

6.E: Confidence Intervals and Sample Size (Exercises)

Chapter 6 Homework

Briefing 6.1 Gender gap in Science

A variety of explanations have been provided for why males are more likely to study science and have a profession in the field of science than are females. One explanation is that teachers are more likely to encourage boys to ask questions and integrate concepts. Kevin Crowley and other researchers sought to answer questions about the role of parents in contributing to the gender gap in science. (Crowley, K., Callanan, M. A., Tenenbaum, H. R., & Allen, E. (2001). Parents explain more often to boys than to girls during shared scientific thinking. *Psychological Science*, 12(3), 258-261.) Their research was published in *Psychological Science*, May 2001.

The research was conducted at a children's museum using video cameras and wireless microphones. It forms the basis for the first four questions.

1. Find the 95% confidence interval for the proportion of times a boy chose to interact with an exhibit at the museum if 144 out of 185 boys initiated this interaction? This means the child chose to interact without parental encouragement.

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

2. Find the 99% confidence interval for the difference in the proportion of times a boy initiated interaction with the exhibit and a girl initiated interaction with the exhibit. Out of 185 boys, 144 initiated interaction. Out of 113 girls, 84 initiated interaction.

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

3. Find the 90% confidence interval for the mean length of time girls remained engaged with the exhibit if the sample mean time is 88 seconds, the standard deviation is 93 seconds and there were 113 girls.

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

4. Find the 95% confidence interval for the difference in the mean length of time boys remained engaged with an exhibit (mean = 107 sec, SD = 117 sec, n = 185) and girls remained engaged (mean = 88 sec, SD = 93 sec, n = 113) with the exhibit.

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

5. What is the 90% confidence interval for the difference in the mean weight of hatchery and wild Coho salmon that have returned to spawn? What is the point estimate for the difference? (Student project, Summer 2002)

	Hatchery	Wild
Mean	2434 grams	2278 grams
Median	2234 grams	2048 grams
Standard Deviation	1066 grams	1000 grams
Sample Size	602	745

Point estimate _____

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

6. If a person cannot afford to pay for heat, how much warmer will their home be than the outside temperature? Outside and inside temperatures were recorded for a vacant log cabin. Find the point estimate for the difference between outside and inside air temperature. Find the 95% confidence interval for the difference between outside air temperature and inside air temperature (inside – outside). Temperatures are recorded in degrees Celsius. (student project Winter 2002)

Outside	Inside	Inside - Outside
2.2	10.5	
6.1	10.5	
8.3	12.2	

6.7	13.3	
13.3	11,7	
15.5	12.8	
3.9	11.1	
2.2	10.0	
7.8	9.4	
0.5	8.9	
-3.3	10	

Point estimate _____

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

Can it be concluded that the inside temperature is warmer than the outside temperature?

7. An experiment was conducted at a photo copy store in which coupons were given to customers. Half of the coupons were black and white while the other half were printed on bright yellow paper. The printing on both was identical as was the amount of discount the customers received (10%). What is the point estimate for the difference in the proportion of color and of black and white coupons that were returned? What is the 95% confidence interval for the difference in the proportion of color and of black and white coupons that were returned? (student project)

	Color	Black and White
Number returned (used)	129	87
Number distributed	250	250

Point estimate _____

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

Can it be concluded that color coupons have a better return (use) rate than black and white coupons?

8. In the early 1900s, males accounted for approximately 10% of all nurses. By 1960, this percentage had fallen to about 2% but since that time it has increased to over 12%. Data was collected from colleges that offered a BS degree in nursing to determine the proportion of the students who are male, as this might give some insight into potential changes within the profession. Out of 2352 nursing students, 273 are male. What is the point estimate? What is the 99% confidence interval for the proportion of male nursing students in a nursing degree program? (based on student project, Brian Walsh Fall 2013)

Point estimate _____

Formula Substitution Margin of Error Confidence Interval

Calculator confidence interval _____

9. Determine the effect of the desired margin of error on the size of the samples that must be taken for 1 population categorical data. Complete the chart. Show formula and substitutions. Use a 95% degree of confidence.

Margin of Error	1%	5%	10%	20%
Sample Size				

What do you conclude?

10. Determine the effect of the degree of confidence on the size of the samples that must be taken for 1 population categorical data. Use a margin of error of 3%.

Degree of Confidence	99%	95%	90%	80%
Sample Size				

What do you conclude?

11. Why Statistical Reasoning Is Important for a Diagnostic Health and Fitness Technician (DHFT) Student and Professional

Developed in collaboration with
Lisa Murray, Professor of HSCI, Nutrition and Physical Education.
This topic is discussed in Nutrition 101.

The FDA recommends that daily sodium intake should not exceed 2300 mg per day. High sodium consumption has been shown to have a negative effect on blood pressure and other health problems.

One of the more popular treats for moviegoers is popcorn. Popcorn by itself is considered a healthy snack, but adding oil, butter, and salt to it can decrease its nutritional value. To estimate the salt content of movie theater popcorn, popcorn of various sizes will be purchased from randomly selected theaters and then sent to a lab for analysis. The final results will be presented as mg of sodium per cup of popcorn. In this case, we don't have a hypothesis about the amount, so the objective will be to create a confidence interval.

Because different theater chains may use different amounts of salt, a random sample will be taken from each of three large theater companies.

- a. What sampling method is being used?
- b. If one of the chains has 389 theaters, which 3 theaters would be selected if the calculator is seeded with the number 21?

_____, _____, _____

The data (mg sodium per cup of popcorn):

50	49	49	35	37
36	86	103	88	53
48	54	38	33	33
80	98	95	55	70

(These numbers are based on data from a study in the Nutrition Action Healthletter).

- c. Make a frequency distribution and histogram for this data.
- d. Find the mean and standard deviation for this sample.
- e. Show the 95% confidence interval for the amount of sodium per cup. Include formula, substitution and the interval.
- f. If the size of bags of popcorn range from 6 cups to 20 cups, what is the range of sodium that could be consumed by buying popcorn at a theater?
- g. How will knowledge of this influence your next purchase of movie theater popcorn?

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