MOTION: Change in position

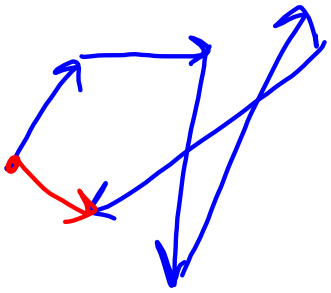
KINEMATICS: Study of motion

MECHANICS: Study of objects in motion

VECTORS VS. SCALARS

DISTANCE: Length of path traveled. (Scalar, direction doesn't matter)
What an odometer reads. Mileage in a car.

DISPLACEMENT: Change in position from start. (Vector, direction matters)
Straight line from start to finish ignoring path taken.



Distance vs. Displacement

Nick forgot his pencil again and this makes Ms. Nigro pace back and forth around the room. Ms. Nigro walks 10m to the right, then 8m to the left, then 3m to the right.

1) What's Ms. Nigro's distance covered?

2) What is Ms. Nigro's displacement?

VECTORS VS. SCALARS

AVERAGE CONSTANT SPEED:
Scalar

How fast, on average, we traveled throughout the entire trip. (Scalar, direction doesn't matter)

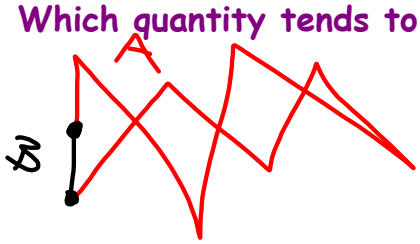
$$\text{Speed} = \frac{\text{Distance (m)}}{\text{Time (s)}}$$

AVERAGE CONSTANT VELOCITY:
Vector

How fast we need to travel to get from start to finish in a straight line. (Vector, direction matters)

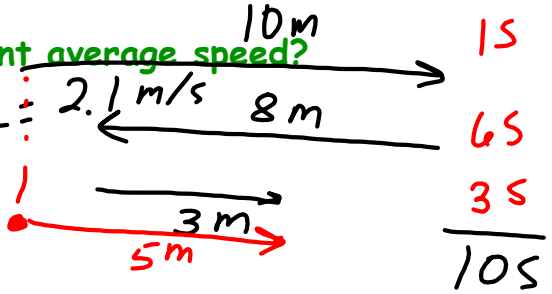
$$\text{Velocity} = \frac{\text{Displacement (m)}}{\text{Time (s)}}$$

Which quantity tends to be larger, speed or velocity?



Speed vs. Velocity

Nick forgot his pencil and this makes Ms. Nigro pace back and forth around the room. Ms. Nigro walks 10m to the right in 1s, then 8m to the left in 6s, then 3m to the right in 3s.



1) What is Ms. Nigro's constant average speed?

$$\text{Avg. Sp} = \frac{\text{Distance}}{\text{Time}} = \frac{21\text{m}}{10\text{s}} = 2.1\ \text{m/s}$$

2) What is Ms. Nigro's constant average velocity?

$$\text{Avg. Vel} = \frac{\text{Displacement}}{\text{Time}} = \frac{5\text{m right}}{10\text{s}} = .5\ \text{m/s right}$$

3) When, if ever, will speed and velocity be equal?

If Direction never changes

Speed vs. Velocity

Bri wants a new lab partner. She moves 3 m North and 4 m East in ~~1 minute.~~ 60 s.

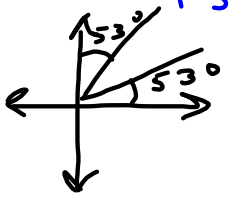
+ Equation
+ sub w/units
+ Solve w/units

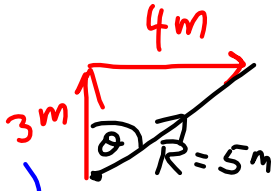
1) What distance did Bri travel?

7 m

2) What is Bri's displacement? (★ Direction)

5 m @ 53° E of N





3) What is Bri's average speed in m/s?

$s = \frac{\text{distance}}{\text{time}} = \frac{7\text{ m}}{60\text{ s}} = .12\text{ m/s}$

4) What is Bri's average velocity in m/s? (★ Direction)

$v = \frac{\text{displacement}}{\text{time}} = \frac{5\text{ m @ } 53^\circ \text{ E of N}}{60\text{ s}} = .08\text{ m/s @ } 53^\circ \text{ E of N.}$

$\text{Tan}\,\theta = \frac{\text{opp}}{\text{adj}}$

$\tan\theta = \frac{4\text{m}}{3\text{m}}$

$\theta =$

5) Why is Bri's speed different from her velocity?

Bri changed direction.

Speed and Velocity

Constant Speed and Constant Velocity

$\bar{v} = \frac{d}{t}$

$\bar{v}$ = average velocity or average speed (m/s)
d = displacement or distance (m)
t = time (s)

1) Taylor is driving her car at 25 m/s East. What is her displacement after 40 seconds?

2) Joey's balloon drifts North at 1.6 m/s. How long will it take to travel 80 meters?

3) A sled travels 52 meters downhill in 4 seconds. Find the average speed.