

Ecologists sometimes find rather strange relationships in our environment. One study seems to indicate a relationship between beavers and beetles. The researchers laid out 23 circular plots, each 4 meters in diameter, in an area where beavers were cutting down cottonwood trees. In each plot, they counted the number of stumps from trees cut by beavers and the number of clusters of beetle larvae. Some ecologists speculate that new sprouts from stumps are more tender than older cottonwood growth, and beetles prefer new sprouts. The resulting data are given below, and the Minitab file is on the course website.

Stumps x	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	4	4	4	5
Larvae y	6	8	9	11	12	14	16	18	10	13	14	21	25	27	30	24	36	30	43	40	50	54	56	

1. (4pt) Calculate $\sum x$, $\sum y$, $\sum xy$, $\sum x^2$, $\sum y^2$, \bar{x} , \bar{y} , s_x , and s_y .
2. (2pt) Using the formulas in the notes, calculate the slope b_1 , intercept b_0 , and correlation coefficient r .
3. (2pt) Make a scatterplot with the regression line superimposed.
4. (1pt) What is the equation of the least-squares regression line and what percentage of the variability in the number of larvae clusters is explained by this regression?
5. (1pt) Based on the regression equation, how many larvae clusters are predicted for 3 stumps? For 5 stumps?
6. (1pt) Based on the regression equation, what are the residual values associated with 3 stumps? With 5 stumps?
7. (1pt) What appears to happen to the number of larvae clusters as the number of stumps increases? Is this consistent with the ecologists opinion given above? Why or why not?