Stat 333

Lab assignment #3

The instructions for using the t-distribution on the computer are the same as the instructions given for the z-distribution on the last assignment except you have to input degrees of freedom for the t-distribution. Note: some answers may be off due to rounding.

1. The length of human pregnancies is approximately normally distributed with mean equal to 266 days and standard deviation equal to 16 days. Dr. Margaret Oswiecmiski obtains a simple random sample of 10 of her patients and obtains the following results:
   279 260 261 266 255 267 230 266 264 240

   (a) Use the data to compute a point estimate for the population mean gestation period. (258.8)
   (b) Construct a 90% confidence interval for the gestation period for all of Dr. Oswiecmiski's patients. Interpret this interval. (250.5, 267.1)
   (c) Do Dr.Oswiecmiski's patients have a mean gestation period different from 266 days? Why?
2. A researcher is interested in approximating the mean number of mile on four-year-old Saturn SCIs. She finds a random sample of 33 such Saturn SCIs in the Chicagoland area and obtains the following results
   45,336 90,574 42,800 84,000 57,506 47,977 10,778 39,176 41,431 86,838
   30,114 90,100 26,560 75,312 44,411 29,000 30,447 25,000 49,874 76,576
   57,145 38,796 32,004 43,128 51,159 54,000 52,181 51,305 33,867 46,178
   51,000 39,174 59,018

   (a) Obtain a point estimate of the population mean number of miles on a four-year-old Saturn SCI. (949477.7)
   (b) Construct and interpret a 95% confidence interval for the population mean number of miles on a four-year old Saturn SCI. (42487.0, 56468.5)
   (c) Construct and interpret a 95% confidence interval for the population mean number of miles on a four-year old Saturn SCI. Assume that σ = 19,700 (42756.2, 56199.2)
   (d) Construct and interpret a 90% confidence interval for the population mean number of miles on a four-year old Saturn SCI. Assume that σ = 19,700 (43836.5, 55119.2)
   (e) What effect does decreasing the level of confidence have on the interval?
   (f) Do the confidence intervals computed in parts (b), (c) and (d) represent an interval estimate for the population mean number of miles on Saturn SCIs in the United States? Why?
3. The students also checked 6 bags of Doritos marked with a net weight of 28.3 grams. They carefully weighed the contents of each, recording the following weights (in grams): 29.3, 28.2, 29.1, 28.7, 28.9, 28.5.
   (a) Find the mean and standard deviation of the observed weights. (28.8)

(b) Construct a 95% confidence interval for the mean weight of such bags of chips (28.36, 29.21)
(c) Explain in context what your interval means
(d) Comment on the company's stated weight of 28.3 grams.

4 Livestock are given a special feed supplement to see if it will promote weight gain. The researchers report that the 77 cows studied gained an average of 56 pounds, with a standard deviation of 10 pounds.
(a) Construct a 99% confidence interval for the mean weight gained for all such cows. (53.0, 59.0)
(b) The makers of the feed supplement claim that cows given the feed supplement should gain around 70 pounds. Does the data confirm this claim?

5. A Gallup poll conducted December 20-21, 1999 asked Americans how many times they bathe during the week. How many subjects would be needed in order to estimate the number of times Americans bathed during the week in 1999 within 0.5 with 95% confidence? Initial survey results indicate that $\sigma \sim 2.9$. (130)

6. A researcher wished to estimate the mean number of miles on four-year-old Saturn SCIs.

(a) How many cars should be in a sample in order to estimate the mean number of miles with 1000 miles with 90% confidence, assuming that $\sigma \sim 19{,}700$ (1051)
(b) How many cars should be in a sample in order to estimate the mean number of miles within 500 miles with 90% confidence, assuming that $\sigma \sim 19{,}700$ (4201)
(c) What effect does increasing the required accuracy have on the sample size?

7. In a poll conducted May 7-10, by ABC News, a simple random sample of 1068 American adults was asked, "Have you ever been shot at?" Of the 1068 adults, 96 responded yes.
(a) Obtain a 95% confidence interval about the population proportion (0.0741, 0.1087)
(b) Interpret the interval.
(c) If the government claims that around 5% of all Americans have been shot at, is this correct based on this survey? Explain

8. The drug Lipitor is meant to lower cholesterol levels. In a clinical trial of 863 patients who received 10 mg doses of Lipitor daily, 47 reported a headache as a side effect.
(a) Construct a 90% confidence interval for the population proportion of Lipitor users who do not report a headache as a side effect. Interpret the interval. (0.9313, 0.9569)
(b) Construct a 95% confidence interval for the population proportion of Lipitor users who do not report a headache as a side effect. (0.9282, 0.9590)
(c) What is the effect of increasing the level of confidence on the width of the interval?

9. A study of 74 patients with ulcers was conducted in which they were prescribed 40 mg of Pepcid. After 8 weeks, 58 reported confirmed ulcer healing. Construct a

99% confidence interval for the proportion of patients with ulcers receiving Pepcid who will have confirmed ulcer healing. (0.638, 0.8828)

10. A sociologist wishes to conduct a poll in order to estimate the percentage of Americans who judge that affirmative action programs for minorities and women should be continued at some level. What size sample should be obtained if she wished the estimate to be within 3 percentage points with 95% confidence if
    (a) She uses a 1999 estimate of 80% obtained from a Time/CNN poll? (680)
    (b) She does not use any prior estimates? (1064)
11. In a Harris Poll conducted in July, 2000, 64% of the people polled answered yes to the following question: "Do you believe in capital punishment, that is the death penalty, or are you opposed to it?" The margin of error in the poll was ±0.03 and the estimate was made with 95% confidence. How many people were surveyed? (980)
12. The mean monthly cellular telephone bill in 1999 was $40.24 with a standard deviation of $21.20 at CTIA. A researcher at CTIA claims that the average monthly bill has increased since then. She conduct a survey of 49 cellular phone users and determines the mean bill to be $45.15.
    (a) Test the researcher's claim. ($z = 1.6212$, p-value=.0525, fail to Rho)
    (b) What would happen to the conclusion if she used $\alpha = 0.1$? (RHo)
13. An energy official claims that the oil output per well in the US has declined from the 1998 level of 11.1 barrels per day with a standard deviation of 1.3 barrels. He randomly samples 50 wells throughout the US and determines the mean output to be 10.7 barrels per day. Test the researcher's claim.
    (z=-2.1757, p-value= 0.0148, Rho)
14. A nutritionist claims that the mean daily consumption of fiber for 20-39-year-old males is less than 20 grams per day. In a survey of 457 males who were 20-39 years old, it was found that the mean daily intake of fiber was 19.1 grams, with standard deviation 9.1 grams.
    (a) Test the nutritionist's claim. (t=-2.114, p-value = 0.0175, Rho)
    (b) What would happen to the conclusion if she used $\alpha = 0.01$? (fail to Rho)
15. In 1989, the average age of an inmate on death row was 36.2 years of age. A sociologist wants to test the claim that the average age of death-row inmate has changed since then. She randomly selected 32 death-row inmates and finds that their mean age is 38.9, with a standard deviation of 9.6. Test the sociologist's claim.
    (t= 1.591, p-value= 0.1218, fail to Rho)
16. A dietician maintains that the total cholesterol for 40-49 year old males is high. Anyone with total cholesterol above 200 is considered to have high cholesterol. She conducts a random sample of 40 males between the ages of 40 and 49 years and finds that their mean total cholesterol is 211, with a standard deviation of 39.2. Test the dietician's claim. (t=1.7747, p-value= 0.0419, Rho)
17. The maximum acceptable level for exposure to microwave radiation is an average of 10 microwatts per square centimeter. It is feared that a large television transmitter may be polluting the air nearby by pushing the level of microwave radiation above the safe limit.
    The following random sample of 9 observations on X, the number of microwatts per square centimeter, taken at locations near the transmitter:

9 11 14 10 10 12 13 8 12

(a) Can the null hypothesis be rejected? What practical conclusion can be drawn?
[no fail to Rho, t=1.5492, p-value = 0.080]

(b) What if the significance level was 0.10? (Rho)

18. The reputations (and hence the sales) of many businesses can be severely damaged by shipments of manufactured items that contain an unusually large percentage of defectives. A manufacturer of alkaline batteries wants to be reasonably certain that fewer than 5% of its batteries are defective. Suppose 300 batteries are randomly selected from a very large shipment. Each is tested and 10 defective batteries are found.
    (a) Will this sample provide sufficient evidence to the manufacturer that this shipment will be satisfactory? (no, fail to Rho, z=-1.3245, p-value= 0.0927)
    (b) What if $\alpha = 0.01$ (fail to RHo)
19. In 1995, 74% of Americans aged 18 and older felt that men were more aggressive than women. In 2000, a similar poll was taken. In a random sample of 1026 Americans 18 years or older resulted in 698 respondents stating that men were more aggressive than women. Is there significant evidence to indicate that the proportion of Americans who believe that men are more aggressive than women has decreased?
(z= -4.3596, p-value= 6.546×10^{-6}, Rho)
20. The drug Prevnar is a vaccine meant to prevent meningitis. It is typically administered to infants. In clinical trials, the vaccine was administered to 710 randomly sampled infants between12 and 15 months of age. Of the 710 infants, 121 experienced a decrease in appetite. Is there significant evidence to conclude that the proportion of infants who receive Prevnar and experience a decrease in appetite is different from 0.135? (z = 2.7603, p-value= 0.0057, Rho)
21. According to the U.S. Census Bureau, 7.1% of all births to nonsmoking mothers are of low birth weight (<5 lbs.,8oz). An obstetrician wanted to know whether nonsmoking mothers between the ages of 35 and 39 year old gave birth to a higher percentage of low-birth-weight babies. She randomly selected 240 births where the mother was 35-39 years old and found that 22 of them gave birth to low-birth-weight babies. Is there significant evidence to support the claim that mothers between 35 and 39 have a higher percentage of low-birth-weight babies?
(z= 1.2466, p-value= 0.1063, fail to RHo)
22. Pathological gambling is an impulse-control disorder. The National Gambling Impact Study Commission randomly selected 2417 adults and found that 35 were pathological gamblers.
    (a) Is there evidence to support the claim that more than 1% of the adult population are pathological gamblers? (z = 2.2140, p-value= 0.0134, Rho)
    (b) What would the conclusion be if $\alpha = .01$? (fail to Rho)