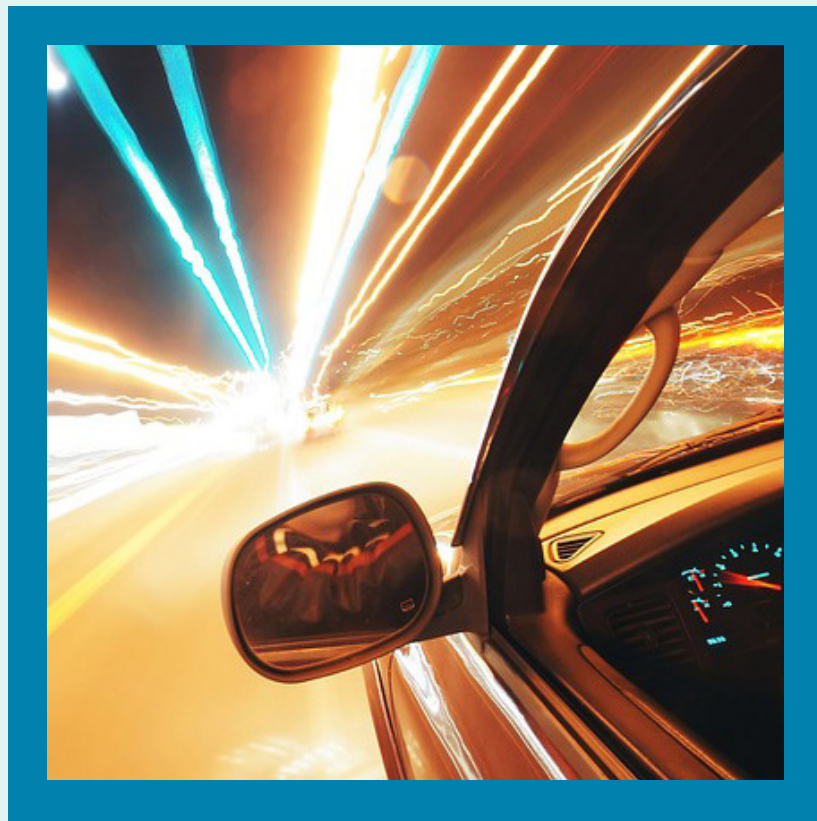


STEM *Sims*™

# Acceleration



# Acceleration

**Do you need an idea for a scientific study?  
Try out one of our ideas or make one of your own.**

**Start learning right now about acceleration and how acceleration affects a vehicle's impact on the environment. Take the following brief quiz to see how much you already know about acceleration. See the bottom of page 4 to check your answers.**

1. Which of the following is *not* an acceleration device found in a car?
  - a. gas pedal
  - b. brake pedal
  - c. steering wheel
  - d. none of these
2. About how fast can a cheetah accelerate?
  - a. 2 miles/hour/second
  - b. 10 miles/hour/second
  - c. 20 miles/hour/second
  - d. 100 miles/hour/second
3. Americans currently use about how many gallons of gasoline each day?
  - a. 365 million
  - b. 36 million
  - c. 3.6 million
  - d. 36 billion
4. About how fast does a top fuel dragster normally accelerate?
  - a. 7 miles/hour/second
  - b. 27 miles/hour/second
  - c. 45 miles/hour/second
  - d. 75 miles/hour/second
5. Which country currently emits the largest amount of carbon dioxide into the atmosphere?
  - a. United States
  - b. China
  - c. India
  - d. Russia



## Accelerating Yourself

Accelerometers are devices used to measure the acceleration of an object. They have a number of applications including activating the airbag in a vehicle during a collision, shutting down a laptop computer to protect it when accidentally dropped, and correctly orienting the display image on a cell phone. Many accelerometers are a simple spring with an attached mass. Any change in motion, which is called acceleration, changes the position of the mass on the spring. The amount of stretch or compression force on the spring is used to determine the acceleration of the device. In this activity, you'll construct and use a simple accelerometer.

### Materials

Small weight (fishing sinker)	Single hole punch	Protractor	Marker
Cardboard square (30 cm by 30 cm)	String (50 cm)	Scissors	Ruler

### Procedure

#### Part 1. Making your accelerometer

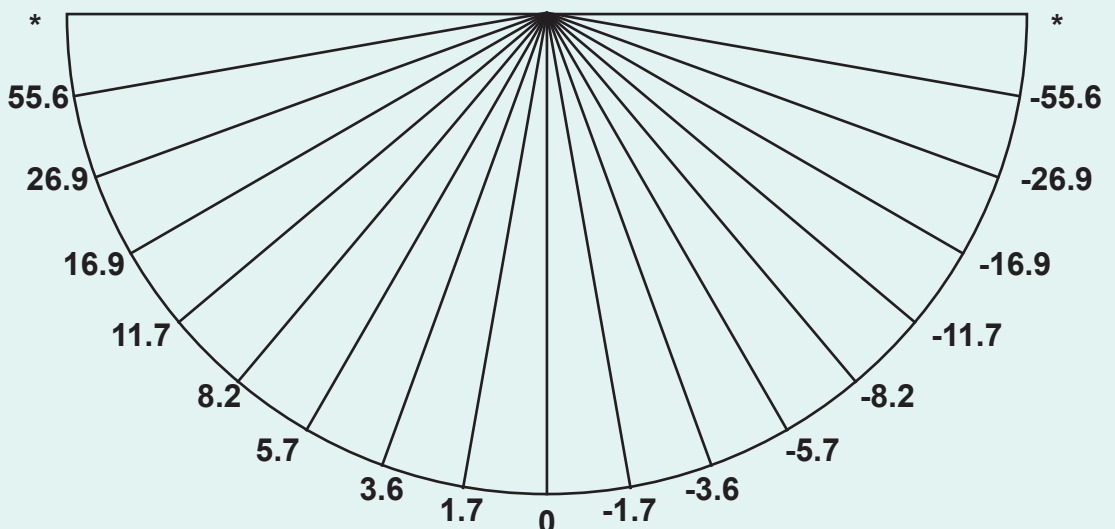
1. Cut the cardboard square into the size and shape of the figure below.
2. Hold the cardboard cutout next to the figure shown below and use the marker and ruler to copy the figure's markings onto the cutout.
3. Use the hole punch to make a hole in the top of the cutout.
4. Tie one end of the string to the hole in the top of the cutout.
5. Tie the other end of the string to the small weight.
2. Make sure that you have a clear area for you to move around.
3. Stand with your accelerometer held horizontally. Note that the string is aligned with an acceleration of 0.
4. Move forward slowly, noting the position changes of the string when you first start moving. Stop and record the acceleration displayed on your accelerometer.
5. Repeat step 4, only change how quickly you begin moving for a total of three trials.

#### Part 2. Using your accelerometer

1. Hold your accelerometer horizontally at all times.
6. Describe how your changes in motion were related to your accelerations.

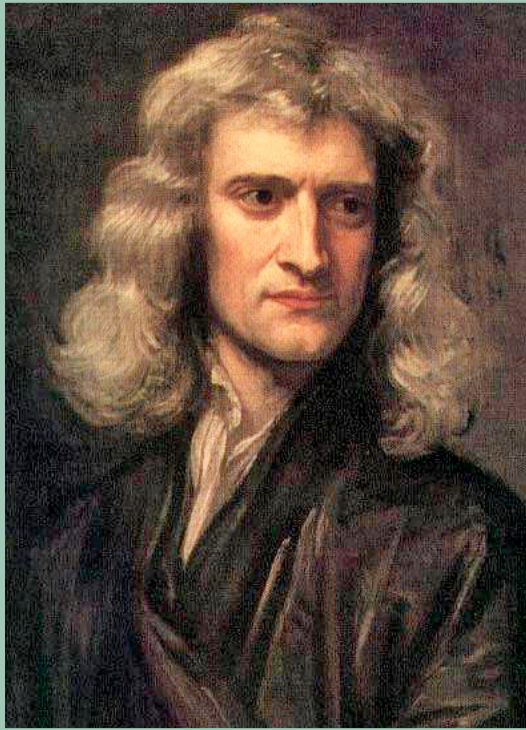
**Accelerometer**  
(meters/second<sup>2</sup>)

*\*undefined*



# Acceleration

## It Took a Plague



Although many other mathematicians laid the groundwork for his discoveries, Isaac Newton is generally referred to as one of the founding fathers of a branch of mathematics called calculus. Newton used his new mathematical methods to help solve problems in physics related to the motion and acceleration of objects. Much of his work creating calculus was completed in England between the years 1664 to 1666.

Another major event was occurring in England and some parts of Europe during the same time Newton was formulating calculus. In particular, the Great Plague of London was ravaging through the general population and was responsible for killing about 15% of the residents of the city. The plague, formally called the bubonic plague, is a bacterial infection transmitted by the bite of the Oriental Rat flea. The fleas were typically carried from place to place by rats.

So what does the plague have to do with Newton inventing calculus? Newton, like most Londoners, was afraid to go out in public for fear of contracting the disease. For this reason, he stayed home and ventured out only to retrieve the necessary essentials for living. During this time, with no television, internet, or other distractions, he used his time for deep thought and reflection. The outcome was one of the most useful and masterful discoveries of all time: calculus.

Newton used his new calculus creation to develop the three laws of motion. His second law defines the concept of acceleration, which is how quickly a moving object changes its motion. The faster an object speeds up, slows down, or changes its direction, the greater the acceleration. Acceleration has unusual units of measure. Since acceleration is a rate of a rate, the quantity is typically measured in meters per second per second.

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**STEMsims.com**

Answers: Page 2 Answers: 1) d. 2) c. 3) a. 4) d. 5) b.

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