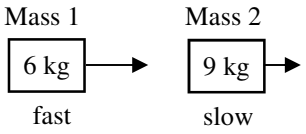
A-Day: Due Tues., Dec 15
B-Day: Due Wed., Dec 16

2009 Momentum 3

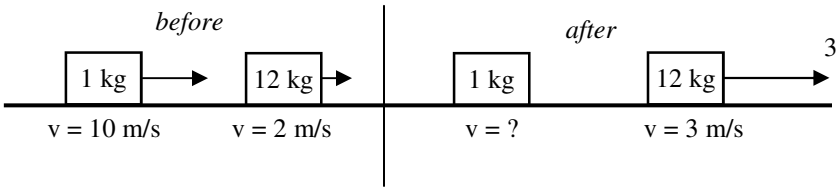


1. A 6 kg mass collides with a 9 kg mass. After the collision, what happens?
   A. Does the 9 kg mass speed up, slow down, or continue at the same speed?

   B. Does the 9 kg mass speed up, slow down, or continue at the same speed?

2. Use the equations at the right to answer the following questions (*there can be more than one answer for each*).
   A) Which have two independent objects beforehand?
   B) Which show a combined object afterwards?
   C) Which one shows all objects are at rest beforehand?
   D) Which show all objects are at rest afterwards?
   E) Which show an object speeding up due to a force?

A) $p_B + I = p_A$
B) $p_{1B} + p_{2B} = p_{1A} + p_{2A}$
C) $p_{1B} + p_{2B} = p_{1+2A}$
D) $p_{1+2B} = p_{1A} + p_{2A}$
E) $p_{1B} + p_{2B} = 0$
F) $0 = p_{1A} + p_{2A}$



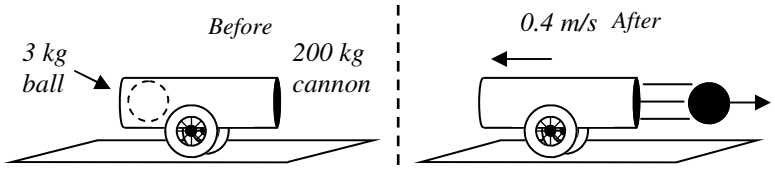
$\Sigma p_{before} \pm I = \Sigma p_{after}$

A. _____

B. _____

3. A 1 kg object moving 10 m/s to the right bumps into a 12 kg object moving 2 m/s to the right. Afterwards the 12 kg object is moving 3 m/s to the right. Calculate the final velocity of the 1 kg object.

   A. On line A, write the conservation of momentum equation for this situation.
   B. On line B, put in "mv" for any "p" and "Ft" for any external I.
   C. Put in what you are given and solve for the final velocity of the 1 kg object.



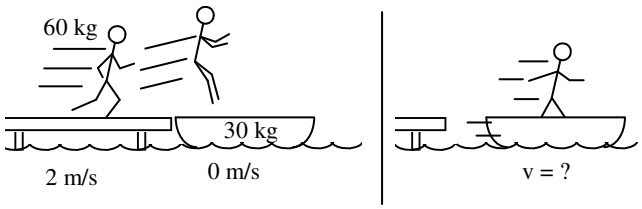
$\Sigma p_{before} \pm I = \Sigma p_{after}$

$0 = p_{cannon} + p_{ball}$

4. A 3 kg cannonball is shot from a 200 kg cannon. The cannon recoils backwards at 0.4 m/s backwards. What is the velocity of the ball after it is shot?
   A. Since the ball is sitting in the cannon, beforehand, what is the initial velocity of the cannon and ball?

   B. What is the net momentum before?

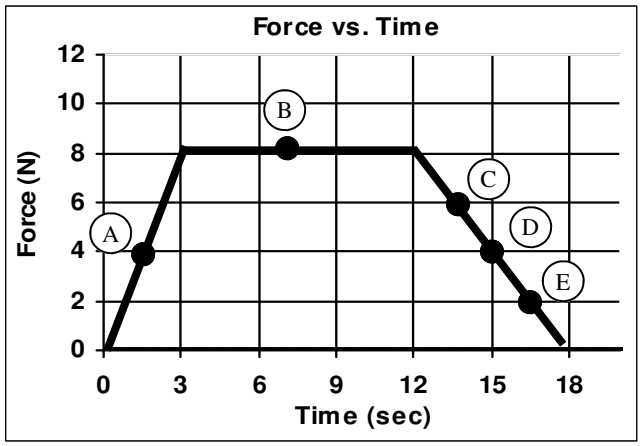
   C. Since momentum MUST be conserved, how much total momentum must there be afterwards?
   E. Is the final velocity of the cannon + or −?
   F. Following the same procedure as the previous problem, solve for the final velocity of the ball.



5. Slim Jim is running 2m/s on the dock and jumps into a boat. How fast is Jim and the boat moving afterwards?
   A. Calculate the initial momentum?

   B. How much momentum does there have to be afterwards?

   C. What is the combined mass of Jim in the boat?
   D. Under the diagram, write the conservation of momentum equation and solve for the final velocity.



6. The graph at the left shows the force acting on an object. The object begins at rest.
   A. Which letter shows a negative force?
   B. At letter A, is the force positive or negative?
   C. So, from 0 to 3 seconds, will the object will move to the right or left?
   D. At letter B is the force positive or negative?
   E. From 3 to 12 seconds, does the object speed up or slow down?
   F. At letter C is the force positive or negative?
   G. At letter D is the force positive or negative?
   H. From 12 to 18 seconds, does the object speed up or slow down?

7. Given $3Na_2CO_3$, (*study the diagram at the right*)
   A) What is the coefficient?
   B) What is the subscript on oxygen?
   C) How many sodium atoms are there in each molecule?
   D) How many molecules of sodium carbonate are there?
   E) How many total oxygen atoms are there?
   F) How many total sodium atoms are there?

Coefficient → $2Al_2O_3 = Al_2O_3 + Al_2O_3$ ← *Expanded*

Subscript → So, $2Al_2O_3 = Al_4O_6$ ← *Reaction Notation*

8. Give reaction notation for A) $3CaCrO_4$ = B) $6Na_2O$ =

Studying for the final.

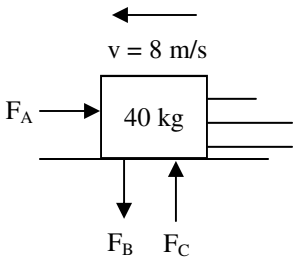
9. An object is at rest
   A) Give two kinds of energy it could have.

   B) Give a kind of energy it could not have.

10. The picture at the right shows an object ***moving to the left*** at 8 m/s.
    A) Identify force A:
    B) Identify force B:
    C) Identify force C:
    D) Calculate force B:

    E) Calculate force C:

    F) Calculate how much energy it has.



    G) If all the forces are shown, will the object have a positive or negative acceleration?