

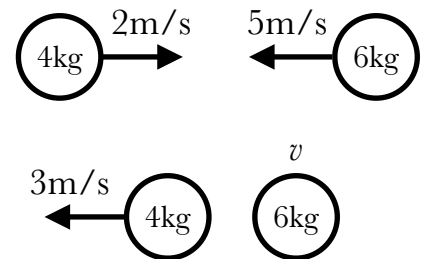
# Week 7: Collisions

## Additional Homework

### Problems (4 points each)

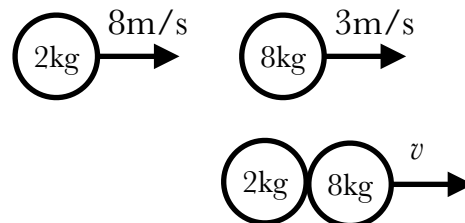
1. A 4kg ball moving at 2m/s to the right collides with a 6kg ball which is moving at 5m/s to the left. After the collision, the 4kg ball is moving to the left at 3m/s.

a. What is the velocity of the 6kg ball after the collision? Is the ball moving to the left or the right?



b. What is the % energy loss during this collision?

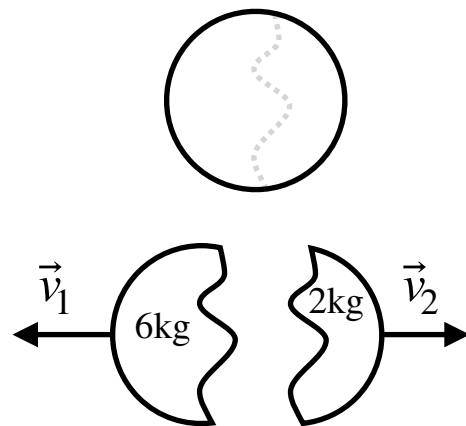
- 2.** A 2kg ball moving at 8m/s to the right overtakes a 8kg ball which is moving at 3m/s to the right. The two balls stick together.
- a.** How fast are the balls moving after they stick together?



- b.** How much energy is lost during the collision?

**3.** An 8kg bomb starts at rest and then explodes and splits into two pieces, a 6kg piece moving to the left with velocity  $\vec{v}_1$  and a 2kg piece moving to the right with velocity  $\vec{v}_2$ . The pieces gain  $\Delta E=300\text{J}$  of kinetic energy due to the explosion.

Find the speeds  $v_1$  and  $v_2$  of the pieces. (Hint: momentum is conserved during the explosion like it is during a collision. Use the formula  $E_f = E_i + \Delta E$ .)



4. A 140g baseball is struck by a baseball bat when the baseball is moving horizontally at 35m/s. After the ball hits the bat, it is moving at 45m/s,  $30^\circ$  above the horizontal. If the baseball was in contact with the bat for 7ms, what is the average power that the bat provides to the ball during contact? (You can ignore gravitational potential energy, and the power that the baseball bat releases as sound, heat, etc.)

