

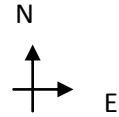
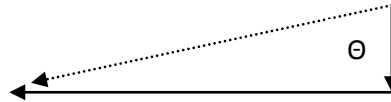
### Average Speed vs. Average Velocity

We've learned the difference between speed (scalar) and velocity (vector).

Speed:  $v = \Delta d / t$       whereas      Velocity:  $\vec{v} = \vec{\Delta d} / t$

Try: A student walks 100 m [S] and then 400 m [W] in 4.5 min to get to school. What is her average speed and velocity?

G: draw this out. It is non-collinear.



R: speed and velocity for whole trip

A:  $v = \Delta d / t$       whereas      Velocity:  $\vec{v} = \vec{\Delta d} / t$

S:  $\Delta d = 100\text{m} + 400\text{m} = \mathbf{500\text{ m}}$  \*no direction required.

$\vec{\Delta d}$  = solve by Pythagorean (for magnitude) and trig for angle ( $\Theta$ )

$$\vec{\Delta d}^2 = 100^2 + 400^2 \quad \vec{\Delta d} = \mathbf{412\text{ m}}$$

$$\text{Tan } \Theta = 400 / 100 \quad \Theta = \mathbf{76^\circ} \quad \text{direction is } \mathbf{[S 76^\circ W]}$$

I want time in seconds.    So 4.5 min = 4.5 x 60 = 270 seconds.

S:      **Average speed = 500/270 = 1.9 m/s**

**Average velocity = 412 / 270 = 1.5 m/s [S 76° W]**

### Homework Questions:

1. Why is average velocity typically less than average speed?
2. Is average velocity ever equal to average speed? Explain using an example if able to.