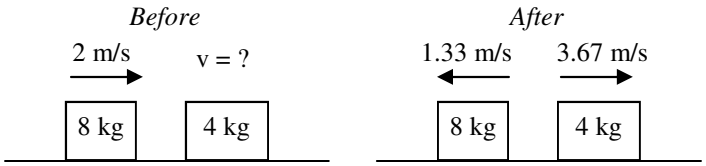
A-Day: Due Fri., Dec 11
B-Day: Due Mon., Dec 14

2009 PreAP Momentum 3

1. 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?

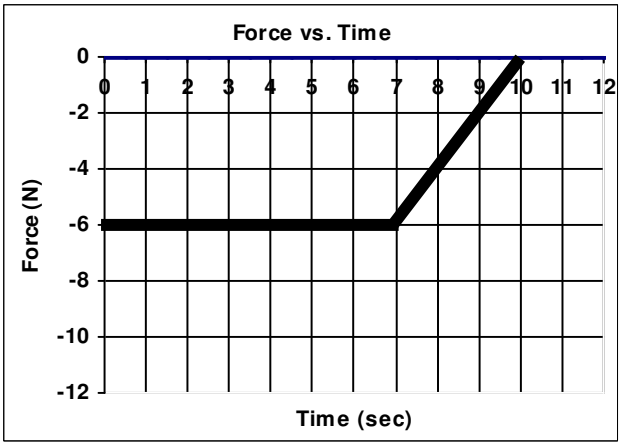
   C. Why?

   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?

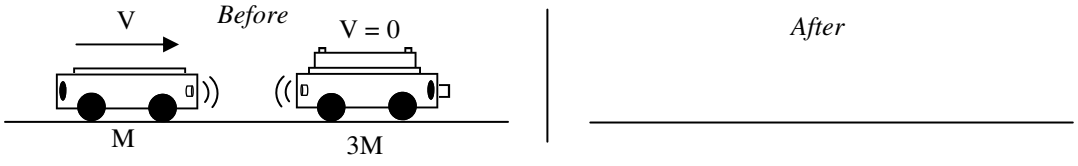
2. Are the following elastic, inelastic, or perfectly inelastic? (or some combo)
   A) _____The spaceshuttle docking with the International Space Station.
   B) _____If an object is moving and it explodes into multiple pieces.
   C) _____A superball bouncing off the ground.
   D) _____Two cars collide, do not stick, and the cars are badly damaged.
   E) _____If there is a lot of sound during a collision.

3. 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 $E_k = 0$.

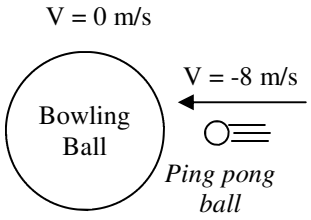


   Use the "Types of Collisions/ Impulse Graph:
4. If a 6 kg object is moving 3 m/s to the right,
   A) Use the graph at the right to find its final velocity. *(Put it all together: all that we've learned.)*

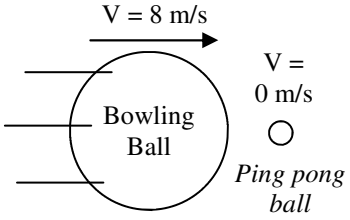
   B) Where on the graph is the object experiencing a positive acceleration?



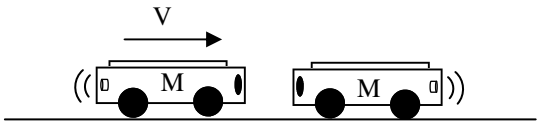
5. Use the diagram above to answer the following.
   A. Draw what happens after.
   B. How much momentum does the right cart have?
   C. How much momentum is there before (use variables)?
   D. How much net momentum must there be afterwards?
   E. As the right cart gets heavier, what happens to the left cart?
   F. If the right cart were infinitely heavy (or held in place), what is the final velocity of the left cart?
   G. Remembering that $\Delta v = v_f - v_i$, what is the change of velocity of the left cart?



6. A ping pong ball moving -8 m/s hits a bowling ball that is at rest. What is the final speed of the ping pong ball (+ is right, – is left)?



7. If the ping pong ball is at rest and struck by the bowling ball going 8 m/s, what is the final speed of the ping pong ball?



8. The two carts above collide and stick.
Both have equal mass M. The left cart is moving at V and the right cart is at rest.
   A. What is Σp_{before}?
   B. What does Σp_{after} have to be?
   C. Since the objects are combined after, what kind of collision is this?

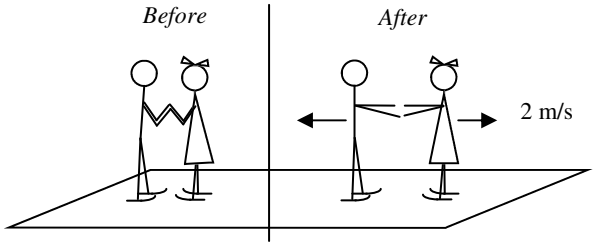
   D. What is the combined object's mass after the collision?

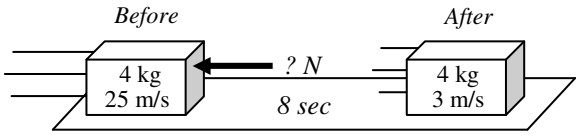
   E. What is the combined object's velocity?

M. $p_{1B} + p_{2B} = p_{1A} + p_{2A}$
N. $p_B - I = p_A$
O. $p_{1+2B} = p_{1A} + p_{2A}$
P. $0 = p_{1A} + p_{2A}$
Q. $p_B - I = 0$
R. $p_B + I = p_A$
S. $p_{1B} + p_{2B} = p_{1+2A}$
T. $0 + I = p_A$
U. $p_{1B} + p_{2B} = 0$

9. Choose the Conservation of Momentum Equation at the left that matches the following situations. You will not use all of the equations.
   A. _____A person moving on a rolling chair throws a medicine ball.
   B. _____A car moving 15 m/s uses its brakes to slow down.
   C. _____A moving object stops.
   D. _____Pool balls collide and ricochet off each other.
   E. _____A car starts to move.
   F. _____A gun is fired.

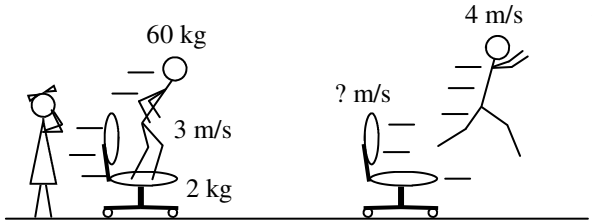
10. Slim Jim and Kim go ice skating. Standing amorously on the ice, they push off from each other. Jim is 60 kg and Kim is 40 kg. If Kim ends up moving to the right at 2 m/s. How fast is Jim moving?



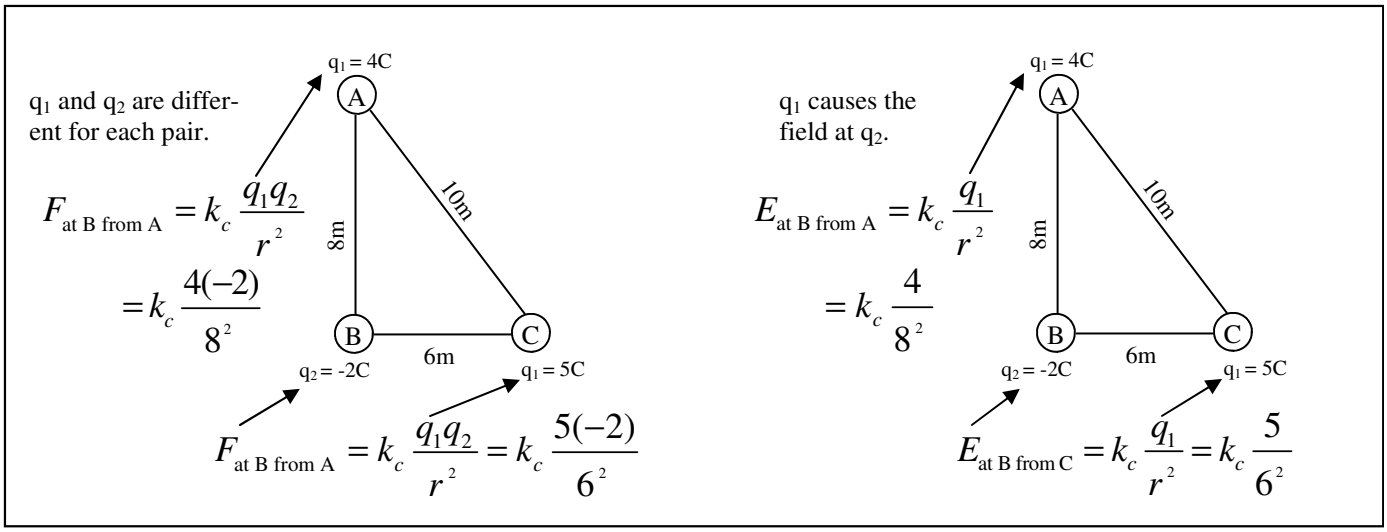


11. A 4 kg object moving 25 m/s slows down for 8 seconds to 3 m/s. Calculate the force.

12. Two identical eggs are dropped from the exact same height. Egg A is dropped onto a brick. Egg B is dropped onto a pillow.
   A. Which one experiences the bigger change of momentum?
   B. Which one experiences the bigger force?
   C. Which experienced the bigger impulse?



13. Much to Kim's horror, Slim Jim tries to impress her. Since she knows he is a very poor skate boarder, he chooses to jump from a rolling chair. Below the diagram, calculate the final velocity of the chair.



14. After studying the diagrams above, answer the following questions:
   A. If you were trying to find the electric field from A at C,
      i. What is q_1? ii. What is q_2? iii. How would E change if charge C were decreased?

   B. Calculate the electric field at A due to C.

   C. Calculate the force between A and C.

Electric Field

Electric Field (*in N/C*) → $E = k_c \frac{q}{r^2}$ ← Charge producing the electric field (*in C*)

Coulomb's Constant = $9\times10^9\ \text{Nm}^2/\text{C}^2$

Distance from the charge (*in m*)

Coulomb's Law

$$F_e = k_c \frac{q_1 q_2}{r^2}$$

Electric Force (*in N*)

Charge 1 (*in Coulombs*)

Charge 2 (*in C*)

Coulomb's Constant = $9\times10^9\ \text{Nm}^2/\text{C}^2$

Distance between the two charges (*in m*)