

CCSU Comprehensive Curriculum for Math

Grade Level 8

Power Standard #1 – Numbers and Operations: Students understand value and apply properties and operations of numbers. (Aligns with Vermont Standard 7.6)

Power Standard #2 – Geometric Figures: Students know and apply the attributes of geometric figures. (Aligns with Vermont Standard 7.7)

Power Standard #3 – Units of Measure: Students know and use units of measure. (Aligns with Vermont Standard 7.7)

Power Standard #4 – Patterns, Equations, and Inequalities: Students identify and extend patterns to express relationships between and among variables, and solve equations and inequalities. (Aligns with Vermont Standard 7.8)

Power Standard #5 – Data: Students represent, interpret, and predict using data. (Aligns with Vermont Standard 7.9)

Power Standard #6 – Probability: Students find probability theoretically and experimentally. (Aligns with Vermont Standard 7.9)

Power Standard #7 – Problem Solving: Students use a variety of approaches to solve problems and communicate solutions. (Aligns with Vermont Standard 7.10)

Grade Level 8, Power Standard 1

CCSU Power Standard #1: Students understand value and apply properties and operations of numbers. (Aligns with Vermont Standard 7.6)

Concepts to Emphasize: Cubed Numbers, Cube Roots, Order of Operations

Aligns with Vermont Standards	Vermont Grade Cluster Expectations <i>Competency Focus</i>	Learning Opportunities	CCSU Power Indicators <i>Proficiency Focus</i>
7.6	M8: 1 Demonstrates conceptual understanding of rational numbers with respect to <u>percents</u> as a way of describing change (percent increase and <u>decrease</u>) using explanations, models, or other representations.	Learning Opportunities: Supplemental Materials	Demonstrate understanding of percent of change (percent increase and decrease) (1a)
	M8: 2 Demonstrates understanding of the relative magnitude of numbers by ordering or comparing rational numbers, <u>common irrational numbers</u> ($\sqrt{2}$, and π), numbers with whole-number or <u>fractional bases</u> and whole-number exponents, <u>square roots</u> , absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols.	Learning Opportunities: <i>Looking for Pythagoras:</i> Inv. 3, 4, 5 Supplemental materials for fractional bases	Compare common irrational numbers (1b)
	M8: 3 No M8: 3 at this grade level		

	<p>M8: 4 Accurately solves problems involving proportional reasoning (<u>percent increase or decrease, interest rates, markups, or rates</u>); and <u>squares, cubes and taking square or cube roots.</u></p> <p>(IMPORTANT: <i>Applies the conventions of order of operations.</i>)</p>	<p>Learning Opportunities: <i>CMP: Looking for Pythagoras:</i> square and roots <i>Growing, Growing, Growing:</i> cube roots. Supplemental materials for interest rates and percent markup, increase and decrease</p>	<p>Demonstrate understanding of percent of change (percent increase and decrease) (1a)</p>
	<p>M8: 5 No M8: 5 at this grade level</p>		
	<p>M8: 6 No M8: 6 at this grade level</p>		
	<p>M8: 7 Estimates and evaluates the reasonableness of solutions appropriate to grade level.</p>	<p>Learning Opportunities: Teacher models estimation/mental math Require students to show evidence of checking for reasonableness of solutions</p>	
	<p>M8: 8 Applies properties of numbers (greatest common factor [GCF], least common multiple [LCM], prime factorization, divisibility, inverses, and identities), and commutative, distributive, and associative properties of operations to solve problems and to simplify computations.</p>	<p>Learning Opportunities: <i>CMP: Say It with Symbols:</i> Inv. 2 and 3 Key to Algebra 2 Skills work</p>	<p>Use the distributive property to compare two expressions (4d)</p>

Grade Level 8, Power Standard 2

CCSU Power Standard #2: Students know and apply the attributes of geometric figures. (Aligns with Vermont Standard 7.7)

Concepts to Emphasize: Pythagorean Theorem, Similar Triangles

Aligns with Vermont Standards	Vermont Grade Cluster Expectations <i>Competency Focus</i>	Learning Opportunities	CCSU Power Indicators <i>Proficiency Focus</i>
7.7	M8: 9 <u>Models situations geometrically. Uses properties and attributes of lines, angles, and two-and three-dimensional shapes) to formulate and solve problems.</u>	Learning Opportunities: Supplemental materials	
	M8: 10 <u>Applies the Pythagorean Theorem to find a missing side of a right triangle, or in problem-solving situations and solves problems by applying the Triangle Inequality Theorem to determine if three line segments with given lengths form a triangle, and the sum of the angles in a convex polygon of any number of sides.</u>	Learning Opportunities: <i>CMP: Looking for Pythagoras: Inv. 1, 2, 3</i>	Apply Pythagorean Theorem to find the length of a side of a right triangle (2a)
	M8: 11 No M8: 11 at this grade level		
	M8: 12 No M8: 12 at this grade level		

	<p>M8: 13 Applies concepts of similarity to determine the impact of scaling on the volume or surface area of three- dimensional figures when linear dimensions are multiplied by a constant factor; to determine the length of sides of similar triangles, or to solve problems involving growth and rate and makes scale drawings.</p>	<p>Learning Opportunities <i>CMP 7: Comparing and Scaling</i></p>	<p>Apply properties of similarity: scale factor’s effect on volume and surface area (2b)</p> <p>Apply proportional reasoning to find side lengths in similar Triangles (2c)</p>
	<p>M8: 14 Demonstrates conceptual understanding of surface area or volume by solving problems involving surface area and volume of rectangular prisms, cylinders, or pyramids. Expresses all measures using appropriate units.</p>	<p>Learning Opportunities <i>CMP: Filling and Wrapping: Inv. 1-4 (completed in 7th grade)</i> Supplemental materials for pyramids</p>	<p>Find volume and surface area of pyramids (2d)</p>
	<p>M8: 16 No M8: 16 at this grade level</p>		
	<p>M8: 17 Sketches a variety of three-dimensional objects using orthogonal views (projections and isometric views), or constructs¹ or accurately represents angle bisector, perpendicular bisector, congruent segments and regular polygons. Draws nets of three-dimensional shapes.</p> <p>¹ Construct—to draw a figure without measuring devices, using only a straight-edge and compass.</p> <p>“Accurately represents” may include, for example, folding paper, using a protractor.</p>	<p>Learning Opportunities: Supplemental materials</p>	
	<p>M8: 18 No M8: 18 at this grade level</p>		

Grade Level 8, Power Standard 3

CCSU Power Standard #3: Students know and use units of measure. (Aligns with Vermont Standard 7.7)

Concepts to Emphasize: Conversions

Aligns with Vermont Standards	Vermont Grade Cluster Expectations <i>Competency Focus</i>	Learning Opportunities	CCSU Power Indicators <i>Proficiency Focus</i>
7.7	M8: 15 Measures and uses units of measures appropriately and consistently when solving problems across the content strands. Makes conversions within <u>or across</u> systems. (See Appendix B for benchmark units and equivalences for each grade.)	<i>Learning Opportunities:</i> Supplemental materials	Convert units across systems given conversion factors and formulas (3a)

Grade Level 8, Power Standard 4

CCSU Power Standard #4: Students identify and extend patterns to express relationships between and among variables and solves equations and inequalities. (Aligns with Vermont Standard 7.8)

Concepts to Emphasize: Y-intercept, Non-linear, Formula

Aligns with Vermont Standards	Vermont Grade Cluster Expectations <i>Competency Focus</i>	Learning Opportunities	CCSU Power Indicators <i>Proficiency Focus</i>
7.8	<p>M8: 19 Identifies and extends to specific cases a variety of patterns (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; and generalizes a linear relationship (<u>nonrecursive explicit equation</u>); generalizes a linear relationship to find a specific case; generalizes a nonlinear relationship using <u>words or^{sc} symbols</u>; or generalizes a common nonlinear relationship to find a specific case.</p>	<p>Learning Opportunities: <i>CMP: Thinking with Mathematical Models</i> <i>Growing, Growing, Growing: Investigation 2</i></p>	<p>Generalize a non-linear relationship to find a specific case ($y=x^2$, solve for y when $x=7$) (4a)</p>
	<p>M8: 20 Demonstrates conceptual understanding of linear relationships ($y = kx$; $y = mx + b$) as a constant rate of change by solving problems involving the relationship between slope and rate of change; <u>informally and formally determining slopes and intercepts represented in graphs, tables, or problem situations</u>; or <u>describing the meaning of slope and intercept in context</u>; and distinguishes between linear relationships (constant rates of change) and</p>	<p>Learning Opportunities: <i>CMP: Thinking with Mathematical Models</i></p>	<p>Find and interpret slope and y-intercept from a table, graph, and equation ($y=mx+b$) (4b)</p>

	<p><u>nonlinear relationships (varying rates of change)</u> represented in tables, graphs, equations, or problem situations; or describes how change in the value of one variable relates to change in the value of a second variable in problem situations with constant and varying rates of change.</p>		
	<p>M8: 21 Demonstrates conceptual understanding of algebraic expressions by evaluating and <u>simplifying (including those with square roots, whole-number exponents, or rational numbers)</u>; or by evaluating an expression within an equation (e.g., determine the value of y when $x = 4$ given $y = 7\sqrt{x} + 2x$).</p>	<p>Learning Opportunities: <i>CMP: Say it with Symbols: Inv. 1</i> Supplemental materials for square roots</p>	<p>Evaluate expressions using order of operations consistent with this grade level (4c)</p>
	<p>M8: 22 Demonstrates conceptual understanding of equality by showing equivalence between two expressions (expressions consistent with the parameters of the left - and right-hand sides of the equations being solved at this grade level) using models or different representations of the expressions, <u>solving formulas for a variable requiring one transformation (e.g., $d = rt$; $d/r = t$)</u>; by solving multistep linear equations <u>with integer coefficients</u>; by <u>showing that two expressions are or are not equivalent by applying commutative, associative, or distributive properties, order of operations, or substitution</u>; and by <u>informally solving problems involving systems of linear equations in a context</u>.</p>	<p>Learning Opportunities: <i>CMP: Say it With Symbols: Inv. 4</i> <i>Key to Algebra book 2 and 3</i></p>	<p>Use the distributive property to compare two expressions (4d)</p> <p>Solve formulas for a variable requiring one transformation (4e)</p>

Grade Level 8, Power Standard 5

CCSU Power Standard #5: Students represent, interpret, and predict using data. (Aligns with Vermont Standard 7.9)

Concepts to Emphasize: Line of best fit, Quartile, Bias/Random/Non-Random (Samples)

Aligns with Vermont Standards	Vermont Grade Cluster Expectations <i>Competency Focus</i>	Learning Opportunities	CCSU Power Indicators <i>Proficiency Focus</i>
7.9	<p>M8: 23 Interprets a given representation (line graphs, scatter plots, histograms, or <u>box-and-whisker plots</u>) to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems.</p> <p>(IMPORTANT: Analyzes data consistent with concepts and skills in M8: 24.)</p>	<p>Learning Opportunities: CMP: Samples and Populations: Inv. 1</p>	Interpret and create Box and Whisker plots including five number summaries (5a)
	<p>M8: 24 Analyzes patterns, trends, or distributions in data in a variety of contexts by determining or using measures of central tendency (mean, median, or mode), dispersion (range or variation), outliers, <u>quartile values</u>, or <u>estimated line of best fit</u> to analyze situations, or to solve problems; and evaluates the sample from which the statistics were developed (bias, <u>random</u>, or <u>nonrandom</u>).</p>	<p>Learning Opportunities: CMP: Samples and Populations: Inv. 1,2,3 Thinking with Mathematical Models</p>	Estimate the line of best fit on scatter plots to analyze the relationship between the variables (5b)

	<p>M8: 25 Organizes and displays data using scatter plots to answer questions related to the data, to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems; or identifies representations or elements of representations that best display a given set of data or situation, consistent with the representations required in <u>M8: 23</u>.</p> <p>(IMPORTANT: <i>Analyzes data consistent with concepts and skills in M8: 24.</i>)</p>	<p>Learning Opportunities: <i>Thinking with Mathematical Models:</i> Inv. 1, 2, 3 <i>Samples and Populations:</i> Inv. 1.5</p>	<p>Estimate the line of best fit on scatter plots to analyze the relationship between the variables (5b)</p>
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Grade Level 8, Power Standard 6

CCSU Power Standard #6: Students find probability theoretically and experimentally. (Aligns with Vermont Standard 7.9)

Concepts to Emphasize: Permutations

Aligns with Vermont Standards	Vermont Grade Cluster Expectations <i>Competency Focus</i>	Learning Opportunities	CCSU Power Indicators <i>Proficiency Focus</i>
	<p>M8: 26 Uses counting techniques to solve problems in context involving combinations or <u>permutations</u> using a variety of strategies (e.g., organized lists, tables, tree diagrams, models, Fundamental Counting Principle, or^{sc} others).</p>	<p>Learning Opportunities: <i>Clever Counting: Inv. 1, 2</i></p>	<p>Find permutations (6a)</p>
	<p>M8: 27 For a probability event in which the sample space may or may not contain equally likely outcomes, determines the possible outcomes by either sample space (organized list, table, tree model, area model) or Fundamental Counting Principle and determines the theoretical probability of that event as a <u>ratio of favorable outcomes to possible outcomes</u>. <u>Expresses the ratio as a fraction, decimal, or percent.</u></p>	<p>Learning Opportunities: <i>CMP 7: What Do You Expect? – Inv. 4, 5</i></p>	<p>Calculate probability with or without equally likely outcomes (6b)</p>

	<p>M8: 28 In response to a teacher- or student-generated question, makes a hypothesis, collects appropriate data, organizes the data, appropriately displays/represents numerical and/or categorical data, analyzes the data to draw conclusions about the questions or hypothesis being tested, and when appropriate to make predictions, asks new questions, or makes connection to real-world situations. (See also GLEs M24, M25 and M29.)</p>	<p>Learning Opportunities: Investigate science connection Modified <i>Samples and Populations</i> unit Embedded in <i>Thinking with Math Models, GGG</i></p>	<p>Estimate the line of best fit on scatter plots to analyze the relationship between the variables (5b)</p>
	<p>M8: 29 Compares and contrasts theoretical and experimental probabilities of <u>compound events</u> using fractions, decimals, or percents; and uses theoretical or experimental probabilities to determine the fairness of a game.</p>	<p>Learning Opportunities: <i>CMP 7: What Do You Expect? – Inv. 4, 5, and 6</i></p>	<p>Calculate probability with or without equally likely outcomes (6b)</p>

Grade Level 8, Power Standard 7

CCSU Power Standard #7: Students use a variety of approaches to solve problems and communicate solutions. (Aligns with Vermont Standard 7.9)

Concepts to Emphasize: Reasonableness

Aligns with Vermont Standards	Vermont Grade Cluster Expectations <i>Competency Focus</i>	Learning Opportunities	CCSU Power Indicators <i>Proficiency Focus</i>
7.10	<p>M8: 30 Demonstrate understanding of mathematical problem solving and communication through:</p> <ul style="list-style-type: none"> • Approach & Reasoning—The reasoning, strategies, and skills used to solve the problem; • Connections—Demonstration of observations, applications, extensions, and generalizations; • Solution—All of the work that was done to solve the problem, including the answer; • Mathematical Language—The use of mathematical language in communicating the solution; • Mathematical Representation—The use of mathematical representation to communicate the solution; and • Documentation—Presentation of the solution. 	<p>Learning Opportunities Problem solving pieces</p>	<p>Approach a problem correctly (7a)</p> <p>Provide solution with evidence (7b)</p> <p>Communicate mathematically (7c)</p>