Example 8–2

Using Table E in Appendix C, find the critical value(s) for each situation and draw the appropriate figure, showing the critical region.

a. A left-tailed test with $\alpha = 0.10$.

b. A two-tailed test with $\alpha = 0.02$.

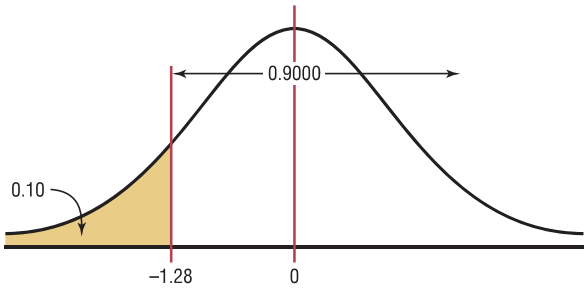
c. A right-tailed test with $\alpha = 0.005$.

Solution *a*

Step 1 Draw the figure and indicate the appropriate area. Since this is a left-tailed test, the area of 0.10 is located in the left tail, as shown in Figure 8–10.

Step 2 Find the area closest to 0.1000 in Table E. In this case, it is 0.1003. Find the z value that corresponds to the area 0.1003. It is -1.28. See Figure 8–10.

Figure 8–10
Critical Value and Critical Region for part *a* of Example 8–2



Solution *b*

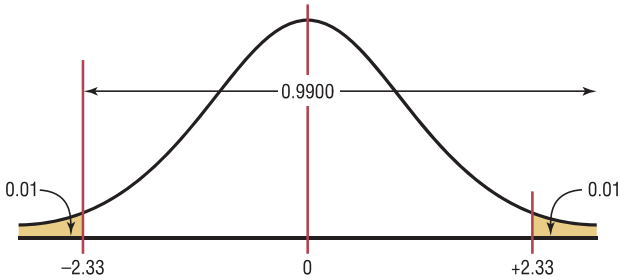
Step 1 Draw the figure and indicate the appropriate area. In this case, there are two areas equivalent to $\alpha/2$, or $0.02/2 = 0.01$.

Step 2 For the left z critical value, find the area closest to $\alpha/2$, or $0.02/2 = 0.01$. In this case, it is 0.0099.

For the right z critical value, find the area closest to $1 - \alpha/2$, or $1 - 0.02/2 = 0.9900$. In this case, it is 0.9901.

Find the z values for each of the areas. For 0.0099, $z = -2.33$. For the area of 0.9901, $z = 0.9901$, $z = +2.33$. See Figure 8–11.

Figure 8–11
Critical Values and Critical Regions for part *b* of Example 8–2



Speaking of Statistics

This study found that people who used pedometers reported having increased energy, mood improvement, and weight loss. State possible null and alternative hypotheses for the study. What would be a likely population? What is the sample size? Comment on the sample size.

RD HEALTH

Step to It

IT FITS in your hand, costs less than $30, and will make you feel great. Give up? A pedometer. Brenda Rooney, an epidemiologist at Gundersen Lutheran Medical Center in LaCrosse, Wis., gave 500 people pedometers and asked them to take 10,000 steps—about five miles—a day. (Office workers typically average about 4000 steps a day.) By the end of eight weeks, 56 percent reported having more energy, 47 percent improved their mood and 50 percent lost weight. The subjects reported that seeing their total step-count motivated them to take more.

— JENNIFER BRAUNSCHWEIGER

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Step 3 Compute the test value.

Step 4 Make the decision to reject or not reject the null hypothesis.

Step 5 Summarize the results.

Example 8–3 illustrates these five steps.

Example 8–3

Days on Dealers' Lots

A researcher wishes to see if the mean number of days that a basic, low-price, small automobile sits on a dealer's lot is 29. A sample of 30 automobile dealers has a mean of 30.1 days for basic, low-price, small automobiles. At $\alpha = 0.05$, test the claim that the mean time is greater than 29 days. The standard deviation of the population is 3.8 days.

Source: Based on information from *Power Information Network*.

Solution

Step 1 State the hypotheses and identify the claim.

$H_0: \mu = 29$ and $H_1: \mu > 29$ (claim)

Step 2 Find the critical value. Since $\alpha = 0.05$ and the test is a right-tailed test, the critical value is $z = +1.65$.

Step 3 Compute the test value.

$$z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{30.1 - 29}{3.8/\sqrt{30}} = 1.59$$

Step 4 Make the decision. Since the test value, $+1.59$, is less than the critical value, $+1.65$, and is not in the critical region, the decision is to not reject the null hypothesis. This test is summarized in Figure 8–13.