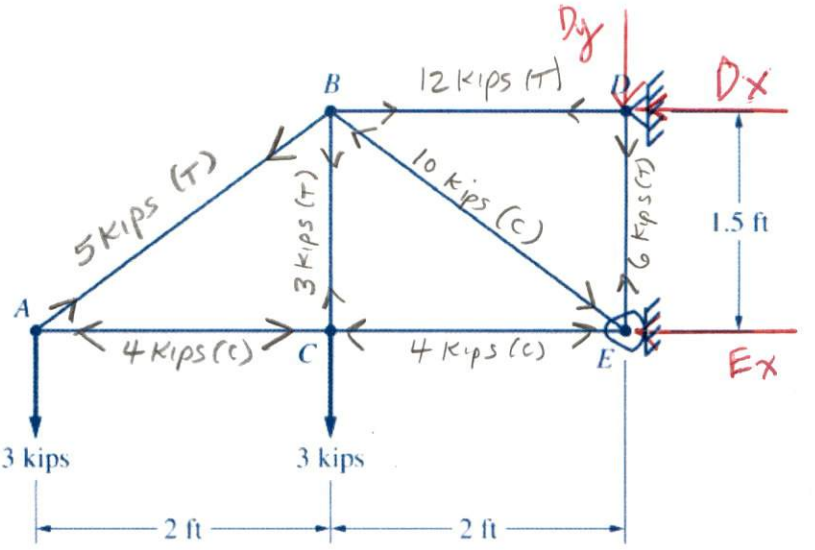
4-5
Solution.



FBD- Entire Truss

ccw +M ↺
cw -M ↻

Equilibrium Equations

$[\Sigma M_D = 0]$ $3\text{ kips}(4\text{ ft}) + 3\text{ kips}(2\text{ ft}) - E_x(1.5\text{ ft}) = 0$

$$E_x = \frac{18\text{ kip.ft}}{1.5\text{ ft}} = \underline{12\text{ kips}} \leftarrow$$

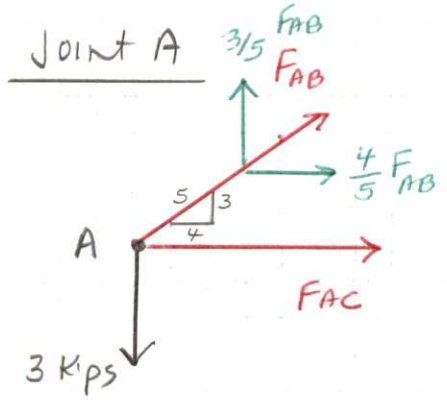
$[\Sigma F_x = 0]$ $-E_x - D_x = 0$

$D_x = -12\text{ kips} \leftarrow$ and $\boxed{D_x = 12\text{ kips} \rightarrow}$

$[\Sigma F_y = 0]$ $-3\text{ kips} - 3\text{ kips} - D_y = 0$

$D_y = -6\text{ kips} \downarrow$ and $\boxed{D_y = 6\text{ kips} \uparrow}$

Joint A



FBD- Joint A

Equilibrium Equations

$[\Sigma F_y = 0]$ $-3\text{ kips} + \frac{3}{5}F_{AB} = 0$

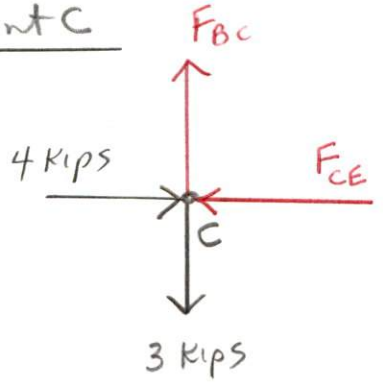
$F_{AB} = \frac{5}{3}(3\text{ kips}) = \underline{5\text{ kips (T)}}$

$[\Sigma F_x = 0]$ $F_{AC} + \frac{4}{5}F_{AB} = 0$

$F_{AC} = -\frac{4}{5}(5\text{ kips}) = -4\text{ kips (T)}$

and $\boxed{F_{AC} = 4\text{ kips (C)}}$

Joint C



FBD - Joint C

Equilibrium Equations

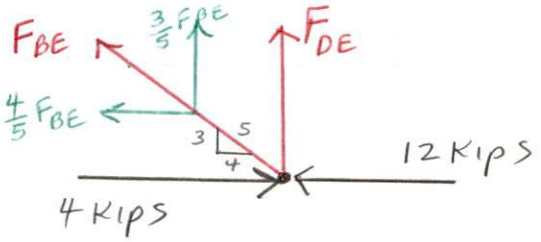
$[\Sigma F_x = 0]$ $\quad 4\,\text{kips} - F_{CE} = 0$

$F_{CE} = \underline{4\,\text{kips}}$ (C)

$[\Sigma F_y = 0]$ $\quad -3\,\text{kips} + F_{BC} = 0$

$F_{BC} = \underline{3\,\text{kips}}$ (T)

Joint E



FBD - Joint E

Equilibrium Equations

$[\Sigma F_x = 0]$ $\quad -\frac{4}{5}F_{BE} - 12\,\text{kips} + 4\,\text{kips} = 0$

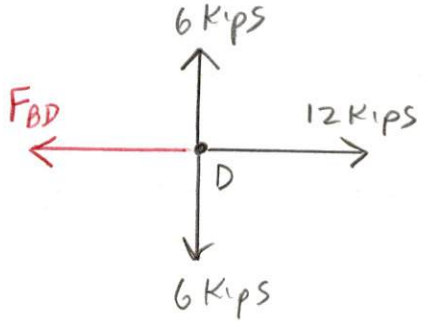
$F_{BE} = -\frac{5}{4}(8\,\text{kips}) = -10\,\text{kips}$ (T)

and $\boxed{F_{BE} = 10\,\text{kips (C)}}$

$[\Sigma F_y = 0]$ $\quad \frac{3}{5}F_{BE} + F_{DE} = 0$

$F_{DE} = -\frac{3}{5}(-10\,\text{kips}) = \underline{6\,\text{kips}}$ (T)

Joint D



FBD - Joint D

Equilibrium Equations

$[\Sigma F_x = 0]$ $\quad -F_{BD} + 12\,\text{kips} = 0$

$F_{BD} = \underline{12\,\text{kips}}$ (T)

check

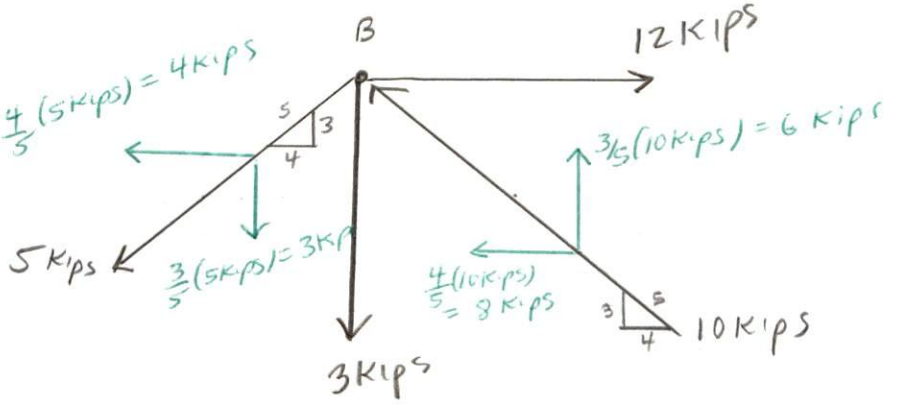
$[\Sigma F_y = 0]$ $\quad 6\,\text{kips} - 6\,\text{kips} = 0$

$0 = 0$ ✓

Joint B is a "spare Joint"

use as a check Joint, next page

Joint B



FBD- Joint B

Equilibrium Equations

$[\Sigma F_x = 0]$ $-4\text{ Kips} + 12\text{ Kips} - 8\text{ Kips} = 0$

$0 = 0$ ✓

$[\Sigma F_y = 0]$ $-3\text{ Kips} - 3\text{ Kips} + 6\text{ Kips} = 0$

$0 = 0$ ✓