STAT 291 - Statistics for the Mathematical Sciences I

Hypothesis Testing Examples

Suppose a manufacturer claims that the average lifetime of one type of batteries that it produces is 54 months. A consumer groups wants to test this claim due to several complaints about false advertising. In a random sample of 50 batteries, the group finds a sample average of 52 months and a standard deviation of 6 months. Is this enough evidence, at the 0.05 level, to conclude that the average lifetime for all batteries of this type made by this manufacturer is less than the 54 months that they claim?

1. **Hypotheses**

2. **Assumptions**

3. **Rejection Region**

4. **Test Statistic**

5. *P*-**value**

6. **Conclusion**

Suppose that a manufacturer claims that a certain model of car that it sells will average 27 miles per gallon, and that the distribution of mpg numbers is normal. A CEO of a large company buys 20 cars randomly from around the country for use by her executives in their travels. She finds that her sample average mpg is only 30.1 with a standard deviation of 3.2. Is this enough evidence, at the 0.01 level, for her to conclude that the average car of this model does not get 27 miles per gallon?

1. **Hypotheses**

2. **Assumptions**

3. **Rejection Region**

4. **Test Statistic**

5. P-**value**

6. **Conclusion**

A candidate for an SGA office is curious about how his chances look for the upcoming election. To see if he can be confident of a victory, he gets several of his friends to help him randomly sample 100 Messiah students about their plans for the election. When asked whether they plan to vote for him, 58 of the students say yes. Based on this sample, can the candidate conclude, at the 0.10 level, that he would get more than 50% of the votes if the election were held today?

1. **Hypotheses**

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The placebo effect describes the phenomenon of improvement in the condition of a patient who is given a placebo. A placebo looks like a real drug, but has no active ingredients. Suppose a study of the effect gives 700 random patients a placebo, that both the patients and the doctors are led to believe is a new experimental drug. Of these patients, 500 report a lessening of their symptoms. Without treatment, it is known that 70% of patients would improve due to natural causes during the duration of the trial. Does the sample support the placebo effect, at the 0.01 level?

1. **Hypotheses**

2. **Assumptions**

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If the previous example had used a study where 5000 out of 7000 patients showed improvement, would that have verified the placebo effect at the 0.01 level?

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Suppose that the standard strength for a certain container that a company produces must be 100 pounds per square inch. A sample of 60 containers is selected, and the sample mean and standard deviation is calculated to be 94.9 and 6.34, respectively. Is this enough information, at the 0.10 level, to conclude that the containers are not strong enough?

1. **Hypotheses**

2. **Assumptions**

3. **Rejection Region**

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6. **Conclusion**

Prior to a forest fire, it was known that a wooded area had an average population of 400 wild turkeys. Ten years after the fire, the government commissions a study to see if the fire helped, or hurt, the average population of wild turkeys in the area. 20 random days throughout the year are selected, and the population is counted on the selected day. When this is done, the average population is 412.1, and the standard deviation of these counts is 10.18. Is it safe to conclude, at the 0.05 level, that the population has changed? If so, how?

1. **Hypotheses**

2. **Assumptions**

3. **Rejection Region**

4. **Test Statistic**

5. *P*-**value**

6. **Conclusion**