

Average and Instantaneous Velocity and Speed

1. Take your Smart Cart out of the box.
2. Turn it on and open your choice of software: SPARKvue or Capstone.
3. Wirelessly connect to the Smart Cart. Change the sample rate of the Position Sensor to 40 Hz.

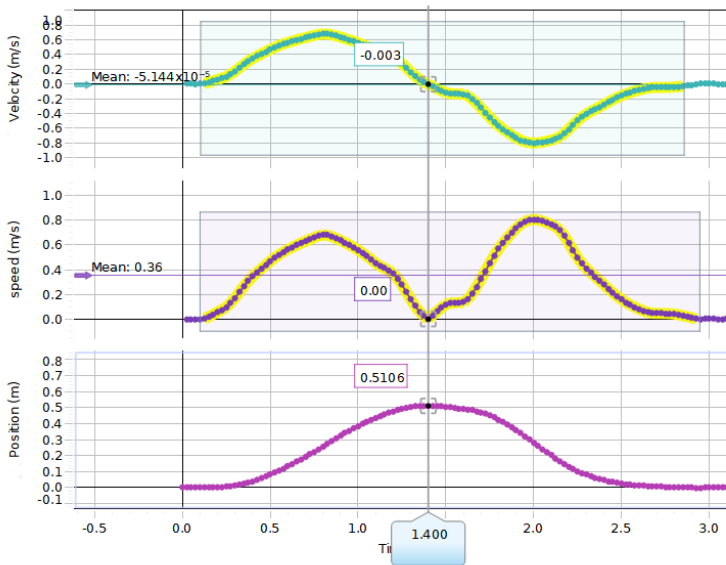


4. Open the calculator in the software and make the following calculation:
 $\text{speed} = \text{abs}([\text{Velocity, Red (m/s)}])$ with units of m/s
5. Create a graph of Velocity vs. Time and add a second plot area of speed vs. Time and add a third plot area of Position vs. Time.
6. Mark a starting point with a piece of tape.
7. Start recording. Push the cart about 20 cm out and back, ending at the same point where you started.

Analysis

1. On the Velocity vs. Time graph, find the maximum positive velocity.
2. What is the instantaneous velocity at the point where you reversed the cart?
3. What is the average velocity over the entire motion of the cart? Highlight the area of the Velocity vs. Time graph during the time of the motion and turn on the mean statistic.
4. What is the average speed over the entire motion of the cart? Highlight the area of the speed vs. Time graph during the time of the motion and turn on the mean statistic.
5. What is the difference between speed and velocity?

Sample Data



The instantaneous velocity when the cart reversed was zero.

The average velocity over the whole trip was zero because we started and stopped in the same place.

The average speed over the whole trip was 0.36 m/s.

Speed is a scalar that is the magnitude of the velocity. Velocity is a vector and has both magnitude (speed) and direction.