Lab 8 – number crunch

The table below describes a bivariate data set of size n = 8. Enter the data into R and look at the scatterplot. Do you think the correlation between **x** and **y** will be positive, negative, or close to zero?

Fill in the following table. Do not find the values by hand or with your calculator. R can do the computations for you very quickly. (The point of this course is to learn how to use R and SAS!) Include totals in the last row of the table.

x	y	x^2	y^2	xy
4	18			
8	16			
20	12			
24	6			
28	14			
32	4			
32	6			
36	4			

Now use the entries in the table to find the following values:

$$Sxx = \sum x^2 - \frac{(\sum x)^2}{n} =$$

$$Syy = \sum y^2 - \frac{(\sum y)^2}{n} =$$

$$Sxy = \sum xy - \frac{(\sum x)(\sum y)}{n} =$$

$$r = \frac{Sxy}{\sqrt{Sxx}\sqrt{Syy}} =$$

$$\hat{\beta}_1 = \frac{Sxy}{Sxx} =$$

$$\hat{\beta}_0 = \overline{Y} - \hat{\beta}_1 \overline{X} =$$

Find the equation of the least-squares regression line:

$$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X$$

Use R and the equation of the least-squares regression line to find $\hat{y}$'s and fill in the following table In the last row of the table find the sum of the errors and the sum of the squared errors. Round the $\hat{y}$'s and errors to the second decimal place and the squared errors to the fourth decimal place.

x	y	$\hat{y}$	$y - \hat{y}$ = error	$e^2 = (y - \hat{y})^2$
4	18			
8	16			
20	12			
24	6			
28	14			
32	4			
32	6			
36	4			

If your answers are correct so far, the sum of the errors should equal _____. (Although due to round off error, your total may only be close to this value.)

Find the following values:

$$SST = Syy =$$

$$SSR = \hat{\beta}_1(Sxy) =$$

$$SSE = SST - SSR =$$

$$r^2 = \frac{SSR}{SST} =$$

$$T = \frac{\hat{\beta}_1 - 0}{\sqrt{\frac{SSE}{(n-2)Sxx}}} =$$

Now write a SAS program that confirms all of your previous answers and reports the results of the following hypothesis test for the true slope.

$$H_0: \beta_1 = 0$$
$$H_a: \beta_1 \neq 0$$

If $\alpha = .05$, draw a picture of the rejection region on the appropriate curve. Identify the critical values.

What is the conclusion of the hypothesis test?

Draw a picture on the appropriate curve and place bounds on the p-value:

According to SAS, what is the exact p-value of this test?

After you have completed this handout, complete the Canvas quiz titled: <u>Lab 08 – number crunch</u>