Marietta City Schools

2024–2025 District Unit Planner

AP Statistics

Unit title	**Unit 6: Inference for Categorical Data: Proportions**	**Unit duration (hours)**	**18 - 22.5 hours**

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

This unit introduces statistical inference, which will continue through the end of the course. Students will analyze categorical data to make inferences about binomial population proportions. Provided conditions are met, students will use statistical inference to construct and interpret confidence intervals to estimate population proportions and perform significance tests to evaluate claims about population proportions, Students begin by learning inference procedures for one proportion and then exam inference methods for a difference between two proportions. They will also interpret the two types of errors that can be made in a significance test, their probabilities, and possible consequences in context.

GA DoE Standards

Standards

6.1 Introducing Statistics: Why Be Normal?
6.2 Constructing a Confidence Interval for a Population Proportion
6.3 Justifying a Claim Based on a Confidence Interval for a Population Proportion
6.4 Setting Up a Test for a Population Proportion
6.5 Interpreting P-Values
6.6 Conducting a Test for a Population Proportion
6.7 Potential Errors When Performing Tests
6.8 Confidence Intervals for the Difference in Two Proportions
6.9 Justifying a Claim Based on a Confidence Interval for a Difference of Population Proportions
6.10 Setting Up a Test for the Difference of Two Population Proportions
6.11 Carrying Out a Test for the Difference of Two Proportions

Concepts/Skills to support mastery of standards

- Identify an appropriate point estimator and calculate the value of a point estimate.
- Interpret a confidence interval in context
- Determine a point estimate and margin of error from a confidence interval

- Use a confidence interval to make a decision about the value of a parameter
- Interpret a confidence level in context
- Describe how sample size and confidence level affect the margin of error
- Explain how practical issues like nonresponse, undercoverage and response bias can affect the interpretations of a confidence interval
- State and check the random, 10% and large counts conditions for constructing a confidence interval or significance test for a population proportion
- Determine the critical value for calculating a C% confidence interval for a population proportion
- Construct and interpret a confidence interval for a population proportion
- Determine the sample size required to obtain a C% confidence interval for a population proportion with a specified margin of error
- Determine whether the conditions are met for doing inference about a difference between proportions
- Construct and interpret a confidence interval for a difference between 2 proportions
- State an appropriate hypothesis for a significance test about a population parameter
- Interpret a p value in context
- Make an appropriate conclusion for a significant test
- Calculate the standardized test statistic and p value for a test about a population proportion
- Perform a significance test about a population proportion
- State appropriate hypothesis for a significance test about a difference between 2 proportions
- Determine whether the conditions are met for performing a test about a difference proportions
- State appropriate hypothesis for a significance test about a difference between 2 proportions
- Determine whether the conditions are met for performing a test about a difference between 2 proportions
- Calculate a standardized test statistic and p value for a test about a difference between 2 proportions
- Perform a significance test about a difference between 2 proportions
- Interpret a Type I and Type II error in context. Find a consequence of each error in a given setting.
- Interpret the power of a significance test and describe what factors affect the power

Vocabulary

Point Estimate	Margin of Error	Plausible Values	Confidence Interval	Confidence Level	10% Condition
Random Condition	Large Counts	Critical Value	Sample Size	1 sample Z interval	2 sample Z interval
Convincing Evidence	Hypothesis Test	Null Hypothesis	Alternative Hypothesis	P-value	Test Statistic

Standardized Test Statistic	1 sided test	2 sided test	Type I error	Type II error	Power

Notation

Sampling distributions for proportions:

Random Variable	Parameters of Sampling Distribution		Standard Error* of Sample Statistic
For one population: $\hat{p}$	$\mu_{\hat{p}} = p$	$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$	$s_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$
For two populations: $\hat{p}_1 - \hat{p}_2$	$\mu_{\hat{p}_1-\hat{p}_2} = p_1 - p_2$	$\sigma_{\hat{p}_1-\hat{p}_2} = \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$	$s_{\hat{p}_1-\hat{p}_2} = \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$ When $p_1 = p_2$ is assumed: $s_{\hat{p}_1-\hat{p}_2} = \sqrt{\hat{p}_c(1-\hat{p}_c)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$ where $\hat{p}_c = \frac{X_1 + X_2}{n_1 + n_2}$

Essential Questions

- When can we use a normal distribution to perform inference calculations involving population proportions?
- How can we narrow the width of a confidence interval?
- If the proportion of subjects who experience serious side effects when taking a new drug is smaller than the proportion of subjects who experience serious side effects when taking a placebo, how can we determine if the difference is statistically significant?
- What factors may affect the probability of errors in significance testing?
- How can we use a confidence interval to make a decision about the value of a parameter?
- What practical issues are not accounted for by margin of error?

- How does increasing or decreasing the confidence level or sample size affect the length of a confidence interval?
- How might a confidence interval give more information than a significance test?
- How do you determine the appropriate inference procedure to use to make a decision pertaining to a population proportion(s)?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

Common Formative Assessment – Ticket out the Door, Homework Quiz

Summative Assessment(s):

Common Summative Assessment – Unit 6 Test (50% Multiple Choice/50% Free Response)

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
3D Construct a confidence interval, provided conditions for inference are met. **4C Justify that inference procedures apply in a given situation** **4D Justify a claim based on a confidence interval**	**Math Medic Lesson: Which way will the Hershey Kiss land?** #1 State and check the random, 10% and large counts conditions for constructing a confidence interval for a proportion. #2 Determine the critical value for calculating a C% confidence interval for a population.	Graphic organizers are provided for each lesson and additional practice as needed. Some students will move through the task independently. Others will need prompts and support for understanding.
1F Identify null and alternative hypotheses. **3E Calculate a test statistic and find a p-value, provided conditions for inference are met.**	**Math Medic Lesson: Can you taste the rainbow?** #1 Perform a significance test about a population proportion.	Graphic organizers are provided for each lesson and additional practice as needed. Some students will move through the task independently. Others will need prompts and support for understanding.

4E Justify a claim using a decision based on significance tests.		
● The Practice of Statistics, 5th Edition ● Notes, Review, and Extra Practice provided on Schoology. ● College Board ● Stats Medic ● AP Statistics Formula Sheet		