TI-Nspire Activity: Investigating Slopes/Motion with Starburst

Activity Overview

In this activity, students investigate various slopes (steep, flat, constant) by plotting data points taken from an experiment. The experiment involves moving a student (the "dropper") along a line at a constant rate (or not) in which he/she drops Starburst at specific increments; in this case we will drop every second. Students then collect data on the distance from the starting point to each Starburst. Students complete a series of activities about this data. An additional activity involves students modeling various slope graphs using a meter stick and a (hot wheel) car.

This lesson is a good compliment to an introductory lesson on slope/slope-intercept form. Students also integrate physical science standards as they explore motion, speed, acceleration and velocity as represented graphically.

Concepts

Slope
Slope-Intercept Form of Linear Equation
Motion, Velocity, Acceleration, Speed (8^{th} grade Physical Science)

Materials

20 meter sticks
Starburst (divided by color)
Stop Watch (1/pair or 1/group)
Colored Pencils (for graphs)
Skateboard/Shopping Cart/Rolling Cart/Chair on Wheels
Hot Wheel Cars (1/pair or 1/group)
Slopes with Starburst SE tns file

Teacher Preparation

Load *Slopes with Starburst SE.tns* file onto all the student handhelds. The activity is designed to be completed as a class at times and as table groups at other times. Please follow the accompanying note pages to help guide instruction. There are "Fast Finishers" activities for those groups that finish ahead of others (or these can be used for homework).

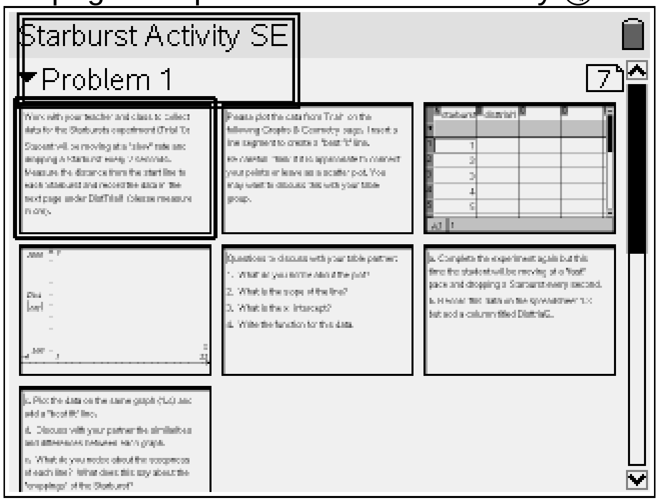
The Classroom

Activity Notes:
Guide the students in opening *Starburst Activity SE.tns* document.
Guide students through each step allowing for deeper exploration, as time allows. Most of the questions will be answers in pairs and/or table groups so be prepared to start and stop the tasks often.

Remind the students how to move between pages.

- To move between pages, press ctrl and ◂ or ▸ on the NavPad.

- To scroll ahead or back several pages in a document, press ctrl and ▲ to view the Page Sorter view of the document. Use the NavPad to move to the desired page and press the center click key to open the page.



Problem 1 Comments

Find a long span of space (hallway, gym, etc.) and lay out 20 meter sticks in a line. You may want to tape them down to keep them steady. You will need to create a way to count off in 1 second increments. I suggest having one student direct the class with a stop watch and have the entire class create a clapping rhythm each second. This clapping will help guide the “dropper” to know when to drop a Starburst. You may try to increase the dropping increment to every 2 seconds but this goes very slowly and makes for less data points.

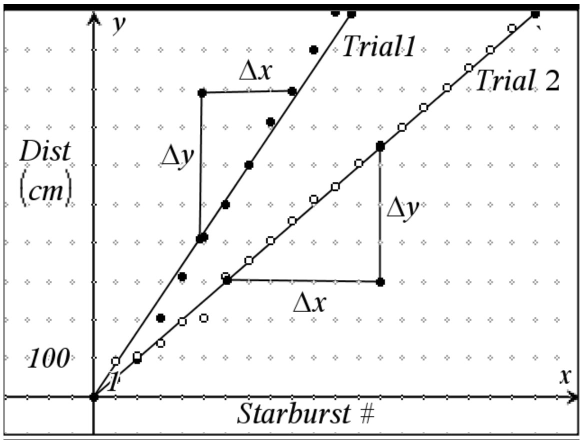
The student needs to move in a steady motion so I recommend using a shopping cart, delivery cart, chair on wheels, skateboard or another device that can be “pushed” to create a steady motion. I recommend that….TEACHER PUSHES THE DEVICE! An alternative is to have the “dropper” walk slowly, bend down and drop the Starburst from the lowest position possible. You want to minimize the drop distance to ensure that the Starburst does not deviate far from the actual vertical distance from the original dropping point.

The data will be inserted into the Lists and Spreadsheets Page 1.2. The program is not set up to automatically graph the data. You may want to edit this feature so that the data automatically graphs the data of Starburst # versus distance from start. This decision will be based upon your purpose and/or comfort level of your students with the technology.

Last, I suggest that you divide the Starburst up by color so you can use the same color for each trial. This eliminates the possibility that the Starburst are mixed up. I suggest that you do not pick up the Starburst until the entire experiment is complete. There are powerful conversations that can happen by discussing the relationship between the span in Starbursts on the ground and their representation in graphical form.
Take the time to discuss the meaning behind the graphs’ slopes and how the information in the graph can be discussed verbally. Students should be encouraged to share ideas and engage in meaningful conversations about extensions and/or what

would happen if you started out at a slow pace and increased the speed halfway through the experiment.

See figure below for an example of a graph using trial data.



You may want to add a third trial with the student changing the pace of movement during the experiment. This data would lead to a great discussion about constant slope and how a change in the “slant” means a change of slope which in turn, represents a change in acceleration.

Problem 2 Comments

Students will work in pairs/groups to model each graph of motion. Each team/pair will need a meter stick and a (hot wheel) car. Any device (coin, block, eraser, Starburst) can be used to mimic the movement but students seem to enjoy using something they can relate to and that better models the concept of speed, acceleration, etc. Lead each group to answer the questions and to record their responses on the included student page. I encourage you to take the time to facilitate the valuable discussions about speed, acceleration i.e. why a constant slope means zero acceleration even if the direction may change and why velocity can be visualized by any change in the graph line.

Problem 3 Comments

These extension ideas are good for “fast finishers.” Please use as you see necessary: extensions, homework, extra credit, etc. Please invite students to create their own ideas for extensions.