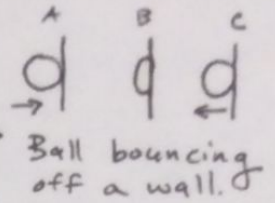
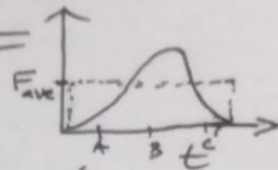


# Impulse WS 1

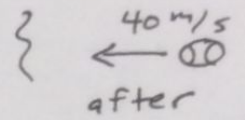
Impulse =  $F_{\text{ave}} \cdot \Delta t = \text{area of}$   $\Rightarrow F$

Impulse unit:  $N \cdot s$  or  $\frac{kg \cdot m}{s}$

$\Delta \vec{p} = m \cdot \Delta \vec{v} = (m \cdot \vec{a}) \Delta t = F_{\text{net ave}} \cdot \Delta t$



1.) 0.145 kg baseball is hit by a bat.  $\circledast \xrightarrow{30 \text{ m/s}}$  before



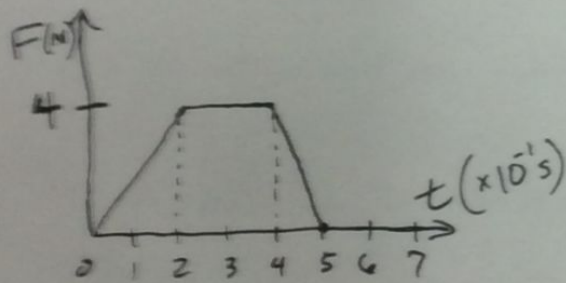
A.) What is the impulse on the ball by bat?

B.) What is the impulse on the bat by ball?

C.) If contact time is .002 seconds, what is  $F_{\text{ave}}$  on ball?

2.) A .3-kg cart at rest is hit by a mallet.  $\rightarrow$

a.) What is the impulse on the cart?



b.) What is the velocity of the cart at  $t = .5 \text{ s}$ ?

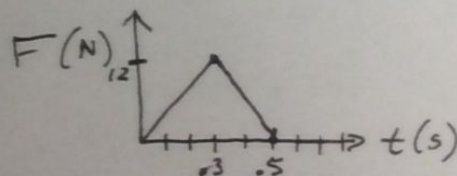
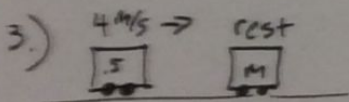
c.) How does the speed of the cart change?

i)  $t = 0$  to  $.2 \text{ s}$

iii)  $t = .3$  to  $.5 \text{ s}$

ii)  $t = .2$  to  $.3 \text{ s}$

iv)  $t = .5$  to  $.7 \text{ s}$



a.) Find the final velocity for the 5 kg cart.

b.) If 'm' moves to the right at  $1 \text{ m/s}$  after the collision,  $m = ?$

4.) A pitcher claims he can throw a .145 kg baseball with as much momentum as a 3 gram bullet moving with a speed of  $1.5 \times 10^3$  m/s. What must the baseball's speed be?

5.) Which has greater kinetic energy, the ball or bullet?

6.) A 60 kg woman jumps from a burning building and falls 10 meters before making contact with a safety net, which stops her in .12 seconds. What is the average force exerted on her by the net?  $g = 9.8 \text{ m/s}^2$

7.) A car is stopped at a traffic light. When the light turns green, the car accelerates, increasing speed from zero to  $5.2$  m/s in 0.832 seconds. What are the magnitudes of the linear impulse and the average force experienced by a 70 kg person?

8.) A friend claims that he can hold onto a 12 kg child in a 60 mph collision ( $1 \text{ m/s} = 2.237 \text{ mph}$ ) lasting .05 seconds. What will be the required force to hold the child?