Richmond Public Schools

Curriculum Framework

Algebra II

Strand: Statistics	
AII.11 The student will **a) identify and describe properties of a normal distribution;** **b) interpret and compare *z*-scores for normally distributed data; and** **c) apply properties of normal distributions to determine probabilities associated with areas under the standard normal curve.**	
Suggested Pacing	
3 Class Periods	
Spiraling Standards	
	AFDA.7-The student will a) identify and describe properties of a normal distribution; b) interpret and compare *z*-scores for normally distributed data; and c) apply properties of normal distributions to determine probabilities associated with areas under the standard normal curve. PS.15-The student will identify random variables as independent or dependent and determine the mean and standard deviations for random variables and sums and differences of independent random variables. PS.16 -The student will identify properties of a normal distribution and apply the normal distribution to determine probabilities.

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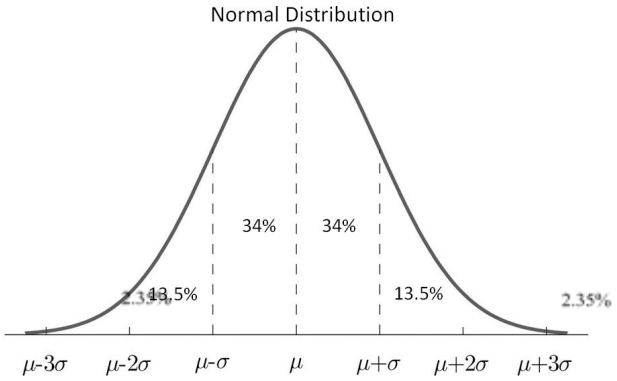
Essential Questions	Common Misconceptions
What is a normal distribution curve and how is the graph constructed? How can the amount of data that lies within 1, 2, 3, or k standard deviations of the mean be found? How does the standard normal distribution curve correspond to probability? How can the area under the standard normal curve be found? How is a standard normal probability table used?	Students may have trouble graphing a normal distribution. Students may confuse skewness Students may not remember the percentages under the curve for each standard deviation. Students may forget to add or subtract the standard deviation Students may have the wrong calculations due to calculating the mean incorrectly Students may calculate probability incorrectly Students may read the z table incorrectly
Understanding the Standard	**Essential Knowledge and Skills**
• The focus of this standard is on the interpretation of descriptive statistics, *z*-scores, probabilities, and their relationship to the normal curve in the context of a data set. • Descriptive statistics include measures of center (mean, median, mode) and dispersion or spread (variance and standard deviation). • Variance (σ^2) and standard deviation (σ) measure the spread of data about the mean in a data set. • Standard deviation is expressed in the original units of measurement of the data. • The greater the value of the standard deviation, the further the data tends to be dispersed from the mean. • In order to develop an understanding of standard deviation as a measure of dispersion (spread), students should have experiences analyzing the formulas for and the relationship between variance and standard deviation. • A normal distribution curve is the family of symmetrical, bell-shaped curves defined by the mean and the standard	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Identify the properties of a normal distribution. (a) • Describe how the standard deviation and the mean affect the graph of the normal distribution. (a) • Solve problems involving the relationship of the mean, standard deviation, and z-score of a normally distributed data set. (b) • Compare two sets of normally distributed data using a standard normal distribution and *z*-scores, given the mean and standard deviation. (b) • Represent probability as area under the curve of a standard normal distribution. (c) • Use the graphing utility or a table of Standard Normal Probabilities to determine probabilities associated with areas under the standard normal curve. (c)

deviation of a data set. The arithmetic mean (μ) is located on the line of symmetry of the curve and is approximately equivalent to the median and mode of the data set.

- The normal curve is a probability distribution and the total area under the curve is 1.
- For a normal distribution, approximately 68 percent of the data fall within one standard deviation of the mean, approximately 95 percent of the data fall within two standard deviations of the mean, and approximately 99.7 percent of the data fall within three standard deviations of the mean. This is often referred to as the Empirical Rule or the 68-95-99.7 rule.



NOTE: This chart illustrates percentages that correspond to subdivisions in one standard deviation increments. Percentages for other subdivisions require the table of Standard Normal Probabilities or a graphing utility.

- The mean and standard deviation of a normal distribution affect the location and shape of the curve. The vertical line of symmetry of the normal distribution falls at the mean. The

- Use a graphing utility to investigate, represent, and determine relationships between a normally distributed data set and its descriptive statistics. (a, b, c)

greater the standard deviation, the wider ("flatter" or "less peaked") the distribution of the data. • A *z*-score derived from a particular data value tells how many standard deviations that data value falls above or below the mean of the data set. It is positive if the data value lies above the mean and negative if the data value lies below the mean. • A standard normal distribution is the set of all *z*-scores. The mean of the data in a standard normal distribution is 0 and the standard deviation is 1. This allows for the comparison of unlike normal data. • The table of Standard Normal Probabilities and graphing utilities may be used to determine normal distribution probabilities. • Given a *z*-score (*z*), the table of Standard Normal Probabilities (*z*-table) shows the area under the curve to the left of *z*. This area represents the proportion of observations with a *z*-score less than the one specified. Table rows show the *z*-score's whole number and tenths place. Table columns show the hundredths place. • Graphing utilities can be used to represent a normally distributed data set and explore relationships between the data set and its descriptive statistics.	
Vocabulary	**Instructional Activities Organized by Learning Objective**
descriptive statistics, data, z-scores, probability, normal curve, normal distribution, mean, median, mode, variance, standard deviation, disperse (spread), outlier, symmetrical, bell shaped curve, arithmetic mean, line of symmetry, probability distribution, skew	**Textbook** Eureka Math Algebra 2 Module 4 Topic B Algebra 2, ©2012, Price, et al, McGraw-Hill page(s) 773 - 778

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Assessment	
Common Assessment AII.11a Common Assessment AII.11b Common Assessment AII.11c	**Notes** Properties of Normal Distribution Z Score (Statistic How to) **Resources** ● **Print** Coach book, Virginia edition, lesson 36 of chapter 4 VDOE Lesson Plan AII.11 ● **Technology-based** Z-Scores (Khan Academy) Probabilities Under the Curve (Khan Academy) **Station Activities** Normal Distribution Explorations (VDOE Plan)
Cross-Curricular Connections	Tiered Differentiations
Technology/Engineering- Design of highways, roads, and the timing of traffic, lights, and routes. **CTE/Finance**-Budgeting, time management, and scheduling	**Tier 1-** Students will calculate Z-Scores and Probabilities using formulas and verify with the graphing calculator. **Tier 2-** Students will calculate z-scores and probabilities using the graphing calculator and z table. **Tier 3-** Student will be given formulas, tables, and the graphing calculator to assist with calculating z-score and probabilities.