

**Virginia Grade 8 Essential Knowledge and Skills Correlated to  
Glencoe Mathematics: Applications and Concepts, Course 3**

<p><b>STRAND: NUMBER AND NUMBER SENSE</b>  <b>STANDARD 8.1</b> The student will</p> <p>a) simplify numerical expressions involving positive exponents, using rational numbers, order of operations, and properties of operations with real numbers;  b) recognize, represent, compare, and order rational numbers expressed in scientific notation; and  c) compare and order decimals, fractions, percents, and numbers written in scientific notation.</p>		<p><b>MAC 3 Lesson(s)</b>  <b>1-2, 2-8</b></p>
<p><b>ESSENTIAL UNDERSTANDINGS</b></p> <p><b>All students should</b></p> <ul style="list-style-type: none"> <li>Understand that any real number can be shown on a number line.</li> <li>Understand that integers, positive and negative fractions, and positive and negative decimals are rational numbers.</li> <li>Understand that an expression is like a phrase in that it has no equal sign.</li> <li>Understand that the order of operations describes the order to use to compute with rational numbers.</li> <li>Understand that numbers can be represented as decimals, fractions, percents, and in scientific notation.</li> <li>Understand and use strategies to simplify expressions and to compare and order numbers.</li> </ul>		<p><b>ESSENTIAL KNOWLEDGE AND SKILLS</b></p> <p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> <li>Simplify numerical expressions containing exponents where the base is a rational number and the exponent is a positive whole number, using the order of operations and properties of operations with real numbers.</li> <li>Recognize, represent, compare, and order rational numbers expressed in scientific notation, using both positive and negative exponents.</li> <li>Compare and order fractions, decimals, percents, and numbers written in scientific notation.</li> </ul>
<p><b>STANDARD 8.2</b> The student will describe orally and in writing the relationship between the subsets of the real number system.</p> <p><b>ESSENTIAL UNDERSTANDINGS</b></p> <p><b>All students should</b></p> <ul style="list-style-type: none"> <li>Understand the relationship between the subsets of the real number system.</li> </ul>		<p><b>MAC 3 Lesson(s)</b>  <b>3-3</b></p>
<p><b>ESSENTIAL KNOWLEDGE AND SKILLS</b></p> <p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> <li>Describe orally and in writing the relationships among the sets of Natural or Counting Numbers, Whole Numbers, Integers, Rational Numbers, Irrational Numbers, and Real Numbers.</li> <li>Illustrate the relationships among the subsets of the real number system by using graphic organizers such as Venn diagrams. Subsets include real numbers, rational numbers, irrational numbers, integers, whole numbers, and natural numbers.</li> <li>Identify the subsets of the real number system to which a given number belongs.</li> <li>Determine whether a given number is a member of a particular subset of the real number system, and explain why.</li> <li>Describe each subset of the set of real numbers.</li> </ul>		<p><b>MAC 3 Lesson(s)</b>  <b>3-3</b></p>

<b>STRAND: COMPUTATION AND ESTIMATION</b>			
<b>STANDARD 8.3 The student will solve practical problems involving rational numbers, percents, ratios, and proportions. Problems will be of varying complexities and will involve real-life data, such as finding a discount and balancing a checkbook.</b>			
<b>ESSENTIAL UNDERSTANDINGS</b>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC 3 Lesson(s)</b>	
All students should	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	Everywhere	
<ul style="list-style-type: none"> <li>Understand how mathematics relates to problems in daily life.</li> <li>Select an appropriate method or methods for computing with rational numbers and percents according to the context of the problem.</li> <li>Understand how to set up a proportion given the relationship between two items.</li> </ul>	<ul style="list-style-type: none"> <li>Solve practical problems by using computation procedures for whole numbers, integers, rational numbers, percents, ratios, and proportions.</li> <li>Maintain a checkbook and check registry for five or fewer transactions.</li> <li>Compute a discount and the resulting (sale) price for one discount.</li> </ul>	1-4 5-6, 5-7	
<b>STANDARD 8.4 The student will apply the order of operations to evaluate algebraic expressions for given replacement values of the variables. Problems will be limited to positive exponents.</b>			
<b>ESSENTIAL UNDERSTANDINGS</b>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC 3 Lesson(s)</b>	
All students should	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	1-2, 1-3, 1-4, 1-5, 1-6, 2-3	
<ul style="list-style-type: none"> <li>Evaluate an algebraic expression by substituting a number for each variable and then simplifying the result.</li> <li>Understand how to apply the order of operations after substituting given values for variables in algebraic expressions.</li> </ul>	<ul style="list-style-type: none"> <li>Substitute numbers for variables in an algebraic expression and simplify the expression by using the order of operations. Exponents used are whole numbers less than 4.</li> <li>Apply the order of operations to evaluate formulas.</li> </ul>	3-4, 3-5, 3-6, 5-8, 5-8b, 7-1, 7-2, 7-3, 7-5, 7-6, 7-7, 7-8	
<b>STANDARD 8.5 The student, given a whole number from 0 to 100, will identify it as a perfect square or find the two consecutive whole numbers between which the square root lies.</b>			
<b>ESSENTIAL UNDERSTANDINGS</b>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC 3 Lesson(s)</b>	
All students should	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	3-1	
<ul style="list-style-type: none"> <li>Understand that a perfect square is the product of a number multiplied by itself.</li> <li>Develop strategies for finding the square root of a number.</li> </ul>	<ul style="list-style-type: none"> <li>Identify the perfect squares from 0 to 100.</li> <li>Identify the two consecutive whole numbers between which the square root of a given whole number from 0 to 100 lies (e.g., <math>\sqrt{57}</math> lies between 7 and 8 since <math>7^2 = 49</math> and <math>8^2 = 64</math>).</li> </ul>	3-2	
<b>STRAND: MEASUREMENT</b>			
<b>STANDARD 8.6 The student will verify by measuring and describe the relationships among vertical angles, supplementary angles, and complementary angles and will measure and draw angles of less than <math>360^\circ</math>.</b>			
<b>ESSENTIAL UNDERSTANDINGS</b>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC 3 Lesson(s)</b>	
All students should	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	Prerequisite Skills	
<ul style="list-style-type: none"> <li>Understand the meaning of the term <i>angle</i>.</li> <li>Understand how to use angle-measuring tools.</li> </ul>	<ul style="list-style-type: none"> <li>Measure angles of less than <math>360^\circ</math> to the nearest degree, using appropriate tools.</li> <li>Identify and describe the relationships among the angles formed by two intersecting lines.</li> <li>Identify and describe pairs of angles that are vertical.</li> </ul>	6-1 6-1	

<ul style="list-style-type: none"> <li>Understand that pairs of angles are named by their defining attributes.</li> </ul>	<ul style="list-style-type: none"> <li>Identify and describe pairs of angles that are supplementary.</li> <li>Identify and describe pairs of angles that are complementary.</li> </ul>	6-1
<b>STANDARD 8.7 The student will investigate and solve practical problems involving volume and surface area of rectangular solids (prisms), cylinders, cones, and pyramids.</b>		
<b>ESSENTIAL UNDERSTANDINGS</b>		
<b>All students should</b> <ul style="list-style-type: none"> <li>Understand the derivation of formulas for volume and surface area of prisms, cylinders, cones, and pyramids.</li> <li>Understand the differences between volume and surface area.</li> </ul>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b> <b>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</b> <ul style="list-style-type: none"> <li>Compute the surface area of a pyramid by finding the sum of the areas of the triangular faces and the base.</li> <li>Compute the surface area of a cone by calculating the sum of the areas of the side and the base, using formulas.</li> <li>Compute the volume and surface area of rectangular solids (prisms), cylinders, cones, and square pyramids, using formulas.</li> <li>Investigate and solve problems involving volume and surface area of rectangular solids (prisms), cylinders, cones and pyramids.</li> </ul>	MAC 3 Lesson(s) 7-8
<b>STRAND: GEOMETRY</b>		
<b>STANDARD 8.8 The student will apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures represented on graph paper. The student will identify applications of transformations, such as tiling, fabric design, art, and scaling.</b>		
<b>ESSENTIAL UNDERSTANDINGS</b>		
<b>All students should</b> <ul style="list-style-type: none"> <li>Understand the relationship between transformations in a coordinate plane and their application in real-life.</li> </ul>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b> <b>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</b> <ul style="list-style-type: none"> <li>Identify the geometric transformations (rotation, reflection, translation, and dilation) by using a variety of real-life examples.</li> <li>Demonstrate the reflection of a figure over a vertical or horizontal line on a coordinate grid.</li> <li>Demonstrate <math>90^\circ</math>, <math>180^\circ</math>, <math>270^\circ</math>, and <math>360^\circ</math> rotations of a figure on a coordinate grid.</li> <li>Demonstrate the translation of a figure on a coordinate grid.</li> <li>Demonstrate the dilation of a figure from a fixed point on a coordinate grid.</li> </ul>	MAC 3 Lesson(s) 4-8, 6-7, 6-8, 6-9
<b>STANDARD 8.9 The student will construct a three-dimensional model, given the top, side, and/or bottom views.</b>		
<b>ESSENTIAL UNDERSTANDINGS</b>		
<b>All students should</b> <ul style="list-style-type: none"> <li>Understand that a three-dimensional object can be represented as a two-dimensional model that represents views of the object from different perspectives.</li> </ul>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b> <b>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</b> <ul style="list-style-type: none"> <li>Construct three-dimensional models, given top, side, and bottom views.</li> </ul>	7-4
<b>STANDARD 8.10 The student will</b> <ol style="list-style-type: none"> <li>verify the Pythagorean Theorem, using diagrams, concrete materials, and measurement; and</li> <li>apply the Pythagorean Theorem to find the missing length of a side of a right triangle when given the lengths of the other two sides.</li> </ol>		
<b>ESSENTIAL UNDERSTANDINGS</b>		
<b>All students should</b> <ul style="list-style-type: none"> <li>Understand that, for a right triangle, the</li> </ul>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b> <b>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</b> <ul style="list-style-type: none"> <li>Identify the parts of a right triangle (the hypotenuse and the legs).</li> </ul>	MAC 3 Lesson(s) 3-4

<p>square of the measure of the hypotenuse equals the sum of the squares of the measures of the base and altitude.</p> <ul style="list-style-type: none"> <li>Understand that the Pythagorean Theorem is a tool to find the measure of any side of a right triangle, given the measures of the other two sides.</li> </ul>	<ul style="list-style-type: none"> <li>Verify the Pythagorean Theorem, using diagrams, concrete materials, and measurement.</li> <li>Find the measure of a side of a right triangle, given the measures of the other two sides. The measures of the sides of the triangle may be whole numbers no larger than 15 or decimals in tenths.</li> <li>Solve real-life problems involving right triangles by using the Pythagorean Theorem.</li> </ul>	<p><b>3-4, 3-5</b></p> <p><b>3-4, 3-5</b></p> <p>3-4, 3-5</p>
<p><b>STRAND: PROBABILITY AND STATISTICS</b>  <b>STANDARD 8.11</b> The student will analyze problem situations, including games of chance, board games, or grading scales, and make predictions, using knowledge of probability.</p>		
<p><b>ESSENTIAL UNDERSTANDINGS</b></p>		
<p>All students should</p> <ul style="list-style-type: none"> <li>Understand how to make predictions based on knowledge of probability.</li> <li>Understand that choices that involve chance are based on an understanding of the reasonableness of obtaining a specific outcome.</li> <li>Understand that knowledge of probability can be used to determine the likelihood of winning such events as contests.</li> </ul>	<p><b>ESSENTIAL KNOWLEDGE AND SKILLS</b></p> <p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> <li>Analyze a problem situation, and determine the likelihood of an event occurring, using knowledge of probability.</li> <li>Predict the outcome of an event by analyzing its probability.</li> <li>Explain the consequences of making different choices, using knowledge of probability.</li> <li>Make predictions about the outcomes of games of chance, board games, and grading scales by using knowledge of probability.</li> </ul>	<p><b>MAC 3 Lesson(s)</b></p> <p>8-1</p> <p><b>8-1, 8-5, 8-6, 8-7</b>  <b>8-2, 8-3, 8-4</b></p> <p>8-1, 8-5, 8-6, <b>8-6b</b>, 8-7</p>
<p><b>STANDARD 8.12</b> The student will make comparisons, predictions, and inferences, using information displayed in frequency distributions; box-and-whisker plots; scattergrams; line, bar, circle, and picture graphs; and histograms.</p>		
<p><b>ESSENTIAL UNDERSTANDINGS</b></p>		
<p>All students should</p> <ul style="list-style-type: none"> <li>Understand that comparisons, predictions, and inferences are made by examining characteristics of a data set displayed in a variety of graphical representations in order to draw conclusions.</li> </ul>	<p><b>ESSENTIAL KNOWLEDGE AND SKILLS</b></p> <p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> <li>Make comparisons, predictions, and inferences, given data sets of no more than 20 items that are displayed in frequency distributions; box-and-whisker plots; scattergrams; line, bar, circle, and picture graphs; and histograms.</li> </ul>	<p><b>MAC 3 Lesson(s)</b></p> <p><b>9-1, 9-1b, 9-2, 9-3, 9-4, 9-6, 9-7, 11-6, 11-6b,</b>  <b>Prerequisite Skills</b></p>
<p><b>STANDARD 8.13</b> The student will use a matrix to organize and describe data.</p>		
<p><b>ESSENTIAL UNDERSTANDINGS</b></p>		
<p>All students should</p> <ul style="list-style-type: none"> <li>Understand that a matrix is a rectangular array of numbers in rows and columns that organizes a data set visually.</li> </ul>	<p><b>ESSENTIAL KNOWLEDGE AND SKILLS</b></p> <p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> <li>Describe the characteristics of a matrix, including designating labels for rows and columns.</li> <li>Use a matrix of no more than 12 entries to organize and describe a data set.</li> <li>Identify the position of an element by row and column.</li> <li>Transfer data from a chart to a matrix.</li> </ul>	<p><b>MAC 3 Lesson(s)</b></p> <p><b>9-8</b></p> <p><b>9-8</b></p> <p><b>9-8</b></p>
<p><b>STRAND: PATTERNS, FUNCTIONS, AND ALGEBRA</b></p>		

<b>STANDARD 8.14</b> The student will a) describe and represent relations and functions, using tables, graphs, and rules; and b) relate and compare tables, graphs, and rules as different forms of representation for relationships.		<b>MAC 3 Lesson(s)</b>
<b>ESSENTIAL UNDERSTANDINGS</b>	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC 3 Lesson(s)</b>
<b>All students should</b>	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	11-3a, 11-3
<ul style="list-style-type: none"> <li>Understand the difference between functions and relations.</li> <li>Understand that a function is a one-to-one relationship between the domain and range.</li> </ul>	<ul style="list-style-type: none"> <li>Graph in a coordinate plane ordered pairs that represent a relation.</li> <li>Write a rule that represents a relation from a table of values.</li> <li>Write a table of values from the rule that represents a relation.</li> <li>Write a table of values from the graph of ordered pairs of a relation.</li> <li>Describe and represent relations and functions, using tables, graphs, and rules.</li> <li>Relate and compare different representations of the same relation.</li> </ul>	11-3 11-2 11-3 11-2, 11-3 11-2, 11-3
<b>STANDARD 8.15</b> The student will solve two-step equations and inequalities in one variable, using concrete materials, pictorial representations, and paper and pencil.	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC 3 Lesson(s)</b>
<b>All students should</b>	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	10-2
<ul style="list-style-type: none"> <li>Understand that an operation that is performed on one side of an equation must be performed on the other side to maintain equality.</li> <li>Understand the procedures for solving inequalities.</li> <li>Understand that when both expressions are multiplied or divided by a negative number, the inequality symbol reverses.</li> </ul>	<ul style="list-style-type: none"> <li>Solve two-step linear equations by showing the steps and using algebraic sentences.</li> <li>Solve two-step inequalities by showing the steps and using algebraic sentences.</li> </ul>	10-7
<b>STANDARD 8.16</b> The student will graph a linear equation in two variables, in the coordinate plane, using a table of ordered pairs.	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC3 Lesson(s)</b>
<b>All students should</b>	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	11-3
<ul style="list-style-type: none"> <li>Understand that the graph of a linear equation in two variables is the set of all ordered pairs that satisfy the equation.</li> </ul>	<ul style="list-style-type: none"> <li>Construct a table of ordered pairs by substituting values for <math>x</math> in a linear equation to find values for <math>y</math>.</li> <li>Plot in the coordinate plane ordered pairs <math>(x, y)</math> from a table.</li> <li>Connect the ordered pairs to form a straight line.</li> </ul>	11-3 11-3
<b>STANDARD 8.17</b> The student will create and solve problems, using proportions, formulas, and functions.	<b>ESSENTIAL KNOWLEDGE AND SKILLS</b>	<b>MAC 3 Lesson(s)</b>
<b>All students should</b>	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to	4-1, 4-2, 4-2b, 4-3, 4-4, 4-5, 4-6, 4-7, 4-7b
<ul style="list-style-type: none"> <li>Understand that proportions, formulas, and functions are ways to express relationships mathematically and are tools for solving problems.</li> </ul>	<ul style="list-style-type: none"> <li>Write problems that require establishing a relationship between ratios.</li> <li>Solve problems by using proportions.</li> <li>Create problems that require the use of a formula.</li> </ul>	4-4, 4-5, 4-6, 4-7 3-5, 5-8, 7-1, 7-2, 7-3, 7-5, 7-6

	<ul style="list-style-type: none"> <li>Substitute known values for variables in a formula.</li> <li>Solve a formula by using algebraic procedures.</li> <li>Create problems that involve a functional relationship.</li> <li>Solve problems that involve functions.</li> </ul>	<p>Everywhere</p> <p>Everywhere</p> <p>11-2</p> <p>11-2, 11-3a, 11-3</p>
<p><b>STANDARD 8.18 The student will use the following algebraic terms appropriately: domain, range, independent variable, and dependent variable.</b></p>		
<p><b>ESSENTIAL UNDERSTANDINGS</b></p>		
<p><b>All students should</b></p> <ul style="list-style-type: none"> <li>Understand that the domain represents all the values for the independent variables and the range represents all the values for the dependent variables.</li> <li>Understand that the independent variable is the value that causes the change in the dependent variable and the dependent variable is affected by the independent variable.</li> </ul>	<p><b>ESSENTIAL KNOWLEDGE AND SKILLS</b></p> <p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> <li>Apply the following algebraic terms appropriately: <i>domain, range, independent variable, and dependent variable.</i></li> <li>Identify examples of domain, range, independent variable, and dependent variable.</li> <li>Determine the domain of a function.</li> <li>Determine the range of a function.</li> <li>Determine the independent variable of a relationship.</li> <li>Determine the dependent variable of a relationship.</li> </ul>	<p>MAC 3 Lesson(s)</p> <p>11-2</p> <p>11-2</p> <p>Glencoe Algebra 1 4-6</p> <p>Glencoe Algebra 1 4-6</p> <p>Glencoe Algebra 1 1-8</p> <p>Glencoe Algebra 1 1-8</p>