LEARNING CHECK

1. Explain why using a nondirectional (two-tailed) hypothesis makes it more difficult to reject the null hypothesis than when using a directional (one-tailed) hypothesis.

   A: A nondirectional test requires that the alpha level accounts for two possible statistical outcomes, whereas a directional test requires the alpha level to account for only one such outcome. Therefore, it is more difficult to detect a statistically significant result when using a nondirectional hypothesis because it is "stretched" in two directions on the distribution of outcomes.

   Let's use the same research situation as that in the previous Learning Check, when I wanted to know whether grades on a recent class exam were better than they have been in the past. As a refresher:

   For my class of 36 students, the mean exam score was 90%.

   Historically, the mean exam score was 80% with a standard deviation of 15%.

2. State the null and research hypotheses (nondirectional), both symbolically and in plain English.

   A:

   $$H_o: \mu_{\text{recent class}} = \mu_{\text{historical mean}}$$
   $$H_r: \mu_{\text{recent class}} \neq \mu_{\text{historical mean}}$$

   In plain English, the null hypothesis states that there is no difference between my recent class and the historical mean on this exam. The nondirectional research hypothesis states that my recent class performed differently from the historical mean on this exam.

3. To test my hypothesis, I use an alpha level of .03. What is my critical value for this test?

   A: Because this is a nondirectional test, we must denote half of .03 (which is .015) for each tail of the distribution as the region of null hypothesis rejection. The critical value is ±2.17.

4. What is the value of my *z* test statistic in this example?

   A:

   $$z = \frac{\bar{x} - \mu}{\sigma_{\text{x-bar}}}$$

(Continued)