6.17. Model: We assume that the safe is a particle moving only in the *x*-direction. Since it is sliding during the entire problem, we can use the model of kinetic friction.

Visualize:

Pictorial representation

Known

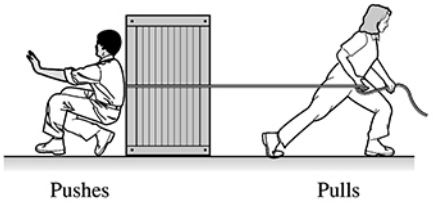
$F_B = 350$ N

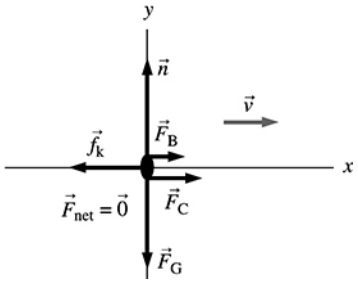
$F_C = 385$ N

$m = 300$ kg

Find

μ_k





Solve: The safe is in equilibrium, since it's not accelerating. Thus we can apply Newton's first law in the vertical and horizontal directions:

$$(F_{net})_x = \Sigma F_x = F_B + F_C - f_k = 0 \text{ N} \Rightarrow f_k = F_B + F_C = 350 \text{ N} + 385 \text{ N} = 735 \text{ N}$$

$$(F_{net})_y = \Sigma F_y = n - F_G = 0 \text{ N} \Rightarrow n = F_G = mg = (300 \text{ kg})(9.80 \text{ m/s}^2) = 2.94 \times 10^3 \text{ N}$$

Then, for kinetic friction:

$$f_k = \mu_k n \Rightarrow \mu_k = \frac{f_k}{n} = \frac{735 \text{ N}}{2.94 \times 10^3 \text{ N}} = 0.250$$

Assess: The value of $\mu_k = 0.250$ is hard to evaluate without knowing the material the floor is made of, but it seems reasonable.