Probability and Statistics

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Unit #1 Collection, Organization, Presentation, and Description of Data

Students will be able to independently use their learning to interpret data efficiently.

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/)

Interpreting Categorical and Quantitative Data: S.ID: #1-4
- Summarize, represent, and interpret data on a single count or measurement variable

Interpreting Categorical and Quantitative Data: S.ID: #5
- Summarize, represent, and interpret data on two categorical and quantitative variables.

Making inferences and Justifying Conclusions: S.IC: #1,3,6
- Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

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:
___Creativity and Innovation
_x__Critical Thinking and Problem Solving
___Communication and Collaboration

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

Enduring Understandings:

Students will understand that . . .

EU 1
data can be collected, organized, summarized and presented through tables and graphs

EU 2
measures of central tendency, variation, and position can be used to summarize a set of data

EU 3
properly developed sampling techniques result in a sample that is representative of the population

Essential Questions:

EU 1
- What are the different types of data?
- What are the different types of graphs?
- How are data and graphs related?
- What meaningful things can be determined when data is collected, organized and presented?

EU 2
- What are real world applications that involve a measure of central tendency and variation, along with position?
- How does abnormal data affect the measures of central tendency, variation, and position?

EU 3
- Why is it important for data to be collected randomly?
- How are sampling techniques selected to properly represent the population being examined?
- How does the sampling technique affect randomization?

Knowledge: *Students will know . . .*	Skills: *Students will be able to . . .*
EU 1 • that quantitative and categorical data can be organized and presented to describe a set of data • that data can be organized and presented in different ways *EU 2* • the measures of central tendency and variation to use to describe a data set given the distribution of the sample • the effects of outliers on the measures of center and variation of a sample • which method to apply dependent upon data distribution • which measure of center, variation, or position to use based of the distribution of the data *EU 3* • the importance of properly developed samples and presentation tools to avoid data becoming misleading • that random sampling is an efficient way to collect data that represents the population being examined	*EU 1* • identify the appropriate shape of distribution of data • recognize the difference between qualitative and quantitative data • recognize the difference between a discrete and continuous data • organize data into frequency distributions • graph data *EU 2* • identify the position of data value in a data set using various measures of position • determine the appropriate central tendency and variation that should be used to describe a data set based on the distribution • analyze a set of data that contains outliers • identify misleading data and consider how the data can be better represented or obtained • determine the percentage of data that lies with a number of standard deviations from the mean based on the distributions of data *EU 3* • determine the difference between a population and a sample • identify the basic sample techniques and the purpose of sampling • develop a simple random sample that represents the population

Stage 2 – Assessment Evidence

Recommended Performance Tasks: *EU 1, 2, 3*

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

Tests and quizzes to include:
- describe the difference between qualitative and categorical data as well as discrete and continuous data and how this effects the method for displaying data
- developing charts and tables to describe data
- identifying proper sampling techniques
- developing random samples that represent the population
- determining the central tendency
- variation and position of given data
- describing flaws with misleading data
- using empirical rule

- Chebyshev's theorem

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: Box Plots and Histograms (T)

- Students will collect and analyze real-life data
- Students will create a histogram and a box plot
- Students will compare the two data displays
- Students will draw conclusions based on the comparison
- http://education.ti.com/calculators/downloads/US/Activities/Detail?id=8200&ref=%2fcalculators%2fdownloads%2fUS%2fActivities%2fSearch%2fSubject%3fs%3d5022%26sa%3d5026%26t%3d1189

TI-Nspire Activity # 2: Are They Truly Random? (T)

- Students will develop lists of random numbers generated by the calculator
- Students will explore their sets of numbers and engage in discussions of whether the random number generator is truly generating number randomly
- Student will look at statistical model of their numbers and discuss whether "patterns" they see in the set of random numbers are possible if the numbers are truly random
- http://education.ti.com/en/us/activity/detail?id=DF8BAD1E52E54C7395021FE22DC4198E

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

Approximate time of completion of unit: 35 days

Students will

- Develop and understanding of statistical terminology (A)
- Differentiate between the two branches of statistics (M)
- Identify types of data and measurements and determine the validity (M)
- Apply various sampling techniques and direct purpose (M)
- Explain difference between an observational and experimental study (T)
- Identify misleading data (M)
- Develop and analyze data that include histograms, scatter diagrams, stem and leaf plots etc. (T)
- Ti-Nspire Activity #1(M)
- Find measures of position for data value (M)
- Find and interpret the measures of central tendency and variation (T)
- Ti-Nspire Activity # 2 (T)
- Identify the presence and effects of outliers, clusters, and correlation while predicting measures such as mean, mode, and standard deviation (T)
- Calculate weighted means (T)
- Use boxplots and five number summaries to analyze data (M)

Key Vocabulary includes:
- mean
- median
- mode
- standard deviation
- variance
- range
- outlier
- quantitative data
- qualitative data
- random
- simple random sample
- bias
- population
- sample
- discrete random variable
- continuous random variable
- Empirical rule
- Chebyshev's theorem
- frequency
- boundaries