A 5.00 kg box is sitting next to a 12.0 kg crate on a horizontal surface. A 150 N force is applied horizontally on the 5.00 kg box. See figure. The coefficient of kinetic friction between each mass and the surface is $\mu_k = 0.600$.

**A.** Construct a free-body diagram for each mass using the objects shown below.

![Free-body diagrams](Image)

**3 Pts**

**B.** Determine the acceleration of the two mass system.

**Box**

\[ m_{\text{box}} \alpha = F_{\text{ext}} - F_{\text{friction,box}} - F_{\text{crate on box}} \]

\[ \alpha = \frac{50 \text{ N}}{17.0 \text{ kg}} = 2.94 \text{ m/s}^2 \]

**Crate**

\[ m_{\text{crate}} \alpha = F_{\text{friction,crate}} - F_{\text{box on crate}} \]

\[ a_{\text{max}} = (0.600)(12.0 \text{ kg})(2.94 \text{ m/s}^2) = 70.6 \text{ N} \]

**6 Pts**

C. As the box and crate accelerate together, what is the force the right face of the box exerts on the left face of the crate?

\[ F_{\text{box on crate}} = m_{\text{crate}} \omega + F_{\text{friction,crate}} = (12.0 \text{ kg})(2.94 \text{ m/s}^2) + 70.6 \text{ N} = 106 \text{ N (to the right)} \]

**6 Pts**

D. As the box and crate accelerate together, what is the magnitude of the force exerted by the left face of the crate on the right face of the box?

\[ F_{\text{crate on box}} = -F_{\text{box on crate}} = 106 \text{ N (to the left)} \]

**2 Pts**