

Motion in 1 direction

Physics – Ch 2

Objectives

- **Describe** motion in terms of frame of reference, displacement, time, and velocity.
- **Calculate** the displacement of an object traveling at a known velocity for a specific time interval.
- **Construct** and **interpret** graphs of position versus time.

1 dimensional motion

- One dimensional motion takes place in ONE dimension
 - North and South
 - Up and Down
 - Forwards and backwards
- Train on the tracks
- To measure motion, you must choose a **frame of reference**. A frame of reference is a system for specifying the precise location of objects in space and time.

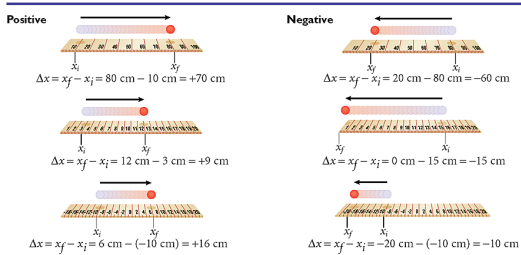
Displacement

- **Displacement** is the change in position
 - It does NOT have to equal the distance covered
 - Ex. Walk to school
 - Ex. Walk to school and back home

$$\Delta x = x_f - x_i$$

displacement = final position – initial position

Positive and Negative Displacements



Practice

	Displacement	Distance
30 m N and 20 m N		
30 m N and 20 m S		
5 m N, 6 m S, 8 m N		

Coordinate system

- Positive directions are..
 - Up
 - North
 - East
 - Right

Ave. Velocity

- **Average velocity** is the total **displacement** divided by the **time interval** during which the displacement occurred.

$$v_{ave} = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i}$$

- This is an AVERAGE! You could be going any velocity during the “trip”

Velocity and Speed

- **Velocity** describes motion with both a direction and a numerical value (a magnitude).
- **Speed** has no direction, only magnitude.
- **Average speed** is equal to the total distance traveled divided by the time interval.

$$average\ speed = \frac{distance\ traveled}{change\ in\ time}$$

Math

- Watch the Average Velocity Video to see how to complete the math!

Ex.

- Is the following a speed, velocity, or neither?
 - 45 m/s
 - 6.7 cm/h
 - 12 m/s N
 - 15 E
 - 100 km/h NE
 - 56 g/ml

Interpreting Velocity Graphically

- For any position-time graph, we can determine the average velocity by drawing a straight line between any two points on the graph
- If the velocity is **constant**, the graph of position versus time is a **straight line**. The slope indicates the velocity.
 - Object 1:** positive slope = positive velocity
 - Object 2:** zero slope = zero velocity
 - Object 3:** negative slope = negative



Instantaneous Velocity

- The **instantaneous velocity** is the velocity of an object at some instant or at a specific point in the object's path.

The instantaneous velocity at a given time can be determined by measuring the slope of the line that is tangent to that point on the position-versus-time graph.

$$\frac{18 \text{ m}}{1.5 \text{ s}} = 12 \text{ m/s}$$

