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#### Chapter 6.1: Confidence intervals

- 1) Find the critical value  $Z_c$  that corresponds to a 94% confidence level.
- 2) A random sample of 150 students has a grade point average with a standard deviation of 0.78. Find the margin of error if  $c = 0.98$
- 3) The standard IQ test has a mean of 98 and a standard deviation of 16. We want to be 90% certain that we are within 4 IQ points of the true mean. Determine the required sample size.

#### Chapter 6.2

- 4) Construct a 95% confidence interval for the population mean,  $\mu$ . Assume the population has a normal distribution. A sample of 20 college students had mean annual earnings of \$3120 with a standard deviation of \$677.
- 5) A local bank needs information concerning the checking account balances of its customers. A random sample of 15 accounts was checked. The mean balance was \$687.75 with a standard deviation of \$256.20. Find a 90% confidence interval for the true mean. Assume that the account balances are normally distributed.

#### Chapter 6.3

- 6) When 500 college students were surveyed, 150 said they own their car. Construct a 95% confidence interval for the proportion of college students who say they own their car.
- 7) The Federal Bureau of Labor Statistics surveys 50,000 people to determine the unemployment rate. If the reported unemployment rate must have an error no more than 0.2% and the rate is known to be 5.8%, what is the corresponding confidence level?

#### Chapter 6.4

- 8) Find the critical values,  $X^2_R$  and  $X^2_L$ , for  $c=0.98$  and  $n = 20$
- 9) Construct a 95% confidence interval for the population standard deviation  $\sigma$  of a random sample of 15 men who have a mean weight of 165.2 pounds with a standard deviation of 13.9 pounds. Assume the population is normally distributed.

10) The mean replacement time for a random sample of 12 microwave ovens is 8.6 years with a standard deviation of 5.1 years. Construct the 98% confidence interval for the population variance,  $\sigma^2$ . Assume the data are normally distributed.

11) A container of car oil is supposed to contain 1000 milliliters of oil. A quality control manager wants to be sure that the standard deviation of the oil containers is less than 20 milliliters. He randomly selects 10 cans of oil with a mean of 997 milliliters and a standard deviation of 32 milliliters. Use these sample results to construct a 95% interval for the true value of  $\sigma$ . Does the confidence interval suggest that the variation in the oil containers is at an acceptable level?

#### Chapter 7: Hypothesis testing with one sample

6) Use the given claim to state a null and an alternative hypothesis. Identify which hypothesis represents the claim.

12) Find the critical value(s) for the indicated z-test and level of significance  $\alpha$

Two tailed test,  $\alpha = 0.005$

18) Use the z-test to test the claim about the population mean  $\mu$  at the given level of significance  $\alpha$  using the given sample statistics

20) Use a P-value to test the claim about the population mean  $\mu$  using the given sample statistics. State your decision for  $\alpha = 0.10$ ,  $\alpha = 0.05$ , and  $\alpha = 0.01$  levels of significance

30) Use a t-test to test the claim about the population mean  $\mu$  at the given level of significance  $\alpha$  using the given sample statistics. For each claim assume the population is normally distributed.

Claim:  $\mu = 4.20$ ;  $\alpha = 0.02$ . Sample statistics:  $\bar{x}$  (with a bar over it) = 4.41,  $s = 0.26$ ,  $n = 9$

34) Use a t-test to investigate the claim. For each claim assume each population is normally distributed.

A certain restaurant claims that its hamburgers have no more than 10 grams of fat. You work for a nutritional health agency and are asked to test this claim. You find that a random sample of nine hamburgers has a mean fat content of 13.5 grams and a standard deviation of 5.8 grams. At  $\alpha = 0.10$ , do you have enough evidence to reject the restaurant's claim?

38) Decide whether the normal sampling distribution can be used to approximate the binomial distribution. If it can, use the z-test to test the claim about the population proportion  $p$  at the given level of significance  $\alpha$  using the given sample statistics

Claim:  $p < 0.70$ ;  $\alpha = 0.01$ . Sample statistics:  $\hat{P}$  (with a triangle cap on it) = 0.50,  $n = 68$

46) Test the claim about the population proportion  $p$

The Western blot assay is a blood test for the presence of HIV. It has been found that this test sometimes gives false positive results for HIV; specifically, when it does not find a certain antibody called p-31 antibody. A medical researcher claims that the rate of false positives in this case is 2%. A recent study of 121 randomly selected U.S. blood donors who tested positive for HIV but did not have p-31 antibodies in their blood found that 4 were actually HIV negative. Test the researcher's claim of a 2% false positive rate at the  $\alpha = 0.05$  level. What do you conclude?

52) Use a  $X^2$  test for a population variance, sample size  $n$ , and level of significance  $\alpha$

Claim:  $\sigma^2$  (to the second power)  $\leq 60$ ;  $\alpha = 0.025$ . Sample statistics:  $s^2 = 72.7$ ,  $n = 15$

56) Test the claim about the population variance or standard deviation. For each claim, assume the population is normally distributed.

A bottler needs to be sure that its liquid dispenser are set properly. The standard deviation of liquid dispensed must be no more than 0.0025 liter. A random sample of 14 bottles has a standard deviation of 0.0031 liter. Test the bottler's claim that the standard deviation is no more than 0.0025 liter at the  $\alpha = 0.01$  level. What do you conclude?

#### Chapter 8: Hypothesis testing with two samples

2) Use the given sample statistics (independent samples) to test the claim about the difference between two population means  $\mu_1$  and  $\mu_2$  at the given level of significance  $\alpha$

Claim:  $\mu_1 = \mu_2$ ,  $\alpha = 0.01$ . Sample statistics:  $\bar{x}$  (with a bar over it and to the first power) = 5595,  $s_1 = 52$ ,  $n_1 = 156$  and  $\bar{x}$  (with a bar over it to the second power) = 5575,  $s_2 = 68$ ,  $n_2 = 34$

6) (a) identify the claim and state  $H_0$  and  $H_a$ , (b) find the critical values ( $s$ ) and identify the rejection region(s), (c) find the standardized test statistic  $z$ , (d) decide whether to reject or fail to reject the null hypothesis, and (e) interpret the decision in the context of the original claim

A study of fast food nutrition compared the caloric content of french fries. Thirty eight randomly selected servings of Burger King medium french fries had a mean of 360 calories and a standard deviation of 50 calories, and 35 randomly selected servings of Wendy's french fries had a mean of 390 calories and a standard deviation of 45 calories. At  $\alpha = 0.10$ , can you support the claim that the caloric contents of the two types of french fries are different?

#### Chapter 9: Correlation and Regression

6) Use the given sample statistics to test the claim about the population correlation coefficient  $\rho$  at the indicated level of significance  $\alpha$

Claim:  $\rho \neq 0$ ,  $\alpha = 0.05$ . Sample statistic:  $r = -0.55$ ,  $n = 22$

10) Test the claim about the population coefficient  $\rho$  at the indicated level of significance  $\alpha$ . Then interpret the decision in the context of the original claim.

The annual number per capita consumption (in kilograms) and the average number of cavities of 11 – and 12-year-old children in seven countries

Sugar Consumption, X	2.1	5.0	6.3	6.5	7.7	8.7	11.6
Cavities, Y	0.59	1.51	1.55	1.70	2.18	2.10	2.43

Is there enough evidence to conclude that there is a linear correlation between sugar consumption and tooth decay? Use  $\alpha = 0.01$

16) Use the data to find the equation of the regression line. Then construct a scatter plot of the data and draw the regression line. Can you make a guess about the sign and magnitude of  $r$ ? Calculate  $r$  and check your guess.

The weight (in pounds) of adult brothers and sisters from eight families

Sister, X	108	136	182	151	144	133	127	157
Brother, y	120	156	212	180	156	175	158	190

What weight would you predict for a male whose sister weighs (a) 140 pounds, (b) 100 pounds, (c) 170 pounds, (d) 200 pounds?

18) Use the data to find the equation of the regression line. Then construct a scatter plot of the data and draw the regression line. Can you make a guess about the sign and magnitude of  $r$ ? Calculate  $r$  and check your guess.

The engine displacement (in cubic inches) and the fuel efficiency (in miles per gallon) of seven automobiles

Displacement, X	170	134	220	305	109	256	322
Fuel Efficiency, Y	29.5	34.5	23.0	17.0	33.5	23.0	15.5

What fuel efficiency rating would you predict for a car with an engine replacement of (a) 86 cubic inches, (b) 198 cubic inches, (c) 289 cubic inches, (d) 407 cubic inches?

Chapter 10: Chi-square tests and the F-distribution

2) Use a  $\chi^2$  goodness-of-fit test to test the claim about the population distribution. Interpret the decision in the context of the original claim

A website design company wants to test the following claim: Of all internet advertisers in the United States, 26% are retail goods and services, 18% are financial services, and 15% are web media, and the remainder are from other categories. A random sample of Internet advertisers finds that 88 are retail goods and services, 73 are financial services, 66 are web media, and 138 are from other categories. Test the claim at  $\alpha = 0.10$

4) Use a  $\chi^2$  goodness-of-fit test to test the claim about the population distribution. Interpret the decision in the context of the original claim

A legal researcher is studying the age distribution of juries by comparing them with the overall age distribution of available jurors. The researcher claims that the jury distribution is different from the overall distribution; that is, there is a noticeable age bias in jury selection in this area. The table shows the number of jurors at a county court in one year and the percent of persons residing in that county by age. Use the population distribution to find the expected juror frequencies. Test the researcher's claim at  $\alpha = 0.01$

	21-29	30-39	40-49	50-59	60 and up
Jury	45	128	244	224	359
Population	20.5%	21.7%	18.1%	17.3%	22.4%

6) Use the given contingency table to (a) find the expected frequencies of each cell in the table, (b) perform a chi-square test for independence, and (c) comment on the relationship between the two variables. Assume the variables are independent

The contingency table shows the results of a random sample of 480 individuals classified by gender and type of vehicle owned. Use  $\alpha = 0.05$

Gender	Type of vehicle owned			
	Car	Truck	SUV	Van
Male	85	96	45	6
Female	110	75	60	3

8) Use the given contingency table to (a) find the expected frequencies of each cell in the table, (b) perform a chi-square test for independence, and (c) comment on the relationship between the two variables. Assume the variables are independent

The table shows the distribution of a random sample of fatal pedestrian motor vehicle collisions by the time of day and gender in a recent year. Use  $\alpha = 0.10$

Gender	Time of Day			
	12am-5:59am	6am-11:59am	12pm-5:59pm	6pm-11:59pm
Male	654	490	654	1471
Female	308	231	308	692

## Comprehensive Overview

1) During June, a local theatre recorded the following number of patrons per day. Construct a frequency distribution for the data. Use six classes

102	116	113	132	128	117	156	182	183	171	168	179
170	160	163	187	185	158	163	167	168	186	117	108
171	173	161	163	168	182						

2) A survey of 40 clothing stores reported the following number of sales held in the month of November

Number of Sales	Frequency
5	3
6	5
7	12
8	9
9	8
10	3

(a) construct frequency distribution

(b) Find Mean

(c) Find Median

(d) Find Mode

(e) Find range

(f) Find Variance

(g) Find standard deviation

3) A quiz consists of six multiple choice questions. Each question has three possible answer choices. How many different answer keys can be made?

4) The probability that it snows and the bus arrives late is 0.023. John hears the weather forecast, and there will be a 40% change of snow tomorrow. Find the probability that the bus will be late, given that it snows.

5) When two dice are rolled, find the probability of getting

a) A sum of 6 or 7

- b) A sum greater than 8
- c) A sum less than 3 or greater than 8
- d) A sum that is divisible by 3
- e) A sum of 16
- f) A sum less than 11

6) American Energy Review reported that 27% of American households burn wood. If a random sample of 500 American households is selected, find the mean, variance and standard deviation of the number of houses that burn wood

7) During a recent cassette sale at Matt's Music Store, the number of tapes customers purchased was distributed as follows:

Number X	30	31	31	33	34
Probability P(X)	0.05	0.021	0.38	0.25	0.11

Find the mean, variance, and standard deviation of the distribution

8) In a corporation, 30% of the people elect to enroll in the financial investment program offered by the company. Find the probability that of 800 randomly selected people, at least 260 have enrolled in the program

9) The average temperature during the summer months for the northeastern part of the United States is 67.0 degrees. A sample of 10 cities had an average temperature of 69.6 degrees for the summer of 1995. The standard deviation of the sample is 1.1 degrees. At  $\alpha = 0.10$ , can it be concluded that the summer of 1995 was warmer than average?

10) A nutritionist wishes to determine, within 2%, the true proportion of adults who snack before bedtime. If she wishes to be 95% confident that her estimate contains the population proportion, how large a sample will she need? A previous study found that 18% of the 100 people surveyed said they did snack before bedtime.