



Part 2

Introduction to In Motion

Review

- In previous learning we have looked at the differences between different vocabulary words in physics. Most notably:
- Scalar vs. Vector
- Distance Vs. Displacement



Comparing Again...

- Two words that have meanings that can be very similar are :
- SPEED
- VELOCITY
- What's the fastest human speed?



Usain Bolt



- Usain Bolt's top speed has been recorded at 12.27 m/s!!!

SPEED

- How fast an object is moving
- Think of when we learned about distance, all we are doing is adding how much time it took to cover that distance.
- A scalar, therefore there is no direction of motion.
- Examples...
 - 20 km/hr
 - 40 m/s
 - 1 mm/ms



FORMULA FOR SPEED

- Speed is measured in 2 quantities:
 - How far an object is going in time (ex 10 km/hr)
- In order to calculate speed in this time, we simply take the distance value (such as km or m) and divide it by the time value (such as hours or seconds).

FORMULA FOR SPEED

$$\text{SPEED} = \frac{\text{distance}}{\text{time}}$$

Ticker Tape Example

- Faster vs. Slower
- When will the points be closer together?
When the tape is pulled faster or when the tape is pulled slower? *Slower*
- Why is this?
The distance the object moves before the next stamp is less

Speed Calculation Examples

- Try out the following examples:
 - 1) A car travels 140 km in a 2 hour time. What is its speed in km/hr?
 - 2) Sam walks to school a total distance of 900m. It takes him about 10 min. What is his speed in m/s?

1) $d = 140 \text{ km}$ $v = \frac{\Delta d}{\Delta t} = \frac{140}{2} = 70 \text{ km/h}$
 $t = 2 \text{ hr}$
 $v = ?$

2) $d = 900 \text{ m}$ $v = \frac{\Delta d}{\Delta t} = \frac{900}{600} = 1.5 \text{ m/s}$
 $t = 10 \text{ min} = 600 \text{ s}$
 $v = ?$

VELOCITY

- How fast an object's position is changing.
- Rate of change of position.
- Think of when we learned about displacement, all we are doing is adding how much time it took to change the position of the person .
- Vector quantity, with both speed and direction.
- Change in distance in change in time

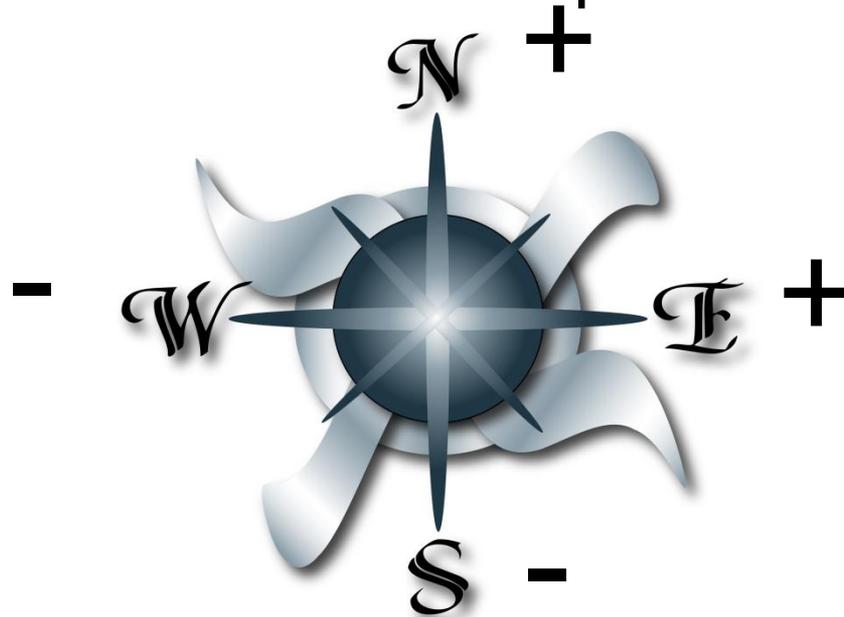
- Example:
 - 140 m W in 10 seconds

FORMULA FOR VELOCITY

$$\text{VELOCITY} = \frac{\text{DISPLACEMENT}}{\text{CHANGE IN TIME}}$$

Displacement in direction

- When dealing with compass direction (North, East, South and West) you must also qualify the directions as either positive or negative.



Practice Problem

- Jenny goes for a run after school for 20 min. She can run 2.5 km (2500m) in this time. If she is running east, what is her velocity?

$$\vec{d} = 2500 \text{ m}$$

$$t = 20 \text{ min} = 1200 \text{ s}$$

$$\vec{v} = ?$$

$$\vec{v} = \frac{\Delta \vec{d}}{\Delta t} = \frac{2500}{1200} = 2.08 \text{ m/s}$$

East