Example 8–19 Replacing $1 Bills with $1 Coins

A statistician read that at least 77% of the population oppose replacing $1 bills with $1 coins. To see if this claim is valid, the statistician selected a sample of 80 people and found that 55 were opposed to replacing the $1 bills. At $\alpha = 0.01$, test the claim that at least 77% of the population are opposed to the change.

Source: *USA TODAY.*

Solution

Step 1 State the hypotheses and identify the claim.

$H_0: p = 0.77$ (claim) and $H_1: p < 0.77$

Step 2 Find the critical value(s). Since $\alpha = 0.01$ and the test is left-tailed, the critical value is -2.33.

Step 3 Compute the test value.

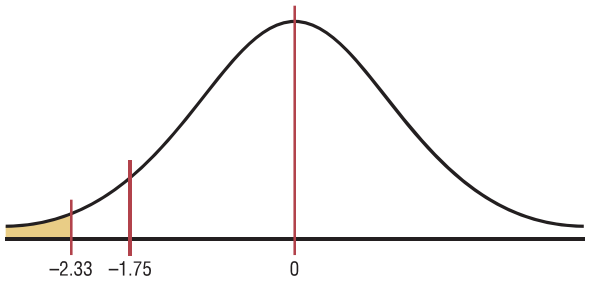
$$\hat{p} = \frac{X}{n} = \frac{55}{80} = 0.6875$$

$$p = 0.77 \quad \text{and} \quad q = 1 - 0.77 = 0.23$$

$$z = \frac{\hat{p} - p}{\sqrt{pq/n}} = \frac{0.6875 - 0.77}{\sqrt{(0.77)(0.23)/80}} = -1.75$$

Step 4 Do not reject the null hypothesis, since the test value does not fall in the critical region, as shown in Figure 8–28.

Figure 8–28
Critical and Test Values for Example 8–19



Step 5 There is not enough evidence to reject the claim that at least 77% of the population oppose replacing $1 bills with $1 coins.

Example 8–20 Attorney Advertisements

An attorney claims that more than 25% of all lawyers advertise. A sample of 200 lawyers in a certain city showed that 63 had used some form of advertising. At $\alpha = 0.05$, is there enough evidence to support the attorney's claim? Use the *P*-value method.

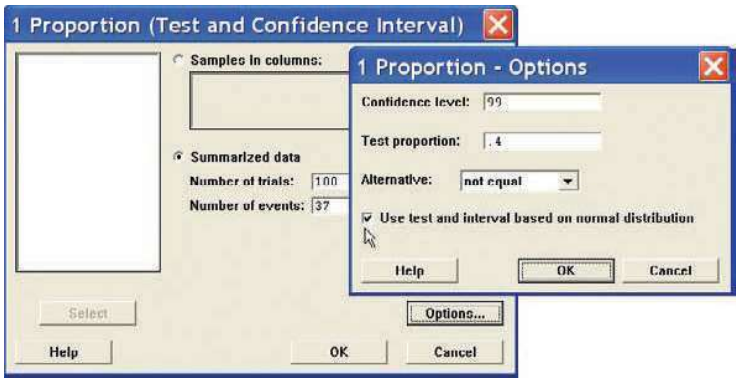
Solution

Step 1 State the hypotheses and identify the claim.

$H_0: p = 0.25$ and $H_1: p > 0.25$ (claim)

7. Very important! Check the box for Use test and interval based on normal distribution.
8. Click [OK] twice.

The results for the confidence interval will be displayed in the session window. Since the P-value of 0.540 is greater than $\alpha = 0.01$, the null hypothesis cannot be rejected.



Test and CI for One Proportion

```
Test of p = 0.4 vs p not = 0.4
Sample   X    N  Sample p          99%  CI          Z-Value  P-Value
1       37  100  0.370000  (0.245638,  0.494362)    -0.61    0.540
```

There is not enough evidence to conclude that the proportion is different from 40%.

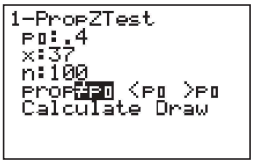
TI-83 Plus or TI-84 Plus
Step by Step

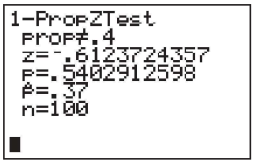
Hypothesis Test for the Proportion

1. Press **STAT** and move the cursor to TESTS.
2. Press **5** for 1-PropZTest.
3. Type in the appropriate values.
4. Move the cursor to the appropriate alternative hypothesis and press **ENTER.**
5. Move the cursor to Calculate and press **ENTER.**

Example TI8–3

This pertains to the previous example. Test the claim that $p = 40\%$, given $n = 100$ and $\hat{p} = 0.37$.





The test statistic is $z = -0.6123724357$, and the P-value is 0.5402912598.

Excel
Step by Step

Hypothesis Test for the Proportion: *z* Test

Excel does not have a procedure to conduct a hypothesis test for the population proportion. However, you may conduct the test of the proportion, using the MegaStat Add-in available on your CD. If you have not installed this add-in, do so, following the instructions from the Chapter 1 Excel Step by Step.

Example XL8–4

This example relates to the previous example. At the 1% significance level, test the claim that $p = 0.40$. The MegaStat test of the population proportion uses the P-value method. Therefore, it is not necessary to enter a significance level.