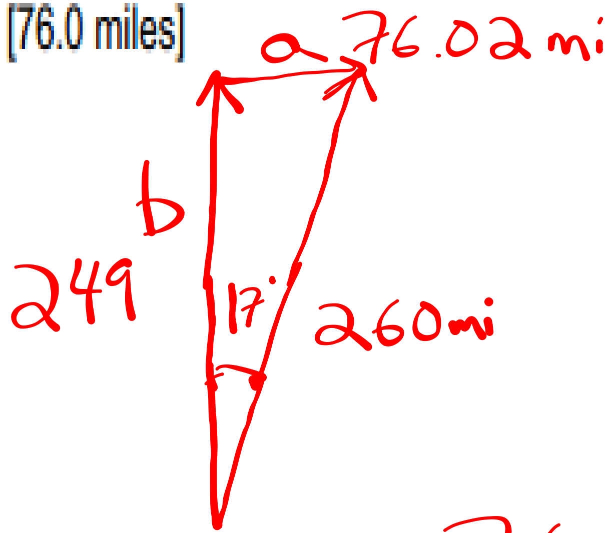
5. Convert 11.2 (N x m^3)/sec^2 into (lb x ft^3)/min^2. [3.20 x 10^5 (lb x ft^3)/min^2]

$$\frac{11.2\ N \cdot m^3}{s^2} \cdot \left(\frac{3.28\ ft}{1\ m}\right)^3 \cdot \frac{.225\ lb}{1\ N} \cdot \left(\frac{60\ s}{1\ min}\right)^2 = 320000\ \frac{lb \cdot ft^3}{min^2}$$

$$3.20 \times 10^5\ \frac{lb \cdot ft^3}{min^2}$$

13. A plane takes off from CSX (Corvallis International Airport) and files in a direction that is 17.0° east of due north. When the plane has traveled a distance of 260.0 miles (relative to the ground), how far east of CSX is the plane? [76.0 miles]

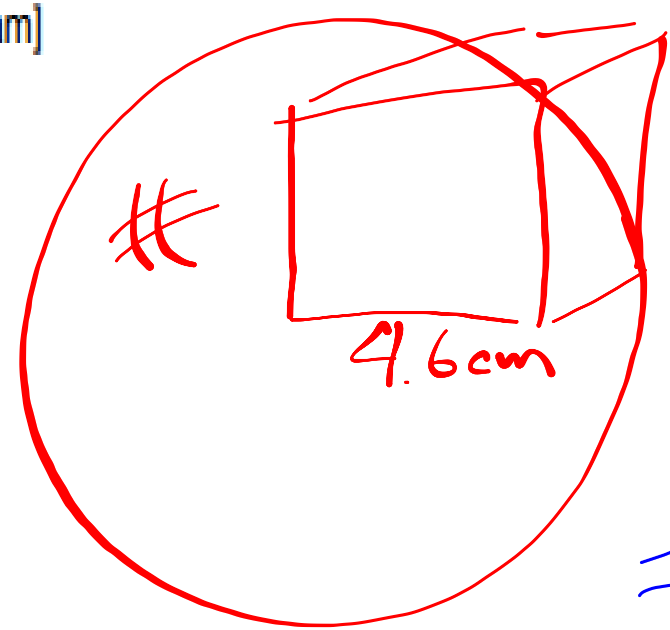


$$\sin\theta = \frac{a}{c}$$

$$\sin 17° = \frac{a}{260\text{ mi}}$$

76 mi

11. A sphere of metal measures 4.6 cm in radius and has a density of 7.9 g/cm^3. What is the mass of the sphere? [3.2 x 10^3 gram]



$$d = \frac{m}{V}$$

$$V_{sphere} = \frac{4}{3}\pi r^3$$

$$7.9 \frac{g}{cm^3} = \frac{m}{407.51\ cm^3}$$

3200 g $\leftarrow$ $3219......$

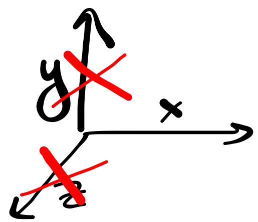
3.2×10^3 g

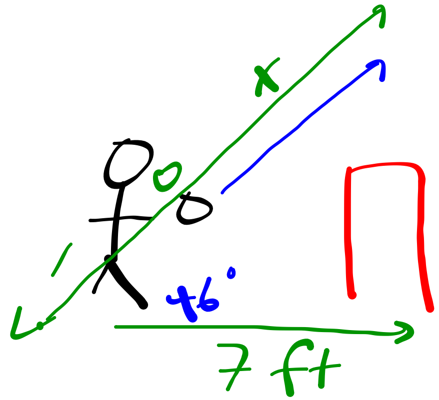
Introduction to 1-D motion:

- Straight-line motion
- Displacement
- Velocity (formula for average velocity)
- Acceleration (formula for average acceleration)

What is 1-D motion?

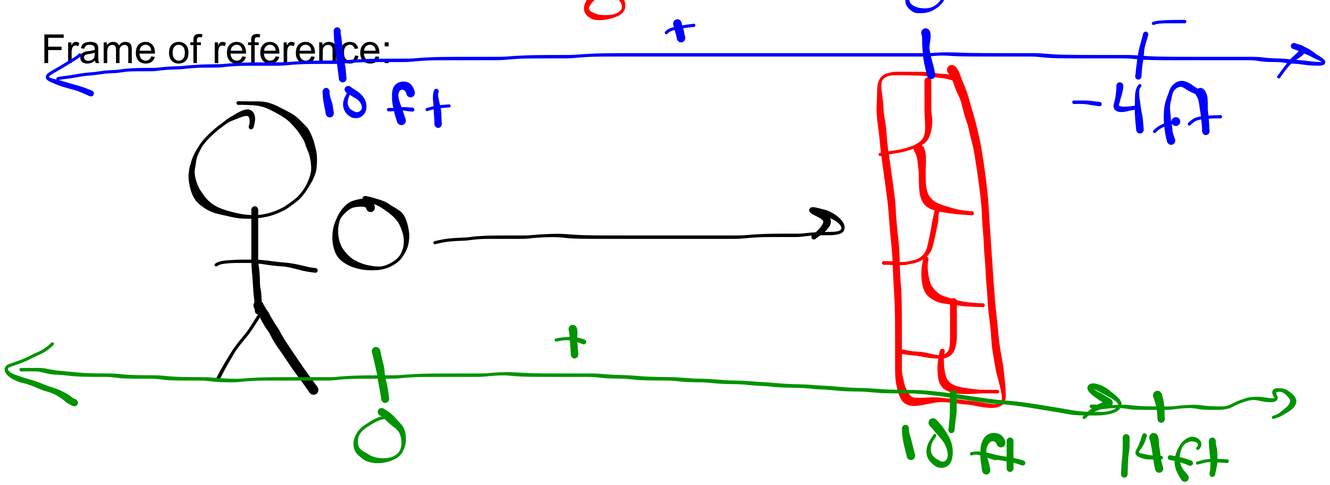
Motion in a straight line:





+ / - values:

Frame of reference:



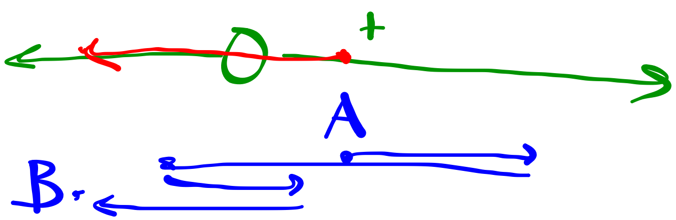
Displacement:

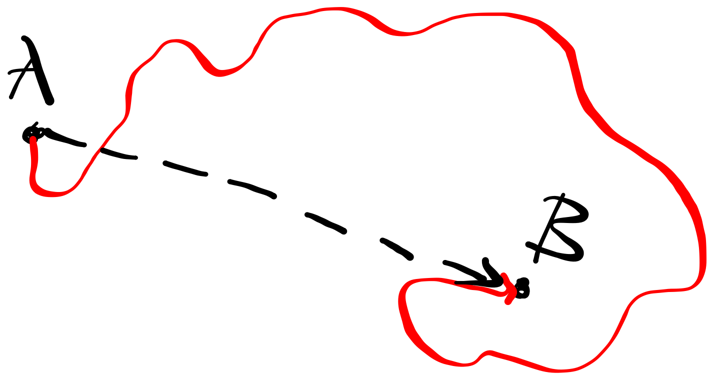
- Measures how far something goes and in what direction (vector quantity)

Shortest distance between an object's start and end point — along with the direction

- Difference between displacement and distance:

Distance does not include direction





Velocity:

- Measures how fast something goes and its direction (vector quantity)

- Difference between speed and velocity:

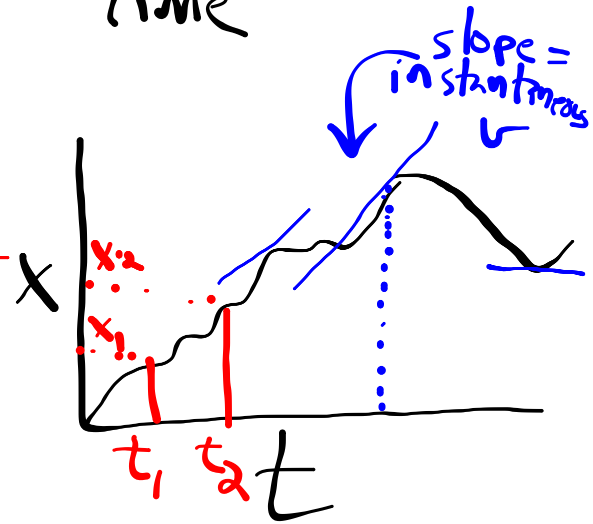
·velocity includes direction

$$\text{speed} = \frac{\text{distance}}{\text{time}} \qquad v = \frac{\text{displacement}}{\text{time}}$$

- Difference between average and instantaneous velocity:

$$\bar{v} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t}$$

$$v_{\Delta t \to 0} = \frac{\Delta x}{\Delta t}$$



Acceleration:

- Measures how fast something's velocity changes (no change = uniform velocity); includes direction (vector quantity)

$4.2\,m/s$

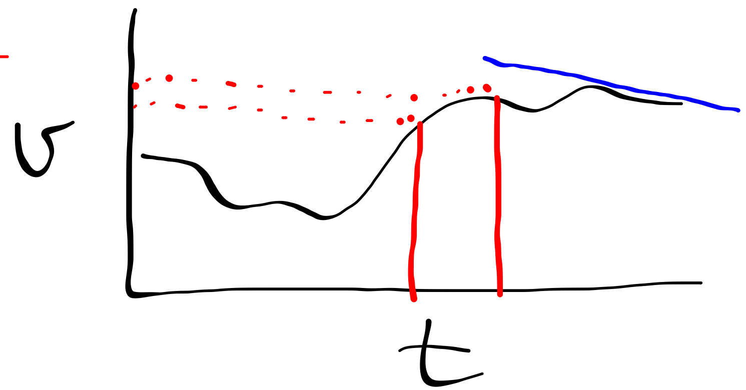
- Anytime velocity changes, acceleration is occurring (3 ways)

• speeding up
• slowing down
• changing direction

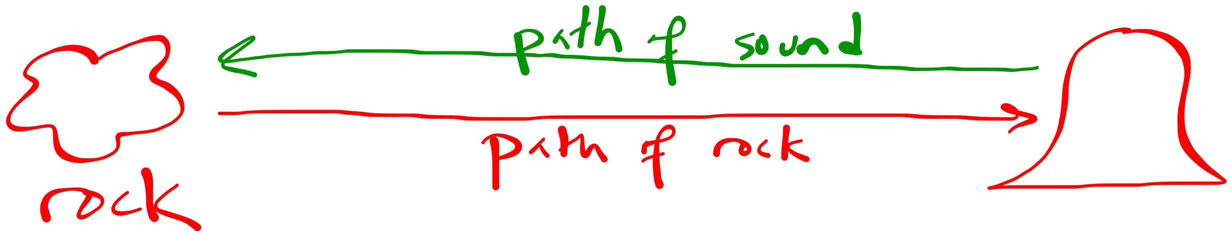
- Difference between average acceleration and instantaneous acceleration

$$\bar{a} = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t}$$

$$a = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t}$$



A rock thrown horizontally at a large bell 50 m away is heard to hit the bell 4.5 s later. If the speed of sound is 330 m/s, what was the speed of the rock? (Disregard the effect of gravity – in other words, ignore any vertical deflection of the rock).



$$S_{sound} = \frac{dist}{time} \qquad 330\,m/s = \frac{50m}{t}$$

$$t_{sound} = .1515\,s$$

$$t_{rock} \approx 4.35s$$

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

$$S = \frac{50}{4.35} = 11.49\,m/s$$

$$11\,m/s$$

At high speeds, a particular automobile is capable of an acceleration of about 0.50 m/s2. At this rate, how long does it take to accelerate from 90 km/h to 100 km/h?

$$\frac{0.50\,m}{s^2}\cdot\frac{1\,km}{1000\,m}\cdot\left(\frac{3600\,s}{1\,hr}\right)^2 = 6480\,\frac{km}{hr^2}$$

$$a=\frac{V_2-V_1}{t_2-t_1}$$

$$6480=\frac{10}{\Delta t}\qquad \frac{km}{\cancel{hr^2}}=\frac{km/hr}{}$$

$$\frac{\cancel{km}}{\cancel{hr}}\cdot\frac{hr^2}{\cancel{km}}$$

$$\boxed{0.00154\,hr}$$

5.54s