


HW due Wed Oct 17th

P. 233 #1-3

1. A compact car, with mass 725kg, is moving at 115 km/h toward the east. Sketch the moving car.

a.) Find the magnitude and direction of its momentum and draw an arrow on your diagram showing the momentum.

b.) A second car, with mass 2175kg, has the same momentum. What is its velocity?

A) 
$$v = \frac{115 \cancel{\text{km}} | 1000 \text{m} | 1 \text{h}}{\text{h} | 1 \cancel{\text{km}} | 3600 \text{s}} = 32 \frac{\text{m}}{\text{s}}$$

$$p = mv = 725 \text{kg} (32 \text{m/s}) = 23,200 \frac{\text{kg} \cdot \text{m}}{\text{s}} \quad \text{Ns}$$

B) $m_2 = 2175 \text{kg}$ (3 X ^{car two is} mass of car one)

$$p = 23200 \frac{\text{kg} \cdot \text{m}}{\text{s}} = 2175 \text{kg} v_2$$

$$v_2 = \frac{p}{m_2} = 10.7 \text{m/s} \quad \left(\frac{1}{3} \text{ speed of car 1} \right)$$

2. The driver of the compact car in the previous problem suddenly applies the brakes hard for 2.0s. As a result, an average force of 5000N is exerted on the car to slow it down.

- What is the change in momentum, that is, the magnitude and direction of the impulse on the car?
- Compare the before and after sketches, and determine the momentum and velocity of the car now.

$$J = F \Delta t = -5000\text{N}(2\text{s}) = -10,000\text{Ns}$$

Impulse = change in momentum

Force opposes the motion

$p_i = 23,200\text{Ns}$

$p_f = 13,200\text{Ns}$

$v_f = \frac{p_f}{m} = \frac{13,200\text{Ns}}{725\text{kg}} = 18.2\frac{\text{m}}{\text{s}}$

IMPULSE = Force X Time

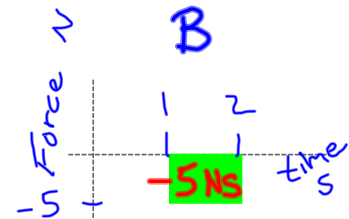
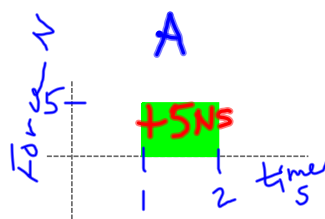
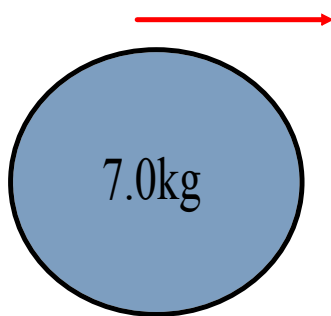
$$J = F \Delta t$$

Impulse = change in momentum

" Fat = mom "

$$F \Delta t = \Delta \text{momentum}$$

3. A 7.0kg bowling ball is rolling down the alley with a velocity of 2.0 m/s. For each impulse, shown in figures A and B, find the resulting speed and direction of the motion of the bowling ball.



Area = H · W
impulse = F · t

$$P_i = m v_i$$

$$= 7 \text{ kg} (2 \text{ m/s})$$

$$P_i = 14 \text{ kg m/s} = 14 \text{ Ns}$$

Impulse A
 $J = +5 \text{ Ns}$

$$P_f = P_i + J$$

$$= 14 \text{ Ns} + 5 \text{ Ns}$$

$$P_f = 19 \text{ Ns}$$

faster

Impulse B
 $J = -5 \text{ Ns}$

$$P_f = P_i + J$$

$$= 14 \text{ Ns} - 5 \text{ Ns}$$

$$P_f = 9 \text{ Ns}$$

slower

