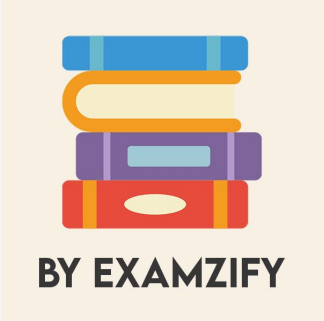
University of Central Florida (UCF) PSY3204C Statistical Methods in Psychology Practice Quiz 3 (Sample)

Study Guide



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Questions

1. What does each F score in a two-way ANOVA primarily represent?

   A. Main effects only

   B. Interaction effects only

   C. The spread of group means

   D. Variability within groups

2. In a study with a 2 x 6 x 9 design, how many independent variables are being examined?

   A. 2

   B. 3

   C. 6

   D. 9

3. When should post hoc tests be used in data analysis?

   A. Only when the sample size is very large

   B. After an ANOVA indicates significant differences among group means

   C. Before conducting any hypothesis tests

   D. After a simple linear regression analysis is completed

4. What is a main effect in the context of factorial design?

   A. The overall average of all participants

   B. The difference between groups based on one independent variable

   C. The combined effect of multiple independent variables

   D. An insignificant result among grouped variables

5. In a paired sample t-test, what are being compared?

   A. Means from two independent groups

   B. Means from the same group across different conditions

   C. Means across multiple groups simultaneously

   D. Variations in independent variable influences

6. Which variance is not utilized in a repeated measures ANOVA?

A. Variance Within

B. Variance Between

C. Variance Residual

D. Variance Total

7. How does a non-parametric test differ from a parametric test?

A. It analyzes numeric data over categorical

B. It requires large sample sizes

C. It investigates category variables instead of quantity variables

D. It focuses on frequency distributions

8. How many hypotheses are typically tested in a two-way ANOVA?

A. One

B. Two

C. Three

D. Four

9. Expected frequencies play a crucial role in assessing which of the following?

A. Nominal data distributions

B. Interval data trends

C. Continuous data means

D. Ordinal data rankings

10. What does a higher kurtosis value suggest about a dataset?

A. The data is normally distributed with low variability

B. The dataset has a sharp peak and heavy tails

C. The data is evenly distributed across the range

D. The dataset contains fewer extreme values

Answers

1. C
2. B
3. B
4. B
5. B
6. A
7. C
8. C
9. A
10. B

Explanations

1. What does each F score in a two-way ANOVA primarily represent?

A. Main effects only

B. Interaction effects only

C. The spread of group means

D. Variability within groups

In a two-way ANOVA, each F score corresponds to a specific hypothesis being tested. The F score can indicate various types of variability among group means. In this context, the F score primarily represents the variance among the group means relative to the variance within the groups themselves. When assessing the main effects of each independent variable, the F score tells us how much the means of the groups defined by one factor differ when controlling for the other factor. Similarly, when evaluating interaction effects, the F score reflects whether the impact of one independent variable on the dependent variable differs depending on the level of the other independent variable. By indicating the ratio of explained variability (between groups) to unexplained variability (within groups), the F score provides insights into the spread and relationship of group means as affected by the independent variables. Therefore, it is accurate to say that it represents the spread of group means in the context of a two-way ANOVA.

2. In a study with a 2 x 6 x 9 design, how many independent variables are being examined?

A. 2

B. 3

C. 6

D. 9

In a study that employs a 2 x 6 x 9 design, the number of independent variables is determined by the number of factors represented in the design notation. Each number in the notation corresponds to a different independent variable (factor), with the values indicating the number of levels each variable operates at in the study. In this case, there are three factors indicated: one with 2 levels, another with 6 levels, and a third with 9 levels. Since there are three different factors present, the correct understanding is that the study is examining three independent variables. This tells us how many different influences might affect the outcome of the research, allowing for a comprehensive analysis of the effects of these variables on the dependent variable.

3. When should post hoc tests be used in data analysis?

A. Only when the sample size is very large

B. After an ANOVA indicates significant differences among group means

C. Before conducting any hypothesis tests

D. After a simple linear regression analysis is completed

Post hoc tests should be used after an ANOVA indicates significant differences among group means. This is because ANOVA (Analysis of Variance) is used to determine whether there are any statistically significant differences between the means of three or more independent groups. However, ANOVA does not specify which specific groups are different from each other; it only tells us that at least one group mean is significantly different from the others. Once ANOVA shows significant results, post hoc tests can be conducted to identify specifically which group means are different. These tests control for the Type I error rate that increases when multiple comparisons are made and provide a more detailed understanding of the differences between groups. Therefore, the correct application of post hoc tests follows a significant ANOVA result, making the answer accurate. Other options presented do not correctly describe the appropriate timing or context for the use of post hoc tests, as they either suggest scenarios that are unrelated to the need for post hoc comparisons or propose incorrect sequencing in the analysis process.

4. What is a main effect in the context of factorial design?

A. The overall average of all participants

B. The difference between groups based on one independent variable

C. The combined effect of multiple independent variables

D. An insignificant result among grouped variables

In the context of factorial design, a main effect refers specifically to the impact of one independent variable on the dependent variable, independent of the effects of other variables. This means that when examining the results of an experiment with multiple independent variables, researchers can identify how each variable individually influences the outcome. When considering the significance of a main effect, it is crucial to look at how the levels of a single independent variable differ in relation to the dependent variable, while holding other variables constant. This allows researchers to draw conclusions about the direct influence of that specific independent variable. For example, in an experiment designed to test the effects of different teaching methods (one independent variable) on student performance (the dependent variable), the main effect of teaching methods would analyze how performance differs across the various methods tested, regardless of factors such as student demographics or the atmosphere of the classroom. Understanding main effects in factorial designs is essential for interpreting experimental data, as it helps identify which independent variables are significant predictors of change in the dependent variable.

5. In a paired sample t-test, what are being compared?

A. Means from two independent groups

B. Means from the same group across different conditions

C. Means across multiple groups simultaneously

D. Variations in independent variable influences

In a paired sample t-test, the focus is on comparing means from the same group measured under different conditions or at two different time points. This statistical method is used when you have two related samples, such as pre-test and post-test measurements for the same subjects. The purpose of the paired sample t-test is to determine whether there are statistically significant differences between these two related means, which helps to analyze the effect of an intervention or change over time on the same participants. This testing approach is particularly advantageous because it controls for individual differences across the samples by analyzing the differences within the same subjects. Consequently, the paired sample t-test increases the statistical power of the test as compared to unpaired tests since it reduces variability due to individual differences. Other answer choices relate to different concepts in statistical analysis. While independent groups require unpaired tests, such as an independent samples t-test, and variations in influences of independent variables typically pertain to more complex analyses like ANOVA, the paired sample t-test is specifically about means from the same group, making the correct answer clear in the context of paired sample comparisons.

6. Which variance is not utilized in a repeated measures ANOVA?

A. Variance Within

B. Variance Between

C. Variance Residual

D. Variance Total

In the context of a repeated measures ANOVA, the analysis focuses on how the means of different conditions relate to one another while accounting for the repeated observations taken from the same subjects. The analysis measures the variance that can be attributed to the observed differences in conditions as well as the variance attributable to the inherent differences among subjects. The variance within, which typically refers to the variance among individual scores in the same condition, is not utilized in the same way in a repeated measures ANOVA. Instead, the key components of the repeated measures ANOVA include variance between treatments (how much scores differ from one condition to another), variance residual (which captures the variability not explained by the model), and the total variance (the overall variability in the data). When analyzing the data in this context, repeated measures allow for the same subjects to be measured across conditions, thus reducing individual differences that can inflate within-group variance. Therefore, while variance within generally reflects error variance in a traditional ANOVA, in a repeated measures design, it is the differences between conditions (variance between) and the error term (variance residual) that are more relevant to the analysis. This distinction makes it clear why variance within is not utilized in the standard framework of a repeated measures ANOVA.

7. How does a non-parametric test differ from a parametric test?

A. It analyzes numeric data over categorical

B. It requires large sample sizes

C. It investigates category variables instead of quantity variables

D. It focuses on frequency distributions

A non-parametric test is designed to be used when the data does not necessarily meet the assumptions required for parametric tests, such as normality of distribution and homogeneity of variance. Unlike parametric tests that are often used for interval or ratio data, non-parametric tests can handle ordinal data or data that do not strictly meet these criteria. The correct distinction here is that non-parametric tests often investigate category variables or ranks instead of strictly focusing on numerical quantities. This makes them particularly valuable when dealing with small sample sizes or when the data is not normally distributed. The flexibility of non-parametric tests allows researchers to analyze a wider range of data types without imposing the strict requirements of parametric methods, making them an essential part of statistical analysis in psychology and other fields. Different test types like the chi-square test for independence and the Mann-Whitney U test for comparing medians are examples of how non-parametric tests can be applied to categorical or ordinal data effectively.

8. How many hypotheses are typically tested in a two-way ANOVA?

A. One

B. Two

C. Three

D. Four

In a two-way ANOVA, researchers typically test three hypotheses. These consist of two main effects and one interaction effect. The main effects are the individual effects of each independent variable on the dependent variable, while the interaction effect assesses whether the effect of one independent variable on the dependent variable differs depending on the level of the other independent variable. For instance, if you are examining the effects of two different teaching methods and two different age groups on test scores, the main effects would look at how teaching methods and age groups independently influence scores. The interaction effect would evaluate whether the impact of a teaching method varies at different age levels. This approach allows for a more nuanced understanding of data by considering how multiple factors work together rather than isolating each factor individually. Thus, understanding that three hypotheses are tested in a two-way ANOVA is essential for correctly interpreting the results of this statistical analysis method.

9. Expected frequencies play a crucial role in assessing which of the following?

A. Nominal data distributions

B. Interval data trends

C. Continuous data means

D. Ordinal data rankings

Expected frequencies are crucial in analyzing nominal data distributions, particularly in the context of chi-square tests. In these tests, researchers compare the observed frequencies of occurrences in different categories to what would be expected under the assumption of no association between the variables. The expected frequencies serve as a baseline for this comparison, allowing for the evaluation of whether any observed differences are statistically significant or if they could simply be due to random chance. In contrast, the other options pertain to data types or analyses where expected frequencies do not have the same importance. For instance, interval data trends and continuous data means involve different statistical approaches, such as regression or t-tests, which focus on measures of central tendency rather than categorical distributions. Similarly, ordinal data rankings, while they can sometimes be analyzed using non-parametric tests, do not typically require an assessment of expected frequencies in the same way that nominal data does. Thus, the role of expected frequencies is primarily associated with nominal data distributions.

10. What does a higher kurtosis value suggest about a dataset?

A. The data is normally distributed with low variability

B. The dataset has a sharp peak and heavy tails

C. The data is evenly distributed across the range

D. The dataset contains fewer extreme values

A higher kurtosis value indicates that the dataset has a sharp peak and heavy tails. This means that the distribution has more extreme values or outliers compared to a normal distribution. In other words, a high kurtosis suggests that the data is more concentrated around the mean and that there are significant deviations from the mean—some observations that are much higher or lower than the average. Such a distribution is often referred to as leptokurtic, where the presence of heavy tails can imply an increased risk for extreme outcomes, which is especially relevant in fields such as finance and psychology, where understanding variability and risk is crucial. A distribution with high kurtosis contrasts with one that has a lower kurtosis, which would typically have a flatter peak and lighter tails, indicating fewer extreme values and thus a more uniform spread of data around the mean. This sharp peak and heavy tails characteristic of higher kurtosis makes it important for statistical analyses that involve predictions or risk assessments based on data behavior.