Probability and Statistics

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Unit 6: Chi Square and Analysis of Variance

Students will be able to independently use their learning to make conclusions when given frequency distributions, contingency tables, and multiple data sets.

Stage 1 – Desired Results

Established Goals

2009 NJCCC Standard(s), Strand(s)/CPI #
(http://www.nj.gov/education/cccs/2009/final.htm)
Common Core Curriculum Standards for Math and English
(http://www.corestandards.org/)

Making Inferences and Justifying Conclusions S.IC: # 1

Understand and evaluate random processes underlying statistical experiments

Making Inferences and Justifying Conclusions S.IC: # 4, 6

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

Conditional Probability and the Rules of Probability S.CP: #4
Understand independence and conditional probability and use them to interpret data.

21st Century Themes
(www.21stcenturyskills.org)

___ Global Awareness
_x__Financial, Economic, Business and
 Entrepreneurial Literacy
___Civic Literacy
___Health Literacy
___Environmental Literacy

21st Century Skills

Learning and Innovation Skills:
_x__Creativity and Innovation
_x__Critical Thinking and Problem Solving
_x__Communication and Collaboration

Information, Media and Technology Skills:
___Information Literacy
___Media Literacy
_x__ICT (Information, Communications and
 Technology) Literacy

Enduring Understandings:

Students will understand that . . .

EU 1
Statistics can be used to test the validity of a claim.

EU 2
Statistics can be used to test claims about three or more population means.

Essential Questions:

EU 1
- How can you test if variables are used with the same frequency or a particular frequency?
- How can you test if variables are independent or dependent?
- How can you test if several proportions are all equal?
- What do the differences between observed and expected values indicate?

EU 2
- How can you test if there is a significant difference among three or more means?
- What are the benefits of ANOVA testing?

Knowledge:	**Skills:**
Students will know . . .	*Students will be able to . . .*
EU 1	*EU 1*
• how to identify which type of test to conduct when given certain information.	• calculate expected values
• the importance of a goodness of fit test	• identify relevant information from a problem
• the importance of a test for independence	• use the relevant information to identify which type of test to conduct
• the importance of a test of homogeneity	• state and complete the five steps in a goodness of fit test
• how large differences between observed and expected values can impact the outcome of the test	• state and complete the five steps in a test for independence
	• state and complete the five steps in a test for homogeneity
EU 2	*EU 2*
• how to identify which type of test to conduct when given certain information.	• identify relevant information from a problem
• the importance of an ANOVA test	• use the relevant information to identify which type of test to conduct
• the efficiency of ANOVA testing	• state and complete the five steps in an ANOVA test

Stage 2 – Assessment Evidence

Recommended Performance Tasks:

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Other Recommended Evidence: *Tests, Quizzes, Prompts, Self-assessment, Observations, Dialogues, etc.*

Assessments to include:
- hypothesis testing for goodness of fit
- independence
- homogeneity and the equality of multiple means.

- Assessed elements from the performance task

- Other teacher-graded evaluations

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: *Consider the WHERETO elements. Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.*

- Ti-Nspire activity #1 – Goodness of Fit

http://education.ti.com/en/us/activity/detail?id=8AC93FCE443F4422A2A3E24C515E611D&ref=/en/us/activity/search/subject?d=F988B132B1A74080AC6C1D0A68C5E3BB&s=B843CE852FC5447C8DD88F6D1020EC61&sa=44D0E51546AF420EA579740D43F22FC7&t=DD50003848CE4396B7D67AA81795D343

- students test claims of whether an observed value fits an expected value
- students will apply the goodness-of-fit test within the chi-square distribution.
- students will use spreadsheets to calculate test statistics

Critical Vocabulary:
- **observed and expected values**
- **contingency tables**
- **goodness of fit test**
- **homogeneity of proportions test**
- **independence test**
- **analysis of variance**

The following are the suggested learning activities in a logical sequence.

Approximate timeline: 20 days

Students will be able to:

- **Calculate expected values for a frequency distribution (A)**
- **conduct a hypothesis test to test a distribution for goodness of fit, using chi-square (T)**
- **Ti-Nspire activity #1 goodness of fit (T)**
- **Calculate expected values for a contingency table (A)**
- **conduct a hypothesis test to test two variables for independence, using chi-square (T)**
- **conduct a hypothesis test to test proportions for homogeneity, using chi-square (T)**
- **use the one-way ANOVA technique to determine if there is a significant difference among three or more means (T)**