A-Day: Due Wed., Nov 13 (Assigned: 11/11)
B-Day: Due Thurs., Nov 14 (Assigned: 11/12)

2008 Momentum 2

1) A 6 kg object speeds up from 5 m/s to 20 m/s. Find Δp.

2) A 10 kg object slows down from 25 m/s to 5 m/s. Find Δp.

3) What is the impulse for Q1 above: What is the impulse for Q2 above:

4) Can an object ever have a negative kinetic energy? Why or why not?

5) Can an object ever have a negative momentum? Why or why not?

6) If an object's kinetic energy is zero, what is its momentum?

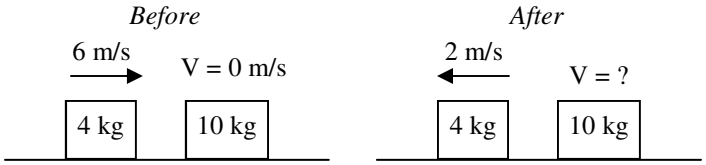
7) Use the equations at the right to answer the following questions.
   A) Which have two independent objects beforehand?
   B) Which show a combined object afterwards?
   C) Which one shows all objects are at rest beforehand?
   D) Which show all objects are at rest afterwards?
   E) Which show an object 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) $0 = p_{1A} + p_{2A}$

8) If the net momentum before equals the net momentum after, is there an external impulse?

9) A 2 kg object going 30 m/s feels a -4 N force for 8 seconds, find the object's final velocity.
Conservation of Momentum Equation: Solve:

10) A 4 kg object going 6 m/s collides with a 10 kg object at rest. After the collision the 4 kg object is going 2 m/s to the left. Find the final velocity of the 10 kg object.
Conservation of Momentum Equation: Solve:



11) Two people are originally at rest on frictionless surface (***wet, oily ice on roller skates, OK?!***).
They push off from each other. Answer the following:
A) What was their momentum before?
B) What happens to the two people?

C) If the person on the left is 80 kg and the person on the right is 60 kg, which person moves faster afterwards?
E) According to the Law of Conservation of Momentum, what does the net momentum of the two have to equal afterwards?

D) If the person on the left ends up going 1.2 m/s to the left, use conservation of momentum to find the velocity of the person on the right.
Conservation of Momentum Equation: Solve:

12) An 70 kg person sitting in a 5 kg rolling chair (at rest) catches a 2 kg ball. Afterwards the person-chair-ball combo rolls backwards at 0.5 m/s. Calculate the initial velocity of the 2 kg ball.
Conservation of Momentum Equation: Solve:

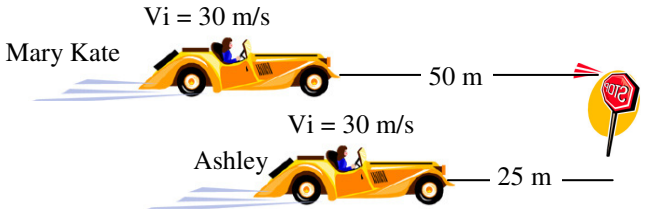
13) The Olsen Twins are driving identical 1,000 kg cars (*it's a twins thang*).

A) What is Ashley's $p_{initial}$?

B) What is Mary Kate's $p_{initial}$?

C) When they stop, what is their final momentum?

D) What is Δp for each car?



Mary Kate, being a bit more cautious than her sister, starts her deceleration at a greater distance (see picture).

E) Whose car's brakes applied the greater force?

F) Whose car stopped in less time?

G) Whose car experienced the greatest impulse?

H) What is the impulse of each car?

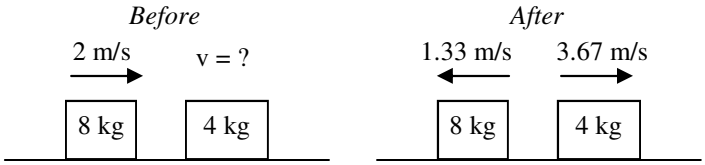
I) Using a kinematic equation, find the time for Mary Kate to stop.

J) Now that you have Mary Kate's stopping time, you can find the force of her brakes.

K) Using ***Conservation of Energy***, find the force of Ashley's brakes. (*Which is actually easier.*)

14) Two object collide as shown in the picture at the right.

A) Keeping track of positives and negatives, find the initial velocity of the 4 kg object.



B) What kind of collision could this not be?

C) Why?

E) Calculate the kinetic energies of the objects, then figure out what kind of collision it is.

F) Were the object damaged in the collision? How do you know?

15) Are the following elastic, inelastic, or perfectly inelastic? (or some combo)

A) ____ The spaceshuttle docking with the International Space Station.

B) ____ If an object is moving and it explodes into multiple pieces.

C) ____ A superball bouncing off the ground.

D) ____ Two cars collide, do not stick, and the cars are badly damaged.

E) ____ If there is a lot of sound during a collision.

16) Is a group of objects moving or not moving?

A) ____ If $p_{net} = 0$, but $E_k \neq 0$.

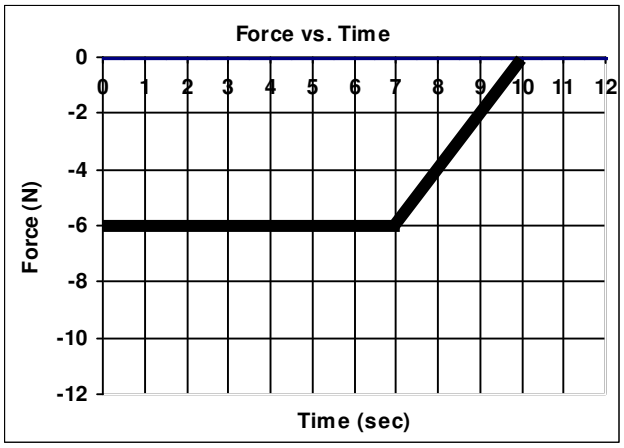
B) ____ If $p_{net} \neq 0$, but $E_k \neq 0$.

C) ____ If $p_{net} = 0$, and $E_k = 0$.

17) If a 6 kg object is moving 3 m/s to the right,

A) Use the graph at the right to find its final velocity. (*Put it all together: all that we've learned.*)

B) Where on the graph is the object experiencing a positive acceleration?



And now for rotation motion!!!!!

18) Remembering that rotational motion must be in radians. An object starts at rest and ends up traveling 1.5 times around a circular track in 32 seconds.
   A. Calculate the angular displacement.

   B. What is its initial angular speed?

   C. Calculate its final angular speed.

   D. Calculate its angular acceleration.

   E. Calculate its tangential acceleration.

   F. Calculate its final tangential speed.

19) A 25 kg ball is spun around with a rope 16 times in 35 seconds. Calculate its angular speed.

20) A car travels 15 m/sec around a track. What is its tangential velocity?