

Have You Lost Your Marbles?



Objective:

In this lesson you will construct a scatter plot and investigate slope as it pertains to a real-life application.

Group size:

Four people

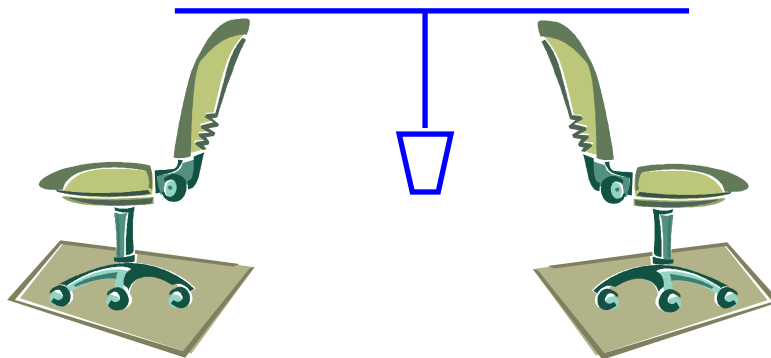
Materials:

Each group will need the following:

- One slinky
- One meter stick (a.k.a. the *bridge*)
- One Dixie Cup (a.k.a. the *bucket*)
- Two paper clips
- Approximately 10 marbles
- One measuring tape

Activity:

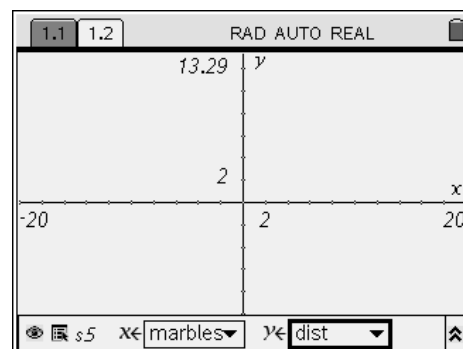
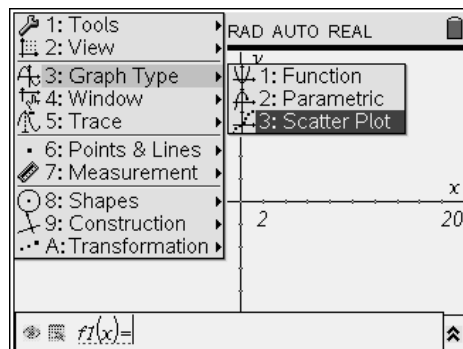
1. Set up your experiment by attaching the *bucket* to the slinky using paper clips. The slinky will be attached to a *bridge* between two chairs. Just slide the slinky onto the meter stick. It should resemble the following illustration:



- Using the Lists & Spreadsheet option on the Nspire, set up a spreadsheet where column A is the **trial** number, column B is the number of **marbles**, and column C is the **distance** to the Floor. Resize the columns so you can read the labels. Fill in the trials with 1 thru 10.

A trial	B marbles	C dist	D	E	F
1	0				
2					
3					
4					
5					

- Record the initial distance from the bottom of the *bucket* to the floor. This is the initial amount with no marbles.
- Add a marble to the bucket. Measure the distance the bottom of the bucket is from the ground. Record this amount in your spreadsheet, as well as the total number of marbles that are in the bucket.
- Repeat step 4 for approximately 10 trials. (Note: you are recording the **total** amount of marbles in the bucket each time.)
- Create a scatter plot of your data. The horizontal axis will be the number of marbles and the vertical axis will be the distance.



- Using menu, window, and window settings, adjust the window to display all of your points nicely. Describe the pattern that exists in your points.

8. Trace your graph and choose any two points on your graph:
 (_____, _____) and (_____, _____)

Find the rate of the change (aka slope) from the number of marbles to the distance of the cup from the ground. _____

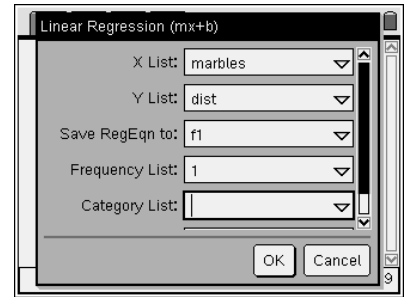
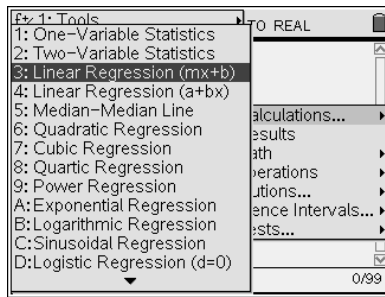
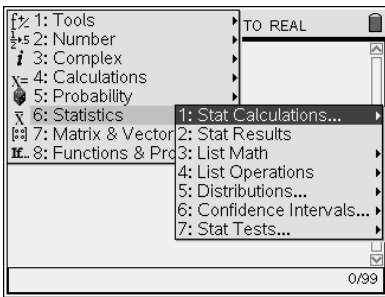
9. Repeat step 8 with two more points. Rate: _____ Are your values in steps 8 & 9 approximately the same? _____

10. Using the line tool, draw a line on your graph that best fits the points you plotted. Adjust the line until it makes the best fit. Using the measurement tool, find the slope of your line.

Slope: _____

How does this compare to the rates (slopes) in #'s 8 and 9? _____

11. Your calculator can find the slope of the best fit line for you! Insert a new calculator screen. Then, press the menu button and choose statistics, stat calculations, and linear regression. Fill in the screens as shown below:



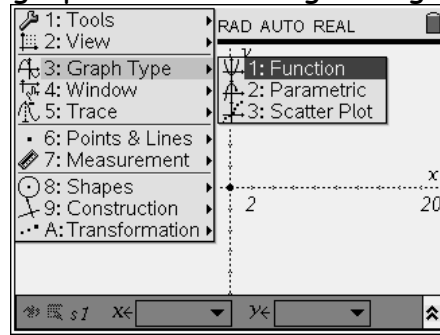
What is the slope of this line? _____

How does it compare to the other slopes? _____

Which slope do you think is the most accurate? _____

In terms of this problem, explain the meaning of the slope (in a complete sentence!). _____

12. Go back to your graph screen. Change the graph type to function.



You should now see your points, your line, and the line of best fit. How does the line you drew compare to the line that the calculator found? _____

For each of the following linear models, use a complete sentence to interpret the slope in the context of the problem:

1. The following linear model shows the number of vacation trips , y , (in millions) in the United States taken by U.S. residents between the years 1985 and 1995 ($t = 0$ represents 1985).

$$y = 26t + 532$$

2. The following linear model shows the total exports (in millions of dollars) for Puerto Rico during the years , t , 1970 through 1988 ($t=0$ represents 1970):

$$T = 688t + 370$$

3. The following linear model shows the number of , y (in 1000's), of cattle that grazed on national forest land during the years of 1970 to 1990:

$$y = 1600 - 11t$$
