

1920S MA482

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Criteria for Successfully Completing a Concept Check

Concept Check questions assess your ability to explain key modeling techniques discussed in the course.

Note: you may collaborate with another individual. See the [Guidelines for Appropriate Collaboration](#) to prevent committing academic misconduct. You are responsible for all answers submitted; the instructor reserves the right to require an oral examination over the answers submitted to ensure the work is that of the student.

Criteria:

Successful completion of a Concept Check requires submission of a response which is characterized by the following:

- Submitted by the due date.
- At least 50 words in length.
- Demonstrates thought was given to the question posed.
- Clearly articulated, meaning a statistician would be able to follow your arguments.
- Demonstrates a firm grasp on the course material and concepts being addressed.

Note: an unsuccessful attempt which is submitted by the due date and represents a "good-faith effort" can be revised and resubmitted. Refer to the [Course Syllabus](#) for the maximum number of resubmissions permitted in the course.

Example:

Consider the following hypothetical scenario question:

- Your company is manufacturing a new device to improve eyesight in those who suffer from night blindness. Your group conducted a randomized controlled study to compare your device against the leading competitor. Lucy, a member of your design team, has been placed in charge of presenting the results of the statistical analysis for the client. The data revealed that participants assigned to your design scored an 85, on average, on a visual test. The participants assigned to the competitor's product scored an 87, on average. The statistical analysis plan called for a two-sample t-test to be used to compare the two designs. As part of her presentation, she has a line on one slide which states "our results prove that our product does just as well as ($p = 0.538$) the leading competitor's." She has asked you to review her slides prior to the presentation; what critique (positive or negative) do you offer? Explain.

Now, consider the following two responses:

1. Lucy, your conclusion is too strong. This error is due to a misinterpretation of a p-value. At a minimum, we should reword your statement to say "we have no evidence ($p = 0.538$) that there is a difference in the average visual score for patient's using our device and those on the competitor's." The statistical analysis conducted (the two-sample t-test) quantifies the evidence of a difference in the two products. The large p-value, therefore, suggests that there is no evidence of a difference in the average response for our design and our competitor's. However, this lack of an effect is not the same as evidence for no effect. The large p-value could simply be due to our study having been underpowered to find an effect that is relevant. Instead of a p-value in this situation, I would recommend reporting a 95% confidence interval for the difference in the average score. From the data, it appears that our design tends to result in lower scores (though not statistically significant). It would be of interest to estimate all differences which are consistent with this data.
2. The difference of 85 and 87 is not that large; so, since the p-value is large, this is a reasonable conclusion. Instead of a two-sample t-test, we should have used a regression model because those are supposed to be better.

For the above question, answer (1) is correct, meets the required length, and clearly articulates the rationale behind the response. It would receive full credit. Answer (2) would not receive credit as it does not meet the minimum length requirement. In addition, Answer (2) fails to address the concepts being discussed in the scenario and incorrectly references material discussed in the course. Linear regression models are not always better; they can prove more powerful in some situations, and these were not discussed in the response. The raw distance between 85 and 87 may not be large; this distance should be judged as large or small from the client's perspective (subject-matter expertise). The statistical significance of this difference is summarized by the p-value. This response fails to meet several of the criteria and would therefore not receive credit.

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