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### Week 10 Reading Questions

**Q1 (1 pt.): Why would we want a model selection criterion to penalize the number of parameters in a model?**

The number of parameters you put into a model can influence the overall accuracy. If you include too many parameters, then you have increased variance, as well as in error. Making the most simplistic model ensures the most accurate statistical outcome.

**Q2 (3 pts.): In 2 - 3 short paragraphs, describe the meaning of the slope parameter  $\beta_1$  in the context of the relationship between the predictor variable,  $x$ , and the response variable  $y$ .**

**Your answer must be in plain non-technical language. Your explanation will be most effective if you use a narrative approach, using a concrete example to illustrate the concept.**

“For each 1-unit change in  $x$ , we expect a  $\beta_1$  change in the value of  $y$ .” – Deck 7

Consider that you want to know how different amounts of water influence the overall biomass of certain plants (i.e. if plants grow more with different amounts of water). In this case, you would have a regression that examines three different water treatments, low, medium, and high amounts of water, and then you would measure the mass for each plant over time.

In this case,  $x$  would be your water treatment, and  $y$  would be the mass of the plants. The parameter  $\beta_1$  is a coefficient that creates change between how much water you gave the plants and the mass of the plants. So, for every increase (or decrease) in the amount of water you give the plant, you have a constant change in the mass of the plant (again, either increased or decreased). You could then compare your low, medium, and high water treatments and see if there are any significant changes in mass between each of the treatments.

**Q3 (1 pt.): Based on the model table, what is the *base case* water treatment?**

The low water treatment is the base case water treatment here.

**Q4 (2 pts.): What is the average plant mass, in grams, for the low water treatment? How did you calculate this quantity?**

The average plant mass for the low water treatment is 2.4 grams. This is simply the estimate for the intercept of the base value (low water treatment).

**Q5 (2 pts.): What is the average plant mass, in grams, for the medium water treatment? How did you calculate this quantity?**

The medium water treatment is the intercept value plus the intercept of the medium water treatment.

$$2.4 \text{ g} + 1.3 \text{ g} = 3.7 \text{ g}$$

**Q6 (1 pt.): Which of the following questions cannot be addressed with the model coefficient table?**  
**Select the correct answer or answers:**

- A. Is there a positive relationship between increased water availability and plant biomass accumulation?
- B. Is water availability a significant predictor for plant biomass accumulation?
- C. What is the average biomass of plants in the high water treatment?