Introduction to Statistics in Psychology: PSY 201

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Study Guide for Exam 2
Exam Date: October 25, 2023 (during the regular class period)

The exam will consist of 10 short-answer questions that will either involve some computation or will require a short essay to explain a concept in statistics. Drawings, graphs, and examples are often helpful when answering an essay question. For computations, you can receive partial credit as long as you show your work. Bring a calculator.

For this exam, you should prepare an "information sheet" that you can bring with you to the exam. On a single 8.5×11 sheet of paper, you can write (hand written only) anything you think might be helpful. You can use both sides of the paper. Since any information you need can be on your sheet, the exam will not include a listing of equations.

Chapter 6

1. Understand both the frequentist and subjective approaches to probability. Be able to given an example of a situation where one or the other would apply.

2. Be able to apply probability calculations to (relatively) simple situations (coin flips, cards, dice).

3. Understand, and be able to apply to simple situations, conditional probability.

4. Understand the term "independent" as it applies to the probabilities of events.

5. Understand the "gambler's fallacy" and its relation to independence.

6. Be able to explain (in general, not mathematical, terms) why shared birthdays are common even for a group of just 25 people.

7. Know what the binomial distribution describes. Know how to get various probabilities from the binomial distribution. Know how to use the on-line calculator

8. Know how to compute the mean and variance of the binomial distribution. Know the basic shape of the binomial distribution for small and large values of N and for various values of π.

9. Know the relation between base rates and Bayes' Theorem.

10. Know how to do (simple) probability calculations using Bayes' Theorem.

Chapter 7

1. Understand the challenges of making decisions with noisy data.

2. Be able to identify signal and noise in a given situation. Be able to provide examples of such situations.

3. Be able to explain and compute the signal-to-noise ratio (d').

4. Be able to explain the role of a criterion in decision making.

5. Be able to explain and interpret the different possible decision outcomes.

Chapter 8

1. Understand what a sampling distribution is. For a single mean, know how it is connected to the population distribution, the statistic of interest, and the sample size.

2. Know what the term *standard error of the mean* refers to.

3. Understand how the shape of the population distribution affects (or not) the shape of the sampling distribution of the mean.

4. Understand how the size of the sample affects (or not) the mean of the sampling distribution of the mean. Understand how sample size affects the standard error of the mean.

5. Know the relationship between the mean of the population and the mean of the sampling distribution of the mean.

6. Know the mathematical relationship between the variance of the population, the sample size, and the variance of the sampling distribution of the mean. (Same for standard deviations.)

7. Know the central limit theorem. Be able to describe what it means (not just state the theorem itself).

8. Know the properties of the t-distribution. Know what a t-score is.

9. Be able to explain (in general terms) the concept of degrees of freedom.

10. Know how to use the on-line calculator to find areas under the t-distribution.

11. Know how to relate probabilities to areas under the t-distribution.

Chapter 9

1. Be able to explain (in general terms) why we test means rather than individual scores. Be sure to discuss the sampling distribution of the mean.

2. Know how to set up and interpret a null hypothesis. Understand its relationship to chance or no effect.

3. Be able to explain how we identify a criterion for a one-tailed test.

4. Be able to explain how we identify a criterion for a two-tailed test.

5. Understand how p-values are related to the criterion.

6. Understand what it means to reject the null hypothesis.

7. Know the definitions and properties of Type I and II errors.

8. Know how to interpret a non-significant result.

9. Know the steps of hypothesis testing. Be able to run a test using the on-line calculator.

10. Understand the common misconceptions about significance testing and the proper interpretation.

11. Understand *power* and know how it relates to Type II errors.

12. Be able to interpret a power analysis using the on-line calculator.

13. Understand (in general terms) the relationship between sample size and power.

Chapter 10

1. Know the difference between a point estimate and an interval estimate of a population parameter.

2. Understand why you might want a confidence interval rather than a point estimate of a statistic.

3. Understand why a 95% confidence interval is *not* an interval with a 0.95 probability of containing the population mean.

4. Understand how the term "95%" is related to a probability statement about samples.

5. Know how to find t values that are used in constructing a confidence interval. Be able to use the on-line calculators.

6. Know the relationship between level of confidence and width of a confidence interval.

7. Know how sample size alters the width of a confidence interval.

8. Know how sample size affects (or not) the proportion of intervals that contain the parameter.

9. Understand the relationship between confidence intervals and hypothesis testing.