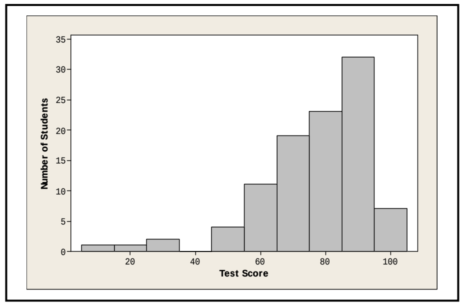
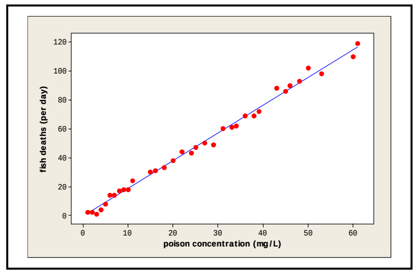
Appendix I: Statistics Survey

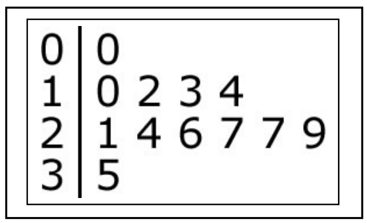
1. This graph is an example of a:
    - A. bar chart
    - B. box plot
    - C. scatterplot
    - D. histogram
    - E. pie chart



2. This graph is an example of:
    - A. stem and leaf plot
    - B. scatterplot
    - C. box plot
    - D. histogram
    - E. bar graph



3. This graph is an example of a:
    - A. bar graph
    - B. time plot
    - C. scatterplot
    - D. box plot
    - E. stem and leaf plot



4. You need to graphically show the distribution of quartiles in a data set. The best graph to use is a:
    - A. box plot
    - B. scatterplot
    - C. time plot
    - D. pie chart
    - E. bar graph

5. You're a marine biologist studying starfish on the Great Barrier Reef, where you have measured the diameter of 542 starfish. You'd like to see the distribution of sizes for the starfish on the reef. You should plot your data on a:
    - A. pie chart
    - B. histogram
    - C. bar chart
    - D. scatterplot
    - E. time plot

6. You have two quantitative variables and want to see if there is a negative association between the two. The best thing to do is to graph the data on a:
    - A. stem and leaf plot
    - B. scatterplot
    - C. histogram
    - D. box plot
    - E. bar chart

7. A biologist is studying two populations of *Geospiza fortis* (finch) in the Galápagos islands. One population on the north side of one of the islands eats large seeds. A second population that is isolated on the south side eats smaller seeds. Her hypothesis is that the mean beak sizes of the two populations are significantly different, and the south-side population constitutes a new finch species. Here is her data set:

Table 1: Analysis of beak size of two populations of *Geospiza fortis*

Finch population	**Beak size, cm (# samples)***
North side	1.12 ±0.06 (34)
South side	1.05 ± 0.02 (41)

* *p-value for mean difference: p=0.06*

If you were a scientist reviewing her data, would you say her data provides convincing evidence that the two populations have significantly different beak sizes?

A. Yes
B. No

Explain how you decided on your answer above.

8. A researcher interested in the lobster fishery analyzed a population of lobsters living in shallow waters off a cove in Maine. He measured the length of all the lobsters in the population. The data is shown below.

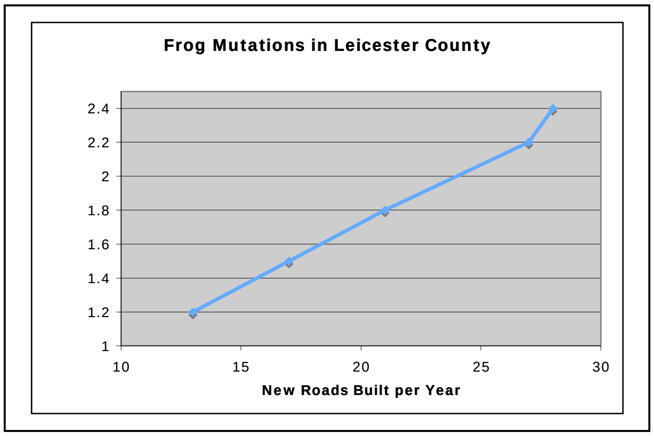
Table 1: Lengths of Maine Lobsters (cm); (*N* = 2,581)

Min	**Quartile 1**	**Q2 (Med)**	**Quartile 3**	**Max**
11.4	23.4	41.1	56.8	71.5

What is true of a lobster that is 56.9 cm in length?

A. About 75% of the lobsters are smaller than that lobster
B. About half the lobsters in the area are bigger, and about half are smaller that that lobster.
C. It is bigger than about 25% of the lobsters in that area.
D. It’s bigger than all but one of the lobsters in that area.

9. Michelle is interested in doing research on amphibians. She's read that in many places, frogs are seen with a lot of birth defects (missing arms, legs, dying very young *etc.*). This is causing a large decline in frog populations around the globe. Pollution is suspected of causing these mutations. Michelle is not so sure, and thinks it might be due to the increase in human population instead, since that could be ruining frog habitats. Working with a biology professor at the local college, she learns that the number of mutations observed in frogs in her home county has increased each of the last five years. Next, she goes to the county survey office to determine how many new roads have been built each year in the county for the last five years. This is the graph of her data:



After graphing her results, she concludes that human populations do indeed have an effect of frog mutations. What is the best analysis of this argument?

A. Michelle has proven an important connection between human population growth and frog death.
B. Michelle's work proves nothing. It's only one graph. She should repeat her analysis in another county just to be sure.
C. Michelle's research is interesting, but she may be confusing causation with correlation.
D. Michelle's data looks good, but she can't prove the connection without doing more statistical analysis of her graph.

10. What is the best way to provide strong evidence that there is a causative relationship between two variables?

A. Graph it on a scatterplot and find the R-squared value. If the R-squared value is close to 1.0, it proves the correlation.
B. Graph it on a histogram and look for the mean of the data.
C. Use a bar graph to compare the means of the two variables. If they are close together, then they are related.
D. Set up a number of experiments to ensure that the explanatory variable is truly the cause of the response variable.

11. You are reading a scientific paper. In one of the data analyses, the paper's authors report that $p = 0.1$. What does this p-value indicate?

A. The data fits the least-squares regression line on a scatterplot very poorly.
B. the null hypothesis must be rejected if $\alpha = 0.05$.
C. Assuming that the null hypothesis is true, there is only a 10% probability of getting the observed result due to random chance.
D. The data is very poor. Only 10% is worth keeping.
E. The data is statistically significant to the 10% confidence level.

REVISED 11. You are reading a scientific paper. In one of the data analyses, the paper's authors report a test statistic (value ± error) with $p = 0.1$. What does this p-value indicate?

F. The data fit the least-squares regression line on a scatterplot very poorly.
G. The null hypothesis must be rejected if $\alpha = 0.05$.
H. Assuming that the null hypothesis is true, there is only a 10% chance that the true value is not within the range of values found by the study.
I. We cannot make any conclusions about the data because the data is very poor. Only 10% is worth keeping.
J. We can have a very high level of confidence in the data. The data is statistically significant to the 100 % confidence level.