

Physics for Kids

Speed and Velocity

Although speed and velocity are often used interchangeably in everyday life, they represent different quantities in physics.

What is speed?

Speed is a measurement of how fast an object moves relative to a reference point. It does not have a direction and is considered a magnitude or scalar quantity. Speed can be figured by the formula:

$$\text{Speed} = \text{Distance/Time}$$

or

$$s = d/t$$

How to Measure Speed

In the United States we mostly think of speed in miles per hour or mph. This is the way the speed of a car is typically measured. In science and physics the standard unit of measure for speed is generally meters per second or m/s.

The measurement of speed can reflect two different scalar quantities.

- **Instantaneous Speed** - The speed of an object at a given moment. The car may be travelling at 50 mph at this moment, but it may slow down or speed up during the next hour.
- **Average Speed** - The average speed is calculated by the distance that an object traveled over a given interval of time. If a car traveled 50 miles over the course of one hour then its average speed will be 50 mph. It may be that the car traveled at instantaneous speeds of 40 mph and 60 mph during that time, but the average speed is 50 mph.

What is velocity?

Velocity is the rate of change in an object's position. Velocity has a magnitude (speed) and a direction. Velocity is a vector quantity. Velocity is represented by the formula:

$$\text{Velocity} = \text{the change in distance/change in time}$$

$$\text{Velocity} = \Delta x / \Delta t$$

How to Measure Velocity

Velocity has the same unit of measure as speed. The standard unit of measure is meters per second or m/s.

What is the difference between speed and velocity?

Speed is the magnitude of velocity. Velocity is the speed of an object plus its direction. Speed is called a scalar quantity and velocity is a vector quantity.

Speed of Light

The fastest possible speed in the universe is the speed of light. The speed of light is 299,792,458 meters per second. In physics this number is represented by the letter "c."

Interesting Facts about Speed and Velocity

- The first scientist to measure speed as distance over time was [Galileo](#).
- A speedometer is a great example of instantaneous speed.
- The speed of light can also be written as 186,282 miles per second.
- The speed of sound in dry air is 343.2 meters per second.
- The escape velocity of Earth is the speed needed to escape from Earth's gravitational pull. It is 25,000 miles per hour.