About the Mathematics

These documents are based on the context of the rectilinear (straight line) motion of an object. One key distinction that is particularly difficult for students is to discern between position and distance traveled. These documents help to make that distinction.

The Velocity Position Distance documents allow the user to provide a velocity function to "drive" the rectilinear (straight line) horizontal motion of an object. The documents produce a corresponding position function by antidifferentiating the user-defined velocity function, using an initial position also set by the user. A "trail" of the path of the object is left so that users can distinguish between the current location of the object and the actual distance it has traveled. The derived position function drives the motion of the object as the user advances the value of time *t* via a slider.

Math Objectives

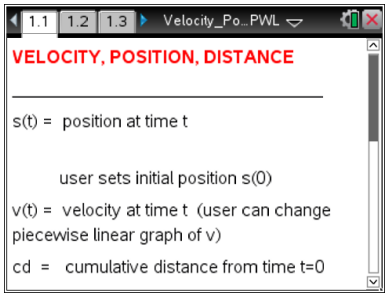
- Students will have an opportunity to work with linked graphical and physical (in the virtual environment of the .tns document) representations of the horizontal motion of an object.

TI-Nspire™ Navigator™ System

- Send the TI-Nspire documents.
- Monitor student progress using Class Capture.
- Use Live Presenter to spotlight student answers.

Activity Materials

Compatible TI Technologies: TI-Nspire™ CX Handhelds, TI-Nspire™ Apps for iPad®, TI-Nspire™ Software



Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is appropriate for use with any of the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions might be required if using other technologies beside the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials

Lesson Files:

TI-Nspire documents

- Velocity_Position_Distance_V.tns
- Velocity_Position_Distance_PWL.tns

Visit www.mathnspired.com for lesson updates.

Using the Documents

The two documents differ in how the user sets the velocity function.

In *Velocity_Position_Distance_V.tns,* the user defines the function v = vel(t). In *Velocity_Position_Distance_PWL.tns,* the velocity function is presented as a continuous piecewise linear graph that can be directly manipulated by moving the vertices that connect the linear pieces of the graph up or down by grabbing and dragging.

In both documents, Page 1.1 provides the title and setting. Page 1.2 is a Calculator page that allows the user to define the velocity function and initial position, and/or to reset the time to t = 0.

On Page 1.3, the velocity function is displayed in the graphing window on the right, with time, position, cumulative distance, and velocity at that time displayed. The user advances time through the use of the slider arrows at the top right.

On Page 1.4, the corresponding position function (determined by antidifferentiating the user-defined velocity function) is displayed.

On both Pages 1.3 and 1.4, a picture of the "trail" is left by the object about the graph of either position or velocity. The time point can be grabbed and dragged along the horizontal axis and a virtual depiction of the object's motion is enacted dynamically.

Possible Applications

Natural questions to ask with these documents concern physical interpretations of the graphical characteristics of the position and velocity functions, especially in terms of direction of movement, and distinctions between position and cumulative distance traveled. A common mistake is to think of the direction of the velocity graph as corresponding to the direction of the object's movement (as opposed to the *sign* of the velocity graph being the relevant characteristic).

The easily-manipulated velocity graph allows for questions that ask for graphs that "tell a story" about the object's movement.

NOTE: These documents are intended to run on the software versions of TI-Nspire. Their complexity is such that they run very slowly on the handheld TI-Nspire units.