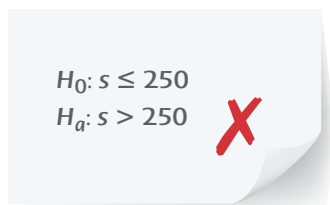


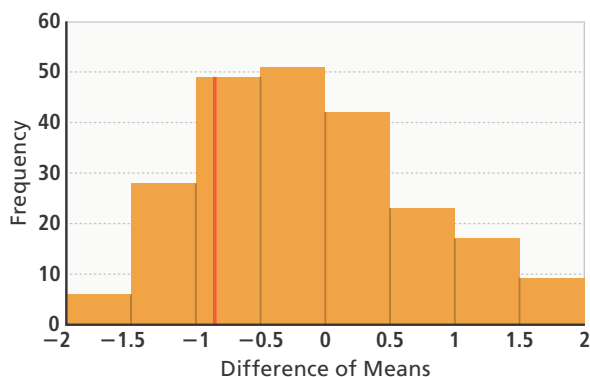


## UNDERSTAND

8. **Communicate Precisely** Becky buys a new hybrid grass seed that is supposed to require only a small amount of water to grow. After Becky plants the new seed, it rains every other day for a two-week period, and the grass grows well. Explain why this particular situation cannot be used to support the claim about the water required to grow the seed.
9. **Error Analysis** Jake's average bowling score was 230. Jake bought a new bowling ball. Since using the new bowling ball Jake's average score has improved to 250. He wrote the null hypothesis and alternative hypothesis for a statistical study to evaluate the effect of the new ball on his bowling score. Explain his error.



10. **Generalize** Using the formula for margin of error,  $m = \frac{2\sigma}{\sqrt{n}}$ , explain why the larger a sample size is, the smaller the margin of error should be.
11. **Reason** Answer the following questions about randomizing samples.
- Why is the method of randomizing samples used when working with experimental data sets?
  - If the red vertical line in the histogram shown represents the difference in the means of the original samples, then how does it compare to the differences of the means in the randomly generated samples?



## PRACTICE

12. Tavon had an average time for the 100-yd dash of 18 seconds. Since starting a strength-training program, he has been running the 100-yd dash in an average time of 15 seconds. Write the null hypothesis and alternative hypothesis for a statistical study to evaluate the effect of the training on Tavon's time in the 100-yd dash.

SEE EXAMPLE 1

13. The coach wants to perform an experiment to determine whether strength training impacts a runner's speed. The coach completed several trials and recorded the speeds of the 100-yd dash (in seconds) of a sample of five track athletes both before and after they tried strength training. SEE EXAMPLE 2

Without Training	18	20	16	15	14
With Training	15	19	17	16	14

- Find the sample means and their difference. Resample the data so that one group has these data values: 15, 20, 17, 15, 14.
  - Identify the data values for the other group.
  - Calculate the difference of the means for the two resample groups.
14. The training regimen was tested again, resulting in the data displayed below. Use a simulation to randomize the data without replacement, creating 50 new groupings. Create a histogram of the differences between group means to display your results. Use the data to draw a conclusion about the initial hypothesis. SEE EXAMPLE 3

Without Vitamins	14	12	18	19	15
With Vitamins	15	12	16	18	14

15. Grain Goodness reports the average price for a box of their granola is \$3.87. A marketing company selects a national sample of 100 retail prices and states the mean price was \$4.42. The standard deviation was \$0.60. What is the margin of error for this new sample? SEE EXAMPLE 4

**APPLY**

- 16. Model with Mathematics** A botanist is doing an experimental research study to determine whether a certain fertilizer will increase the yield of soybean plants. The botanist included several soybean farmers in his study. The average yield of soybeans for each farmer (in bushels per acre) of the crops with and without fertilizer are recorded in the table shown.

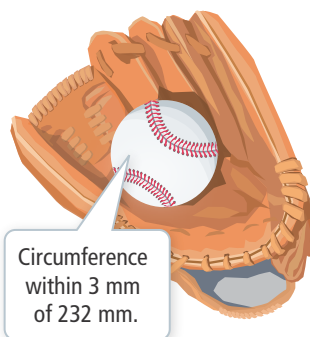
Without Fertilizer	40	42	45	50	47
With Fertilizer	42	40	46	49	48

Find the means of both samples and their difference. State how the average yield of the soybean crops with the fertilizer compares to the average yield of the soybean crops without fertilizer.

- 17. Communicate Precisely** A randomization of the data from Exercise 16, placed into two new random groups, is shown in the table.

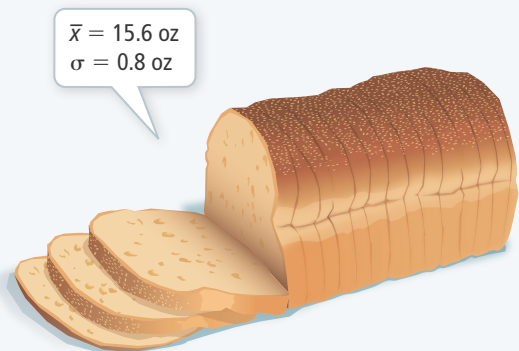
New Group 1	46	50	40	42	47
New Group 2	40	49	42	48	45

- Find the difference between the sample means of the new groups.
  - Does it provide evidence that the difference in the original two sample means is due to the effects of the fertilizer or just due to chance?
- 18. Make Sense and Persevere** The rules state that a baseball must have a certain circumference. What hypotheses would you test to determine whether the baseballs made on a new machine are within the specifications?



**ASSESSMENT PRACTICE**

- 19.** What are the different types of hypotheses used in a statistical study? Select all that apply
- Ⓐ experimental      Ⓑ supported  
Ⓒ alternative      Ⓓ strategic  
Ⓔ null
- 20. SAT/ACT** A survey found that 72% of freshmen planned to take at least one spring break trip while in college with a margin of error of  $\pm 3.5\%$ . Central U claims that 75% of freshman plan trips. Is their claim reasonable?
- Ⓐ No, their claim is not within the margin of error.  
Ⓑ No, their claim is within the margin of error.  
Ⓒ Yes, their claim is not within the margin of error.  
Ⓓ Yes, their claim is within the margin of error.
- 21. Performance Task** Loaves of a particular brand of wheat bread are labeled as weighing at least 16 oz. A consumer advocate studies the weights of 500 loaves of this bread.



**Part A** Find  $H_0$  and  $H_a$ .

**Part B** Calculate the margin of error.

**Part C** Predict a range of reasonable values estimating the population parameter.

**Part D** Test the validity of the claim of the weight printed on the labels.