Solution

Requirement check The only requirement is that the sample data be a simple random sample. Based on the design of this experiment, we assume that the sample data are a simple random sample. ✔

The claim that the median is less than 98.6°F is the alternative hypothesis, while the null hypothesis is the claim that the median is equal to 98.6°F.

H_0: Median is equal to 98.6°F. (median $=$ 98.6°F)

H_1: Median is less than 98.6°F. (median $<$ 98.6°F)

Following the procedure outlined in Figure 13-1, we use a negative sign to represent each temperature below 98.6°F, and we use a positive sign for each temperature above 98.6°F. We discard the 15 data values of 98.6 since they result in differences of zero. We have 68 negative signs and 23 positive signs, so $n = 91$ and $x = 23$ (the number of the less frequent sign). The sample data do not contradict the alternative hypothesis, because most of the 91 temperatures are below 98.6°F. The value of n exceeds 25, so we convert the test statistic x to the test statistic z:

$$z = \frac{(x + 0.5) - \left(\frac{n}{2}\right)}{\frac{\sqrt{n}}{2}}$$

$$= \frac{(23 + 0.5) - \left(\frac{91}{2}\right)}{\frac{\sqrt{91}}{2}} = -4.61$$

In this one-tailed test with $\alpha = 0.05$, we use Table A-2 to get the critical z value of -1.645. From Figure 13-3 we can see that the test statistic of $z = -4.61$ does fall within the critical region, so we reject the null hypothesis.

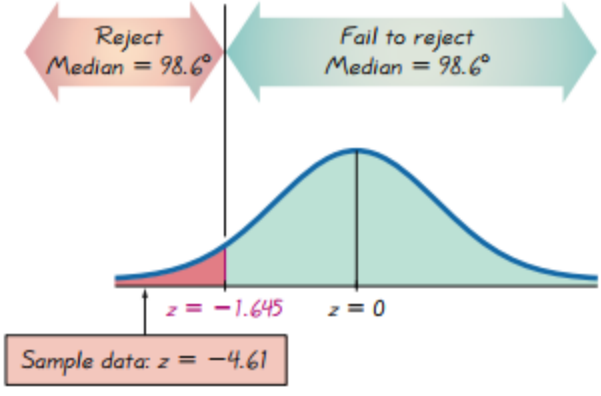

Figure 13-3 Testing the Claim That the Median Is Less Than 98.6°F

Interpretation

There is sufficient sample evidence to support the claim that the median body temperature of healthy adults is less than 98.6°F. It is not equal to 98.6, as is commonly believed.