6 | Momentum | Review

Name _____ Period ____

1. A gun is fired and recoils, sending a 30 g bullet flying to the east with a velocity of 500 m/s.
    a. Calculate the bullet's momentum.

    b. How much momentum does the gun have? Explain your answer.

    c. How fast does the gun travel: * more than 500 m/s *500 m/s * less than 500 m/s * 0 m/s

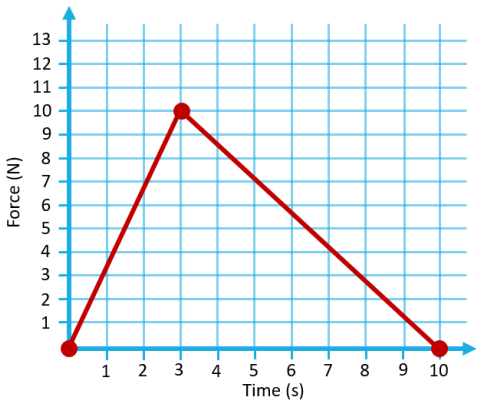
    d. Explain how the gun and bullet can have different velocities but the same change in momentum?

2. A 0.015 kg marble moving to the right at 0.225 m/s makes a head-on collision with a 0.03 kg marble moving to the left at 0.18 m/s. After the collision, the smaller marble moves to the left at 0.315 m/s. What is the velocity of the 0.03 kg marble after the collision? (pay attention to direction!)

3. A 0.5 kg object is at rest. A 3.0 N force to the right acts on the object during a time interval of 1.5 s.
   (a) What is the velocity of the object at the end of this interval?

   (b) What could you do to increase the momentum of the object?

4. What is the total impulse represented by the graph on the right?



5. (Impulse and momentum for an impact) You buy a case for your new iPhone that claims to decrease the force of impact when you drop it. You calculate that if your 0.08 kg phone falls out of your pocket, it is traveling about 4 m/s by the time it hits the ground. With the case, the time duration of the impact increases to 0.1 seconds (compared to 0.02 seconds without the case). Compare the following values with and without the case.

	With Case	Without Case
F		
Δt		
m	0.08 kg	0.08 kg
Δv		
Impulse		

6. A physics student hurls a 315-gram ball directly into a 3.54-kg box which is at rest on a table top. The baseball strikes the box with a pre-impact speed of 54.1 m/s. The box is filled with towels to help absorb the blow and effectively catch the ball. The coefficient of friction between the box and the table is 0.714.
    a. What is the velocity of the ball and box after the collision?

    b. How much kinetic energy is dissipated in the collision? (what % of the initial KE remains?)

    c. Show that the ball and box slide 1.4 m across the table after the collision.

7. **Bonus:** Suppose I shoot a 40-g bullet from a Winchester muzzle loader rifle into a 7-kg pendulum (bucket). After impact, the bucket and bullet rise 2.34 m. Use conservation of energy and momentum to find the bullet's initial velocity.