Name: _____ Period: _____ Date: _____

StickMan Physics Scalars and Vectors Guided Notes: https://www.stickmanphysics.com/stickman-physics-home/one-dimensional-motion/scalars-and-vectors/

Velocity and Speed Variables

Name	Variable	Unit	Unit Abbreviation
Velocity or Speed			
Time			
Displacement or Distance			

A **scalar** in physics includes only a magnitude. Magnitude is a number and a unit.

Q: What is an example of magnitude?

A **vector** in physics includes a magnitude and a direction. Two common vectors are **displacement** like 5 meters east and **velocity**.

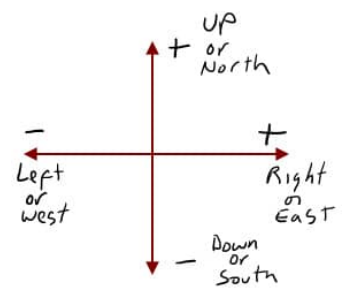
Q: What is an example of velocity?

Distance (a scalar) is a measure between two points. Because distance has no direction you add up all of the segments traveled.

Displacement (a vector) is a measure of where you are from the origin. So how far in what direction from the **origin** or starting point.

Q: A StickMan travels 6 meters east followed by 4 meters west. What is his distance traveled (show work)?

Q: A StickMan travels 6 meters east followed by 4 meters west. What is his displacement (show work)?



Common direction signs of vectors

Calculating Scalar Speed and Vector Velocity

- Scalars go with scalars, so use distance to calculate speed as seen in the equation on the right.
- Vectors go with vectors, so use displacement to calculate velocity as seen in the equation to the right.
- A common variable form is: $v = \frac{\Delta X}{\Delta t}$ **or just** $v = \frac{X}{t}$
- In different equations x or Δx may be used interchangeably to represent displacement or position.
- **Δx would represent change in position ($x_f - x_i$)** and displacement is often just written as x in common equations.
- A time interval (t) can be calculated ($t_f - t_i$)

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

$$\text{Velocity} = \frac{\text{Displacement}}{\text{Time}}$$

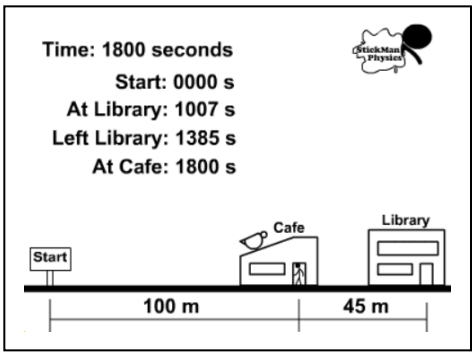
Instantaneous velocity is the velocity at that instant. For example, if stopped, his instantaneous velocity is 0 m/s but a few seconds later he is going again and its 4 m/s.

Total displacement divided by the total time is **average velocity**. If total displacement was +14 m and the time it took was 4 seconds. v = +14/4 becomes 3.5 m/s forward.

Acceleration (a **vector**) describes a velocity changes over time. Therefore, the unit for acceleration has the unit for velocity over another time unit. So a meters per second change per second states as **m/s/s** or more commonly **m/s^2**.

Example Problems:

Thomas, on his lunch break, took 30 minutes to go to the library and then the cafe.



1. What distance did Thomas travel during lunch?

2. What was his displacement?

3. Determine the speed of Thomas during the 30 minute (1800 second) lunch?

4. What was the velocity of Thomas during the 30 minutes?

Take the quiz at the bottom of the page. Number the questions and show all work.