Changes in Momentum

When a force is applied to an object, the object's velocity changes. This means that its momentum will also change.

The change in momentum depends on the size of the force and the time for which it is applied. The relationship between these values is shown by this equation:

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

● Momentum is measured in **kilogram meters per second** (**kg m/s**).

● Time is measured in **seconds** (**s**).

● Force is measured in **newtons** (**N**).

A soccer ball with a mass of 0.5 kg is kicked from stationary to a velocity of 8 m/s. The kicker's foot is in contact with ball for 0.1 seconds. What force does the kicker use?

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

$$= \frac{(0.5 \times 8) - (0.5 \times 0)}{0.1}$$

$$= \frac{4}{0.1}$$

$$= \textbf{40 N}$$

A tennis ball is rolled at a toy car with a mass of 0.1 kg. The car is moved with a velocity of 0.5 m/s. If the ball and car are in contact for 0.05 seconds, with what force is the tennis ball rolled?

$$\textbf{force} = \frac{\textbf{change in momentum}}{\textbf{time}}$$

$$= \frac{(0.1 \times 0.5) - (0.1 \times 0)}{0.1}$$

$$= \frac{0.05}{0.05}$$

$$= \textbf{1 N}$$

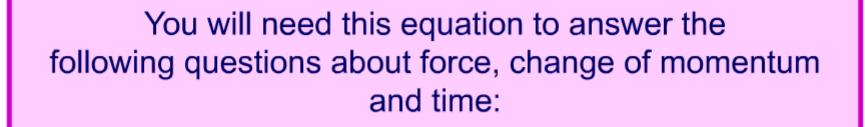You will need this equation to answer the following questions about force, change of momentum and time:

force = change in momentum / time

Click **"start"** to begin.

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