Steppin' Out

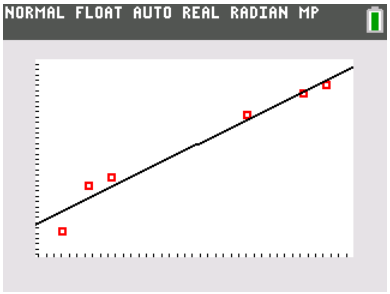
Student Activity

Name _____

Class _____

Introduction

Scientists are often called upon to help the police solve cases. By studying the behaviors and characteristics of a large group of people, scientists can determine averages for a population. These averages help police make educated guesses about criminals.



Objectives

In this activity, you will:

- graph data and determine a line that best fits your data
- identify the relationship between stride length and height

You'll Need

- TI-84 Plus CE, with the Science Tools App

Collecting the Data

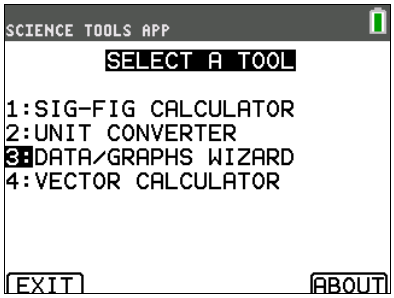
1. First, collect data on height and stride length. Set up two stations with two people at each, one person to collect data and one person to record data.

   a) At station 1, use the tape measure or meter stick to measure each person's height without shoes to the nearest half centimeter, and record it next to the person's name in the data table.

   b) At station 2, mark a starting line with chalk or tape. Have each person stand with the backs of his or her heels at the edge of the starting line. Starting at this point, each person should take 10 normal-length walking steps in a straight line. After the 10th step, the person should stop and bring his or her heels together. Mark the final position of the back of the person's heels, and measure the distance, in centimeters, between that mark and the edge of the starting line. Calculate the average stride length by dividing this distance by 10. Record each person's average stride length, in centimeters, next to the person's name in the data table.

2. Next use the **SciTools App** to determine the relationship between height and stride length. Turn the calculator on, and press [apps] to see the list of applications. Scroll down to select **SCI TOOLS**, and press [enter]. Press [enter] again to get to the **SciTools SELECT A TOOL** menu.

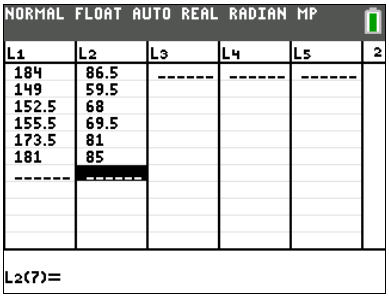
3. Choose option **3: DATA/GRAPHS WIZARD** by pressing [3].



4. Press y= to select **DATA**. This will open the **List Editor**. Three lists—**L1, L2**, and **L3**—will be displayed on your screen. Use the arrow keys to select list **L1**. If there are already data in **L1**, use the up arrow to highlight **L1**, and press clear, enter.

5. Enter the heights of the students in **L1**. To enter a height, type in the height and press enter. The cursor should move down to the next line, where you can enter the next height.

6. When you finish entering the heights, use the arrow keys to select list **L2**. If there are already data in **L2**, use the up arrow to highlight **L2** and press clear,enter . Enter the stride lengths in **L2**. Make sure that both measurements for a particular student are in the same row; **L1** and **L2** should contain the same number of entries. Do not enter the students' names in the data lists in your calculator.

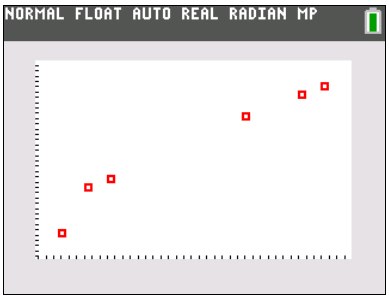


7. Next, plot your data on a graph to see what the relationship is between height and stride length. Press mode to return to the **DATA/GRAPHS WIZARD** menu. Press window to select **PLOT DATA**.

8. Press y= to select **SCATTERPLOT** (2VAR). This will tell the calculator to plot the data in a dot plot, or scatter plot. A screen will come up asking you to choose the list containing your independent variable data. **L1** is automatically highlighted. The independent (x-axis) variable is height. So select **L1**, the list containing height data, for the independent variable by pressing enter.

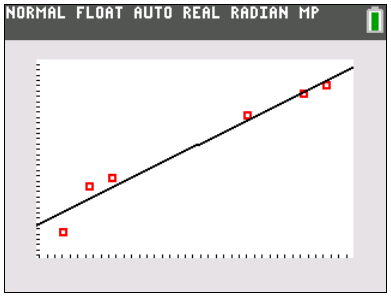
9. A screen will come up asking you to choose the dependent variable data. The dependent (y-axis) variable is stride length. Use the arrow keys to select **L2**, the list that contains stride length data, for the dependent variable. Then press enter.

10. A screen will come up that contains a scatter plot of the height and stride length data. Press trace to bring up a cursor on your screen. You can use the arrow keys to move the cursor between data points. The height and stride length for each data point are listed at the bottom of the screen (remember that height is x and stride length is y).



11. Your data should fall along a fairly straight line. The calculator can determine the equation for the straight line that best fits your data. Then, you can use the equation to determine the height or stride length of anyone, even if his or her measurements are different from the data you collected. To determine the equation, press 2nd, MODE. This will bring up the **CHOOSE A FIT METHOD** menu. Press ENTER to select **LIN REG**. This tells the calculator to determine a straight line that fits through your data.

12. The calculator should now show a line—the best-fit line—on your scatter plot. Notice that the line does not touch all of the data points. However, it does fall fairly close to most of them.



13. To find the equation for the best-fit line, press [Y=]. The equation for the line begins with **Y1**= on the screen. For example, in this screen, the equation for the line is approximately ***y*=0.71*x* – 44.05**. (If you have equations listed on any other lines, as in this screen, just ignore them. They are not important for these data.) Write the equation for your best-fit line in the master data table. Record only the first two decimal places for each number in the equation.

14. To exit the **Data/Graphs Wizard**, press [2nd], [mode] to return to the main menu, then [2nd], [mode] again to return to the **SELECT A TOOL** menu. Press [y=] to exit the **SciTools** App. You should create your own data tables for this experiment. Your master data table should contain each student's name, his or her height, and his or her stride length.

Data Analysis

Equation describing your data: _____

(**Hint:** Remember that, in the equation you wrote down, *x* is height and *y* is stride length, both in centimeters.)

1. Using the equation you calculated for the relationship between height and stride length, determine the approximate heights of people with the following stride lengths: a) 75.5 cm, b) 45.5 cm, and c) 50.0 cm.

2. Using the equation you calculated for the relationship between height and stride length, predict the stride length of someone new, based on his or her height. (For example, the person can be your teacher, your principal, or a student in a different class.) Then measure the person's actual stride length. How close was your prediction to the actual stride length?

3. Suppose you measure the stride length of a set of footprints, you predict that the person who made them is 175 cm tall, and you later find out that the person is actually only 152 cm tall. Give one possible reason that your prediction was incorrect.