

Name: _____

Date: _____

Momentum



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*.

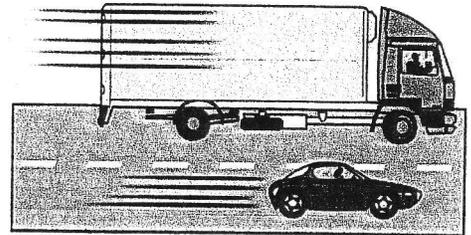
We can find momentum using this equation:

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

Velocity is a term that refers to both speed and direction. For our purposes we will assume that the vehicles are traveling in a straight line. In that case, velocity and speed are the same.

The equation for momentum is abbreviated like this: $p = m \times v$.

Momentum, symbolized with a p , is expressed in units of $\text{kg} \cdot \text{m}/\text{sec}$; m is the mass of the object, in kilograms; and v is the velocity of the object in m/sec .



PRACTICE

Use your knowledge about solving equations to work out the following problems:

- If the truck has a mass of 2,000 kilograms, what is its momentum? Express your answer in $\text{kg} \cdot \text{m}/\text{sec}$. $70,000 \text{ Kg} \cdot \frac{\text{m}}{\text{sec}}$
- If the car has a mass of 1,000 kilograms, what is its momentum? $35,000 \text{ Kg} \cdot \frac{\text{m}}{\text{sec}}$
- An 8-kilogram bowling ball is rolling in a straight line toward you. If its momentum is $16 \text{ kg} \cdot \text{m}/\text{sec}$, how fast is it traveling? $2 \frac{\text{m}}{\text{sec}}$
- A beach ball is rolling in a straight line toward you at a speed of $0.5 \text{ m}/\text{sec}$. Its momentum is $0.25 \text{ kg} \cdot \text{m}/\text{sec}$. What is the mass of the beach ball? $.5 \text{ Kg}$
- A 4,000-kilogram truck travels in a straight line at $10.0 \text{ m}/\text{sec}$. What is its momentum? $40,000 \text{ Kg} \cdot \frac{\text{m}}{\text{sec}}$
- A 1,400-kilogram car is also traveling in a straight line. Its momentum is equal to that of the truck in the previous question. What is the velocity of the car? $29 \frac{\text{m}}{\text{sec}}$
- Which would take more force to stop in 10 seconds: an 8.0-kilogram ball rolling in a straight line at a speed of $0.2 \text{ m}/\text{sec}$ or a 4.0-kilogram ball rolling along the same path at a speed of $1.0 \text{ m}/\text{sec}$?
- The momentum of a car traveling in a straight line at $20 \text{ m}/\text{sec}$ is $24,500 \text{ kg} \cdot \text{m}/\text{sec}$. What is the car's mass? $1,225 \text{ Kg}$
- A 0.14-kilogram baseball is thrown in a straight line at a velocity of $30 \text{ m}/\text{sec}$. What is the momentum of the baseball? $4.2 \text{ Kg} \cdot \frac{\text{m}}{\text{sec}}$
- Another pitcher throws the same baseball in a straight line. Its momentum is $2.1 \text{ kg} \cdot \text{m}/\text{sec}$. What is the velocity of the ball? $15 \frac{\text{m}}{\text{sec}}$
- A 1-kilogram turtle crawls in a straight line at a speed of $0.01 \text{ m}/\text{sec}$. What is the turtle's momentum? $.01 \text{ Kg} \cdot \frac{\text{m}}{\text{sec}}$