Chapter 3 - Example #1 -"Does Fidgeting keep your slim?"

Name: _____ Date: _____

INSTRUCTIONS: Problem description and data on page 164. Work through these questions. Check your answers in the textbook and/or on my Web Site.

1) Define the Explanatory and Response Variables

EXPLANATORY (x) – NON-EXERCISE ACTIVITY (NEA in calories)

RESPONSE (Y) – FAT GAIN (KG)

Which variable will you be predicting? $\hat{y}$ is FAT GAIN.

2) **Investigate:**

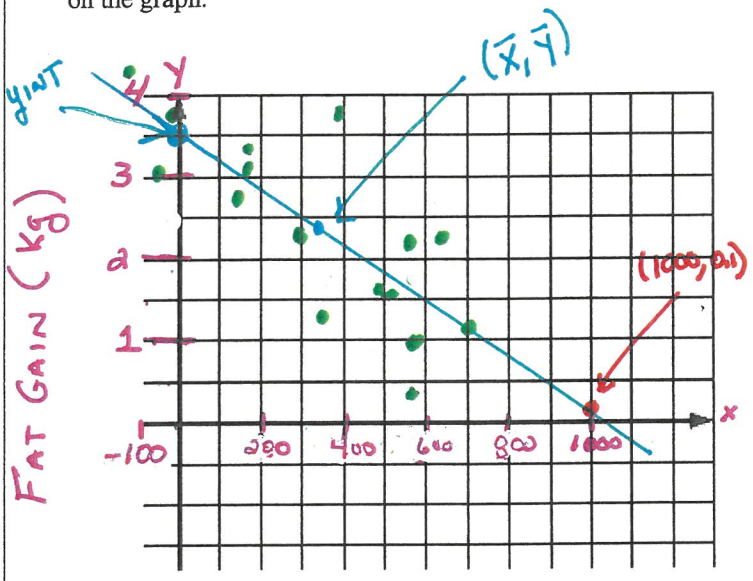
- **Enter L1 - Non-exercise activity**
- **Enter L2 - Fat Gained**

What are the mean and standard deviation for each variable using correct notation?

NEA: $\bar{x} = 324.75$ cal. $S_x = 257.66$ CAL.

Fat: $\bar{y} = 2.39$ kg $S_y = 1.14$ kg

a) Sketch a scatterplot. Tip: make sure the y-intercept can be fit on the graph.



b) Find the Correlation Coefficient (r). Does it support what you see in the scatter plot?

r = -0.7786 YES, because the graph appears linear with a negative slope and data points pretty close together.

c) Describe the association in context (direction, form, and strength)?

THERE IS A NEGATIVE, LINEAR, MODERATELY STRONG ASSOCIATION BETWEEN NON-EXERCISE ACTIVITY AND FAT GAIN

3) **Develop Model:**

a. Provide the linear regression equation in context:

$\widehat{FATGAIN} = 3.505 - 0.00344\,(NEA)$

b. **Sketch the regression line on your scatter plot with 3 points. Label the y-intercept, ($\bar{x}$, $\bar{y}$) , and a 3rd point.**

(0, 3.5) (325, 2.4) (1,000, 0.1) USED TRACE

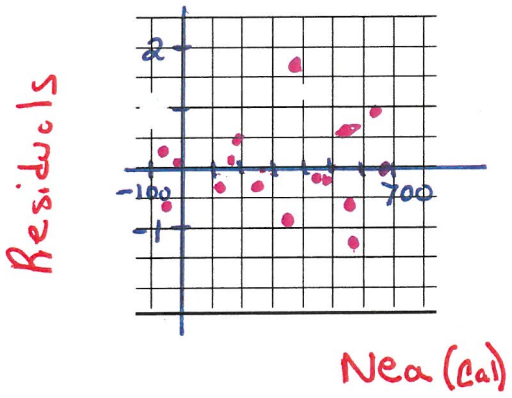
c. Describe the slope of the line in context. $b = -0.00344$

THE SLOPE TELLS US THAT THE PREDICTED FAT GAIN GOES DOWN BY ABOUT 0.003 KG FOR EACH ADDITIONAL NEA caloric ADDED

d. Describe the y-intercept in context $a = 3.505$

The model estimates the fat gain is about 3.5kg IF THE NEA DOES NOT CHANGE WHEN A PERSON OVEREATS (IE. NEA = ∅)

e) Plot the residuals



f) One subject's NEA rose by 135 calories and gained 2.7 KG of fat.
Find the predicted fat gain: $x = 135$ $y = 2.7$

$\widehat{FATGAIN} = 3.505 - 0.00344(135) = 3.041$ kg

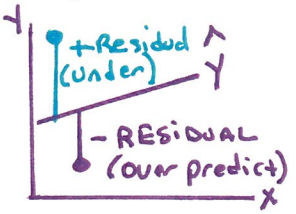
Find its residual:

$residual = y - \hat{y} = 2.7 - 3.04$

$residual = -0.34$ KG

Did the model over predict or under predict? OVERPREDICT

Explain the residual in context.



THE RESIDUAL WHEN THE ACTUAL NEA IS 2.7 CAL. IS -0.34KG. THE LSRL has overpredicted FAT GAIN BY 0.34 KG.

g. You assess the appropriateness of a linear model by reviewing the scatter and residual plot. Review these plots and describe if a linear model is appropriate and why.

1) Scatterplot... By reviewing the scatterplot we can visually see a moderately strong, negative, linear association between FAT GAIN and NEA.

2) Residual Plot... By reviewing the residual plot, we can see there is NO pattern in the residuals indicating a linear model is appropriate in this case.

h. You use r^2 to measure the strength of the model. What is r^2 and describe in context.

$r^2 = .606$ r^2 measures the strength of the model to predict. About 61% of the variation in predicting FAT GAIN can be explained by this model using NEA.

i. When would it be inappropriate to predict with LSRL? What is this called?

THE LSRL Model can only make predictions within the range of data values collected. MAKING PREDICTIONS OUTSIDE OF THE COLLECTED DATA IS CALLED "EXTRAPOLATION."