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Week 5 Practice Questions
1. How do you assess the statistical significance of an insight?
Statistical significance is a crucial concept in data analysis. It involves using hypothesis testing techniques to evaluate if observed data is unlikely to occur by chance. Common tools for this purpose include t-tests, chi-square tests, and ANOVA. The p-value is a critical metric; a smaller p-value suggests stronger evidence against the null hypothesis. However, it's essential to remember that statistical significance doesn't necessarily translate to practical importance, and researchers should consider effect size alongside significance.

2. What is the Central Limit Theorem? Explain it. Why is it important?
The Central Limit Theorem is a foundational idea in statistics. It states that, regardless of the original distribution, the sum or average of a large number of independent, identically distributed random variables approximates a normal distribution. This is particularly important because it enables statisticians to make inferences about populations based on samples. The CLT is a fundamental underpinning for many statistical methods and hypothesis tests.

3. What is statistical power?
Statistical power gauges a test's ability to detect a real effect. It depends on factors like sample size, effect size, and significance level. High power is essential for minimizing the risk of Type II errors, where a false null hypothesis is not rejected. Striking a balance between power and significance is crucial in experimental design to ensure robust and reliable results.

4. How do you control for biases?
Biases in research can significantly impact the validity of findings. Researchers employ various strategies to control biases, such as randomization in experimental design, blinding methods, and careful participant selection. Techniques like systematic reviews and meta-analyses help identify and mitigate biases. Rigorous awareness and mitigation of potential biases contribute to the reliability of study outcomes.

5. What are confounding variables?
Confounding variables are external factors that can distort the interpretation of study results. Techniques like random assignment, matching, and statistical methods (e.g., regression analysis) help isolate the true effect of the independent variable by controlling for confounding variables. Addressing confounding variables is crucial for establishing accurate associations between variables.

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6. What is A/B testing?

A/B testing, also known as split testing, is a practical approach in marketing and product development. It involves comparing two versions (A and B) to determine which performs better. Random assignment of users helps control for confounding variables. Statistical analysis is then applied to assess if observed differences are statistically significant, providing insights into the effectiveness of changes.

7. What are confidence intervals?

Confidence intervals offer a range within which the true value of a population parameter is likely to fall with a specified level of confidence. For instance, a 95% confidence interval suggests that in repeated studies, 95% of the intervals would capture the true parameter. Confidence intervals complement hypothesis testing by providing a more comprehensive perspective on the plausible values for the population parameter.