The Line of Best Fit

Use the site's regression tool or a graphing calculator for the fits. Then read the slope and y-intercept in the story, predict, and judge the prediction.

Name _____ Date _____

Words we use

say the math word, then the plain English

WORD	PLAIN ENGLISH	WHAT YOU DO
Line of best fit	The line that comes closest to all the points. Also called the least squares regression line.	Let technology find it; you read it.
Least squares	Making the total of the squared misses as small as possible.	Squaring keeps positive and negative misses from canceling.
Regression	Finding the best-fitting line or curve for data.	Choose the family first, then fit.
Predicted value	What the model says y should be for a given x.	Put x into the model. Say about.
Interpolate	Predict inside the data.	Fairly safe.
Extrapolate	Predict outside the data.	Riskier the farther you go. Ask if it makes sense.

Part A The lab rat

W = 100 + 40t gives a rat's weight in grams after t weeks. It was weighed in weeks 0 to 8.

1. What does the 40 mean? What does the 100 mean?

2. Predict the weight at 10 weeks.

3. When does the rat reach 760 grams? Show the Unit 1 moves.

4. What does the model predict for a 5-year-old rat (260 weeks)? Is that reasonable?

Part B Fit a line: used cars

Enter this data in the site's regression tool or a graphing calculator. x is miles in thousands; y is the price in thousands of dollars.

x	12	25	33	41	52	60	74	85	96	110
y	21.5	19.8	18.9	17.0	16.4	14.1	13.2	10.9	10.4	7.6

1. Write the line of best fit (round m to two decimals and b to one). What is r?

2. What does the slope mean in the story? The y-intercept?

3. Predict the price of a car with 70 thousand miles.

4. About how many miles would a $12 thousand car have?

Part C Inside or outside?

PREDICTION	INTERPOLATION OR EXTRAPOLATION	DOES IT MAKE SENSE?
The rat at week 4.5		
The rat at week 20		
A car with 70 thousand miles		
A car with 170 thousand miles		

Part D In your own words

1. What makes the least squares line the best line? Why square the distances?

Part E Exit ticket

1. H = 5 + 2w gives a plant's height in cm after w weeks. What do the 2 and the 5 mean?

2. Predict the height at week 6. When is it 25 cm?

Answer key

Part A. 1. It gains about 40 grams a week; it weighed about 100 grams at birth. 2. 500 grams. 3. 100 + 40t = 760; 40t = 660; t = 16.5 weeks. 4. 10,500 grams (10.5 kg): not reasonable, far outside the data.

Part B. 1. y = –0.14x + 23.2; r is about –0.995. 2. The price drops about $140 for each thousand miles; a car with 0 miles would cost about $23,200. 3. About 13.4, so about $13,400. 4. About 80 thousand miles.

Part C. Interpolation, yes. Extrapolation, doubtful (900 grams). Interpolation, yes. Extrapolation, no: the model gives a price below $0.

Part D. It makes the total of the squared distances from the points to the line as small as possible. Squaring keeps misses above and below from canceling.

Part E. 1. It grows about 2 cm a week; it was about 5 cm at week 0. 2. 17 cm; 5 + 2w = 25 gives w = 10.