



## Physical Science

### Unit 7

#### Motion



## What is time?

- ▶ **TIME** identifies an exact moment or how long something takes to do
- ▶ Measured in seconds
  - Can be measured in minutes, hours, or days
  - Look at your data and decide what unit is best
    - ▶ Example: Would your age make sense in seconds?

## Converting time

- ▶ Mixed units of time need to be converted to seconds
  - EXAMPLE: 2 minutes and 15 seconds
- ▶ How to convert
  1. Separate total time into each unit
  2. Convert separately into seconds
  3. Add together



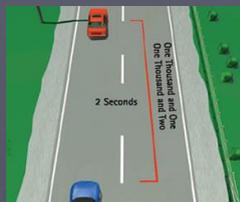
## Examples

- ▶ 25 minutes and 31 seconds
- ▶ 1531 seconds
- ▶ 1 hour 54 minutes and 31 seconds
- ▶ 6871 seconds
- ▶ 4 days 3 hours 10 minutes and 2 seconds
- ▶ 357002 seconds



## Distance

- ▶ How far from one point to another
- ▶ Measured in units of length
  - Meter, millimeter, centimeter, kilometer
- ▶ Again, have to look at data to determine what is the best unit to use



## "Converting" distance

- ▶ K H D b d c m
- ▶ All you have to do to convert mixed units is move the decimal place
  - EXAMPLE: 3 meters and 10 centimeters = 3.1m
- ▶ 5 kilometers and 4 meters
- ▶ 5.004 km
- ▶ 4 meters and 21 centimeters = ? cm
- ▶ 421 cm

## Speed

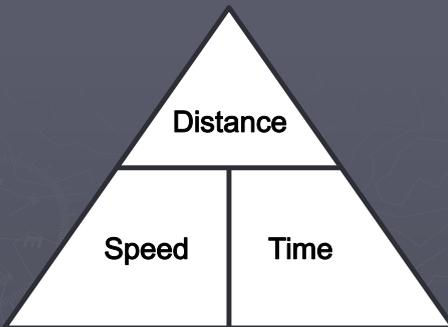
- ▶ Simply saying how fast you walked doesn't work for scientists
  1. Exactly how fast are you walking?
  2. How many meters do you walk for each second?
  3. Do you always walk the same number of meters every second?

## Speed



- ▶ How quickly an object gets from one place to another
  - Distance and Time
  - $S = \frac{d}{t}$        $t = \frac{d}{s}$        $d = st$
  - Usually measured in meters/second, but can be in kilometers/hour

## Speed



## Calculating Speed

- ▶ A football field is about 100 m long. If it takes a person 20 seconds to run its length, how fast (what speed) were they running?

Given:

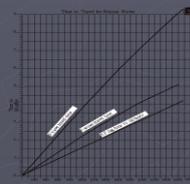
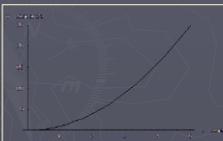
Equation:

Substitution:

Answer with unit:

## Why Graph?

- ▶ Organizes data into a model:
  - Make predictions
  - Shows relationships between variables



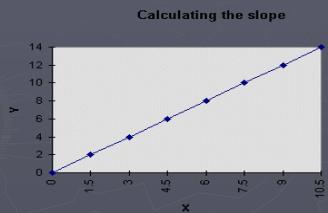
## How can we find speed using a graph?

- ▶ Use if lots of data points
  - Finds overall speed instead of speed for each point
    - ▶ Can also be used to find each point too!
- ▶ To find speed, graph distance vs. time



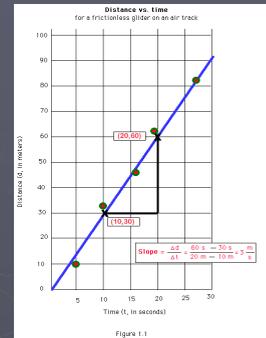
## What is slope?

- ▶ Rise (vertical change)  
Run (horizontal change)



- ▶ Each point on a graph is a specific position at an exact time

- Slope gives you the total distance in the total time
- ▶ SPEED!!!



## Acceleration

- ▶ How speed changes over time
- ▶  $A = \frac{S_f - S_i}{t}$  or  $\frac{\text{change in speed}}{\text{change in time}}$
- ▶ Units =  $\text{m/s}^2$



## Calculating Acceleration

- ▶ A car goes from 0 to 100 km/hr in 10 seconds. What is its acceleration?

Given:

Equation:

Substitution:

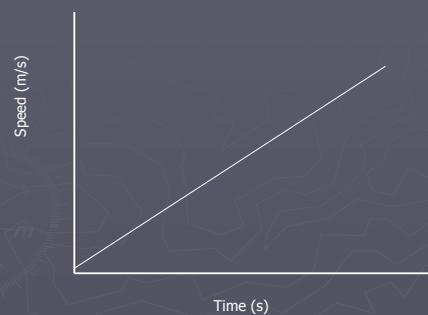
Answer with unit:

## Acceleration and Graphs

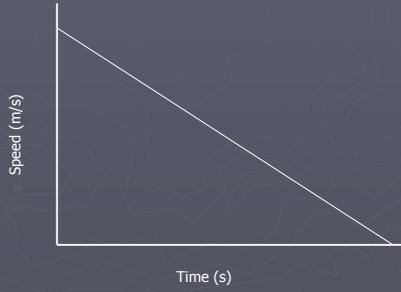
- ▶ Another motion graph that is useful is the speed vs. time graph
- ▶ It is used to show acceleration because it has the speed over a time



## What does this graph tell us?



What does this graph tell us?



What does this graph tell us?

