The **significance level** α is the probability of making the mistake of rejecting the null hypothesis when it is true. This is the same α introduced in Section 7-2, where we defined the confidence level for a confidence interval to be the probability $1 - \alpha$. Common choices for α are 0.05, 0.01, and 0.10, with 0.05 being most common.

Step 5: Identify the Statistic Relevant to the Test and Determine Its Sampling Distribution (such as normal, t, or χ^2)

Objective

Based on the sample statistic that is relevant to the claim being tested, identify the sampling distribution of the statistic (such as normal, Student t, or χ^2) so that the correct sampling distribution can be used in Step 6.

For this chapter, verify that any requirements are satisfied, then use Table 8-2 to choose the correct sampling distribution.

Example: The claim $p > 0.5$ is a claim about the population proportion p, so use the normal distribution provided that the requirements are satisfied. (With $n = 100$, $p = 0.5$, and $q = 0.5$ as in Example 1, $np \geq 5$ and $nq \geq 5$ are both true.)

Table 8-2

Parameter	Sampling Distribution	Requirements	Test Statistic
Proportion p	Normal (z)	$np \geq 5$ and $nq \geq 5$	$z = \dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$
Mean μ	t	σ not known and normally distributed population or σ not known and $n > 30$	$t = \dfrac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$
Mean μ	Normal (z)	σ known and normally distributed population or σ known and $n > 30$	$z = \dfrac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$
St. dev. σ or variance σ^2	χ^2	Strict requirement: normally distributed population	$\chi^2 = \dfrac{(n-1)s^2}{\sigma^2}$

Step 6: Find the Value of the Test Statistic, Then Find Either the P-Value or the Critical Value(s)

Objective

First transform the relevant sample statistic to a standardized score called the *test statistic*. Then find the *P-value* that can be used to make a decision about the null hypothesis, or find *critical values* that can be used with the test statistic in making a decision about the null hypothesis.

The **test statistic** is a value used in making a decision about the null hypothesis. It is found by converting the sample statistic (such as the sample proportion $\hat{p}$, the sample mean $\bar{x}$, or the sample standard deviation s) to a score (such as z, t, or χ^2) with the assumption that the null hypothesis is true. In this chapter we use the test statistics in the last column of Table 8-2.

Example: From Example 1 we have a claim made about the population proportion p, we have $n = 100$ and $x = 58$, so $\hat{p} = x/n = 0.58$. Because we also have the null hypothesis of H_0: $p = 0.5$, we are working with the assumption that $p = 0.5$, and it follows that $q = 0.5$. Using $n = 100$, $\hat{p} = 0.58$, $p = 0.5$, and $q = 0.5$, we can evaluate the test statistic as shown below. (See that the result of $z = 1.60$ is included in each of the previous displays from technology, so technology can do this calculation for us.)

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.58 - 0.5}{\sqrt{\frac{(0.5)(0.5)}{100}}} = 1.60$$