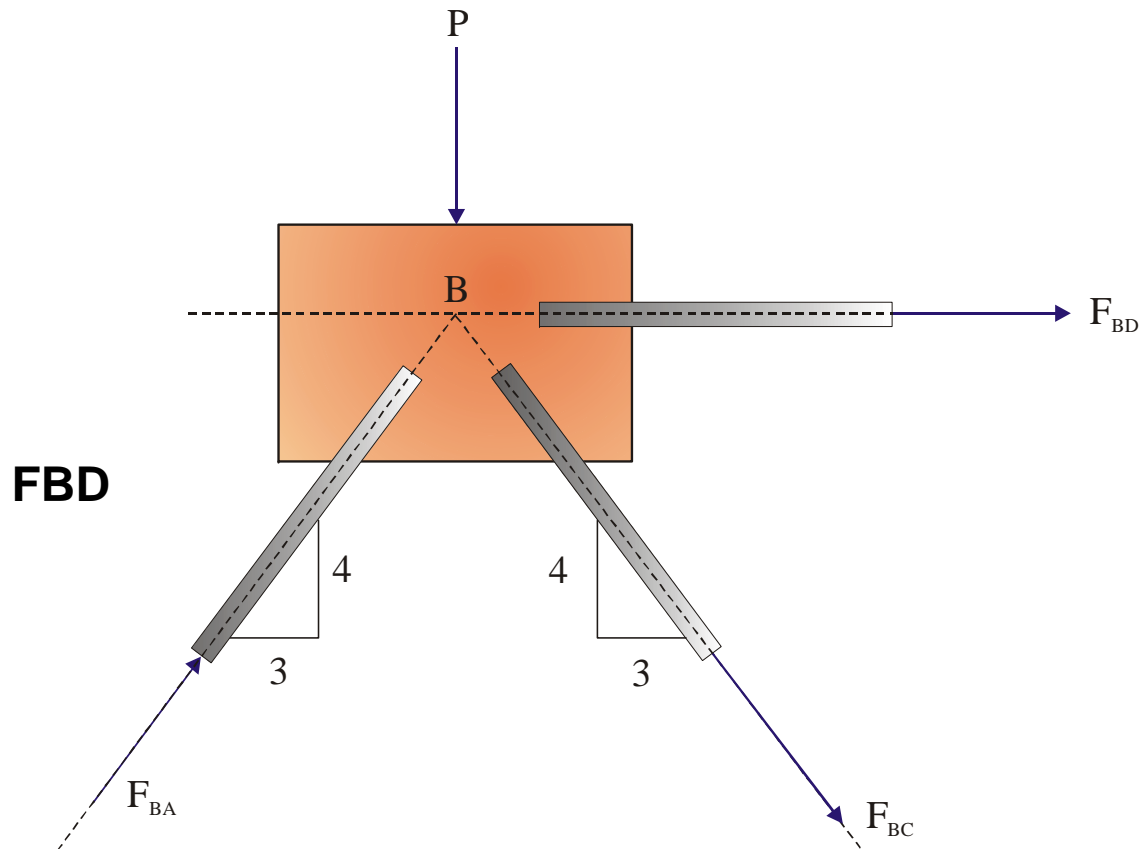


Example 2.9

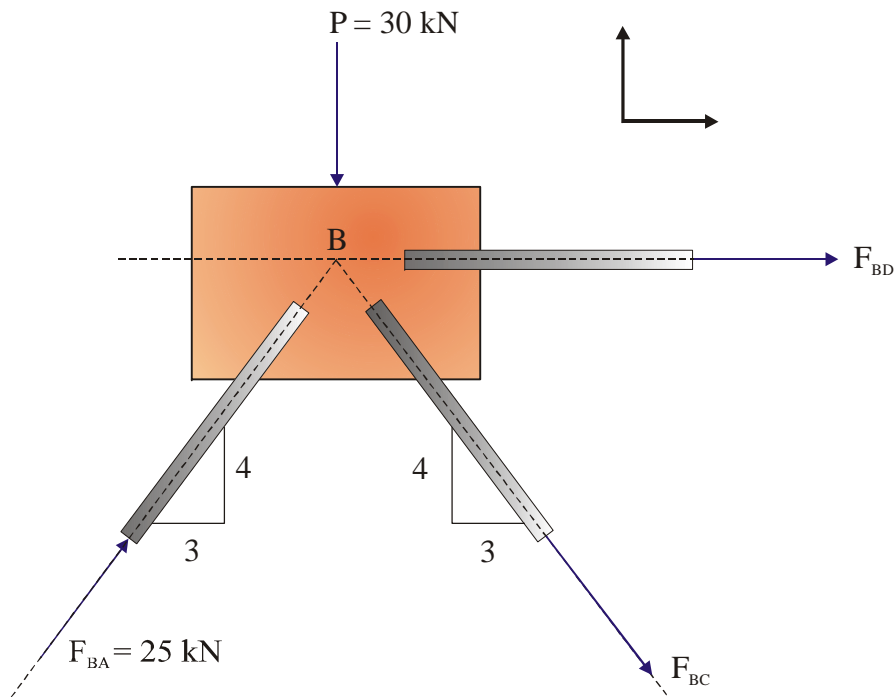
J. Frye

Example 2.9:

A welded connection is in equilibrium under the action of the four forces. Knowing that $P = 30$ kN and $F_{BA} = 25$ kN and given the FBD shown, determine the magnitude of the other two forces. Redraw the FBD indicating the magnitude and correct direction of all forces.



Note: The senses of F_{BD} and F_{BC} in this FBD are assumed (they may be incorrect).



FBD

$$\sum F_x = 0 \rightarrow$$

$$F_{BD} + \frac{3}{5}(25) + \frac{3}{5}F_{BC} = 0 \quad (1)$$

$$\sum F_y = 0 \uparrow$$

$$-30 + \frac{4}{5}(25) - \frac{4}{5}F_{BC} = 0 \quad (2)$$

Solving (2):

$$F_{BC} = -12.5 \text{ kN}$$

(Minus sign indicates direction in FBD assumed incorrectly.)

$$\therefore F_{BC} = 12.5 \text{ kN}$$

Substitute $F_{BC} = -12.5$ in Equation (1).

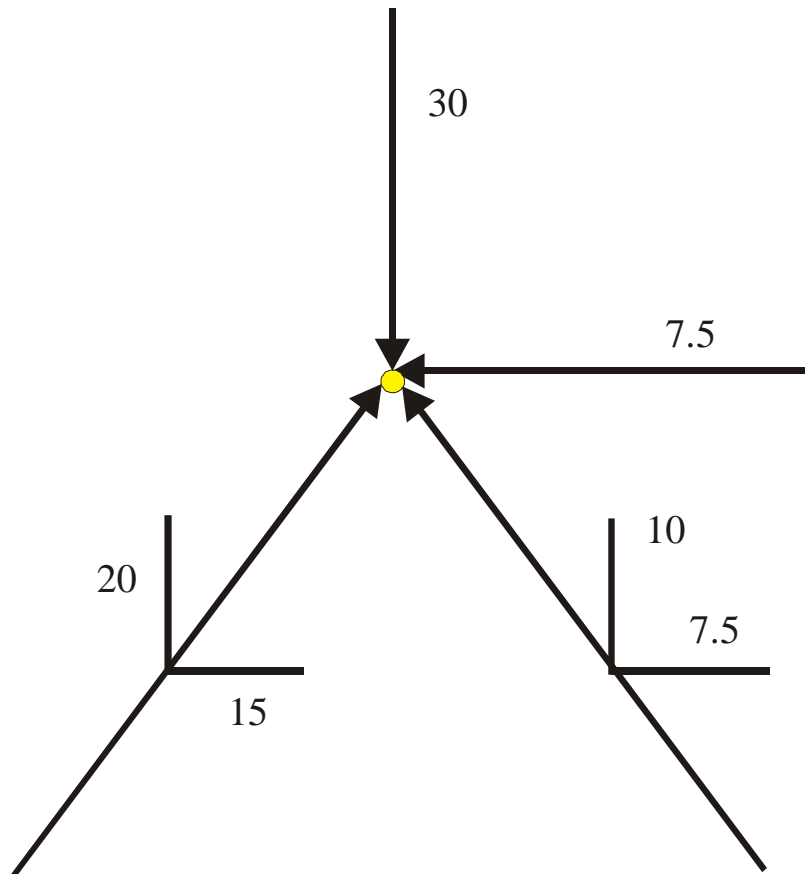
$$F_{BD} + \frac{3}{5}(25) + \frac{3}{5}(-12.5) = 0$$

$$F_{BD} = -7.5 \text{ kN}$$

(Minus sign indicates direction in FBD assumed incorrectly.)

$$\therefore F_{BD} = 7.5 \text{ kN} \leftarrow$$

CHECK – Resolve all sloping forces into rectangular components and put on placeholders



$$\sum F_x = 0 \rightarrow$$

$$15 - 7.5 - 7.5 = 0$$

$$0 = 0$$

$$\sum F_y = 0 \uparrow$$

$$-30 + 20 + 10 = 0$$

$$0 = 0$$