

9.1: Prelude to Hypothesis Testing

CHAPTER OBJECTIVES

By the end of this chapter, the student should be able to:

- Differentiate between Type I and Type II Errors
- Describe hypothesis testing in general and in practice
- Conduct and interpret hypothesis tests for a single population mean, population standard deviation known.
- Conduct and interpret hypothesis tests for a single population mean, population standard deviation unknown.
- Conduct and interpret hypothesis tests for a single population proportion

One job of a statistician is to make statistical inferences about populations based on samples taken from the population. Confidence intervals are one way to estimate a population parameter. Another way to make a statistical inference is to make a decision about a parameter. For instance, a car dealer advertises that its new small truck gets 35 miles per gallon, on average. A tutoring service claims that its method of tutoring helps 90% of its students get an A or a B. A company says that women managers in their company earn an average of \$60,000 per year.



Figure 9.1.1: You can use a hypothesis test to decide if a dog breeder's claim that every Dalmatian has 35 spots is statistically sound. (Credit: Robert Neff)

A statistician will make a decision about these claims. This process is called "hypothesis testing." A hypothesis test involves collecting data from a sample and evaluating the data. Then, the statistician makes a decision as to whether or not there is sufficient evidence, based upon analysis of the data, to reject the null hypothesis. In this chapter, you will conduct hypothesis tests on single means and single proportions. You will also learn about the errors associated with these tests.

Hypothesis testing consists of two contradictory hypotheses or statements, a decision based on the data, and a conclusion. To perform a hypothesis test, a statistician will:

- Set up two contradictory hypotheses.
- Collect sample data (in homework problems, the data or summary statistics will be given to you).
- Determine the correct distribution to perform the hypothesis test.
- Analyze sample data by performing the calculations that ultimately will allow you to reject or decline to reject the null hypothesis.
- Make a decision and write a meaningful conclusion.

To do the hypothesis test homework problems for this chapter and later chapters, make copies of the appropriate special solution sheets. See [Appendix E](#).

Glossary

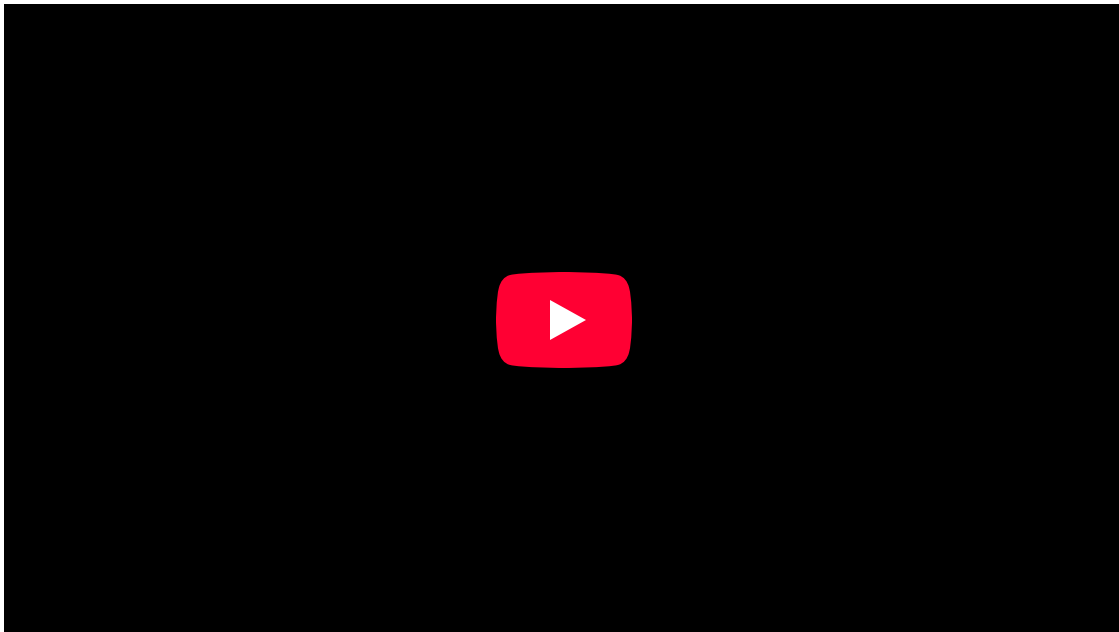
Confidence Interval (CI)

an interval estimate for an unknown population parameter. This depends on:

- The desired confidence level.
- Information that is known about the distribution (for example, known standard deviation).
- The sample and its size.

Hypothesis Testing

Based on sample evidence, a procedure for determining whether the hypothesis stated is a reasonable statement and should not be rejected, or is unreasonable and should be rejected.



Hypothesis Testing Procedure

- Determine the hypotheses in words
- Write down H_0 and H_1 in symbols
- Determine the level of significance
- Conduct the survey or experiment
- Calculate the test statistic
- Calculate the p-value

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