DINWIDDIE COUNTY Public Schools

Math 7

Math Curriculum

Dinwiddie County Public Schools provides each student the opportunity to become a productive citizen, engaging the entire community in the educational needs of our children.

Math 7 Curriculum Guide

- The DCPS Curriculum Guide contains key concepts and SOL numbers for each week. These skill areas must be cross referenced with the DOE Enhanced Scope and Sequence and DOE Curriculum Framework.
- Grade Level(s): 7
- Prerequisite: Math 6
- Course Description: The seventh-grade standards continue to emphasize the foundations of algebra. Students who successfully complete the seventh-grade standards should be prepared to study Algebra I in grade eight. Topics in grade seven include proportional reasoning, integer computation, solving two-step linear equations, and recognizing different representations for relationships. Students will apply the properties of real numbers in solving equations, solve inequalities, and use data analysis techniques to make inferences, conjectures, and predictions.

Virginia Department of Education Mathematics SOL Curriculum Framework

Virginia Department of Education Mathematics SOL Standards

Virginia Department of Education Mathematics 2016 SOL Standards - Effective 2018-2019

Mathematical Instructional Resources

Nine Weeks	Approximate # of Days Taught	Topic	Target SOL
1	6 even/7 odd	**Integers** Model Addition, Subtraction, Multiplication, and Division of Integers Add, Subtract, Multiply, and Divide Integers Order of Operations Practical/Real World Problems *Solve Practical Problems Involving Operations With Rational Numbers	7.3
1	9	**Number and Number Sense** Investigate and Describe the Concept of Negative Exponents for Powers of Ten Determine Scientific Notation for Numbers Greater Than Zero Compare and Order Fractions, Decimals, Percents, and Numbers Written in Scientific Notation (*No More Than Four Numbers Expressed As Positive/Negative Integers, Fractions (Proper/Improper), Mixed Numbers, Decimals, Percents) Determine Square Roots and Absolute Value *Identify Perfect Squares from 0 to 400	7.1
1	4	**Expressions** Write Verbal Expressions as Algebraic Expressions and Sentences as Equations and Vice Versa Evaluate Algebraic Expressions for Given Replacement Values of the Variables *Limit Exponents from 1 to 4, Grouping Symbols Only Include Brackets/Parenthesis/Absolute Value, Square Roots Limited to Perfect Squares	7.13 (7.11)
1	2	**Properties** Apply the Commutative and Associative Properties for Addition and Multiplication Apply the Distributive Property Apply the Additive and Multiplicative Identity Properties Apply the Additive and Multiplicative Inverse Properties Apply the Multiplicative Property of Zero	7.16
1	2 even/3 odd	**Sequences** Describe and Represent Arithmetic and Geometric Sequences, Using Variable Expressions	7.2

Nine Weeks	Approximate # of Days Taught	Topic	Target SOL
2	8 even/9 odd	**Equations** Solve One- And Two-Step Linear Equations in One Variable Solve Practical Problems Requiring the Solution of One- And Two-Step Linear Equations *Apply Properties of Real Numbers When Solving Equations	7.14 (7.12)
2	6 even/ 5 odd	**Inequalities** Solve One-Step Inequalities in One Variable Graph Solutions to Inequalities on a Number Line. * Solve Two-Step Inequalities in One Variable *Coefficients and Terms are Rational	7.15 (7.13)
2	6 even/7 odd	**Proportions** Solve Single-Step and Multistep Practical Problems, Using Proportional Reasoning Compute Tax, Tip, and Discount Determine Whether Plane Figures Are Similar Write Proportions Representing Corresponding Sides of Similar Figures *Determine Unknown Side Lengths and Angle Measures of Two Similar Quadrilaterals or Triangles *Convert Between Measurements	7.4 and 7.6 (7.3 and 7.5)
1st Cumulative Assessment Nov. 29-30			
2	3	**Quadrilaterals** Identify, Describe, and Compare/ Contrast Quadrilaterals Including Square, Rectangle, Trapezoid, Parallelogram, and Rhombus *Determine Unknown Side Lengths and Angle Measures of Quadrilaterals	7.7 (7.6)
3	4	**Surface Area and Volume** Describe Volume and Surface Area of Cylinders Solve Practical Problems Involving the Volume and Surface Area of Rectangular Prisms and Cylinders Describe How Changing One Measured Attribute of a Rectangular Prism Affects Its Volume and Surface Area	7.5 (7.4)

Nine Weeks	Approximate # of Days Taught	Topic	Target SOL
		2nd Cumulative Assessment February 9, 12	
3	7	**Transformations** Given A Polygon in the Coordinate Plane, Will Represent Transformations (Reflections, Dilations, Rotations, and Translations) By Graphing In the Coordinate Plane *Transformations Can Include Two Transformations	7.8 (7.7)
3	6	**Probability** Investigate and Describe the Difference Between the Experimental Probability and Theoretical Probability of an Event Draw and Evaluate Tree Diagrams Apply the Fundamental Counting Principle to Determine Probability of Compound Events	7.9 7.10 (7.8)
4	6	**Graphing** Given Data for a Practical Situation, Construct and Analyze Histograms Compare and Contrast Histograms with Other Types of Graphs (*Line Plots, Circle Graphs, Stem-and-Leaf Plots) Presenting Information from the Same Data Set *Data Points Are Not Limited *Make Observations and Inferences Based on Graphs	7.11 (7.9)
4	5	**Functions** Represent Relationships with Tables, Graphs, Rules, and Words	7.12 (7.10)
		Mock SOL April 27, 30	
4		***Slope** Determine Slope and y-Intercepts Using Verbal Descriptions, Tables, Equations, and Graphs Write Equations in y=mx+b Form	(7.10)

* Crosswalk (Summary of Revisions): 2016 Mathematics Standards of Learning and Curriculum Framework

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Proportional Reasoning **Virginia SOL 7.1** The student will a. investigate and describe the concept of negative exponents for powers of ten; b. determine scientific notation for numbers greater than zero;* c. compare and order fractions, decimals, percents and numbers written in scientific notation;* d. determine square roots;* and e. identify and describe absolute value for rational numbers. *SOL test items measuring Objective 7.1b-d will be completed **without** the use of a calculator.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Recognize** powers of 10 with negative exponents by examining patterns. ● **Write** a power of 10 with a negative exponent in fraction and decimal form. ● **Recognize** a number greater than zero in scientific notation. ● **Write** a number greater than zero in scientific notation. ● **Compare** and **determine** equivalent relationships between numbers larger than zero, written in scientific notation. ● **Order** no more than three numbers greater than zero written in scientific notation. ● **Represent** a number in fraction, decimal, and percent forms. ● **Compare**, **order**, and **determine** equivalent relationships among fractions, decimals, and percents. Decimals are limited to the thousandths place, and percents are limited to the tenths place. Ordering is limited to no more than four numbers. ● **Compare** and **order** fractions, decimals, percents, and numbers written in scientific notation. ● **Determine** the square root of a perfect square less than or equal to 400 without the use of a calculator. ● **Demonstrate** absolute value using a number line. ● **Determine** the absolute value of a rational number.	**Essential Questions and Understandings** ● When should scientific notation be used? Scientific notation should be used whenever the situation calls for use of very large or very small numbers. ● How are fractions, decimals and percents related? Any rational number can be represented in fraction, decimal and percent form. ● What does a negative exponent mean when the base is 10? A base of 10 raised to a negative exponent represents a number between 0 and 1. ● How is taking a square root different from squaring a number? Squaring a number and taking a square root are inverse operations. ● Why is the absolute value of a number positive? The absolute value of a number represents distance from zero on a number line regardless of direction. Distance is positive. **Teacher Notes and Elaborations** *Scientific notation* is used to represent very large and very small numbers. A number is in scientific notation when it is written in the form: $a \cdot 10^n$ where $1 \leq a < 10$ and n is an integer. A number written in scientific notation is the product of two factors, a decimal greater than or equal to one but less than 10, and a power of 10 (e.g., $3.1 \cdot 10^5 = 310{,}000$ and $2.85 \cdot 10^{-4} = 0.000285$). *Percent* means "per hundred". A number followed by a percent symbol (%) is equivalent to that number with a denominator of 100 (e.g., $\frac{60}{100} = 0.60$, 0.60 = 60%). Equivalent relationships among fractions, decimals, and percents can be determined by using manipulatives (e.g., fraction bars, Base-10 blocks, fraction circles, graph paper, number lines and calculators). Multiple experiences should be provided when numbers are represented in different formats for comparing and/or ordering. An *exponent* tells how many times the base is used as a factor. In the expression 3^2, 3 is the base and 2 is the exponent. Negative exponents for powers of 10 are used to represent numbers between 0 and 1 (e.g., $10^{-3} = \frac{1}{10} \cdot \frac{1}{10} \cdot \frac{1}{10}$ and $10^{-3} = \frac{1}{10^3}$ and $\frac{1}{10^3} = 0.001$).

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
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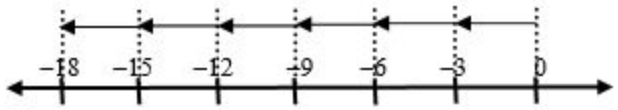
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Proportional Reasoning **Virginia SOL 7.1** The student will a. investigate and describe the concept of negative exponents for powers of ten; b. determine scientific notation for numbers greater than zero;* c. compare and order fractions, decimals, percents and numbers written in scientific notation;* d. determine square roots;* and e. identify and describe absolute value for rational numbers. *SOL test items measuring Objective 7.1b-d will be completed **without** the use of a calculator.	**Teacher Notes and Elaborations** *(continued)* The *absolute value* of a number is the distance from 0 on the number line regardless of direction (e.g., $\left\|-\frac{1}{2}\right\|=\frac{1}{2}$, $\left\|\frac{-1}{2}\right\|=\frac{1}{2}$, , and $\left\|\frac{1}{2}\right\|=\frac{1}{2}$). The distance between two rational numbers on the number line is the absolute value of their difference. Example 1: The distance between 5 and 2 is or $\|2-5\|=3$. Example 2: The distance between 3.5 and ( ) is or . Example 3: The distance between ( ) and (-1) is or $\|(-1)-(-4)\|=3$. Example 4: The distance between $1\frac{2}{3}$ and $4\frac{1}{5}$ is $\left\|1\frac{2}{3}-4\frac{1}{5}\right\|=2\frac{8}{15}$ or $\left\|4\frac{1}{5}-1\frac{2}{3}\right\|=2\frac{8}{15}$.

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Proportional Reasoning **Virginia SOL 7.1** **Foundational Objectives** **6.2b, c, d** The student will b. identify a given fraction, decimal or percent from a representation; c. demonstrate equivalent relationships among fractions, decimals, and percents; and d. compare and order fractions, decimals, and percents. **6.3** The student will a. identify and represent integers; b. order and compare integers; and c. identify and describe absolute value of integers. **6.5** The student will investigate and describe concepts of positive exponents and perfect squares. **5.2** The student will a. recognize and name fractions in decimal form and vice versa; and b. compare and order fractions and decimals in a given set from least to greatest and greatest to least. **5.3** The student will identify and describe the characteristics of prime and composite numbers; and even and odd numbers. **4.1b** The student will compare two whole numbers through millions, using symbols (>, <, or =). *(continued to next column)*	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml **Foundational Objectives** *(continued)* **4.2** The student will a. compare and order fractions and mixed numbers; b. represent equivalent fractions; and c. identify the division statement that represents a fraction. **4.3c, d** The student will c. compare and order decimals; and d. given a model, write the decimal and fraction equivalents. **4.5a** The student will determine common multiples and factors, including least common multiple and greatest common factor.	● Students, working in pairs, take turns giving each other a percent, a decimal, and a fraction to order from the least to the greatest. ● The students will work in pairs using grid paper and colored pencils, to practice converting fractions to decimals and percents. Each pair will design a color pattern on the grid paper. Have pairs exchange patterns. Then have the group members determine the fraction of the total grid covered by each color. They should then express the part as a decimal and a percent. ● Use manipulatives such as tiles, base ten blocks, counters, grid paper, geoboards, and calculators to demonstrate relationships among fractions, decimals, and percents and identify fractional parts of sets. ● Use play money to have students show relationships of fractional and decimal value of pennies, nickels, dimes, quarters = ___dimes = $___. ● On a number line mark 0, $\frac{1}{2}$, and 1. Give each student a copy of the number line and a chip. Name a fraction, decimal, or percent and have students place their chip on the number line approximately where the fraction would be located. Check answers and discuss differences. Repeat as many times as needed with different fractions. ● Explore percents as numerical displays in graphs, newspapers, and periodicals to understand real-life applications.

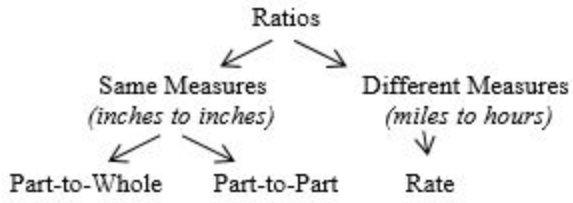
Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Proportional Reasoning **Virginia SOL 7.2** The student will describe and represent, arithmetic and geometric sequences using variable expressions.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Analyze** arithmetic and geometric sequences to discover a variety of patterns. ● **Identify** the common difference in an arithmetic sequence. ● **Identify** the common ratio in a geometric sequence. ● **Given** an arithmetic or geometric sequence, **write** a variable expression to describe the relationship between two consecutive terms in the sequence. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Identify, Write **Analyze –** Analyze **Key Vocabulary** arithmetic sequence common difference common ratio consecutive terms geometric sequence variable expression	**Essential Questions and Understandings** ● What are arithmetic sequences? In an arithmetic sequence, the numbers are found by using a common difference. ● What are geometric sequences? In a geometric sequence, the numbers are found by using a common ratio. ● When are variable expressions used? Variable expressions can express the relationship between two consecutive terms in a sequence. **Teacher Notes and Elaborations** In the numeric pattern of an *arithmetic sequence*, students must determine the difference, called the "*common difference*", between each succeeding number in order to determine what is added to each previous number to obtain the next number. Sample arithmetic sequences include: 4, 7, 10, 13, … (The common difference is 3) 10, 3, -4, , … (The common difference is -7) -6, , 4, 9, … (The common difference is 5) In *geometric sequences*, students must determine what each number is multiplied by in order to obtain the next number in the geometric sequence. This multiplier is called the "*common ratio*". Sample geometric sequences include: 2, 4, 8, 16, 32,… (The common ratio is 2) 1, 5, 25, 125, 625,… (The common ratio is 5) 80, 20, 5, 1.25,…. (The common ratio is $\frac{1}{4}$) By using manipulatives to build patterns that model sequences, numeric expressions for each step number can be written using the same pattern. A *variable expression* can then be written to express the relationship between two consecutive terms of a sequence. - If n represents a number in the sequence 3, 6, 9, 12, …, the next term in the sequence can be determined using the variable expression $n + 3$. - If n represents a number in the sequence 1, 5, 25, 125, …, the next term in the sequence can be determined by using the variable expression $5n$. *Consecutive terms* immediately follow each other in some order. For example 5 and 6 are consecutive whole numbers, 2 and 4 are consecutive even numbers.

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Proportional Reasoning **Virginia SOL 7.2** **Foundational Objectives** **6.17** The student will identify and extend geometric and arithmetic sequences. **5.17** The student will describe the relationship found in a number pattern and express the relationship. **4.15** The student will recognize, create, and extend numerical and geometric patterns.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Number, Number Sense Computation and Estimation **Focus** Integer Operations and Proportional Reasoning **Virginia SOL 7.3** The student will a. model addition, subtraction, multiplication and division of integers; and b. add, subtract, multiply, and divide integers.* *SOL test items measuring Objective 7.3b will be completed **without** the use of a calculator.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Model addition**, subtraction, multiplication and division of integers using pictorial representations of concrete manipulatives. ● **Formulate** rules for addition, subtraction, multiplication, and division of integers. ● **Add, subtract**, **multiply** and **divide** integers. ● **Simplify** numerical expressions involving addition, subtraction, multiplication and division of integers using order of operations. ● **Solve** practical problems involving addition, subtraction, multiplication, and division with integers. **Cognitive Level (Bloom's Taxonomy, Revised)** **Apply –** Add, Subtract, Multiply, Divide, Solve **Analyze –** Model **Create** – Formulate **Key Vocabulary** absolute value integers opposites	**Essential Questions and Understandings** ● The sums, differences, products and quotients of integers are either positive, zero, or negative. How can this be demonstrated? This can be demonstrated through the use of patterns and models. **Teacher Notes and Elaborations** The set of *integers* is the set of whole numbers and their *opposites* (…–3, –2, –1, 0, 1, 2, 3…). Integers are used in practical situations such as temperature changes (above/below zero), balance a checking account (deposits/withdrawals), and changes in altitude (above /below sea level). Concrete experiences in formulating rules for adding and subtracting integers should be explored by examining patterns using calculators, along a number line, and using manipulatives, such as two-color counters, or by using algebra tiles. Concrete experiences in formulating rules for multiplying and dividing integers should be explored by examining patterns using calculators, along a number line, and using manipulatives, such as two-color counters, or by using algebra tiles. For example the following model represents the number sentence $-3 \cdot 6 = -18$.  The *absolute value* of an integer is the distance on a number line that a number is from zero. It is always written as a positive number. Students should recognize and be able to read the symbol for absolute value (e.g., is read as "The absolute value of negative seven equals seven."). Open ended questions should be used to promote deeper understanding of integers. Example: Name a number that can be placed in the blank to make the value of the expression a negative number. $(-14) -$ _____Answer: Any number greater than) *(continued)*

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Number, Number Sense Computation and Estimation **Focus** Integer Operations and Proportional Reasoning **Virginia SOL 7.3** The student will a. model addition, subtraction, multiplication and division of integers; and b. add, subtract, multiply, and divide integers.* *SOL test items measuring Objective 7.3b will be completed **without** the use of a calculator.	**Teacher Notes and Elaborations** *(continued)* The order of operations is a convention that defines the computation order to follow in simplifying an expression. In grades 5 and 6, students simplify expressions by using the order of operations in a demonstrated step-by-step approach. The order of operations is as follows: - First, complete all operations within grouping symbols**. If there are grouping symbols within other grouping symbols, do the innermost operation first. - Second, evaluate all exponential expressions. - Third, multiply and/or divide in order from left to right. - Fourth, add and/or subtract in order from left to right. **Parentheses ( ), brackets [ ], braces {}, absolute value , and the division bar – as in $\frac{3+4}{5+6}$ should be treated as grouping symbols. The overuse of the acronym *PEMDAS* tends to reinforce inaccurate use of the order of operations. Students frequently multiply before dividing and add before subtracting because they do not understand the correct order of operations. Example: $4 \div 2(3+5)$ $4 \div 2(8)$ $2(8)$ 16

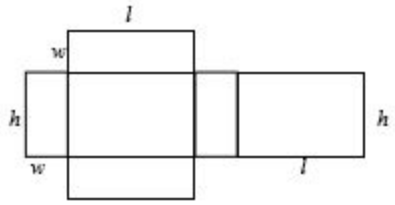
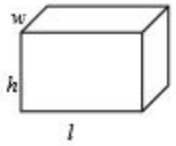
Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Number, Number Sense Computation and Estimation **Focus** Integer Operations and Proportional Reasoning **Virginia SOL 7.3** **Foundational Objectives** **6.3** The student will a. identify and represent integers; b. order and compare integers; and c. identify and describe absolute value of integers. **6.8** The student will evaluate whole number numerical expressions, using the order of operations.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Use real-life examples such as weather maps to demonstrate positive and negative temperatures, stock market to illustrate gains and losses, banking examples involving credits and debits, and problems involving sea level to understand ways in which positives and negatives are used. • Students think about how they would figure their bank balance, if they wrote a check for an amount larger than their balance (i.e. $100 – $125 = -$25). Discuss how subtracting an integer produces the same answer as adding the opposite. • Have the students work in groups of four to investigate integers. Give each group a number line showing -20 to +20 and a deck of cards with the face cards removed. Each student starts at zero. As a student is dealt a card face up, the student moves that number of places: red is negative, black is positive. The first student to reach negative 20 or positive 20 wins.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Integer Operations and Proportional Reasoning **Virginia SOL 7.4** The student will solve single-step and multi-step practical problems, using proportional reasoning.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Write** proportions that represent equivalent relationships between two sets. ● **Solve** a proportion to find a missing term. ● **Apply** proportions to convert units of measurement between the U.S. Customary System and the metric system. Calculators may be used. ● **Apply** proportions to solve problems that involve percents. ● **Apply** proportions to solve practical problems, including scale drawings. Scale factors shall have denominators no greater than 12 and decimals no less than tenths. Calculators may be used. ● **Using** 10% as a benchmark, mentally **compute** 5%, 10%, 15%, or 20% in a practical situation such as tips, tax and discounts. ● **Solve** problems involving tips, tax, and discounts. Limit problems to only one percent computation per problem. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Write **Apply –** Apply, Compute, Solve **Key Vocabulary** discount (amount of discount) means equivalent extremes percent proportion rate (discount rate, tax rate, unit rate) tip ratio tax sale price (discount price) scale factor	**Essential Questions and Understandings** ● What makes two quantities proportional? Two quantities are proportional, when one quantity is a constant multiple of the other. **Teacher Notes and Elaborations** A *ratio* is a comparison of two numbers or measures using division. Both numbers in a ratio have the same unit of measure. A ratio may be written three ways: as a fraction $\frac{a}{b}$, using the notation *a*:*b*, or in words *a* to *b*. Ratios are part of a large web of mathematical concepts and skills known as proportional reasoning that make use of ideas from multiplication, division, fractions, and measurement. Proportional reasoning is the ability to make and use multiplicative comparisons among quantities (Math Matters, 2006, Suzanne H. Chapin and Art Johnson). Ratios compare either the same measures or different measures to each other. If the measures are the same, the comparisons are part-to-whole or part-to-part. If the measures are different, the comparison is a rate.  A *rate* is a ratio that compares two quantities measured in different units. A *unit rate* is a rate with a denominator of 1. Examples of unit rates include miles/hour and revolutions/minute. A *discount rate* is the percent off an item (e.g., If an item is reduced in price by 20%, 20% is the discount rate.) The *amount of discount* (*discount*) is how much is subtracted from the original amount. The *sale price* (*discount price*) is the result of subtracting the discount from the original price.

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Integer Operations and Proportional Reasoning **Virginia SOL 7.4** The student will solve single-step and multi-step practical problems, using proportional reasoning.	**Teacher Notes and Elaborations** *(continued)* A *sales tax rate* is the percent of tax (e.g., Virginia has a 5% tax rate on most items purchased.) Sales tax is the amount added to the price of an item based on the tax rate. A *tip* is a small sum of money given as acknowledgment of services rendered, (a gratuity). It is often times computed as a percent of the bill or service. A *proportion* is a statement of equality between two ratios. It states that one ratio is *equivalent* (equal) to another ratio. Proportions are widely used as a problem-solving method. A proportion can be written as , $a:b = c:d$, or a is to b as c is to d. A proportion can be solved by finding the product of the means and the product of the extremes. For example, in the proportion $a:b = c:d$, a and d are the *extremes* and b and c are the *means*. If values are substituted for a, b, c, and d such as $5:12 = 10:24$, then the product of extremes ($5 \cdot 24$) is equal to the product of the means ($12 \cdot 10$). In a proportional situation, both quantities increase or decrease multiplicatively. Both are multiplied by the same factor. A proportion can be solved by finding equivalent fractions. Proportions are used in every-day contexts, such as speed, recipe conversions, scale drawings, map reading, reducing and enlarging, comparison-shopping, and monetary conversions. A *scale factor* is a ratio that compares the sizes of the parts of the scale drawing of an object with the actual sizes of the corresponding parts of the object (e.g., If the scale drawing is ten times the size of the actual object, the scale factor is 10:1). Proportions can be used to convert between measurement systems. For example: If 2 inches is about 5 cm, how many inches are in 16 cm? A *percent* is special ratio in which the denominator is 100. Proportions can be used to represent percent problems as follows: $\frac{\text{percent}}{100} = \frac{\text{part}}{\text{whole}}$ NOTE: Premature use of rules encourages students to apply rules without thinking and, thus, the ability to reason proportionally often does not develop. Instruction is a must to help students develop proportional thought processes (Teaching Student-Centered Mathematics, Grades 5-8, 2006, John Van de Walle and LouAnn Lovin).

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Number, Number Sense, Computation and Estimation **Focus** Integer Operations and Proportional Reasoning **Virginia SOL 7.4** **Foundational Objectives** **6.1** The student will describe and compare data, using ratios, and will use appropriate notations such as $\frac{a}{b}$, a to b, and a:b. **6.2a** The student will investigate and describe fractions, decimals and percents as ratios. **6.6b** The student will estimate solutions and then solve single-step and multi-step practical problems involving addition, subtraction, multiplication, and division of fractions. **6.7** The student will solve single-step and multi-step practical problems involving addition, subtraction, multiplication, and division of decimals. **5.5b** The student will create and solve single-step and multi-step practical problems involving decimals. **5.6** The student will solve single-step and multi-step practical problems involving addition and subtraction with fractions and mixed numbers and express answers in simplest form. *(continued)*	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml **Foundational Objectives** *(continued)* **4.4d** The student will solve single-step and multi-step addition, subtraction, and multiplication problems with whole numbers. **4.5d** The student will solve single-step and multi-step practical problems involving addition and subtraction with fractions and with decimals.	• Create a scale model of a classroom. • By setting up a proportion of height to shadow length, students will find the height of a tree, building, etc. The students will measure their height, the length of their shadow, and the length of the shadow of a tree or building. For example: $\frac{\text{student height}}{\text{student shadow}} = \frac{\text{tree height}}{\text{tree shadow}}$ • Each student makes a drawing, to scale, of his/her bedroom. • Using string and following actual highways on a map, students will measure the distance between two given cities. After measuring the length of the string in inches or centimeters, the students will use the scale on the map to determine the actual distance in miles. Using predetermined values for miles per gallon and cost of gas per gallon, students will compute the cost of the trip. • Have students bring in newspaper ads and use them to determine discounts when the original price and percent of discount are given. • Students obtain menus from their cafeteria or their favorite restaurants. In groups of two, students record what they would like to order and the cost of each item. Afterwards, they are to determine the tax, 15% tip that they should leave, and the total cost of their meal. • Students think of something they would like to buy for their room (i.e. clock radio, computer, etc.). They find at least three newspapers and/or catalog advertisements for the item. Students are to write why each is a good choice or why it is not a good choice. Next, they tell which item they would choose to buy and why. • Students collect and bring to class sales circulars from local papers that express the discounts on sale items in a variety of ways, including percent off, fraction off, and dollar amount off. For items chosen from the circular, the students discuss which form is the easiest form of expression of the discount, which is most understandable to the consumer, and which makes the sale seem the biggest bargain.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Proportional Reasoning **Virginia SOL 7.5** The student will a. describe volume and surface area of cylinders; b. solve practical problems involving the volume and surface area of rectangular prisms and cylinders; and c. describe how changing one measured attribute of a rectangular prism affects its volume and surface area. **Pacing** **Unit 8:** Measurement **Time:** 12 Blocks	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Determine** if a practical problem involving a rectangular prism or cylinder represents the application of volume or surface area. ● **Find** the surface area of a rectangular prism. ● **Solve** practical problems that require finding the surface area of a rectangular prism. ● **Develop** a procedure and formula for finding the surface area of a cylinder. ● **Find** the surface area of a cylinder. ● **Solve** practical problems that require finding the surface area of a cylinder. ● **Find** the volume of a rectangular prism. ● **Solve** practical problems that require finding the volume of a rectangular prism. ● **Develop** a procedure and formula for finding the volume of a cylinder. ● **Find** the volume of a cylinder. ● **Solve** practical problems that require finding the volume of a cylinder. ● **Describe** how the volume of a rectangular prism is affected when one measured attribute is multiplied by a scale factor. Problems will be limited to changing attributes by scale factors (e.g., , 2, 3, 5, and 10) only.	**Essential Questions and Understandings** ● How are volume and surface area related? Volume is a measure of the amount a container holds while surface area is the sum of the areas of the surfaces on the container. ● How does the volume of a rectangular prism change when one of the attributes is increased? There is a direct relationship between the volume of a rectangular prism increasing when the length of one of the attributes of the prism is changed by a scale factor. **Teacher Notes and Elaborations** The following is a list of some traditional formulas used in previous grades: Area of a rectangle: Area of a parallelogram: $A = bh$ Area of a circle: $A = \pi r^2$ Circumference of a circle: $C = 2\pi r$ The ratio of the circumference of any circle to the length of its diameter is π (pi). Pi is a nonterminating nonrepeating decimal. The most commonly used rational number approximations for π are 3.14 and $\frac{22}{7}$. The area of a rectangle is computed by multiplying the lengths of two adjacent sides. The *radius* of a circle is a segment connecting the center of the circle to a point on the circle. The *diameter* of a circle is a segment connecting two points on the circle and passing through the center. The area of a circle is computed by squaring the radius and multiplying that product by π ($A = \pi r^2$, where $\pi \approx 3.14$ or $\frac{22}{7}$). Nets are two-dimensional drawings (e.g., a drawing of a figure that has length and width) of three-dimensional figures (e.g., a figure that has length, width, and height) that can be used to help students find surface area. A *net* of a solid is a two dimensional figure that can be folded into a three dimensional shape. A *rectangular prism* can be represented on a flat surface as a net that contains six rectangles – two that have measures of the length and width of the base, two others that have measures of the length and height, and two others that have measures of the width and height.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Proportional Reasoning **Virginia SOL 7.5** The student will a. describe volume and surface area of cylinders; b. solve practical problems involving the volume and surface area of rectangular prisms and cylinders; and c. describe how changing one measured attribute of a rectangular prism affects its volume and surface area. **Pacing** **Unit 8:** Measurement **Time:** 12 Blocks	*(continued)* ● **Describe** how the surface area of a rectangular prism is affected when one measured attribute is multiplied by a scale factor. Problems will be limited to changing attributes by scale factors $\frac{1}{2}$, 2, 3, 5, and 10) only. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Find **Understand** – Describe **Analyze –** Solve **Evaluate –** Determine **Create -** Develop **Key Vocabulary** base cube cylinder diameter face formula height length net pi ( ) radius rectangular prism scale factor surface area volume width	**Teacher Notes and Elaborations** *(continued)* A *face* is a flat side of a solid figure. *Surface area* of any solid figure is the total area of the surface of the solid. The surface area of a rectangular prism is the sum of the areas of all six faces ($SA = 2lw + 2lh + 2wh$).   A *formula* is an equation that shows a mathematical relationship. Some formulas used in determining measurements in geometry use B to represent the area of the base of the solid figure. The *base* of a solid figure is the bottom, side or face of the solid figure. The *volume* of a solid is the total amount of space inside a three-dimensional object. A unit for measuring volume is the cubic unit. The volume of a rectangular prism is computed by multiplying the area of the base, B, (length times width) by the height of the prism ($V = lwh$ or $V = Bh$). A *cube* is a rectangular prism in which every face is a square and every edge is the same length. A *scale factor* is a ratio that compares the sizes of the parts of the scale drawing of an object with the actual sizes of the corresponding parts of the object (e.g., If the scale drawing is ten times the size of the actual object, the scale factor is 10).

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations

SOL Reporting Category
Measurement and Geometry

Focus
Proportional Reasoning

Virginia SOL 7.5
The student will
a. describe volume and surface area of cylinders;
b. solve practical problems involving the volume and surface area of rectangular prisms and cylinders; and
c. describe how changing one measured attribute of a rectangular prism affects its volume and surface area.

Teacher Notes and Elaborations *(continued)*

There is a direct relationship between changing one measured attribute of a rectangular prism by a scale factor and its volume. For example, doubling the length of a prism will double its volume. This direct relationship does not hold true for surface area. For example, doubling the length will only double the area of the affected sides. It will not double the total surface area.

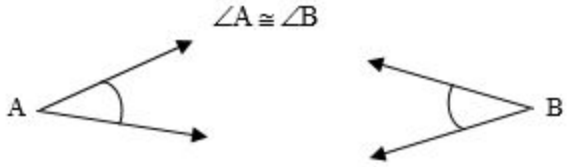
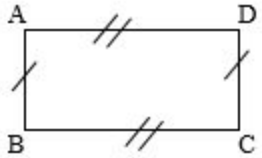
Example: Given a rectangular prism with the following dimensions: $l = 5$ meters, $w = 4$ meters and $h = 3$ meters. Students should describe how the volume and surface area of a rectangular prism is affected when one attribute is multiplied by a scale factor.

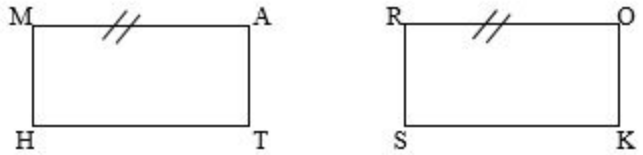
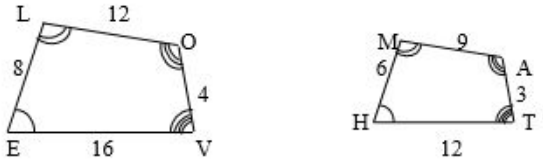
	Length	Width	Height	Volume	Surface Area
Original Figure	5	4	3	60 m^3	94 m^2
Using the original figure:					
Multiply length by 2	10	4	3	120 m^3	164 m^2
Multiply width by 2	5	8	3	120 m^3	158 m^2
Multiply height by 2	5	4	6	120 m^3	148 m^2
Multiply length by $\frac{1}{2}$	$2\frac{1}{2}$	4	3	30 m^3	59 m^2
Multiply width by $\frac{1}{2}$	5	2	3	30 m^3	62 m^2
Multiply height by	5	4	$1\frac{1}{2}$	30 m^3	67 m^2

A *cylinder* can be represented on a flat surface as a net that contains two circles (bases for the cylinder) and one rectangular region whose length is the circumference of the circular base and whose width is the height of the cylinder. The surface area of the cylinder is the area of the two circles and the rectangle ($SA = 2\ \pi r^2 + 2\ \pi rh$).

The volume of a cylinder is computed by multiplying the area of the circular base, B, (πr^2) by the height of the cylinder ($V = \pi r^2 h$ or $V = Bh$).

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Measurement and Geometry **Focus** Proportional Reasoning **Virginia SOL 7.5** **Foundational Objectives** **6.10** The student will a. define pi (π) as the ratio of the circumference of a circle to its diameter; b. solve practical problems involving circumference and area of a circle, given the diameter or radius; c. solve practical problems involving area and perimeter; and d. describe and determine the volume and surface area of a rectangular prism. **5.8a, b** The student will a. find perimeter, area, and volume in standard units of measure; and b. differentiate among perimeter, area, and volume and identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation. **5.9** The student will identify and describe the diameter, radius, chord, and circumference of a circle.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Students bring in cereal and oatmeal boxes from home and cut them apart to determine the surface area. • Students stack unit cubes in various ways and find the surface areas of the structures they have built. They sketch their figures and discuss which figure has the largest surface area and which has the smallest surface area. • The students will work in groups of three or four using 1" cubes and 1" by 1" grid paper. Have the students design the cubes on the grid paper in a 3 x 5 rectangle. The students will then figure the area of the rectangle by counting the cubes. Next have the students add a second layer of cubes to the rectangle and give the area. Add the areas in order to determine the volume. Continue adding layers until the students arrive at the formula V= (area of base) h. • Three-dimensional models may be built from pictures showing the top, side and/or bottom views. Pictures may be line drawings or drawings on dot paper. Volume can then be determined by counting the cubes. Surface area can be determined by counting all outside faces.

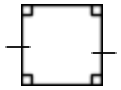
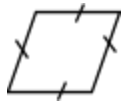
Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Proportional Reasoning **Virginia SOL 7.6** The student will determine whether plane figures (quadrilaterals and triangles) are similar and write proportions to express the relationships between corresponding sides of similar figures.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Identify** corresponding sides and corresponding and congruent angles of similar figures using the traditional notation of curved lines for the angles. ● **Write** proportions to express the relationships between the lengths of corresponding sides of similar figures. ● **Determine** if quadrilaterals or triangles are similar by examining congruence of corresponding angles and proportionality of corresponding sides. ● **Given** two similar figures, **write** similarity statements using symbols such as $\Delta ABC \sim \Delta DEF$, $\angle A$ corresponds to $\angle D$, and $\overline{AB}$ corresponds to $\overline{DE}$. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Identify **Evaluate** – Determine **Key Vocabulary** corresponding parts congruent hatch mark polygon proportion ratio similar figures	**Essential Questions and Understandings** ● How do polygons that are similar compare to polygons that are congruent? Congruent polygons have the same size and shape. Similar polygons have the same shape, and corresponding angles between the similar figures are congruent. However, the lengths of the corresponding sides are proportional. All congruent polygons are considered similar with the ratio of the corresponding sides being 1:1. **Teacher Notes and Elaborations** The symbol ~ is used to indicate that two *polygons* (a closed plane figure constructed with three or more straight-line segments that intersect only at their vertices) are similar. *Congruent* figures have identical size and shape. In congruent figures, one figure can be superimposed upon the other figure. The traditional notation for marking corresponding congruent angles is to use a curve on each angle. Denote which angles are congruent with the same number of curved lines. For example, if $\angle A$ is congruent to $\angle B$, then both angles will be marked with the same number of curved lines.  Congruent sides are denoted with the same number of *hatch marks* on each congruent side. Given Figure ABCD, and $\overline{AB} \cong \overline{DC}$  *(continued)*

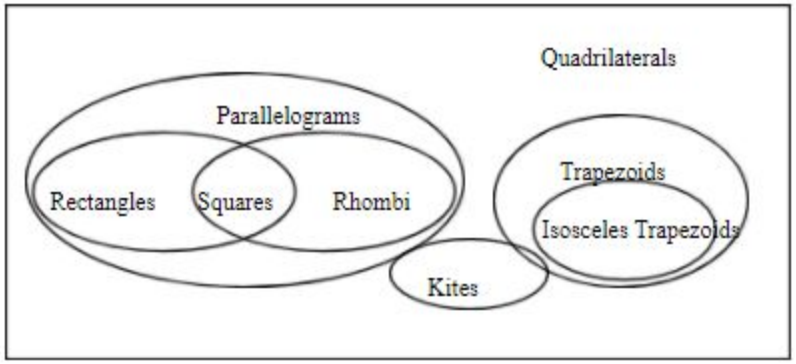
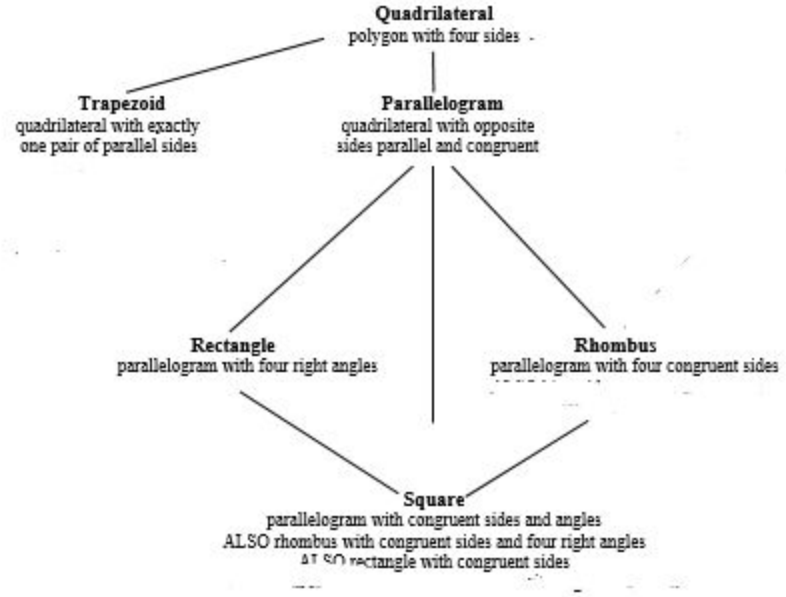
Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Proportional Reasoning **Virginia SOL 7.6** The student will determine whether plane figures (quadrilaterals and triangles) are similar and write proportions to express the relationships between corresponding sides of similar figures.	**Teacher Notes and Elaborations** *(continued)* In another example, a side on a polygon with two hatch marks is congruent to the side with two hatch marks on a congruent polygon. Based on the following figures, it can be concluded that $\overline{MA} \cong \overline{RO}$.  *Corresponding parts* is a one-to-one mapping between two figures. Similar figures are the same shape, but not always the same size. $\Delta ABC \sim \Delta DEF$. Therefore: $\angle A$ corresponds to and $\angle A \cong \angle D$ corresponds to and $\angle B \cong$ $\angle C$ corresponds to $\angle F$ and $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ A *proportion* is a statement of equality between two ratios. It states that one *ratio* (comparison) is equivalent to another ratio. Proportions can be written to express these relationships and solved to find a missing length if the others are known. Two polygons are similar if corresponding (matching) angles are congruent and the lengths of corresponding sides are proportional.  $\angle L \cong \angle M$ $\angle O \cong \angle A$ $\angle V \cong \angle T$ $\angle E \cong \angle H$ $\frac{LO}{MA} = \frac{OV}{AT} = \frac{VE}{TH} = \frac{EL}{HM} = \frac{4}{3}$ Therefore Quad LOVE ~ Quad MATH *(continued)*

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Proportional Reasoning **Virginia SOL 7.6** The student will determine whether plane figures (quadrilaterals and triangles) are similar and write proportions to express the relationships between corresponding sides of similar figures.	**Teacher Notes and Elaborations** *(continued)* Congruent figures have corresponding parts that have equal measures while *similar figures* have corresponding angles congruent but corresponding sides with proportional measures. Congruent polygons have the same size and shape. Congruent polygons are similar polygons for which the ratio of the corresponding sides is 1:1. Similarity statements can be used to determine corresponding parts of similar figures such as: Given $\Delta ABC \sim \Delta DEF$ Therefore: $\angle A$ corresponds to $\angle D$ corresponds to $\angle C$ corresponds to corresponds to $\overline{DE}$ corresponds to corresponds to $\overline{DF}$

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Measurement and Geometry **Focus** Proportional Reasoning **Virginia SOL 7.6** **Foundational Objectives** **6.12** The student will determine congruence of segments, angles, and polygons. **5.11** The student will measure right, acute, obtuse, and straight angles. **5.12** The student will classify a. angles as right, acute, obtuse, or straight; and b. triangles as right, acute, obtuse, equilateral, scalene, or isosceles. **4.10** The student will a. identify and describe representations of points, lines, line segments, rays, and angles, including endpoints and vertices; and b. identify representations of lines that illustrate intersection, parallelism, and perpendicularity.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Each student is given two rectangular cards to see if they are similar. The students measure the cards in inches and compare the two ratios to see if they are equal. If they are not similar, one of the cards is cut so they are similar. • Students are given several quadrilaterals and asked to identify which are similar. Students must identify congruency and proportionality to support their decisions.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Relationships between Figures **Virginia SOL 7.7** The student will compare and contrast the following quadrilaterals based on properties: parallelogram, rectangle, square, rhombus, and trapezoid.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Identify** the classification(s) to which a quadrilateral belongs, using deductive reasoning and inference. ● **Compare** and **contrast** attributes of the following quadrilaterals: parallelogram, rectangle, square, rhombus, and trapezoid. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Identify **Analyze –** Compare, Contrast **Key Vocabulary** congruent diagonal hatch marks isosceles trapezoid kite parallel parallelogram plane figure polygon quadrilateral rectangle rhombus square trapezoid vertex *(continued)*	**Essential Questions and Understandings** ● Why can some quadrilaterals be classified in more than one category? Every quadrilateral in a subset has all of the defining attributes of the subset. For example, if a quadrilateral is a rhombus, it has all the attributes of a rhombus. However, if that rhombus also has the additional property of 4 right angles, then that rhombus is also a square. **Teacher Notes and Elaborations** A *polygon* is a simple closed plane figure whose sides are line segments that intersect only at their endpoints. In regular polygons all angles are congruent and all sides are congruent. A *quadrilateral* is a closed *plane figure* (two-dimensional) with four sides that are line segments. Two lines in the same plane are *parallel* if they do not intersect. They are everywhere the same distance from each other. Two geometric figures that are the same shape and size are *congruent*. Two angles are congruent if they have the same measure. Two line segments are congruent if they are the same length. A *diagonal* is a line segment that connects two non-consecutive vertices. A *vertex* is a common point to two sides of an angle or a polygon. Denote which angles are congruent with the same number of curved lines. Congruent sides are denoted with the same number of *hatch marks* on each congruent side. Arrows are used in diagrams to indicate that lines are parallel. *Parallelogram* A *parallelogram* is a quadrilateral whose opposite sides are parallel and congruent. Opposite angles are congruent. A diagonal divides the parallelogram into two congruent triangles. The diagonals of a parallelogram bisect each other.  *(continued)*

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Relationships between Figures **Virginia SOL 7.7** The student will compare and contrast the following quadrilaterals based on properties: parallelogram, rectangle, square, rhombus, and trapezoid.	**Teacher Notes and Elaborations** *(continued)* *Rectangle* A *rectangle* is a parallelogram with four right angles. The diagonals of a rectangle are the same length (congruent) and bisect each other. Since a rectangle is a parallelogram, a rectangle has the same properties as those of a parallelogram.  *Square* A *square* is a rectangle with four congruent sides and a rhombus with four right angles. Squares have special characteristics that are true for all squares, such as diagonals are perpendicular bisectors and diagonals bisect opposite angles. Since a square is a rectangle, a square has all the properties of a rectangle and of a parallelogram.  *Rhombus* A *rhombus* is a parallelogram with four congruent sides whose diagonals bisect each other and intersect at right angles. Opposite angles are congruent.  *Trapezoid* A *trapezoid* is a quadrilateral with exactly one pair of parallel sides. A trapezoid may have none or two right angles. A trapezoid with congruent, non-parallel sides is called an *isosceles trapezoid.*  *Kite* A kite is a quadrilateral with two pairs of adjacent congruent sides. One pair of opposite angles is congruent.  *(continued)*

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Relationships between Figures **Virginia SOL 7.7** The student will compare and contrast the following quadrilaterals based on properties: parallelogram, rectangle, square, rhombus, and trapezoid.	**Teacher Notes and Elaborations** *(continued)* Quadrilaterals can be sorted according to common attributes, using a variety of materials. A chart, graphic organizer, or a Venn diagram can be made to organize quadrilaterals according to attributes such as sides and/or angles.  

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Measurement and Geometry **Focus** Relationships between Figures **Virginia SOL 7.7** **Foundational Objectives** **6.13** The student will describe and identify properties of quadrilaterals. **5.13a** The student, using plane figures (square, rectangle, triangle, parallelogram, rhombus, and trapezoid), will develop definitions of these plane figures. **4.10b** The student will identify representations of lines that illustrate intersection, parallelism, and perpendicularity. **4.12** The student will a. define polygon; and b. identify polygons with 10 or fewer sides.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	● Have students locate and make lists of where different geometric shapes are found. ● Students search for parallelograms, rectangles, squares, rhombi, and trapezoids. Students will describe the characteristics of each quadrilateral and how the shapes are alike and different. ● Prepare a bulletin board with shapes and the appropriate name of each shape. Each day, a student will go to the bulletin board and place the correct name under the appropriate shape. ● Make a flowchart demonstrating the relationships among all quadrilaterals.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Relationships between Figures **Virginia SOL 7.8** The student, given a polygon in the coordinate plane, will represent transformations (reflections, dilations, rotations, and translations) by graphing in the coordinate plane.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Identify** the coordinates of the image of a right triangle or rectangle that has been translated either vertically, horizontally or a combination of a vertical and horizontal translation. ● **Identify** the coordinates of the image of a right triangle or rectangle that has been rotated 90° or 180° about the origin. ● **Identify** the coordinates of the image of a right triangle or a rectangle that has been reflected over the *x*- or *y*-axis. ● **Identify** the coordinates of a right triangle or rectangle that has been dilated. The center of the dilation will be the origin. ● **Sketch** the image of a right triangle or rectangle translated vertically or horizontally. ● **Sketch** the image of a right triangle or rectangle that has been rotated 90° or 180° about the origin. ● **Sketch** the image of a right triangle or rectangle that has been reflected over the *x*- or *y*-axis. ● **Sketch** the image of a dilation of a right triangle or rectangle limited to a scale factor of , , 2, 3, or 4. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Sketch, Identify	**Essential Questions and Understandings** ● How does the transformation of a figure affect the size, shape and position of that figure? Translations, rotations and reflections do not change the size or shape of a figure. A dilation of a figure and the original figure are similar. Reflections, translations and rotations usually change the position of the figure. **Teacher Notes and Elaborations** A *coordinate plane*, or Cartesian Coordinate system, is a way to locate points in a plane. Points are plotted on the grid. The *coordinates* of a point is an *ordered pair* of numbers that locates a point in the coordinate plane with reference to the *x*- and *y*-axes. The first coordinate in the ordered pair, (*x*-coordinate), is the distance from the origin along the *x*-axis (*horizontal* axis). The second coordinate in the ordered pair (*y*-coordinate) is the distance along the *y*-axis (*vertical* axis). The *origin* is the point assigned to zero on the number line or the point where the *x*-and *y*-axes intersect in a coordinate system. The coordinates of this point are (0, 0). Circular motion can occur in two possible directions. A *clockwise* motion is one that proceeds in the same direction as a clock's hands: from the top to the right, then down and then to the left, and back up to the top. The opposite rotation is *counterclockwise*. The *x*-axis and the *y*-axis divide the coordinate plane into four sections called *quadrants*. The value of the coordinates in the ordered pair determines the location of the point in one of the four quadrants. The quadrants are named in counterclockwise order. The signs for the coordinates in the ordered pairs are for quadrant I (+, +); for quadrant II, (-, +); for quadrant III, (-, -) and for quadrant IV, (+, -). A *transformation* is a movement of a figure in a coordinate plane. It changes a figure into another figure, called the image. A *rotation* of a geometric figure is a turn of the figure around a fixed point (clockwise or counterclockwise). The point may or may not be on the figure. The fixed point is called the *center of rotation*. A *translation* of a geometric figure is a slide of the figure in which all the points on the figure move the same distance in the same direction. Translations can also be combinations of vertical and horizontal slides.

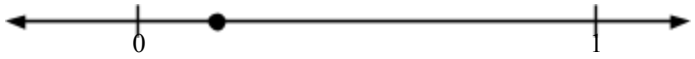
Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Measurement and Geometry **Focus** Relationships between Figures **Virginia SOL 7.8** The student, given a polygon in the coordinate plane, will represent transformations (reflections, dilations, rotations, and translations) by graphing in the coordinate plane.	*(continued)* **Key Vocabulary** center of rotation clockwise coordinate plane coordinates (ordered pair) counterclockwise dilation horizontal axis (*x*-axis) image origin preimage quadrant reflection rotation scale factor transformation translation vertical axis (*y*-axis)	**Teacher Notes and Elaborations** *(continued)* A *reflection* is a transformation that reflects (flips) a figure across a line in the plane. It creates a mirror image of a figure on the opposite side of a line. Each point on the reflected figure is the same distance from the line as the corresponding point in the original figure. A *dilation* of a geometric figure is a transformation that changes the size of a figure by a scale factor to create a similar figure. The *scale factor* is the ratio of corresponding side lengths of a figure and its image after dilation. The *image* of a polygon is the resulting polygon after the transformation. The *preimage* is the polygon before the transformation. A transformation of preimage point A can be denoted as the image A' (read as "A prime"). When a geometric figure is translated on a coordinate plane, the new vertices are labeled as follows: point A corresponds to , point B corresponds to B', and so on. Sometimes double prime ( ) and triple prime (A'') notations are used. When applying transformations, experiences should include plotting the points in the coordinate plane and identifying the coordinates in list format. Example: .

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Measurement and Geometry **Focus** Relationships between Figures **Virginia SOL 7.8** **Foundational Objectives** **6.11** The student will a. identify the coordinates of a point in a coordinate plane; and b. graph ordered pairs in a coordinate plane. **6.12** The student will determine congruence of segments, angles, and polygons. **4.11** The student will a. investigate congruence of plane figures after geometric transformations, such as reflection, translation, and rotation, using mirrors, paper folding, and tracing; and b. recognize the images of figures resulting from geometric transformations, such as translation, reflection, and rotation.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Use patty paper to trace figures to determine the type of transformation. • Bring in advertisements from flyers, newspapers, and coupon mailers. Have students identify different types of transformations found in the ads. • Wallpaper samples can be used to illustrate different transformations.

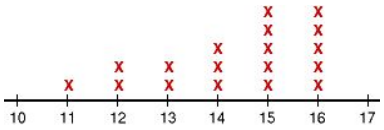
Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.9** The student will investigate and describe the difference between the experimental probability and theoretical probability of an event. **Pacing** **Unit 10:** Probability **Time:** 6 Blocks	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Determine** the theoretical probability of an event. ● **Determine** the experimental probability of an event. ● **Describe** changes in the experimental probability as the number of trials increases. ● **Investigate** and **describe** the difference between the probability of an event found through experiment or simulation versus the theoretical probability of that same event. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Describe **Evaluate –** Investigate, Determine **Key Vocabulary** event experimental probability Law of Large Numbers outcome probability sample space sampling simulation theoretical probability	**Essential Questions and Understandings** ● What is the difference between the theoretical and experimental probability of an event? Theoretical probability of an event is the expected probability and can be found with a formula. The experimental probability of an event is determined by carrying out a simulation or an experiment. In experimental probability, as the number of trials increases, the experimental probability gets closer to the theoretical probability. **Teacher Notes and Elaborations** The *probability* of an event occurring is a ratio expressing the chance or likelihood that a certain event will occur, given the number of possible *outcomes* (results) of an experiment. An *event* is a subset of a sample space. The *sample space* is the set of all possible outcomes of an experiment. The *theoretical probability* of an event is the expected probability and can be found with a formula. $$\text{Theoretical probability of an event} = \frac{\text{number of possible favorable outcomes}}{\text{total number of possible outcomes}}$$ The *experimental probability* of an event is determined by carrying out a *simulation* or an experiment. The experimental probability is found by repeating an experiment many times and using the ratio. $$\text{Experimental probability} = \frac{\text{number of times desired outcomes occur}}{\text{total number of trials in the experiment}}$$ Experimental probability is not exact since the results may vary if the experiment is repeated. In experimental probability, as the number of trials increases, the experimental probability gets closer to the theoretical probability (*Law of Large Numbers*). Experiences should include comparing the difference between the probability of an event found through an experiment or simulation and the theoretical probability of the same event. An important use of experimental probability is to make predictions about a large group of people based on the results of a poll or survey. This technique, called *sampling*, is used when it is impossible to question every member of a group.

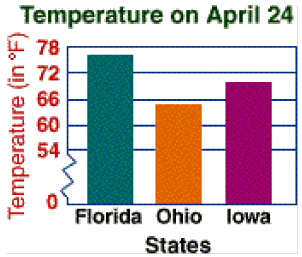
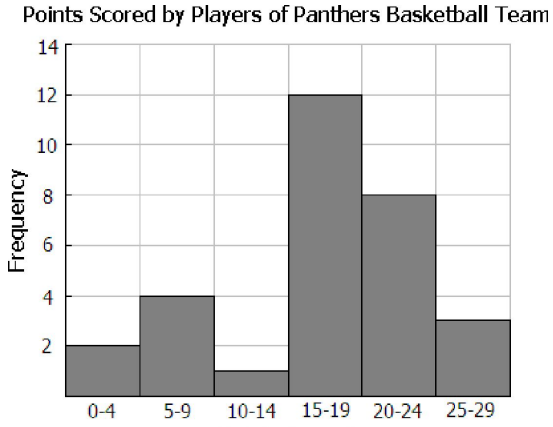
Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.9** **Foundational Objectives** **6.16** The student will a. compare and contrast dependent and independent events; and b. determine probabilities for dependent and independent events. **5.14** The student will make predictions and determine the probability of an outcome by constructing a sample space. **4.13** The student will a. predict the likelihood of an outcome of a simple event; and b. represent probability as a number between zero and one, inclusive.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	● Plan and carry out experiments that use concrete materials (e.g., coins, spinners, number cubes, etc.) to determine an experimental probability of an event. ● Students form large groups and, then, break into pairs of students. Each pair of students is given one number cube with faces labeled 1-6 and a score sheet. One student in each pair tosses the number cube 20 times, while the other student tallies the results on the score sheet. Students then reverse roles. Upon completion students should return to their larger group to compare and discuss their results. In particular, they should decide whether the chance of tossing a 1, 2, or 3 is the same as the chance of tossing a 4, 5, or a 6 and why? Compile the results from all classes. Describe how these results approach the theoretical probability of the events. ● Using two number cubes, work with the class to list all the possible outcomes of rolling both cubes. Students work in pairs with two number cubes. Rolling the number cubes 10 times students list their outcomes. The two students compare their results with the results from the list (table) of all possible outcomes. Discuss with students how close their results were to the original results. Have students do the experiment 10 more times adding these results to the first 10 and again compare results with the original results. Ask, "Are your results any closer to the original results?" Do the experiment 10 more times and compare results.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.10** The student will determine the probability of compound events using the Fundamental (Basic) Counting Principle.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Compute** the number of possible outcomes by using the Fundamental (Basic) Counting Principle. ● **Determine** the probability of a compound event containing no more than two events. **Cognitive Level (Bloom's Taxonomy, Revised)** **Apply** – Compute **Evaluate** - Determine **Key Vocabulary** compound event dependent event Fundamental Counting Principle independent event outcomes probability sample space tree diagram	**Essential Questions and Understandings** ● What is the Fundamental (Basic) Counting Principle? The Fundamental (Basic) Counting Principle is a computational procedure used to determine the number of possible outcomes of several events. ● What is the role of the Fundamental (Basic) Counting Principle in determining the probability of compound events? The Fundamental (Basic) Counting Principle is used to determine the number of outcomes of several events. It is the product of the number of outcomes for each event that can be chosen individually. **Teacher Notes and Elaborations** *Probability* is the chance of an event occurring. A *sample space* is the set of all possible outcomes of a situation that can be represented in a list, chart, picture, or tree diagram. The *Fundamental (Basic) Counting Principle* is a computational procedure to determine the number of possible outcomes of several events. It is the product of the number of outcomes for each event that can be chosen individually (e.g., the possible outcomes or outfits of four shirts, two pants, and three shoes is $4 \cdot 2 \cdot 3$ or 24). *Tree diagrams* are used to illustrate possible outcomes of events. They can be used to support the Fundamental (Basic) Counting Principle. **Pants** **Shirts** **Possible Outcomes** blue → red: blue pants w/red shirt blue → green: blue pants w/green shirt blue → White: blue pants w/white shirt tan → red: tan pants w/red shirt tan → green: tan pants w/green shirt tan → white: tan pants w/white shirt This tree diagram illustrates the possible *outcomes* (results). Using the Fundamental (Basic) Counting Principle the possible outcomes can be found by multiplying the number of pant choices times the shirt choices ($2 \cdot 3 = 6$). *(continued)*

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.10** The student will determine the probability of compound events using the Fundamental (Basic) Counting Principle.	**Teacher Notes and Elaborations** *(continued)* *Events are independent* when the outcome of one has no effect on the outcome of the other. For example, rolling a number cube and flipping a coin are independent events. *Events are dependent* when the outcome of one event is influenced by the outcome of the other. For example, when drawing two marbles from a bag, ***not*** **replacing** the first after it is drawn affects the outcome of the second draw. A *compound event* combines two or more simple events (independent or dependent). For example, a bag contains 4 red, 3 green and 2 blue marbles. What is the probability of selecting a green and then a blue marble (with or without replacement)? With replacement (independent) the probability is: which can be simplified to $\frac{2}{27}$. Without replacement (dependent) the probability is: $\frac{3}{9}\cdot\frac{2}{8}=\frac{6}{72}$ which can be simplified to $\frac{1}{12}$. The probability of an event can be represented as a ratio (the equivalent fraction, decimal, or percent) or plotted on a number line. Example: If a die is rolled twice what is the theoretical probability of the number being even on the first roll and greater than 4 on the second roll. $\frac{1}{2}\cdot\frac{2}{6}=\frac{1}{6}$ or $0.1\overline{6}$ or approximately 16.7% The value of this probability can also be plotted on a number line. 

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.10** **Foundational Objectives** **6.16** The student will a. compare and contrast dependent and independent events; and b. determine probabilities for dependent and independent events. **5.14** The student will make predictions and determine the probability of an outcome by constructing a sample space. **4.13** The student will a. predict the likelihood of an outcome of a simple event; and b. represent probability as a number between zero and one, inclusive.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• The standard Virginia state license plate has three letters followed by four digits. How many different license plates are possible if the digits and letters can be repeated? (175,760,000) How many are possible if they cannot be repeated? (78,624,000) • Students will list several items of clothing and then determine the different outfits that they could create with these items. • Obtain three chips; one with sides marked A and B, one with B and C, and one with A and C. All chips will be flipped at the same time. Make a tree diagram to show all possible results. Determine probability that none of the chips matches or that at least two will match. Similar experiments may be done with spinners, flipping coins, and number cubes. • Students study the chances of winning in the Virginia Lottery Pick 3 and Pick 4 daily events using the Basic Counting Principle. They compare the chances of winning with the size of the prize. • Bring in menus from various restaurants. Have students determine the possible number of meals using various combinations. For example, how many meals with an entrée and a drink are possible?

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.11** The student, given data in a practical situation, will a. construct and analyze histograms; and b. compare and contrast histograms with other types of graphs presenting information from the same data set.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Collect, analyze, display**, and **interpret** a data set using histograms. For collection and display of raw data, limit the data to 20 items. ● **Determine** patterns and relationships within data sets (e.g., trends). ● Make **inferences**, **conjectures**, and predictions based on analysis of a set of data. ● Compare and contrast histograms with line plots, circle graphs, and stem and leaf plots presenting information from the same data set. **Cognitive Level (Bloom's Taxonomy, Revised)** **Understand** – Predictions **Analyze –** Analyze, Compare, Contrast, Inferences, Conjectures **Key Vocabulary** circle graph conjecture frequency distribution histogram inference intervals line plot prediction stem-and-leaf plot tally trends	**Essential Questions and Understandings** ● What type of data are most appropriate to display in a histogram? Numerical data that can be characterized using consecutive intervals are best displayed in a histogram. **Teacher Notes and Elaborations** Statistics are generalizations about data that has been gathered, organized and summarized, displayed in tables and graphs, and interpreted. All graphs tell a story and include a title and labels that describe the data. A *line plot* shows the frequency of data on a number line. Line plots are used to show the spread of the data and quickly identify the range, mode, and any outliers.  A *stem-and-leaf plot* displays data from least to greatest using the digits of the greatest place value to group data. **Number of Sit-Ups** Stem | Leaves 3 | 4 6 8 8 4 | 0 3 6 7 7 5 | 0 0 1 2 Each tens digit is called the *stem*. The ones digits are called the *leaves*. A *frequency distribution* shows how often an item, a number, or range of numbers occurs. It can be used to construct a histogram. A *tally* is a mark used to keep count in each interval. **STUDENTS WHO READ GARFIELD** Age Group | Tally | Frequency | Cumulative Frequency 7-10 | 𝍸 | 7 | 7 11-14 | 𝍸 | 7 | 14 ← 7 + 7 15-18 | 𝍸 | 3 | 17 ← 14 + 3 19-22 | 𝍸 | 3 | 20 ← 17 + 3

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.11** The student, given data in a practical situation, will a. construct and analyze histograms; and b. compare and contrast histograms with other types of graphs presenting information from the same data set.	**Teacher Notes and Elaborations** *(continued)* *Bar graphs* are utilized to compare counts of different categories both categorical or discrete data. A bar graph uses parallel bars; either horizontal or vertical, to represent counts for several categories. One bar is used for each category with the length of the bar representing the count for that category. There is space before, between, and after the bars. The axis displaying the scale representing the count for the categories should extend one increment above the greatest recorded piece of data. The values should represent equal increments. Each axis should be labeled, and the graph should have a title.  Graphs make it easier to observe patterns in data. Some graphs includes two scales, or rulers – the horizontal axis and the vertical axis. An *interval* is the difference between the values on a scale. A *histogram* is a form of *bar graph* in which the categories are consecutive and equal *intervals*. If no data exists in an interval, that interval must still be labeled in the graph. A histogram uses numerical instead of categorical data. Data for a histogram can be represented in a frequency table or a stem-and-leaf plot. The intervals are shown on the *x*-axis and the number of elements in each interval is represented by the height of a bar located above the interval. The length or height of each bar is determined by the number of data elements (frequency) falling into a particular interval. Histograms summarize data but do not provide information about specific data points. 

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations

SOL Reporting Category
Probability, Statistics, Patterns, Functions, and Algebra

Focus
Applications of Statistics and Probability

Virginia SOL 7.11
The student, given data in a practical situation, will

a. construct and analyze histograms; and
b. compare and contrast histograms with other types of graphs presenting information from the same data set.

Teacher Notes and Elaborations *(continued)*

Comparisons, predictions and inferences are made by examining characteristics of a data set displayed in a variety of graphical representations to draw conclusions.

The information displayed in different graphs may be examined to determine how data are or are not related, ascertaining differences between characteristics (comparisons), *trends* (patterns and relationships within data sets) that suggest what new data might be like (*predictions*), and/or "what could happen if" (*inference*).

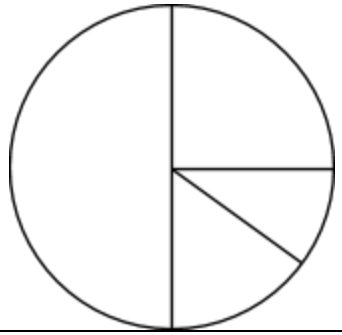
A *conjecture* is a statement that has not been proved to be true nor shown to be false.

Circle graphs are best used for data showing a relationship of the parts to the whole. The focus at this level is to use fractional parts to draw the circle graph. Benchmark measurements should be halves, thirds, fourths, sixths, eighths, twelfths, and any combination of these measurements. All experiences are not limited to these measurements.

Favorite Sports

Sport	Number	Fractional part of circle	Measure of central angle
Football	10	$\frac{10}{40}=\frac{1}{4}$	
Soccer	20	$\frac{20}{40}=\frac{1}{2}$	
Baseball	4	$\frac{4}{40}=\frac{1}{10}$	$\frac{1}{10}\times 360=36°$
Basketball	6	$\frac{6}{40}=\frac{3}{20}$	$\frac{3}{20}\times 360=54°$
Total	40	$\frac{40}{40}=1$	360º

Football Soccer Baseball Basketball

	(the angles times 6  Extension: The tools needed to construct a circle graph are a compass and a protractor. To construct a circle graph find the fractional part of the whole. Multiply each fractional part by 360 number of degrees in a circle). Draw a circle using a compass. Using a protractor, make central (angles whose vertex is the center of the circle) based on the products of the fractional parts 360. Mean, median and mode are measures of center often used to compare sets of data. In grade students determined which measure is appropriate for a given situation or given set of data.

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Applications of Statistics and Probability **Virginia SOL 7.11** **Foundational Objectives** **6.14** The student, given a problem situation, will a. construct circle graphs; b. draw conclusions and make predictions, using circle graphs; and c. compare and contrast graphs that present information from the same data set. **6.15** The student will a. describe mean as balance point; and b. decide which measure of center is appropriate for a given purpose. **5.15** The student, given a problem situation, will collect, organize, and interpret data in a variety of forms, using stem-and-leaf plots and line graphs. **4.14** The student will collect, organize, display, and interpret data from a variety of graphs.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Students research to find the ages of the Presidents when they took office. Construct a histogram displaying this data. What can the students determine about the ages of the Presidents when they took office? • Students are asked to predict how many metals the United States will win in the next Olympics. They write their prediction on a Post-It-Note and an explanation of their reasoning. The predictions are collected and displayed on line plot, stem-and-leaf plots, circle graphs, or histograms. Discuss which graph will best display this data and why it is the best choice. • Students collect data on topics that interest them, display their findings using a histogram. Compare this histogram with a line plot, stem-and-leaf plot, or circle graph displaying the same data. Possible topics include the following: - number of minutes spent on homework per week; - allowances of each student in the class; or - number of hours of television watched per week.

<table>
<tr><th>Curriculum Information</th><th>Essential Knowledge and Skills
Key Vocabulary</th><th>Essential Questions and Understandings
Teacher Notes and Elaborations</th></tr>
<tr>
<td><u>SOL Reporting Category</u>
Probability, Statistics, Patterns, Functions, and Algebra

<u>Focus</u>
Linear Equations

<u>Virginia SOL 7.12</u>
The student will represent relationships with tables, graphs, rules, and words.</td>
<td>The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:
● Describe and represent relations and functions, using tables, graphs, rules, and words. Given one representation, students will be able to represent the relation in another form.

<u>Cognitive Level (Bloom's Taxonomy, Revised)</u>
Remember – Describe

<u>Key Vocabulary</u>
function
relation
table of values</td>
<td><u>Essential Questions and Understandings</u>
● What are the different ways to represent the relationship between two sets of numbers?
Rules that relate elements in two sets can be represented by word sentences, equations, tables of values, graphs or illustrated pictorially.

<u>Teacher Notes and Elaborations</u>
Tables, graphs, rules, and words are used to illustrate and describe patterns and functional relationships.

A relation is any set of ordered pairs. For each first member, there may be many second members.

A function is a relation in which there is one and only one second member for each first member.
For example: The function that relates earnings to time worked is
earnings = rate of pay × hours worked.

Some examples of functions are:

- The function that relates distance traveled to the rate of travel and the time is distance = rate × time; for example, a student traveling at 30 miles per hour on a motor bike, would produce the following table:

<table>
<tr><td>TIME (t)</td><td>1 hour</td><td>2 hours</td><td>3 hours</td><td>4 hours</td></tr>
<tr><td>DISTANCE (d)</td><td>30 miles</td><td>60 miles</td><td>90 miles</td><td>120 miles</td></tr>
</table>

The equation that represents this function is $d = 30t$.

- A person makes $30 an hour. A function representing this is $e = 30h$ where e represents the earnings and h is the number of hours worked. The following represents a table of values for this function.

<table>
<tr><td>TIME (t)</td><td>1 hour</td><td>2 hours</td><td>3 hours</td><td>4 hours</td></tr>
<tr><td>EARNINGS (e)</td><td>$30</td><td>$60</td><td>$90</td><td>$120</td></tr>
</table>
</td>
</tr>
</table>

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.12** The student will represent relationships with tables, graphs, rules, and words.	**Teacher Notes and Elaborations** *(continued)* A table of values is the data used to make a graph in the coordinate system. The values are used to graph points. Graphs may be constructed from ordered pairs represented in a table. The ordered pairs in the following table are $(-2,0),\ (-1,1),\ (0,2),\ (1,3),\ (2,4)$. The equation represented in this table and graph is . $x + 2$ | | 0 | | -1 | 1 | | 0 | 2 | | 1 | 3 | | 2 | 4 | Rules that relate elements in two sets can be represented by word sentences, equations, tables of values, graphs, or illustrated pictorially. As a *table of values,* a function has a unique value assigned to the second variable for each value of the first variable. As a graph, a function is any curve (including straight lines) such that any vertical line would pass through the curve only once (vertical line test). Some relations are functions; all functions are relations.

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.12** **Foundational Objectives** **6.17** The student will identify and extend geometric and arithmetic sequences. **5.17** The student will describe the relationship found in a number pattern and express the relationship. **4.15** The student will recognize, create, and extend numerical and geometric patterns.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• A student can text 150 letters in one minute. Create a table to illustrate this relationship. Write a function rule to represent the relationship between the number of letters and the time in which they are typed. Use your rule to determine the number of letters typed in 15 minutes. How long will it take the student to type 2,850 letters?

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.13** The student will a. write verbal expressions as algebraic expressions and sentences as equations and vice versa; and b. evaluate algebraic expressions for given replacement values of the variables.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Write** verbal expressions as algebraic expressions. Expressions will be limited to no more than two operations. ● **Write** verbal sentences as algebraic equations. Equations will contain no more than one variable term. ● **Translate** algebraic expressions and equations to verbal expressions and sentences. Expressions will be limited to no more than two operations. ● **Identify** examples of expressions and equations. ● **Apply** the order of operations to evaluate expressions for given replacement values (integers, fractions, and decimals) of the variables. Limit the number of replacements to no more than three per expression. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Write **Understand** – Identify, Translate **Apply -** Apply **Key Vocabulary** algebraic equation algebraic expression constant expression grouping symbols order of operations substitution term variable coefficient variable expression verbal expression verbal sentence	**Essential Questions and Understandings** ● How can algebraic expressions and equations be written? Word phrases and sentences can be used to represent algebraic expressions and equations. **Teacher Notes and Elaborations** An *expression* is a name for a number. A *variable* is a symbol (a placeholder) used to represent an unspecified member of a set. A *variable expression* is an expression that contains a variable (e.g., $2x$). A numerical expression is an expression that contains only numbers (e.g., $7 + 4$). A *constant* is a numerical expression that is part of an algebraic expression (e.g., In the expression $4x + 9$, 9 is the constant.). An *algebraic expression* is a variable expression that contains at least one variable (e.g., $2x – 5$). A *verbal expression* is a word phrase (e.g., "the sum of two consecutive integers"). A *verbal sentence* is a complete word statement (e.g., "The sum of two consecutive integers is five."). An *algebraic equation* is a mathematical statement that states that two expressions are equal (e.g., $2x + 1 = 5$). A phrase written in words may translate into an algebraic expression, whereas a sentence may translate into an algebraic equation. A *term* is a number, variable, product, or quotient in an expression of sums and/or differences. The expression $3x + 4y – 7$ contains 3 terms ($3x$, $4y$, $–7$). A *coefficient* is the numerical factor of a variable in a term. In the term $2x$, 2 is the coefficient and in the term n, 1 is the coefficient. To evaluate an algebraic expression, *substitute* (replace) a given replacement value for a variable and apply the order of operations. For example, if $a = 3$ and $b = -2$ then $5a + b$ can be evaluated as: $5a + b$ Note: Expressions cannot be solved and do not contain equal signs. $5(3) + (-2)$ $15 + (\quad)$ 13 The *order of operations* is a convention that defines the computation order to follow in simplifying an expression. The order of operations is as follows: - First, complete all operations within grouping symbols*. If there are grouping symbols within other grouping symbols, do the innermost operation first. - Second, evaluate all exponential expressions. - Third, multiply and/or divide in order from left to right. - Fourth, add and/or subtract in order from left to right. - *Parentheses ( ), brackets [ ], braces {}, absolute value , and the division bar – as in should be treated as *grouping symbols*.

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.13** **Foundational Objectives** **6.8** The student will evaluate whole number numerical expressions, using the order of operations. **5.7** The student will evaluate whole number numerical expressions using the order of operations limited to parentheses, addition, subtraction, multiplication, and division. **5.18a, b** The student will a. investigate and describe the concept of variable; and b. write an open sentence to represent a given mathematical relationship using a variable. **4.16a** The student will recognize and demonstrate the meaning of equality in an equation.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	● Use algebra tiles to model algebraic expressions. ● Use counters and cups to represent algebraic expressions. Each counter may represent one unit and each cup represents the unknown value. Students should model expressions such as: "the sum of four and a number" with four counters and a cup. "twice a number" with two cups. ● Students, working in pairs, construct a cross-number puzzle whose answers are the solutions to equations. Clues will be given as word expressions. Student pairs will exchange their puzzles with other pairs and, then try to solve the puzzles. ● The students, working in pairs using index cards and pencils, convert word phrases into algebraic expressions. Each student will write a phrase for his or her age on the index card, for example, "I am 14 years younger than three times my sister's age." Next, the students will exchange cards and write each phrase as an expression in algebraic form.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.14** The student will a. solve one- and two-step linear equations in one variable; and b. solve practical problems requiring the solution of one- and two-step linear equations.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Represent** and **demonstrate** steps for solving one- and two-step equations in one variable using concrete materials, pictorial representations, and algebraic sentences. ● **Translate** word problems/practical problems into algebraic equations and solve them. ● **Solve** one- and two-step linear equations in one variable. ● **Solve** practical problems that require the solution of a one- or two-step linear equation. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Describe **Understand** – Identify, Order **Apply** – Solve, Demonstrate, Represent **Key Vocabulary** inverse operations	**Essential Questions and Understandings** ● When solving an equation, why is it important to perform identical operations on each side of the equal sign? An operation that is performed on one side of an equation must be performed on the other side to maintain equality. **Teacher Notes and Elaborations** An equation is a mathematical sentence that states that two expressions are equal. *Inverse operations* are pairs of operations that undo each other. The inverse operation for addition is subtraction and the inverse operation for multiplication is division. A one-step equation is defined as an equation that requires the use of one operation to solve (e.g., $x+3=-4$). A two-step equation is defined as an equation that requires the use of two operations to solve (e.g., $2x + 1 = -5$; $-7 = 3x - 2$; ; ; $\frac{4}{x}=2$). The following demonstrates steps for solving a two-step equation algebraically. $2(x+2)=14$ $\frac{2(x+2)}{2}=\frac{14}{2}$ multiplicative inverse $x+2+(-2)=7+(-2)$ additive inverse $x+0=5$ $x=5$ Practical problems can be translated into equations in order to solve the problems.

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.14** **Foundational Objectives** **6.18** The student will solve one-step linear equations in one variable involving whole number coefficients and positive rational solutions. **5.18** The student will a. investigate and describe the concept of variable; b. write an open sentence to represent a given mathematical relationship using a variable; c. model one-step linear equations in one variable using addition and subtraction; and d. create a problem situation based on a given open sentence, using a single variable. **4.16a** The student will recognize and demonstrate the meaning of equality in an equation.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Use balance scales to model equations. • Use 2-color counters and cups to model equations. • Students will write one- or two-step equations on index cards. They will switch cards with a partner and try to solve their equations. • Students use Algeblocks or algebra tiles to solve one- and two-step equation.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.15** The student will a. solve one-step inequalities in one variable and b. graph solutions to inequalities on the number line.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Represent** and **demonstrate** steps in solving inequalities in one variable, using concrete materials, pictorial representations, and algebraic sentences. ● **Graph** solutions to inequalities on the number line. ● **Identify** a numerical value that satisfies the inequality. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Describe **Apply –** Represent, Demonstrate **Key Vocabulary** inequality inverse operations	**Essential Questions and Understandings** ● How are the procedures for solving equations and inequalities the same? The procedures are the same except for the case when an inequality is multiplied or divided on both sides by a negative number. Then the inequality sign is changed from less than to greater than, or greater than to less than. ● How is the solution to an inequality different from that of a linear equation? In an inequality, there can be more than one value for the variable that makes the inequality true. **Teacher Notes and Elaborations** An *inequality* is a mathematical sentence that states that one quantity is less than (or greater than) another quantity. An inequality is a mathematical sentence that compares two expressions using one of the symbols $<$, $>$, $\leq$, $\geq$, or $\neq$. A one-step inequality is defined as an inequality that requires the use of one operation to solve (e.g., $x - 4 > 9$). *Inverse operations* are pairs of operations that undo each other. The inverse operation for addition is subtraction and the inverse operation for multiplication is division. When both expressions of an inequality are multiplied or divided by a negative number, the inequality symbol reverses (e.g., $-3x < 15$ is equivalent to). To illustrate why an inequality is reversed when multiplying or dividing with a negative number, use the inequality $-x < 0$, or "the opposite of a number is less than zero." For this to be true, the original number must be greater than zero. Because the graph of 3 is to the right of the graph of 2, $3 > 2$. Multiplying both numbers by -1 gives -3 and -2. Because the graph of is to the left of the graph of , < -2, that is, the inequality is reversed. Solutions to inequalities can be represented using a number line. Inequalities using the $<$ or $>$ symbols are represented on a number line with an open circle on the number and a shaded line over the solution set. Ex: $x < 5$ or $5 > x$. Graphing can be used to demonstrate that both inequalities represent the same solution set.

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.15** The student will a. solve one-step inequalities in one variable and b. graph solutions to inequalities on the number line.	**Teacher Notes and Elaborations** *(continued)* Inequalities using the ≤ or ≥ symbols are represented on a number line with a closed circle on the number and shaded line in the direction of the solution set. When graphing $x \leq 5$ fill in the circle on the number line above the 5 to indicate that the 5 is included. (Note: The graph must be drawn on the number line, not above the number line.) Experiences should also include solving and graphing inequalities with the variable on the right side (e.g., $12 \geq x + 4$).

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.15** **Foundational Objectives** **6.20** The student will graph inequalities on a number line.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Use 2-color counters and cups to model inequalities. • Students will write one-step inequalities on index cards. They will switch cards with a partner and try to solve the one-step inequalities. • Students use Algeblocks or algebra tiles to solve one-step inequalities.

Curriculum Information	Essential Knowledge and Skills Key Vocabulary	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.16** The student will apply the following properties of operations with real numbers: a. the commutative and associative properties for addition and multiplication; b. the distributive property; c. the additive and multiplicative identity properties; d. the additive and multiplicative inverse properties; and e. the multiplicative property of zero.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representations to:** ● **Identify** properties of operations used in simplifying expressions. ● **Apply** the properties of operations to simplify expressions. **Cognitive Level (Bloom's Taxonomy, Revised)** **Remember** – Identify **Apply –** Apply **Key Vocabulary** additive identity property (identity property of addition additive inverse property (inverse property of addition) associative property of addition associative property of multiplication commutative property of addition commutative property of multiplication distributive property identity elements inverses multiplicative identity property (identity property of multiplication) multiplicative inverse property (inverse property of multiplication) multiplicative property of zero reciprocal	**Essential Questions and Understandings** ● Why is it important to apply properties of operations when simplifying expressions? Using the properties of operations with real numbers helps with understanding mathematical relationships. **Teacher Notes and Elaborations** The *commutative property of addition* states that changing the order of the addends does not change the sum (e.g., $5 + 4 = 4 + 5$, $(2 \cdot 3) + 6 = 6 + (2 \cdot 3)$). The *commutative property of multiplication* states that changing the order of the factors does not change the product (e.g., $5 \cdot 4 = 4 \cdot 5$, $(2 + 3)6 = 6(2 + 3)$). The *associative property of addition* states that regrouping the addends does not change the sum [e.g., 5 + (4 + 3) = (5 + 4) + 3]. The *associative property of multiplication* states that regrouping the factors does not change the product [e.g., $5(4 \cdot 3) = (5 \cdot 4)3$]. Subtraction and division are neither commutative nor associative. The *distributive property* states that the product of a number and the sum (or difference) of two other numbers equals the sum (or difference) of the products of the number and each other number [e.g., $5(3 + 7) = (5 \cdot 3) + (5 \cdot 7)$, or $5(3 – 7) = (5 \cdot 3) – (5 \cdot 7)$]. *Identity elements* are numbers that combine with other numbers without changing the other numbers. The additive identity is zero (0). The multiplicative identity is one (1). The *additive identity property* states that the sum of any real number and zero is equal to the given real number (e.g., $5 + 0 = 5$). The *multiplicative identity property* states that the product of any real number and one is equal to the given real number (e.g., $8 \cdot 1 = 8$). There are no identity elements for subtraction and division. *Inverses* are numbers that combine with other numbers and result in identity elements [e.g., $5 + (-5) = 0$;]. The *additive inverse property* states that the sum of a number and its additive inverse always equals zero (e.g., $5 + (-5) = 0$). The *multiplicative inverse property* states that the product of a number and its multiplicative inverse (or *reciprocal*) always equals one (e.g., $4 \cdot \frac{1}{4} = 1$). Zero has no multiplicative inverse.

Curriculum Information	Essential Questions and Understandings Teacher Notes and Elaborations
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.16** The student will apply the following properties of operations with real numbers: a. the commutative and associative properties for addition and multiplication; b. the distributive property; c. the additive and multiplicative identity properties; d. the additive and multiplicative inverse properties; and e. the multiplicative property of zero.	**Teacher Notes and Elaborations** *(continued)* The *multiplicative property of zero* states that the product of any real number and zero is zero. Division by zero is not a possible arithmetic operation. Division by zero is undefined. Examples such as the following should be using in instruction to identify and apply properties of operations. Example 1: Step 1: $-25\ (7)(\quad)$ Step 2: $7(\ -25\ )(\quad)$ Between step 1 and step 2 the Commutative property of multiplication was applied. Step 3: $7[(\quad)(\quad)]$ Between step 2 and step 3 the Associative property of multiplication was applied. Step 4: $7(100)$ Step 5: 700 Example 2: Step 1: $\frac{2}{3}+\left(-\frac{2}{3}\right)+7$ Step 2: $0+7$ Between step 1 and step 2 the Additive inverse property was applied. Step 3: 7 Between step 2 and step 3 the Additive identity property was applied. Example 3: $3(4+6)=12+18$ The Distributive property is shown in this equation.

Curriculum Information	Resources	Sample Instructional Strategies and Activities
SOL Reporting Category Probability, Statistics, Patterns, Functions, and Algebra **Focus** Linear Equations **Virginia SOL 7.16** **Foundational Objectives** **6.19** The student will investigate and recognize a. the identity properties for addition and multiplication; b. the multiplicative property of zero; and c. the inverse property for multiplication. **5.19** The student will investigate and recognize the distributive property of multiplication over addition. **4.16b** The student will investigate and describe the associative property for addition and multiplication. **3.20** The student will a. investigate the identity and the commutative properties for addition and multiplication; and b. identify examples of the identity and commutative properties for addition and multiplication.	Text: Mathematics Course 2 VA Grade 7, ©2012, Prentice Hall, Pearson Education VDOE Enhanced Scope and Sequence Sample Lesson Plans http://www.doe.virginia.gov/testing/sol/scope_sequence/mathematics_2009/index.php Mathematics SOL Resources www.doe.virginia.gov/instruction/mathematics/index.shtml	• Students work in pairs. They will select an index card containing an expression and its simplified form, missing the operations, and grouping symbols. In order to arrive at the given value, the students will arrange the operations in correct order. For example: Expression: 5 3 2 When simplified is equal to 25 Answer: 5(3 + 2) Justification: Distributive property

NOTES

Grade 7– Crosswalk (Summary of Revisions): 2016 *Mathematics Standards of Learning and Curriculum Framework*

Additions (2016 SOL)	Deletions from Grade 7 (2009 SOL)
• 7.1d EKS – Identify the perfect squares from 0 to 400 • 7.2 – Solve practical problems involving operations with rational numbers • 7.5 EKS – Determine unknown side lengths or angle measures, given two similar quadrilaterals or triangles; solve a proportion to find a missing side length of similar quadrilaterals and triangles • 7.6b – Determine unknown side lengths or angle measures [EKS bullet moved from 6.13] of quadrilaterals, using properties of quadrilaterals • 7.10 – Determine slope as rate of change and write an equations in $y = mx$ form to represent a proportional relationship; graph lines representing proportional relationships; determine the y-intercept and write equations of lines in $y = x + b$ form to represent the relationship; graph lines representing additive relationships; and make connections among representations (verbal descriptions, tables, equations, and graphs) • 7.13 – Solve two-step inequalities and practical problems [Moved from 8.15b]	• 7.2 – Describe and represent arithmetic and geometric sequences using variable expressions [Included in AFDA.1 EKS and AII.5] • 7.3 – Model operations with integers [Moved to 6.6a EKS] and perform operations with integers [Moved to 6.6a] • 7.5c – Describe how changing one attribute of a rectangular prism affects surface area and volume [Included in 8.6b] • 7.6 – Determine whether two figures are similar [Included in G.7] • 7.8 – Transform a figure using dilation [Included in 8.7] and rotation [Included in G.3] • 7.10 – Determine the probability of compound events using the Fundamental Counting Principle [Moved to 5.15] • 7.14a – Solve one-step linear equations in one variable and practical problems [Included in 6.13]
Parameter Changes/Clarifications (2016 SOL)	**Moves within Grade 7 (2009 SOL TO 2016 SOL)**
• 7.1b EKS – Compare and order no more than four numbers written in scientific notation; convert between a number written in scientific notation and decimals • 7.1c and 7.1c EKS – Compare and order rational numbers (positive/negative) expressed as integers, fractions (proper/improper), mixed numbers, decimals, and percents • 7.3 EKS – Create and use a ratio table to determine missing values in a proportional relationship; apply proportional reasoning to convert units of measurement given the conversion factor [Moved from 6.9] • 7.7 EKS – Transformations of a right triangle or rectangle can include both translation and then reflection over the x- or y-axis, or reflection over the x- or y-axis and then translation • 7.8a – Determine theoretical and experimental probabilities explicitly included in standard • 7.9a EKS – Number of data values to construct a histogram is no longer limited • 7.9b – Observations/inferences about data represented in a histogram now in standard • 7.9c – Compare histograms with the same data represented in other graphs now specified as line plots, circle graphs, and stem-and-leaf plots • 7.11 EKS – Represent algebraic expressions using concrete materials and pictorial representations; evaluating expressions – limit exponents to 1, 2, 3, or 4; no braces, but can include brackets and absolute value; square roots limited to perfect squares • 7.13 EKS – Solve one-step and two-step inequalities including practical problems using addition, subtraction, multiplication and division; coefficients and numeric terms are rational • 7.11, 7.12, 7.13 EKS and US - apply properties of real numbers and properties of equality/inequality	• 7.4 – [Moved to 7.3] • 7.5a, b – [Moved to 7.4a, b] • 7.6 – [Moved to 7.5] • 7.7 – [Moved to 7.6] • 7.8 – [Moved to 7.7] • 7.9 – [Moved to 7.8] • 7.11 – [Moved to 7.9] • 7.12 – [Included in 7.10e] • 7.13a – Write verbal expressions and sentences as algebraic expressions and equations and vice versa [Included in 7.12 EKS] • 7.13b – [Moved to 7.11] • 7.14 – [Moved to 7.12] • 7.15 – [Moved to 7.13] • 7.16 – Properties of real numbers [Incorporated into 7.11, 7.12, and 7.13 EKS and US]

EKS = Essential Knowledge and Skills, referring to the column on the right side of the Curriculum Framework
US = Understanding the Standard, referring to the column on the left side of the Curriculum Framework

Comparison of Mathematics Standards of Learning – 2009 to 2016

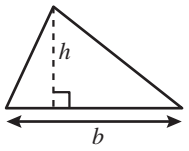
2009 SOL	2016 SOL
Number and Number Sense *On the state assessment, items measuring this objective are assessed without the use of a calculator.	
7.1 The student will a) investigate and describe the concept of negative exponents for powers of ten; b) determine scientific notation for numbers greater than zero;* c) compare and order fractions, decimals, percents, and numbers written in scientific notation;* d) determine square roots;* and e) identify and describe absolute value for rational numbers.	7.1 The student will a) investigate and describe the concept of negative exponents for powers of ten; b) compare and order numbers greater than zero written in scientific notation;* c) compare and order rational numbers;* d) determine square roots of perfect squares;*and e) identify and describe absolute value of rational numbers.
7.2 The student will describe and represent arithmetic and geometric sequences, using variable expressions. [Included in AFDA.1 EKS and AII.5]	
Computation and Estimation *On the state assessment, items measuring this objective are assessed without the use of a calculator.	
	7.2 The student will solve practical problems involving operations with rational numbers.
7.3 The student will a) model addition, subtraction, multiplication, and division of integers; and [Moved to 6.6a EKS] b) add, subtract, multiply, and divide integers.* [Moved to 6.6a]	
7.4 The student will solve single-step and multistep practical problems, using proportional reasoning.	7.3 The student will solve single-step and multistep practical problems, using proportional reasoning.
Measurement and Geometry	
7.5 The student will a) describe volume and surface area of cylinders; b) solve practical problems involving the volume and surface area of rectangular prisms and cylinders; and c) describe how changing one measured attribute of a rectangular prism affects its volume and surface area. [Included in 8.6b]	7.4 The student will a) describe and determine the volume and surface area of rectangular prisms and cylinders; and b) solve problems, including practical problems, involving the volume and surface area of rectangular prisms and cylinders.
7.6 The student will determine whether plane figures—quadrilaterals and triangles—are similar [Included in G.7] and write proportions to express the relationships between corresponding sides of similar figures.	7.5 The student will solve problems, including practical problems, involving the relationship between corresponding sides and corresponding angles of similar quadrilaterals and triangles.

2009 SOL	2016 SOL
7.7 The student will compare and contrast the following quadrilaterals based on properties: parallelogram, rectangle, square, rhombus, and trapezoid.	7.6 The student will a) compare and contrast quadrilaterals based on their properties; and b) determine unknown side lengths or angle measures of quadrilaterals.
7.8 The student, given a polygon in the coordinate plane, will represent transformations (reflections dilations [Included in 8.7a and G.3], rotations [Included in G.3], and translations) by graphing in the coordinate plane.	7.7 The student will apply translations and reflections of right triangles or rectangles in the coordinate plane.
Probability and Statistics	
7.9 The student will investigate and describe the difference between the experimental probability and theoretical probability of an event.	7.8 The student will a) determine the theoretical and experimental probabilities of an event; and b) investigate and describe the difference between the experimental probability and theoretical probability of an event.
7.10 The student will determine the probability of compound events, using the Fundamental (Basic) Counting Principle. [Moved to 5.15]	
7.11 The student, given data for a practical situation, will a) construct and analyze histograms; and b) compare and contrast histograms with other types of graphs presenting information from the same data set.	7.9 The student, given data in a practical situation, will a) represent data in a histogram; b) make observations and inferences about data represented in a histogram; and c) compare histograms with the same data represented in stem-and-leaf plots, line plots, and circle graphs.
Patterns, Functions, and Algebra	
7.12 The student will represent relationships with tables, graphs, rules, and words. [Included in 7.10e]	7.10 The student will a) determine the slope, m, as a rate of change in a proportional relationship between two quantities and write an equation in the form $y = mx$ to represent the relationship; b) graph a line representing a proportional relationship between two quantities given the slope and an ordered pair, or given the equation in $y = mx$ form, where m represents the slope as rate of change; c) determine the y-intercept, b, in an additive relationship between two quantities and write an equation in the form $y = x + b$ to represent the relationship; d) graph a line representing an additive relationship between two quantities given the y-intercept and an ordered pair, or given the equation in the form $y = x + b$, where b represents the y-intercept; and e) make connections between and among representations of a proportional or additive relationship between two quantities using verbal descriptions, tables, equations, and graphs.

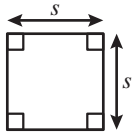
2009 SOL	2016 SOL
7.13 The student will a) write verbal expressions as algebraic expressions and sentences as equations and vice versa; and [Included in 7.12 EKS] b) evaluate algebraic expressions for given replacement values of the variables.	7.11 The student will evaluate algebraic expressions for given replacement values of the variables.
7.14 The student will a) solve one- and two-step linear equations in one variable; and b) solve practical problems requiring the solution of one- and two-step linear equations. [One-step equations included in 6.13]	7.12 The student will solve two-step linear equations in one variable, including practical problems that require the solution of a two-step linear equation in one variable.
7.15 The student will a) solve one-step inequalities in one variable; and b) graph solutions to inequalities on the number line.	7.13 The student will solve one- and two-step linear inequalities in one variable, including practical problems, involving addition, subtraction, multiplication, and division, and graph the solution on a number line.
7.16 The student will apply the following properties of operations with real numbers: a) the commutative and associative properties for addition and multiplication; b) the distributive property; c) the additive and multiplicative identity properties; d) the additive and multiplicative inverse properties; and e) the multiplicative property of zero. [Included in EKS and US for 7.2, 7.11, 7.12, and 7.13]	

Grade 7 Mathematics Formula Sheet
2009 *Mathematics Standards of Learning*

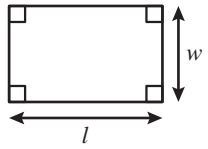
Geometric Formulas



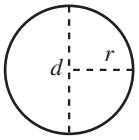
$$A = \frac{1}{2}bh$$



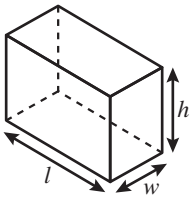
$$p = 4s$$
$$A = s^2$$



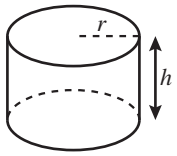
$$p = 2l + 2w$$
$$A = lw$$



$$C = 2\pi r$$
$$C = \pi d$$
$$A = \pi r^2$$



$$V = lwh$$
$$S.A. = 2lw + 2lh + 2wh$$



$$V = \pi r^2 h$$
$$S.A. = 2\pi r^2 + 2\pi rh$$

Pi

$$\pi \approx 3.14$$
$$\pi \approx \frac{22}{7}$$

Abbreviations

milligram	mg
gram	g
kilogram	kg
milliliter	mL
liter	L
kiloliter	kL
millimeter	mm
centimeter	cm
meter	m
kilometer	km
square centimeter	cm^2
cubic centimeter	cm^3

ounce	oz
pound	lb
quart	qt
gallon	gal.
inch	in.
foot	ft
yard	yd
mile	mi.
square inch	sq in.
square foot	sq ft
cubic inch	cu in.
cubic foot	cu ft

Area	A
Circumference	C
Perimeter	p
Surface Area	$S.A.$
Volume	V

DMS Algebra Readiness - Push-in Tutoring Sheet

Date: _____ **Tutor Name: _____**

_____ Period	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:
_____ Period	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:

DMS Algebra Readiness - Push-in Tutoring Sheet

_____ Period	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:	Teacher_____Time_____ SOL_____ Signature_____ Students: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Activity:
Extra Work Times	WIN Teacher_____ Time_____ Signature_____ Students/SOL/activity: _____ _____ _____ _____	**Lunch and Learn** Time: _____ Students/SOL/activity: _____ _____ _____	***NOTES FOR THE DAY***

Tutor Signature: _____ Date: _____

Principal Signature: _____ Date: _____

DMS Content Area Instructional Map

Grade Level: 7th			9-Weeks: 1st		
Instructional Week/Date	Mon.	Tues.	Wed.	Thur.	Fri.
9/4 - 9/8		*Policies and procedures *Absolute value SOL 7.1 (odd)	*Policies and procedures *Absolute value SOL 7.1 (even)	*Policies and procedures *Square roots SOL 7.1 (odd)	*Policies and procedures *Square roots SOL 7.1 (even)
9/11 - 9/15	*Quiz SOL 7.1 (absolute value and square roots) *Powers of ten SOL 7.1 (odd)	*Quiz SOL 7.1 (absolute value and square roots) *Powers of ten SOL 7.1 (even)	*Scientific notation SOL 7.1 (odd)	*Scientific notation SOL 7.1 (even)	*Scientific notation SOL 7.1 *Quiz SOL 7.1 (scientific notation) (odd)
9/18-9/22	*Scientific notation SOL 7.1 *Quiz SOL 7.1 (scientific notation) (even)	*Conversion of fraction/ decimal/percent SOL 7.1 (odd)	*Conversion of fraction/ decimal/percent SOL 7.1 (even)	*Quiz SOL 7.1 (conversion of fraction/decimal/ percent) *Compare and order SOL 7.1 (odd)	*Quiz SOL 7.1 (conversion of fraction/decimal/ percent) *Compare and order SOL 7.1 (even)
9/25-9/29	*Compare and order SOL 7.1 (odd)	*Compare and order SOL 7.1 (even)	Math CA SOL 7.1 (odd)	Math CA SOL 7.1 (even)	*Properties SOL 7.16 *Assign properties project due 10/23-24 (odd)
10/2-10/6	*Properties SOL 7.16 *Assign properties project due 10/23-24 (even)	*Adding integers SOL 7.3 (odd)	*Adding integers SOL 7.3 (even)	*Adding integers SOL 7.3 (odd- extra day)	
10/9-10/13	*Subtraction integers SOL 7.3 (odd)	*Subtraction integers SOL 7.3 (even)	*Multiplying and dividing integers SOL 7.3 (odd)	*Multiplying and dividing integers SOL 7.3 (even)	*Quiz SOL 7.3 (integer computation) *Integer word problems (odd)
10/16-10/20	*Quiz SOL 7.3 (integer computation) *Integer word problems (even)	*Order of operations SOL 7.3 (odd)	*Order of operations SOL 7.3 (even)	Math CA SOL 7.3 (odd)	Math CA SOL 7.3 (even)
10/23-10/27	*Math Project due SOL 7.16 *Expressions SOL 7.13 (odd)	*Math Project due SOL 7.16 *Expressions SOL 7.13 (even)	*Values of expressions SOL 7.13 (odd)	*Values of expressions SOL 7.13 (even)	*Quiz SOL 7.13 (expressions) *Sequences SOL 7.2 (odd)
10/30-11/3	*Quiz SOL 7.13 (expressions) *Sequences SOL 7.2 (even)	*Sequences SOL 7.2 (odd- extra day)	Math CA SOL 7.2 and 7.13 (odd)	Math CA SOL 7.2 and 7.13 (even)	*Proportions and word problems SOL 7.4 (odd)

Grade Level: 7th			9-Weeks: 2nd		
Instructional Week/Date	Mon.	Tues.	Wed.	Thur.	Fri.
11/6-11/10	*Proportions SOL 7.4 (even)		*Proportion word problems SOL 7.4 (even)	*Quiz SOL 7.4 (proportions) *Discount SOL 7.4 (odd)	*Quiz SOL 7.4 (proportions) *Discount SOL 7.4 (even)
11/13-11/17	*Tax and tip SOL 7.4 *Quiz SOL 7.4 (discount, tax, and tip) (odd)	*Tax and tip SOL 7.4 *Quiz SOL 7.4 (discount, tax, and tip) (even)	*Assign discount, tax, and tip project- due 12/11-12 *Similar figures SOL 7.6 (odd)	*Assign discount, tax, and tip project- due 12/11-12 *Similar figures SOL 7.6 (even)	*Similar figures SOL 7.6 (odd)
11/20-11/24	*Similar figures SOL 7.6 (even)	*Review SOL 7.4 and 7.6 (odd-extra day)			
11/27-12/1	Math CA SOL 7.4 and 7.6 (odd)	Math CA SOL 7.4 and 7.6 (even)	Math Cumulative Assessment #1 (odd)	Math Cumulative Assessment #1 (even)	*Adding and subtracting one step equations SOL 7.14 (odd)
12/4-12/8	*Adding and subtracting one step equations SOL 7.14 (even)	*Multiplying and dividing one step equations SOL 7.14 (odd)	*Multiplying and dividing one step equations SOL 7.14 (even)	*Multiplying and dividing one step equations SOL 7.14 *Quiz SOL 7.14 (one step) (odd)	*Multiplying and dividing one step equations SOL 7.14 *Quiz SOL 7.14 (one step) (even)
12/11-12/15	Math Project due SOL 7.4 *Two step equations SOL 7.14 (odd)	Math Project due SOL 7.4 *Two step equations SOL 7.14 (even)	*Two step equations SOL 7.14 (odd)	*Two step equations SOL 7.14 (even)	*Two step equations SOL 7.14 (odd)
12/18-12/22	*Two step equations SOL 7.14 (even)	*Review SOL 7.14 (odd-extra day)			
1/1-1/5			*Review SOL 7.14 (odd)	*Review SOL 7.14 (even)	Math CA SOL 7.14 (odd)
1/8-1/12	Math CA SOL 7.14 (even)	*Graph inequalities SOL 7.15 (odd)	*Graph inequalities SOL 7.15 (even)	*Quiz SOL 7.15 (graph inequality) *Solve one step inequalities SOL 7.15 (odd)	*Quiz SOL 7.15 (graph inequality) *Solve one step inequalities SOL 7.15 (even)
1/15-1/19		*Solve one step inequalities SOL 7.15 (even- extra day)	*Solve one step inequalities SOL 7.15 (odd)	*Solve one step inequalities SOL 7.15 (even)	*Quiz SOL 7.15 (one step) *Solve two step inequalities SOL 7.15 (odd)
1/22-1/26	*Quiz SOL 7.15 (one step) *Solve two step inequalities SOL 7.15 (even)	*Solve two step inequalities SOL 7.15 (odd)	*Solve two step inequalities SOL 7.15 (even)	Math CA SOL 7.15 (odd)	Math CA SOL 7.15 (even)

Grade Level: 7th			9-Weeks: 3rd		
Instructional Week/Date	Mon.	Tues.	Wed.	Thur.	Fri.
1/29-2/2		*Surface area and volume of rectangular prisms SOL 7.5 (even)	*Surface area and volume of rectangular prisms SOL 7.5 (odd)	*Surface area and volume of cylinders SOL 7.5 (odd)	*Surface area and volume of cylinders SOL 7.5 (even)
2/5-2/9	*Quiz SOL 7.5 (surface area and volume) *Surface area and volume word problems SOL 7.5 (odd)	*Quiz SOL 7.5 (surface area and volume) *Surface area and volume word problems SOL 7.5 (even)	*Surface area and volume changing attributes SOL 7.5 (odd)	*Surface area and volume changing attributes SOL 7.5 (even)	Math Cumulative Assessment #2 (odd)
2/12-2/16	Math Cumulative Assessment #2 (even)	*Quadrilaterals SOL 7.7 (odd)	*Quadrilaterals SOL 7.7 (even)	*Quadrilaterals SOL 7.7 *Assign quad project due 3/6-7 *Quiz SOL 7.7 (quads) (odd)	*Quadrilaterals SOL 7.7 *Assign quad project due 3/6-7 *Quiz SOL 7.7 (quads) (even)
2/19-2/22		*Coordinate plane and graphing SOL 7.8 (even)	*Coordinate plane and graphing SOL 7.8 (odd)	*Translations SOL 7.8 (even)	*Translations SOL 7.8 (odd)
2/26-3/2	*Reflections SOL 7.8 (even)	*Reflections SOL 7.8 (odd)	*Rotations SOL 7.8 (even)	Rotations SOL 7.8 (odd)	*Dilations SOL 7.8 (even)
3/5-3/9	*Dilations SOL 7.8 (odd)	*Math Project due SOL 7.7 *Quiz SOL 7.8 (transformations) *Review SOL 7.8 (even)	*Math Project due SOL 7.7 *Quiz SOL 7.8 (transformations) *Review SOL 7.8 (odd)	Math CA SOL 7.8 (even)	Math CA SOL 7.8 (odd)
3/12-3/16	*Tree diagrams and FCP SOL 7.9 (even)	*Tree diagrams and FCP SOL 7.9 (odd)	*Quiz SOL 7.9 (tree diagrams and FCP) *Experimental probability of single events SOL 7.10 (even)	*Quiz SOL 7.9 (tree diagrams and FCP) *Experimental probability of single events SOL 7.10 (odd)	*Theoretical probability of single events SOL 7.10 (even)
3/19-3/23	*Theoretical probability of single events SOL 7.10 (odd)	*Quiz SOL 7.10 (single events) *Probability of compound events SOL 7.10 (even)	*Quiz SOL 7.10 (single events) *Probability of compound events SOL 7.10 (odd)	*Compare experimental and theoretical probabilities (even)	*Compare experimental and theoretical probabilities (odd)
3/26-3/30	Math CA SOL 7.9 and 7.10 (even)	Math CA SOL 7.9 and 7.10 (odd)	*Graphs SOL 7.11 (even)	*Graphs SOL 7.11 (odd)	

Grade Level: 7th			9-Weeks: 4th		
Instructional Week/Date	Mon.	Tues.	Wed.	Thur.	Fri.
4/9-4/13	*Graphs SOL 7.11 (odd)	*Graphs SOL 7.11 (even)	*Graphs SOL 7.11 *Assign graph project- due 5/9-10 *Quiz SOL 7.11 (graphs) (odd)	*Graphs SOL 7.11 *Assign graph project- due 5/9-10 *Quiz SOL 7.11 (graphs) (even)	*Function or relation SOL 7.12 (odd)
4/16-4/20	*Function or relation SOL 7.12 (even)	*Quiz SOL 7.12 (function or relation) *Functions, graphs, tables, rules SOL 7.12 (odd)	*Quiz SOL 7.12 (function or relation) *Functions, graphs, tables, rules SOL 7.12 (even)	*Functions, graphs, tables, rules SOL 7.12 (odd)	*Functions, graphs, tables, rules SOL 7.12 (even)
4/23-4/27	*Functions, graphs, tables, rules SOL 7.12 (odd)	*Functions, graphs, tables, rules SOL 7.12 (even)	*Functions, graphs, tables, rules SOL 7.12 (odd)	*Functions, graphs, tables, rules SOL 7.12 (even)	Math Mock SOL (odd)
4/30-5/4	Math Mock SOL (even)	SOL Review	SOL Review	SOL Review	SOL Review
5/7-5/11	SOL Review	SOL Review	Math Project due SOL 7.11 (odd)	Math Project due SOL 7.11 (even)	SOL Review
5/14-5/18	SOL Review	SOL Review	SOL Review	SOL Review	SOL Review
5/21-5/25	SOL testing	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.
5/28-6/1		*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.
6/4-6/8	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.
6/11-6/15	*New SOLs and additions to current SOLs and projects, etc.	*New SOLs and additions to current SOLs and projects, etc.	Awards	*New SOLs and additions to current SOLs and projects, etc.	