PRACTICE MIDTERM ONE
Introduction to Evolution and Scientific Inquiry
Instructor: Dr. Spielman

NOTE: On a real exam you can expect 1-2 additional questions.

Question 1

For each of the following alternative hypothesis, do the following:

- State whether the hypothesis is directional or nondirectional.
- In a single complete sentence, write the appropriate corresponding null hypothesis.
- State if the hypothesis is scientific, i.e. testable and falsifiable. You need to only write yes/no for "scientific," not testable/falsifiable each.

a. Hawks prefer to eat rabbits over mice.

b. The Great Sphinx of Giza was built by ancient aliens who visited Earth.

c. The amount of nitrogen in the soil affects the growth rate of oak trees.

d. Diets high in sugary foods increase the risk for adult onset diabetes.

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Question 2

Consider the following scenario: Researchers tested whether eating different types of protein has an effect on chicken weight. They collected 578 baby chicks and randomly placed them into four groups receiving different feeds: one group received the standard chicken feed, and groups 2-4 each received their feed supplemented with a different protein source ("Protein1", "Protein2", or "Protein3"). Researchers measured the weight of chickens in grams after two weeks of feeding on different diets.

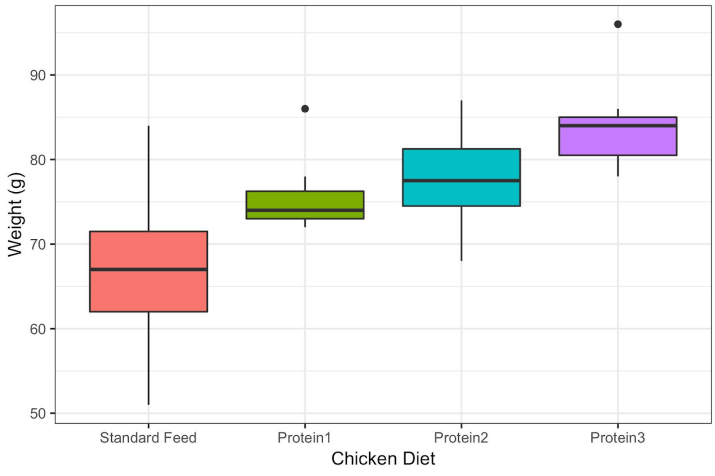
a. What is the alternative hypothesis for this experiment?

b. What is the null hypothesis for this experiment?

c. What is the independent variable for this experiment? Is this variable categorical or quantitative? If quantitative, is it discrete or continuous?

d. What is the dependent variable for this experiment? Is this variable categorical or quantitative? If quantitative, is it discrete or continuous?

e. The researchers obtained the results shown in the figure to the right. Do the results produced by this study support or fail to support the alternative hypothesis? *Explain your answer in 2-4 sentences total. (8 points)*



f. State which feed group (Standard Feed, Protein1, Protein2, Protein3) has the...

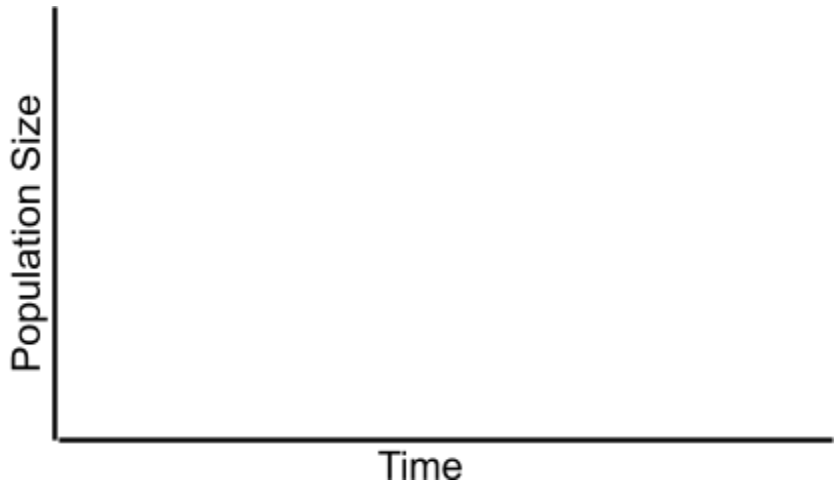
- Largest mean? _____
- Smallest mean? _____
- Largest standard deviation? _____
- Smallest standard deviation?_____

(For the purposes of THIS QUESTION, just answer about standard deviation, not COV).

g. Assume that there are the same number of chickens in each experimental group. Based on this information and the results figure, which group is likely to have the larger standard error: "Standard Feed" or "Protein1"?

Question 3
Provide a *precisely-worded* definition of biological evolution as a single complete sentence.

Question 4
Draw a graph for how a resource-limited population is expected to grow over time, with the axes as given below (directly draw in this space). Additionally state the name for this type of population growth in the space provided.



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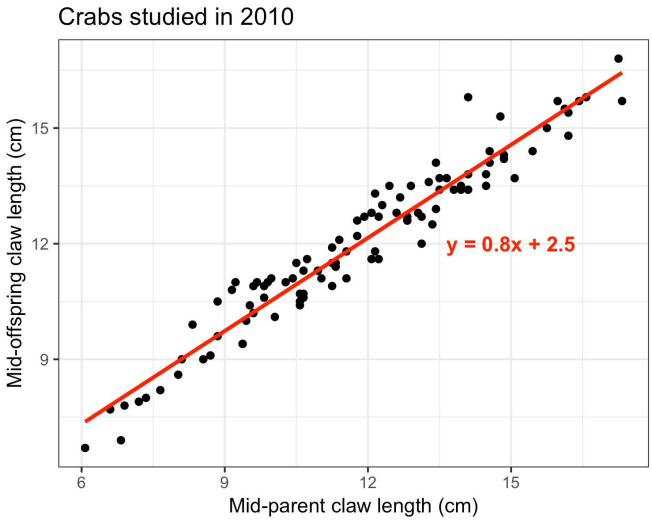
Question 6
Researchers studied a population of crabs in Florida in 2010 in order to determine whether claw length was evolving in the population.

a. In 2010, researchers obtained the results show in the figure to the right for claw length measurements among 100 parent-offspring groups.
Based on these results, do you conclude that claw length is a heritable trait? Your answer must indicate which specific quantity you used to assess heritability. If claw lengths is heritable, indicate if it is high or low. Explain your entire answer in 1-2 sentences. *(8 points)*



b. Interpret the correlation in the figure for part (a) by filling in the blank: *(2 points each)*

- Is the correlation positive or negative? _____
- Is the correlation strong, moderate, or weak? _____

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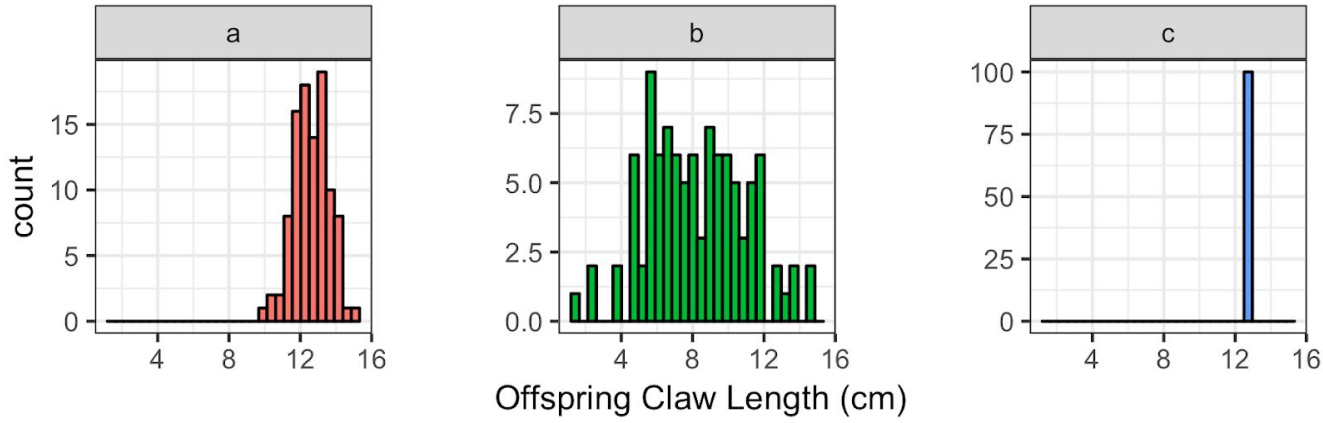
c. Imagine crab parents with an average claw length of 12.5 cm have 100 offspring. Given your answer to part (a), circle which distribution below (a, b, or c) is most likely to represent offspring claw lengths.



d. In the axes below, draw **points and a trendline** for hypothetical midparent-midoffspring that would give the opposite conclusion about heritability to your answer for part (a). Do not worry about specific numbers or axis tick marks - just draw plot points and a line!