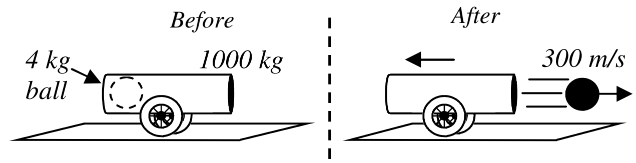
A-Day: Due Thurs., Dec 17
B-Day: Due Fri., Dec 18

2009 Momentum 4

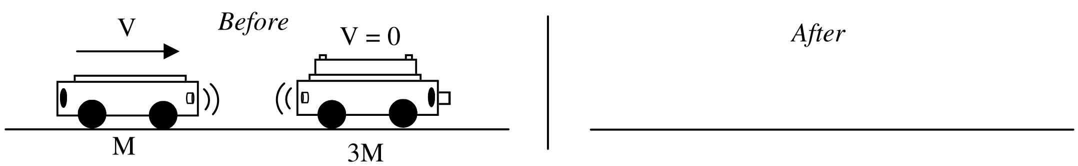


1. A cannon shoots a cannonball (give diagram)
   A. What is the net momentum before?
   B. So, what must be the net momentum after?
   C. So, which has more momentum after: the gun or the bullet?
   D. Below the diagram, calculate the velocity of the cannon after.

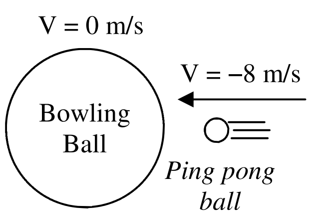
   E. Calculate the momentum of the cannon after.

   F. Calculate the momentum of the ball after.

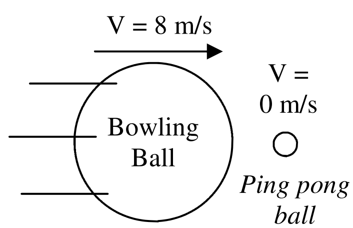
   G. Again, which has more momentum after: the gun or the bullet?



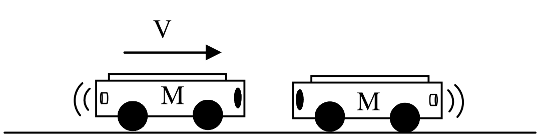
2. Use the diagram above to answer the following.
   A. Draw what happens after.
   B. How much momentum does the right cart have?
   C. How much momentum is there before (use variables)?
   D. How much net momentum must there be afterwards?
   E. As the right cart gets heavier, what happens to the left 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?



3. 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)?



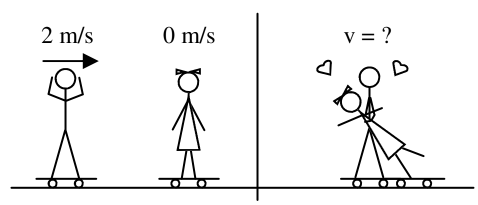
4. If the ping pong ball is at rest and struck by the bowling ball going 8 m/s, what is the final speed of the ping pong ball?



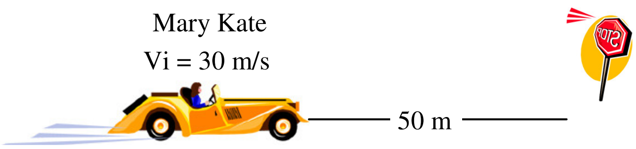
5. The two carts above collide and stick. Both have equal mass M. The left cart is moving at V and the right cart is at rest.
   A. What is Σp_{before}?
   B. What does Σp_{after} have to be?
   C. Since the objects are combined after, what kind of collision is this?

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

   E. What is the combined object's velocity?

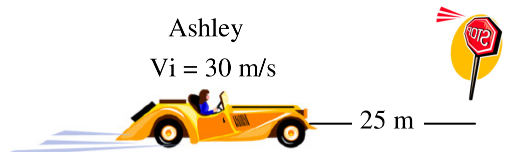


6. Slim Jim takes up skate boarding. Unfortunately he doesn't learn very fast. At one point he loses control and "meets" Slim Kim. We know Jim is 60 kg. Kim is only 40 kg. How fast are the two moving afterwards? (Use $\Sigma p_b \pm I = \Sigma p_a$)



p_b = p_a =

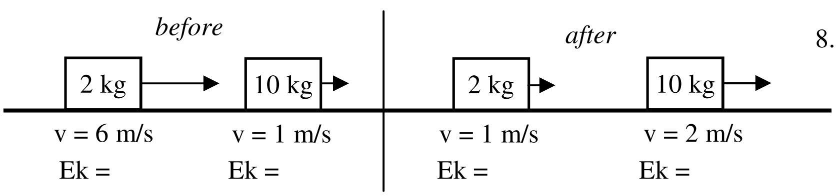
Δp =



p_b = p_a =

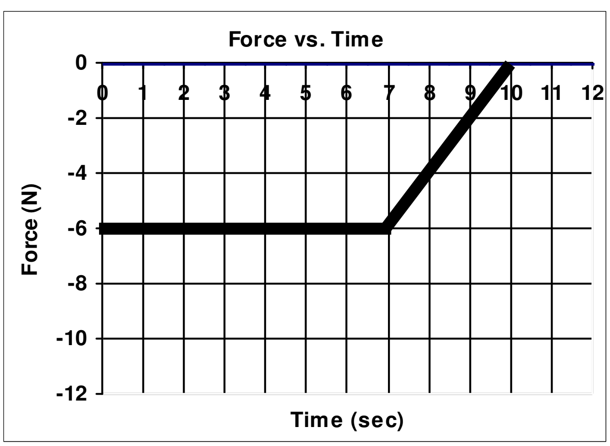
Δp =

7. The Olsen Twins are driving identical 1,000 kg cars (*it's a twins thang*).
   - A. Calculate and label the initial momentum of each car.
   - B. When they stop, what is their final momentum (*label it above*)?
   - C. Calculate and label Δp for each car.
   - D. Which one had a bigger change of momentum?
   - E. Remembering that impulse equals the change of momentum, which one had the bigger impulse
   - F. Which one needed a bigger force to stop?
   - G. What's the final velocity for each car?
   - H. Using a kinematic equation, find the time for Mary Kate to stop.



ΣEk =   ΣEk =

8. The diagram at the right shows a collision, with the final velocities already given.
   - A. Calculate the net kinetic energy before.
   - B. Calculate the net kinetic energy after.
   - C. Using your "Types of Collisions" notes to decide what kind of collision it is.



Use the Impulse graph notes to answer the following:

9. A. Find the impulse given on the graph.

   B. If the object is 6 kg and moving 3 m/s to the right to begin with, use the impulse you just found to find its final velocity. (*Use $\Sigma p_b \pm I = \Sigma p_a$, again.*)

10. Balance the reactions below. (*Hint: treat the (CrO_4) as if it was just another element. Don't break it up.*)

____ Fe + ____ O_2 → ____ Fe_2O_3

____ K_3N + ____ $Ca(CrO_4)$ → ____ Ca_3N_2 + ____ $K_2(CrO_4)$

11. The picture at below shows a test tube with a cork sealing the opening.
    - A) Is this an open or closed reaction?
    - B) Will the mass of his products be greater than, less than, or equal to his reactants?
    - C) Why?
    - D) What Law does this setup allow us to prove?