

Psychology 320: Review Questions for the Final Exam. DISCLAIMER: The final exam for the class **may** draw from some of the questions presented on these pages. There is no guarantee that any of these questions will be used on the final exam. These are given for the purpose of study only. There may be some errors. Students are responsible for the correct solution regardless of whether there are errors on these pages. **ANSWERS for these questions WILL NOT be supplied by the instructor. Any student asking for the answers will be penalized on both their class participation grade and the personal evaluation of the instructor.**

1. The mean weight for team A with 15 members is 140 lbs., the mean weight for team B with 7 members is 135 lbs., and the mean weight for team C with 20 members is 160 lbs. The overall mean weight for all three teams is

- a 145.00
- b 138.78
- c 148.69
- d 178.43

2. Let's assume that we have determined the salary of all the professors at your school. In plotting the distribution of salaries we notice that it is positively skewed. For this distribution

- a. mean = median
- b. mean < median
- c. mean > median
- d. can't tell from the information given

3. For any distribution of scores $\sum (X - M) =$.

- a. 0
- b. $\sum X$
- c. 1
- d. M

4. A distribution has a mean of 78 and a median of 92. This distribution is

- a. symmetrical
- b. negatively skewed
- c. positively skewed
- d. not enough information given

5. In a positively skewed distribution, the mean

- a) underestimates central tendency
- b) overestimates central tendency
- c) is as accurate of central tendency as is the median
- d) accurately represents central tendency
- e) none of these

Questions 6, 7 and 8 pertain to the following situation. Suppose we are interested in the average reading achievement test score of the currently enrolled students in Edison Elementary School.

6. The average score of Ms. Grady's class is a

- a. sample
- b. statistic
- c. parameter
- d. population
- e. constant

7. The set of test scores for these children constitutes

- a. an element
- b. a sample
- c. a population
- d. a parameter

e. a statistic

8. The standard deviation of all students in Edison School is a

- a. variable
- b. sample
- c. population
- d. parameter
- e. statistic

9. In a certain statistics course, four exams were given. Each student's grade was based on a weighted average of his exam scores. The first two tests had weights of 1, the third test had a weight of 2, and the final test had a weight of 3. The exam scores for one student are listed below.

Exam	Grade
1	75.2
2	78.4
3	85.8
4	93.3

The student's overall average was _____.

- a. 83.2
- b. 83.17
- c. 83.175
- d. 83.18

10. Three scores in a distribution are: 20, 25, 35. The Z-score equivalents of the first two are, respectively, -1 and -5 . The Z-score equivalent of the third score

- a. 0.00
- b. 0.50
- c. 0.66
- d. 1.00
- e. cannot be determined from the above information

11. Which is not a defect of Z scores?

- a. about half the values will be negative
- b. decimals are required to assure sufficient discrimination between values
- c. they do not have an immediate meaning
- d. they are awkward for communicating to the ordinary public
- e. all of the above are defects

12. The formula for finding a score in a new distribution which is equivalent to a given score in another distribution is based on the principle that two scores will be considered equivalent if

- a. their Z-score position is the same
- b. their Z-score position is the same and the distributions are normal
- c. the same percentage of scores fall below each in their respective distributions
- d. all of the above are true
- e. only a and c are true

13. A score of 85 is received on a test in which $M = 100$ and $S = 15$. An equivalent score on a scale where $X = 50$ and $S = 10$ is

- a. 35
- b. 40
- c. 45
- d. 46
- e. none of the above

14. A score of 650 is earned on a test in which $M = 500$ and $S = 100$. An equivalent score on a scale where $X = 100$ and $S = 10$ is
- 105
 - 110
 - 113
 - 120
 - none of the above
15. For normal distributions, centile ranks
- tend to exaggerate differences between persons at the low end of the scale
 - tend to exaggerate differences between persons at the high end of the scale
 - tend to exaggerate differences between persons at the middle of the scale
 - represent differences between scores equally throughout the scale
 - none of these
16. The graph of a linear transformation is
- a line
 - a line which may be curved, but only in one direction
 - a straight line
 - a scatter plot of dots
 - none of the above
17. The major disadvantage of centile ranks as a kind of derived score is that
- they are not readily intelligible to the public
 - they cannot be determined accurately
 - they are suitable only when the distribution is normal
 - changes in raw scores are not necessarily reflected by proportionate changes in centile ranks
 - they are difficult to compute
18. If a set of scores is positively skewed, the set of Z-scores derived from them will be
- positively skewed
 - normally distributed
 - very close to a normal distribution, but slightly positively skewed
 - symmetrical but not normal
 - slightly negative in skew with the center point at the mean.
19. A raw score of 32 probably represents the poorest performance in a distribution having which set of characteristics?
- $M = 50, S = 20$
 - $M = 40, S = 5$
 - $M = 42, S = 10$
 - $M = 60, S = 30$
 - $M = 38, S = 9$
20. On a physics exam, the instructor gives a bonus question worth 10 points. The class average (mean) without counting the bonus question is 83. If everyone gets the bonus question correct, the class mean would
- remain the same
 - equal $83 + 10/N$
 - equal 93
 - exceed the median
21. The most commonly encountered measure of central tendency is the
- mean
 - median
 - mode
 - standard deviation
 - mean, median and mode are used equally

22. Which of the following is not a property of the mean?
- The mean is sensitive to the exact value of all the scores.
 - The sum of the deviations about the mean equals zero.
 - The sum of the squared deviations about the mean is a minimum.
 - The mean is most subject to sampling variation.
 - The mean is most affected by extreme scores.
23. What percentage of scores in the distribution fall between $Z = -2.00$ and $Z = +2.00$?
- 47.5
 - 68
 - 75
 - 95
 - cannot determine with information given
24. In a bell-shaped distribution, .
- median = mean
 - median > mean
 - median < mean
 - mode = median = mode
 - standard deviation equals variance
25. If a constant of 5 is subtracted from all of the scores, the standard deviation
- decreases by 5
 - decreases by $\sqrt{5/N}$
 - remains the same
 - decreases by $5/N$
26. Which of the following is not a measure of variability?
- standard deviation
 - range
 - index of dispersion
 - variance
 - all of the above are measures of variability
27. Which of the following do (does) not measure average dispersion?
- standard deviation
 - range
 - sum of squares
 - b and c
28. In calculating the standard deviation SPSS uses _____ in the denominator of the computational formula.
- N
 - $N-1$
 - $\sum (X - M)^2$
 - M
29. The most commonly encountered measure of variability is .
- range
 - standard deviation
 - index of dispersion
 - semi-interquartile range
 - variance
30. Which of the following is (are) not true?
- μ stands for the mean of a population
 - σ stands for the standard deviation of a population
 - s stands for the standard deviation of a sample
 - M stands for the mean of a sample
 - all of the above are true

31. Given the following scores: 42, 35, 10, 15, 20, 25, 42, 33, 32, 20, 25, 26, 28, 29, 28, 27. What is the centile rank for 42?
- a) 90.6
 - b) 93.8
 - c) 94
 - d) 97
 - e) none of these

Questions 32 – 36 pertain to the following data.

A testing bureau reports that the mean for the population of Graduate Record Exam (GRE) scores is 500 with a standard deviation of 90. The scores are normally distributed.

32. The percentile rank of a score of 667 is
- a. 96
 - b. 96.8
 - c. 96.9
 - d. 96.86
 - e. none of these
33. The proportion of scores, which lie above 650, is
- a 0.4525
 - b 0.9525
 - c .00475
 - d 0.05
34. The proportion of scores, which lie between 460 and 600, is
- a 0.4394
 - b .05365
 - c .04406
 - d .04635
 - e. none of these
35. The raw score that lies at the 90th percentile is
- a. 615
 - b. 385
 - c. 615
 - d. 1
 - e. 385
36. The proportion of scores between 300 and 400 is
- a. 0.3665
 - b. 0.4868
 - c. 0.8533
 - d. 0.1203
 - e. none of these
37. A normal distribution has a mean of 40 and std dev, of 5. What is the probability of sampling an individual with a score greater than 48?
- a) 0.4192
 - b) 0.4452
 - c) 0.0537
 - d) 0.0793
 - e) none of these
38. A normal distribution has a mean of 36 and S^2 of 16. What proportion of the distribution falls between scores of $X = 30$ and $X = 38$?
- a) 0.3753
 - b) 0.6247
 - c) 0.2417
 - d) 0.1997

e) 0.0963

39. A distribution is normal with $M = 45$ and $S = 4$. What is the 60th percentile?

- a) 47
- b) 40
- c) 49
- d) 46
- e) 48

40. A distribution with $M = 48$ and $S = 12$ is transformed into a new distribution with $M = 100$ and $SD = 20$. What is the value in the new distribution for a score of $X = 54$ from the original distribution?

- a) 20
- b) 110
- c) 146
- d) 52
- e) 90

41. A distribution of scores has a S of 20. Within this distribution, a score of $X = 80$ corresponds to a $Z = -0.50$. What is the mean of the distribution?

- a) 40
- b) 45
- c) 70
- d) 80
- e) 90

42. A distribution of scores has $M = 44$. Within this distribution, a X value of 38 corresponds to a $Z = -1.5$. What is the standard deviation of the distribution?

- a) 4
- b) -4
- c) 4.8
- d) -4.8
- e) none of these

43. The standard deviation of the Z distribution equals

- a. 1
- b. 0
- c. ΣX
- d. N
- e. s

44. The mean of the Z distribution equals

- a. 1
- b. 0
- c. ΣX
- d. N
- e. M

45. The Z score corresponding to the mean of a raw score distribution equals

- a. the mean of the raw scores
- b. 0
- c. 1
- d. N
- e. none of these

46. The normal curve is

- a. linear
- b. rectangular
- c. bell-shaped
- d. skewed
- e. both a and c

47. A distribution that is not a normal distribution is

- a) abnormal
- b) not useful
- c) the result of faulty information
- d) occurs only in psychological studies
- e) none of these

Questions 48, 49 and 50 use the following set of scores on a social psychology exam:

87, 69, 70, 75, 78, 80, 69, 79, 88, 86, 93, 90, 56, 77, 92

48. What is the corresponding Z-score for 77?

- a) **-0.22**
- b) **-0.23**
- c) **0.235**
- d) **0.23**
- e) **0.22**

49. The raw score $X = 88$ has an equivalent Stanford-Binet scaled score of

- a) **89**
- b) **90**
- c) **110**
- d) **111**
- e) **112**

50. The percentile rank for $X = 88$ is

- a) **76**
- b) **76.7**
- c) **77**
- d) **78**
- e) **80**

51. The length of time required for a math test was found to be approximately normal, with the average equal to 85 minutes, and a S of 13.3 minutes. Allowing sufficient time for 91% of the students to complete the test, the test should be terminated after how many minutes?

- a) **102.0**
- b) **102.8**
- c) **102.96**
- d) **103.0**
- e) **none of these**

52. A variable, X is normally distributed with unknown μ but a known σ of 2.57. The number of scores in the distribution is 10000. If 8023 scores are above the value of 12.2 what is the mean?

- a) **14.38**
- b) **14.39**
- c) **10.02**
- d) **10.01**
- e) **28.42**

53. A variable X is normally distributed with mean of 7.56 and a std. dev. of 0.715. What is the probability that $6.35 < X < 7.28$.

- a) **0.3070**
- b) **0.3708**
- c) **0.3094**
- d) **0.3030**
- e) **0.3748**

54. What is the value of Z_0 where the probability of $(-Z_0 < Z < Z_0) = .5$?
- 0.67
 - 0.68
 - 0.00
 - value above 1.99
 - none of these

For questions 55 and 56 use the following data:

Person	A	B	C	D	E	F	G	H	I	J
Score	12	12	7	10	9	12	13	8	9	8

55. The Z score for individual E is
- 0.47
 - 9.00
 - 4.27
 - 0.47
 - none of these
56. The Z score for individual G is
- 1.42
 - 13.00
 - 1.42
 - 6.16
 - none of these

Questions 57, 58 and 59 pertain to the following information.

A distribution has a mean of 60.0 and a standard deviation of 4.3.

57. The raw score corresponding to a Z score of 0.00 is
- 64.3
 - 14.
 - 4.3
 - 60
 - none of these
58. The raw score corresponding to a Z score of -1.51 is
- 54
 - 67
 - 66
 - 53
 - none of these
59. The raw score corresponding to a Z score of 2.02 is _
- 51.3
 - 68
 - 68.6
 - 68.7
 - none of these
60. If a population of scores is normally distributed, has a mean of 45 and a standard deviation of 6, the most extreme 5% of the scores lie beyond the score(s) of
- 35.13
 - 45.99
 - 56.76 and 33.24
 - 45.99 and 35.13
 - none of these

61. Correlation and regression differ in that
- correlation is primarily concerned with the size and direction of relationships
 - regression is primarily used for prediction
 - both a and b are true
 - neither a nor b are true
62. A scatter plot .
- has to do with electron scatter
 - is a graph of paired X and Y values
 - must be linear
 - is a frequency graph of X values
 - none of these
63. The primary reason we use a scatter plot in linear regression is
- to determine if the relationship is linear or curvilinear
 - to determine the direction of the relationship
 - to compute the magnitude of the relationship
 - to determine the slope of the least squares regression line
64. If a relationship is linear,
- the relation can be most accurately represented by a straight line
 - all the points fall on a curved line
 - the relationship is best represented by a curved line
 - all the points must fall on a straight line
65. In the equation $Y = aX + b$, X and Y are .
- constants
 - statistics
 - population parameters
 - variables
 - unknowns
66. In question 65, a is
- a constant
 - the slope of the line
 - the Y axis intercept
 - a and b
 - a variable
67. In question 65, b is
- a constant giving the value of the Y axis intercept
 - a constant giving the value of the slope of the line
 - a variable relating X to Y
 - a variable relating Y to X
 - none of these
68. In a positive relationship, .
- as X increases, Y increases
 - as X decreases, Y decreases
 - a and b
 - as X increases, Y decreases
 - none of these
69. In a negative relationship,
- as X increases, Y increases
 - as X decreases, Y decreases
 - a and b

- d. as X increases, Y decreases
e. none of these
70. In a positive relationship,
a. **a** is negative
b. **a** is positive
c. **b** must be positive d. **b** must be negative
71. In a negative relationship,
a. **a** is positive
b. **a** can be either positive or negative
c. **b** must be negative
d. **a** is negative
72. In a perfect relation, .
a. all the points fall on the line
b. none of the points fall on the line
c. some of the points fall on the line
d. the points form an ellipse around the line
73. In an imperfect relation, .
a. all the points fall on the line
b. a relationship exists, but all of the points do not fall on the line
c. no relationship exists
d. a relationship exists, but none of the points can fall on the line
74. A relation can be .
a. perfect
b. imperfect
c. nonexistent
d. a, b and c
75. The regression equation most often used in psychology minimizes
a. $\sum (Y - Y')$
b. $\sum (Y - Y')^2$
c. $\sum (Y - X)^2$
d. M
e. none of the above
76. The regression of Y on X.
a. predicts X given Y
b. predicts X' given X
c. predicts Y given X
d. predicts Y given Y'
77. The regression of X on Y
a. predicts Y given X
b. predicts Y given X
c. predicts X given Y
d. is generally the same as the regression of Y on X
e. c and d
78. During the past 5 years there has been an inflationary trend. Listed below is the average cost of a gallon of milk for each year.
- | 1981 | 1982 | 1983 | 1984 | 1985 |
|--------|--------|--------|--------|--------|
| \$1.10 | \$1.23 | \$1.30 | \$1.50 | \$1.65 |
- Assuming a linear relationship exists, and that the relationship continues unchanged through 1981, what would you predict for the average cost of a gallon of milk in 1986?

- a. \$1.77
- b. \$1.72
- c. \$1.70
- d. \$1.83
- e. none of these

79. An educational psychologist wanted to show that SAT scores provide a accurate indication of how a student will perform in college. A random sample of five students was selected. Due to technical difficulties, only the standard scores are available for each student. For the data below what is the coefficient of determination

Student	1	2	3	4	5
SAT	1.716	-.395	-.191	-1.348	.218
GPA	1.909	-.956	-.525	-.404	-.024

- a) .73
- b) .74
- c) .75
- d) .85
- e) .86

Questions 80-84 pertain to the following data

A researcher collects data on the relationship between the amount of daily exercise an individual gets and the percent body fat of the individual. The following scores are recorded.

Individual	1	2	3	4	5
Exercise (min)	10	18	26	33	44
% Fat	30	25	18	17	14

80. Assuming a linear relationship holds, the least squares regression line for predicting % fat from the amount of exercise an individual gets is

- a. $Y' = 0.476X + 33.272$
- b. $Y' = 1.931X + 66.363$
- c. $Y' = -0.476X + 33.272$
- d. $Y' = -0.432X + 32.856$
- e. none of these

81. If an individual exercises 20 minutes daily, his predicted % body fat would be

- a. 21.63
- b. 27.74
- c. 27.88
- d. 23.75
- e. none of these

82. The least squares regression line for predicting the amount of exercise from % fat is ..

- a. $Y' = -1.931X + 66.363$
- b. $Y' = -0.476X + 33.272$
- c. $Y' = 1.931X + 66.363$
- d. $Y' = -1.905X + 62.325$
- e. None of these

83. If an individual has 22% fat, his predicted amount of daily exercise is .

- a. 22.80
- b. 23.88
- c. 24.76
- d. 20.22
- e. none of these

84. The value for the standard error of estimate in predicting % fat from daily exercise is .

- a. 3.35
- b. 4.32

- c. 2.14
- d. 1.66
- e. none of above

85. Given the following regression equation: $Y' = 5 + 0.5X$, where X is a score on an attitude scale and Y is a job satisfaction score) In plotting this line, one set of points is $X = 0$ and $Y = 5$. The other set of points would be

- a) $Y = 4, X = -2$
- b) $X = 0, Y = 5$
- c) $X = 2, Y = 4$
- d) $Y = -3, X = -16$
- e) none of these

86. In which of the following cases would you NOT use the Pearson r?

- a) the range of scores in one distribution is restricted
- b) one of the distributions is skewed
- c) the relationship between variables is nonlinear
- d) a, b and c
- e) a and c only

87. A high value of the coefficient of determination indicates that

- a) there is a causal relationship between variables
- b) performing linear regression is unnecessary
- c) you can expect a large change in X as a function of Y
- d) b and c only
- e) none of these

88. With _____ you can estimate the value of one variable based on knowledge of the value of another.

- a) linear regression
- b) the Pearson r
- c) the slope of the line
- d) the standard error
- e) all of these

89. Which of the following is not a regression coefficient?

- a) a
- b) b
- c) r
- d) r^2
- e) all are regression coefficients.

90. The coefficient of determination allows you to

- a) determine two points on the regression line
- b) predict Y scores if you are given X scores
- c) predict X scores if you are given Y scores
- d) predict accurately
- e) none of these

91. When $r = 0$, the best estimate of Y from a known X is

- a) the standard deviation of X
- b) the standard deviation of Y
- c) Mean of X
- d) Mean of Y
- e) no prediction is possible

92. The primary reason we use a scatter plot in linear regression is

- a) to determine if the relationship is linear or curvilinear
- b) to determine the direction of the relationship

- c) to compute the magnitude of the relationship
- d) to determine the slope of the least squares regression line
- e) none of these

93. Which of the following statements is true?

- a) correlation implies causation
- b) causation implies correlation
- c) neither a nor b
- d) both a and b
- e) either a or b

94. The lowest degree of correlation shown below is

- a) 0.75
- b) -0.33
- c) -0.25
- d) 0.15
- e) 0.27

95. Data gathered show that people who earn high salaries tend to have larger vocabularies than people with low salaries. In causal terms, this indicates:

- a) increasing vocabulary tends to increase salary
- b) no conclusion can be drawn from the correlation alone
- c) increasing salary tends to increase vocabulary
- d) no increase in vocabulary tends to no increase in salary
- e) the relationship is due to some third variable such as intelligence

96. Given $M_x = 30$, $S_x = 3$, $M_y = 20$, $S_y = 5$ and $r_{xy} = 0.6$. What is the intercept of the regression line to predict Y using X?

- a) 0.30
- b) 0.36
- c) 1.00
- d) 22.8
- e) 9.2

97. Given $N=12$, $\Sigma XY = 1060$, $\Sigma Y^2 = 16224$, $M_x = 2.25$, $\Sigma X^2 = 113$, $\Sigma Y = 426$. What is the value for r ?

- a) 0.432
- b) 0.42
- c) 0.43
- d) 0.41
- e) none of these

98. The following least-squares equation: $Y' = 5.46 + 0.25X$ was found for the data given below:

Person	1	2	3	4	5	6
X	3	8	3	2	6	7
Y	3	9	7	8	8	5

The computed standard error of estimate is

- a) **0.01**
- b) **1.976**
- c) **1.608**
- d) **23.431**
- e) **15.523**

99. The closer the points on a scatter diagram fall to the regression line, the between the scores.

- a. higher the correlation
- b. lower the correlation
- c. correlation doesn't change
- d. need more information

100. Which of the following is (are) correct interpretation(s) of correlation? Correlation .

- a. indicates the degree of the relationship between two variables
- b. indicates a causal relationship between two variables
- c. is useful in deciding which variables to manipulate in an experimental study
- d. a and b
- e. a and c f. a, b and c

101. Knowing no more than that IQ and memory scores are correlated 0.84, you could validly conclude that

- a. good memory causes high IQ
- b. high IQ causes good memory
- c. neither good memory nor high IQ causes each other
- d. a third variable causes both good memory and high IQ
- e. none of the above

102. When deciding which measure of correlation to employ with a specific set of data, you should consider

- a. whether the relationship is linear or nonlinear
- b. type of scale of measurement for each variable
- c. the population mean and standard deviation
- d. a and b
- e. none of the above

103. The proportion of variance accounted for by a correlation between two variables is determined by .

- a. Y^2
- b. r^2
- c. r
- d. η^2 e. χ^2

104. Which of the following statements is true?

- a. Correlation implies causation.
- b. Causation implies correlation.
- c. neither a nor b
- d. both a and b

105. If the correlation between two sets of scores is 0 and one had to predict the value of Y for any given value of X, the best prediction of Y would be .

- a. **a**
- b. M_X
- c. 0
- d. M_Y

106. A traffic safety officer conducted an experiment to determine whether there is a correlation between people's ages and driving speeds. Six individuals were randomly sampled and the following data were collected.

Age	20	25	45	46	60	65
Speed (mph)	60	47	55	38	45	35

The value of Pearson r equals .

- a. -0.698
- b. -0.70
- c. +0.698
- d. +0.70 e. none of these

107. In question 106, the proportion of variability of Y accounted for by X is

- a. 0.487
- b. -0.49
- c. 0.49
- d. -0.487 e. none of these

108. For the data in question 106, is the correlation significant
- using $\alpha = .05$ 1 tail?
 - using $\alpha = .05$ 2 tail?
 - using $\alpha = .01$ 2 tail?
 - using $\alpha = .01$ 1 tail?
 - not significant
109. If $r = 0.458$, $S_Y = 3.438$, and $S_X = 5.217$, the value of **a**, the slope of the line of best fit predicting Y using X is
- 0.695
 - 0.70
 - 0.302
 - .30
 - none of the above

110. Each participant in a psychological experiment was measured on reaction time and the number of items correct:

Participant	1	2	3	4	5	6	7	8	9
Reac. time	3	10		4	5	9	8	7	5
# correct	8	15	6	6		12	10	10	8

The raw score regression equation for predicting reaction time from the number of items correct is

- $Y' = -3.48 + 1.024X$
 - $Y' = -1.36 + .805X$
 - $Y' = 4.57 + .805X$
 - $Y' = 3.15 + 1.024X$
 - $Y' = -1.4 + .808X$
111. If two variables have the same standard deviation, then the regression line
- slope equals 1
 - slope decreases as the correlation coefficient increases
 - slope is equal to the coefficient of determination
 - has a negative slope
 - slope is equal to the correlation coefficient
112. To reduce the Type II errors in testing statistical hypotheses, one must
- perform the calculations more carefully
 - develop independent checks
 - lower the sample size(s)
 - tolerate more Type I errors
 - use a more stringent level of significance
113. The Central Limit Theorem states that the sampling distribution
- of the mean will approach the normal curve as sample size gets larger
 - of the mean will approach the normal curve as the number of samples increases
 - of the mean will approach the normal curve only if the population is normally distributed
 - of any statistics will approach the normal curve as the number of samples increase
 - none of these
114. Which of the following are examples of parametric tests?
- t-test
 - F-test
 - Mann-Whitney U test
 - Chi-square test
 - a and b

115. Which of the following are examples of nonparametric tests?

- a. t-test
- b. Scheffé test
- c. Mann-Whitney U test
- d. F-test
- e. a and d

Use the following information for questions 116 – 119.

A researcher believes that women today weigh less than in previous years. To investigate this belief, he randomly samples 41 adult women and records their weights. The scores have a mean of 111 lbs. and a standard deviation of 12.4. A local census taken several years ago shows the mean weight of adult women was 115 lbs.

116. The test statistic value of the appropriate hypothesis test for testing H_0 is

- a. -2.07
- b. +2.07
- c. -0.32
- d. +0.32
- e. none of these

117. The df for determining the critical value is

- a. 41
- b. 40
- c. 39
- d. 42
- e. need more information

118. Using $\alpha = .01$, 2 tail, the appropriate critical value is .

- a. 2.20
- b. 2.71
- c. -2.02
- d. -2.71
- e. none of these

119. What do you conclude, using $\alpha = .01$, 2 tail?

- a. do not reject H_0
- b. accept H_0
- c. reject H_0
- d. retain H_0
- e. a and c

120. If a researcher rejects the null hypothesis, that person may be making

- a) a Type I error
- b) a Type II error
- c) a correct decision
- d) a and c
- e) b and c

121. If alpha is changed from .05 to .01,

- a) the probability of a Type II error decreases
- b) the probability of a Type I error increases
- c) the error probabilities stay the same; the probability of not rejecting H_0 increase
- d) the probability of not rejecting a false H_0 increases
- e) nothing important happens

122. Methods that allow us to determine whether a difference observed between two or more groups is likely to represent a real difference rather than a chance happening are called _____ statistics.

- a) inferential .
- b) descriptive
- c) hypothetical .

- d) null
 - e) vital.
123. The measure of variability associated with the distribution of sample means is called
- a) standard deviation
 - b) standard error of the mean
 - c) standard score
 - d) standard error of estimate
 - e) the sampling value of M
124. Rejecting the null hypothesis when the alternative hypothesis is true is
- a) Type I error
 - b) Type II error
 - c) correct decision
 - d) unknown or inconclusive
 - e) just not done today
125. In an experiment using the uncorrelated groups design, there are 10 subjects in one group and 12 subjects in the other group. The sampling distribution of t which is appropriate for that experiment is identical to the t distribution which is appropriate for a single sample design with _____ subjects.
- a. 22
 - b. 21
 - c. 20
 - d. 11
 - e. none of these
126. Which of the following are assumptions underlying the use of the t test for uncorrelated groups?
- a. the variance of each population is known
 - b. the sampling distribution of $M_1 - M_2$ must be normal
 - c. the samples are drawn from populations having equal variances
 - d. all of the above
 - e. b and c
127. A contingency table
- a. is a two-way table
 - b. involves two variables
 - c. involves two mutually exclusive variables
 - d. all of the above
 - e. a and b
128. A correlated groups design is more sensitive than an independent groups design if _____.
- a. there are large inter-subject differences
 - b. there are small inter-subject differences
 - c. the experimental treatment effect is strong
 - d. there is a high correlation between paired scores
 - e. a and e
129. The null hypothesis for a nondirectional H_1 using the t test for correlated groups asserts that _____.
- a. $\mu_1 - \mu_2 = 0$
 - b. $\mu_1 - \mu_2 \geq 0$
 - c. $\mu_1 - \mu_2 \neq 0$
 - d. $\mu_1 \neq \mu_2$
 - e. none of the above
130. Student's t test for correlated groups really reduces to
- a. Scheffe test
 - b. Student's t test for single samples using difference scores
 - c. Student's t test for uncorrelated groups
 - d. none of the above

131. Student's t test for correlated groups is .
- used to eliminate random error
 - simplify computations
 - generally impractical because we need to know more about each participant
 - generally less powerful than Student's t test for independent groups
 - reduce the effects of individual differences among participants
132. The t test for correlated groups requires that .
- the sampling distribution of X is normally distributed
 - $n > 30$
 - the population raw scores are normally distributed
 - the sampling distribution of $\mu_1 - \mu_2$ is normally is normally distributed
- e. b, c and d
133. Using the t test for uncorrelated groups, a directional alternative hypothesis predicts .
- $\mu_1 > \mu_2$
 - $\mu_1 = \mu_2$
 - $\mu_1 < \mu_2$
 - a or c, depending on the direction
 - all of the above
134. The χ^2 test is .
- always directional
 - never directional
 - generally nondirectional
 - generally directional
135. In the t test for uncorrelated groups, .
- we estimate $\mu_1 - \mu_2$
 - we estimate σ^2
 - we estimate $M_1 - M_2$
 - $df = N - 1$
136. If you reject the null hypothesis you may be making,
- a correct decision
 - a Type 1 error
 - a Type 2 error
 - a and c
 - a and b

In answering questions 137 - 140 refer to the following data.

A professor of women's studies is interested in determining if stress affects the menstrual cycle. Ten women are randomly sampled for an experiment and randomly divided into two groups. One of the groups is subjected to moderate stress for two months while the other lives in a relatively stress-free environment. The professor measures the menstrual cycle (in days) of each woman during the second month. The following data are obtained.

moderate stress	18	25	17	20	23
relatively stress-free	20	23	26	30	28

137. The computed test statistic value (rounded to 2 decimal places) for this hypothesis test is
- 2.06
 - 2.07
 - 0.29
 - 2.16
 - none of these
138. The df for determining the critical value is
- 4

- b. 9
- c. 8
- d. 3
- e. none of these

139. Using $\alpha = .05$, 2 tail, the critical value is
- a. +2.26
 - b. +2.31
 - c. -2.26
 - d. -2.31
 - e. none of these

140. Using $\alpha = .05$, 2 tailed-test, your decision and conclusion is
- a. accept H_0 ; there is insufficient evidence stress affects the menstrual cycle
 - b. do not reject H_0 ; there is insufficient evidence that stress affects the menstrual cycle
 - c. do not reject H_0 ; there is evidence that stress does not affect the menstrual cycle
 - d. reject H_0 ; there is evidence stress affects the menstrual cycle
 - e. reject H_0 ; there is sufficient evidence stress affects the menstrual cycle

In answering questions 141 - 144, refer to the following experiment.

A health educator wants to evaluate the effect of a dental film on the frequency with which children brush their teeth. A random selection of 8 children is used for the experiment. First, a baseline of the number of times the children brush their teeth over a month's period is established. Next, the children are shown the dental film and again the number of teeth brushings are recorded for a month. The following data are recorded.

subject	1	2	3	4	5	6	7	8
After film	28	29	25	30	25	27	28	24
Baseline	25	28	22	30	26	24	25	22

141. The computed test statistic value rounded to 2 decimal places is
- a. 3.13
 - b. 3.14
 - c. 3.58
 - d. 3.57
 - e. none of these

142. The df for determining the critical value is
- a. 8
 - b. 16
 - c. 7
 - d. 14
 - e. none of these

143. Using $\alpha = .05$, 2 tail, the critical value is
- a. 2.37
 - b. 2.36
 - c. 2.14
 - d. 2.15
 - e. none of these

144. Using $\alpha = .05$, 2 tailed-test, what do you conclude?
- a. retain H_0 ; there is insufficient evidence that the film has an effect on the frequency of tooth brushing
 - b. reject H_0 ; there is sufficient evidence that the film affects the frequency of tooth brushing
 - c. reject H_0 ; there is evidence that the film affects the frequency of tooth brushing
 - d. accept H_0 ; there is evidence that the film has no effect on the frequency of tooth brushing
 - e. reject H_0 ; there is insufficient evidence that the film does not have an effect on tooth brushing

145. In the t test when the size of the sample is increased and $\alpha = .05$, the value of β
- a. increase

- b. decreases
- c. stays the same
- d. is equal to $1 - \alpha$
- e. c and d

146. The parameter being estimated in the analysis of variance is the .

- a. sample mean
- b. variance of the Ho populations
- c. sample variance
- d. mean of the Ho populations
- e. the test statistic. F

147. Given two samples where Sample 1 has $M = 19$, $S.D. = 30$, $N = 12$ and Sample 2 has $M = 18$, $S.D. = 6$, and $N = 10$. If s_{DM} is computed to be 10.1, your conclusion about these samples would be

- a) that they are probably not statistically different
- b) that they are related or matched samples
- c) retain the hypothesis of equal means
- d) reject the hypothesis of equal means
- e) that they are probably statistically different

148 With a computed chi-square value of 23.33 for a goodness-of-fit where $k = 15$, the chi-square value is

- a) significant at the .05 level
- b) significant at the .01 level
- c) significant at the .001 level
- d) not significant at .05 and .01 levels
- e) a and b

149. A psychologist designed and collected data from a study designed to determine which therapy is best in reducing math test anxiety. Subjects were given a math test after treatment and the scores are represented in terms of centile ranks.

Method	Centile Scores			
A	75	80	65	74
B	90	72	70	76 77
C	83	86	69	67

The critical value for this problem using $\alpha = .01$ is

- a) 9.21
- b) 7.744
- c) 7.5385
- d) 7.56
- e) none of these

150. In an independent samples design, the Dogs mean was 54.0 and the Cats mean was 53.9. Larger scores are better. A t-value of 2.50 was calculated. For a two-tailed test with $\alpha = .05$, which conclusion is appropriate?

- a) If $df = 5$, Dogs are significantly better than Cats
- b) If $df = 4$, Cats are significantly better than Dogs
- c) If $df = 8$, Dogs are significantly better than Cats
- d) If $df = 8$, Cats are significantly better than Dogs
- e) If $df = 9$, Dogs are not significantly different from Cats

151. If the group means in an one-way ANOVA are found to be very different from one another, the value of MSW / MSB should be

- a) less than 1
- b) greater than 1
- c) approximately equal to 1
- d) unaffected by the value of the group mean
- e) b and d

152. Which one of the following does not illustrate two dependent samples?

- a) College sophomores are split into two groups
- b) Marital couples are split into two groups
- c) Typists' performance is measured on two different word processors
- d) School children are measured before and after the school term
- e) all of the above illustrate two dependent samples

153. The percentages of Freshmen, Sophomores, Juniors and Seniors at a private school in 1970 were 33, 28, 22, and 17 respectively. In 1995, the school consisted of 226 Freshmen, 214 Sophomores, 191 Juniors and 101 Seniors.. What is the numerical value of the test statistics that would be used to determine if the composition of the school has changed after 25 years?
- a) 2.97
 - b)) 5.70
 - c) 8.00
 - d) 11.39
 - e) cannot be determined from data given

Questions 154, 155, and 156 use the following information

A researcher interested in the effects of marijuana on recognition of auditory stimuli presented eight subjects with an auditory stimulus. The amount of time, in seconds, it took each subject to recognize the stimulus was measured. This task was performed twice (1) while under the influence of marijuana and (2) while not under the influence of marijuana. Data are presented below:

Subject	1	2	3	4	5	6	7	8
Marijuana	0.73	0.83	0.69	0.67	0.72	0.43	0.84	1.02
No Marijuana	0.63	0.65	0.64	0.41	0.71	0.44	0.83	0.86

154. The appropriate statistical test to use for these data would be
- a) independent group t-test
 - b) paired-difference t-test
 - c) Wilcoxon Rank Sum test
 - d) Mann-Whitney U test
 - e) Tukey HSD test
155. The independent variable for this study is (are)
- a) amount of time
 - b) amount of marijuana
 - c) auditory stimulus
 - d) recognition
 - e) two presentations
156. The dependent variable for the study is (are)
- a) amount of time
 - b) amount of marijuana
 - c) auditory stimulus
 - d) recognition
 - e) two presentations

Given the following incomplete ANOVA summary table for a research study. Compute the missing values, then answer questions 157 and 158.

Source	df	Sums of Squares	Mean Square	F
Within Groups	36	1518.6		
Between Groups	3	553.5		
Total	39			

157. The computed value for MS treatment is
- 2072.1
 - 42.1833
 - 184.5000
 - 553.5
 - 1518.6
158. Using the computed F-value, the null hypothesis
- would be rejected using $\alpha = 0.05$
 - would be rejected using $\alpha = 0.01$
 - both a and b
 - would not be rejected at $\alpha = 0.05$
 - cannot be determined from information given
159. If its assumptions are met, the analysis of variance technique is appropriate when
- two or more factors are varied
 - several levels of a single independent variable are compared
 - three or more groups are involved
 - all of the these
160. As the differences between the group means increases,
- MSB increases
 - F value decreases
 - t, the test statistic decreases
 - all of these
 - none of the above

Questions 161 and 162 uses the following data:

Given the following raw data collected from a psychology experiment on the effects of a tranquilizer on depression. The lower values indicate greater depression.

Conditions					T	T ²	M	
Placebo (P)	12	8	15	13	48	2304	12.00	
Low Dose (L)	18	24	16	25	83	6889	20.75	
High Dose (H)	16	7	10	8	41	1681	10.25	

161. For these data analyzed with an ANOVA, the SS within is
- 386.666
 - 421.818
 - 133.5000
 - 168.651
 - 253.1666
162. One possible statement of the research hypothesis would be
- $\mu_P \neq \mu_L \neq \mu_H$
 - $\mu_P \neq \mu_L$
 - $\mu_P = \mu_L = \mu_H$
 - $\mu_P > \mu_L > \mu_H$
 - none of these
163. If $SS_T = 20$ and $SS_B = 14$, $SS_W =$
- 34
 - 6
 - 14/20
 - need more information
164. The F value in the ANOVA summary table increases as
- the variability between means increases relative to the variability within groups
 - the variability between means decreases relative to the variability within groups

- c. the total variability increases
- d. the total variability decreases
- e. the variability within groups remains the same

165. Which of the following is (are) true about the F distribution?

- a. it has no negative values
- b. it is positively skewed
- c. there are a family of F curves uniquely determined by df(numerator) and df(denominator)
- d. the mean of the F distribution equals 0
- e. e. a, b and c

166. If we have one IV with four levels and we did a t-test between all possible nonredundant pairs of sample means at the 1% level of significance, the overall familywise error rate will be approximately

- a) 0.01
- b) 0.01/6
- c) 0.05
- d) 0.06
- e) none of these listed

Questions 167 and 168 uses the data from the following problem:

A single sample of size $n = 13$ is drawn from a population where $\mu = 15.673$. The M is 18.285 and the S is 3.621.

167. In a hypothesis test where $H_1: \mu > 15.673$, $\alpha = .01$, the critical value is approximately

- a) 2.681
- b) 3.055
- c) 1.782
- d) 2.650
- e) none of these

168. In a hypothesis test where $H_1: \mu > 15.673$, $\alpha = .01$, the test statistic value is approximately

- a) 2.659
- b) 2.601
- c) 2.555
- d) 2.499
- e) none of these

169. A major limitation of a two-group design is that

- a. we can't run enough subjects
- b. very often, two groups are insufficient for a clear interpretation
- c. the population parameters may not be applicable
- d. the means between groups may not differ
- e. there are no limitations

170. When analyzing data from experiments which involve more than two groups

- a. doing t tests on all possible pairs of means decreases the probability of making Type I errors
- b. doing t tests on all possible pairs of means increases the probability of making Type I errors
- c. it is generally permissible to do t tests between all possible pairs of means and use t distribution
- d. doing t tests on all possible pairs of means increases the probability of making Type II errors
- e. stop and do nothing

171. The alternative hypothesis in the one-way ANOVA with 3 groups is

- a. $\mu_1 = \mu_2 = \mu_3$
- b. $\mu_1 \neq \mu_2 \neq \mu_3$
- c. $\mu_1 > \mu_2 > \mu_3$
- d. b or c
- e. none of these

172. The alternative hypothesis in the one-way ANOVA with 4 levels of the IV states that

- a. all conditions have the same effect
- b. one or more of the conditions have different effects

- c. $\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$
 - d. $\mu_1 = \mu_2 = \mu_3 = \mu_4$
 - e. b or c
173. Which of the following is(are) true?
- a. df for MSW = $N - k$
 - b. df for MSB = $k - 1$
 - c. $df_T = N - 1$
 - d. all of the above
174. The one-way ANOVA partitions the total variability into .
- a. SSw and SSB
 - b. MSW and MSB
 - c. SSw and SST
 - d. SSB and MSB
175. Which of the following would cause F, the test statistic to increase?
- a. an increase in the difference between the means
 - b. an increase in the within-groups variability
 - c. an increase in the magnitude of the independent variable's effect
 - d. a and b
 - e. a and c
- 176 If $df_B = 2$ and $df_W = 14$, using $\alpha = .05$, The critical value would be
- a. 19.42
 - b. 4.60
 - c. 3.74
 - d. 6.51
 - e. none of these
177. MSB is a measure of
- a. σ^2 alone
 - b. σ^2 + the effects of the independent variable
 - c. the variability between the means
 - d. b and c
178. The two-way analysis of variance .
- a. assesses the effects of two independent variables in one experiment
 - b. allows an assessment of the interaction between two independent variables
 - c. results in calculation of three F ratio's
 - d. all of the above
 - e. a and b
179. Which of the following are called "main effects" in a two-way analysis of variance?
- a. the effect of Factor A
 - b. the effect of Factor B
 - c. the interaction of Factors A and B
 - d. all of the above
 - e. a and b
180. In a two-way ANOVA, if there is a significant interaction between Factor A and Factor B, which of the following may be true?
- a. the effect of Factor A is not the same at all levels of Factor B
 - b. The effect of Factor B is not the same at all levels of Factor A
 - c. the effects of the two Factors do not differ across levels
 - d. a and/or b
 - e. need more information
181. The row variance estimate MSR and the column variance estimate MSC are used to measure .
- a. the main effects of the independent variables
 - b. the interaction effects of the independent variables
 - c. a and b

d. none of the above

Questions 182 - 191 pertain to the following data.

An investigator conducts an experiment involving the effects of three levels of a drug on memory. Subjects are randomly assigned to one of three conditions. A different drug level is administered in each condition. Memory is measured 10 minutes after each subject receives the drug. The following scores are recorded. The higher the score, the better the memory.

Drug Level		
1	2	3
6	9	14
10	7	13
8	9	15
12	13	19

182. $SS_B =$

- a. 94.2 b. 96.0 c. 96.5 d. 97.4

183. $SS_w =$

- a. 62.25 b. 59.75 c. 56.65 d. 57.00

184. $MS_B =$

- a. 48.250 b. 50.145 c. 51.254 d. 45.750

185. $MS_w =$

- a. 6.813
b. 6.558
c. 6.702
d. 6.639

186. F (The test statistic) =

- a. 8.31
b. 7.30
c. 7.27
d. 6.45

187. Using $\alpha = .05$, the critical value is

- a. 8.02
b. 4.26
c. 19.38
d. 4.46
e. none of these

188. Using $\alpha = .05$, what do you conclude?

- a. reject H_0 ; there is evidence the drug has the same effect on memory at all levels
b. reject H_0 ; there is evidence the drug does not have the same effect on memory at all levels
c. do not reject H_0 ; there is insufficient evidence that the drug affects memory
d. accept H_0 ; there is evidence that the drug has no effect on memory
e. retain H_0 ; there is insufficient evidence that the drug does not affect memory

189. Assume you are going to do a *post hoc* comparison between drug levels 2 and 3 using the HSD test. The obtained value from the appropriate statistical table for the appropriate statistic is _____.

- a. $t = -3.16$
b. $q = 4.46$
c. $q = -4.46$

- d. $q = 5.25$
190. Using $\alpha = .05$, the appropriate HSD critical value is .
 a. 2.179
 b. 3.20
 c. 3.95 d. 5.43 e. none of these
191. Using $\alpha = .05$, what is your conclusion?
 a. Level 2 is significant greater than Level 3
 b. Level 2 is significant lesser than Level 3
 c. Level 2 is significant different than Level 3
 d. the level 2 and 3 are not significantly different e. none of these
192. A significant interaction effect occurs when
 a. there are no main effects
 b. variable A has a main effect and variable B does not
 c. the combined effects of variables A and B yield an unexpected effect
 d. none of the above
193. The null hypothesis for the two-way ANOVA asserts that .
 a. the within-cells variance estimate is an estimate of σ^2
 b. $\mu_{a1} = \mu_{a2} = \mu_{a3} = \mu_{ar}$
 c. $\mu_{b1} = \mu_{b2} = \mu_{b3} = \mu_{bc}$
 d. $\mu_{a1b1} = \mu_{a1b2} = \mu_{arbc}$
 e. b, c and d
194. Which of the following increase(s) as the effect of the A variable increases?
 a. MSR
 b. MSC
 c. MSW
 d. d. $MSR \times C$
195. Which of the following increase(s) as the effect of the B variable increases?
 a. MSR
 b. MSC
 c. MSW
 $MSR \times C$
196. Which of the following increase(s) as the interaction effect increases?
 a. MSR
 b. MSC
 c. MSW
 d. $MSR \times C$
197. If the null hypothesis is correct, which of the following is (are) an estimate of σ^2 ?
 a. MSR
 b. MSC
 c. MSW
 d. $MSR \times C$
 e. all of these
198. If there are no main effects, then .
 a. MSC/MSW is less than the critical value
 b. MSR/MSW is less than the critical value
 c. $MSR \times C/MSW$ is less than the critical value
 d. a and b

- e. b and c
199. If the A variable has a real effect, .
- MSC/MSW must equal or exceed the critical value
 - MSR/MSW must equal or exceed the critical value
 - it is possible that MSC/MSW is less than the critical value
 - it is possible that MSR/MSW is less than the critical value
200. A main effect for variable A means that
- the effect of variable A is the same over all levels of variable B
 - the effect of variable A is significant when averaged over all levels of variable B
 - the effect of variable A is not the same over all levels of variable B
 - variable A has a greater effect than variable B
201. In a normal distribution with $N = 200$, we would expect to find how many cases between +1 S.D. and +2.0 SD?
- 100
 - 136
 - 32
 - 27
 - 50
202. A two-tailed test is _____ powerful than a one-tailed test if the difference is in the direction that we would have predicted.
- more
 - less
 - equally
 - almost as
 - more or less
203. Which of the following F values, if obtained from an experiment would lead to multiple comparison tests if the probability of a Type I error is .01?
- $F = 10.5$, $df = 1, 10$
 - $F = 4.08$, $df = 3, 8$
 - $F = 6.00$, $df = 4, 9$
 - $F = 4.98$, $df = 9, 10$
 - at least two of the previous choices
204. The acronym "SPSS" stands for
- Statistical Programs for the Social Sciences
 - Statistical Package for the Social Sciences
 - Statistics Programs for the Social Sciences
 - Statistical Package for Scientific Studies
 - none of these
205. The "sig" level reported in an SPSS output is essentially equivalent to saying
- H_0 is rejected given H_0 is not true
 - H_0 is accepted given H_0 is not true
 - H_0 is rejected given H_0 is true
 - H_0 is not rejected given H_0 is true
 - cannot determine with information given
206. When raw scores are transformed to standard scores using a linear transformation, the resulting standard scores will
- be normally distributed
 - maintain the same standard deviation but different mean as the raw scores
 - maintain the same shape distribution as the raw scores
 - maintain the same centile ranks as the raw scores

e) at least two of the choices above.

207. A two-factor experiment has been done to test the effects of an antipsychotic drug on schizophrenic behavior. Patients in this study were divided into expressed aggression groups (high, medium, and low) and each was given one of two dosage levels (high and Low). The cell means of the dependent variable are given in the table below:

		B: Dosage	
		Low	High
A: Aggression	Low	15	30
	Medium	15	15
	High	10	30

These data most likely depicts

- a) significant A effect, significant B effect, nonsignificant interaction
- b) nonsignificant A effect, significant B effect, nonsignificant interaction
- c) nonsignificant A effect, nonsignificant B effect, significant interaction
- d) significant A effect, significant B effect, significant interaction
- e) cannot determine from information given

208. The two-way analysis of variance .

- a. assesses the effects of two independent variables in one experiment
- b. allows an assessment of the interaction between two independent variables
- c. results in calculation of three F ratio's
- d. all of the above
- e. a and b

209. Which of the following are called "main effects" in a two-way analysis of variance?

- a. the effect of Factor A
- b. the effect of Factor B
- c. the interaction of Factors A and B
- d. all of the above
- e. a and b

210. In a two-way ANOVA, if there is a significant interaction between Factor A and Factor B, which of the following may be true?

- a. the effect of Factor A is not the same at all levels of Factor B
- b. The effect of Factor B is not the same at all levels of Factor A
- c. the effects of the two Factors do not differ across levels
- d. a and/or b
- e. need more information

211. The row variance estimate MSR and the column variance estimate MSC are used to measure .

- a. the main effects of the independent variables
- b. the interaction effects of the independent variables
- c. a and b
- d. none of the above

For questions 212-220, refer to the following material.

An investigator collects the following data on variables A and B, using a two-way independent groups design. Use $\alpha = .05$ in analyzing the data.

	Variable B		
	(1)	(2)	(3)
Variable A	10	13	15
	12	15	19
	14	17	20

	18	22	25
	17	16	19
	15	18	26
	17	19	30
(2)	19	22	31
	23	27	36
	20	21	29

212. The value of the test statistic, F for the A variable is
- 2.66
 - 16.34
 - 29.11
 - 11.23
 - none of these
213. The value of the test statistic, F for the B variable is
- 2.66
 - 16.34
 - 29.11
 - 11.23
 - none of these
214. The value of the test statistic, F for the interaction is
- 2.66
 - 16.34
 - 29.11
 - 11.23
 - none of these
215. The critical value for the A variable equals
- 3.40
 - 7.82
 - 5.81
 - 4.26
216. The critical value for the B variable equals
- 3.40
 - 7.82
 - 5.81
 - 4.26
217. The critical value for the interaction equals
- 3.40
 - 7.82
 - 5.81
 - 4.26
218. The conclusion regarding the A variable is
- do not reject H_0 ; there is insufficient evidence for an A effect.
 - reject H_0 ; there is evidence of a significant main effect for variable A
 - accept H_0 ; there is evidence that variable A has no real effect
 - reject H_0 ; there is evidence that variable A had only a chance effect
219. The conclusion regarding the B variable is .
- do not reject H_0 ; there is insufficient evidence for an B effect.
 - reject H_0 ; there is evidence of a significant main effect for variable B
 - accept H_0 ; there is evidence that variable B has no real effect

- d. reject H_0 ; there is evidence that variable B had only a chance effect
220. The conclusion regarding the interaction is.
- do not reject H_0 ; there is insufficient evidence for an interaction effect between variables A and B
 - accept H_0 ; there is evidence of a chance is a reasonable explanation
 - reject H_0 ; there is evidence of a significant interaction between variables A and B
 - reject H_0 ; there is insufficient evidence against no interaction between variables A and B
221. Given $\sum x^2 = 28$, $n = 10$, $M = 8$ in a test of the hypothesis: $H_0: \mu = 6.6$ versus $H_1: \mu \neq 6.6$. What is the value for the standard error?
- 2.37
 - 2.51
 - 0.56
 - 0.59
 - none of these
222. Suppose the difference between the two sample means is 2.63 standard error units away from 0. A friend would be correct in saying "I failed to reject the null hypothesis" if
- the df is 13 and $\alpha = .01$, one tail test
 - the df is 5 and $\alpha = .05$, two tail test
 - the df is 21 and $\alpha = .01$, one tail test
 - the df is 3 and $\alpha = .05$, one tail test
 - none of these
223. In a poll of recent college females graduates, 65 said they want careers and 35 said they did not. The response of female high school graduates was 45 for careers and 55 not for careers. What is the value of chi-square?
- 0.3
 - 3.8
 - 8.1
 - 10.8
 - 7.9
224. Chi-square is used to test differences between .
- proportions
 - means
 - variances
 - none of the above
225. The larger the discrepancy between f_o and f_e for each cell,
- the more likely the results will not be significant
 - the more likely H_0 will be rejected
 - the more likely the population proportions are the same
 - the more likely the population proportions are different
 - a and c
 - b and d
226. For any given alpha level, the critical value for the chi-square test .
- increases with increases in N
 - decreases with increases in N
 - increases with increases in degrees of freedom
 - a and c
227. Chi-square should not be used if
- df = 1
 - f_e is below 5
 - f_o is below 5

- d. $f_e = f_0$
228. Chi-square may be used with
 a. nominal data
 b. ordinal data
 c. interval data
 d. ratio data
 e. all of these
229. To compute χ^2 , the entries in the contingency table should be
 a. frequencies
 b. means
 c. variances
 d. degrees of freedom
230. The degrees of freedom for a contingency table equal
 a. $rc - 1$
 b. $(r - 1)(c - 1)$
 c. $(r - 1)(c)$
 d. $(c - 1)(r)$
 e. $N - 1$
231. In most situations, parametric tests
 a. have the same power as nonparametric tests
 b. are less powerful than nonparametric tests
 c. are more powerful than nonparametric tests
 d. are less sensitive than nonparametric tests
 e. b and d
232. Which of the following are true?
 a. f_0 is the symbol for the observed frequency
 b. f_e is the symbol for the expected frequency
 c. χ^2 is the symbol for chi-square
 d. all of the above
233. The sampling distribution of chi-square is .
 a. skewed
 b. varies with df
 c. is a theoretical distribution
 d. all of the above
 e. a and b
234. When evaluating χ^2 test statistic the critical region for rejection of H_0
 a. lies under both tails of the distribution
 b. lies under the right hand tail of the distribution
 c. lies under the left hand tail of the distribution
 d. lies in the middle of the distribution
 e. none of these

For questions 235 - 238 refer to the following information.

Prior to a recent gubernatorial election, a survey was conducted to determine whether there was a relationship between sexual gender and preference for the Democratic or Republican candidate. The following data were recorded.

	Candidate Preference		
	Republican	Democrat	
Female	82	118	200
Male	68	132	200
	150	250	400

235. The value of χ^2 (test statistic) =
- 2.06
 - 2.09
 - 1.80
 - 1.75
 - none of these

236. The value of df =
- 2
 - 1
 - 3
 - need more information

237. Using $\alpha = .05$ the critical value is
- 3.841
 - 5.412
 - 2.706
 - 3.841
 - none of these

238. Using $\alpha = .05$, what is your conclusion?
- accept H_0 ; there is evidence that no relationship between sex and candidate preference
 - reject H_0 ; there is evidence of a significant relationship between sex and candidate preference
 - retain H_0 ; there is evidence the study does not show a significant relationship between sex and candidate preference
 - do not reject H_0 ; there is insufficient evidence that this study shows a significant relationship between sex and candidate preference

239. In a hypothesis test that compares three teaching methods, A, B and C, the null alternative hypothesis would be
- $\mu_1 = \mu_2 = \mu_3$
 - $\mu_1 \neq \mu_2 \neq \mu_3$
 - $\mu_B = \mu_C = \mu_A$
 - $\mu_C \neq \mu_B \neq \mu_A$
 - none of these

240. The term "nonparametric statistics" refers to a variety of statistical procedures which
- make no assumption regarding the spread of the scores from the population
 - deal only with scores which can be ranked
 - require non-normally distributed data
 - make no underlying assumption about the reliability of the data
 - b and c

241. Given the following ANOVA Summary Table:

Source	df	SS	MS	F
A	2	9.94	4.97	3.31
B	3	13.95	4.65	3.10
AB	6	22.32	3.72	2.48
Error	24	36.00	1.50	
TOTAL	35	82.21		

Assuming equal sample sizes for all treatment combinations, if the appropriate Tukey test were to be performed to determine which mean differences are statistically significant, which of the following would be the correct value for **HSD** at $\alpha = .05$?

- 1.248
- 1.592
- 3.606
- at least 2 of these
- none of these

242. A developmental psychologist developed a theory that predicted the proportion of children who would during a period of stress (1) cling to the mother, (2) attack the mother or (3) attack a younger sibling. The stress situation was setup and the responses of 50 children recorded. The appropriate χ^2 test is a test of
- goodness of fit with 2 df
 - goodness of fit with 40 df
 - independence with 2 df
 - independence with 49 df
 - none of these
243. For an experiment comparing three treatment conditions with a sample of $n=10$ in each treatment, the F-value would have degrees of freedom equal to
- 29
 - 2, 29
 - 2, 27
 - 3, 27
 - none of these
244. When samples are dependent, this affects the
- choice of h_0
 - choice of h_1
 - mean of the sampling distribution
 - standard deviation of the sampling distribution
 - b and c
245. In statistical work, a significant difference is one that is large enough
- to be meaningful to experimenter
 - that it would rarely be expected to occur by chance
 - that chance cannot affect it
 - that it leads to acceptance of the null hypothesis
 - to satisfy the general population

A psychologist wanted to determine if the type of therapy was related to the level (amount) of recovery for psychotic patients. The data were collected and summarized by two graduate students. In the process, the raw data were lost but partial observed and expected frequencies were found and given below. **Questions 246 through 249** pertain to these data. Hint: a correct answer can be determine for Questions 246 and 247 without knowing the missing values.

Observed Frequencies

Level of Recovery	Type of Therapy		
	A	B	C
High	19	?	14
Medium	20	6	?
Low	10	12	18

Expected Frequencies

Level of Recovery	Type of Therapy		
	A	B	C
High	22.430	22.887	19.683
Medium	?	13.028	11.204
Low	13.802	14.085	12.113

246. For the data given above, the degrees of freedom is
- 8
 - 4
 - 3
 - 2
 - 1

247. The critical value for $\alpha = 0.01$ is
- a) 9.21
 - b) 11.3
 - c) 13.3
 - d) 6.63
 - e) 18.5
248. The total number of subjects participating in this study is
- a) 132
 - b) 98
 - c) 92
 - d) 142
 - e) 190
249. The computed test statistic is
- a) 17.89
 - b) 17.90
 - c) 17.91
 - d) 17.92
 - e) none of these
250. According to your instructor, nonparametric tests are based on a sampling distribution of
- a) means
 - b) mean differences
 - c) ranks
 - d) variances
 - e) percentiles
251. The nonparametric test that corresponds in design to the one way anova is the
- a) Chi-square
 - b) Mann-Whitney U
 - c) Wilcoxon Rank Sum
 - d) Cramer's V
 - e) none of these
252. When comparing parametric statistical tests with nonparametric ones,
- a) the power of parametric ones is higher than the nonparametric ones when the data are parametric
 - b) the power of parametric ones is higher than the nonparametric ones when the data are nonparametric
 - c) the power of parametric ones is lower than the nonparametric ones when the data are parametric
 - d) the power of parametric ones is about the same as the nonparametric ones when the data are nonparametric
 - e) none of these
253. In a statistical test, $1 - \alpha$ is
- a) the probability of accepting a false H_0
 - b) the probability of rejecting a false H_0
 - c) the probability of rejecting H_0 when H_0 is true
 - d) the probability of not rejecting H_0 when H_0 is false
 - e) none of the above
254. If the outcome of a hypothesis test is significant at the .05 level, it
- a) will also be significant at the .01 level
 - b) will not be significant at the .01 level (one-tail)
 - c) will not be significant at the .01 level (two-tail)
 - d) may be significant at the .01 level
 - e) none of the above

255. If the distribution is symmetrical, which is the best measure of central tendency?

- a. mode
- b. median
- c. mean
- d. variance

Short Answer Questions

1. List three characteristics of a Z distribution.
2. Is a Z distribution always normally shaped? Explain.
3. Does the z transformation result in a score having the same units of measurement as the raw score?
4. Explain. Why is this advantageous?
5. Define the following: positive, negative, linear, curvilinear, perfect, and imperfect relationship.
6. Why is it important to know the standard error of estimate for a set of paired scores?
7. The analysis of variance is a nondirectional technique and yet it uses a one-tailed evaluation. Is this statement correct? If so, how can you explain this apparent contradiction?
8. The analysis of variance technique analyzes the variability of the data. Yet a significant F value indicates there is at least one significant mean difference between the conditions. How does analyzing the variability of the data allow conclusions about the means of the conditions?
9. In the two-way ANOVA, what is a main effect? What is an interaction?
10. Describe the sampling distribution of F.
11. Briefly describe the process involved in hypothesis testing, beginning with H_1 and H_0 , and ending with generalization to the population.
12. Define Type I and Type II error. Why is it important to know the possible errors we might make when rejecting or not rejecting H_0 ?
13. When is it appropriate to use a directional hypothesis? Discuss.
14. Why is alpha usually set at .05 or .01?
15. Why do we directly evaluate H_0 rather than H_1 ?
16. What is a main effect? Given an example of one.
17. If the obtained probability in an experiment equals .1500, then the probability that chance alone is at work equals .1500. Is this statement true? Explain.
18. The null hypothesis for a directional H_1 asserts that chance alone is at work or there is a real effect in the direction opposite to that predicted by H_1 . This is a correct statement, and yet we reject or not reject this H_0 based on assuming chance alone is at work. What about the possibility of a real effect in the opposite direction?
19. You are comparing two methods of psychotherapy, Method A and Method B. You have randomly assigned 10 subjects to method A and 10 other subjects to Method B. The dependent variable is the number of weeks in therapy to achieve a cure. The variance of Method A scores turns out to be much greater than Method B scores. What inference test would you use? Explain.
20. You are interested in whether chewing nicotine gum reduces smoking. You record the number of cigarettes smoked daily by 15 subjects under normal conditions. One week later, you have them chew nicotine gum for two weeks and record the number of cigarettes smoked daily during the two weeks. The data turns out to be very skewed. What inference test would you use? Explain.
21. Compare and contrast the uncorrelated groups design with the correlated groups design.

22. What are the assumptions underlying the t test for independent groups.

23. How does the variability of the sample data affect the power of the t test? Explain, using the appropriate equations.

24. Complete the following incomplete summary ANOVA table for a 3 x 3 factorial

Source	SS	df	MS	F
Error	62.0	_____	2.0	
A	_____	_____	_____	3.5
B	12.0	_____	_____	_____
A × B	40.0	_____	_____	_____
Total	120.0	_____		

25 Given the following study and data:

A psychologist investigated the question concerning whether dissimilarity fosters attraction. College students were asked to fill out a questionnaire concerning their attitudes toward a wide range of topics. Some time later they were shown the "attitudes" of a stranger to the same items and were asked to rate the stranger as to probable liking of the stranger and probable enjoyment of working with him. The "attitudes" of the stranger were really made up by the experimenter and varied over subjects regarding the proportion of attitudes held by the stranger that were similar to those held by the rater. Thus for each subject data were collected concerning his attitudes and the attraction of a stranger. Compute r , the correlation between attitudes and attraction.

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Proportion of similar attitudes	.30	.44	.67	.00	.50	.15	.58	.32	.72	1.0	.87	.09	.82	.64	.24
Attraction	8.9	9.3	9.6	6.2	8.8	8.1	9.5	7.1	11	11.7	11.5	7.3	10	10	7.5

26. A neuroscientist suspects that low levels of a brain neurotransmitter serotonin may be causally related to aggressive behavior. To study this, she obtains 9 rhesus monkeys. The monkeys are observed daily for 6 months and the number of aggressive acts are recorded. Serotonin levels in the striatum are also measured daily for each animal. The number of aggressive acts and serotonin levels are computed for each animal and are presented below:

Subj #	1	2	3	4	5	6	7	8	9
Serotonin	0.32	0.35	0.38	0.41	0.43	0.51	0.53	0.60	0.63
Acts	6.0	3.8	3.0	5.1	3.0	3.8	2.4	3.5	2.2

- Find the regression line that predicts the number of aggressive acts from serotonin levels.
- Based on these data, what is the predicted number of aggressive acts if a rhesus monkey had a serotonin level of 0.46 mg.? (This one is done through hand computations. The solution must be clearly marked.)
- Compute the standard error.
- compute the coefficient of determination

27. A Psychology 321 class was randomly divided into two groups. Six participants found their reaction time (RT) to an auditory "go" signal and their RT to a visual "go" signal. Seven participants found their RT first to the visual signal and then to the auditory signal. The scores for each person are arranged in rows for the 13 members of the class. All values are in seconds.

Auditory RT	0.19	0.23	0.14	0.19	0.18	0.21	0.18	0.17	0.16	0.17	0.19	0.17	0.16
Visual RT	0.17	0.23	0.20	0.19	0.19	0.22	0.23	0.16	0.21	0.19	0.18	0.20	0.19

- Write the null and alternative hypotheses in statistical terms
- Compute the value of the test statistic
- State the decision rule using $\alpha = .05$ and the decision.
- What is your conclusion?

28. It has been reported that employment interviewers spend more time talking to applicants who are eventually hired than to applicants who are rejected. To determine whether this is true for college students, a student researcher persuaded 22 friends to pose as an applicant went to 22 job interviews (one person per interview). A record of the duration and outcome are given below:

Hired (# of minutes in interview)	Rejected (# minutes in interview)
29 25 20 26 21 26 22 26 19 21 25	17 20 15 26 13 18 20 17 16 14 20

- a. State the null and alternative hypothesis in statistical terms b. Compute the test statistic (use backside)
 c. State your decision rule using $\alpha = .05$ and decision d. What is your conclusion?

29. A researcher is interested in determining if an enriched environment increases the number of branches in dendrites in experimental rats. Previous research has shown rats with no enrichment have an average of 12.45 branches per dendrite. In the current research, 10 rats were given 20 minutes of an enriched environment (e.g. toys, exercise, etc.) each day for 60 days. At the end of 60 days one dendrite was extracted from each rat without harming the rat and the number of branches were counted. The results were 12, 15, 18, 12, 22, 18, 20, 16, 14, and 20. Conduct the appropriate hypothesis test to determine if an enriched environment increased the number of branches of dendrites. Use $\alpha = .05$.

30. The following table gives a non-linearly transformed scaled score of a group of 14 students in mathematics and art. Using the appropriate statistical method do a hypothesis test to determine if the students differ significantly on the two subject matters. Use $\alpha = .05$

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Math	22	37	36	38	42	58	58	60	62	65	66	56	67	62
Art	53	68	42	49	51	65	51	71	55	74	68	64	67	65

31. A cognitive psychologist working with a paper producing company wanted to determine the brightness in paper developed by two different processes. From each lot of paper created from the two processes, nine samples were drawn from each of the two processes. The data below are measures of brightness for the two processes.

Process	Brightness								
A	6.1	9.2	8.7	8.9	7.6	7.1	9.5	8.3	9.0
B	9.1	8.2	8.6	6.9	7.5	7.9	8.3	7.8	8.9

Given that the data are of dubious metric, perform the appropriate hypothesis test at $\alpha = .05$ to determine if a difference in brightness measurements exist between the two processes.

32. A psychological experiment was conducted to compare the lengths of response time (in seconds) for two different stimuli. In order to remove person-to-person variability in the responses, both stimuli were applied to each of nine participants. Reaction time research has presented mixed results concerning the underlying distribution and measurement properties. Given the data below, develop the appropriate hypothesis test to determine if Stimulus 2 produces longer response times than Stimulus 1. Use $\alpha = .05$.

Participant	Stimulus 1	Stimulus 2
1	9.4	10.3
2	7.8	8.9
3	5.6	4.1
4	12.1	14.7
5	6.9	8.7
6	4.2	7.1
7	8.8	11.3
8	7.7	5.2
9	6.4	7.8

33. A company wished to study the difference among four sales-training programs on the sales abilities of their sales personnel. Thirty-two people were randomly divided into four groups of equal size and the groups were then exposed to the different sales-training programs. However, the number of trainees completing the program varied from group to group because some dropped out during the training program. At the end of the training programs, each salesperson was randomly assigned a sales area from a group of sales areas that were judged to have equivalent sales potentials. The numbers of sales made by each of the four groups of salespeople during the first week after completing the training program are listed in the table below. Given the dropout rate and the uncertainty about the distribution of sales from such training programs, develop the appropriate hypothesis test to determine if there are any differences between the different training programs.

Program								
A	78	84	86	92	69	733		
B	99	86	90	93	94	85	97	91
C	74	87	80	83	78			
D	81	63	71	65	86	79	73	70

34. Fisher and Byrne* studied how men and women differed in their response to another person invading one's personal space. This study involved two variables, sex of participant (male and female) and spatial relationship between the subject and an invader. The dependent variable was the level of attraction the subject felt toward the invader. The level of attraction scores ranged from 2 (most negative) to 14 (most positive). This study was recently replicated in part. The data from this replication are given below. Using two-way ANOVA with $\alpha = 0.05$, determine if there are sex and spatial relationship effects, on the dependent variable, level of attraction.

Male

Adjacent	9	8	11	10	10	9	
One Seat Away	10	10	9	9	12	11	
Across		14	12	10	11	11	10

Female

Adjacent	9	8	11	10	10	9	
One Seat Away	11	8	9	7	9	10	
Across		13	8	10	9	11	12

* Fisher, J.D. and D. Byrne (1975). Too close for comfort: Sex difference in response to invasion of personal space. *Journal of Personal and Social Psychology*, 32, 15-21.

Conduct the appropriate hypothesis test. Show all hand computations

35. An educational administrator at a big school decided to study the relationship between productivity and rank of professors (Assistant, Associate and Full) For each faculty member sampled, it was rank was obtained from personnel files. The number of publications determined productivity. Conduct the appropriate hypothesis test to determine whether the two variables are related. Use $\alpha = 0.05$.

		Productivity		
		High	Medium	Low
Assistant		58	39	12
Associate		20	25	36
Full		12	19	32

Conduct the appropriate hypothesis test using $\alpha = .05$. Show all hand computations.

36. A market researcher hypothesized that consumers would choose item A 38% of the time, while items B and C are chosen 27% and 35%, respectively. To test this hypothesis, 200 consumers are recruited. Each consumer is asked to choose item A, B, or C. The results are:

Choice	Frequency
A	80
B	50
C	70
Total	200

Conduct the appropriate hypothesis test to determine if these data fit the hypothesized distribution of choices. Use $\alpha = 0.05$.

37. The study by Comrey, Backer & Wong (1978) was replicated. The Comrey Personality Scales was administered to 16 students. The study compared Asian students with non-Asian students on the Social Conformity versus Rebelliousness Scale. It was hypothesized that Asian student would score higher (more socially conforming) than non-Asian students. The data are given below.

Asian	70	76	72	56	49	65	63	70
Non-Asian	52	44	38	30	40	38	60	51

Using the .05 level, conduct the appropriate hypothesis test to determine whether Asian students have significantly higher scores than non-Asian students on social conformity.

38. A large company has been monitoring its customer service calls. Typically, 58% of these are for technical support, 18% are customer complaints and the remaining calls require no service. Management wanted to know if these percentages stayed constant throughout the year, so they take a random sample of 423 customer service calls received over the past year. They get the following results: Technical Support: 204;

Complaints: 98; No Service Required: 121. Conduct the appropriate hypothesis test to determine at the .05 level whether the percentages have changed.

39. A health educator wants to evaluate the effect of a dental film on the frequency with which children brush their teeth. Eight randomly chosen kids are measured on the number of times they brushed their teeth for one month before viewing the dental film and again for a month after the film. The data are given below: Conduct the appropriate hypothesis test to determine if the health educator was correct.

Kids	1	2	3	4	5	6	7	8
Before	25	28	22	30	26	24	25	22
After	28	29	25	30	25	28	28	24

40. In a study of the role of the situation in shaping emotional experience, subjects were injected with adrenaline. One-half of the subjects were informed of the true effects of this injection (pounding heart, tremors), while the other half were told that the injection would have no side effects (misinformed). After the injection, subjects were asked to wait in another room in which another subject in the experiment was also waiting. For one-half of the subjects, this other subject (actually an accomplice of the experimenter) acted in an euphoric manner (happy), whereas for the other half of the subjects, this confederate acted angrily. After a few minutes, subjects filled out a mood rating scale. Conduct the appropriate hypothesis test to determine if information about arousal and the confederate's behavior had an effect on the subject's mood. Use $\alpha = .05$.

MOOD SCORE

Informed		Misinformed	
Happy confederate	Angry confederate	Happy confederate	Angry confederate
1	2	6	-5
3	3	7	-4
4	6	10	-6
7	3	9	-8

(21-point scale from -10 to +10)

41. In an experiment on actor-observer discrepancy, subjects were asked to indicate the degree of personal responsibility for an act performed by the subject him/herself or by another person that led to a positive or to a negative outcome. Conduct the appropriate hypothesis test to determine if making attributions for the self versus other and outcome have an effect on the degree of responsibility assigned. Use $\alpha = .05$.

DEGREE OF RESPONSIBILITY

Subject		Other Person	
Positive outcome	Negative outcome	Positive outcome	Negative outcome
9	3	3	8
8	4	7	11
7	2	4	10
11	6	5	8
9	2	2	7

(11-point scale; the higher the score, the greater the responsibility)

42. In an experiment on the effect of self-interest on persuasion, participants heard a persuasive message delivered by one of three sources. In one condition, the position argued by the message source was in his/her self-interest; in a second condition, the position was opposed to the apparent self-interest of the source; and in the third condition, there was no apparent connection between the source's self-interest and his/her position. Conduct the appropriate hypothesis test to determine if apparent self-interest has an effect on persuasion. Use $\alpha = .05$.

LEVEL OF AGREEMENT

Consistent with self-	Opposed to self-interest	No connection
-----------------------	--------------------------	---------------

6	8	6	
2	9	5	_^
3	11	4	
1	7	7	
2	10	3	
2	6	5	

(11-point scale; the higher the score, the greater the agreement with the source's position).

43. In a study of group productivity, participants worked alone or shared the responsibility for building widgets with one other, with three others, or with fifteen others. Use $\alpha = .05$. Conduct the appropriate hypothesis test to determine if group size had an effect on productivity

WIDGETS PER PERSON

Alone	Two-person group	Four-person group	Sixteen-person group
24	20	20	19
27	18	16	14
22	17	14	17
26	18	17	12
25	19	15	16

44. In a study of rehearsal and memory, subjects were shown three consonants and were then asked to count backward by threes from the time they saw these consonants until they were asked to recall them. The request for recall came 3, 6, 9, 12, or 15 seconds after the subjects began counting. Conduct the appropriate hypothesis test to determine if recall was affected by the prevention of rehearsal. Use $\alpha = .05$.

PERCENT OF CONSONANT SETS CORRECTLY RECALLED

Three seconds	Six seconds	Nine seconds	Twelve seconds	Fifteen seconds
50	40	23	10	8
55	38	25	12	11
45	42	21	11	7
47	43	24	7	12
52	37	22	8	9

45. Before and after seeing a film about marijuana, 16 subjects completed a questionnaire designed to assess their attitudes toward legalization of the drug. For the data given in the table below, conduct the appropriate hypothesis test to determine if viewing the film can be expected to result in more favorable attitudes toward legalization of marijuana. Use $\alpha = .05$.

Favorableness of Attitude

Subject	Before	After	Subject	Before	After
1	13	16	9	19	20
2	16	18	10	16	18
3	10	12	11	15	18
4	14	18	12	14	15
5	15	18	13	12	12
6	12	15	14	13	17
7	11	12	15	14	16
8	18	20	16	15	17

46. Expanding technology and the growth of knowledge in medicine require that nurses continually upgrade their skills. One way to accomplish this upgrading is through continuing-education workshops. The present

study investigated the impact of a 60-hour workshop on a measure of the participants' cognitive knowledge. Twenty-two staff nurses took a paper-and-pencil pretest to evaluate their basic knowledge of nursing prior to the 10-day workshop. The following data were obtained. Conduct the appropriate hypothesis test to determine if the workshop improved the nursing skills. Use $\alpha = .05$. (Suggested by Donovan, M., Wolpert, P. and Yasko, J. (1981). Gaps and contracts. Nursing Outlook, 467-471.)

Knowledge Score

Subject	Pretest Score	Posttest Score
1	29	35
2	20	41
3	24	33
4	32	41
5	33	39
6	19	20
1	17	29
8	32	42

47. Random samples of seventh-, eighth-, and ninth-grade students were interviewed following one year of school busing. Each student was asked, "Did black and white students mix more than, the same as, or less than last year?" Conduct the appropriate hypothesis test to determine if school busing led to more mixing between white and black students. Use $\alpha = .01$.

Response	Grade			Sum
	7	8	9	
More	26	12	4	42
Same	18	25	35	78
Less	6	13	11	30
Sum	50	50	50	150

48. The effect on exploratory behavior of administering at random intervals a noxious stimulus, electric shock, to gerbils during infancy was investigated. Animals were randomly assigned to the experimental condition, shock, or the control condition, non-shock. The dependent variable, duration in minutes of exploratory behavior during one day, was measured when the animals were 6 months old. For the data in the table, conduct the appropriate hypothesis test to determine if the experimental condition led to a reduction in exploratory behavior than the control condition. Use $\alpha = .05$.

Control Group						Experimental Group						
40	42	25	30	33	31	34	32	26	30	16	24	20

49. In an experiment on sex-typed behavior, a random sample of boys ages 5 to 8 was given choices among such toys as a football, a doll carriage, a dump truck, and dishes. The number of "sex-appropriate" choices for boys at each age is listed in the table.

# of sex appropriate choices	Age	# of sex appropriate choices	Age
7.5	18	7.5	15
7.0	13	5.0	7
5.5	11	5.5	8
8.0	20	6.0	12
6.5	13	8.0	17
6.0	14	7.0	14
5.0	9	6.5	12
8.0	18	5.5	10
6.5	14	5.0	8
6.0	10	7.0	16
7.5	19		

- (a) Compute the values for the line of best fit that predicts the number of sex-appropriate choices using age.
- (b) For a 6-year-old boy, estimate the number of sex-appropriate choices.
- (c) Determine if r is statistically significant at the $\alpha = .05$ level.

50. A researcher studied the difference between two different types of therapy for drug addiction. Eleven participants received therapy A and 10 participants received therapy B. After 6 weeks of treatment each participant was evaluated by a medical team. Each participant received a functioning rating. The higher the rating the higher the functioning. In a hypothesis test where the researcher felt therapy A would turn out to be more effective than therapy B, the data were analyzed using SPSS. The partial output is given below.

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Std. Error Difference
dv	Equal variances assumed	.070	.794	2.557	19	.019	2.35345
	Equal variances not assumed			2.553	18.7	.020	2.35709

Conduct the appropriate hypothesis test. Show all five steps. ,

- 51. In a poll of recent college female graduates, 65 said they want careers and 35 said they did not. The response of female high school graduates was 45 for careers and 55 not for careers. Perform a hypothesis test to determine if career choice is related to education level. Use $\alpha = .05$.

True-False Questions

- 1. A z distribution always is normally shaped.
- 2. All standard scores are z scores.
- 3. A Z score is a transformed score.
- 4. A Z score designates how many standard deviations the raw score is above or below the mean.
- 5. The z distribution takes on the same shape as the raw scores.
- 6. Z scores allow comparison of variables that are measured on different scales.
- 7. In a normal curve, the area contained between the mean and a score which is 2.30 standard deviations above the mean is 0.4893 of the total area.
- 8. The normal curve reaches the horizontal axis in 4 standard deviations above and below the mean.
- 9. For any z distribution of normally distributed scores, P_{50} is always equal to zero.
- 10. Tabled F values are one-tailed probability levels.
- 11. The F distribution has no negative values.
- 12. When in doubt about which measure of central tendency to use, just compute the mean.
- 13. Variance ratio is the statistic underlying the F distribution.
- 14. The F distribution is a family of curves, each uniquely determined by df.
- 15. The F test is not used when comparing 2 or more estimates of the H_0 population variance.
- 16. The total variability of a set of data can be completely partitioned into the between-groups variability and the within-groups variability.
- 17. The within-groups variability increases necessarily as the between-groups variability increases.
- 18. The inventor of the Students' t-test is James E. Guinness.
- 19. There are five basic ANOVA designs.
- 20. The least conservative multiple comparison test is the Fisher LSD test.
- 21. The t-test can be used in multiple comparison tests where tests are unplanned.
- 22. The Central Limit Theorem is of historical value only.

23. A researcher cannot accept the null hypothesis
24. Centiles are reserved for nonparametric statistical methods
25. The Chi-square test is used for frequency or categorical data only
26. For every nonparametric statistical method, there is usually a unique set of tabled critical values for it.
27. Eta-squared and omega-squared are two measures one can use to measure effect size
28. The research of B.F. Skinner does not use inferential statistical methods.
29. Inferential statistical methods usually involve using groups of participants instead of single or a few participants

30. William Sealy Gossett published his monumental work under a pseudonym because he was afraid of being persecuted by though police.

31. The most conservative and most versatile method of post hoc comparisons following a significant ANOVA F test is the Scheffe test.

32. Most conservative means that the researcher will be rejecting the null hypothesis more often than more liberal procedures.

34. There are only two IQ scaled scores.
35. The McCall T-score scale is used exclusively for personality tests.
36. The effective and most useful range of scaled scores usually lies between 3 standard deviation units on each side of the mean.
37. The study of psychology involves studying nonphysical phenomena.
38. The two levels of alpha used in psychological research were based on a sound theoretical basis.
39. According to your instructor Z-scores are rounded to 2 decimal places because the use of the normal curve table requires it.
40. Counterbalancing is needed when dealing with some dependent samples because the measurements are correlated.
41. In a 2 x 5 factorial design, there are two main effects.
42. There are two types of interaction effects in a two-way ANOVA: ordinal and nominal
43. By changing the alpha level from .05 to .01, with everything else held constant, the probability of type 2 error will increase.
44. Rejecting the null hypothesis when in fact it is true is called a type 1 error.
45. The use of effect size in the most recent psychological research studies increases the credibility of psychological research.
46. In a 2 uncorrelated samples t-test, one can achieve statistical significance by increasing sample size even if there is a very small difference between sample means.
47. In a 2 x 2 x 2 factorial anova design, there are 7 sets of null and alternative hypotheses to be tested.
48. Repeated measures and matched participants studies utilize the same statistical methods when analyzing the data.
49. With two uncorrelated groups, the value of $F = t^2$.
50. Nonparametric tests are less powerful than parametric tests but they are more flexible.