# Practice: Confidence Intervals and Hypothesis Testing

1. Write hypothesis for the following situation:

Employees at a firm are worried about the effect of June/July sales on employee productivity. They estimate that on a regular business day employees spend on average 15 minutes of company time checking sites not connected to the business. The firm want to determine if there is convincing evidence that employee productivity changed during the June/July sale period. H0=15, H1!=15

1. Write hypotheses for the following scenario: Census Bureau data show that the mean household income in the area served by a shopping mall is $72,500 per year. A market research firm questions shoppers at the mall to find out whether the mean household income of mall shoppers is higher than that of the general population. H0=72,500, H1>72,500
2. A test statistic for a two-sided significance test is z=2.3. Sketch a standard normal curve, mark the z-value, find the p, and shade it in. Would you reject the null hypothesis at a level α=0.05? YES. P=0.02<0.05. If the p value is smaller than a we reject the hypothesis. (I shaded the tail\*2)
3. The p-value for a significance test is 0.082. Do you reject the null hypothesis at α=0.05? α=0.01? Why? No. If the p values is bigger than the a we accept the hypothesis.
4. A 95% confidence interval for a population mean is (57,65). Can you reject the null hypothesis that μ=68 at the 5% significance level? Why? Can you reject the null hypothesis that μ=62at the 5% significance level? Why? Yes. 68 is out of the confidence interval.

No. 62 is within the confidence interval.

1. Statistics can help decide the authorship of literary works. Sonnets by a certain Elizabethan poet are known to contain an average of μ=8.9 new words (words that were not used in the author's other works), σ=2.5.A new manuscript with 30 sonnets has come to light with an average of = 10.2 new words. We test H0: μ=8.9, Ha: μ>8.9. What can you conclude about the authorship of the new poems? (10.2-8.9)/(2.5/^30) = 2.85 , p=0.002<a. That's why we reject the hypothesis.
2. The level of calcium in the blood in healthy young adults varies with a mean of about 9.5 mg per deciliter and standard deviation around 0.4. A clinic in rural Guatemala measures the blood calcium level of 160 healthy pregnant women at their first visit for prenatal care. The mean is 9.1. Is this an indication that the mean calcium level in the population of these women is less than 9.5? Carry out a significance test, and report your conclusion. Include a confidence interval as well. (9.1-9.5)/(0.4/^160) = -12.65 , p=0.0000.....<a. That's why we reject the hypothesis.
3. A lab is analyzing the components of an ingredient in a medicine, which mean is supposed to be 0.86 with standard deviation of 0.0068. Their sample mean of 50 samples is 0.84. Is there a significant difference in the mean? (Complete all steps – state hypothesis, decide on α, and find test statistic, p-value, state conclusion) H0=0.86, H1!=0.86, A=0.01

(0.84-0.86)/(0.0068/^50) = -0.002 , p=0.99>a. That's why we accept the hypothesis.

1. The local library has decided that the mean overdue number of days is 7.6, with a standard deviation of 2.9 days. They increase the fine for overdue books and a random sample of 100 books shows a mean of 7.1 days late. Has the increased fine reduced the mean overdue rate? Use alpha = 0.02.

(Complete all steps – state hypothesis, decide on α, and find test statistic, p-value, state conclusion) H0=7.6, H1<7.6, A=0.02

(7.1-7.6)/(2.9/^100) = -1.72, p=0.042>a. That's why we accept the hypothesis.

1. Researchers believe that the average number of headaches per student during a semester of statistics is 12. Statistic students believe that the average is higher. In a sample of n = 36 students the mean is 14 headaches per semester with a standard deviation of 4.9. Test the student’s belief at the 1% level (alpha =0.01). H0=12, H1>12, A=0.01

(14-12)/(4.9/^36) = 2.45 , p=0.007<a. That's why we reject the hypothesis.