(b) Your customers are college students. You are interested in finding out which of two new product labels is more appealing.

(c) Your customers are college students. You are interested in assessing their interest in a new product.

7.84 Identify the design. The following situations all require inference about a mean or means. Identify each as (1) a single sample, (2) matched pairs, or (3) two independent samples. Explain your answers.

(a) You want to estimate the average age of your store's customers.

(b) You do an SRS survey of your customers every year. One of the questions on the survey asks about customer satisfaction on a seven-point scale, with the response 1 indicating "very dissatisfied" and 7 indicating "very satisfied." You want to see if the mean customer satisfaction has improved from last year.

(c) You ask an SRS of customers their opinions on each of two new floor plans for your store.

7.85 Number of critical food violations. The results of a major city's restaurant inspections are available through its online newspaper.[44] Critical food violations are those that put patrons at risk of getting sick and must immediately be corrected by the restaurant. An SRS of $n = 250$ inspections from the collection of inspections since January 2012 were collected, resulting in $\bar{x} = 1.031$ violations and $s = 2.022$ violations.

(a) Test the hypothesis that the average number of critical violations is less than 1.5, using a significance level of 0.05. State the two hypotheses, the test statistic, and the P-value.

(b) Construct a 95% confidence interval for the average number of critical violations and summarize your result.

(c) Which of the two summaries (significance test versus confidence interval) do you find more helpful in this case? Explain your answer.

(d) These data are integers ranging from 0 to 10. The data are also skewed to the right, with 79% of the values either a 0 or a 1. Given this information, do you think use of the t procedures is appropriate? Explain your answer.

7.86 Two-sample t test versus matched pairs t test. Consider the following data set. The data were actually collected in pairs, and each row represents a pair. **PAIRED**

Group 1	Group 2
48.86	48.88
50.60	52.63
51.02	52.55
47.99	50.94
54.20	53.02
50.66	50.66
45.91	47.78
48.79	48.44
47.76	48.92
51.13	51.63

(a) Suppose that we ignore the fact that the data were collected in pairs and mistakenly treat this as a two-sample problem. Compute the sample mean and variance for each group. Then compute the two-sample t statistic, degrees of freedom, and P-value for the two-sided alternative.

(b) Now analyze the data in the proper way. Compute the sample mean and variance of the differences. Then compute the t statistic, degrees of freedom, and P-value.

(c) Describe the differences in the two test results.

7.87 Two-sample t test versus matched pairs t test, continued. Refer to the previous exercise. Perhaps an easier way to see the major difference in the two analysis approaches for these data is by computing 95% confidence intervals for the mean difference.

(a) Compute the 95% confidence interval using the two-sample t confidence interval.

(b) Compute the 95% confidence interval using the matched pairs t confidence interval.

(c) Compare the estimates (that is, the centers of the intervals) and margins of error. What is the major difference between the two approaches for these data?

7.88 Average service time. Another benchmark that was measured in the **QSRMagazine.com** drive-thru study, described in Exercise 7.49 (page 430), was the service time.[45] A summary of the results (in seconds) for two of the chains is shown below:

Chain	n	$\bar{x}$	s
Taco Bell	165	240.38	36.3
McDonald's	165	289.05	40.7

(a) Is there a difference in the average service time between these two chains? Test the null hypothesis that the chains' average service time is the same. Use a significance level of 0.05.

(b) Construct a 95% confidence interval for the difference in average service time.

(c) Lex plans to go to Taco Bell and Sam to McDonald's. Is the interval in part (b) likely to contain the difference in their service times they encounter? Explain your answer.

7.89 The efficacy of digital mindfulness training. There is growing evidence that in-person mindfulness training can reduce stress. Little is known, however, about the efficacy of self-guided digital training. To investigate this, a group of researchers randomized 69 participants to either a digital training group or a control group.[46] For the digital group, participants were asked to complete the first 10 guided meditations using the mindfulness app *Headspace*. For the control group, participants were asked to listen to the 10 excerpts from an audiobook on mindfulness using *Headspace*. The following table summarizes the change from baseline in feelings of stress as measured using the Stress Overload Scale (SOS).

(a) Car...
differ...
test sta...
(Softw...

(b) Ca...
reduce...
statist

7.90
exerci...
($n = 1$...
traini...
this i...
previ...

10.3 More on BMI and physical activity. Refer to Examples 10.2 (page 522) and 10.3.

(a) What is the predicted BMI for a woman who averages 9500 steps per day?

(b) If an observed BMI at $x = 9.5$ were 24.3, what would be the residual?

(c) Suppose that you wanted to use the estimated population regression line to examine the predicted BMI for a woman who averages 4000, 10,000, or 16,000 steps per day. Discuss the appropriateness of using the least-squares equation to predict BMI for each of these activity levels.

10.4 Significance test for the population slope. Test the null hypothesis that the slope is zero versus the two-sided alternative in each of the following settings using the $\alpha = 0.05$ significance level:

(a) $n = 20$, $\hat{y} = 28.5 + 1.4x$, and $SE_{b_1} = 0.65$.

(b) $n = 32$, $\hat{y} = 30.8 + 2.2x$, and $SE_{b_1} = 1.05$.

(c) $n = 16$, $\hat{y} = 29.3 + 2.2x$, and $SE_{b_1} = 1.05$.

10.5 95% confidence interval for the slope. For each of the settings in the previous Check-in question, find the 95% confidence interval for the slope and explain what the interval tells you.