

## Momentum Practice Problems

Which is more difficult to stop: A tractor-trailer truck barreling down the highway at 35 meters per second, or a small two-seater sports car traveling the same speed?

You probably guessed that it takes more force to stop a large truck than a small car. In physics terms, we say that the truck has greater *momentum*.

$$\text{momentum} = \text{mass of object} \times \text{velocity of object}$$

show all your work with units:

1. If the truck has a mass of 2,000 kilograms, what is its momentum? ( $v = 35 \text{ m/s}$ )  
Express your answer in  $\text{kg}\cdot\text{m/s}$ .

$$2000 \text{ kg} \times 35 \text{ m/s} = 70,000 \text{ kg}\cdot\text{m/s}$$

2. If the car has a mass of 1,000 kilograms, what is its momentum? ( $v = 35 \text{ m/s}$ )

$$1000 \text{ kg} \times 35 \text{ m/s} = 35,000 \text{ kg}\cdot\text{m/s}$$

3. An 8-kilogram bowling ball is rolling in a straight line toward you. If its momentum is  $16 \text{ kg}\cdot\text{m/sec}$ , how fast is it traveling?

$$v = \text{momentum}/\text{mass} = 16 \text{ kg}\cdot\text{m/s}/8 \text{ kg} = 2 \text{ m/s}$$

## Newton's Second Law Practice Problems

**Force = mass x acceleration**

**Show all work:**

1. What force is required to accelerate a car at a rate of  $2 \text{ m/s}^2$  if the car has a mass of 3,000 kg?

$$F = \underline{\hspace{2cm}}$$

$$M = \underline{\hspace{2cm}}$$

$$a = \underline{\hspace{2cm}}$$

$$F = 3,000 \text{ kg} \times 2 \text{ m/s}^2 = 6,000 \text{ N}$$

2. A 10 kg bowling ball would require what force to accelerate out a window and onto someone's BMW? (assume the bowling ball is in free fall).

$$F = \underline{\hspace{2cm}}$$

$$M = \underline{\hspace{2cm}}$$

$$a = \underline{\hspace{2cm}}$$

$$F = 10 \text{ kg} \times 9.8 \text{ m/s}^2 = 98 \text{ N}$$