Chapter 10

1. Which of the following research situations is most likely to use an independent-measures design?
   - Evaluate the difference in verbal skills between 3-year-old girls and 3-year-old boys.
   - Evaluate the development of verbal skills between age 2 and age 3 for a sample of girls.
   - Evaluate the effectiveness of a cholesterol medication by comparing cholesterol levels before and after the medication.
   - Evaluate the effectiveness of a diet program by measuring how much weight is lost during 4 weeks of dieting.

2. The null hypothesis for the independent-measures t test states:
   - $\mu_1 - \mu_2 = 0$
   - $M_1 - M_2 = 0$
   - $\mu_1 - \mu_2 \neq 0$
   - $M_1 - M_2 \neq 0$

3. One sample has $n = 6$ and $SS = 20$ and a second sample has $n = 6$ and $SS = 30$. What is the pooled variance for the two samples?
   - 25
   - 50
   - 50/10
   - 50/6
4. One sample of \( n = 5 \) scores has a variance of \( s^2 = 10 \) and a second sample of \( n = 10 \) scores has \( s^2 = 20 \). If the pooled variance is computed for these two samples, then the value obtained will be ________.

   - a. closer to 10 than to 20
   - b. Cannot be determined without more information.
   - c. closer to 20 than to 10
   - d. exactly halfway between 10 and 20

5. Which of the following sets of sample data would produce the largest value for an independent-measures \( t \) statistic? Assume that \( n = 10 \) for all samples. Note: You should not need to do any serious calculations to answer this question.

   - a. First sample: \( M = 30 \) and \( SS = 50 \). Second Sample: \( M = 35 \) and \( SS = 50 \).
   - b. First sample: \( M = 30 \) and \( SS = 10 \). Second Sample: \( M = 50 \) and \( SS = 10 \).
   - c. First sample: \( M = 30 \) and \( SS = 10 \). Second Sample: \( M = 35 \) and \( SS = 10 \).
   - d. First sample: \( M = 30 \) and \( SS = 50 \). Second Sample: \( M = 50 \) and \( SS = 50 \).

6. Two samples, each with \( n = 6 \) subjects, produce a pooled variance of 20. Based on this information, the estimated standard error for the sample mean difference would be ________.

   - a. the square root of \( (20/5 + 20/5) \)
   - b. the square root of \( (20/6 + 20/6) \)
   - c. 20/6
   - d. 20/12

7. A researcher reports \( t(24) = 5.30 \) for an independent-measures experiment. How many individuals participated in the entire experiment?

   - a. 12
   - b. 26
   - c. 25
   - d. 24
8. An independent-measures experiment uses one sample with n = 10 and a second sample with n = 15 to compare two experimental treatments. The t statistic from this experiment will have degrees of freedom equal to ________.

   a. 25  
   b. 24  
   c. 23  
   d. Cannot be determined with unequal sample sizes.

9. For an independent-measures research study, the value of Cohen’s d or r² helps to describe:

   a. the risk of a Type I error.  
   b. the risk of a Type II error.  
   c. how much difference there is between the two treatments.  
   d. whether the difference between the two treatments is likely to have occurred by chance.

10. For the independent-measures t statistic, if other factors are held constant, increasing sample variance will ________ the chances of a significant t statistic and ________ measures of effect size.

    a. decrease, decrease  
    b. increase, increase  
    c. increase, decrease  
    d. decrease, increase

Chapter 11

1. For which of the following situations would a repeated-measures study be appropriate?

   a. Compare personality scores for individuals diagnosed with an eating disorder and those who are not diagnosed.
   b. Compare salary levels for college graduates and those who did not graduate from college.
   c. Compare attitude scores for males versus females.
   d. Compare reaction times before and after taking a pain medication.
2. For a repeated-measures hypothesis test, the null hypothesis states ________.
   a. $\mu_D = 0$
   b. $\mu_1 = \mu_2$
   c. $M_1 = M_2$
   d. $M_D = 0$

3. In general, if the variance of the difference scores increases, then the value of the t statistic will:
   a. increase (move farther toward the tail of the distribution).
   b. stay the same - the t statistic is not affected by the variance of the difference scores.
   c. may increase or may decrease. There is no consistent relationship between variance and the size of the t statistic.
   d. decrease (move toward 0 at the center of the distribution).

4. A research report describing the results from a repeated-measures study includes the following: "The data show no significant difference between the two treatments, $t(10) = 1.65, p > .05."$ Based on this report, you can conclude that a total of ________ individuals participated in the research study.
   a. 11
   b. 9
   c. 10
   d. 12

5. A researcher uses a repeated-measures study to compare two treatment conditions with a set of 20 scores in each treatment. What would be the value of df for the repeated-measures t statistic?
   a. $df = 19$
   b. $df = 38$
   c. $df = 39$
   d. $df = 18$
6. A researcher obtains $t = 2.10$ for a repeated-measures study using a sample of $n = 16$ participants. Based on this $t$ value, what is the correct decision?

- a. Reject the null hypothesis with either $\alpha = .05$ or $\alpha = .01$
- b. Fail to reject the null hypothesis with either $\alpha = .05$ or $\alpha = .01$
- c. Reject the null hypothesis with $\alpha = .05$ but not with $\alpha = .01$
- d. Cannot make a decision without additional information.

7. Which of the following samples will produce the largest value for a $t$ statistic? Assume each sample has $n = 10$ scores.

- a. $M_D = 10$ with $SS = 40$
- b. $M_D = 10$ with $SS = 20$
- c. $M_D = 5$ with $SS = 40$
- d. $M_D = 5$ with $SS = 20$

8. An advantage of a repeated-measured design (compared to an independent-measures design) is that it reduces the contribution of error variability due to ________.

- a. the effect of the treatment
- b. degrees of freedom
- c. $M_D$
- d. individual differences

9. A researcher obtains a $t$ statistic of $t = 2.00$ from a repeated measures study using $n = 17$ participants. If the effect size is measured using $r^2$ then the value of $r^2$ for the study would be ________.

- a. $r^2 = 4/16 = 0.25$
- b. $r^2 = 4/20 = 0.20$
- c. $r^2 = 4.00$
- d. The value of $r^2$ cannot be determined from the information provided.
10. A researcher obtains $t = 3.00$ for a repeated-measures study using a sample of $n = 10$ participants. If the researcher measures effect size using the percentage of variance accounted for, what value will be obtained for $r^2$?

- a. $9/18 = 0.50$
- b. 9
- c. $9/19 = 0.47$
- d. $3/12 = 0.25$

Chapter 12

1. Which of the following research questions would be an appropriate situation for using estimation instead of a hypothesis test?

- a. Does the amount of background noise have an effect on people's ability to concentrate?
- b. How much improvement will result from a special program to teach reading skills?
- c. Is there any difference in mathematics skills between adolescent boys and adolescent girls?
- d. Does a new cholesterol medication have any effect?

2. A researcher knows that 4-year-old girls tend to have better verbal skills than 4-year-old boys. To determine how much better, the researcher obtains a sample of boys and a sample of girls and gives each child a verbal ability test. The scores from the test are used to estimate the mean difference. Which estimation equation should the researcher use?

- a. Cannot answer without additional information.
- b. The single-sample $t$ equation.
- c. The repeated-measures $t$ equation.
- d. The independent-measures $t$ equation.
3. The purpose of a confidence interval is to:

- a. use a sample mean or mean difference to estimate the corresponding population mean or mean difference.
- b. use a level of confidence to estimate a sample mean.
- c. use \( \mu \) to estimate the value of a sample mean.
- d. use the sample mean to determine a level of confidence.

4. What value(s) for \( t \) would be used for a point estimate of a population mean using a single-sample \( t \) statistic?

- a. Cannot answer without additional information.
- b. \( t = \pm 1.96 \)
- c. \( t = \pm 1.00 \)
- d. \( t = 0 \)

5. What value(s) can be estimated using the independent-measures \( t \) statistic?

- a. The difference between two population means.
- b. The values for two different population means.
- c. The value of an unknown population mean.
- d. The mean for the entire population of difference scores.

6. If all other factors are held constant, which of the following would produce the smallest width for a confidence interval for \( \mu \)?

- a. A 90% confidence interval based on a sample of \( n = 100 \).
- b. A 90% confidence interval based on a sample of \( n = 25 \).
- c. An 80% confidence interval based on a sample of \( n = 25 \).
- d. An 80% confidence interval based on a sample of \( n = 100 \).
7. Two separate samples, each with \( n = 4 \), are used to construct a 99% confidence interval for the mean difference between two populations. The correct \( t \) values for the interval are ________.

   a. ±2.58
   b. ±3.707
   c. ±2.998
   d. ±3.143

8. An 80% confidence interval for the population mean ranges from 14 to 22. Based on this information:

   a. the sample mean is \( M = 14 \).
   b. the sample mean is \( M = 18 \).
   c. none of the other 3 choices is correct.
   d. the sample mean is \( M = 22 \).

9. Compared to a point estimate, an interval estimate:

   a. has less precision but greater confidence.
   b. has greater precision and greater confidence.
   c. has less precision and less confidence.
   d. has greater precision but less confidence.

10. Estimation would be appropriate:

    a. after a hypothesis test where the decision was to reject the null hypothesis.
    b. after a hypothesis test where the decision was to fail to reject the null hypothesis.
    c. after a hypothesis test no matter what the decision was made.
    d. estimation should never be done after a hypothesis test.
Chapter 13

1. For an experiment comparing more than two treatment conditions you should use analysis of variance rather than separate t tests because:

   a. a test based on variances is more sensitive than a test based on means.
   b. ANOVA has less risk of a Type I Error because several means are compared in one test.
   c. ANOVA has less risk of a Type II Error because several means are compared in one test.
   d. you are less likely to make a mistake in the computations of ANOVA.

2. When the null hypothesis is true for an ANOVA, what is the expected value for the F-ratio?

   a. 0
   b. 1.00
   c. $N - k$
   d. $k - 1$

3. An analysis of variance produces $SS_{total} = 90$ and $SS_{within treatments} = 40$. For this analysis, what is $SS_{between treatments}$?

   a. 130
   b. Cannot be determined without additional information.
   c. 50
   d. 3600

4. In analysis of variance, the F-ratio is a ratio of:

   a. sample variances divided by sample means.
   b. sample means divided by variances.
   c. variances.
   d. sample means.
5. For an independent-measures experiment comparing two treatment conditions with a sample of \( n = 10 \) in each treatment, the F-ratio would have df equal to ________.

   a. 19  
   b. 18  
   c. 1, 19  
   d. 1, 18

6. A researcher reports an F-ratio with df = 2, 36 for an independent-measures experiment. How many treatment conditions were compared in this experiment?

   a. 36  
   b. 3  
   c. 38  
   d. 2

7. Which combination of factors is most likely to produce a large value for the F-ratio and a large value for \( \eta^2 \)?

   a. Small mean differences and large sample variances.  
   b. Large mean differences and large sample variances.  
   c. Large mean differences and small sample variances.  
   d. Small mean differences and small sample variances.

8. The purpose of a post hoc test is to:

   a. determine whether or not a complete ANOVA is justified.  
   b. determine which treatments are different.  
   c. determine whether or not a Type I Error was made in the ANOVA.  
   d. determine how much difference there is between treatments.
9. In general the distribution of F-ratios is:

- a. negatively skewed with all values greater than or equal to zero.
- b. positively skewed with all values greater than or equal to zero.
- c. symmetrical with a mean of zero.
- d. symmetrical with a mean equal to df_{between}.

10. Under what circumstances are post tests necessary?

- a. When you reject the null hypothesis with more than 2 treatment conditions.
- b. When you fail to reject the null hypothesis with more than 2 treatment conditions.
- c. When you fail to reject the null hypothesis with exactly 2 treatment conditions.
- d. When you reject the null hypothesis with exactly 2 treatment conditions.

**Chapter 14**

1. In the F-ratio for a repeated-measures ANOVA, variability due to individual differences:

- a. must be computed and subtracted out of the numerator and the denominator.
- b. is automatically eliminated from both the numerator and the denominator.
- c. is automatically eliminated from the denominator but must be computed and subtracted out of the numerator.
- d. is automatically eliminated from the numerator but must be computed and subtracted out of the denominator.

2. A repeated-measures study uses a sample of n = 8 participants to evaluate the mean differences among three treatment conditions. In the analysis of variance for this study, what is the value for df_{total}?

- a. 23
- b. 7
- c. 2
- d. 21
3. In a repeated-measures ANOVA, a P value corresponds to:
   a. the product obtained by multiplying all the scores for each individual person.
   b. each individual score in the research study.
   c. the total of all the scores for an individual treatment.
   d. the total of all the scores for an individual person.

4. A researcher obtains an F-ratio with df = 2, 12 from an ANOVA for a repeated-measures research study. How many subjects participated in the research study?
   a. 13
   b. 7
   c. 15
   d. 14

5. Which of the following are sources of variability that contribute to $SS_{\text{between treatments}}$ in a repeated ANOVA?
   a. treatment effect, individual differences, and chance/error
   b. treatment effect and individual differences
   c. treatment effect and chance/error
   d. individual differences and chance/error

6. In a repeated-measures ANOVA, a P value is obtained by:
   a. $N-k$
   b. finding the sum of the scores for a participant in the study.
   c. finding the sum of the scores for a treatment.
   d. summing the T values of all treatments.
7. In a repeated-measures ANOVA the SS_{within treatments} is divided into two components. What are they?

- a. between treatments and error
- b. between subjects and error
- c. total variability and error
- d. between subjects and between treatments

8. The results of a repeated-measures ANOVA are reported as follows, F(3, 27)=1.12, p > .05. How many subjects participated in the study?

- a. 36
- b. 40
- c. 9
- d. 10

9. For a repeated-measures ANOVA, which of the following is computed differently, compared to an independent-measures ANOVA?

- a. the denominator of the F-ratio
- b. between treatment SS
- c. total SS
- d. within treatment SS

10. The appropriate denominator for the F-ratio for a repeated-measures ANOVA is:

- a. remaining variance when the variance within treatments is subtracted from the variance between subjects.
- b. remaining variance when the variance between subjects is subtracted from the variance within treatments.
- c. variance within treatments.
- d. variance between subjects.