The following questions are similar to the types of questions you will see on the final exam that cover chapters 22 through 25. The actual final exam will be between 70 and 80 multiple-choice questions and it will cover *all* the material in the class, not merely the material in chapters 22–25.

Please note that while a calculator might be helpful for some of these sample questions, a calculator will not be needed for the final exam. Also note that the normal table (as on page 157) will be included with the final exam, just as on midterms 1 and 3.

Question 1. Consider the research hypothesis: Working at least 5 hours per day at a computer contributes to deterioration of eyesight. The alternative hypothesis is:

(A) Insufficient information is given to allow us to determine the alternative hypothesis.

(B) Working at least five hours a day at a computer contributes to deterioration of eyesight.

(C) Working at least five hours a day at a computer does not contribute to the deterioration of eyesight.

(D) Working at least five hours a day at a computer improves eyesight.

Question 2. A statistical study considers the question of whether highly educated people are less likely to develop Alzheimer's disease than others. In this study, the alternative hypothesis is:

(A) There is no relationship between level of education and the development of Alzheimer's disease.

(B) Highly educated people are less likely than others to develop Alzheimer's disease.

(C) There is a relationship between level of education and the development of Alzheimer's disease.

(D) Insufficient information is given to allow us to determine the null hypothesis.

(E) Highly educated people are certain of developing Alzheimer's disease.

Question 3. The following table shows some data summaries for amount of change carried by people in a sample taken from class.

smallskip

		Men	Women
	Mean	59	82
	SEM	9	12
	SD of difference	15	

To test the research hypothesis that women carry more change than men, we must compute the test statistic:

(A) $\frac{59}{9} - \frac{82}{12} = -0.28$

(B) $\frac{59}{9} + \frac{82}{12} = 13.39$

(C) $\frac{59-82}{15} = -1.53$

(D) $\frac{59+82}{15} = 9.40$

Question 4. A study was conducted to see if PSU students sleep fewer than 8 hours. The study was based on a sample of 100 students. The sample mean number of hours of sleep was 7 and the SD was 5 hours. What is the p-value? (Hint: The test statistic is very easy to compute here without a calculator.)

(A) .05

(B) .95

(C) .025

(D) .975

Question 5. Consider the research hypothesis that there is a difference in the proportions of men and women at PSU who own cell phones. Data from the class survey question: Do you own a cell phone?

	No	Yes	
Female	26	51	77
Male	19	16	35
	45	67	112

If the chi-square statistic is 4.215 (which equals 2.053^2), the p-value is:

(A) greater than .05

(B) less than .05

(C) can't tell

(D) equal to .05

Question 6. If the sample size is large enough, almost any null hypothesis can be rejected.

(A) True

(B) False

Question 7. If a result is statistically significant, this means that it is an important result.

(A) True

(B) False

Question 8. In a study to see if a new variety of popcorn pops faster than the old variety, we collected the following data on time to complete popping in minutes:

	Old variety	New variety
Mean	15	10
SEM	3	4

Which of the following is true? (Hint: The test statistic is very easy to compute here without a calculator.)

(A) We would support the research advocate

(B) We would not support the research advocate

(C) Not enough information to decide

The following material pertains to the next five questions: Lee Salk exposed one group of newly born infants, the *treatment group*, to the sound of a human heartbeat. Next, Salk compared their weight gains to those of a group of newly born infants not exposed, the *control group*.

Question 9. In Salk's experiment, a Type I error occurs if:

(A) Infants not exposed to the sound of a human heartbeat do not hear the heartbeat.

(B) Infants exposed to the sound of a human heartbeat actually hear the heartbeat.

(C) The study fails to reject the hypothesis that exposed infants have the same mean weight gain as unexposed infants when, in fact, this hypothesis is not valid.

(D) The study rejects the hypothesis that exposed infants have the same mean weight gain as unexposed infants when, in fact, this hypothesis is valid.

Question 10. Salk concluded from his data that the treatment group had higher mean weight gain than the control group. The error which he possibly commits here is:

(A) In thinking that the sound of a heartbeat could have an effect on an infant's weight.

(B) A Type I error.

(C) No error at all; we know that infants exposed to a heartbeat are healthier.

(D) A Type II error.

Question 11. In Salk's experiment, the *alternative hypothesis* is:

(A) Infants not exposed to the sound of a human heartbeat will hear the heartbeat.

(B) Infants exposed to the sound of a human heartbeat will gain the same mean weight as infants who are not exposed to the sound of a heartbeat.

(C) Infants exposed to the sound of a human heartbeat will gain a higher mean weight than infants not exposed to the sound of a heartbeat.

(D) Infants exposed to the sound of a human heartbeat will hear the heartbeat.

Question 12. In Lee Salk's experiment involving infants, the *null hypothesis* is:

(A) Infants exposed to the sound of a human heartbeat will gain the same mean weight as infants who are not exposed to the sound of a heartbeat.

(B) Infants exposed to the sound of a human heartbeat will gain a higher mean weight than infants who are not exposed to the sound of a heartbeat.

(C) Infants not exposed to the sound of a human heartbeat will hear the heartbeat.

(D) Infants exposed to the sound of a human heartbeat will hear the heartbeat.

Question 13. In Salk's experiment, a Type II error occurs if:

(A) The study rejects the hypothesis that exposed infants have the same mean weight gain as unexposed infants when, in fact, this hypothesis is valid.

(B) Infants exposed to the sound of a human heartbeat actually hear the heartbeat.

(C) The study fails to reject the hypothesis that exposed infants have the same mean weight gain as unexposed infants when, in fact, this hypothesis is not valid.

(D) Infants not exposed to the sound of a human heartbeat do not hear the heartbeat.

Question 14. During lunch today, I found a shiny new dime! To study the problem of whether the coin is fair, I choose as my test statistic the number of heads obtained in 20 tosses. When I tossed the coin 20 times, I obtained 13 heads. Bearing in mind that the probability of 13 or more heads in 20 tosses of a fair coin is 13.16%, my decision is to:

(A) Reject the null hypothesis: I have strong evidence against the hypothesis that the coin is fair.

(B) Fail to reject the null hypothesis: I do not have strong evidence against the hypothesis that the coin is fair.

(C) Reject the null hypothesis: I have strong evidence against the hypothesis that the coin is unfair.

(D) Fail to reject the null hypothesis: I do not have strong evidence against the hypothesis that the coin is unfair.

Question 15. Fiona receives a beautiful four-sided die for her eighteenth birthday. After playing with it for two hours, she starts to suspect that her die is *more favorable* to rolling "1" than to any other number. Fiona's alternative hypothesis is

(A) One-sided

(B) Two-sided

Question 16. Fiona chooses for her test statistic the *standardized score* corresponding to the sample proportion of 1's obtained in 300 rolls of her die. The standardized score is

$$\frac{\text{Sample proportion - Population proportion}}{\text{S.D. of the sample proportion}}$$

Fiona rolled her die 300 times and obtained a "1" on 93, or 31%, of her rolls. The value of Fiona's test statistic is:

(A) $\frac{300-93}{\sqrt{\frac{(0.25)(1-0.25)}{300}}} = 8{,}280$

(B) $\frac{0.31-0.25}{\sqrt{\frac{(0.31)(1-0.31)}{300}}} = 2.25$

(C) $\frac{0.31-0.25}{\sqrt{\frac{(0.25)(1-0.25)}{300}}} = 2.4$

(D) $\frac{0.25-0.31}{\sqrt{\frac{(0.25)(1-0.25)}{300}}} = -2.4$

Question 17. Fiona's null hypothesis is that

(A) The die rolls "1" with probability less than 0.25.

(B) The die rolls "1" with probability equal to 0.25.

(C) The die rolls "1" with probability greater than 0.25.

(D) The die rolls "1" with probability not equal to 0.25.

Question 18. Meta-analysis is

(A) a collection of statistical techniques for combining studies

(B) the computation of a test statistic followed by a decision regarding a null hypothesis for data presented in the form of a table

(C) a way to make statistical significance equivalent to practical significance

(D) the use of stratified or cluster sampling

Question 19. To study the effects of exercise on lean body (muscle) weight change, a random sample of 36 students was placed on a two-month long exercise program. At the end of the program, all 36 students' changes in lean body weight were measured. The sample mean change in muscle weight was 1.05 pounds and the sample *standard deviation* was 3.6 pounds. The study organizers wish to know if the results of this sample provide good evidence that this exercise program causes a statistically significant change in the population mean lean body weight. The value of this test statistic (standardized score) is:

(A) $\frac{1.05}{3.6} = 0.29$

(B) $\frac{3.6}{1.05/\sqrt{36}} = 20.57$

(C) $\frac{3.6}{1.05} = 3.43$

(D) $\frac{1.05}{3.6/\sqrt{36}} = 1.75$

Question 20. Joe Palermo interviewed 507 randomly chosen PSU students and found that 59%of the students in his sample like to play chess. Consider the research question of whether or not a *majority* of PSU students like to play chess. The test for this research question is a:

(A) Both a one-sided and two-sided test.

(B) Neither a one-sided nor two-sided test.

(C) One-sided test.

(D) Two-sided test.

Question 21. Suppose ten studies were conducted to assess the relationship between watching violence on television and subsequent violent behavior in children. Suppose that none of the ten studies detected a statistically significant relationship. True or false: It is possible for a meta-analysis to detect a statistically significant relationship in this example.

(A) True

(B) False

Question 22. Suppose ten studies were conducted to assess the relationship between watching violence on television and subsequent violent behavior in children. Suppose that none of the ten studies detected a statistically significant relationship. What would be the result of applying the vote-counting method to this example?

(A) Vote-counting will not detect a relationship in this example.

(B) Vote-counting will detect a relationship in this example.

(C) Vote-counting might detect a relationship in this example, but we would need more information.

Question 23. The "file drawer" problem refers to

(A) a gambling choice in which the player must choose among three drawers.

(B) a method of selecting a representative sample from a population.

(C) the challenge of building quality furniture.

(D) the bias resulting from considering only published studies, which are more likely to contain statistically significant results than those unpublished studies sitting in file drawers.

(E) the fact that studies that have been sitting around for many years in file drawers are out-of-date.

Question 24. Which of the following is a problem that can occur in a meta-analysis when data sets are combined inappropriately?

(A) Simpson's paradox

(B) the Fibonacci effect

(C) the file drawer problem

(D) the vote-counting paradox