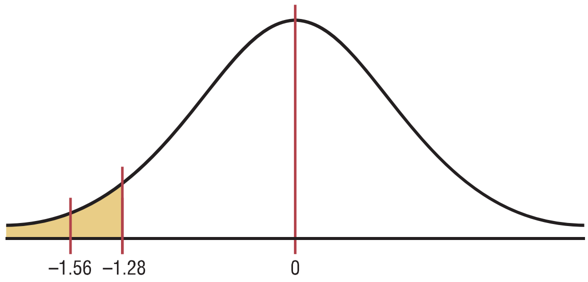
Step 4 Make the decision. Since the test value, −1.56, falls in the critical region, the decision is to reject the null hypothesis. See Figure 8–14.

Figure 8–14
Critical and Test Values for Example 8–4



Step 5 Summarize the results. There is enough evidence to support the claim that the average cost of men's athletic shoes is less than $80.

Comment: In Example 8–4, the difference is said to be significant. However, when the null hypothesis is rejected, there is always a chance of a type I error. In this case, the probability of a type I error is at most 0.10, or 10%.

Example 8–5

Cost of Rehabilitation

The Medical Rehabilitation Education Foundation reports that the average cost of rehabilitation for stroke victims is $24,672. To see if the average cost of rehabilitation is different at a particular hospital, a researcher selects a random sample of 35 stroke victims at the hospital and finds that the average cost of their rehabilitation is $26,343. The standard deviation of the population is $3251. At $\alpha = 0.01$, can it be concluded that the average cost of stroke rehabilitation at a particular hospital is different from $24,672?

Source: Snapshot, *USA TODAY.*

Solution

Step 1 State the hypotheses and identify the claim.

H_0: μ = \$24,672 and H_1: $\mu \neq$ \$24,672 (claim)

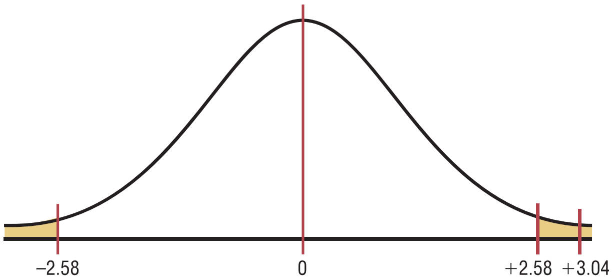
Step 2 Find the critical values. Since $\alpha = 0.01$ and the test is a two-tailed test, the critical values are +2.58 and −2.58.

Step 3 Compute the test value.

$$z = \frac{\overline{X} - \mu}{\sigma/\sqrt{n}} = \frac{26,343 - 24,672}{3251/\sqrt{35}} = 3.04$$

Step 4 Make the decision. Reject the null hypothesis, since the test value falls in the critical region, as shown in Figure 8–15.

Figure 8–15
Critical and Test Values for Example 8–5



Example 8–7 Wind Speed

A researcher claims that the average wind speed in a certain city is 8 miles per hour. A sample of 32 days has an average wind speed of 8.2 miles per hour. The standard deviation of the population is 0.6 mile per hour. At $\alpha = 0.05$, is there enough evidence to reject the claim? Use the *P*-value method.

Solution

Step 1 State the hypotheses and identify the claim.

H_0: $\mu = 8$ (claim) and H_1: $\mu \neq 8$

Step 2 Compute the test value.

$$z = \frac{8.2 - 8}{0.6/\sqrt{32}} = 1.89$$

Step 3 Find the *P*-value. Using Table E, find the corresponding area for $z = 1.89$. It is 0.9706. Subtract the value from 1.0000.

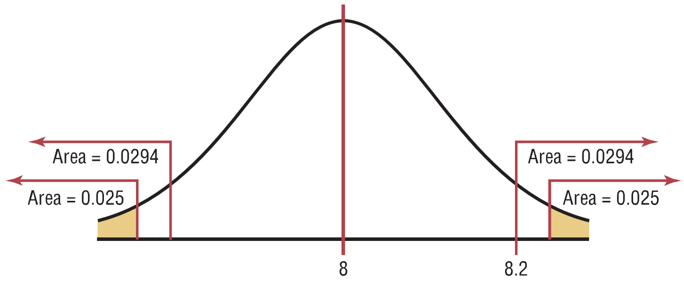
$$1.0000 - 0.9706 = 0.0294$$

Since this is a two-tailed test, the area of 0.0294 must be doubled to get the *P*-value.

$$2(0.0294) = 0.0588$$

Step 4 Make the decision. The decision is to not reject the null hypothesis, since the *P*-value is greater than 0.05. See Figure 8–20.

Figure 8–20
***P*-Values and α Values for Example 8–7**



Step 5 Summarize the results. There is not enough evidence to reject the claim that the average wind speed is 8 miles per hour.

In Examples 8–6 and 8–7, the *P*-value and the α value were shown on a normal distribution curve to illustrate the relationship between the two values; however, it is not necessary to draw the normal distribution curve to make the decision whether to reject the null hypothesis. You can use the following rule:

Decision Rule When Using a *P*-Value

If *P*-value $\leq \alpha$, reject the null hypothesis.

If *P*-value $> \alpha$, do not reject the null hypothesis.

In Example 8–6, *P*-value $= 0.0113$ and $\alpha = 0.05$. Since *P*-value $\leq \alpha$, the null hypothesis was rejected. In Example 8–7, *P*-value $= 0.0588$ and $\alpha = 0.05$. Since *P*-value $> \alpha$, the null hypothesis was not rejected.