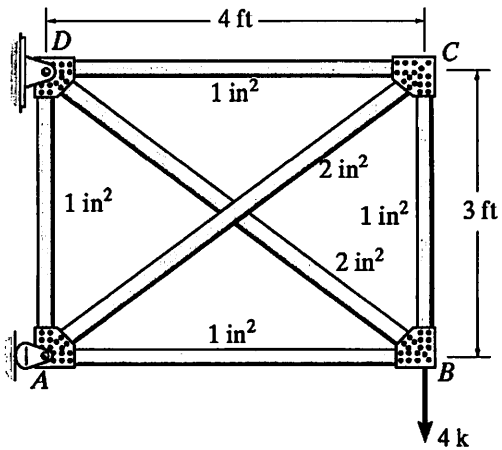
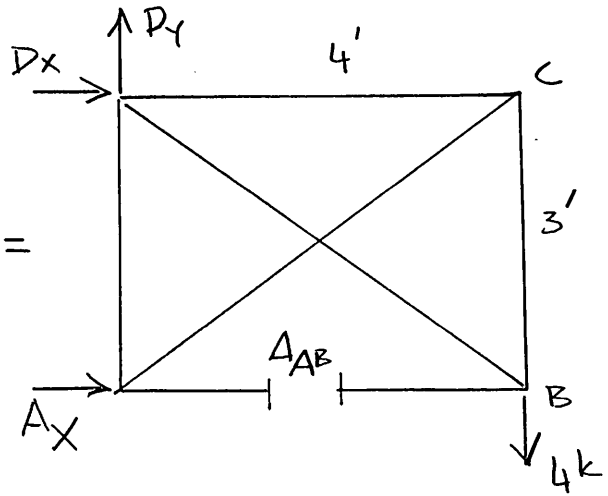
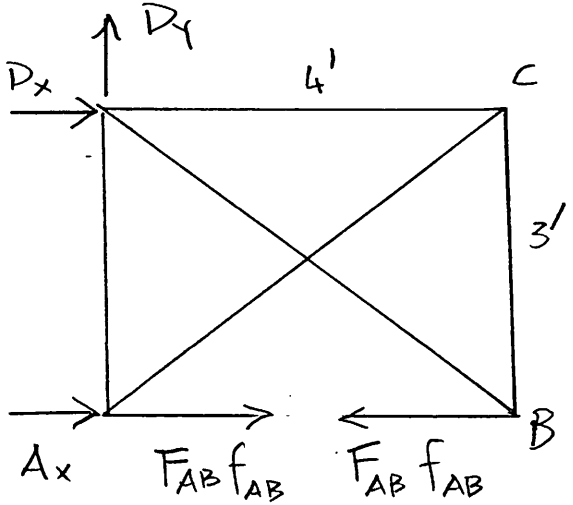
Problem 9-27 – Determine the force in each truss member. The cross-sectional area of each member is indicated in the figure. Assume the members are pin connected at their ends. *E*=29(103) ksi.





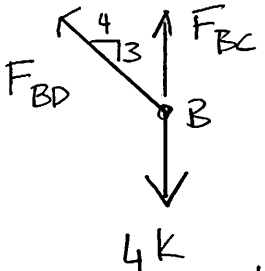
+



$$\Delta_{AB} + F_{AB} f_{AB} = 0$$

REAL FORCES

JOINT B



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

$$= -\frac{4}{5} F_{BD}$$

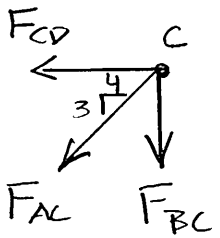
$$F_{BD} = 0$$

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

$$= F_{BC} - 4k$$

$$F_{BC} = 4k$$

JOINT C



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

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

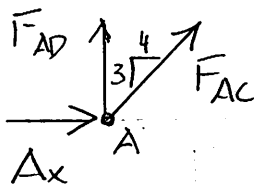
$$F_{AC} = -6.67$$

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

$$= -F_{CD} - \frac{4}{5} F_{AC}$$

$$F_{CD} = 5.33k$$

JOINT A



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

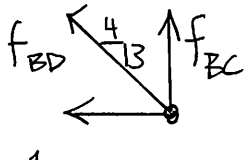
$$= F_{AD} + \frac{3}{5} F_{AC}$$

$$F_{AD} = 4^k$$

Problem 9-27 – Determine the force in each truss member. The cross-sectional area of each member is indicated in the figure. Assume the members are pin connected at their ends. E=29(103) ksi.

VIRTUAL FORCES

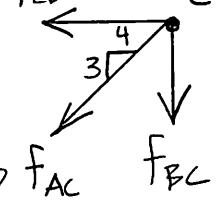
JOINT B



$$\pm\rightarrow \sum F_x = 0$$
$$= -1 - \frac{4}{5} f_{BD}$$
$$f_{BD} = -1.25$$

$$+\uparrow \sum F_y = 0$$
$$= f_{BC} + \frac{3}{5} f_{BD}$$
$$f_{BC} = 0.75$$

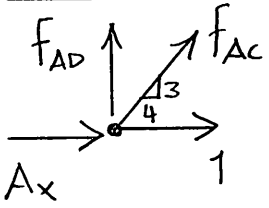
JOINT C



$$+\uparrow \sum F_y = 0$$
$$= -f_{BC} - \frac{3}{5} f_{AC}$$
$$f_{AC} = -1.25$$

$$\pm\rightarrow \sum F_x = 0$$
$$= -f_{CD} - \frac{4}{5} f_{AC}$$
$$f_{CD} = 1$$

JOINT A



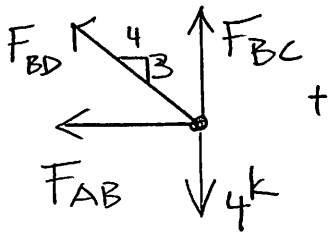
$$+\uparrow \sum F_y = 0$$
$$= f_{AD} + \frac{3}{5} f_{AC}$$
$$f_{AD} = 0.75$$

MEMBER	F(k)	f	L(ft)	A(in²)	Ffl/A (kft/in²)	ffL/A (ft/in²)
AB	0	1	4	1	0	4
BC	4	0.75	3	1	9	1.69
CD	5.33	1	4	1	21.32	4
DA	4	0.75	3	1	9	1.69
AC	-6.67	-1.25	5	2	20.84	3.91
BD	0	-1.25	5	2	0	3.91
					60.16	19.19

Problem 9-27 – Determine the force in each truss member. The cross-sectional area of each member is indicated in the figure. Assume the members are pin connected at their ends. E=29(103) ksi.

$$F_{AB} = -\frac{\Delta_{AB}}{f_{AB}} = -\frac{60.16\ k\,ft/in^2}{19.19\ ft/in^2} = \underline{-3.14\ k}$$

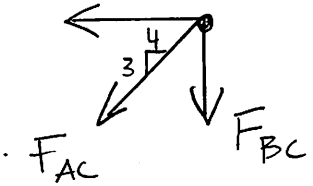
JOINT B



$$\pm\rightarrow \sum F_x = 0 = -F_{AB} - \frac{4}{5}F_{BD} \qquad \underline{F_{BD} = 3.92^k}$$

$$+\uparrow \sum F_y = 0 = F_{BC} + \frac{3}{5}F_{BD} - 4^k \qquad \underline{F_{BC} = 1.65^k}$$

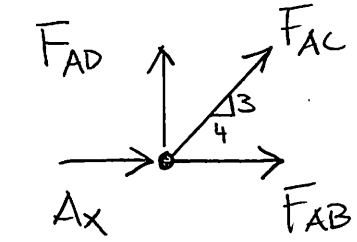
JOINT C



$$+\uparrow \sum F_y = 0 = -F_{BC} - \frac{3}{5}F_{AC} \qquad \underline{F_{AC} = -2.75^k}$$

$$\pm\rightarrow \sum F_x = 0 = -F_{CD} - \frac{4}{5}F_{AC} \qquad \underline{F_{CD} = 2.20^k}$$

JOINT A



$$+\uparrow \sum F_y = 0 = F_{AD} + \frac{3}{5}F_{AC} \qquad \underline{F_{AD} = 1.65^k}$$