

Momentum Example

1

A person applies a net force of 175 N to a stalled car. How long must this force be applied if the 1370 kg car needs to reach 5.0 mph (2.24 m/s) to attempt a push-start?

$$v_0 = 0 \Rightarrow \Delta v = v$$

$$J = F \Delta t = m \Delta v$$

$$\Delta t = \frac{m \Delta v}{F} = \frac{(1370\text{ kg})(2.24\text{ m/s})}{175\text{ N}} = \boxed{17.5\text{ s}}$$

If another automobile can accomplish the same feat in 1.0 s , determine 1) the force applied, 2) work done on the car when $\mu = 0.04$.

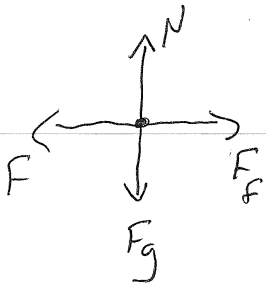
Note: "on the car" implies your system should be the car only.

$$F \Delta t = m \Delta v$$

$$v_0 = 0 \Rightarrow \Delta v = v$$

$$F = \frac{m \Delta v}{\Delta t} = \frac{(1370\text{ kg})(2.24\text{ m/s})}{1.0\text{ s}} = \boxed{3,070\text{ N}}$$

(2)



$$\Sigma F_y = 0 = N + F_g$$

$$\Sigma F_x = -ma = -F + F_f = -3,070\text{N}$$

For the car as only part of system

$$W = Fd_{||} = \Delta E_k = \frac{1}{2}mv^2$$

$$= \frac{1}{2}(1370\text{kg})\left(2.24\frac{\text{m}}{\text{s}}\right)^2$$

$$= 3.44 \text{E}3 \text{ J}$$