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| Introduction to Probability, Statistics and Data Handling | Hypothesis Testing |
| Tutorial 8 | |

1. State the null hypothesis, H_0 , and the alternative hypothesis, H_a , in terms of the appropriate parameter (μ or p).
 - a. The mean number of years Americans work before retiring is 34.
 - b. At most 60% of Americans vote in presidential elections.
 - c. The mean starting salary for San Jose State University graduates is at least \$100,000/year.
 - d. Twenty-nine percent of high school seniors get drunk each month.
 - e. About half of Americans prefer to live away from cities, given the choice.
 - f. Europeans have a mean paid vacation each year of six weeks.
 - g. Private universities' mean tuition cost is more than \$20,000 per year.

2. It is hoped that a newly developed pain reliever will more quickly produce perceptible reduction in pain to patients after minor surgeries than a standard pain reliever. The standard pain reliever is known to bring relief in an average of 3.5 minutes with standard deviation 2.1 minutes. To test whether the new pain reliever works more quickly than the standard one, 50 patients with minor surgeries were given the new pain reliever and their times to relief were recorded. The experiment yielded sample mean $\bar{x} = 3.1$ minutes and sample standard deviation $s = 1.5$ minutes. Is there sufficient evidence in the sample to indicate, at the 5% level of significance, that the newly developed pain reliever does deliver perceptible relief more quickly?

3. Your statistics instructor claims that 60 percent of the students who take her Elementary Statistics classes go through life feeling more enriched. For some reason that she can't quite figure out, most people don't believe her. You decide to check this out on your own. You randomly survey 64 of her past Elementary Statistics students and find that 34 feel more enriched as a result of her class. Now, what do you think? Use the proportions method.

4. In the past the average length of an outgoing telephone call from a business office has been 143 seconds. A manager wishes to check whether that average has decreased after the introduction of policy changes. A sample of 100 telephone calls produced a mean of 133 seconds, with a standard deviation of 35 seconds. Perform the relevant test at the 1% level of significance.

5. A normal distribution has a standard deviation of 1. We want to verify a claim that the mean is greater than 12. A sample of 36 is taken with a sample mean of 12.5.
 $H_0: \mu \leq 12$ $H_a: \mu > 12$. The p-value is 0.0013. Draw a graph that shows the p-value.

6. Suppose a consumer group suspects that the proportion of households that have three cell phones is 30%. A cell phone company has reason to believe that the proportion is not 30%. Before they start a big advertising campaign, they conduct a hypothesis test. Their marketing people survey 150 households with the result that 43 of the households have three cell phones.
 - a. The value that helps determine the p-value is p' . Calculate p' .
 - b. What is a success for this problem?
 - c. What is the level of significance?
 - d. Draw the graph for this problem. Draw the horizontal axis. Label and shade appropriately.
 - e. Make a decision. _____ (Reject/Do not reject) H_0 because _____.