

Chapter 9 Review

MULTIPLE CHOICE

- You are going to construct a 90% t confidence interval for a population mean based on a sample size of 16. What is the critical value t^* you will use in constructing this interval?
 - 1.341
 - 1.753
 - 1.746
 - 2.131
 - 1.337
- A 99% confidence interval for the true mean weight loss (in pounds) for people on the Skinny Quick diet plan is found to be (1.3, 5.2). Which of the following is (are) correct?
 - The probability is 0.99 that the mean weight loss is between 1.3 lbs and 5.2 lbs.
 - The probability is 0.99 that intervals constructed by this process will capture the true population mean.
 - We are 99% confident that the true mean weight loss for this program is between 1.3 lbs and 5.2 lbs.
 - This interval provides evidence that the Skinny Quick plan is effective in reducing the mean weight of people on the plan.
 - I and II only
 - II only
 - II and III only
 - II, III, and IV only
 - All of these statements are correct
- A 99% confidence interval for the weights of a random sample high school wrestlers is reported as (125, 160). Which of the following statements about this interval is true?
 - At least 99% of the weights of high school wrestlers are in the interval (125, 160).
 - The probability is 0.99 that the true mean weight of high school wrestlers is in the interval (125, 160).
 - 99% of all samples of this size will yield a confidence interval of (125, 160).
 - The procedure used to generate this confidence interval will capture the true mean weight of high school wrestlers 99% of the time.
 - The probability is 0.99 that a randomly selected wrestler will weigh between 125 and 160 lbs.
- This year's statistics class was small (only 15 students). This group averaged 74.5 on the final exam with a sample standard deviation of 3.2. Assuming that this group is a random sample of all students who have taken statistics and the scores in the final exam for all students are approximately normally distributed, which of the following is an approximate 96% confidence interval for the true population mean of all statistics students?
 - 74.5 ± 7.245
 - 74.5 ± 7.197
 - 74.5 ± 1.871
 - 74.5 ± 1.858
 - 74.5 ± 1.772
- A paint manufacturer advertises that one gallon of its paint will cover 400 sq ft of interior wall. Some local painters suspect the average coverage is considerably less and decided to conduct an experiment to find out. If μ represents the true average number of square feet covered by the paint, which of the following are the correct null and alternative hypotheses to be tested?
 - $H_0: \mu = 400$ $H_a: \mu > 400$
 - $H_0: \mu \geq 400$ $H_a: \mu \neq 400$
 - $H_0: \mu = 400$ $H_a: \mu \neq 400$
 - $H_0: \mu \neq 400$ $H_a: \mu < 400$
 - $H_0: \mu \geq 400$ $H_a: \mu < 400$

11. A 99% confidence interval for a population mean is to be constructed. A sample of size 20 will be used for the study. Assuming that the population from which the sample is drawn is approximately normal, what is the upper critical value needed to construct the interval?
12. A study was conducted to determine if male and female 10th graders differ in performance in mathematics. Twenty-three randomly selected males and 26 randomly selected females were given a 50-question multiple-choice test as part of the study. The scores were approximately normally distributed. The results of the study were as follows:

	MALES	FEMALES
Sample size	23	26
Mean	40.3	39.2
Std. Deviation	8.3	7.6

Construct a 99% confidence interval for the true difference between the mean score for males and the mean scores for females. Does the interval suggest that there is a difference between the true means for males and females?

13. The Mathematics Department wants to estimate within five students, and with 95% confidence, how many students will enroll in Statistics next year. They plan to ask a sample of eligible students whether or not they plan to enroll in Statistics. Over the past 5 years, the course has had between 19 and 79 students enrolled. How many students should they sample? (Note: assuming a reasonably symmetric distribution, we can estimate the standard deviation by $\text{Range}/4$)
14. Professor Olsen has taught statistics for 41 years and has kept the scores of every test he has ever given. Every test has been worth 100 points. He is interested in the average test score over the years. He doesn't want to put all the scores (there are thousands of them) into a computer to figure out the exact average so he asks his daughter, Anna, to randomly select 50 of the tests and use those to come up with an estimate of the population average. Anna has been studying statistics at college and decides to create a 98% confidence interval for the true average score. The mean test score for the 50 randomly selected tests she selects is 73.5 with a standard deviation of 7.1. What does she tell her father?
15. A certain type of pen is claimed to operate for a mean of 190 hours. A random sample of 49 pens is tested, and the mean operating time is found to be 188 hours with a standard deviation of 6 hours.
- Construct a 95% confidence interval for the true mean operating time of this type of pen. Does the company's claim seem justified?
 - Describe the steps involved in conducting a hypothesis test, at the 0.05 level of significance, that the true mean differs from 190 hours. Do not actually carry out the complete test, but do state the null and alternative hypotheses.
16. A young researcher thinks there is a difference between the mean ages at which males and females win Oscars for best actor or actress. The student found the mean age for all best actors winners and all best actress winners and constructed a 95% confidence interval for the mean difference between their ages. Is this an appropriate use of a confidence interval? Why or why not?

17. Twenty-six pairs of identical twins are enrolled in a study to determine the impact of training on ability to memorize a string of letters. Two programs (A and B) are being studied. One member of each pair is randomly assigned to one of the two groups and the other twin goes into the other group. Each group undergoes the appropriate training program, and then the scores for pairs of twins are compared. The mean and standard deviations for groups A and B are determined as well as the mean and standard deviation for the difference between each twin's score. Is this study a *one-sample* or *two-sample* situation, and how many degrees of freedom are involved in determining the *t*-value?
18. Which of the following statements is (are) correct? Explain.
- I. A confidence interval can be used instead of a test statistic in any hypothesis test involving means or proportions.
 - II. A confidence interval can be used instead of a test statistic in a two-sided hypothesis test involving means or proportions.
 - III. The standard error for constructing a confidence interval for a population proportion and the standard error for a significance test for a population proportion are the same.
 - IV. The standard error for constructing a confidence interval for a population mean and the standard error for a significance test for a population mean are the same.
19. The average math SAT score at Hormone High School over the years is 520. The mathematics faculty believes that this year's class of seniors is the best the school has ever had in mathematics. One hundred seventy-five seniors take the exam and achieve an average score of 531 with a sample standard deviation of 96. Does this performance provide good statistical evidence that this year's class is, in fact, superior?
20. An avid reader, Booker Worm, claims that he reads books that average more than 375 pages in length. A random sample of 13 books on his shelf had the following number of pages: 595, 353, 434, 382, 420, 225, 408, 422, 315, 502, 503, 384, 420. Do the data support Booker's claim? Test at the 0.05 level of significance.
21. The statistics teacher, Dr. Tukey, gave a 50-point quiz to his class of 10 students and they didn't do very well, at least by Dr. Tukey's standards (which are quite high). Rather than continuing to the next chapter, he spent some time reviewing the material and then gave another quiz. The quizzes were comparable in length and difficulty. The results of the two quizzes were as follows.
- | Student | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Quiz 1 | 42 | 38 | 34 | 37 | 36 | 26 | 44 | 32 | 38 | 31 |
| Quiz 2 | 45 | 40 | 36 | 38 | 34 | 28 | 44 | 35 | 42 | 30 |
- Do the data indicate that the review was successful, at the 0.05 level, at improving the performance of the students in this material? Give good statistical evidence for your conclusion.

22. A company uses two different models, call them model A and model B, of a machine to produce electronic locks for hotels. The company has several hundred of each machine in use in its various factories. The machines are not perfect, and the company would like to phase out of service the one that produces the most defects in the locks. A random sample of 13 model A machines and 11 model B machines are tested and the data for the average number of defects per week are given in the following table.

	n	\bar{x}	s
Model A	13	11.5	2.3
Model B	11	13.1	2.9

Dotplots of the data indicate that there are no outliers or strong skewness in the data and there are no strong departures from normal. Do these data provide statically convincing evidence that the two machines differ in terms of the number of defects produced?

23. Take another look at the preceding problem. Suppose there were 30 of each model machine that were sampled. Assuming that the sample means and standard deviations are the same as given in question 22, how might this have affected the hypothesis test you performed in that question?