

BVSD Fifth Grade Mathematics Transition Overview

Moving from 2009 BVSD Math Standards (2009 CED) to New Colorado Academic Standards for Mathematics (CAS) and the Boulder Valley Curriculum Essentials - 2012

Introduction: The new Colorado Academic Standards represent a major shift in mathematics education. These standards, based off of the Common Core State Standards for Mathematics (CCSSM), which have been adopted by more than 45 states, are the result of a national movement to align our standards with the highest performing nations in the world. Boulder Valley has adopted the Colorado Academic Standards as our Curriculum Essentials verbatim.

Central to the new standards are the 8 Standards for Mathematical Practice. These standards align with the previous NCTM Standards for Mathematical Processes which were included in the 2009 BVSD Math Standards as the last Essential Learning at each grade level. The chart below illustrates how the Practice Standards align with the Process standards.

Process Standards and Practice Standards

New Standards for Mathematical Practice	Expectations from 2000 NCTM Standards and BVSD 2009 Math Standards
1. Make sense of problems and persevere in solving them. 5. Use appropriate tools strategically	Problem Solving <ul style="list-style-type: none"> • Selects, applies, and translates among mathematical representations to solve problems and justifies the reasonableness of solutions • Given a real-world problems selects an appropriate method to solve the problem by determining if the information provided is sufficient, insufficient or extraneous • Creates and illustrates a real-world problem from a given math sentence
2. Reason abstractly and quantitatively. 3. Critique the reasoning of others. 8. Look for and express regularity in repeated reasoning.	Reasoning and Proof <ul style="list-style-type: none"> • Analyzes and evaluates the mathematical thinking, strategies and arguments of peers, teachers and others
3. Construct viable arguments.	Communication <ul style="list-style-type: none"> • Develops, tests and explains mathematical conjectures • Recognizes and utilizes key academic vocabulary relevant to mathematics in verbal and written communication
6. Attend to precision. 7. Look for and make use of structure.	Connections <ul style="list-style-type: none"> • Recognizes, uses, and explains connections among mathematical ideas in contexts both inside and outside of mathematics classrooms
4. Model with mathematics.	Representations <ul style="list-style-type: none"> • Creates and uses representations to organize, record and explain mathematical ideas clearly to peers, teachers and others

State Standards: There has also been a shift at the level of the content standards. In the prior Colorado State Standards there were six standards. These have been condensed into four standards. Standards 1 and 6 have been combined as have standards 4 and 5. This shift had been anticipated and incorporated into the 2009 CED. The chart below illustrates this alignment.

2010 Colorado Academic Standards	2005 Colorado Model Content Standards
Standard 1: Number Sense, Properties, and Operations	Standard 1: Number Sense and Number Relationships Standard 6: Computation
Standard 2: Patterns, Functions, and Algebraic Structures	Standard 2: Patterns and Algebra
Standard 3: Data Analysis, Statistics, and Probability	Standard 3: Data and Probability
Standard 4: Shape, Dimension and Geometric Relationships	Standard 4: Geometry Standard 5: Measurement

Personal and Financial Literacy (PFL): Standards related to PFL are integrated throughout the new standards. Although these are not a part of the Common Core State Standards, Colorado added these standards at each grade level when adopting new standards at the State level.

Fifth Grade Overview

Standard 1: Number Sense, Properties, and Operations

Students apply their understanding of fractions and fraction models to solve addition and subtraction problems with unlike denominators. Students also use the meaning of fractions, and of multiplication and division, to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.) Students develop understanding of why division procedures work based on the meaning of base ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of decimals and properties of operations to add and subtract decimals to hundredths. Students use the relationship between decimals and fractions to understand and explain why the procedures for multiplying and dividing these rational numbers make sense.

Standard 2: Patterns, Functions, and Algebraic Structure

Students in 5th grade will work with data and extend patterns in tables. They will determine the rules that can define number patterns. Coordinate graphing is now first introduced in 5th grade.

Standard 3: Data Analysis, Statistics, and Probability

Fifth grade students will continue to gain experiences with plotting fractional amounts onto graphs; building on CAS expectations in prior grades. All topics related to probability and finding median, mode, and range have been moved to middle school.

Standard 4: Shape, Dimension, and Geometric Relationship

Students recognize volume as an attribute of three-dimensional space. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by multiplying layers in arrays of cubes. They measure necessary attributes of shapes in order to determine volumes.

Colorado Academic Standards (CAS) Alignment to BVSD 2009 Math Standards (2009 CED)

Purpose: This document has been created to help teachers understand how the new standards for mathematics (CAS) align with the previous standards: BVSD 2009 Math Standards (2009 CED). Often there is a partial alignment of the new with the old, for that reason the commentary in the notes column was included to help teachers to understand the shift. We hope that this will facilitate teams in the revision of their curriculum maps, assessments, and instructional units.

Fifth Grade

Standard: 1. Number Sense, Properties, and Operations		
Concepts and Skills: 1. The decimal number system describes place value patterns and relationships that are repeated in large and small numbers and forms the foundation for efficient algorithms		
CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
a. Explain 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. (CCSS: 5.NBT.1) i. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. (CCSS: 5.NBT.2) ii. Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. (CCSS: 5.NBT.2) iii. Use whole-number exponents to denote powers of 10. (CCSS: 5.NBT.2)	<ul style="list-style-type: none">• 4M2F - Demonstrates fluency with multiplying whole numbers by powers of ten	<ul style="list-style-type: none">• Evidence Outcomes “ii.” and “iii.” are new.

Standard: 1. Number Sense, Properties, and Operations

Concepts and Skills: 1. The decimal number system describes place value patterns and relationships that are repeated in large and small numbers and forms the foundation for efficient algorithms (cont'd)

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>b. Read, write, and compare decimals to thousandths. (CCSS: 5.NBT.3)</p> <p>i. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form.¹ (CCSS: 5.NBT.3a)</p> <p>ii. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. (CCSS: 5.NBT.3b)</p>	<ul style="list-style-type: none"> • 5M1b: Generates and recognizes equivalent forms of rational numbers using words, symbols, concrete materials, and pictorial representations • 5M1a: Reads, writes, compares, and orders rational numbers including placing them on a number line 	<ul style="list-style-type: none"> • CAS expectations align with the 2009 CED.
<p>c. Use place value understanding to round decimals to any place. (CCSS: 5.NBT.4)</p>		<ul style="list-style-type: none"> • New
<p>d. Convert like measurement units within a given measurement system. (CCSS: 5.MD)</p> <p>i. Convert among different-sized standard measurement units within a given measurement system.² (CCSS: 5.MD.1)</p> <p>ii. Use measurement conversions in solving multi-step, real world problems. (CCSS: 5.MD.1)</p>		<ul style="list-style-type: none"> • New to 5th grade • Fifth grade teachers should note that these measurement topics are introduced in CAS 4th grade (CCSS: 4.MD.1).

¹ e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times 1/10 + 9 \times 1/100 + 2 \times 1/1000$. (CCSS: 5.NBT.3a)

² e.g., convert 5 cm to 0.05 m. (CCSS: 5.MD.1)

Standard: 1. Number Sense, Properties, and Operations

Concepts and Skills: 2. Formulate, represent, and use algorithms with multi-digit whole numbers and decimals with flexibility, accuracy, and efficiency

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>a. Fluently multiply multi-digit whole numbers using standard algorithms. (CCSS: 5.NBT.5)</p>	<ul style="list-style-type: none"> • 4M2g: Uses place value and properties of operations to develop and apply efficient, accurate, and generalizable methods to multiply two-digit by two-digit whole numbers • 5M2g: Uses place value and properties of operations to develop and flexibly apply efficient, accurate, and generalizable methods to multiply two digit by three digit whole numbers 	<ul style="list-style-type: none"> • Language relating to the use of standard algorithms is new.
<p>b. Find whole-number quotients of whole numbers.³ (CCSS: 5.NBT.6)</p> <p>i. Use strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. (CCSS: 5.NBT.6)</p> <p>ii. Illustrate and explain calculations by using equations, rectangular arrays, and/or area models. (CCSS: 5.NBT.6)</p>	<ul style="list-style-type: none"> • 4M2b: Uses the inverse relationship of multiplication and division to solve problems • 4M2e: Uses a variety of models to demonstrate the distributive property of multi-digit multiplication and division problems • 5M2a: Develops and applies efficient, accurate, and generalizable methods for solving division problems • 5M2b: Solves partitioning (how many groups) and sharing (how many in each group) division problems (e.g. up to 3 digit by 2 digit) and interprets any remainders involved in relation to context 	<ul style="list-style-type: none"> • CAS expectations align with the 2009 CED.
<p>c. Add, subtract, multiply, and divide decimals to hundredths. (CCSS: 5.NBT.7)</p> <p>i. Use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. (CCSS: 5.NBT.7)</p> <p>ii. Relate strategies to a written method and explain the reasoning used. (CCSS: 5.NBT.7)</p>	<ul style="list-style-type: none"> • 5M1d: Adds and subtracts decimals (to the thousandths place) and common fractions in context using a variety of models (e.g., fractions bars, rulers, money) • 5M1e: Solves problems in context involving commonly used fractions, decimals (to the thousandths place), and percentages • 6M1a: Explains and utilizes efficient computational procedures for adding, subtracting, multiplying, and dividing positive rational numbers accurately 	<ul style="list-style-type: none"> • CAS specifically indicates that basic operations with decimals should be supported by concrete models and drawings.

³ with up to four-digit dividends and two-digit divisors. (CCSS: 5.NBT.6)

Standard: 1. Number Sense, Properties, and Operations

Concepts and Skills: 2. Formulate, represent, and use algorithms with multi-digit whole numbers and decimals with flexibility, accuracy, and efficiency (cont'd)

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
d. Write and interpret numerical expressions. (CCSS: 5.OA) i. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. (CCSS: 5.OA.1) ii. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. ⁴ (CCSS: 5.OA.2)	<ul style="list-style-type: none">• 5M2d Algebra connection: Identifies the properties of multiplication and addition and uses them to evaluate numeric expressions and solve equations• 5M5a: Selects, applies, and translates among mathematical representations to solve problems and justifies the reasonableness of solutions	<ul style="list-style-type: none">• Use of parentheses brackets and braces is new to 5th grade, and builds on the 3rd grade CAS expectations where students are expected to start learning the conventional order of operations.

³ with up to four-digit dividends and two-digit divisors. (CCSS: 5.NBT.6)

⁴ For example, express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product. (CCSS: 5.OA.2)

Standard: 1. Number Sense, Properties, and Operations

Concepts and Skills: 3. Formulate, represent, and use algorithms to add and subtract fractions with flexibility, accuracy, and efficiency

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>a. Use equivalent fractions as a strategy to add and subtract fractions. (CCSS: 5.NF)</p> <p>i. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.⁵ (CCSS: 5.NF.2)</p> <p>ii. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions⁶ with like denominators. (CCSS: 5.NF.1)</p> <p>iii. Solve word problems involving addition and subtraction of fractions referring to the same whole.⁷ (CCSS: 5.NF.2)</p>	<ul style="list-style-type: none">• 5M1c: Estimates sums and differences of whole numbers and fractions using the benchmarks 0, $\frac{1}{2}$, and 1 (e.g., $\frac{5}{6} + \frac{7}{8}$ must be equal to an amount less than, but close to 2)• 5M1e: Solves problems in context involving commonly used fractions, decimals (to the thousandths place), and percentages• 6M1a: Explains and utilizes efficient computational procedures for adding, subtracting, multiplying, and dividing positive rational numbers accurately• 6M1e: Generates equivalent forms of a rational number (e.g. $\frac{1}{4} = \frac{2}{8} = 0.25 = 25\%$)	<ul style="list-style-type: none">• CAS does not limit fractions to “common fractions.”

⁵ For example, recognize an incorrect result $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$, by observing that $\frac{3}{7} < \frac{1}{2}$. (CCSS: 5.NF.2)

⁶ in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. (In general, $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$.) (CCSS: 5.NF.1)

⁷ including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. (CCSS: 5.NF.2)

Standard: 1. Number Sense, Properties, and Operations

Concepts and Skills: 4. The concepts of multiplication and division can be applied to multiply and divide fractions

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
a. Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). (CCSS: 5.NF.3)	<ul style="list-style-type: none"> 3M2e: Models, names, and compares common fractions (halves, thirds, fourths) as equal partitions of a whole or set and locates on a number line (e.g., place $3 \frac{1}{2}$ on a number line) 	<ul style="list-style-type: none"> Interpreting the meaning of fractions as a form of division was introduced in 3rd grade 2009 CED.
b. Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers. ⁸ (CCSS: 5.NF.3)	<ul style="list-style-type: none"> 5M2c: Represents remainders as fractions or decimals (in relation to money) as appropriate for division contexts 	<ul style="list-style-type: none"> CAS expectations align with the 2009 CED.
c. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. ⁹ In general, $(a/b) \times (c/d) = ac/bd$. (CCSS: 5.NF.4a)		<ul style="list-style-type: none"> New
d. 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. (CCSS: 5.NF.4b) i. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. (CCSS: 5.NF.4b)	<ul style="list-style-type: none"> 5M4h: Solves problems involving perimeter of polygons and area of rectangles 	<ul style="list-style-type: none"> Solving area problems involving fractional units is new.

⁸ e.g., by using visual fraction models or equations to represent the problem. For example, 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? (CCSS: 5.NF.3)

⁹ For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (CCSS: 5.NF.4a)

Standard: 1. Number Sense, Properties, and Operations

Concepts and Skills: 4. The concepts of multiplication and division can be applied to multiply and divide fractions (cont'd)

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>e. Interpret multiplication as scaling (resizing). (CCSS: 5.NF.5)</p> <p>i. Compare 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.¹⁰ (CCSS: 5.NF.5a)</p> <p>ii. Apply the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1. (CCSS: 5.NF.5b)</p>	<ul style="list-style-type: none"> 6M1c: Solves problems involving the relationship of fractions, decimals, and percents in problem solving situations 	<ul style="list-style-type: none"> Evidence Outcomes “i.” and “ii.” are new. Principles of fraction equivalence build upon understandings of equivalent fractions introduced in 3rd and 4th grade CAS.
<p>f. Solve real world problems involving multiplication of fractions and mixed numbers.¹¹ (CCSS: 5.NF.6)</p>	<ul style="list-style-type: none"> 5M1e: Solves problems in context involving commonly used fractions, decimals (to the thousandths place), and percentages 	<ul style="list-style-type: none"> Multiplication of fractions and mixed numbers is new at 5th grade. Percentages are no longer part of this grade’s standards.

¹⁰ Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number. (CCSS: 5.NF.5b)

Explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number (CCSS: 5.NF.5b)

¹¹ e.g., by using visual fraction models or equations to represent the problem. (CCSS: 5.NF.6)

Standard: 1. Number Sense, Properties, and Operations

Concepts and Skills: 4. The concepts of multiplication and division can be applied to multiply and divide fractions (cont'd)

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>g. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.¹² (CCSS: 5.NF.7a)</p> <p>h. Interpret division of a whole number by a unit fraction, and compute such quotients.¹³ (CCSS: 5.NF.7b)</p> <p>i. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions.¹⁴ (CCSS: 5.NF.7c)</p>	<ul style="list-style-type: none">• 6M1a: Explains and utilizes efficient computational procedures for adding, subtracting, multiplying, and dividing positive rational numbers accurately• 6M1c: Solves problems involving the relationship of fractions, decimals, and percents in problem solving situations	<ul style="list-style-type: none">• CAS limits this standard to division of unit fractions by whole numbers (i.e. $\frac{1}{4} \div 2$) and division of whole numbers by unit fractions (i.e., $4 \div \frac{1}{2}$).

¹² For example, create a story context for $(\frac{1}{3}) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(\frac{1}{3}) \div 4 = \frac{1}{12}$ because $(\frac{1}{12}) \times 4 = \frac{1}{3}$. (CCSS: 5.NF.7a)

¹³ For example, create a story context for $4 \div (\frac{1}{5})$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (\frac{1}{5}) = 20$ because $20 \times (\frac{1}{5}) = 4$. (CCSS: 5.NF.7b)

¹⁴ e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share $\frac{1}{2}$ lb of chocolate equally? How many $\frac{1}{3}$ -cup servings are in 2 cups of raisins? (CCSS: 5.NF.7c)

Standard: 2. Patterns, Functions, and Algebraic Structures

Concepts and Skills: 1. Number patterns are based on operations and relationships

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>a. Generate two numerical patterns using given rules. (CCSS: 5.OA.3)</p> <p>b. Identify apparent relationships between corresponding terms. (CCSS: 5.OA.3)</p> <p>c. Form ordered pairs consisting of corresponding terms from the two patterns, and graphs the ordered pairs on a coordinate plane.¹ (CCSS: 5.OA.3)</p> <p>d. Explain informally relationships between corresponding terms in the patterns. (CCSS: 5.OA.3)</p>	<ul style="list-style-type: none"> • 5M3d: Interprets data representations and patterns within data representations to make convincing arguments about a data set • 5M3d Algebra Connection: Identifies, extends, describes, and represents numeric and geometric growth patterns using words, tables, graphs, and simple equations • 5M3d Algebra Connection: Describes how change in one quantity affects change in another • 5M3d Algebra Connection: Identifies and compares constant and varying rates of change • 5M3f: Matches graphs, tables, data sets, and scenarios to one another. • 4M4d: Reads, plots, and identifies ordered pairs in quadrant one. 	<ul style="list-style-type: none"> • Forming ordered pairs and graphing those are new. • In 2009 CED variables were introduced in 5th grade. In CAS, students will have experience with letters and symbols as early as 2nd grade and should be using them with familiarity in 5th grade. • The matching of line graphs to given scenarios (e.g. Investigations Graph Stories, or Qualitative Graphs) is not explicitly mentioned in CAS.
<p>e. Use patterns to solve problems including those involving saving and checking accounts.² (PFL)</p>	<ul style="list-style-type: none"> • 5M3d Algebra Connection: Identifies, extends, describes, and represents numeric and geometric growth patterns using words, tables, graphs, and simple equations 	<ul style="list-style-type: none"> • The context of saving and checking accounts is new.
<p>f. Explain, extend, and use patterns and relationships in solving problems, including those involving saving and checking accounts such as understanding that spending more means saving less (PFL)</p>	<ul style="list-style-type: none"> • 5M3d Algebra Connection: Identifies, extends, describes, and represents numeric and geometric growth patterns using words, tables, graphs, and simple equations • 5M3d Algebra Connection: Describes how change in one quantity affects change in another 	<ul style="list-style-type: none"> • The context of saving and checking accounts is new.

¹ For example, given the rule "add 3" and the starting number 0, and given the rule "add 6" and the starting number 0, generate terms and the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. (CCSS: 5.OA.3)

² such as the pattern created when saving \$10 a month

Standard: 3. Data Analysis, Statistics, and Probability

Concepts and Skills: 1. Visual displays are used to interpret data

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>a. Represent and interpret data. (CCSS: 5.MD)</p> <p>i. Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). (CCSS: 5.MD.2)</p> <p>ii. Use operations on fractions for this grade to solve problems involving information presented in line plots.¹ (CCSS: 5.MD.2)</p>	<ul style="list-style-type: none">• 5M3c: Organizes data by choosing and constructing appropriate data representations with suitable scales (e.g., line plots, line graphs, bar graphs, pictographs, tables, and charts)• 5M3d: Interprets data representations and patterns within data representations to make convincing arguments about a data set	<ul style="list-style-type: none">• Evidence Outcome “i.” builds on similar experiences students will have had in 4th and 3rd grade.• Evidence Outcome “ii” is new.• Topics related to finding median, mode, and range have been moved to 6th grade.• The following performance indicators from the 2009 CED are not included in CAS:<ul style="list-style-type: none">○ 5M3a: Develops questions about categorical and numerical data and distinguishes between them○ 5M5b: Collects data and describes how data collection methods affect the results

¹ For example, 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. (CCSS: 5.MD.2)

Standard: 4. Shape, Dimension, and Geometric Relationships

Concepts and Skills: 1. Properties of multiplication and addition provide the foundation for volume an attribute of solids.

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>a. Model and justify the formula for volume of rectangular prisms. (CCSS: 5.MD.5b)</p> <p>i. Model the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes.¹ (CCSS: 5.MD.5b)</p> <p>ii. 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. (CCSS: 5.MD.5a)</p> <p>iii. Represent threefold whole-number products as volumes to represent the associative property of multiplication. (CCSS: 5.MD.5a)</p>	<ul style="list-style-type: none">• 5M2d: Geometry/Measurement Connection: Determines the relationship between the number of cubic units that fill a rectangular prism and the dimensions of the prism• 5M2d Algebra connection: Identifies the properties of multiplication and addition and uses them to evaluate numeric expressions and solve equations• 5M4d Makes and tests conjectures about geometric relationships including measurements of shapes and solids	<ul style="list-style-type: none">• Expectations in CAS align with the 2009 CED.

¹ 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. (CCSS: 5.MD.3a)
A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. (CCSS: 5.MD.3b)

Standard: 4. Shape, Dimension, and Geometric Relationships

Concepts and Skills: 1. Properties of multiplication and addition provide the foundation for volume an attribute of solids (cont'd)

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>b. Find volume of rectangular prisms using a variety of methods and use these techniques to solve real world and mathematical problems. (CCSS: 5.MD.5a)</p> <p>i. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (CCSS: 5.MD.4)</p> <p>ii. 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. (CCSS: 5.MD.5b)</p> <p>iii. Use the additive nature of volume to find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts. (CCSS: 5.MD.5c)</p>	<ul style="list-style-type: none">• 5M2d: Geometry/Measurement Connection: Determines the relationship between the number of cubic units that fill a rectangular prism and the dimensions of the prisms	<ul style="list-style-type: none">• The application of formulas for calculating volume is new. Students will have had similar experiences with applying formulas for area and perimeter in 4th grade.• Evidence Outcome “iii.” is new• Use of appropriate units and tools (5M4f) are part of the CAS Standards for Mathematical Practice• The following performance indicators from the 2009 CED are now in middle school CAS<ul style="list-style-type: none">○ 5M4a: Represents a solid in 2 dimensions (e.g., recognize a 3-D figure from its net)○ 5M4e: Predicts and describes the results of transformations for 2 dimensional shapes: reflections (flips), translations (slides), and rotations (turns)

Standard: 4. Shape, Dimension, and Geometric Relationships

Concepts and Skills: 2. Geometric figures can be described by their attributes and specific locations in the plane

CAS Evidence Outcomes	Alignment with 2009 BVSD Math Standards	Notes
<p>a. Graph points on the coordinate plane² to solve real-world and mathematical problems. (CCSS: 5.G)</p> <p>b. Represent real world and 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. (CCSS: 5.G.2)</p>	<ul style="list-style-type: none">• 4M4d: Reads, plots, and identifies ordered pairs in quadrant one• 4M4e: Locates points, creates paths, and measures distances on maps, scale drawings, and grids using provided scales	<ul style="list-style-type: none">• CAS expectations align with those in the 4th grade 2009 CED.
<p>c. Classify two-dimensional figures into categories based on their properties. (CCSS: 5.G)</p> <p>i. Explain that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.³ (CCSS: 5.G.3)</p> <p>ii. Classify two-dimensional figures in a hierarchy based on properties. (CCSS: 5.G.4)</p>	<ul style="list-style-type: none">• 5M4b: Sorts, classifies, and names shapes and solids using their attributes• 5M4d: Makes and tests conjectures about geometric relationships including measurements of shapes and solids	<ul style="list-style-type: none">• Language relating to classifying figures in a hierarchy is new.

² e.g., x-axis and x-coordinate, y-axis and y-coordinate

³ For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.