

**Momentum & Impulse Worksheet 1**

1. A deer with a mass of 146 kg is running head on toward you with a speed of 17 m/s. You are going north. Find the momentum of the deer.

2. A .5 kg football is thrown with a velocity of 15 m/s to the right. A stationary receiver catches the ball and brings it to rest in .02 seconds. What is the force exerted on the ball by the receiver?

3. A 2500 kg car traveling to the north is slowed down uniformly from an initial velocity of 20 m/s by a 6250 N braking force acting opposite the car's motion. (Hint – force is negative 6250 not positive). Use the impulse momentum theorem to answer the following questions:

a. What is the car's velocity after 2.5 s?

b. How far does the car move during 2.5 s?

c. How long does it take the car to come to a complete stop (final velocity now equals zero)?

4. A 63 kg astronaut is on a spacewalk when the tether line to the shuttle breaks. The astronaut is able to throw a spare 10 kg oxygen tank in a direction away from the shuttle with a speed of 12 m/s, propelling the astronaut back to the shuttle. Assuming the astronaut starts from rest with respect to the shuttle, find the astronaut's final speed with respect to the shuttle after the tank is thrown.

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5. A 1500 kg car traveling at 15 m/s to the south collides with a 4500 kg truck that is initially at rest at a stoplight. The car and truck stick together and move together after the collision. What is the final velocity of the two vehicle mass?

6. A .25 kg arrow with a velocity of 12 m/s to the west strikes and pierces the center of a 6.8 kg target.  
a. What is the final velocity of the combined mass?

7. A .015 kg marble sliding to the right at 22.5 cm/s on a frictionless surface makes an elastic head-on collision with a .015 kg marble moving to the left at 18 cm/s. After the collision, the first marble moves to the left at 18 cm/s.

a. Find the velocity of the second marble after the collision.



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### Conservation of Momentum Worksheet

1. A spring is compressed between two carts, one with a mass of 5 kg and one with a mass of 10 kg. Which will move away with a higher velocity?
  
  
  
  
  
  
  
  
  
  
2. If a 100 N weight sits on a scale in an express elevator, what will happen to the weight shown on the scale when the elevator accelerates upward?
  - a. Reference #2, what will the weight be when the elevator is traveling a constant speed?
  
  
  
  
  
  
  
  - b. Reference # 2, what will the weight be when the elevator is slowing to a stop?
  
  
  
  
  
  
  
  
  
  
3. Joe the fisherman attempts to leap from his small fishing boat to the dock his boat is next to, but ends up in the water between his boat and the dock, why?
  
  
  
  
  
  
  
  
  
  
4. What is the momentum of a 10 kg mass moving at 5 m/s?
  
  
  
  
  
  
  
  
  
  
5. What is the momentum of a 2 kg mass moving at 25 m/s?
  
  
  
  
  
  
  
  
  
  
6. Which has more momentum, a 3 kg mass at 9 m/s or a 5 kg mass at 5 m/s?
  
  
  
  
  
  
  
  
  
  
7. Which has more momentum, a 2 kg mass at 40 m/s or a 75 kg mass at 1 m/s?

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### Conservation of Momentum Worksheet

8. Which has more momentum, a 4 kg mass at 15 m/s or an 8 kg mass at 8 m/s?
  
9. In a collision, a 5 kg mass moving at 2 m/s transfers all of its momentum to a 1 kg mass. What is the velocity of the 1 kg mass after the collision?
  
10. In a collision, a 2 kg mass moving at 50 m/s transfers all of its momentum to a 25 kg mass. What is the velocity of the 25 kg mass after the collision?
  
11. In a collision, a 25 kg mass moving at 3 m/s transfers all of its momentum to a 5 kg mass. What is the velocity of the 5 kg mass after the collision?
  
12. An 8 kg mass moving at 8 m/s collides with a stationary 5 kg mass. After the collision, both the 8 and the 5 kg mass move off in the same direction. If the 8 kg mass is moving at 3 m/s, what is the speed of the 5 kg mass?
  
13. A 5 kg mass moving at 15 m/s collides with a stationary 2 kg mass. After the collision, both the 5 and the 2 kg mass move off in the same direction. If the 2 kg mass is moving at 25 m/s, what is the speed of the 5 kg mass?
  
14. An 8 kg mass moving at 8 m/s collides with a 6 kg mass moving in the same direction at 6 m/s. After the collision, both the 8 and the 6 kg mass continue to move in the same direction. If the 8 kg mass is moving at 5 m/s, what is the speed of the 6 kg mass?
  
15. What law governs # 14?