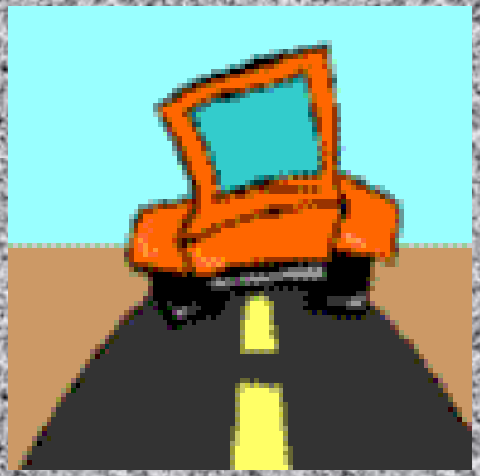
LEQ: How can equations be used to describe the motion of an object?

Objective: Given appropriate information, calculate the speed or velocity of an object (including units).

Speed & Velocity



Motion

- Motion is described **relative** to something else
  - An object can be described as **moving or not moving** at the same time depending on what is used as the reference frame

Speed

- Speed is a quantity that describes **how an object moves**
- Speed is the **rate** at which **distance** is covered, and it is measured in units of distance divided by time.

Speed

- ***Instantaneous*** speed is the speed at any instant
  - Could be determined by looking at **speedometer**
  - Could be measured with a **radar gun**
  - Could be calculated using **equations** (initial or final speed) or graphs

Speed

- ***Average*** speed is the total distance covered divided by the time interval

Speed

d = distance
s = speed
t = time

Possible speed units:

- *mi/hr*
- *m/s*
- *ft/min*

Speed

$$s = \frac{d}{t}$$

Speed and distance are **directly** related.

Speed

$$s = \frac{d}{t}$$

Speed and time are **inversely** related.

Speed

$d = s \times t$

Speed

$$s = \frac{d}{t}$$

Speed

$$t = \frac{d}{s}$$

Calculations

1. A football player can run from end-zone to end-zone, a distance of 100 yards, in 15.0 seconds. What is his average speed during this run?

Calculations

2. A family begins a vacation by driving 85 miles east, starting in Hanover. This part of the trip took 1.5 hours. What is the average speed for this trip?

Calculations

3. How long would it take a cheetah to run 75 m running at 25 m/s?

Calculations

4. A greyhound can run 160 m in 10 s. What is the speed of this animal?

Calculations

5. How far can a turtle travel in 30 s walking at 1 cm/s?

Velocity

- Velocity is speed together with **direction**
  - Velocity is constant only when speed and direction are both **constant**
  - Velocity is a ***vector*** quantity… having both magnitude (**size**) and direction

Velocity

- http://www.teachersdomain.org/resources/phy03/sci/phys/mfw/accel/index.html

  http://www.teachersdomain.org/asset/phy03_int_accel/