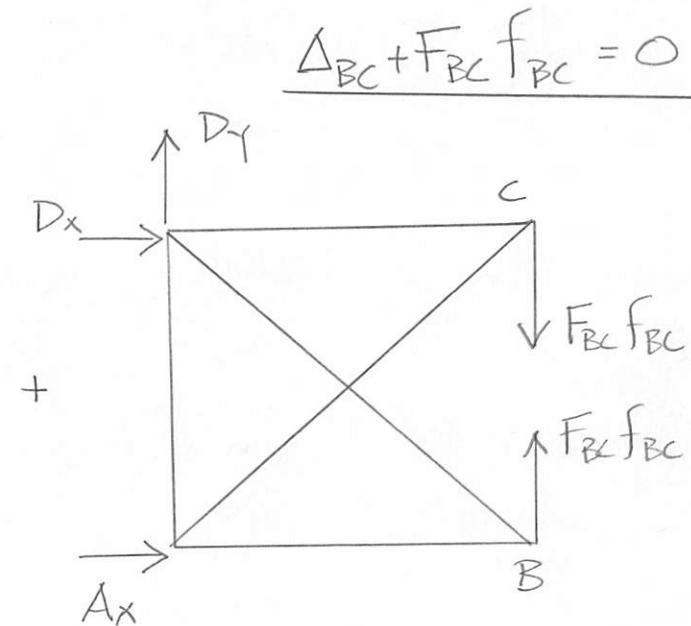
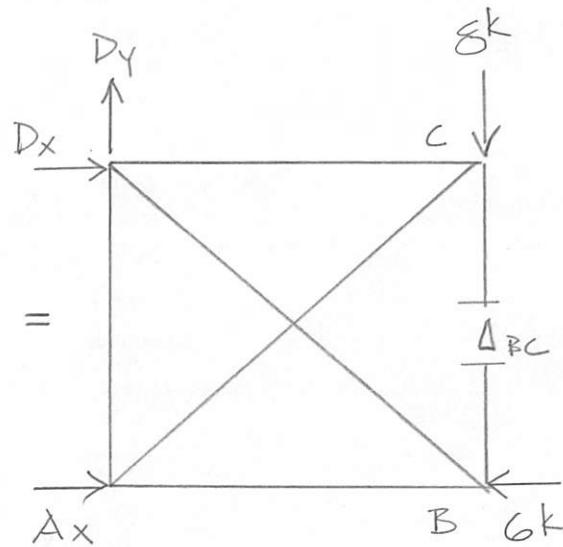
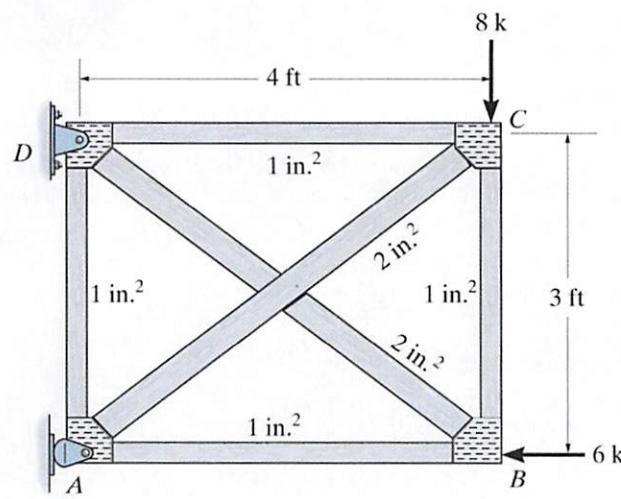


Problem 9c-3 – Determine the reactions and bar forces in the truss.



### REAL FORCES

$$\begin{aligned} \text{JOINT B} \\ \frac{F_{BD}}{\sqrt{3}} + \uparrow \sum F_y = 0 &= \frac{3}{5} F_{BD} \\ F_{BD} = 0 & \\ + \rightarrow \sum F_x = 0 & \\ = -F_{AB} - 6k & \\ F_{AB} = -6k & \end{aligned}$$

$$\begin{aligned} \text{JOINT C} \\ \frac{8k}{\sqrt{3}} + \uparrow \sum F_y = 0 &= -\frac{3}{5} F_{AC} - 8k \\ F_{AC} = -13.33k & \\ + \rightarrow \sum F_x = 0 & \\ = -F_{CD} - \frac{4}{5} F_{AC} & \\ F_{CD} = 10.67k & \end{aligned}$$

$$\begin{aligned} \text{JOINT A} \\ \frac{F_{AD}}{\sqrt{3}} + \uparrow \sum F_y = 0 &= F_{AD} + \frac{3}{5} F_{AC} \\ F_{AD} = 8k & \end{aligned}$$

**Problem 9c-3 – Determine the reactions and bar forces in the truss.**

VIRTUAL FORCES

$$\begin{aligned} \text{JOINT B} \\ \begin{array}{l} f_{BD} \leftarrow 4 \\ \downarrow 3 \\ F_{AB} \end{array} & + \uparrow \sum F_y = 0 \\ & = 1 + \frac{3}{5} f_{BD} \\ & \underline{f_{BD} = -1.667} \\ + \rightarrow \sum F_x = 0 & \\ & = -f_{AB} - \frac{4}{5} f_{BD} \\ & \underline{f_{AB} = 1.333} \end{aligned}$$

$$\begin{aligned} \text{JOINT C} \\ \begin{array}{l} f_{CD} \leftarrow 4 \\ \downarrow 3 \\ F_{AC} \end{array} & + \uparrow \sum F_y = 0 \\ & = -1 - \frac{3}{5} f_{AC} \\ & \underline{f_{AC} = -1.667} \\ + \rightarrow \sum F_x = 0 & \\ & = -f_{CD} - \frac{4}{5} f_{AC} \\ & \underline{f_{CD} = 1.333} \end{aligned}$$

$$\begin{aligned} \text{JOINT A} \\ \begin{array}{l} f_{AD} \uparrow 4 \\ \rightarrow 3 \\ f_{AB} \end{array} & + \uparrow \sum F_y = 0 \\ & = f_{AD} + \frac{3}{5} f_{AC} \\ & \underline{f_{AD} = 1} \end{aligned}$$

MEMBER	F(k)	f	L(ft)	A(in <sup>2</sup> )	FFL/A(kft/in <sup>2</sup> )	ffL/A (ft/in <sup>2</sup> )
AB	-6	1,333	4	1	-31.99	7.11
AC	-13.33	-1.667	5	2	55.55	6.95
AD	8	1	3	1	24	3
BC	0	1	3	1	0	3
CD	10.67	1,333	4	1	56.76	7.11
BD	0	-1.667	5	2	0	6.95

$$\sum 104.33 \quad 34.11$$

Problem 9c-3 – Determine the reactions and bar forces in the truss.

$$F_{BC} = -\frac{\Delta_{BC}}{f_{BC}} = -\frac{104.33 \text{ kft/in}^2}{34.11 \text{ k/in}^2} = \underline{-3.06 \text{ k}}$$

J O I N T B

$$\begin{aligned} +\uparrow \sum F_y &= 0 \\ F_{BD} \sin 3/4 &= 3.06 \text{ k} \\ F_{BD} &= \underline{5.10 \text{ k}} \end{aligned}$$

$$\begin{aligned} +\rightarrow \sum F_x &= 0 \\ -F_{AB} - \frac{4}{5} F_{BD} &= 6 \text{ k} \\ F_{AB} &= \underline{-10.08 \text{ k}} \end{aligned}$$

J O I N T C

$$\begin{aligned} +\uparrow \sum F_y &= 0 \\ -\frac{3}{5} F_{AC} - 8 \text{ k} + 3.06 \text{ k} &= 0 \\ F_{AC} &= \underline{-8.23 \text{ k}} \end{aligned}$$

$$\begin{aligned} +\rightarrow \sum F_x &= 0 \\ -F_{CD} - \frac{4}{5} F_{AC} &= 0 \\ F_{CD} &= \underline{6.59 \text{ k}} \end{aligned}$$

J O I N T A

$$\begin{aligned} +\uparrow \sum F_y &= 0 \\ F_{AD} + \frac{3}{5} F_{AC} &= 0 \\ F_{AD} &= \underline{4.94 \text{ k}} \end{aligned}$$