Imagine Math

Built for
West Virginia

2017–2018 School Year

West Virginia College & Career Readiness Standard Correlation

Table of Contents

Correlation to West Virginia College & Career Readiness Standards

Grade 3

Standards not addressed:	
M.3.19	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves or quarters.

Grade 4

Standards not addressed:	
M.4.20	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
M.4.22	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots (e.g., from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection).

Grade 5

Standards not addressed:	
M.5.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. (e.g., Given the rule "Add 3" and the starting number 0 and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.)
M.5.18	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m) and use these conversions in solving multi-step, real-world problems.

Grade 6

Grade 7	
Standards not addressed:	
M.7.13	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
M.7.17	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
Grade 8	
Standards not addressed:	
M.8.16.A	Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length.
M.8.16.B	Verify experimentally the properties of rotations, reflections, and translations: b. Angles are taken to angles of the same measure.
M.8.16.C	Verify experimentally the properties of rotations, reflections, and translations: c. Parallel lines are taken to parallel lines.
Algebra I	
Standards not addressed:	
M.A1HS.2	Define appropriate quantities for the purpose of descriptive modeling. Instructional Note: Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.
M.A1HS.39	Compute (using technology) and interpret the correlation coefficient of a linear fit. Instructional Note: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship.
M.A1HS.48.B	Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. Instructional Note: Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II.

Geometry	
Standards not addressed:	
M.GHS.22	Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
M.GHS.23	Prove the Laws of Sines and Cosines and use them to solve problems. Instructional Note: With respect to the general case of the Laws of Sines and Cosines, the definitions of sine and cosine must be extended to obtuse angles.
M.GHS.49	Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
M.GHS.51	Use probabilities to make fair decisions (e.g., drawing by lots and/or using a random number generator).
M.GHS.52	Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, and/or pulling a hockey goalie at the end of a game).
M.GHS.54	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

Math I	
Standards not addressed:	
M.1HS.2	Define appropriate quantities for the purpose of descriptive modeling. Instructional Note: Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.
M.1HS.37	Compute (using technology) and interpret the correlation coefficient of a linear fit. Instructional Note: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship.

Grade 3

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
Operations and Algebraic Thinking			
Represent and solve problems involving multiplication and division.			
M.3.1	Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each (e.g., describe context in which a total number of objects can be expressed as 5 × 7).	Operations and Algebraic Thinking	Concept of Multiplication - Arrays Concept of Multiplication - Grouping Concept of Multiplication - Word Problems
M.3.2	Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each (e.g., describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8).	Operations and Algebraic Thinking	Concept of Division Constructing Division Problems Interpreting Division Problems
M.3.3	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).	Operations and Algebraic Thinking	Multiplication and Division Word Problems - Equations Multiplication and Division Word Problems - Solutions Multiplication and Division Word Problems - Visual Models
M.3.4	Determine the unknown whole number in a multiplication or division equation relating three whole numbers (e.g., determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = ? ÷ 3, 6 × 6 =?).	Operations and Algebraic Thinking	Division as an Unknown-Factor Problem Solving Multiplication and Division Equations

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
Understand properties of multiplication and the relationship between multiplication and division.			
M.3.5	Apply properties of operations as strategies to multiply and divide (e.g., If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known: Commutative Property of Multiplication. 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30: Associative Property of Multiplication. Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56: Distributive Property. Instructional Note: Students need not use formal terms for these properties.	Operations and Algebraic Thinking	Multiplication and Division Fact Families Properties of Addition and Multiplication Relationship Between Multiplication and Division Using Visual Models to Understand the Distributive Property
M.3.6	Understand division as an unknown-factor problem (e.g., find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8).	Operations and Algebraic Thinking	Division as an Unknown-Factor Problem Multiplication and Division Fact Families Solving Multiplication and Division Equations
Multiply and divide within 100.			
M.3.7	Learn multiplication tables (facts) with speed and memory in order to fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows that 40 ÷ 5 = 8) or properties of operations by the end of Grade 3.	Operations and Algebraic Thinking	Developing Fluency Using 2 as a Factor Developing Fluency Using 5 or 10 as a Factor Multiplication and Division Fact Families Using Halves and Doubles to Solve Multiplication Problems
Solve problems involving the four operations, and identify and explain patterns in arithmetic.			
M.3.8	Solve two-step word problems using the four operations, represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. Instructional Note: This standard is limited to problems posed with whole numbers and having whole number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).	Operations and Algebraic Thinking	Estimating Sums and Differences - Application Modeling and Solving Two-Step Word Problems Solving Two-Step Word Problems

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
M.3.9	Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain those using properties of operations (e.g., observe that 4 times a number is always even and explain why 4 times a number can be decomposed into two equal addends).	Operations and Algebraic Thinking	Additive and Multiplicative Patterns
Number & Operations in Base Ten			
Use place value understanding and properties of operations to perform multi-digit arithmetic.			
M.3.10	Use place value understanding to round whole numbers to the nearest 10 or 100.	Number and Operations in Base Ten	Reasoning About Place Value and Rounding Rounding to the Nearest Ten and Hundred
M.3.11	Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.	Number and Operations in Base Ten	Reasoning About Addition and Subtraction Within 1,000 Structuring Within 1,000
M.3.12	Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations.	Number and Operations in Base Ten	Multiplying by Multiples of Ten
Number & Operations—Fractions			
Develop understanding of fractions as numbers.			
M.3.13	Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. Instructional Note: Fractions in this standard are limited to denominators of 2, 3, 4, 6, and 8.	Number and Operations - Fractions	Understanding Fractions - Equal Areas

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
M.3.14.A	Understand a fraction as a number on the number line and represent fractions on a number line diagram. a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. (e.g., Given that b parts is 4 parts, then 1/b represents 1/4. Students partition the number line into fourths and locate 1/4 on the number line.)	Number and Operations - Fractions	Unit Fractions on the Number Line
M.3.14.B	Understand a fraction as a number on the number line and represent fractions on a number line diagram. b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line. (e.g., Given that a/b represents 3/4 or 6/4, students partition the number line into fourths and represent these fractions accurately on the same number line; students extend the number line to include the number of wholes required for the given fractions.) n the number line and represent fractions on a number line diagram.	Number and Operations - Fractions	Fractions on the Number Line
M.3.15.A	Explain equivalence of fractions in special cases and compare fractions by reasoning about their size. a. Understand two fractions as equivalent (equal) if they are the same size or the same point on a number line.	Number and Operations - Fractions	Modeling Equivalent Fractions with Number Lines
M.3.15.B	Explain equivalence of fractions in special cases and compare fractions by reasoning about their size. b. Recognize and generate simple equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent (e.g., by using a visual fraction model).	Number and Operations - Fractions	Visual Models of Equivalent Fractions

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
M.3.15.C	Explain equivalence of fractions in special cases and compare fractions by reasoning about their size. c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. (e.g., Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.)	Number and Operations - Fractions	Whole Numbers as Fractions Whole Numbers as Fractions on the Number Line
M.3.15.D	Explain equivalence of fractions in special cases and compare fractions by reasoning about their size. d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, = or < and justify the conclusions (e.g., by using a visual fraction model).	Number and Operations - Fractions	Comparing Fractions with the Same Numerator or Denominator Recognizing Valid Fraction Comparisons I
Measurement & Data			
Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.			
M.3.16	Tell and write time to the nearest minute, measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes (e.g., by representing the problem on a number line diagram).	Measurement and Data	Adding and Subtracting Time
M.3.17	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg) and liters (l). Add, subtract, multiply or divide to solve one-step word problems involving masses or volumes that are given in the same units (e.g., by using drawings, such as a beaker with a measurement scale) to represent the problem. Instructional Note: Exclude compound units such as cm^3 and finding the geometric volume of a container.	Measurement and Data	Capacity or Weight

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
Represent and interpret data.			
M.3.18	Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs (e.g., draw a bar graph in which each square in the bar graph might represent 5 pets).	Measurement and Data	Introduction to Data Displays
M.3.19	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves or quarters.	This standard is not addressed.	This standard is not addressed.
Geometric measurement: understand concepts of area and relate area to multiplication and to addition.			
M.3.20.A	Recognize area as an attribute of plane figures and understand concepts of area measurement. a. A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area and can be used to measure area.	Measurement and Data	Concept of Area Unit Squares
M.3.20.B	Recognize area as an attribute of plane figures and understand concepts of area measurement. b. A plane figure which can be covered without gaps or overlaps by b unit squares is said to have an area of b square units.	Measurement and Data	Concept of Area
M.3.21	Measure areas by counting unit squares (square cm, square m, square in, square ft. and improvised units).	Measurement and Data	Concept of Area Unit Squares
M.3.22.A	Relate area to the operations of multiplication and addition. a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.	Measurement and Data	Area of Rectangles

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
M.3.22.B	Relate area to the operations of multiplication and addition. b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.	Measurement and Data	Area of Rectangles
M.3.22.C	Relate area to the operations of multiplication and addition. c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.	Measurement and Data	Area of Rectangles
M.3.22.D	Relate area to the operations of multiplication and addition. d. Recognize area as additive and find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.	Measurement and Data	Area of Basic Composite Figures Recognizing Area as Additive
Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.			
M.3.23	Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.	Measurement and Data	Perimeter
Geometry			
Reason with shapes and their attributes.			
M.3.24	Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), that the shared attributes can define a larger category (e.g. quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.	Geometry	Classifying Quadrilaterals I

West Virginia CCRS		Imagine Math	
Grade 3		*Unit*	*Lesson*
M.3.25	Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as ¼ or the area of the shape.	Number and Operations - Fractions	Understanding Fractions - Notation

Grade 4

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
Operations and Algebraic Thinking			
Use the four operations with whole numbers to solve problems.			
M.4.1	Interpret a multiplication equation as a comparison (e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5). Represent verbal statements of multiplicative comparisons as multiplication equations.	Operations and Algebraic Thinking	Multiplication as a Comparison - Word Problems
M.4.2	Multiply or divide to solve word problems involving multiplicative comparison (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem) and distinguish multiplicative comparison from additive comparison.	Operations and Algebraic Thinking	Multiplication as a Comparison - Equations
M.4.3	Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	Operations and Algebraic Thinking	Using Equations to Model and Solve Multi-step Problems
Gain familiarity with factors and multiples.			
M.4.4	Find all factor pairs for a whole number in the range 1–100, recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.	Operations and Algebraic Thinking	Factors Relating Factors and Multiples I Relating Factors and Multiples II
Generate and analyze patterns.			
M.4.5	Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. (e.g., Given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.)	Operations and Algebraic Thinking	Generating and Describing Number Patterns

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
Number & Operations in Base Ten			
Generalize place value understanding for multi-digit whole numbers.			
M.4.6	Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right (e.g., recognize that 700 ÷ 70 = 10 by applying concepts of place value and division).	Number and Operations in Base Ten	Understanding Place Value Relationships
M.4.7	Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, = and < symbols to record the results of comparisons.	Number and Operations in Base Ten	Place Value Concepts Using Place Value Concepts to Compare Whole Numbers
M.4.8	Use place value understanding to round multi-digit whole numbers to any place.	Number and Operations in Base Ten	Rounding Whole Numbers Using Rounding in Problem Solving
Use place value understanding and properties of operations to perform multi-digit arithmetic.			
M.4.9	Fluently add and subtract multi-digit whole numbers using the standard algorithm.	Number and Operations in Base Ten	Adding and Subtracting with the Standard Algorithm Adding Whole Numbers
M.4.10	Multiply a whole number of up to four digits by a one-digit whole number, multiply two two-digit numbers, using strategies based on place value and the properties of operations and illustrate and explain the calculation by using equations, rectangular arrays and/or area models.	Number and Operations in Base Ten	Multiplying 2-Digit Numbers by 2-Digit Numbers Multiplying Whole Numbers
M.4.11	Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays and/or area models.	Number and Operations in Base Ten	Dividing Multiples of Ten Dividing Whole Numbers - One-Digit Divisors

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
Number & Operations—Fractions			
Extend understanding of fraction equivalence and ordering.			
M.4.12	Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.	Number and Operations- Fractions	Generating Equivalent Fractions Modeling Equivalent Fractions Reducing Fractions Understanding Fractions - Relationship Between Numerator and Denominator
M.4.13	Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½). Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, = or <, and justify the conclusions by using a visual fraction model.	Number and Operations- Fractions	Comparing Fractions with Different Numerators and Different Denominators Recognizing Valid Fraction Comparisons II
Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.			
M.4.14.A	Understand the fraction a/b, with a > 1, as the sum of a of the fractions 1/b. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.	Number and Operations - Fractions	Adding and Subtracting Fractions with Like Denominators Adding and Subtracting Fractions with Like Denominators in Real-World Situations
M.4.14.B	Understand the fraction a/b, with a > 1, as the sum of a of the fractions 1/b. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation and justify decompositions by using a visual fraction model (e.g., 3/8 = 1/8 + 1/8 + 1/8; 3/8 = 1/8 + 2/8; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8).	Number and Operations - Fractions	Decomposing Fractions and Mixed Numbers Writing Fractions as Mixed Numbers and Mixed Numbers as Fractions

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
M.4.14.C	Understand the fraction a/b, with a > 1, as the sum of a of the fractions 1/b. c. Add and subtract mixed numbers with like denominators by replacing each mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction.	Number and Operations - Fractions	Adding and Subtracting Mixed Numbers with Like Denominators Adding and Subtracting Mixed Numbers with Like Denominators - Conceptual Strategies
M.4.14.D	Understand the fraction a/b, with a > 1, as the sum of a of the fractions 1/b. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators by using visual fraction models and equations to represent the problem.	Number and Operations - Fractions	Word Problems with Fractions and Mixed Numbers - Estimation Word Problems with Fractions and Mixed Numbers - Visual Models
M.4.15.A	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. a. Understand a fraction a/b as a multiple of 1/b, (e.g., use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4)).	Number and Operations - Fractions	Multiplying Unit Fractions by Whole Numbers
M.4.15.B	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number (e.g., use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. In general, n × (a/b) = (n × a)/b).	Number and Operations - Fractions	Multiplying Fractions by Whole Numbers

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
M.4.15.C	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. c. Solve word problems involving multiplication of a fraction by a whole number by using visual fraction models and equations to represent the problem (e.g., If each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?).	Number and Operations - Fractions	Solving Word Problems with Multiplication of Fractions by Whole Numbers
Understand decimal notation for fractions, and compare decimal fractions.			
M.4.16	Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100 (e.g., express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100). Instructional Note: Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.	Number and Operations - Fractions	Adding Fractions with Denominators of 10 or 100 Understanding Fractions with Denominators of 10 and 100
M.4.17	Use decimal notation for fractions with denominators 10 or 100 (e.g., rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram).	Number and Operations - Fractions	Comparing Decimal Fractions
		Number and Operations in Base Ten	Comparing and Ordering Decimal Fractions Comparing Fractions and Decimals Decimal Notation I Decimal Notation II Fraction and Decimal Equivalents
M.4.18	Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, = or <, and justify the conclusions by using a visual model.	Number and Operations - Fractions	Decimals to Hundredths Recognizing Valid Decimal Comparisons
		Number and Operations in Base Ten	Comparing Decimals to Hundredths Introduction to Comparing Decimals to Hundredths

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
Measurement & Data			
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.			
M.4.19	Know relative sizes of measurement units within a system of units, including the metric system (km, m, cm; kg, g; l, ml), the standard system (lb, oz), and time (hr, min, sec.). Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. (e.g., Know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...)	Measurement and Data	Units of Measure - Customary Units of Measure - Metric
M.4.20	Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.	This standard is not addressed.	This standard is not addressed.
M.4.21	Apply the area and perimeter formulas for rectangles in real world and mathematical problems by viewing the area formula as a multiplication equation with an unknown factor. (e.g., find the width of a rectangular room given the area of the flooring and the length.)	Measurement and Data	Area and Perimeter of Rectangles
Represent and interpret data.			
M.4.22	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots (e.g., from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection).	This standard is not addressed.	This standard is not addressed.

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
Geometric measurement: understand concepts of angle and measure angles.			
M.4.23.A	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.	Measurement and Data	Angles
M.4.23.B	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: b. An angle that turns through b one-degree angles is said to have an angle measure of b degrees.	Measurement and Data	Angles
M.4.24	Measure angles in whole-number degrees using a protractor and sketch angles of specified measure.	Measurement and Data	Angles
M.4.25	Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems (e.g., by using an equation with a symbol for the unknown angle measure).	Measurement and Data	Angles
Geometry			
Draw and identify lines and angles, and classify shapes by properties of their lines and angles.			
M.4.26	Draw points, lines, line segments, rays, angles (right, acute, obtuse) and perpendicular and parallel lines. Identify these in two-dimensional figures.	Geometry	Classifying Quadrilaterals II Classifying Triangles

West Virginia CCRS		Imagine Math	
Grade 4		*Unit*	*Lesson*
M.4.27	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	Geometry	Classifying Quadrilaterals II Classifying Triangles
M.4.28	Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	Geometry	Symmetry

Grade 5

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
Operations and Algebraic Thinking			
Write and interpret numerical expressions.			
M.5.1	Use parentheses, brackets or braces in numerical expressions and evaluate expressions with these symbols.	Expressions and Equations	Evaluating Simple Expressions
M.5.2	Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. (e.g., Express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.)	Operations and Algebraic Thinking	Writing and Interpreting Simple Expressions Writing Simple Expressions
Analyze patterns and relationships.			
M.5.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. (e.g., Given the rule "Add 3" and the starting number 0 and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.)	This standard is not addressed.	This standard is not addressed.
Number & Operations in Base Ten			
Understand the place value system.			
M.5.4	Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	Number and Operations in Base Ten	Place Value Relationships Within Whole Numbers and Decimals
M.5.5	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	Number and Operations in Base Ten	Multiplying and Dividing by Powers of Ten Multiplying by Powers of Ten

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
M.5.6.A	Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names and expanded form (e.g., 347.392 = 3×100+4×10+7×1+3×(1/10)+9(1/100)+2×(1/1000)).	Number and Operations in Base Ten	Comparing Fractions and Decimals Decimals to Thousandths Fraction and Decimal Equivalents
M.5.6.B	Read, write, and compare decimals to thousandths. b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, = and < symbols to record the results of comparisons.	Number and Operations in Base Ten	Comparing Decimals to Thousandths
M.5.7	Use place value understanding to round decimals to any place.	Number and Operations in Base Ten	Reasoning About Rounding Decimals Rounding Decimals to the Nearest Tenth and Hundredth
Perform operations with multi-digit whole numbers and with decimals to hundredths.			
M.5.8	Fluently multiply multi-digit whole numbers using the standard algorithm.	Number and Operations in Base Ten	Multiplying 3-digit by 2-digit Whole Numbers Using the Standard Algorithm
M.5.9	Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	Number and Operations in Base Ten	Dividing Whole Numbers - Two-Digit Divisors
M.5.10	Add, subtract, multiply and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between related operations, relate the strategy to a written method and explain the reasoning used.	Number and Operations in Base Ten	Adding and Subtracting Decimals in Real-World Situations Calculating with Decimals Dividing Decimals to Hundredths Multiplying Decimals to Hundredths Using Reasoning and Estimation to Calculate with Decimals

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
Number & Operations—Fractions			
Use equivalent fractions as a strategy to add and subtract fractions.			
M.5.11	Add and subtract fractions with unlike denominators, including mixed numbers, by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators (e.g., 2/3 + 5/4 = 8/12 + 15/12 = 23/12). Instructional Note: In general, a/b + c/d = (ad + bc)/bd.	Number and Operations- Fractions	Adding and Subtracting Fractions Adding and Subtracting Fractions - Multistep Word Problems Subtracting Fractions
M.5.12	Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers (e.g., recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2).	Number and Operations- Fractions	Adding and Subtracting Fractions Adding and Subtracting Fractions - Multistep Word Problems Adding Fractions - Estimation Strategies Subtracting Fractions - Estimation Strategies
Apply and extend previous understandings of multiplication and division to multiply and divide fractions.			
M.5.13	Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers by using visual fraction models or equations to represent the problem. (e.g., Interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3 and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?)	Number and Operations - Fractions	Understanding Fractions as Division

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
M.5.14.A	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. (e.g., Use a visual fraction model to show (2/3) × 4 = 8/3 and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15.) Instructional Note: In general, (a/b) × (c/d) = ac/bd.	Number and Operations- Fractions	Multiplying Fractions by Fractions Multiplying Fractions by Whole Numbers to Solve Multistep Problems Understanding Products with Fractions
M.5.14.B	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas.	Number and Operations- Fractions	Multiplying Fractions by Fractions Understanding Products with Fractions
M.5.15.A	Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.	Number and Operations- Fractions	Understanding Products with Fractions
M.5.15.B	Interpret multiplication as scaling (resizing), by: b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n×a)/(n×b) to the effect of multiplying a/b by 1.	Number and Operations- Fractions	Understanding Products with Fractions
M.5.16	Solve real-world problems involving multiplication of fractions and mixed numbers by using visual fraction models or equations to represent the problem.	Number and Operations- Fractions	Multiplying Fractions by Whole Numbers to Solve Multistep Problems

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
M.5.17.A	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Instructional Note: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division, but division of a fraction by a fraction is not a requirement at this grade. a. Interpret division of a unit fraction by a non-zero whole number and compute such quotients. (e.g., Create a story context for (1/3) ÷ 4 and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.)	Number and Operations - Fractions	Dividing Unit Fractions by Whole Numbers
M.5.17.B	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Instructional Note: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division, but division of a fraction by a fraction is not a requirement at this grade. b. Interpret division of a whole number by a unit fraction and compute such quotients. (e.g., Create a story context for 4 ÷ (1/5) and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.)	Number and Operations - Fractions	Dividing Whole Numbers by Unit Fractions

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
M.5.17.C	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Instructional Note: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division, but division of a fraction by a fraction is not a requirement at this grade. c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions by using visual fraction models and equations to represent the problem. (e.g., How much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?)	Number and Operations - Fractions	Dividing Unit Fractions by Whole Numbers Dividing Whole Numbers by Unit Fractions
Measurement & Data			
Convert like measurement units within a given measurement system.			
M.5.18	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m) and use these conversions in solving multi-step, real-world problems.	This standard is not addressed.	This standard is not addressed.
Represent and interpret data.			
M.5.19	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. (e.g., Given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally).	Measurement and Data	Line Plots
Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.			
M.5.20.A	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume and can be used to measure volume.	Measurement and Data	Volume of Rectangular Prisms I

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
M.5.20.B	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. b. A solid figure which can be packed without gaps or overlaps using b unit cubes is said to have a volume of b cubic units.	Measurement and Data	Volume of Rectangular Prisms I
M.5.21	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	Measurement and Data	Volume of Rectangular Prisms I
M.5.22.A	Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes (e.g., to represent the associative property of multiplication).	Measurement and Data	Volume of Rectangular Prisms II
M.5.22.B	Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real-world and mathematical problems.	Measurement and Data	Volume of Rectangular Prisms II
M.5.22.C	Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. c. Recognize volume as additive and find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.	Measurement and Data	Volume of Rectangular Prisms II

West Virginia CCRS		Imagine Math	
Grade 5		*Unit*	*Lesson*
Geometry			
Graph points on the coordinate plane to solve real-world and mathematical problems.			
M.5.23	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines, the origin, arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).	Geometry	Introduction to Scatter Plots Introduction to the Coordinate Plane
M.5.24	Represent real-world mathematical problems by graphing points in the first quadrant of the coordinate plane and interpret coordinate values of points in the context of the situation.	Geometry	Introduction to Scatter Plots Representing Real-World Quantities in the First Quadrant
Classify two-dimensional figures into categories based on their properties.			
M.5.25	Understand that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category (e.g., all rectangles have four right angles and squares are rectangles, so all squares have four right angles).	Geometry	Classifying 2-Dimensional Figures Classifying Quadrilaterals II
M.5.26	Classify two-dimensional figures in a hierarchy based on properties.	Geometry	Classifying 2-Dimensional Figures Classifying Quadrilaterals II

Grade 6

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
Ratios and Proportional Relationships			
Understand ratio concepts and use ratio reasoning to solve problems.			
M.6.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (e.g., "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes.")	Ratios and Proportional Relationships	Concept of Ratios and Rates Identifying Unit Rates Ratios Solving Problems with Unit Rates
M.6.2	Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (e.g., "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.") Instructional Note: Expectations for unit rates in this grade are limited to non-complex fractions.	Ratios and Proportional Relationships	Concept of Ratios and Rates Identifying Ratios Identifying Unit Rates Solving Problems with Unit Rates
M.6.3.A	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.	Ratios and Proportional Relationships	Ratios Using Ratios to Solve Problems
		The Number System	Rational Numbers in the Coordinate Plane II

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
M.6.3.B	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. b. Solve unit rate problems including those involving unit pricing and constant speed. (e.g., If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?)	Ratios and Proportional Relationships	Distance, Rate, and Time Ratios Solving Problems with Unit Rates
M.6.3.C	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.	Ratios and Proportional Relationships	Calculations with Percent Percent Concepts Reasoning with Percents Circle Graphs
M.6.3.D	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	Ratios and Proportional Relationships	Converting Units of Measure I Converting Units of Measure II

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
The Number System			
Apply and extend previous understandings of multiplication and division to divide fractions by fractions.			
M.6.4	Interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions by using visual fraction models and equations to represent the problem. (e.g., Create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?)	The Number System	Dividing Fractions by Fractions Operations with Fractions - Mixed Practice Using Division of Fractions to Represent and Solve Problems Using the Relationship Between Multiplication and Division to Divide Fractions
Compute fluently with multi-digit numbers and find common factors and multiples.			
M.6.5	Fluently divide multi-digit numbers using the standard algorithm.	Number and Operations in Base Ten	Dividing Whole Numbers - Standard Algorithm
M.6.6	Fluently add, subtract, multiply and divide multi-digit decimals using the standard algorithm for each operation.	Number and Operations in Base Ten	Adding and Subtracting Decimals Adding and Subtracting Decimals in Real-World Situations Calculating with Decimals Using Reasoning and Estimation to Calculate with Decimals
M.6.7	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor (e.g., express 36 + 8 as 4 (9 + 2)).	The Number System	Greatest Common Factor Greatest Common Factor - Applications Least Common Multiple

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
Apply and extend previous understandings of numbers to the system of rational numbers.			
M.6.8	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	The Number System	Integer Concepts
M.6.9.A	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.	The Number System	Integer Concepts with a Number Line
M.6.9.B	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.	The Number System	Integers in the Coordinate Plane I Integers in the Coordinate Plane II Rational Numbers in the Coordinate Plane II
M.6.9.C	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	The Number System	Comparing Rational Numbers I Integer Concepts Integer Concepts with a Number Line Rational Numbers in the Coordinate Plane I

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
M.6.10.A	Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. (e.g., interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.)	The Number System	Classifying and Ordering Real Numbers Comparing Rational Numbers II
M.6.10.B	Understand ordering and absolute value of rational numbers. b. Write, interpret, and explain statements of order for rational numbers in real-world contexts (e.g., write -3 °C > -7 °C to express the fact that -3 °C is warmer than -7 °C.	The Number System	Classifying and Ordering Real Numbers
M.6.10.C	Understand ordering and absolute value of rational numbers. c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. (e.g., for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars).	The Number System	Absolute Value I
M.6.10.D	Understand ordering and absolute value of rational numbers. d. Distinguish comparisons of absolute value from statements about order. (e.g., recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.)	The Number System	Absolute Value II
M.6.11	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	The Number System	Distance on the Coordinate Plane II Rational Numbers in the Coordinate Plane II
Expressions and Equations			
Apply and extend previous understandings of arithmetic to algebraic expressions.			
M.6.12	Write and evaluate numerical expressions involving whole-number exponents.	Expressions and Equations	Evaluating Expressions and Equations with Exponents Understanding Exponents

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
M.6.13.A	Write, read and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. (e.g., Express the calculation, "Subtract y from 5" as 5 – y.)	Expressions and Equations	Introduction to the Language of Algebra
M.6.13.B	Write, read and evaluate expressions in which letters stand for numbers. b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. (e.g., Describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.)	Expressions and Equations	Evaluating Expressions with Real Numbers
M.6.13.C	Write, read and evaluate expressions in which letters stand for numbers. c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order: Order of Operations (e.g., use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length s = 1/2).	Expressions and Equations	Evaluating Expressions and Equations with Exponents Evaluating Expressions with Two Operations Evaluating Simple Expressions
M.6.14	Apply the properties of operations to generate equivalent expressions (e.g., apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y).	Expressions and Equations	Combining Like Terms Evaluating Expressions with the Distributive Property Identifying and Generating Equivalent Expressions Using the Distributive Property to Represent Real-World Situations

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
M.6.15	Identify when two expressions are equivalent; i.e., when the two expressions name the same number regardless of which value is substituted into them. (e.g., The expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.)	Expressions and Equations	Combining Like Terms Identifying and Generating Equivalent Expressions
Reason about and solve one-variable equations and inequalities.			
M.6.16	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	Expressions and Equations	Reasoning About One-Step Equations
M.6.17	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number or depending on the purpose at hand, any number in a specified set.	Expressions and Equations	Introduction to the Language of Algebra
M.6.18	Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.	Expressions and Equations	Introduction to Solving Word Problems with Algebra Writing and Solving One-Step Equations
M.6.19	Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	Expressions and Equations	Concept of Inequalities I

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
Represent and analyze quantitative relationships between dependent and independent variables.			
M.6.20	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (e.g., In a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.)	Expressions and Equations	Independent and Dependent Quantities
Geometry			
Solve real-world and mathematical problems involving area, surface area, and volume.			
M.6.21	Find the area of right triangles, other triangles, special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	Geometry	Area of Parallelograms Area of Trapezoids and Composite Figures Area of Triangles
M.6.22	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = B h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	Geometry	Surface Area and Volume of Rectangular Prisms
M.6.23	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	Geometry	Distance on the Coordinate Plane I

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
M.6.24	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	Geometry	Surface Area and Volume of Rectangular Prisms Surface Area of Pyramids
Statistics and Probability			
Develop understanding of statistical variability.			
M.6.25	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. (e.g., "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.)	Statistics and Probability	Data Analysis
M.6.26	Through informal observation, understand that a set of data collected to answer a statistical question has a distribution which can be described by its center (mean/ median), spread (range), and overall shape.	Statistics and Probability	Box Plots Measures of Center - Mean Measures of Center - Median Measures of Spread - Range Quartiles Stem-and-Leaf Plots Summarizing Data
M.6.27	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number.	Statistics and Probability	Measures of Spread - Range Quartiles Understanding the Effects of Outliers on Mean and Median

West Virginia CCRS		Imagine Math	
Grade 6		*Unit*	*Lesson*
Summarize and describe distributions.			
M.6.28	Display numerical data in plots on a number line, including dot plots, histograms and box plots.	Geometry	Introduction to Scatter Plots
		Statistics and Probability	Bar Graphs and Histograms Box Plots Circle Graphs Stem-and-Leaf Plots
M.6.29.A	Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations.	Statistics and Probability	Summarizing Data
M.6.29.B	Summarize numerical data sets in relation to their context, such as by: b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.	Statistics and Probability	Summarizing Data
M.6.29.C	Summarize numerical data sets in relation to their context, such as by: c. Giving quantitative measures of center (median and/or mean), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	Statistics and Probability	Box Plots Deviation from the Mean Measures of Center - Mean Measures of Center - Median Stem-and-Leaf Plots Summarizing Data
M.6.29.D	Summarize numerical data sets in relation to their context, such as by: d. Relating the choice of measures of center to the shape of the data distribution and the context in which the data were gathered.	Statistics and Probability	Deviation from the Mean Summarizing Data

Grade 7

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
Ratios and Proportional Relationships			
Analyze proportional relationships and use them to solve real-world and mathematical problems.			
M.7.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. (e.g., If a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour.)	Ratios and Proportional Relationships	Interpreting Points on Graphs of Proportional Relationships
M.7.2.A	Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).	Ratios and Proportional Relationships	Proportion Concepts Proportional Relationships in Tables and Equations
M.7.2.B	Recognize and represent proportional relationships between quantities. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships.	Ratios and Proportional Relationships	Interpreting Unit Rates on Graphs
M.7.2.C	Recognize and represent proportional relationships between quantities. c. Represent proportional relationships by equations. (e.g., If total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.)	Ratios and Proportional Relationships	Introduction to Similar Figures Proportion Concepts Proportional Relationships in Tables and Equations Using Similar Figures to Solve Problems
M.7.2.D	Recognize and represent proportional relationships between quantities. d. Explain what a point (x,y) on the graph of a proportional relationship means in terms of the situation. Focus special attention on the points (0,0) and (1,r) where r is the unit rate.	Ratios and Proportional Relationships	Interpreting Points on Graphs of Proportional Relationships

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.3	Use proportional relationships to solve multistep ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, and/or percent error).	Ratios and Proportional Relationships	Percent and Percent Change Percent and Percent Error Proportions in Scale Drawings Simple Interest Using Proportions to Solve Problems
The Number System			
Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.			
M.7.4.A	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. (e.g., A hydrogen atom has 0 charge because its two constituents are oppositely charged.)	The Number System	Adding and Subtracting Rational Numbers I
M.7.4.B	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction, depending on whether q is positive or negative. (i.e., To add "p + q" on the number line, start at "0" and move to "p" then move |q| in the positive or negative direction depending on whether "q" is positive or negative.) Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.	The Number System	Adding and Subtracting Rational Numbers I

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.4.C	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts.	The Number System	Adding and Subtracting Rational Numbers II
M.7.4.D	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. d. Apply properties of operations as strategies to add and subtract rational numbers.	The Number System	Adding and Subtracting Rational Numbers I
M.7.5.A	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.	The Number System	Multiplying and Dividing Rational Numbers
M.7.5.B	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real world contexts.	The Number System	Multiplying and Dividing Rational Numbers

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.5.C	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. c. Apply properties of operations as strategies to multiply and divide rational numbers.	The Number System	Multiplying and Dividing Rational Numbers
M.7.5.D	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.	The Number System	Multiplying and Dividing Rational Numbers
M.7.6	Solve real-world and mathematical problems involving the four operations with rational numbers. Instructional Note: Computations with rational numbers extend the rules for manipulating fractions to complex fractions.	The Number System	Operations with Rational Numbers I Writing and Interpreting Expressions with Rational Numbers
Expressions and Equations			
Use properties of operations to generate equivalent expressions.			
M.7.7	Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients.	Expressions and Equations	Common Factors in Polynomials
M.7.8	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. (e.g., a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05.")	Expressions and Equations	Solving Word Problems with Algebra

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
Solve real-life and mathematical problems using numerical and algebraic expressions and equations.			
M.7.9	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (e.g., If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.)	Expressions and Equations	Fraction, Decimal, and Percent Equivalents Operations with Rational Numbers II Writing and Interpreting Expressions with Rational Numbers
M.7.10.A	Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. (e.g., The perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width? An arithmetic solution similar to "54 – 6 – 6 divided by 2" may be compared with the reasoning involved in solving the equation 2w – 12 = 54. An arithmetic solution similar to "54/2 – 6" may be compared with the reasoning involved in solving the equation 2(w – 6) = 54.)	Expressions and Equations	Solving and Modeling Two-Step Problems Solving Equations with the Distributive Property Solving Equations with the Distributive Property in Context

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.10.B	Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities. b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. (e.g., As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.)	Expressions and Equations	Concept of Inequalities II Modeling, Evaluating, and Graphing Two-Step Inequalities in One Variable
Geometry			
Draw construct, and describe geometrical figures and describe the relationships between them.			
M.7.11	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	Ratios and Proportional Relationships	Introduction to Similar Figures Proportions in Scale Drawings Similarity Using Proportions to Solve Problems Using Similar Figures to Solve Problems
M.7.12	Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.	Geometry	Using Line Segments and Angles to Make Triangles
M.7.13	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	This standard is not addressed.	This standard is not addressed.

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.			
M.7.14	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	Geometry	Area of Circles Circumference Surface Area of Composite Solids Surface Area of Cones Surface Area of Cylinders
M.7.15	Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	Geometry	Angle Pairs Angles in a Polygon
M.7.16	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	Geometry	Area of Complex Composite Figures Surface Area and Volume of Rectangular Prisms Surface Area of Composite Solids Surface Area of Cones Surface Area of Cylinders Surface Area of Pyramids Surface Area of Spheres
Statistics and Probability			
Use random sampling to draw inferences about a population.			
M.7.17	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.	This standard is not addressed.	This standard is not addressed.

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.18	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. (e.g., Estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.)	Statistics and Probability	Sampling
Draw informal comparative inferences about two populations.			
M.7.19	*Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.*	Statistics and Probability	Measures of Spread - Range Understanding the Effects of Outliers on Mean and Median
M.7.20.A	Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations.	Statistics and Probability	Summarizing Data
M.7.20.B	Summarize numerical data sets in relation to their context, such as by: b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.	Statistics and Probability	Summarizing Data
M.7.20.C	Summarize numerical data sets in relation to their context, such as by: c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	Statistics and Probability	Box Plots

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.21	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. (e.g., The mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.)	Statistics and Probability	Comparing Data
M.7.22	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. (e.g., Decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.)	Statistics and Probability	Sampling
Investigate chance processes and develop, use, and evaluate probability models.			
M.7.23	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely and a probability near 1 indicates a likely event.	Statistics and Probability	Compound Probability Probability and Sample Spaces Simple Probability
M.7.24	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. (e.g., When rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.)	Statistics and Probability	Making Predictions

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.25.A	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. (e.g., If a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.)	Statistics and Probability	Compound Probability
M.7.25.B	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. (e.g., Find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?)	Statistics and Probability	Simple Probability
M.7.26.A	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.	Statistics and Probability	Compound Probability
M.7.26.B	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.	Statistics and Probability	Compound Probability Probability and Sample Spaces

West Virginia CCRS		Imagine Math	
Grade 7		*Unit*	*Lesson*
M.7.26.C	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. c. Design and use a simulation to generate frequencies for compound events. (e.g., Use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?)	Statistics and Probability	Simulations of Simple and Compound Events
		Ratios and Proportional Relationships	Proportion Concepts

Grade 8

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Grade 8		*Unit*	*Lesson*
The Number System			
Know that there are numbers that are not rational, and approximate them by rational numbers.			
M.8.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a rational number. Instructional Note: A decimal expansion that repeats the digit 0 is often referred to as a "terminating decimal."	The Number System	Approximating Values of Irrational Numbers
M.8.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram and estimate the value of expressions such as π^2. (e.g., By truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.)	The Number System	Approximating Values of Irrational Numbers
Expressions and Equations			
Work with radicals and integer exponents.			
M.8.3	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	Expressions and Equations	Applying Properties of Integer Exponents Understanding Properties of Integer Exponents
M.8.4	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.	Expressions and Equations	Understanding Square and Cube Roots
M.8.5	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other (e.g., estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger).	Expressions and Equations	Interpreting Numbers Written in Scientific Notation

West Virginia CCRS		Imagine Math	
Grade 8		*Unit*	*Lesson*
M.8.6	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. (e.g., Use millimeters per year for seafloor spreading.) Interpret scientific notation that has been generated by technology.	Expressions and Equations	Operations with Numbers in Scientific Notation
Understand the connections between proportional relationships, lines, and linear equations.			
M.8.7	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. (e.g., Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.)	Expressions and Equations	Interpreting Slope
M.8.8	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.	Expressions and Equations	Slope
			Slope-Intercept Form
Analyze and solve linear equations and pairs of simultaneous linear equations.			
M.8.9.A	Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).	Expressions and Equations	Analyzing Solution Sets to Linear Equations with the Variable on Both Sides
M.8.9.B	Solve linear equations in one variable. b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	Expressions and Equations	Solving Equations with the Variable on Both Sides Solving Two-Step Equations

West Virginia CCRS		Imagine Math	
Grade 8		*Unit*	*Lesson*
M.8.10.A	Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.	Expressions and Equations	Solving a System of Linear Equations Graphically
M.8.10.B	Analyze and solve pairs of simultaneous linear equations. b. Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection. (e.g., 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.)	Expressions and Equations	Solving a System of Linear Equations Algebraically
M.8.10.C	Analyze and solve pairs of simultaneous linear equations. c. Solve real-world and mathematical problems leading to two linear equations in two variables. (e.g., Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.)	Expressions and Equations	Solving a System of Linear Equations - Applications
Functions			
Define, evaluate, and compare functions.			
M.8.11	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Instructional Note: Function notation is not required in grade 8.	Expressions and Equations	Slope
M.8.12	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (e.g., Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.)	Expressions and Equations	Slope
		Interpreting Functions	Comparing Functions Using Different Representations

West Virginia CCRS		Imagine Math	
Grade 8		*Unit*	*Lesson*
M.8.13	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (e.g., The function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.)	Functions	Point-Slope Form
Use functions to model relationships between quantities.			
M.8.14	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	Functions	Point-Slope Form Slope-Intercept Form
M.8.15	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	Functions	Interpreting Graphs of Real-World Situations Introduction to Sketching Graphs of Real-World Situations
Geometry			
Understand congruence and similarity using physical models, transparencies, or geometry software.			
M.8.16.A	Verify experimentally the properties of rotations, reflections and translations: a. Lines are taken to lines, and line segments to line segments of the same length.	This standard is not addressed.	This standard is not addressed.
M.8.16.B	Verify experimentally the properties of rotations, reflections and translations: the same length. b. Angles are taken to angles of the same measure.	This standard is not addressed.	This standard is not addressed.

West Virginia CCRS		Imagine Math	
Grade 8		*Unit*	*Lesson*
M.8.16.C	Verify experimentally the properties of rotations, reflections and translations: c. Parallel lines are taken to parallel lines.	This standard is not addressed.	This standard is not addressed.
M.8.17	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.	Geometry	Composition of Transformations Congruence Reflections Rotations Translations
M.8.18	Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.	Geometry	Composition of Transformations Dilations Dilations in the Coordinate Plane Reflections Rotations Translations
M.8.19	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations; given two similar two dimensional figures, describe a sequence that exhibits the similarity between them.	Geometry	Composition of Transformations Dilations Reflections Rotations Translations
M.8.20	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. (e.g., Arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.)	Geometry	Angles in a Polygon Parallel Lines and Transversals
Understand and apply the Pythagorean Theorem.			
M.8.21	Explain a proof of the Pythagorean Theorem and its converse.	Geometry	Understanding the Pythagorean Theorem

West Virginia CCRS		Imagine Math	
Grade 8		*Unit*	*Lesson*
M.8.22	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	Geometry	Pythagorean Theorem - Distance Formula Pythagorean Theorem - Hypotenuse Pythagorean Theorem - Legs Pythagorean Theorem - Mixed Problems
M.8.23	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	Geometry	Pythagorean Theorem - Distance Formula
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.			
M.8.24	Know the formulas for the volumes of cones, cylinders and spheres and use them to solve real-world and mathematical problems.	Geometry	Volume of Composite Solids Volume of Cylinders Volume of Pyramids and Cones Volume of Spheres
Statistics and Probability			
Investigate patterns of association in bivariate data.			
M.8.25	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association and nonlinear association.	Statistics and Probability	Comparing Linear and Nonlinear Data
M.8.26	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model fit by judging the closeness of the data points to the line.	Building Functions	Direct Variation
		Statistics and Probability	Comparing Linear and Nonlinear Data
M.8.27	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. (e.g., In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.)	Building Functions	Direct Variation
		Functions	Slope-Intercept Form

West Virginia CCRS		Imagine Math	
Grade 8		*Unit*	*Lesson*
M.8.28	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. (e.g., Collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?)	Statistics and Probability	Patterns of Association in Data

Algebra I

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Relationships between Quantities and Reasoning with Equations			
Reason quantitatively and use units to solve problems.			
M.A1HS.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	Statistics and Probability	Standard Deviation
M.A1HS.2	Define appropriate quantities for the purpose of descriptive modeling. Instructional Note: Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.	This standard is not addressed.	This standard is not addressed.
M.A1HS.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	Quantities	Using Units to Solve Problems
Interpret the structure of expressions.			
M.A1HS.4.A	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients.	Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions Interpreting the Structure of Quadratic Expressions and Expressions with Rational Exponents
M.A1HS.4.B	Interpret expressions that represent a quantity in terms of its context. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. (e.g., Interpret $P(1 + r)^n$ as the product of P and a factor not depending on P. Instructional Note: Limit to linear expressions and to exponential expressions with integer exponents.	Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions Interpreting the Structure of Quadratic Expressions and Expressions with Rational Exponents

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Create equations that describe numbers or relationships.			
M.A1HS.5	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Instructional Note: Limit to linear and exponential equations, and, in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs.	Creating Equations	Modeling Quadratic Relationships with Equations, Inequalities, and Graphs Writing Linear Inequalities in One Variable
M.A1HS.6	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. Instructional Note: Limit to linear and exponential equations, and, in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs.	Creating Equations	Equations of Parallel and Perpendicular Lines Modeling Quadratic Relationships with Equations, Inequalities, and Graphs
		Interpreting Functions	Radical Functions and Their Graphs
M.A1HS.7	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. (e.g., Represent inequalities describing nutritional and cost constraints on combinations of different foods.) Instructional Note: Limit to linear equations and inequalities.	Creating Equations	Writing Linear Inequalities in One Variable
		Reasoning with Equations and Inequalities	Graphing Linear Inequalities and Systems of Linear Inequalities in Real-World Situations
M.A1HS.8	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (e.g., Rearrange Ohm's law V = IR to highlight resistance R.) Instructional Note: Limit to formulas with a linear focus.	Creating Equations	Modeling Quadratic Relationships with Equations, Inequalities, and Graphs

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Understand solving equations as a process of reasoning and explain the reasoning.			
M.A1HS.9	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. Instructional Note: Students should focus on and master linear equations and be able to extend and apply their reasoning to other types of equations in future courses. Students will solve exponential equations with logarithms in Algebra II.	Reasoning with Equations and Inequalities	Solving Linear Equations in One Variable as a Reasoning Process
Solve equations and inequalities in one variable.			
M.A1HS.10	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. Instructional Note: Extend earlier work with solving linear equations to solving linear inequalities in one variable and to solving literal equations that are linear in the variable being solved for. Include simple exponential equations that rely only on application of the laws of exponents, such as $5^x = 125$ or $2^x = 1/16$.	Reasoning with Equations and Inequalities	Solving Linear Equations in One Variable as a Reasoning Process Solving Linear Inequalities in One Variable
Linear and Exponential Relationships			
Extend the properties of exponents to rational exponents.			
M.A1HS.11	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. (e.g., We define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.) Instructional Note: Address this standard before discussing exponential functions with continuous domains.	Interpreting Functions	Radical Functions and Their Graphs
		The Real Number System	Using Rational Exponents to Rewrite Expressions

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.12	Rewrite expressions involving radicals and rational exponents using the properties of exponents. Instructional Note: Address this standard before discussing exponential functions with continuous domains.	Interpreting Functions	Radical Functions and Their Graphs
		The Real Number System	Using Rational Exponents to Rewrite Expressions
Solve systems of equations.			
M.A1HS.13	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	Reasoning with Equations and Inequalities	Solving Systems of Linear Equations
M.A1HS.14	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. Instructional Note: Build on student experiences graphing and solving systems of linear equations from middle school to focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to standards in Geometry which require students to prove the slope criteria for parallel lines.	Reasoning with Equations and Inequalities	Solving Systems of Linear Equations
Represent and solve equations and inequalities graphically.			
M.A1HS.15	Recognize that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). Instructional Note: Focus on linear and exponential equations and be able to adapt and apply that learning to other types of equations in future courses.	Interpreting Functions	Radical Functions and Their Graphs
		Reasoning with Equations and Inequalities	Solving Exponential Equations Graphically Solving Linear Equations Graphically

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.16	Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately (e.g., using technology to graph the functions, make tables of values or find successive approximations). Include cases where f(x) and/ or g(x) are linear, polynomial, rational, absolute value, exponential and logarithmic functions. Instructional Note: Focus on cases where f(x) and g(x) are linear or exponential.	Reasoning with Equations and Inequalities	Solving Exponential Equations Graphically Solving Linear Equations Graphically
M.A1HS.17	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	Reasoning with Equations and Inequalities	Graphing Linear Inequalities and Systems of Linear Inequalities in Real-World Situations
Understand the concept of a function and use function notation.			
M.A1HS.18	Recognize that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). Instructional Note: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of function at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear functions and exponential functions having integral domains.	Interpreting Functions	Function Notation I Function Notation II

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.19	Use function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context. Instructional Note: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of function at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear functions and exponential functions having integral domains.	Interpreting Functions	Function Notation I
M.A1HS.20	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (e.g., The Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n)+ f(n-1)$ for $n \geq 1$. Instructional Note: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of function at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear functions and exponential functions having integral domains. Draw connection to M.A1HS.27, which requires students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions.	Interpreting Functions	Sequences as Functions
Interpret functions that arise in applications in terms of a context.			
M.A1HS.21	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Instructional Note: Focus on linear and exponential functions.	Interpreting Functions	Interpreting Graphs of Linear and Exponential Functions in Context Sketching Graphs of Linear and Exponential Functions from a Context Sketching Graphs of Quadratic Functions in Context

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.22	Relate the domain of a function to its graph and where applicable, to the quantitative relationship it describes. (e.g., If the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.) Instructional Note: Focus on linear and exponential functions.	Interpreting Functions	Sketching Graphs of Quadratic Functions in Context
M.A1HS.23	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Instructional Note: Focus on linear functions and exponential functions whose domain is a subset of the integers. The Unit on Quadratic Functions and Modeling in this course and the Algebra II course address other types of functions.	Interpreting Functions	Rate of Change for Linear and Exponential Functions Sketching Graphs of Quadratic Functions in Context
Analyze functions using different representations.			
M.A1HS.24.A	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	Interpreting Functions	Sketching and Transforming Graphs of Quadratic Functions from Symbolic Representations Sketching Graphs of Linear Functions from Symbolic Representations
M.A1HS.24.B	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph exponential and logarithmic functions, showing intercepts and end behavior and trigonometric functions, showing period, midline and amplitude.	Interpreting Functions	Introduction to Logarithms

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.25	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (e.g., Given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.) Instructional Note: Focus on linear and exponential functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as y = 3n and y = 1002n)	Interpreting Functions	Comparing Functions Using Different Representations
Build a function that models a relationship between two quantities.			
M.A1HS.26.A	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context.	Building Functions	Writing Quadratic Functions from a Context
M.A1HS.26.B	Write a function that describes a relationship between two quantities. b. Combine standard function types using arithmetic operations. (e.g., Build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.)	Building Functions	Composite Functions Writing Quadratic Functions from a Context
M.A1HS.27	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. Instructional Note: Limit to linear and exponential functions. Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.	Building Functions	Writing Arithmetic Sequences Explicitly and Recursively Writing Geometric Sequences Recursively Writing Geometric Sequences Using an Explicit Formula

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Build new functions from existing functions.			
M.A1HS.28	Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. Instructional Note: Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard.	Building Functions	Transformations of Graphs of Linear and Exponential Functions
		Interpreting Functions	Sketching and Transforming Graphs of Quadratic Functions from Symbolic Representations
Construct and compare linear, quadratic, and exponential models and solve problems.			
M.A1HS.29.A	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals; exponential functions grow by equal factors over equal intervals.	Linear, Quadratic, and Exponential Models	Distinguishing Between Linear and Exponential Relationships
M.A1HS.29.B	Distinguish between situations that can be modeled with linear functions and with exponential functions. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.	Linear, Quadratic, and Exponential Models	Distinguishing Between Linear and Exponential Relationships
M.A1HS.29.C	Distinguish between situations that can be modeled with linear functions and with exponential functions. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	Linear, Quadratic, and Exponential Models	Distinguishing Between Linear and Exponential Relationships

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.30	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship or two input-output pairs (include reading these from a table). Instructional Note: In constructing linear functions, draw on and consolidate previous work in Grade 8 on finding equations for lines and linear functions.	Linear, Quadratic, and Exponential Models	Writing Linear and Exponential Functions Based on Different Representations
M.A1HS.31	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. Instructional Note: Limit to comparisons between exponential and linear models.	Linear, Quadratic, and Exponential Models	Introduction to Nonlinear Models
Interpret expressions for functions in terms of the situation they model.			
M.A1HS.32	Interpret the parameters in a linear or exponential function in terms of a context. Instructional Note: Limit exponential functions to those of the form $f(x) = b^x + k$.	Interpreting Functions	Rewriting and Interpreting Exponential Functions in Terms of Context
Descriptive Statistics			
Summarize, represent, and interpret data on a single count or measurement variable.			
M.A1HS.33	Represent data with plots on the real number line (dot plots, histograms, and box plots).	Interpreting Categorical and Quantitative Data	Data Displays on the Real Number Line
		Statistics and Probability	Box Plots
M.A1HS.34	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. Instructional Note: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.	Interpreting Categorical and Quantitative Data	Comparing the Shape, Center, and Spread of Data Sets

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.35	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). Instructional Note: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.	Interpreting Categorical and Quantitative Data	Comparing the Shape, Center, and Spread of Data Sets
		Statistics and Probability	Measures of Center - Mean Measures of Center - Median Measures of Spread - Range
Summarize, represent, and interpret data on two categorical and quantitative variables.			
M.A1HS.36	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data.	Interpreting Categorical and Quantitative Data	Summarizing and Interpreting Categorical Data
M.A1HS.37.A	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.	Interpreting Categorical and Quantitative Data	Fitting Functions to Data
M.A1HS.37.B	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. b. Informally assess the fit of a function by plotting and analyzing residuals. Instructional Note: Focus should be on situations for which linear models are appropriate.	Interpreting Categorical and Quantitative Data	Fitting Functions to Data
M.A1HS.37.C	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. c. Fit a linear function for scatter plots that suggest a linear association.	Interpreting Categorical and Quantitative Data	Fitting Functions to Data

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Interpret linear models.			
M.A1HS.38	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. Instructional Note: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship.	Interpreting Categorical and Quantitative Data	Correlation
M.A1HS.39	Compute (using technology) and interpret the correlation coefficient of a linear fit. Instructional Note: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship.	This standard is not addressed.	This standard is not addressed.
M.A1HS.40	Distinguish between correlation and causation. Instructional Note: The important distinction between a statistical relationship and a cause-and-effect relationship is the focus.	Interpreting Categorical and Quantitative Data	Correlation
Expressions and Equations			
Interpret the structure of equations.			
M.A1HS.41.A	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients.	Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions Interpreting the Structure of Quadratic Expressions and Expressions with Rational Exponents

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.41.B	Interpret expressions that represent a quantity in terms of its context. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1 + r)n$ as the product of P and a factor not depending on P. Instructional Note: Exponents are extended from the integer exponents found in the unit on Relationships between Quantities and Reasoning with Equations to rational exponents focusing on those that represent square or cube roots.	Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions Interpreting the Structure of Quadratic Expressions and Expressions with Rational Exponents
M.A1HS.42	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. Instructional Note: Focus on quadratic and exponential expressions.	Seeing Structure in Expressions	Factoring Polynomials Factoring Quadratic Expressions
Write expressions in equivalent forms to solve problems.			
M.A1HS.43.A	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines.	Seeing Structure in Expressions	Factoring Expressions Factoring Polynomials Factoring Quadratic Expressions
M.A1HS.43.B	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	Interpreting Functions	Rewriting Quadratics to Reveal Their Structure
M.A1HS.43.C	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.	Interpreting Functions	Rewriting and Interpreting Exponential Functions in Terms of Context

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Perform arithmetic operations on polynomials.			
M.A1HS.44	Recognize that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. Instructional Note: Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of x.	Arithmetic with Polynomials and Rational Expressions	Adding and Subtracting Polynomials
Create equations that describe numbers or relationships.			
M.A1HS.45	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. Instructional Note: Extend work on linear and exponential equations in the Relationships between Quantities and Reasoning with Equations unit to quadratic equations.	Creating Equations	Modeling Quadratic Relationships with Equations, Inequalities, and Graphs Writing Linear Inequalities in One Variable
M.A1HS.46	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. Instructional Note: Extend work on linear and exponential equations in the Relationships between Quantities and Reasoning with Equations unit to quadratic equations.	Creating Equations	Equations of Parallel and Perpendicular Lines Modeling Quadratic Relationships with Equations, Inequalities, and Graphs
		Interpreting Functions	Radical Functions and Their Graphs
M.A1HS.47	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (e.g., Rearrange Ohm's law V = IR to highlight resistance R. Instructional Note: Extend work on linear and exponential equations in the Relationships between Quantities and Reasoning with Equations unit to quadratic equations. Extend this standard to formulas involving squared variables.	Creating Equations	Modeling Quadratic Relationships with Equations, Inequalities, and Graphs

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Solve equations and inequalities in one variable.			
M.A1HS.48.A	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.	Reasoning with Equations and Inequalities	Solving Quadratic Equations with Real and Complex Roots - Completing the Square Solving Quadratics - Completing the Square
M.A1HS.48.B	Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. Instructional Note: Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II.	This standard is not addressed.	This standard is not addressed.
Solve systems of equations.			
M.A1HS.49	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$. Instructional Note: Include systems consisting of one linear and one quadratic equation. Include systems that lead to work with fractions. For example, finding the intersections between $x^2 + y^2 = 1$ and $y = (x+1)/2$ leads to the point (3/5, 4/5) on the unit circle, corresponding to the Pythagorean triple $3^2 + 4^2 = 52$.	Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
Quadratic Functions and Modeling			
Use properties of rational and irrational numbers.			
M.A1HS.50	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. Instructional Note: Connect to physical situations (e.g., finding the perimeter of a square of area 2).	The Real Number System	Products and Sums with Rational and Irrational Numbers
Interpret functions that arise in applications in terms of a context.			
M.A1HS.51	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Instructional Note: Focus on quadratic functions; compare with linear and exponential functions studied in the Unit on Linear and Exponential Relationships.	Interpreting Functions	Interpreting Graphs of Linear and Exponential Functions in Context Sketching Graphs of Linear and Exponential Functions from a Context Sketching Graphs of Quadratic Functions in Context
M.A1HS.52	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. Instructional Note: Focus on quadratic functions; compare with linear and exponential functions studied in the Unit on Linear and Exponential Relationships.	Interpreting Functions	Sketching Graphs of Quadratic Functions in Context Understanding the Domain of a Function

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.53	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Instructional Note: Focus on quadratic functions; compare with linear and exponential functions studied in the Unit on Linear and Exponential Relationships.	Interpreting Functions	Rate of Change for Linear and Exponential Functions Sketching Graphs of Quadratic Functions in Context
Analyze functions using different representations.			
M.A1HS.54.A	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	Interpreting Functions	Sketching and Transforming Graphs of Quadratic Functions from Symbolic Representations Sketching Graphs of Linear Functions from Symbolic Representations
M.A1HS.54.B	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	Interpreting Functions	Piecewise, Step, and Absolute Value Functions Radical Functions and Their Graphs
M.A1HS.55.A	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	Building Functions	Writing Quadratic Functions From Their Graphs
		Interpreting Functions	Rewriting Quadratics to Reveal Their Structure
		Seeing Structure in Expressions	Factoring Polynomials
M.A1HS.55.B	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.	Building Functions	Writing Quadratic Functions From Their Graphs
		Interpreting Functions	Rewriting and Interpreting Exponential Functions in Terms of Context

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.56	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. Instructional Note: Highlight issues of domain, range, and usefulness when examining piecewise-defined functions. Extend work with quadratics to include the relationship between coefficients and roots, and that once roots are known, a quadratic equation can be factored.	Interpreting Functions	Comparing Functions Using Different Representations
Build a function that models a relationship between two quantities.			
M.A1HS.57.A	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context.	Building Functions	Writing Quadratic Functions from a Context
M.A1HS.57.B	Write a function that describes a relationship between two quantities. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.	Building Functions	Composite Functions Writing Quadratic Functions from a Context
Build new functions from existing functions.			
M.A1HS.58	Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. Instructional Note: Focus on quadratic functions, and consider including absolute value functions.	Building Functions	Transformations of Graphs of Linear and Exponential Functions
		Interpreting Functions	Sketching and Transforming Graphs of Quadratic Functions from Symbolic Representations

West Virginia CCRS		Imagine Math	
Algebra I		*Unit*	*Lesson*
M.A1HS.59	Find inverse functions. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$. Instructional Note: Focus on linear functions but consider simple situations where the domain of the function must be restricted in order for the inverse to exist, such as $f(x) = x^2$, $x > 0$.	Building Functions	Writing Inverse Functions
Construct and compare linear, quadratic and exponential models and solve problems.			
M.A1HS.60	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. Instructional Note: Compare linear and exponential growth to quadratic growth.	Linear, Quadratic, and Exponential Models	Introduction to Nonlinear Models

Geometry

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
Congruence, Proof and Constructions			
Experiment with transformations in the plane.			
M.GHS.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	Congruence	Defining Basic Geometric Elements
M.GHS.2	Represent transformations in the plane using, for example, transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle).	Congruence	Representing Transformations with Algebra
M.GHS.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle).	Congruence	Rotational and Reflectional Symmetry
M.GHS.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle).	Congruence	Defining Transformations

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
M.GHS.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, for example, graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle)	Congruence	Rigid Motion and Congruence
Understand congruence in terms of rigid motions.			
M.GHS.6	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. Instructional Note: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.	Congruence	Rigid Motion and Congruence
M.GHS.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. Instructional Note: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.	Congruence	What Is Proof?

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
M.GHS.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. Instructional Note: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.	Congruence	Proving Theorems About Congruent Triangles
Prove geometric theorems.			
M.GHS.9	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. Instructional Note: Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words. Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning.	Congruence	Proving Theorems About Lines and Angles What Is Proof?
M.GHS.10	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. Instructional Note: Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words. Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning. Implementation of this standard may be extended to include concurrence of perpendicular bisectors and angle bisectors as preparation for M.GHS.36.	Congruence	Proving Theorems About Congruent Triangles Proving Theorems About Relationships in Triangles
		Similarity, Right Triangles, and Trigonometry	Problem Solving with Congruent Triangles Proving Theorems About Similar Triangles

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
M.GHS.11	Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. Instructional Note: Encourage multiple ways of writing proofs, such as in narrative paragraphs, using flow diagrams, in two-column format, and using diagrams without words. Students should be encouraged to focus on the validity of the underlying reasoning while exploring a variety of formats for expressing that reasoning.	Congruence	Proving Theorems About Parallelograms
Make geometric constructions.			
M.GHS.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. Instructional Note: Build on prior student experience with simple constructions. Emphasize the ability to formalize and explain how these constructions result in the desired objects. Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.	Congruence	Constructing Angles and Special Line Segments
M.GHS.13	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. Instructional Note: Build on prior student experience with simple constructions. Emphasize the ability to formalize and explain how these constructions result in the desired objects. Some of these constructions are close	Congruence	Constructing Inscribed Figures

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
Similarity, Proof, and Trigonometry			
Understand similarity in terms of similarity transformations.			
M.GHS.14.A	Verify experimentally the properties of dilations given by a center and a scale factor. a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.	Similarity, Right Triangles, and Trigonometry	Properties of Dilations II
M.GHS.14.B	Verify experimentally the properties of dilations given by a center and a scale factor. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	Similarity, Right Triangles, and Trigonometry	Properties of Dilations I
M.GHS.15	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	Similarity, Right Triangles, and Trigonometry	Transformations and Similarity
M.GHS.16	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	Similarity, Right Triangles, and Trigonometry	Transformations and Similarity
Prove theorems involving similarity.			
M.GHS.17	Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.	Similarity, Right Triangles, and Trigonometry	Proving Theorems About Congruent Triangles Proving Theorems About Relationships in Triangles Problem Solving with Congruent Triangles Proving Theorems About Similar Triangles
M.GHS.18	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	Similarity, Right Triangles, and Trigonometry	Problem Solving with Transformations and Similarity

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
Define trigonometric ratios and solve problems involving right triangles.			
M.GHS.19	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	Similarity, Right Triangles, and Trigonometry	Similarity and Trigonometric Ratios
M.GHS.20	Explain and use the relationship between the sine and cosine of complementary angles.	Similarity, Right Triangles, and Trigonometry	Sine and Cosine of Complementary Angles
M.GHS.21	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	Geometry	Pythagorean Theorem - Hypotenuse Pythagorean Theorem - Legs Pythagorean Theorem - Mixed Problems
		Similarity, Right Triangles, and Trigonometry	Problem Solving with Similarity and Trigonometric Ratios
Apply trigonometry to general triangles.			
M.GHS.22	Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.	This standard is not addressed.	This standard is not addressed.
M.GHS.23	Prove the Laws of Sines and Cosines and use them to solve problems. Instructional Note: With respect to the general case of the Laws of Sines and Cosines, the definitions of sine and cosine must be extended to obtuse angles.	This standard is not addressed.	This standard is not addressed.
M.GHS.24	Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles. Instructional Note: With respect to the general case of the Laws of Sines and Cosines, the definitions of sine and cosine must be extended to obtuse angles.	Similarity, Right Triangles, and Trigonometry	Law of Sines and Law of Cosine

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
Extending to Three Dimensions			
Explain volume formulas and use them to solve problems.			
M.GHS.25	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. Instructional Note: Informal arguments for area and volume formulas can make use of the way in which area and volume scale under similarity transformations: when one figure in the plane results from another by applying a similarity transformation with scale factor k, its area is k2 times the area of the first. Similarly, volumes of solid figures scale by k3 under a similarity transformation with scale factor k.	Geometric Measurement and Dimension	Understanding Formulas for Curved Figures
M.GHS.26	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. Instructional Note: Informal arguments for area and volume formulas can make use of the way in which area and volume scale under similarity transformations: when one figure in the plane results from another by applying a similarity transformation with scale factor k, its area is k2 times the area of the first. Similarly, volumes of solid figures scale by k3 under a similarity transformation with scale factor k.	Geometry	Volume of Cylinders Volume of Pyramids and Cones Volume of Spheres
Visualize the relation between two dimensional and three-dimensional objects.			
M.GHS.27	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	Geometric Measurement and Dimension	Cross Sections of 3-Dimensional Figures

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
Apply geometric concepts in modeling situations.			
M.GHS.28	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Instructional Note: Focus on situations that require relating two- and three-dimensional objects, determining and using volume, and the trigonometry of general triangles.	Modeling with Geometry	Modeling Objects with Geometric Figures
Connecting Algebra and Geometry Through Coordinates			
Use coordinates to prove simple geometric theorems algebraically.			
M.GHS.29	Use coordinates to prove simple geometric theorems algebraically. (e.g., Prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point (0, 2).	Expressing Geometric Properties with Equations	Coordinates of Parallel and Perpendicular Lines Problem Solving with Coordinates of Parallel and Perpendicular Lines Problem Solving with the Equation of a Circle
M.GHS.30	Prove the slope criteria for parallel and perpendicular lines and uses them to solve geometric problems. (e.g., Find the equation of a line parallel or perpendicular to a given line that passes through a given point.) Instructional Note: Relate work on parallel lines to work in High School Algebra I involving systems of equations having no solution or infinitely many solutions.	Expressing Geometric Properties with Equations	Coordinates of Parallel and Perpendicular Lines
M.GHS.31	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	Expressing Geometric Properties with Equations	Dividing a Segment Proportionally
M.GHS.32	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. This standard provides practice with the distance formula and its connection with the Pythagorean theorem.	Expressing Geometric Properties with Equations	Using Coordinates to Find Perimeters and Areas

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
Translate between the geometric description and the equation for a conic section.			
M.GHS.33	Derive the equation of a parabola given a focus and directrix. Instructional Note: The directrix should be parallel to a coordinate axis.	Expressing Geometric Properties with Equations	Deriving the Equation of a Parabola from Its Definition
Circles With and Without Coordinates			
Understand and apply theorems about circles.			
M.GHS.34	Prove that all circles are similar.	Expressing Geometric Properties with Equations	Equation of a Circle
M.GHS.35	Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	Circles	Tangents, Chords, Radii, and Angles in Circles
M.GHS.36	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	Circles	Quadrilaterals Inscribed in Circles
M.GHS.37	Construct a tangent line from a point outside a given circle to the circle.	Circles	Tangents, Chords, Radii, and Angles in Circles
Find arc lengths and areas of sectors of circles.			
M.GHS.38	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. Instructional Note: Emphasize the similarity of all circles. Reason that by similarity of sectors with the same central angle, arc lengths are proportional to the radius. Use this as a basis for introducing radian as a unit of measure. It is not intended that it be applied to the development of circular trigonometry in this course.	Circles	Radians and Area of Sectors

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
Translate between the geometric description and the equation for a conic section.			
M.GHS.39	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	Expressing Geometric Properties with Equations	Equation of a Circle Problem Solving with the Equation of a Circle
Use coordinates to prove simple geometric theorems algebraically.			
M.GHS.40	Use coordinates to prove simple geometric theorems algebraically. (e.g., Prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point (0, 2).) Instructional Note: Include simple proofs involving circles.	Expressing Geometric Properties with Equations	Coordinates of Parallel and Perpendicular Lines Problem Solving with Coordinates of Parallel and Perpendicular Lines Problem Solving with the Equation of a Circle
Apply geometric concepts in modeling situations.			
M.GHS.41	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Instructional Note: Focus on situations in which the analysis of circles is required.	Modeling with Geometry	Modeling Objects with Geometric Figures
Applications of Probability			
Understand independence and conditional probability and use them to interpret data.			
M.GHS.42	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	Conditional Probability and the Rules of Probability	Organizing Possible Outcomes of Events
M.GHS.43	Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.	Conditional Probability and the Rules of Probability	Understanding Independent and Dependent Events

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
M.GHS.44	Recognize the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. Instructional Note: Build on work with two-way tables from Algebra I to develop understanding of conditional probability and independence.	Conditional Probability and the Rules of Probability	Understanding Conditional Probability
M.GHS.45	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. Instructional Note: Build on work with two-way tables from Algebra I to develop understanding of conditional probability and independence.	Conditional Probability and the Rules of Probability	Modeling Probability Situations Using Two-Way Frequency Tables
M.GHS.46	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.	Conditional Probability and the Rules of Probability	Using Area Models for Compound Probability
Use the rules of probability to compute probabilities of compound events in a uniform probability model.			
M.GHS.47	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.	Conditional Probability and the Rules of Probability	Modeling Probability Situations Using Two-Way Frequency Tables Understanding Conditional Probability
M.GHS.48	Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.	Conditional Probability and the Rules of Probability	Relating Probabilities of Unions and Intersections of Events

West Virginia CCRS		Imagine Math	
Geometry		*Unit*	*Lesson*
M.GHS.49	Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.	This standard is not addressed.	This standard is not addressed.
M.GHS.50	Use permutations and combinations to compute probabilities of compound events and solve problems.	Conditional Probability and the Rules of Probability	Using Area Models for Compound Probability
Use probability to evaluate outcomes of decisions. Instructional Note: This unit sets the stage for work in Algebra II, where the ideas of statistical inference are introduced. Evaluating the risks associated with conclusions drawn from sample data (i.e. incomplete information) requires an understanding of probability concepts.			
M.GHS.51	Use probabilities to make fair decisions (e.g., drawing by lots and/or using a random number generator).	This standard is not addressed.	This standard is not addressed.
M.GHS.52	Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, and/or pulling a hockey goalie at the end of a game).	This standard is not addressed.	This standard is not addressed.
Modeling with Geometry			
Visualize relationships between two dimensional and three-dimensional objects and apply geometric concepts in modeling situations.			
M.GHS.53	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	Modeling with Geometry	Modeling Objects with Geometric Figures
M.GHS.54	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).	This standard is not addressed.	This standard is not addressed.
M.GHS.55	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	Geometry	Volume of Cylinders Volume of Pyramids and Cones Volume of Spheres

Math I

West Virginia College & Career Readiness Standards – Mathematics

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Relationships between Quantities			
Reason quantitatively and use units to solve problems.			
M.1HS.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	Quantities	Using Units to Solve Problems
		Statistics and Probability	Standard Deviation
M.1HS.2	Define appropriate quantities for the purpose of descriptive modeling. Instructional Note: Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.	This standard is not addressed.	This standard is not addressed.
M.1HS.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	Quantities	Using Units to Solve Problems
Interpret the structure of expressions.			
M.1HS.4.A	Interpret expressions that represent a quantity in terms of its context.* a. Interpret parts of an expression, such as terms, factors, and coefficients.	Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions Interpreting the Structure of Quadratic Expressions and Expressions with Rational Exponents
M.1HS.4.B	Interpret expressions that represent a quantity in terms of its context.* b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1 + r)^n$ as the product of P and a factor not depending on P.	Seeing Structure in Expressions	Interpreting the Structure of Linear and Exponential Expressions Interpreting the Structure of Quadratic Expressions and Expressions with Rational Exponents

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Create equations that describe numbers or relationships.			
M.1HS.5	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions and simple rational and exponential functions. Instructional Note: Limit to linear and exponential equations and in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs.	Creating Equations	Modeling Quadratic Relationships with Equations, Inequalities, and Graphs Writing Linear Inequalities in One Variable
M.1HS.6	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. Instructional Note: Limit to linear and exponential equations and in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs.	Creating Equations	Equations of Parallel and Perpendicular Lines Modeling Quadratic Relationships with Equations, Inequalities, and Graphs
		Interpreting Functions	Radical Functions and Their Graphs
M.1HS.7	Represent constraints by equations or inequalities, and by systems of equations and/ or inequalities, and interpret solutions as viable or non-viable options in a modeling context. (e.g., Represent inequalities describing nutritional and cost constraints on combinations of different foods.) Instructional Note: Limit to linear equations and inequalities.	Creating Equations	Writing Linear Inequalities in One Variable
		Reasoning with Equations and Inequalities	Graphing Linear Inequalities and Systems of Linear Inequalities in Real-World Situations
M.1HS.8	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (e.g., Rearrange Ohm's law V = IR to highlight resistance R. Instructional Note: Limit to formulas with a linear focus.	Creating Equations	Modeling Quadratic Relationships with Equations, Inequalities, and Graphs
Linear and Exponential Relationships			
Represent and solve equations and inequalities graphically.			
M.1HS.9	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). Instructional Note: Focus on linear and exponential equations and be able to adapt and apply that learning to other types of equations in future courses.	Building Functions	Writing Quadratic Functions From Their Graphs
		Interpreting Functions	Radical Functions and Their Graphs
		Reasoning with Equations and Inequalities	Solving Exponential Equations Graphically Solving Linear Equations Graphically

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
M.1HS.10	Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value exponential, and logarithmic functions. Instructional Note: Focus on cases where f(x) and g(x) are linear or exponential.	Reasoning with Equations and Inequalities	Solving Exponential Equations Graphically Solving Linear Equations Graphically
M.1HS.11	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality) and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	Reasoning with Equations and Inequalities	Graphing Linear Inequalities and Systems of Linear Inequalities in Real-World Situations
Understand the concept of a function and use function notation.			
M.1HS.12	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). Instructional Note: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of function at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear and exponential functions.	Interpreting Functions	Function Notation I Function Notation II
M.1HS.13	Use function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context. Instructional Note: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of function at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear and exponential functions.	Interpreting Functions	Function Notation I Function Notation II

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
M.1HS.14	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n)+ f(n-1) for n ≥ 1. Instructional Note: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of function at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear and exponential functions. Draw connection to M.1HS.21, which requires students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions.	Interpreting Functions	Sequences as Functions
Interpret functions that arise in applications in terms of the context.			
M.1HS.15	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Instructional Note: Focus on linear and exponential functions.	Interpreting Functions	Interpreting Graphs of Linear and Exponential Functions in Context Sketching Graphs of Quadratic Functions in Context
M.1HS.16	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (e.g., If the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.) Instructional Note: Focus on linear and exponential functions.	Interpreting Functions	Sketching Graphs of Quadratic Functions in Context Understanding the Domain of a Function

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
M.1HS.17	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Instructional Note: Focus on linear functions and intervals for exponential functions whose domain is a subset of the integers. Mathematics II and III will address other function types.	Interpreting Functions	Rate of Change for Linear and Exponential Functions Sketching Graphs of Quadratic Functions in Context
Analyze functions using different representations.			
M.1HS.18.A	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima.	Interpreting Functions	Sketching and Transforming Graphs of Quadratic Functions from Symbolic Representations Sketching Graphs of Linear Functions from Symbolic Representations
M.1HS.18.B	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	Interpreting Functions	Introduction to Logarithms Sketching Graphs of Exponential Functions from Symbolic Representations
M.1HS.19	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (e.g., Given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.) Instructional Note: Focus on linear and exponential functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as $y = 3^n$ and $y = 100 \cdot 2^n$.	Interpreting Functions	Comparing Functions Using Different Representations

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Build a function that models a relationship between two quantities.			
M.1HS.20.A	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process or steps for calculation from a context.	Building Functions	Writing Linear and Exponential Functions from a Context
M.1HS.20.B	Write a function that describes a relationship between two quantities. b. Combine standard function types using arithmetic operations. (e.g., Build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.)	Building Functions	Composite Functions Writing Quadratic Functions from a Context
M.1HS.21	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. Instructional Note: Limit to linear and exponential functions. Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.	Building Functions	Writing Arithmetic Sequences Explicitly and Recursively Writing Geometric Sequences Recursively Writing Geometric Sequences Using an Explicit Formula
Build new functions from existing functions.			
M.1HS.22	Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. Instructional Note: Focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard.	Building Functions	Transformations of Graphs of Linear and Exponential Functions
		Interpreting Functions	Sketching and Transforming Graphs of Quadratic Functions from Symbolic Representations

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Construct and compare linear, quadratic, and exponential models and solve problems.			
M.1HS.23.A	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals; exponential functions grow by equal factors over equal intervals.	Linear, Quadratic, and Exponential Models	Distinguishing Between Linear and Exponential Relationships
M.1HS.23.B	Distinguish between situations that can be modeled with linear functions and with exponential functions. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.	Linear, Quadratic, and Exponential Models	Distinguishing Between Linear and Exponential Relationships
M.1HS.23.C	Distinguish between situations that can be modeled with linear functions and with exponential functions. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	Linear, Quadratic, and Exponential Models	Distinguishing Between Linear and Exponential Relationships
M.1HS.24	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).	Linear, Quadratic, and Exponential Models	Writing Linear and Exponential Functions Based on Different Representations
M.1HS.25	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. Instructional Note: Limit to comparisons between exponential and linear models.	Linear, Quadratic, and Exponential Models	Introduction to Nonlinear Models
Interpret expressions for functions in terms of the situation they model.			
M.1HS.26	Interpret the parameters in a linear or exponential function in terms of a context. Instructional Note: Limit exponential functions to those of the form $f(x) = b^x + k$.	Interpreting Functions	Rewriting and Interpreting Exponential Functions in Terms of Context

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Reasoning with Equations			
Understand solving equations as a process of reasoning and explain the reasoning.			
M.1HS.27	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. Instructional Note: Students should focus on linear equations and be able to extend and apply their reasoning to other types of equations in future courses. Students will solve exponential equations with logarithms in Mathematics III.	Reasoning with Equations and Inequalities	Solving Linear Equations in One Variable as a Reasoning Process
Solve equations and inequalities in one variable.			
M.1HS.28	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. Instructional Note: Extend earlier work with solving linear equations to solving linear inequalities in one variable and to solving literal equations that are linear in the variable being solved for. Include simple exponential equations that rely only on application of the laws of exponents, such as $5^x = 125$ or $2^x = 1/16$.	Reasoning with Equations and Inequalities	Solving Linear Equations in One Variable as a Reasoning Process Solving Linear Inequalities in One Variable
Solve systems of equations.			
M.1HS.29	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. Instructional Note: Build on student experiences graphing and solving systems of linear equations from middle school to focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to M.1HS.50, which requires students to prove the slope criteria for parallel lines.	Reasoning with Equations and Inequalities	Solving Systems of Linear Equations

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
M.1HS.30	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. Instructional Note: Build on student experiences graphing and solving systems of linear equations from middle school to focus on justification of the methods used. Include cases where the two equations describe the same line (yielding infinitely many solutions) and cases where two equations describe parallel lines (yielding no solution); connect to M.1HS.50, which requires students to prove the slope criteria for parallel lines.	Reasoning with Equations and Inequalities	Solving Systems of Linear Equations
Descriptive Statistics			
Summarize, represent, and interpret data on a single count or measurement variable.			
M.1HS.31	Represent data with plots on the real number line (dot plots, histograms, and box plots).	Statistics and Probability	Box Plots
M.1HS.32	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. Instructional Note: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.	Interpreting Categorical and Quantitative Data	Comparing the Shape, Center, and Spread of Data Sets
M.1HS.33	Interpret differences in shape, center and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). Instructional Note: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.	Interpreting Categorical and Quantitative Data	Comparing the Shape, Center, and Spread of Data Sets
		Statistics and Probability	Measures of Center - Mean Measures of Center - Median Measures of Spread - Range

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Summarize, represent, and interpret data on two categorical and quantitative variables.			
M.1HS.34	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data.	Interpreting Categorical and Quantitative Data	Summarizing and Interpreting Categorical Data
M.1HS.35.A	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.	Interpreting Categorical and Quantitative Data	Fitting Functions to Data
M.1HS.35.B	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. b. Informally assess the fit of a function by plotting and analyzing residuals. (Focus should be on situations for which linear models are appropriate.)	Interpreting Categorical and Quantitative Data	Fitting Functions to Data
M.1HS.35.C	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. c. Fit a linear function for scatter plots that suggest a linear association.	Interpreting Categorical and Quantitative Data	Fitting Functions to Data
Interpret linear models.			
M.1HS.36	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. Instructional Note: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship.	Interpreting Categorical and Quantitative Data	Correlation

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
M.1HS.37	Compute (using technology) and interpret the correlation coefficient of a linear fit. Instructional Note: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship.	This standard is not addressed.	This standard is not addressed.
M.1HS.38	Distinguish between correlation and causation. Instructional Note: The important distinction between a statistical relationship and a cause-and-effect relationship arises here.	Interpreting Categorical and Quantitative Data	Correlation
Congruence, Proof, and Constructions			
Experiment with transformations in the plane.			
M.1HS.39	Know precise definitions of angle, circle, perpendicular line, parallel line and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	Congruence	Defining Basic Geometric Elements
M.1HS.40	Represent transformations in the plane using, for example, transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle).	Congruence	Representing Transformations with Algebra

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
M.1HS.41	Given a rectangle, parallelogram, trapezoid or regular polygon, describe the rotations and reflections that carry it onto itself. Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle).	Congruence	Rotational and Reflectional Symmetry
M.1HS.42	Develop definitions of rotations, reflections and translations in terms of angles, circles, perpendicular lines, parallel lines and line segments. Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle).	Congruence	Defining Transformations
M.1HS.43	Given a geometric figure and a rotation, reflection or translation draw the transformed figure using, e.g., graph paper, tracing paper or geometry software. Specify a sequence of transformations that will carry a given figure onto another. Instructional Note: Build on student experience with rigid motions from earlier grades. Point out the basis of rigid motions in geometric concepts, (e.g., translations move points a specified distance along a line parallel to a specified line; rotations move objects along a circular arc with a specified center through a specified angle).	Congruence	Rigid Motion and Congruence

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Understand congruence in terms of rigid motions.			
M.1HS.44	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. Instructional Note: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.	Congruence	Rigid Motion and Congruence
M.1HS.45	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. Instructional Note: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.	Congruence	What Is Proof?
M.1HS.46	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. Instructional Note: Rigid motions are at the foundation of the definition of congruence. Students reason from the basic properties of rigid motions (that they preserve distance and angle), which are assumed without proof. Rigid motions and their assumed properties can be used to establish the usual triangle congruence criteria, which can then be used to prove other theorems.	Congruence	Proving Theorems About Congruent Triangles

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
Make geometric constructions.			
M.1HS.47	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. Instructional Note: Build on prior student experience with simple constructions. Emphasize the ability to formalize and defend how these constructions result in the desired objects. Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.	Congruence	Constructing Angles and Special Line Segments
M.1HS.48	Construct an equilateral triangle, a square and a regular hexagon inscribed in a circle. Instructional Note: Build on prior student experience with simple constructions. Emphasize the ability to formalize and defend how these constructions result in the desired objects. Some of these constructions are closely related to previous standards and can be introduced in conjunction with them.	Congruence	Constructing Inscribed Figures
Connecting Algebra and Geometry through Coordinates			
Use coordinates to prove simple geometric theorems algebraically.			
M.1HS.49	Use coordinates to prove simple geometric theorems algebraically. (e.g., Prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point (0, 2).) Instructional Note: Reasoning with triangles in this unit is limited to right triangles (e.g., derive the equation for a line through two points using similar right triangles).	Expressing Geometric Properties with Equations	Coordinates of Parallel and Perpendicular Lines Problem Solving with Coordinates of Parallel and Perpendicular Lines Problem Solving with the Equation of a Circle

West Virginia CCRS		Imagine Math	
Math I		*Unit*	*Lesson*
M.1HS.50	Prove the slope criteria for parallel and perpendicular lines; use them to solve geometric problems. (e.g., Find the equation of a line parallel or perpendicular to a given line that passes through a given point.) Instructional Note: Reasoning with triangles in this unit is limited to right triangles (e.g., derive the equation for a line through two points using similar right triangles). Relate work on parallel lines to work on M.1HS.29 involving systems of equations having no solution or infinitely many solutions.	Expressing Geometric Properties with Equations	Coordinates of Parallel and Perpendicular Lines
M.1HS.51	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, (e.g., using the distance formula). Instructional Note: Reasoning with triangles in this unit is limited to right triangles (e.g., derive the equation for a line through two points using similar right triangles). This standard provides practice with the distance formula and its connection with the Pythagorean theorem.	Expressing Geometric Properties with Equations	Using Coordinates to Find Perimeters and Areas