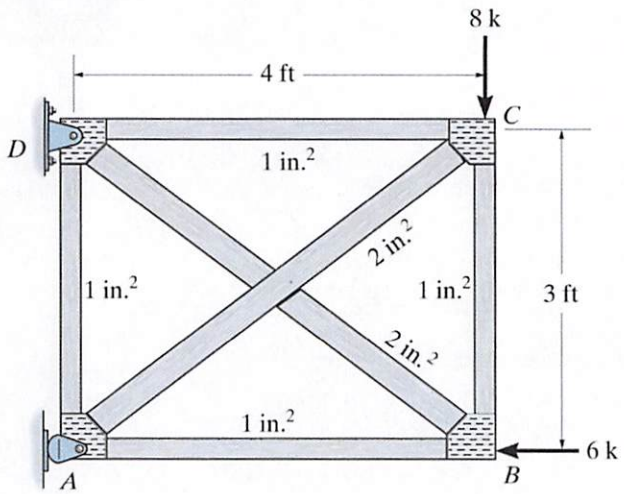
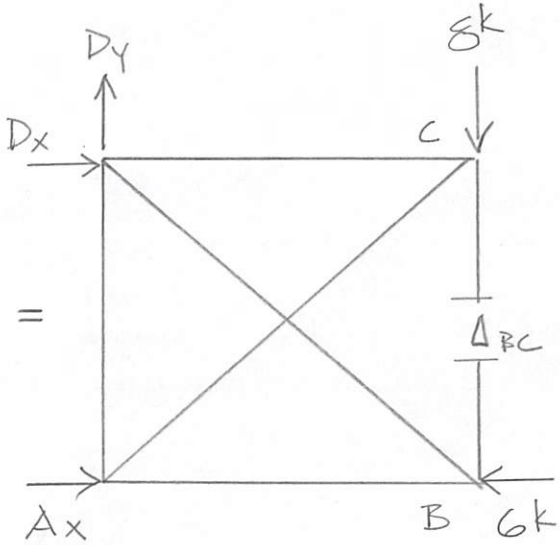
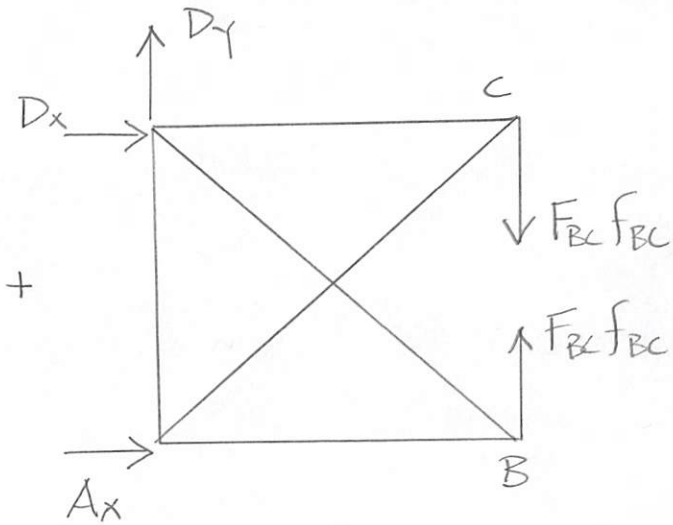
Problem 9c-3 – Determine the reactions and bar forces in the truss.



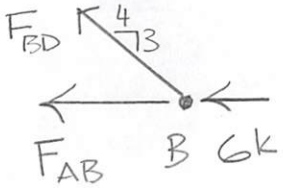
$$\Delta_{BC} + F_{BC} f_{BC} = 0$$





REAL FORCES

JOINT B



$$+\uparrow \sum F_y = 0 = \frac{3}{5} F_{BD}$$

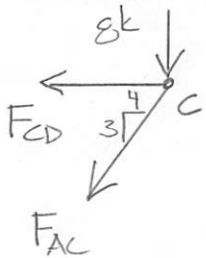
$$F_{BD} = 0$$

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

$$= -F_{AB} - 6k$$

$$F_{AB} = -6^k$$

JOINT C



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

$$= -\frac{3}{5} F_{AC} - 8^k$$

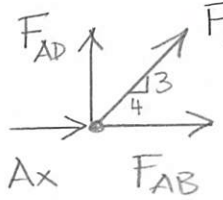
$$F_{AC} = -13.33^k$$

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

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

$$F_{CD} = 10.67k$$

JOINT A



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

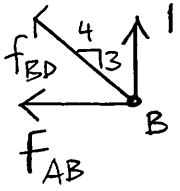
$$= F_{AD} + \frac{3}{5} F_{AC}$$

$$F_{AD} = 8k$$

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

VIRTUAL FORCES

JOINT B



$+\uparrow \sum F_y = 0$

$= 1 + \frac{3}{5} f_{BD}$

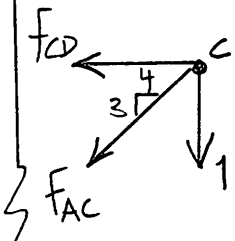
$f_{BD} = -1.667$

$\pm\rightarrow \sum F_x = 0$

$= -f_{AB} - \frac{4}{5} f_{BD}$

$f_{AB} = 1.333$

JOINT C



$+\uparrow \sum F_y = 0$

$= -1 - \frac{3}{5} f_{AC}$

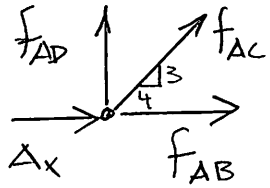
$f_{AC} = -1.667$

$+\rightarrow \sum F_x = 0$

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

$f_{CD} = 1.333$

JOINT A



$+\uparrow \sum F_y = 0$

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

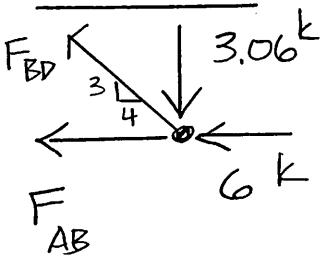
$f_{AD} = 1$

MEMBER	F(k)	f	L(ft)	A(in^2)	FfL/A($k\cdot ft/in^2$)	ffL/A(ft/in^2)
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	34.11

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

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

JOINT B



$+\uparrow \sum F_y = 0$

$= \frac{3}{5}F_{BD} - 3.06^k$

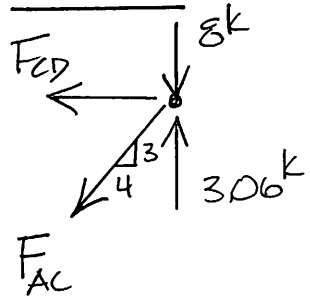
$\underline{F_{BD} = 5.10k}$

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

$= -F_{AB} - \frac{4}{5}F_{BD} - 6^k$

$\underline{F_{AB} = -10.08k}$

JOINT C



$+\uparrow \sum F_y = 0$

$= -\frac{3}{5}F_{AC} - 8^k + 3.06^k$

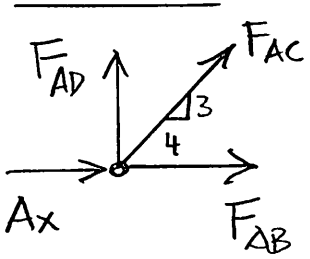
$\underline{F_{AC} = -8.23^k}$

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

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

$\underline{F_{CD} = 6.59^k}$

JOINT A



$+\uparrow \sum F_y = 0$

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

$\underline{F_{AD} = 4.94^k}$