

The Differences between Velocity and Acceleration

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.
4. Change the sample rate of the Smart Cart Position sensor to 40 Hz.
5. Set up a graph of Velocity vs. Time and Acceleration vs. Time using the Position sensor's Velocity and Acceleration.
6. Make an inclined plane by placing the top edge of one textbook on top of a second textbook.

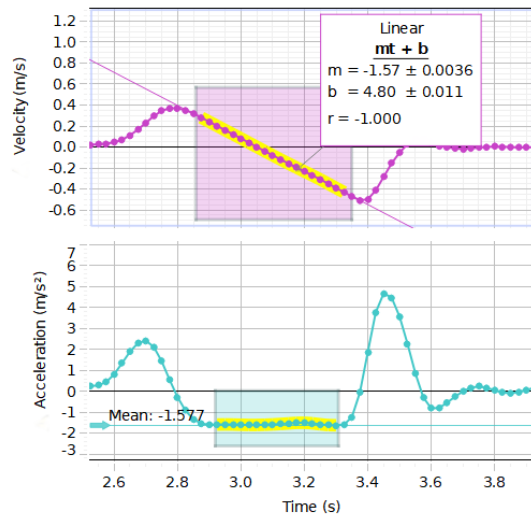


7. Put the Smart Cart at the bottom of the incline, with its force sensor end oriented up the incline.
8. Start recording and push the cart so it just barely reaches the top of the incline and then rolls back down. Stop recording when it gets back down.
9. Examine the graphs and determine where the cart is:
 - a. going up the incline.
 - b. going down the incline.
 - c. at the top of the incline.

For each of these cases, is the velocity positive, negative, zero, and/or constant? Is the acceleration positive, negative, zero, and/or constant?

10. When the cart is going up the incline, which direction is the velocity? Which direction is the acceleration? Is the cart accelerating or decelerating?
11. When the cart is at the top of the incline, the velocity is zero. Which direction is the acceleration? Is the cart accelerating or decelerating?
12. When the cart is going down the incline, which direction is the velocity? Which direction is the acceleration? Is the cart accelerating or decelerating?
13. On the Velocity vs. Time graph, find the slope of the straight-line portion. Compare this to the acceleration on the Acceleration vs. Time graph.

Sample Data



When the cart is going up the incline, the velocity is positive (up the incline) while the acceleration is constant and negative (down the incline). The cart is decelerating.

When the cart is at the top of the incline, the velocity is zero while the acceleration is constant and negative (down the incline). The cart is accelerating.

When the cart is going down the incline, the velocity is negative (down the incline) while the acceleration is constant and negative (down the incline).

The slope of the Velocity vs. Time graph is -1.57 m/s^2 . The average acceleration from the Acceleration vs. Time graph is -1.577 m/s^2 , which is 0.6% different from the slope.