Velocity Notes

FRAME OF REFERENCE

The object or background used to determine motion and its direction. The frame of reference is assumed/defined to be at rest. Everything around us has motion (you, the wall, the air,...). There is no matter that we know of that does not have some type of motion associated with it. All objects move relative to some frame of reference. I am moving relative to a moving car. The earth is moving relative to the sun. Two cars passing each other are moving relative to the ground and each other.

MOTION

Motion occurs when an object starts in one position and has at least one change in that position during a period of time. The study of motion requires three basic measurements:

DISTANCE (d) - how far from one position to another As a result of motion an object will travel a certain distance. Distance is measured in units of length - meters (m), feet (ft), miles (mi), etc.

DIRECTION (→) - How the position changes relative to the starting point: north, south, east, west; positive and negative; up, down, left, right; etc.

TIME (t) - Duration of an event from start to finish. Time as we define it appears to be irreversible and is commonly measured in seconds (s), minutes (min), hours (hr), etc.

HOW FAST?

SPEED (v) - the rate at which distance is covered. Speed is calculated: the distance divided by the time - $v = d/t$ The resulting units are those of distance over time. Instantaneous speed is measured at a specific point (instant). Average speed is the total distance covered divided the total time of the event; this is usually what most people mean when they say "speed". Speed is a scalar quantity, magnitude (size) only.

VELOCITY (v) - The speed and direction of the motion. Velocity involves a change in position, known as displacement (Δx). Δ stands for 'change in' or 'final - initial' and x represents position. For an object to have a velocity the initial and final positions must be different. Velocity is calculated by dividing the displacement by the time interval - $v = \Delta x/\Delta t$ Instantaneous velocity is measured at a specific point (instant). Average speed is the total displacement divided the total time of the event. Velocity is a vector quantity, magnitude and direction.

GRAPHICAL REPRESENTATIONS OF MOTION: Constant, changing, or zero slopes