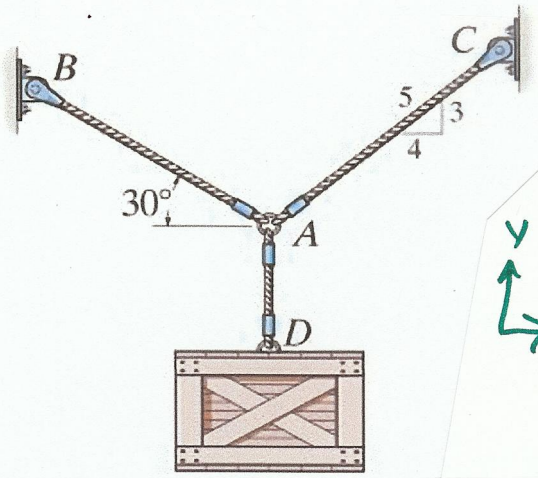
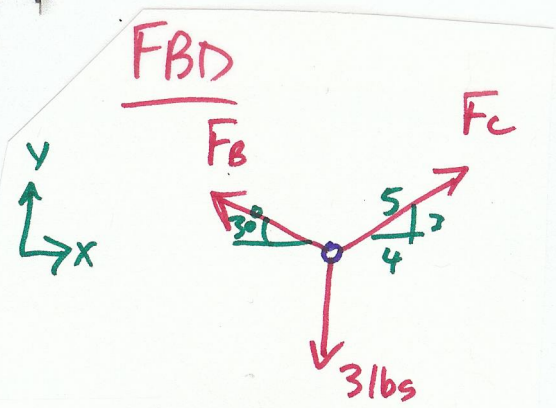
Equilibrium of a Particle 1

The crate has a weight of 3 lbs. Determine the force in each supporting cable (1) experimentally and (2) analytically. For the experimental set-up, use three springs and trace the force trajectories on the paper so they follow the diagram below. With one spring reading 3 lbs, read and record the other two springs. Now draw the free body diagram and solve the problem analytically below. Do your experimental and analytical answers match? If not, why?





CONCURRENT
2 EQNS
2 UNKS

$$\rightarrow \Sigma F_x = 0 = -F_B \cos 30 + \tfrac{4}{5} F_C$$

$$\uparrow \Sigma F_y = 0 = F_B \sin 30 + \tfrac{3}{5} F_C - 3$$

REWRITE

$$-.866 F_B + 0.8 F_C = 0$$

$$0.5 F_B + 0.6 F_C = 3$$

$$\begin{bmatrix} -.866 & 0.8 \\ 0.5 & 0.6 \end{bmatrix} \begin{Bmatrix} F_B \\ F_C \end{Bmatrix} = \begin{Bmatrix} 0 \\ 3 \end{Bmatrix}$$

$$\begin{Bmatrix} F_B \\ F_C \end{Bmatrix} = \begin{bmatrix} -.866 & 0.8 \\ 0.5 & 0.6 \end{bmatrix}^{-1} \begin{Bmatrix} 0 \\ 3 \end{Bmatrix} = \begin{Bmatrix} 2.61 \\ 2.82 \end{Bmatrix}$$

$F_B = 2.61$ lbs

$F_C = 2.82$ lbs