Simple Computations with Impulse = Momentum Change

Read from **Lesson 1** of the **Momentum and Collisions** chapter at **The Physics Classroom**:

http://www.physicsclassroom.com/Class/momentum/u4l1b.html
http://www.physicsclassroom.com/Class/momentum/u4l1c.html

A car with a mass of 1000 kg is at rest at a stoplight. When the light turns green, it is pushed by a net force of 2000 N for 10 s.

1. What is the value of the **acceleration** that the car experiences?

2. What is the value of the **change in velocity** that the car experiences?

3. What is the value of the **impulse** on the car?

4. What is the value of the **change in momentum** that the car experiences?

5. What is the **final velocity** of the car at the end of 10 seconds?

The car continues at this speed for a while.

6. What is the value of the change in momentum the car experiences as it continues at this velocity?

7. What is the value of the impulse on the car as it continues at this velocity?

The brakes are applied to the car, causing it to come to rest in 4 s.

8. What is the value of the **change in momentum** that the car experiences?

9. What is the value of the **impulse** on the car?

10. What is the value of the **force** (average) that causes the car to stop?

11. What is the **acceleration** of the car as it stops?

There is a disease known as *formula fixation* that is common among physics students. It particularly infects those who perceive physics as an applied math course where numbers and equations are simply combined to solve algebra problems. However, this is **not** the true nature of physics. Physics concerns itself with ideas and concepts that provide a reasonable explanation of the physical world. When students divorce the mathematics from the ideas, formula fixation takes root and even mathematical problem solving can become difficult. Do you have *formula fixation*? Test your health by trying these computational problems.

12. A force of 800 N causes an 80-kg fullback to change his velocity by 10 m/s. Determine the impulse experienced by the fullback. **PSYW**

13. A 0.80-kg soccer ball experiences an impulse of 25 N•s. Determine the momentum change of the soccer ball. **PSYW**

14. A 1200-kg car is brought from 25 m/s to 10 m/s over a time period of 5.0 seconds. Determine the force experienced by the car. **PSYW**

15. A 90-kg tight end moving at 9.0 m/s encounters a 400 N•s impulse. Determine the velocity change of the tight end. **PSYW**

16. A 0.10-kg hockey puck decreases its speed from 40 m/s to 0 m/s in 0.025 s. Determine the force that it experiences. **PSYW**

17. **A Real Brain Twister:** A 0.10-kg hockey puck is at rest. It encounters a force of 20 N for 0.2 seconds that sets it into motion. Over the next 2.0 seconds, it encounters 0.4 Newtons of resistance force. Finally, it encounters a final force of 24 N for 0.05 seconds in the direction of motion. What is the final velocity of the hockey puck? **PSYW**

You may have been *tricked*, but those were not intended as trick questions. The questions were intended to test your understanding of the concepts of momentum change, impulse, mass, force, time and velocity change. How is your understanding level progressing? Do you have formula fixation?