

## 8.E: Rare Events, the Sample, Decision and Conclusion (Optional Exercises)

### ? Exercise 8.E. 3

When do you reject the null hypothesis?

### ? Exercise 8.E. 4

The probability of winning the grand prize at a particular carnival game is 0.005. Is the outcome of winning very likely or very unlikely?

**Answer**

The outcome of winning is very unlikely.

### ? Exercise 8.E. 5

The probability of winning the grand prize at a particular carnival game is 0.005. Michele wins the grand prize. Is this considered a rare or common event? Why?

### ? Exercise 8.E. 6

It is believed that the mean height of high school students who play basketball on the school team is 73 inches with a standard deviation of 1.8 inches. A random sample of 40 players is chosen. The sample mean was 71 inches, and the sample standard deviation was 1.5 years. Do the data support the claim that the mean height is less than 73 inches? The  $p$ -value is almost zero. State the null and alternative hypotheses and interpret the  $p$ -value.

**Answer**

$$H_0 : \mu \geq 73$$

$$H_a : \mu < 73$$

The  $p$ -value is almost zero, which means there is sufficient data to conclude that the mean height of high school students who play basketball on the school team is less than 73 inches at the 5% level. The data do support the claim.

### ? Exercise 8.E. 7

The mean age of graduate students at a University is at most 31 years with a standard deviation of two years. A random sample of 15 graduate students is taken. The sample mean is 32 years and the sample standard deviation is three years. Are the data significant at the 1% level? The  $p$ -value is 0.0264. State the null and alternative hypotheses and interpret the  $p$ -value.

### ? Exercise 8.E. 8

Does the shaded region represent a low or a high  $p$ -value compared to a level of significance of 1%?

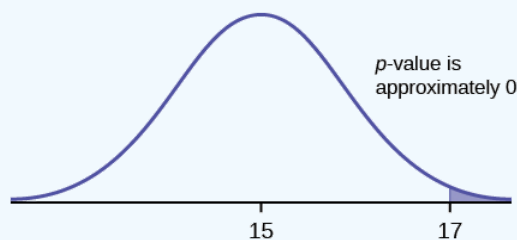


Figure 8.E. 3.

**Answer**

The shaded region shows a low  $p$ -value.

**? Exercise 8.E. 9**

What should you do when  $\alpha > p\text{-value}$ ?

**? Exercise 8.E. 10**

What should you do if  $\alpha = p\text{-value}$ ?

**Answer**

Do not reject  $H_0$ .

**? Exercise 8.E. 11**

If you do not reject the null hypothesis, then it must be true. Is this statement correct? State why or why not in complete sentences.

*Use the following information to answer the next seven exercises:* Suppose that a recent article stated that the mean time spent in jail by a first-time convicted burglar is 2.5 years. A study was then done to see if the mean time has increased in the new century. A random sample of 26 first-time convicted burglars in a recent year was picked. The mean length of time in jail from the survey was three years with a standard deviation of 1.8 years. Suppose that it is somehow known that the population standard deviation is 1.5. Conduct a hypothesis test to determine if the mean length of jail time has increased. Assume the distribution of the jail times is approximately normal.

**? Exercise 8.E. 12**

Is this a test of means or proportions?

**Answer**

means

**? Exercise 8.E. 13**

What symbol represents the random variable for this test?

**? Exercise 8.E. 14**

In words, define the random variable for this test.

**Answer**

the mean time spent in jail for 26 first time convicted burglars

**? Exercise 8.E. 15**

Is the population standard deviation known and, if so, what is it?

**? Exercise 8.E. 16**

Calculate the following:

a.  $\bar{x}$  \_\_\_\_\_

b.  $\sigma$  \_\_\_\_\_

c.  $s_x$  \_\_\_\_\_

d.  $n$  \_\_\_\_\_

**Answer**

- a. 3
- b. 1.5
- c. 1.8
- d. 26

### ? Exercise 8.E. 17

Since both  $\sigma$  and  $s_x$  are given, which should be used? In one to two complete sentences, explain why.

### ? Exercise 8.E. 18

State the distribution to use for the hypothesis test.

**Answer**

$$\bar{X} - N\left(2.5, \frac{1.5}{\sqrt{26}}\right)$$

### ? Exercise 8.E. 19

A random survey of 75 death row inmates revealed that the mean length of time on death row is 17.4 years with a standard deviation of 6.3 years. Conduct a hypothesis test to determine if the population mean time on death row could likely be 15 years.

- a. Is this a test of one mean or proportion?
- b. State the null and alternative hypotheses.  
 $H_0$ : \_\_\_\_\_  $H_a$ : \_\_\_\_\_
- c. Is this a right-tailed, left-tailed, or two-tailed test?
- d. What symbol represents the random variable for this test?
- e. In words, define the random variable for this test.
- f. Is the population standard deviation known and, if so, what is it?
- g. Calculate the following:
  - i.  $\bar{x}$  = \_\_\_\_\_
  - ii.  $s$  = \_\_\_\_\_
  - iii.  $n$  = \_\_\_\_\_
- h. Which test should be used?
  - i. State the distribution to use for the hypothesis test.
  - j. Find the  $p$ -value.
- k. At a pre-conceived  $\alpha = 0.05$ , what is your:
  - i. Decision:
  - ii. Reason for the decision:
  - iii. Conclusion (write out in a complete sentence):

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