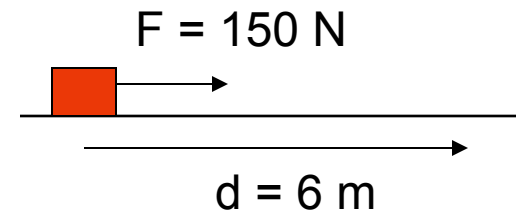## Problem 5.6

A horizontal force of 150 N pushes a 40 kg crate a distance 6 meters at constant velocity on a rough horizontal surface.
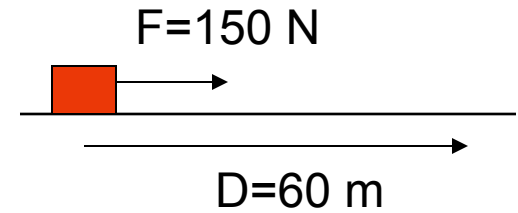
F = 150 N

d = 6 m

a.) What is the work done by the 150 N force?

b.) What is the coefficient of friction?
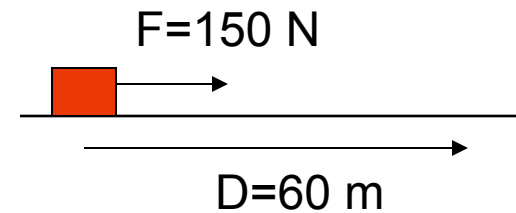
1.)

Prob 5.6

F=150 N

D=60 m

A horizontal force of 150 N pushes a 40 kg crate a distance 6 meters at constant velocity on a rough horizontal surface.

a.) What is the work done by the 150 N force?

$$W_{man} = \vec{F} \bullet \vec{d}$$
$$= \left| \vec{F}_{man} \right| \left| \vec{d} \right| \cos \theta$$
$$= (150 \text{ nt}) \ (6 \text{ m}) \ \cos 0^{o}$$
$$= 900 \text{ nt} \bullet \text{m} \qquad (= 900 \text{ joules})$$

F=150 N

D=60 m

b.) What is the coefficient of friction?

For constant velocity, no energy is being put into the system or taken out so the total work must equal zero and:

$$W_F + W_{friction} = \vec{F}_F \bullet \vec{d} + \vec{F}_{friction} \bullet \vec{d} = \cancel{\Delta KE}^{0}$$

$$= (900 \text{ joules}) + (\mu_k N) d \cos\theta = 0$$

$$= (900 \text{ joules}) + (\mu_k mg) d \cos 180° = 0$$

$$\Rightarrow \quad \mu_k = \frac{(900 \text{ joules})}{(40 \text{ kg})(9.8 \text{ m/s}^2)(6 \text{ m})(1)}$$

$$\Rightarrow \quad \mu_k = .383$$