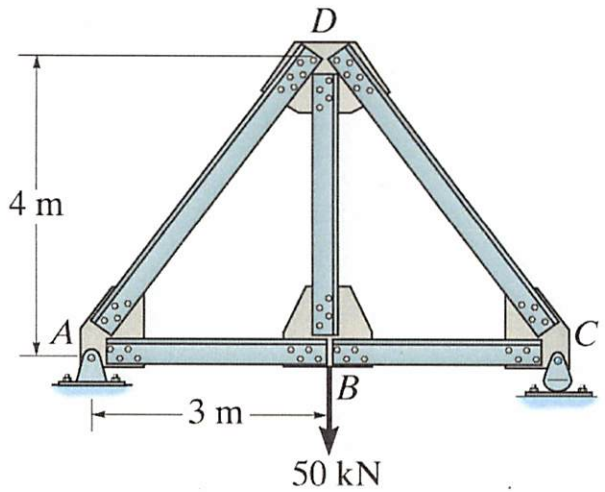
$$f_{BC} = 3/8$$

JOINT B



$$+\uparrow \sum F_y = 0 = f_{BD}$$

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



$$\gamma_{D_{VERTICAL}} = \frac{237.5\ kNm}{AE}$$

$$\frac{FL}{L^2\left[F/L^2\right]}$$

Element	*F* (kN)	*f*	*L* (m)	*FfL*
AB	18.75	3/8	3	21.0938
AD	-31.25	-5/8	5	97.6563
BC	18.75	3/8	3	21.0938
CD	-31.25	-5/8	5	97.6563
BD	50	0	4	0

$\sum$ 237.5