# Regents Physics

# Defining and Graphing Motion

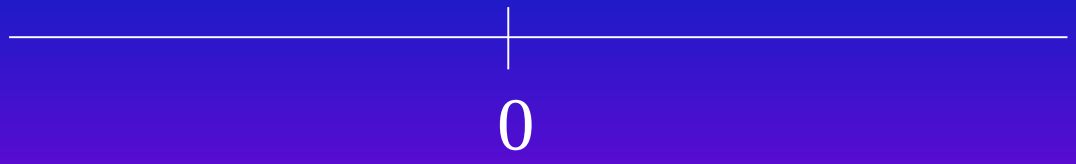
APlusPhysics

# Objectives

- Understand the difference between position, distance, and displacement.
- Understand the difference between speed and velocity.
- Construct and interpret graphs and diagrams of position, velocity, and acceleration versus time.
- Determine and interpret slopes and areas of motion graphs.

# Position

- An object's position, in one dimension, can be assigned to a variable on a number scale.
- You can assign the zero point, as well as the positive and negative directions.



# Distance and Displacement

- Distance is a scalar, measured in meters, and is given the symbol $\boldsymbol{d}$.

- Displacement is a vector which describes the straight line from your starting point to your ending point.
- Displacement is also measured in meters, and is also given the symbol $\boldsymbol{d}$.

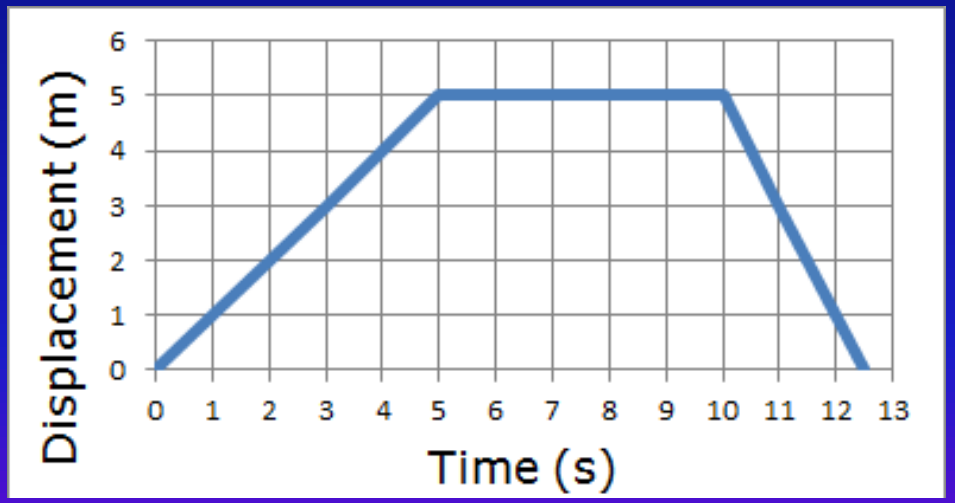
# Average Speed and Average Velocity

- Average speed is the rate at which distance is traveled, and is a scalar. $\bar{v} = \frac{d}{t}$
- Average speed is measured in meters/second.
- Speed is a Scalar.

- Average velocity is the rate at which displacement changes, and is a vector. $\bar{v} = \frac{d}{t}$
- Average velocity is also measured in meters/second.
- Velocity is a Vector.

# Displacement-Time Graphs

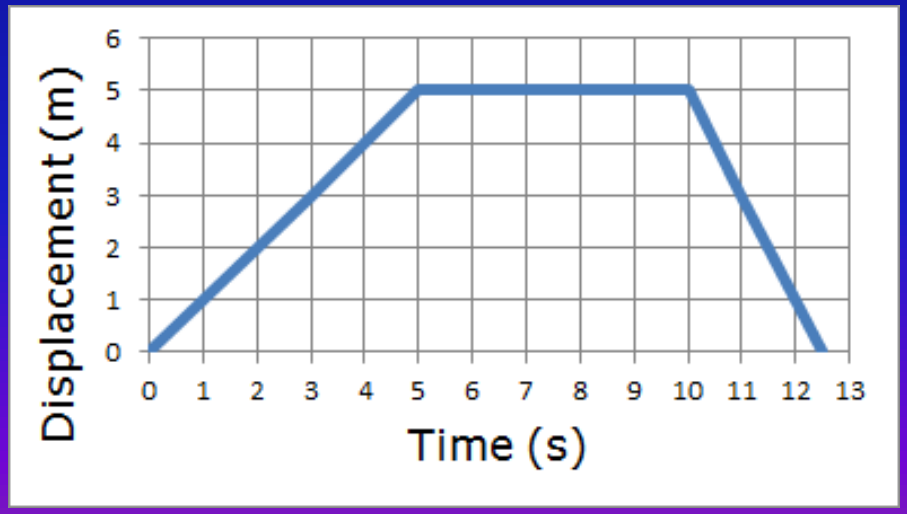
- Shows displacement as a function of time.
  - Dog wanders away from her house at a constant 1 m/s.
  - Dog takes a 5 s rest.
  - Dog returns to house at 2 m/s

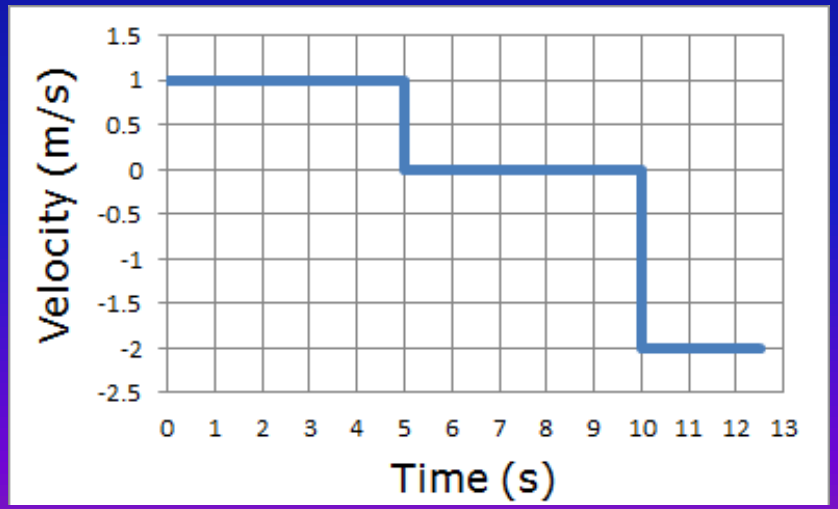



- Slope gives you the velocity

# Velocity-time Graphs

- Shows velocity as a function of time.
  - Related to *d*-*t* graph by slope
- Area under the *v*-*t* graph gives you change in displacement!



# Acceleration-Time Graphs

- Taking the slope of the *v*-*t* graph gives you acceleration.
- Taking the area under the *a*-*t* graph gives you an object's change in velocity.