

TECEP® Test Description for STA-201-TE

PRINCIPLES OF STATISTICS

This exam assesses students' development of tools and techniques needed to design studies that provide representative data for mathematical analysis and statistical interpretation. It evaluates skills and knowledge related to many different disciplines and professions including sciences, social sciences, and business. Topics include types of statistics, data representations (tables, graphs, and charts), measures of location and variation, probability concepts, continuous and discrete distributions, confidence intervals, hypothesis tests, and regression and correlation analysis. The exam emphasizes the application of statistical methods for real-world problems. In solving these problems, students will demonstrate their ability to use appropriate notation and formulas. Problems may be viewed as statistical studies, and, as such, students should be able to interpret results and justify conclusions. This exam also evaluates students' competency in quantitative reasoning/literacy, one of the institutional learning outcomes. (3 credits)

- **Test format:** 100 multiple choice questions (1 point each)
- **Passing score:** 55%. Your grade will be reported as CR (credit) or NC (no credit).
- **Time limit:** 2 hours

Note: You may bring a non-programmable calculator but probably won't need it. The exam is concept-based, so you do not need to memorize every formula. However, you do need to be familiar with formulas so you can identify the appropriate situation in which to use them. You should memorize the following formulas: mean--median--standard deviation--z-score--variances.

OUTCOMES ASSESSED ON THE TEST

- Recognize basic principles of statistical design.
 - Organize and summarize data into tables, charts, diagrams, and graphs.
 - Calculate and interpret measures of central tendency and variation.
 - Evaluate the likelihood a statistical inference is correct.
 - Apply concepts of the normal distribution.
 - Apply the appropriate procedures to test hypotheses.
 - Examine associations between variables.
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TOPICS ON THE TEST AND THEIR APPROXIMATE DISTRIBUTION

The table below indicates the main topics covered by this exam and the approximate percentage of the exam devoted to each main topic. Under the main topic heading is a list of related—but more specific—topics. It is important to review these topics to determine how much prior knowledge you have and/or how much additional study is necessary.

Topic	Percentage
Levels of measurement - Nominal, ordinal, interval, ratio - Discrete and continuous - Qualitative and quantitative data	5%
Organizing and summarizing data with tables and graphs - Relative frequency distribution - Cumulative frequency distribution - Grouped and ungrouped data - Percentiles - Pie charts - Bar charts - Area charts - Frequency polygon - Skewness - Scatterplot	15%
Central tendency and variability - Mean, median, mode, range - Standard deviation - Variance	15%
Normal distributions and standard scores - Z scores - Area under the normal curve	5%
Measures of relationship: correlation - Correlation coefficient - Pearson r - Correlation and causation - Proportion of common variance	5%
Regression and prediction - Independent and dependent variables - Regression line - Standard error of prediction	5%
Populations, samples, sampling distributions, and probability - Random sampling - Stratified random sampling	10%



• Sample size • Standard error of the mean • Sampling distribution of the mean • Probability • Central Limit Theorem	
Hypothesis testing and estimation • Null hypothesis • The z test • Type I and Type II errors • Degrees of freedom • Levels of statistical significance • Confidence interval • Criteria of significance	15%
T tests for one sample, two independent samples, two dependent samples • The t test • Degrees of freedom • Variance estimation • Repeated-measures design • Matched-subjects design	10%
ANOVA (analysis of variance) • One-way ANOVA • Two-way ANOVA • Sum of squares • Within-group variation • Between-group variation • F ratio • Main effect • Interaction	10%
Chi-square test for qualitative data • Chi-square test statistic • Degrees of freedom • Observed and expected frequencies • Test of independence	5%

STUDY MATERIALS

Below is a list of recommended study materials to help prepare you for your exam. Most textbooks in this subject include the topics listed above and will prepare you for the test. If you choose another text, be sure to compare its table of contents against the topic list to make sure all topics are covered.



Title
Minium, E. W., & Clarke, R. <i>Elements of Statistical Reasoning</i> (current edition). New York, NY: John Wiley.

SAMPLE QUESTIONS

The questions below are designed to help you study for your TECEP. Answering these questions does not guarantee a passing score on your exam.

Please note that the questions below **will not** appear on your exam.

1. On a national survey, respondents are asked to list their background as African-American, Hispanic, Asian-American, Caucasian, or Other. What level of measurement is being used?
 - a. Nominal
 - b. Ordinal
 - c. Interval
 - d. Ratio
2. What type of frequency distribution organizes observations into classes with more than one value?
 - a. Relative frequency distribution
 - b. Frequency distribution for grouped data
 - c. Frequency distribution for ungrouped data
 - d. Cumulative frequency distribution
3. Which of the following is the best basis for predicting Y scores from known values of X?
 - a. The correlation coefficient
 - b. r^2
 - c. The regression line
 - d. Analysis of variance
4. Which type of graph would best depict a student's scores on monthly math tests over the past two years?
 - a. Frequency polygon
 - b. Pie chart
 - c. Scatterplot
 - d. Bar chart



5. What does a correlation coefficient express?
- The arithmetic average of a sample of data
 - The degree and direction of relationship between two variables
 - The effect size of an experimental treatment
 - The difference between two population means
6. What is the median of the following values? 4, 4, 5, 6, 7, 8, 8, 9
- 4
 - 5
 - 6.5
 - 7.5
7. The mean of the scores on a certification exam is 300, the standard deviation is 50, and the scores are normally distributed. Approximately what percentage of students score 200 or lower on the test?
- 2.28%
 - 13.59%
 - 34.13%
 - 50.00%
8. In a statistics class, the probability of earning a grade of either A or B is equal to .50 and the probability of a grade of C is equal to .30. What is the probability of a grade of either A, B or C?
- .20
 - .30
 - .50
 - .80
9. In both one- and two-factor ANOVA, the denominator of an F ratio is always
- a variance estimate
 - a treatment effect
 - differences in between-groups means
 - greater than the numerator
10. If the amount of variation in height that is associated with variation in weight is 49%, what is the correlation between these variables?
- .07
 - .49
 - .70
 - Indeterminate



11. If exactly one of the values 6, 9, 10, 8, 7 is dropped, which of the following statistics must change?

- a. Mean
- b. Median
- c. Mode
- d. None must change

12. The percentage of the area under a normal curve that falls between the mean and one standard deviation below the mean is approximately

- a. 34%
- b. 50%
- c. 68%
- d. 95%

13. Increasing the sample size four-fold will

- a. double the size of the standard error of the mean
- b. reduce the size of the standard error of the mean by half
- c. reduce the size of the standard error of the mean by one-fourth
- d. not affect the size of the standard error of the mean

14. Given the following tabular entries, for an observed t of 3.100, the probability is best expressed as

t	p
2.145	.05
2.977	.01
4.140	.001

- a. greater than .01
- b. less than .05
- c. less than .01
- d. greater than .001



15. Which situation below suggests the possible effect of one treatment but not the other, and no interaction?

30	30	30
40	40	40
50	50	50

A

30	30	30
20	30	40
30	30	30

B

30	40	50
40	50	60
50	60	70

C

40	40	40
40	40	40
40	40	40

D

- a. A
- b. B
- c. C
- d. D

16. What is being stated when we specify the interval that probably contains a particular parameter?

- a. The critical region
- b. The point estimation
- c. The alpha-level
- d. The confidence interval

17. The sample means that would occur by chance are described by the

- a. numerator of the F ratio
- b. denominator of the F ratio
- c. z ratio
- d. appropriate sampling distribution

18. Which of the following is a valid purpose for a confidence interval?

- a. To use the population mean to estimate the value of a sample mean
- b. To use a sample mean to estimate the value of a population mean
- c. To increase the likelihood of a Type I error
- d. To increase the power of a test

19. When compared to the population standard deviation, a sample standard deviation tends to be

- a. an underestimate
- b. an overestimate
- c. approximately equal
- d. variable, depending on the sample



20. Tom has 10 pens in one desk drawer (3 red, 4 blue, 2 black, 1 green) and 10 pens in another desk drawer (1 red, 4 blue, 2 black, 3 green). If he selects one pen from each drawer without looking, what is the probability that both will be red?
- a. .01
 - b. .03
 - c. .04
 - d. .40
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ANSWERS TO SAMPLE QUESTIONS

- | | | |
|--------|---------|---------|
| 1. (a) | 8. (d) | 15. (a) |
| 2. (b) | 9. (a) | 16. (d) |
| 3. (c) | 10. (c) | 17. (d) |
| 4. (a) | 11. (d) | 18. (b) |
| 5. (b) | 12. (a) | 19. (a) |
| 6. (c) | 13. (b) | 20. (b) |
| 7. (a) | 14. (c) | |

