We now find the *P*-value by using the following procedure, which is shown in Figure 8-4:

Left-tailed test: *P*-value = area to left of test statistic z

Right-tailed test: *P*-value = area to right of test statistic z

Two-tailed test: *P*-value = *twice* the area of the extreme region bounded by the test statistic z

Because the hypothesis test we are considering is two-tailed with a test statistic of $z = 1.57$, the *P*-value is twice the area to the right of $z = 1.57$. Referring to Table A-2, we see that the cumulative area to the *left* of $z = 1.57$ is 0.9418, so the area to the right of that test statistic is $1 - 0.9418 = 0.0582$. The *P*-value is twice 0.0582, so we get *P*-value = 0.1164. (If using technology with the unrounded z score, the *P*-value is found to be 0.1169, as shown in the TI-83/84 Plus calculator display.) Figure 8-6 shows the test statistic and *P*-value for this example.

Step 7: Because the *P*-value of 0.1164 is greater than the significance level of $\alpha = 0.05$, we fail to reject the null hypothesis.

Step 8: Because we fail to reject H_0: $p = 0.93$, we fail to reject the claim that 93% of computers have antivirus programs. We conclude that there is not sufficient sample evidence to warrant rejection of the claim that 93% of computers have antivirus programs. (See Table 8-3 for help with wording this final conclusion.)

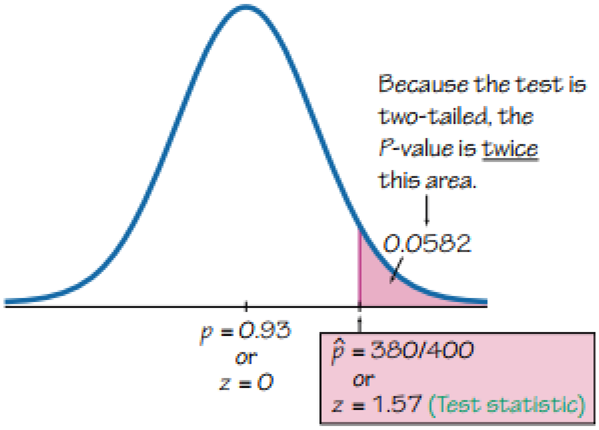

Figure 8-6 ***P*-Value Method**

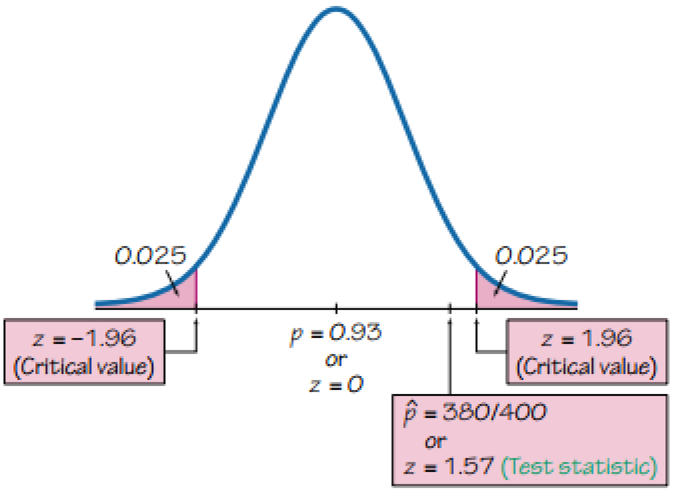

Figure 8-7 **Critical Value Method**

Critical Value Method

The critical value method of testing hypotheses is summarized in Figure 8-2 in Section 8-2. When using the critical value method with the claim given in Example 1, Steps 1 through 5 are the same as in Steps 1 through 5 for the *P*-value method, as shown above. We continue with Step 6 of the critical value method.

Step 6: The test statistic is computed to be $z = 1.57$ as shown for the preceding *P*-value method. With the critical value method, we now find the critical values (instead of the *P*-value). This is a two-tailed test, so the area of the critical region is an area of $\alpha = 0.05$, which is divided equally between the two tails. Referring to Table A-2 and applying the methods of Section 6-2, we find that the critical values of $z = -1.96$ and $z = 1.96$ are at the boundaries of the critical region, as shown in Figure 8-7.