Instruction

Prerequisite Skills

This lesson requires the use of the following skills:

- creating a scatter plot given data in a table (8.SP.1)
- understanding that the general shape of the graph of a linear function is a line (8.F.3)

Introduction

In previous lessons, we have plotted and analyzed data that appears to have a linear relationship. The data points in some data sets were very close to a linear model, while other data sets had points that were farther from the linear model. For variables that seem to have a linear relationship, the strength of that relationship can be analyzed using the correlation coefficient. A **correlation** is a relationship between two events, such as x and y, where a change in one event implies a change in another event. The **correlation coefficient**, r, is a quantity that allows us to determine how strong this relationship is between two events. It is a value that ranges from –1 to 1. A correlation coefficient close to –1 indicates a strong negative correlation, a correlation coefficient close to 1 indicates a strong positive correlation, and a correlation coefficient of 0 indicates a very weak or no linear correlation. A positive correlation indicates that as one variable increases, the other variable also increases. A negative correlation indicates that as one variable increases, the other variable decreases. You will use a calculator to calculate the correlation coefficient. Note that a correlation between two events does not imply that changing one event *causes* a change in the other event—only that a change might have taken place in the other event. This will be explored more later.

Key Concepts

- A correlation is a relationship between two events, where a change in one event implies a change in another event.
- Correlation doesn't mean that a change in the first event *caused* a change in the other event.
- The strength of a linear correlation can be measured using a correlation coefficient.
- Before determining the correlation coefficient, look at the scatter plot of the data and make an initial assessment of the strength of a linear relationship between the two events.
- Use the following steps to determine the correlation coefficient on a graphing calculator.

Instruction

On a TI-83/84:

Step 1: Set up the calculator to find correlations. Press [2ND], then [CATALOG] (the "0" key). Scroll down and select DiagnosticOn, then press [ENTER]. (This step only needs to be completed once. The calculator will stay in this mode until changed in this menu.)

Step 2: To calculate the correlation coefficient, first enter the data into a list. Press [2ND], then L1 (the "1" key). Scroll to enter data sets. Press [2ND], then L2 (the "2" key). Enter the second event in L2.

Step 3: Calculate the correlation coefficient. Press [STAT], then select CALC at the top of the screen. Scroll down to 8: LinReg(a+bx), and press [ENTER].

The *r* value (the correlation coefficient) is displayed along with the equation.

On a TI-Nspire:

Step 1: Go to the lists and spreadsheet page. The icon looks like a table.

Step 2: Enter the data into the first column underneath the shaded row, pressing [enter] after each data value.

Step 3: Use the nav pad to arrow up to the first row below the shaded row and then arrow over to the right so that you are in the second column. Enter the data values, pressing [enter] after each data value.

Step 4: Press the [menu] key.

Step 5: Arrow down to 4: Statistics, and press the center click key.

Step 6: Press the center click key again to select 1: Stat Calculations.

Step 7: Choose 3: Linear Regression (mx+b).

Step 8: At the XList field, press [clear] and then type in "a[]". To type "[]", press the [ctrl] key and then the [(] key.

Step 9: Press [tab] to go the YList field and type in "b[]".

Step 10: Press [tab] to go the Results field and check that results are listed in "c[]". If not, change them.

Step 11: Press [tab] to "OK" and press the center click key.

Step 12: Arrow down until you see the "r" and look to the right. The number to the right is the correlation coefficient, *r*.

Instruction

- A correlation coefficient close to –1 indicates a strong negative correlation.
- A correlation coefficient close to 1 indicates a strong positive correlation.
- A correlation coefficient of 0 indicates a very weak or no linear correlation.
- The correlation coefficient assesses the strength of a linear relationship between two variables.
- The correlation coefficient does not assess causation—that one event causes the other.

Common Errors/Misconceptions

- using the correlation coefficient to analyze data that is not linear
- incorrectly using the correlation coefficient to assess the strength of a relationship