



Marietta City Schools
2025–2026 District Unit Planner

AP Statistics

Unit title	Unit 8 - Other Inference Topics (Chi-Square & Slopes)	Unit duration (hours)	5-7.5 hours
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Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

Unit 8 introduces chi-square tests, which can be used when there are two or more categories. Students need to understand how to select from the following tests: the chi-square test for goodness of fit (for a distribution of proportions of one categorical variable in a population), the chi-square test of independence (for association between categorical variables within a single population), or the chi-square test for homogeneity (for comparing distributions of a categorical variable across populations or treatments). To integrate conceptual understanding, connections can be made between frequency tables, conditional probability and calculating expected counts. The chi-square statistic is introduced to measure the distance between observed and expected counts relative to expected counts.

Students may be surprised to learn that there is variability in slope. In their previous courses, the slope of the line of best fit does not vary for a particular set of bivariate quantitative data. In this unit, students learn how to construct confidence intervals for and perform significance tests about the slope of a population regression line when appropriate conditions are met.

GA DoE Standards

Standards

- 8.1 Introducing Statistics: Are My Results Unexpected?
- 8.2 Setting Up a Chi-Square Goodness of Fit Test
- 8.3 Carrying Out a Chi-Square Goodness of Fit Test
- 8.4 Expected Counts in Two-Way Tables
- 8.5 Setting Up a Chi-Square Test for Homogeneity or Independence
- 8.6 Carrying Out a Test for a Chi-Square Test for Homogeneity or Independence
- 8.7 Skills Focus: Selecting an Appropriate Procedure for Categorical Data

- 9.1 Introducing Statistics: Do Those Points Align?
- 9.2 Confidence Intervals for the Slope of a Regression Model
- 9.3 Justifying a Claim about a slope of a Regression Model Based on a Confidence Interval
- 9.4 Setting Up a Test the Slope of a Regression Model

9.5 Carrying Out a Test for the Slope of a Regression Model
 9.6 Skills Focus: Selecting an Appropriate Inference Procedure

Concepts/Skills to support mastery of standards

- State appropriate hypotheses and complete the expected counts and chi-square test statistic for a chi-square goodness of fit test
- Calculate the degrees of freedom and the p value for a chi square test of goodness of fit
- Perform a chi-square test for goodness of fit
- Conduct a follow analysis when the results of a chi square test are statistically significant
- If a test is statistically significant, find the largest component of chi square and analysis
- State appropriate hypothesis and compute the expected counts and chi square test statistic for chi square based on data in a 2 way table
- State and check the random, 10%, and large count conditions for a chi square test based on data in a 2 way table.
- Calculate degrees of freedom and P value for chi square 2 way table
- Choose the appropriate test in a given setting.
- Perform a chi square test for independence
- Perform a chi square test for homogeneity
- Identify and interpret statistics when doing inference for slopes
- Use a simulation to estimate a P-value when performing a significance test for slope
- Construct and interpret a confidence interval for the slope B of the population regression line
- Perform a significance test about the slope B of the population

Vocabulary

Chi Square Goodness of Fit Test	Chi Square Test Statistic	Null Hypothesis	Alternative Hypothesis	Alternative Hypothesis	P-Value	Expected Counts
Random Condition	10% Condition	Large Counts	Parameter	Statistically Significant	Chi-Square Test for Homogeneity	Chi-Square Test for Independence
Slope	Simulation	Explanatory Variable	Response Variable	Least Square Regression Line	Standard Error	Linear

Notation

$$\text{Chi-square statistic: } \chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

Sampling distributions for simple linear regression:

Random Variable	Parameters of Sampling Distribution		Standard Error* of Sample Statistic
For slope: b	$\mu_b = \beta$	$\sigma_b = \frac{\sigma}{\sigma_x \sqrt{n}}$ <p>where $\sigma_x = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$</p>	$s_b = \frac{s}{s_x \sqrt{n-1}}$ <p>where $s = \sqrt{\frac{\sum (y_i - \hat{y}_i)^2}{n-2}}$ and $s_x = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$</p>

Essential Questions

- How does increasing the degrees of freedom influence the shape of the chi-square distribution?
- Why is it inappropriate to use statistical inference to justify a claim that there is no association between variables?
- What value would we get for the test statistic if our sample was very close to what is expected?
- What value would we get for the test statistic if our sample was very far from what is expected?
- Does the data find convincing evidence for/against the claim?
- How do you determine what type chi square test would be appropriate?
- How can there be variability in slope if the slope statistic is uniquely determined for a line of best fit?
- When is it appropriate to perform inference about the slope of a population regression line based on sample data?
- Why do we not conclude that there is no correlation between two variables based on the results of a statistical inference for slopes?

Assessment Tasks

List of common formative and summative assessments.

Formative Assessment(s):

Common Formative Assessment – Ticket out the Door

Summative Assessment(s):

Common Summative Assessment – Unit 8 material is included in a summative assessment.

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
<p>IE Identify an appropriate inference method for significance tests. IF Identify null and alternative hypothesis 3E Calculate a test statistic and find a p-value, provided conditions for inference are met. 4E Justify a claim using a decision based on significance tests.</p>	<p>Math Medic: Chi-Math Goodness of Fit (What is your favorite color M&M?)</p> <ol style="list-style-type: none"> 1. State appropriate hypothesis and compute the expected counts and chi-square test statistic and chi-square goodness of fit test 2. Calculate the degree of freedom and the P-value for a chi-square goodness of fit test. 	<p>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.</p>

Content Resources

- The Practice of Statistics, 5th Edition
- Notes, Review, and Extra Practice provided on Schoology
- College Board
- Stats Medic
- AP Statistics Formula Sheet