

Follow these steps to solve each problem. [This slideshow](#) may help.

1. Find the momentum of each object “before” by multiplying the mass and the velocity.
2. Find the total momentum “before” by adding the momentum of the objects.
3. Find the total momentum “after.” (Hint: momentum is always conserved in collisions and explosions.)
4. If there is a “sticky” collision...
  - a. Divide total momentum by total mass to find the velocity of the combined object. Done!
5. If there is an explosion...
  - a. Find the momentum of the object where you have both mass and velocity. The momentum of the other object is equal but has the opposite sign.
  - b. Divide this other momentum by the mass of the other object. Done!
6. If there is a “bouncy” collision...
  - a. Find the momentum of the object where you have both mass and velocity and subtract it from the total momentum.
  - b. Divide the remaining momentum by the mass of the other object to find the unknown velocity.

**A 500 kg cannon fires an 8 kg cannonball at 125 m/s.  
How fast will the cannon recoil?**

Momentum of cannon before firing: \_\_\_\_\_

Momentum of cannonball before firing: \_\_\_\_\_

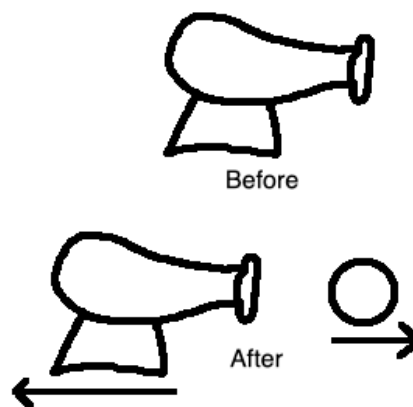
Total momentum of objects before firing: \_\_\_\_\_

Total momentum of objects after firing: \_\_\_\_\_

Momentum of cannonball after firing: \_\_\_\_\_

Momentum of cannon after firing: \_\_\_\_\_

Velocity of cannon after firing: \_\_\_\_\_





A 10,000 kg truck moving at 15 m/s rear-ends an unmoving 750 kg Smart car. They lock together. How fast will they be moving after the collision?

Momentum of truck before collision: \_\_\_\_\_

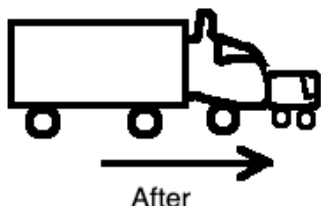
Momentum of Smart car before collision: \_\_\_\_\_

Total momentum of vehicles before collision: \_\_\_\_\_

Total momentum of vehicles after collision: \_\_\_\_\_

Total mass of vehicles after collision: \_\_\_\_\_

Velocity of vehicles after collision: \_\_\_\_\_



A 10,000 kg truck moving at 15 m/s rear-ends a 750 kg Smart car moving at 10 m/s in the same direction. The Smart car flies forward at 30 m/s. How fast is the truck moving after the collision?

Momentum of truck before collision: \_\_\_\_\_

Momentum of Smart car before collision: \_\_\_\_\_

Total momentum of vehicles before collision: \_\_\_\_\_

Total momentum of vehicles after collision: \_\_\_\_\_

Momentum of Smart car after collision: \_\_\_\_\_

Momentum of truck after collision: \_\_\_\_\_

Velocity of truck after collision: \_\_\_\_\_

