Marietta City Schools

2024–2025 District Unit Planner

AP Statistics

Unit title	Unit 8: Inference for Categorical Data: Chi-Square	Unit duration (hours)	5-7.5 hours

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.

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

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

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

Notation

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

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?

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 the Spring Semester Mock AP Exam.

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
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 baked on significance tests.**	**Math Medic: Chi-Math Goodness of Fit (What is your favorite color M&M?))** 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.	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.

Content Resources

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