

## Questions on lesson 2.4?

We will be having our concept mastery quiz shortly.

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7. The local water company also conducted a survey of 120 people which they said showed that people prefer tap water over Whatta Water. Forty-one of the respondents said Whatta Water tastes better.

a. Use a 95% confidence interval to determine a range of values for the population proportion of people who prefer Whatta Water. Explain your work.

The assumption again is that the results will be 50% if there is no difference between the two kinds of water.

$$\hat{p} = \frac{41}{120} \approx 0.34 \approx 34\%$$

standard deviation  $\rightarrow \sqrt{\frac{0.34(1-0.34)}{120}} \approx 0.043 \approx 4.3\%$

$$34 \pm 2(4.3)$$

$34 - 8.6 = 25.4$

$34 + 8.6 = 42.6$


$\rightarrow$  Between 25.4% and 42.6% is our 95% C.I.

b. Use the sample proportion and standard deviation of the sampling distribution to label the horizontal axis of the normal curve.

margin of error

$$\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$\frac{s}{\sqrt{n}}$$



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b. Use the sample proportion and standard deviation of the sampling distribution to label the horizontal axis of the normal curve.

Percent Preferring Whatta Water

c. Based on the range of values of the 95% confidence interval, what conclusion can you draw about the local water company's claim that tap water tastes better than Whatta Water?

Whatta Water's claim is probably true, because 50% is not in the 95% C.I. The difference between 34% and 50% is statistically significant.

88 Chapter 2 Making Inferences and Justifying Conclusions

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## FROM LESSON 2.4 - NOT IN YOUR BOOK

1. Legislators have been trying to increase public support for the construction of a new bridge in their state's largest city through a broad advertising campaign. Prior to the advertising campaign, 539 out of 1400 people that were polled said they supported the bridge project. Following the advertising campaign, 561 out of 1100 people that were polled said they supported the project.
- a. Determine the sample proportion of people who support the new bridge for each poll.

$$\frac{539}{1400} = 0.385 = 38.5\% \quad \Bigg| \quad \frac{561}{1100} = 0.51 = 51\%$$

- b. Determine whether the results of the 2 polls are statistically significant. Use a 95% confidence interval when making your calculations.

$$\sqrt{\frac{0.385(1-0.385)}{1400}} \approx 0.013 \approx 1.3\% \quad \Bigg| \quad \sqrt{\frac{0.51(1-0.51)}{1100}} \approx 0.015 \approx 1.5\%$$

→  $38.5 \pm 2(1.3)$   
 → 35.9% to 41.1% is the 95% C.I.

→  $51 \pm 2(1.5)$   
 → 48% to 54% is the 95% C.I.

These 2 polls are statistically significant because their 95% C.I. don't overlap.

- c. Based on your findings in part (b), what can you conclude about the impact of the ad campaign?

The ad has been effective because the results of the poll taken before the ad are statistically significant compared to the poll results after the ad.

## FROM LESSON 2.4 - NOT IN YOUR BOOK

2. A random sample of 150 qualifying speeds was collected from data on stock car races. The mean qualifying speed was 191.8 miles per hour with a standard deviation of 2.1 miles per hour.
- a. Determine a range of values for the population mean using a 95% confidence interval.

$$\frac{S}{\sqrt{n}} \rightarrow \frac{2.1}{\sqrt{150}} \approx 0.17 \text{ mph} \rightarrow 191.8 \pm 2(0.17)$$

191.4 mph to 192.14 mph  
is the 95% C.I.

- b. Burn Rubber Tires introduces a new tire they claim is revolutionary. They guarantee these tires will increase the speeds of stock cars. A random sample of 150 qualifying speeds of cars using these new tires is collected. The average qualifying speed of cars with these tires is 192.08 miles per hour. Are the results of the sample using the new tires statistically significant? What can you conclude about the effectiveness of the new tires? Explain your reasoning.

3. On average, 48% of all babies born in the United States are girls. In the past year, 473 of the 860 babies born in one particular county were girls. Determine whether the birth rate for girls in this county is statistically significant. Use a 95% confidence interval when making your calculations.

**DIY****Designing a Study and Analyzing the Results****2.5****NOT IN YOUR BOOK**

1. U.S. high school juniors who took the ACT last year were asked to check a box in the answer booklet stating whether they had completed an ACT prep course prior to taking the exam. To determine whether a prep course improved ACT scores, researchers collected a random sample of ACT test scores from 1500 U.S. high school juniors who completed a prep course prior to taking the ACT exam. They also collected a random sample of ACT test scores from 1500 U.S. high school juniors who did not complete a prep course prior to taking the ACT exam. Those who completed the prep course had a mean score of 22.1 with a standard deviation of 3.9. Those who did not complete the prep course had a mean score of 21.3 with a standard deviation of 4.3.
  - a. Identify the samples and the population.
  - b. Identify the characteristic of interest.
  - c. Are the researchers conducting a sample survey, an observational study, or an experiment? Explain your reasoning.
  - d. Determine the standard deviation for both population means.
  - e. Determine a 95% confidence interval for both population means.
  - f. Is the difference between the 2 population means statistically significant? Explain your reasoning.
  - g. What can you conclude about the effectiveness of the ACT prep course? Discuss the effect of any potential bias on the results.

## PG.102 IN YOUR BOOK

Use the following guidelines to design and conduct a sample survey, observational study, or experiment, summarize and analyze the data, and draw conclusions. You can use this page as a checklist while planning and conducting your study.

<b>I. Design a sample survey, observational study, or experiment.</b>	
• Select a characteristic of interest to learn about from a sample survey, observational study, or experiment.	
• Select a question that can be answered by collecting quantitative data.	
• Identify the population.	
• Identify the characteristic being studied.	
• Describe the method for choosing a random sample.	
• Address potential sources of bias.	
<b>II. Conduct the sample survey, observational study, or experiment.</b>	
• Use the sampling method to collect data for your sample survey, observational study, or experiment.	
<b>III. Summarize the data of the sample survey, observational study, or experiment.</b>	
• Calculate measures of center.	
• Calculate measures of spread.	
• Select the most appropriate method(s) to display the data (dot plot, histogram, stem-and-leaf plot, box-and-whisker plot, normal curve).	
• Describe the characteristics of the graphical display.	
<b>IV. Analyze the data of the sample survey, observational study, or experiment.</b>	
• Use confidence intervals to determine a range of values for the population mean(s) or proportion(s).	
• Using statistical significance to make inferences about populations.	
<b>V. Draw conclusions based on the results of the sample survey, observational study, or experiment.</b>	
• Write a conclusion that answers the question of interest of your sample survey, observational study, or experiment. Use the data and data analysis to justify your conclusion.	

Be prepared to share your results and methods.

Homework

Finish lesson 2.5