Motion

Motion is the change of an object's position in time

Motion

- (How far ?) (m)
- ----------
- (How much time?) (s)

How far?

- 1. Distance (“d”) is the total length of a path that an object travels. Distance is a scalar quantity having magnitude but no direction. The units are units of length such as meters.
- 2. Displacement (“D”) is the change in position of an object described by a vector that begins at the initial position of the object (“START”) and ends at its final position (“FINISH”). Displacement is a vector having both magnitude and direction.

Example

- A car is driven on NYS Thruway (“Highway 87”) from NYC to Albany to Buffalo. The distance traveled by the car is 673 km. The magnitude of the total Displacement of the car, however, is only the length of the vector connecting NYC and Buffalo----approximately 504 km.

Example

- A student walks 5.0 m east and then 12.0 m north. What is the distance and Displacement of the student?
- Distance = 5.0 m + 12.0 m = 17.0 m
- Displacement = Vector connecting start to finish. This vector is the hypotenuse of a 5-12-13 right triangle. The magnitude is 13 m and the angle is arctan(12/5) = 67 degrees N of E.

Group Activity

- **Determine the distance (“d”) and the Displacement (“D”) of the following:**
- 1. You toss a tennis ball three meters up in the air and then you catch it as it falls back down.
- 2. LeBron James runs up and back a 20 m basketball court 100 times during a game.
- 3. A boy runs 125 m north and then 75 m south.
- 4. A student walks 3 blocks south, 4 blocks west, and 3 blocks north.