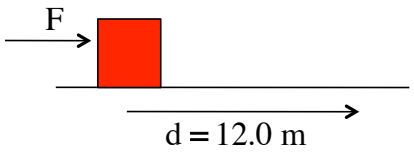
Problem 7.32

A worker pushed a 35.0 kg crate with a constant, horizontal force "F" that maintains a constant speed over a 12.0 meter distance. It does 350. joules of work in the process.

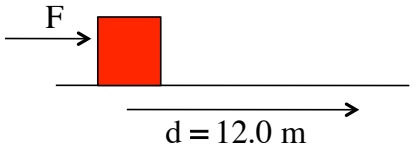


a.) How big is F?

At this point, this should be almost insultingly easy:

$$W_F = \vec{F} \bullet \vec{d}$$
$$= Fd\cos 0^o$$
$$\Rightarrow \quad F = \frac{W_F}{d}$$
$$= \frac{(350.\ \text{J})}{(12.0\ \text{m})}$$
$$= 29.2\ \text{N}$$

b.) If "F" is increased, how will the motion change?



In the original situation, the frictional force and "F" just balanced so there was no acceleration. With "F" increased, there should be a constant acceleration. Put in terms of energy, the energy being provided by "F" in the original situation was being exactly removed by friction. With "F" being larger, it now puts more energy into the system than friction takes out, and there will be (according to the Work/Energy Theorem) a change of kinetic energy. Translation: The body's velocity magnitude increases.

c.) If "F" is decreased, how will the motion change?

Assuming it *was* originally moving, "F" won't put as much energy into the system as friction takes out, and the body will slow down finally coming to rest. If it is not originally moving, the body will not move at all (static friction is larger than kinetic friction, so if it starts out at rest and "F" is small, the body won't go anywhere).