

Chapter 7	Hypothesis Testing
Section 2	Basics of Hypothesis Testing

In previous chapters we've talked about point estimates. A point estimate is a value obtained from a sample, and it is an estimate of the population value.

From a sample, \bar{x} (the sample mean) is the point estimate for μ (the population mean).

From a sample, \hat{p} (the sample proportion) is the point estimate for p (the population proportion).

We obtain the point estimates in order to get a picture of the population, and to draw inferences about the population.

As we saw in Chapter 8, there is an error in the point estimate that is related to the sample size and our level of confidence.

What we want to know is if the point estimate is significantly close. This is where hypothesis testing comes in.

Our hypothesis test has five steps:

1. Identify the null hypothesis H_0 : the point estimate value is equal to the population value.
2. Identify the alternate hypothesis H_1 : the point estimate value is:
 - a. less than the population value (left tailed test)
 - b. greater than the population value (right tailed test)
 - c. or not equal to the population value (two tailed test)
3. Determine the critical value by identifying the following and drawing the curve:
 - a. The test type (z , t , χ^2)
 - b. The tails (left, right, or two)
 - c. The degrees of freedom, if needed
 - d. The level of significance (alpha)
4. Calculate the test statistic using the correct formula and make a decision:
 - a. Reject H_0 : If the test statistic is inside the critical region, then you reject the null hypothesis – which means the alternate hypothesis is true: the point estimate value is less than, greater than, or not equal to the population value.
 - b. Fail to Reject H_0 : If the test statistic is outside the critical region, then you fail to reject the null hypothesis – which means there is not sufficient evidence to support the alternative hypothesis.

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5. Draw a conclusion:

Reject: There is sufficient evidence to support the hypothesis that...

Fail to Reject: There is not sufficient evidence to support the hypothesis that...

Replace the ... with a restatement of the question.

In the next sections, we will talk about the formulas to be used in Step 4.

The p-Value

In Step 4 of our hypothesis test, we calculated a test statistic. We can take that one step further and calculate the probability associated with that test statistic – this is the p value.

The p value tells us the minimum level of significance at which we would reject the null hypothesis.

So, if the level of significance is greater than p value – we reject the null hypothesis.

If the level of significance is less than the p value – we fail to reject the null hypothesis.