

Least Squares Regression

ID: 9825

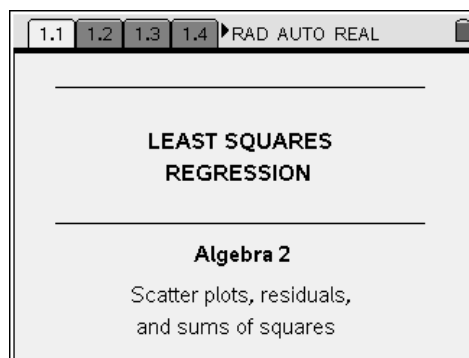
Name _____

Class _____

In this activity, you will explore:

- *scatter plots*
- *residuals (differences between actual and predicted values)*
- *the sum of the squares of the residuals*

Open the file *Alg2Act08_LeastSquares_EN.tns* on your handheld and follow along with your teacher to work through the activity. Use this document as a reference and to record your answers.

**Problem 1 – A more scattered scatter plot**

On page 1.3, adjust the line to better fit the data.

- What is the equation of your line?

Move to page 1.4 and change the existing equation to the equation you found above. Then find the lengths of the *residuals*, the vertical distances from the point to the line, and then find the sum of the squares of the residuals.

- What is the sum?

Adjust the line to make the lowest possible sum you can.

- What is this sum? What is the equation that gives this sum?

Advance to page 1.7 and perform a **Linear Regression ($mx+b$)**.

- What is the value of m in the regression equation? The value of b ?
- Write the regression equation here.
- What is the value of the correlation coefficient, r ?

Return to page 1.4 and edit the equation to the regression equation (round decimals to at least three places).

- What is the sum of the squares now?

Problem 2 – A less scattered scatter plot

On page 2.2, adjust the line to where you think the least squares line would be.

- What is the equation of your line?

Find the lengths of the residuals and the sum of the squares of the residuals.

- What is the sum?

Adjust the line to make the lowest possible sum you can.

- What is this sum? What is the equation that gives this sum?

Advance to page 2.4 and perform a **Linear Regression (mx+b)**.

- What is the value of m in the regression equation? The value of b ?
- Write the regression equation here.
- What is the value of the correlation coefficient, r ?

Return to back to page 2.2 and edit the equation to the regression equation (round decimals to at least three places).

- What is the sum of the squares now?

Look back at the value of r and the sum of the squares for each of the least squares regression lines in Problems 1 and 2.

- Make a conjecture about a possible relationship between the correlation coefficient r and the sum of the squares.

Extension

On page 3.2, enter the equation of the least squares regression line found in Problem 2. Then, find the sum of the *absolute values* of the residuals (this will be the same as adding the lengths of the segments representing the residuals). Adjust the line to minimize the sum as much as possible.

- Write the equation that minimizes the sum here.

Move to page 3.4, and again enter the equation of the least squares regression line. Then, find the sum of the *shortest distances* between the actual and predicted data points. Adjust the line to minimize the sum as much as possible.

- Write the equation that minimizes the sum here.