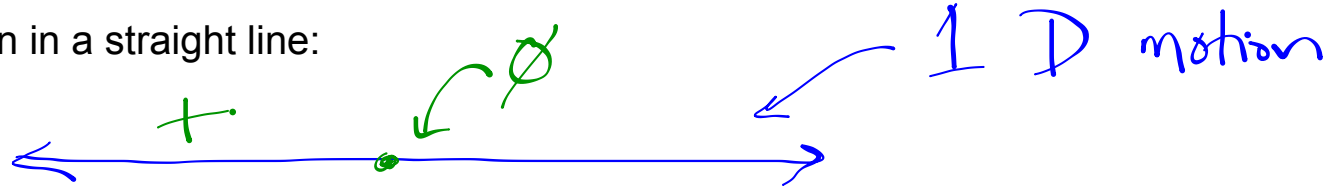# Introduction to 1-D motion:

- Straight-line motion

- Displacement

- Velocity (formula for average velocity)

- Acceleration (formula for average acceleration)

What is 1-D motion?

Motion in a straight line:

1 D motion

+

0

+ / - values:

$+ \Rightarrow$ one direction

$- \Rightarrow$ the other direction

Frame of reference:

1. Where is "0"?

2. Which direction is $+$?

Displacement:

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

position ≠ displacement

(motion match: position vs. time)　↳ CHANGE in position

(Δx)

- Difference between displacement and distance:

displacement: the shortest distance between an object's starting/ending points + direction

distance: the total length of the path an object takes

displacement
(w/ direction)
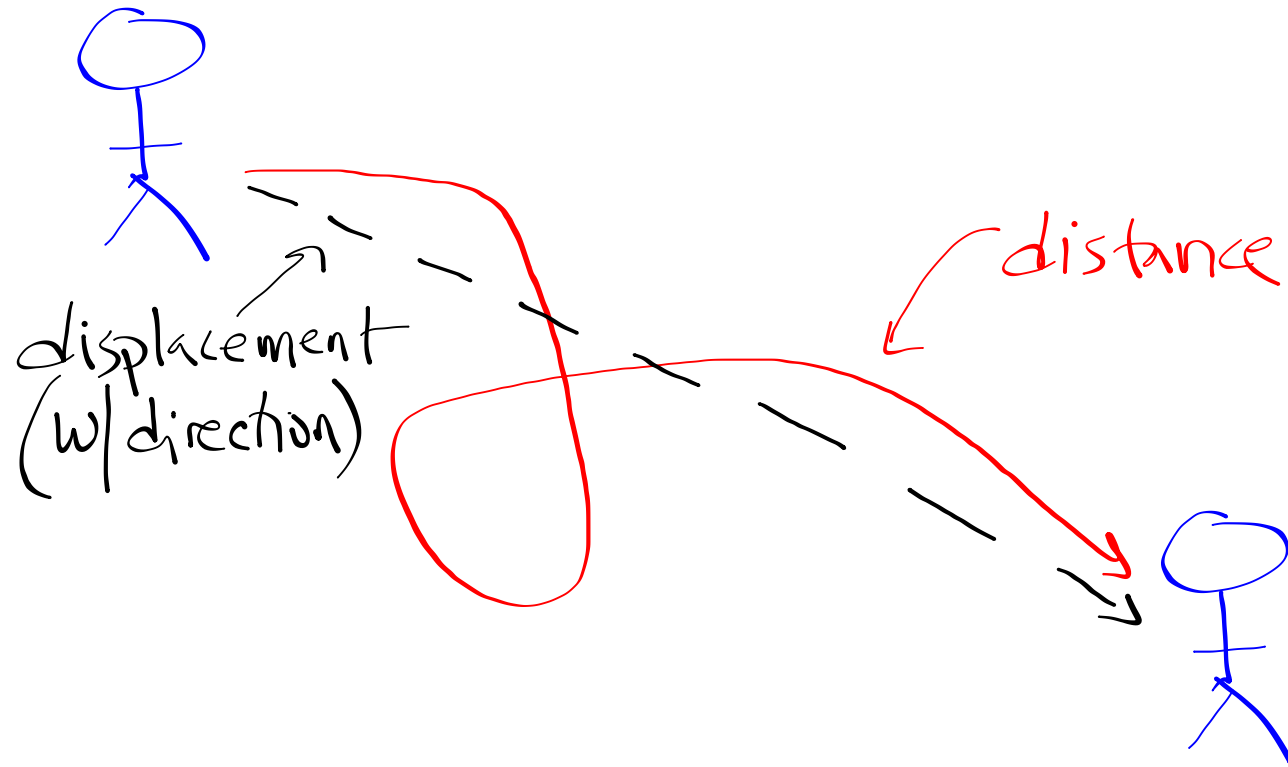
distance

Velocity:

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

$$speed = 11 \, m/s$$

$$velocity = -11 \, m/s$$

- Difference between speed and velocity:

vel. has direction, speed doesn't

$$velocity = \frac{displacement}{time} \qquad speed = \frac{distance}{time}$$

- Difference between average and instantaneous velocity:

$$\bar{v} = \frac{\Delta x}{\Delta t} \qquad v = speed + direction \\ at \ a \ moment \ in \ time$$

Acceleration:

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

- Anytime velocity changes, acceleration is occurring (3 ways)
  - velocity becoming more positive (+ acceleration)
  - velocity becoming more negative (− acceleration)
  - change of direction

- Difference between average acceleration and instantaneous acceleration

$$\overline{a} = \frac{\Delta v}{\Delta t}$$

$a =$ how much an object is accelerating at a moment in time