

Using Functions in Models and Decision Making: Regression in Linear and Nonlinear Functions

V.A Student Activity Sheet 1: Analyzing Linear Regression Equations

One factor that talent scouts look for in potentially competitive swimmers is the ratio of their height to their arm span. For most people, arm span is generally equal to height. Consider U.S. Olympic swimmer Michael Phelps, who is 6 feet, 4 inches (193 centimeters) tall with an arm span of 6 feet, 7 inches (200 centimeters). In fact, the U.S. swim team found that its male swimmers have an average height of 187.1 centimeters and an average arm span of 192.9 centimeters. Of course, other factors influence the success of a swimmer, but coaches often look at a swimmer's physical attributes, including arm span, to determine which strokes he or she should focus on.

At a local competitive swim club, the coach measured the height and arm span of his top 10 swimmers. The data are shown in the table below.

Height (cm)	Arm Span (cm)
172	173
173	175
179	182
180	185
183	187
186	189
187	186
190	195
191	191
192	196

1. Enter the data given in the table into your graphing calculator and make a scatterplot. Sketch the graph below and describe it in words.
2. Use what you know about the situation and the data to find a function model for this data set. Explain your reasoning.

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- Use your graphing calculator to compute a regression analysis of the swimmers' arm spans in relation to their height. What does the information from the calculator tell you? How does the equation given by the calculator compare to the function you found in Question 2?
- Work in a group of four students. Each group member enters one of the data sets below into a graphing calculator, makes a scatterplot, and performs a linear regression analysis. Compare the graphs and the values of the correlation coefficients (r). Record an observation about how the value of r describes the strength and direction of the relationship between the variables.

x	y
-2	-4
-1	-2
0	0
1	2
2	4

x	y
-2	2
-1	-3
0	0
1	-2
2	5

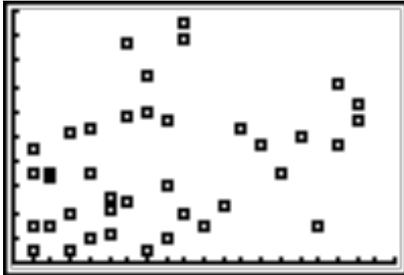
x	y
-2	9
0	0
1	7
5	-2
7	4

x	y
0	8
1	5
2	4
3	1
4	0

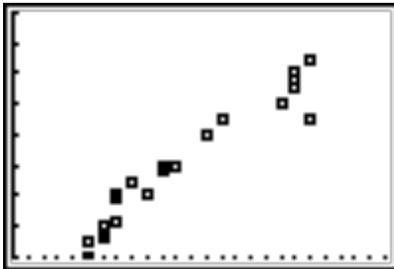
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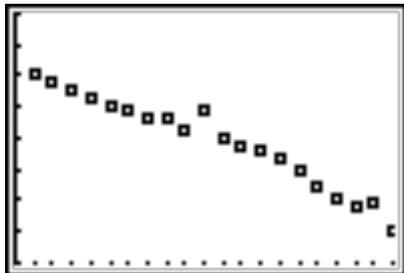
5. Consider each scatterplot below. Draw a line to match each r -value to a scatterplot.



$$r = 0.972$$



$$r = 0.333$$



$$r = -0.976$$

6. **REFLECTION:** Does a strong correlation indicate a cause-and-effect relationship between variables? Give examples to justify your response.
7. **EXTENSION:** Think of a situation that might have a linear relationship. Research the situation to find data relating the variables and perform a linear regression analysis on the data. Make sure your data set is of ample size. Use the regression analysis to determine a model and describe the strength of the model.