Probability and Statistics

2014-2015

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Unit 4 Normal Distribution

Students will be able to independently use their learning to explain how the normal curve is used in real life.

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 #2,4

- Summarize, represent, and interpret data on a single count or measurement variable.

Making Inferences and Justifying Conclusions S-IC #1,3,6

- Understand and evaluate random processes underlying statistical experiments.
- 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:
_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

	Life and Career Skills: _x__Flexibility and Adaptability _x__Initiative and Self-Direction ___Social and Cross-Cultural Skills _x__Productivity and Accountability _x__Leadership and Responsibility
Enduring Understandings: *Students will understand that . . .* *EU 1* the distribution of data is used to model real world phenomenon. *EU 2* the normal distribution is significant in statistics. *EU 3* standardization can be used to compare and contrast data of different units.	**Essential Questions:** *EU 1* • What does skewness imply about the spread of data? • How does the distribution of data model real-world phenomenon? *EU 2* • What is the normal distribution? • What does the normal distribution imply about the spread of data? • How can data be analyzed? • Why is the normal distribution essential in the study of statistics? • How can technology be used to analyze data using the normal distribution? *EU 3* • How can data be compared? • What effect does sample size have on a distribution? • What as the differences between using a z-score or a t-score?

Knowledge: *Students will know . . .*	**Skills:** *Students will be able to . . .*
EU 1 • the two types of skewness that apply to data • the distribution is effected by outliers. • the normal distribution is a symmetric unimodal distribution . *EU 2* • a normally distributed curve is symmetric and centered at the mean. • how the mean and standard deviation affect the distribution of data values for a normally distributed set of data. • the area under the normally distributed curve is directly related to the probability of an occurrence or interval of occurrences. *EU 3* • the standard normal distribution is an “even equalizer” that allows comparisons to be drawn between normally distributed sets of data. • the Central Limit Theorem applies to large sample sizes.	*EU 1* • identify a distribution of data as symmetric or skewed. • identify outliers. • determine whether a distribution of data is symmetric or skewed. *EU 2* • identify the characteristics of a normally distributed curve. • sketch a normal curve to represent a given situation. • calculate probability from scenarios involving z-scores in a standard normal distribution. • calculate z-score(s) from scenarios involving probability in a standard normal distribution. • find a data value(s) that corresponds to a certain probability for an approximately normal distributed set of data. • determine the probability of a region of data value(s)for an approximately normal distributed set of data. • find a mean value(s) that corresponds to a certain probability for sampling distribution of sample means. *EU 3* • convert a data value from a normal distribution into a standard normal variable (z-score). • determine the probability of a region of mean value(s) for a sampling distribution of sample means

Stage 2 – Assessment Evidence

Recommended Performance Tasks:

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

Assessments to include:

- identifying distribution as skewed/symmetric
- properties of the normal distribution
- find area/probability when given z-scores
- find z-scores when given area/probability
- conversion of data values to z-scores
- finding probability when given data values
- find data values when given probability
- the Central Limit Theorem

- Cumulative Normal Distribution Unit Assessment

- 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: Statistics: Normal Probability Plot (T)

- Students will identify the shape of a distribution as being skewed or mound-shaped and approximately symmetric.
- Students will recognize that a normal probability plot of skewed data is nonlinear and either concave up or concave down.
- Students will recognize that a normal probability plot of approximately normal data is approximately linear.
- Students will identify outliers on a normal probability plot.
- Use appropriate tools strategically (CCSS Mathematical Practices).
  http://education.ti.com/calculators/timathnspired/US/Activities/Detail?sa=5026&t=1192&id=16925

TI-Nspire Activity #2: Statistics: Z-Scores (T)

- Students will identify the percent of area under any normal curve that is 1, 2, or 3 standard deviation units from the mean.
- Students will recognize that for any member of the family of normal curves, the areas whose boundaries are the same number of standard deviations from the respective means of the curves are always equal.
- Students will reason abstractly and quantitatively (CCSS Mathematical Practices).
- http://education.ti.com/calculators/timathnspired/US/Activities/Detail?sa=5026&t=1192&id=13318

Critical Vocabulary:

- Symmetry
- skewness
- unimodal
- continuous random variable
- z-score
- sampling distribution
- standard error
- relative position

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

Approximate timeline: 18 days

Students will

- **Identify distributions as skewed/symmetric based on visual representations of the data (A)**
- **Ti-Nspire Activity1: normal probability plot (T)**
- **Apply the properties of the normal distribution to find the probability of a data point falling in a particular region (M)**
- **Ti-Nspire Activity 2: z –scores (T)**
- **Find area/probability when given z-scores (M)**
- **Find z-scores when given area/probability (M)**
- **Convert data values to z-scores to utilize the properties of the normal distribution (M)**
- **Find probability when given data values (M)**
- **Find data values when given probability (M)**
- **Apply the Central Limit Theorem to sets of sample data to make inferences regarding the population of interest (T)**