Motion, Speed, Velocity and Acceleration

VECTORS AND SCALORS ORIGIN - POINT AT WHICH BOTH VARIABLES ARE AT 0 (ZERO)

MAGNITUDE – SIZE

VECTORS – DIRECTION (represented by arrows)

SCALARS – QUANTITIES W/OUT DIRECTION (ex distance m, time s, temp C)

RESULTANT – SUM OF VECTORS
6m east plus 2 m east = 8m east
▶ Resulatant subtracting vectors

A - B = A+(-B)
A = 20 m west
B = 5 m east





Time Interval/Displacement

Time interval - change in time =final time –initial time

▶ formula

Displacement - Change in distance = final distance – initial distance
 formula

Motion

Motion – an object's change in position relative to a reference point



Reference Point

The Earth's surface is used as a common reference point

A moving object can be used as a reference point as well





Speed

- Speed is the distance traveled divided by the time interval during which the motion occurred
- Normally, objects do not travel at a constant speed
- Average Speed <u>total distance</u> total time

Which Distance?

Farmer Jones drives 6 miles down a straight road. he turns around and drives 4 miles back. What was his average speed for this trip if it took 1 hour?



Your answer to this problem depends on your interpretation of "distance traveled". You could say:

- The total distance traveled by Farmer Jones is 10 miles. Therefore his average speed is 10 mi/hr.
- The <u>net distance</u> traveled by Farmer Jones is 2 miles. Therefore, his average speed is 2 mi/hr.

There are good reasons to use either interpretation - it's mostly a matter of preference. We will interpret "distance traveled" to be <u>net distance</u> (also called <u>displacement)</u>. Farmer Jones' average speed was 2 mi/hr.

Velocity

Velocity is the speed of an object in a particular direction
 Imagine two birds leave the same tree at the same time. The both fly at 10km/hr for 5 minutes. Why don't they end up at the same place?



Velocity

Velocity appears to be very similar to speed, however, when describing the velocity of an object you need to provide a magnitude and a direction ► Magnitude – the speed of the object Direction – the direction the object is moving ▶ Pg 43 demo

Velocity

Ex) A bus has a velocity of 35miles/hr heading west



Resultant Velocity

An object can have a resultant velocity if it is experiencing more than one motion.
 For example if a person walks down the center of a bus while it is in motion there are two velocities occurring.

I. The movement of the bus

2. The movement of the person inside the bus

Example



Example



Acceleration

Acceleration is the rate at which velocity changes over time An object accelerates if its speed, direction, or both change Average acceleration = final velocity – starting velocity time it takes to change velocity

Acceleration

Example

A car on the highway is traveling 55 mi/hr and it passes another car. In order to pass, the car has to accelerate to 65 mi/hr. The car reaches this velocity 40 seconds later. What is the average acceleration of the car?

Acceleration and Velocity

As velocity <u>increases</u>, so does acceleration
 As velocity <u>decreases</u>, so does acceleration
 When direction changes, so does acceleration
 When there is a <u>constant velocity</u>, there is no acceleration