# Bermudian Springs PA Core Standards
# Math Framework
# Fifth Grade

# Introduction

Bermudian Springs School District, in partnership with all stakeholders, recognizes the importance of our students being able to use mathematics in everyday life and in the workplace. New knowledge, tools, and ways of solving math problems will significantly enhance opportunities for shaping our students future. Math competencies open doors to productive futures. All students should have the opportunity and support necessary to learn significant math with depth and understanding. Common Core has provided critical areas designed to bring focus to the standards at each grade by describing key concepts in order to guide instruction. The critical areas for instructional focus for fifth grade math outlined by the *Common Core* include the following three areas:

1. **Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions).** Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between 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.)

2. **Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations.** 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 models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

3. **Developing understanding of volume.** Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. 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 viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems
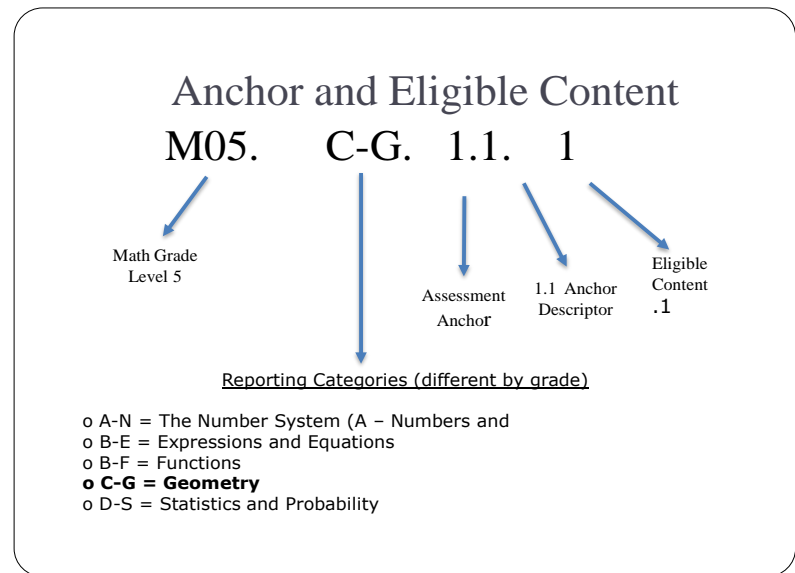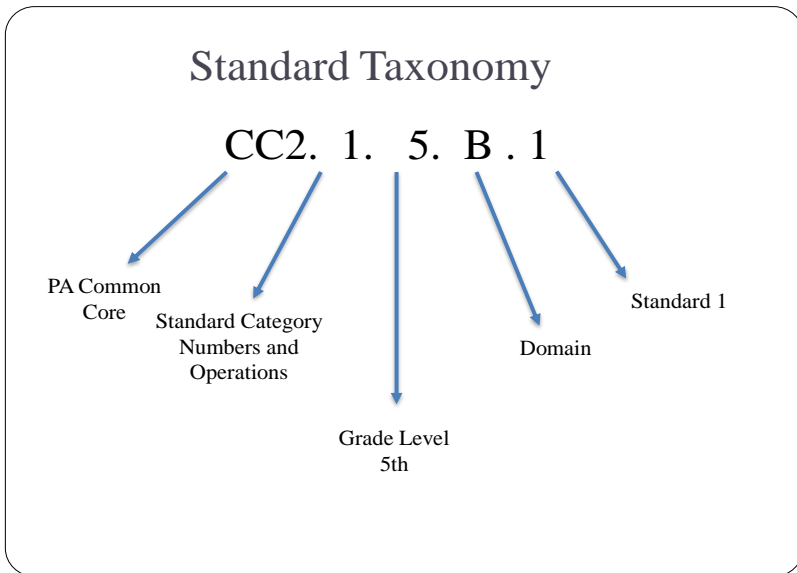
# Standards for Mathematical Practices for Fifth Grade

Bermudian Springs School District incorporated the following Mathematical Practices which are expected to be integrated into every mathematics lesson for all students as outlined in the Pennsylvania Core Standards. Below are a few examples of how these mathematical practices may be integrated into some tasks that Bermudian students will apply in fifth grade.

| Mathematic Practices | Explanations and Examples |
|---|---|
| **1. Make sense of problems and persevere in solving them.** | Mathematically proficient students in grade 5 should solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?" |
| **2. Reason abstractly and quantitatively.** | Mathematically proficient students in grade 5should recognize that a number represents a specific quantity. They connect quantities to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions that record calculations with numbers and represent or round numbers using place value concepts. |
| **3. Construct viable arguments and critique the reasoning of others.** | In fifth grade mathematical proficient students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?" They explain their thinking to others and respond to others' thinking. |
| **4. Model with mathematics.** | Mathematically proficient students in grade 5 experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems. |

| 5. Use appropriate tools strategically. | Mathematically proficient fifth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real world data. |
|---|---|
| 6. Attend to precision. | Mathematically proficient students in grade 5 continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units. |
| 7. Look for and make use of structure. | In fifth grade mathematically proficient students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation. |
| 8. Look for and express regularity in repeated reasoning. | Mathematically proficient fifth graders use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations. |

| Mathematical Standards: Development and Progression | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre K | K | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | HS |
| **2.1 Numbers and Operations** | | (A) Counting & Cardinality | | | | | | | | | | |
| | | | (B) Number and Operations in Base Ten | | | | | | (D) Ratios and Proportional Relationships | | | (F) Number and Quantity |
| | | | | | (C) Number and Operations - Fractions | | | | (E) The Number System | | | |
| **2.2 Algebraic Concepts** | | (A) Operations and Algebraic Thinking | | | | | | | (B) Expressions and Equations | | | (D) Algebra |
| | | | | | | | | | (C) Functions | | | |
| **2.3 Geometry** | | (A) Geometry | | | | | | | | | | |
| **2.4 Measurement, Data and Probability** | | (A) Measurement and Data | | | | | | | (B) Statistics and Probability | | | |



## Standard Taxonomy

CC2. 1. 5. B . 1

PA Common Core

Standard Category Numbers and Operations

Grade Level 5th

Domain

Standard 1

## Anchor and Eligible Content

M05. C-G. 1.1. 1

Math Grade Level 5

Assessment Anchor

1.1 Anchor Descriptor

Eligible Content .1

Reporting Categories (different by grade)

o A-N = The Number System (A – Numbers and
o B-E = Expressions and Equations
o B-F = Functions
o **C-G = Geometry**
o D-S = Statistics and Probability

| 2.1 Number and Operations |
|---|

**Domain:** (B) Number & Operations in Base Ten

**Standard: CC.2.1.5.B.1 Apply place value concepts to show an understanding of operations and rounding as they pertain to whole numbers and decimals**

**Anchor Descriptor:  M05.A-T.1.1** Demonstrate understanding of place value of whole numbers and decimals, and compare quantities or magnitudes of numbers.

- **M05.A-T.1.1.1** Demonstrate an understanding that in a multi-digit number, a digit in one place represents 1/10 of what it represents in the place to its left. Example: Recognize that in the number 770, the 7 in the tens place is 1/10 the 7 in the hundreds place.
- **M05.A-T.1.1.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and 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. Example 1: $4 \times 10^2 = 400$ Example 2: $0.05 \div 10^3 = 0.00005$
- **M05.A-T.1.1.3** Read and write decimals to thousandths using base-ten numerals, word form, and expanded form.  Example: $347.392 = 300 + 40 + 7 + 0.3 + 0.09 + 0.002 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (0.1) + 9 \times (0.01) + 2 \times (0.001)$
- **M05.A-T.1.1.4** Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols.
- **M05.A-T.1.1.5** Round decimals to any place (limit rounding to ones, tenths, hundredths, or thousandths place).

| Key Concepts | Key Vocabulary |
|---|---|
| Demonstrate understanding of place value of whole numbers and decimals, and compare quantities or magnitudes of numbers | Place Value, Whole Numbers, Decimals, Magnitude, Base Ten Numerals Word Form, Expanded Form |

**Competencies**
*Describe what students should be able to do (key skills) as a result of this instruction*

- Make magnitude estimates to evaluate operation work (check their work)
- Write numbers in expanded form
- Compare difference in million, billion, trillion in terms of time to complete a task
- Identify what magnitude of an item they would like to have (10, 1, or .1 pieces of fruit)
- Students can relate classroom experiences to analyze the national debt situation
- Students can apply concepts learned to compare populations in class, school, county, state, country, continent, world

| 2.1 Number and Operations |
|---|
| **Domain:** (B) Number & Operations in Base Ten |
| **Standard: CC.2.1.5.B.2 Extend an understanding of operations with whole numbers to perform operations including decimals.** |
| **Anchor Descriptor: M05.A-T.2.1** Use whole numbers and decimals to compute accurately (straight computation or word problems).<br>    • **M05.A-T.2.1.1** Multiply multi-digit whole numbers (not to exceed 3-digit by 3-digit).<br>    • **M05.A-T.2.1.2** Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.<br>    • **M05.A-T.2.1.3** Add, subtract, multiply, and divide decimals to hundredths (no divisors with decimals). |

| Key Concepts | Key Vocabulary |
|---|---|
| Use whole numbers and decimals to compute accurately (straight computation or word problems). | add, subtract, multiply, divide, multi-digit whole numbers, whole-number quotients, decimals to hundredths |

| **Competencies**<br>*Describe what students should be able to do (key skills) as a result of this instruction* |
|---|
| • Interpret word problems to identify what operation is needed<br>• Solve word problems with all four operations<br>• Students can use alternate algorithms to prove their answers<br>• Students can create a household budget given certain conditions<br>• Students can formulate when their student lunch account will go to zero using an average daily expenditure |

| 2.1 Number and Operations |
|---|

**Domain:** (C) Number & Operations - Fractions

**Standard: CC.2.1.5.C.1 Use the understanding of equivalency to add and subtract fractions.**

**Anchor Descriptor: M05.A-F.1.1** Solve addition and subtraction problems involving fractions (straight computation or word problems).
- **M05.A-F.1.1.1** Add and subtract fractions (including mixed numbers) with unlike denominators. (May include multiple methods and representations.) Example: 2/3 + 5/4 = 8/12 + 15/12 = 23/12

| Key Concepts | Key Vocabulary |
|---|---|
| Solve addition and subtraction problems involving fractions (straight computation or word problems). | add, subtract, fractions, unlike denominators |

**Competencies**
*Describe what students should be able to do (key skills) as a result of this instruction*

- Interpret word problems to identify what operation is needed
- Solve word problems containing fractions using addition and subtraction
- Students can apply concepts of fractions to real life situations
- Students can revise recipes to a set denominator
- Students can modify a recipe due to serving size requirements

| 2.1 Number and Operations |
|---|

**Domain:** (C) Number & Operations - Fractions

**Standard: CC.2.1.5.C.2 Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**

**Anchor Descriptor: M05.A-F.2.1** Solve multiplication and division problems involving fractions and whole numbers (straight computation or word problems).

- **M05.A-F.2.1.1** Solve word problems involving division of whole numbers leading to answers in the form of fractions (including mixed numbers).
- **M05.A-F.2.1.2** Multiply a fraction (including mixed numbers) by a fraction.
- **M05.A-F.2.1.3** Demonstrate an understanding of multiplication as scaling (resizing). Example 1: 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. Example 2: 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.
- **M05.A-F.2.1.4** Divide unit fractions by whole numbers and whole numbers by unit fractions.

| Key Concepts | Key Vocabulary |
|---|---|
| Solve multiplication and division problems involving fractions and whole numbers (straight computation or word problems). | multiply, divide, word problems, whole numbers, fractions, scaling |

**Competencies**
*Describe what students should be able to do (key skills) as a result of this instruction*

- Interpret word problems to identify what operation is needed
- Solve word problems containing fractions using multiplication and division
- Students can be sure that they have enough supplies for the class knowing the amount of supplies per box
- Students can assess if they will have enough food for a set number of guests

| 2.2 Algebraic Concepts |
|---|

**Domain:** (A) Operations and Algebraic Thinking

**Standard: CC.2.2.5.A.1 Interpret and evaluate numerical expressions using order of operations.**

**Anchor Descriptor: M05.B-O.1.1** Analyze and complete calculations by applying the order of operations.

- **M05.B-O.1.1.1** Use multiple grouping symbols (parentheses, brackets, or braces) in numerical expressions, and evaluate expressions containing these symbols.
- **M05.B-O.1.1.2** Write simple expressions that model calculations with numbers, and interpret numerical expressions without evaluating them. Example 1: Express the calculation "add 8 and 7 then multiply by 2" as $2 \times (8 + 7)$. Example 2: Recognize that $3 \times (18{,}932 + 921)$ is three times as large as $18{,}932 + 921$, without having to calculate the indicated sum or product.

| Key Concepts | Key Vocabulary |
|---|---|
| Analyze and complete calculations by applying the order of operations | grouping symbols (parentheses, brackets, or braces), numerical expressions, number models, order of operations |

**Competencies**
*Describe what students should be able to do (key skills) as a result of this instruction*

- List steps for order of operations
- Write or describe what an expression means
- Match real life mathematical situations with numerical expressions
- Students can determine how many groups of the same size can be created with number of remainders and also construct the corresponding mathematical problem

| 2.2 Algebraic Concepts |
|---|
| **Domain:** (A) Operations and Algebraic Thinking |
| **Standard: CC.2.2.5.A.4 Analyze patterns and relationships using two rules.** |
| **Anchor Descriptor: M05.B-O.2.1** Create, extend, and analyze patterns. <ul><li>**M05.B-O.2.1.1** Generate two numerical patterns using two given rules. Example: 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.</li><li>**M05.B-O.2.1.2** Identify apparent relationships between corresponding terms of two patterns with the same starting numbers that follow different rules. Example: Given two patterns in which the first pattern follows the rule "add 8" and the second pattern follows the rule "add 2," observe that the terms in the first pattern are 4 times the size of the terms in the second pattern.</li></ul> |

| Key Concepts | Key Vocabulary |
|---|---|
| Create, extend, and analyze patterns | numerical patterns, rules |

| **Competencies** |
|---|
| *Describe what students should be able to do (key skills) as a result of this instruction* |
| <ul><li>If given the rules add 3 and add 6, identify terms for add 6 would be twice as much as add 3</li><li>Create a pattern of numbers that follows 2 rules (*2+1) to explain a real word pattern</li><li>Analyze a pattern to determine missing number(s)</li><li>Compare rate of depletion for two lunch scenarios-buy regular lunch vs. buy regular lunch plus a snack</li></ul> |

| 2.3 Geometry |
|---|
| **Domain:** (A) Geometry |
| **Standard: CC.2.3.5.A.1 Graph points in the first quadrant on the coordinate plane and interpret these points when solving real world and mathematical problems.** |
| **Anchor Descriptor: M05.C-G.1.1** Identify parts of a coordinate grid, and describe or interpret points given an ordered pair.<br>• **M05.C-G.1.1.1** Identify parts of the coordinate plane (x-axis, y-axis, and the origin) and the ordered pair (x-coordinate and y-coordinate). Limit the coordinate plane to quadrant I.<br>• **M05.C-G.1.1.2** Represent real-world and mathematical problems by plotting points in quadrant I of the coordinate plane, and interpret coordinate values of points in the context of the situation. |

| Key Concepts | Key Vocabulary |
|---|---|
| Identify parts of a coordinate grid, and describe or interpret points given an ordered pair. | coordinate plane, x-axis, y-axis, origin, ordered pairs, quadrant I, points |
| **Competencies**<br>*Describe what students should be able to do (key skills) as a result of this instruction* | |
| • Read a map with landmarks on grids<br>• Students will be able to locate items on a grid map | |

| 2.3 Geometry |
|---|
| **Domain:** (A) Geometry |
| **Standard: CC.2.3.5.A.2 Classify two- dimensional figures into categories based on an understanding of their properties.** |
| **Anchor Descriptor: M05.C-G.2.1** Use basic properties to classify two-dimensional figures.<br>• **M05.C-G.2.1.1** Classify two-dimensional figures in a hierarchy based on properties. Example 1: All polygons have at least 3 sides, and pentagons are polygons, so all pentagons have at least 3 sides. Example 2: A rectangle is a parallelogram, which is a quadrilateral, which is a polygon; so, a rectangle can be classified as a parallelogram, as a quadrilateral, and as a polygon. |

| Key Concepts | Key Vocabulary |
|---|---|
| Use basic properties to classify two-dimensional figures. | two-dimensional figures, properties |
| **Competencies**<br>*Describe what students should be able to do (key skills) as a result of this instruction* | |
| • Given a shape, identify properties<br>• Apply polygon properties to identify traffic signs | |

| 2.4 Measurement, Data and Probability |
|---|
| **Domain:** (A) Measurement and Data |
| **Standard: CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.** |
| **Anchor Descriptor: M05.D-M.1.1** Solve problems using simple conversions (may include multistep, real-world problems). |

- **M05.D-M.1.1.1** Convert among different-sized measurement units within a given measurement system. A table of equivalencies will be provided. Example: Convert 5 cm to meters.

| Key Concepts | Key Vocabulary |
|---|---|
| Solve problems using simple conversions (may include multistep, real-world problems). | conversion of measurements |

| Competencies |
|---|
| *Describe what students should be able to do (key skills) as a result of this instruction* |

- Students will be able to solve for alternate measures of length
- Students will be able to compare a set measurement in different units
- Apply knowledge of conversion to determine how many miles a 5 or 10 k run would total
- Assess how much material would be needed to cover a 16 foot space using yards

| 2.4 Measurement, Data and Probability |
|---|
| **Domain:** (A) Measurement and Data |
| **Standard: CC.2.4.5.A.2 Represent and interpret data using appropriate scale.** |
| **Anchor Descriptor: M05.D-M.2.1** Organize, display, and answer questions based on data. |

- **M05.D-M.2.1.2** Display and interpret data shown in tallies, tables, charts, pictographs, bar graphs, and line graphs, and use a title, appropriate scale, and labels. A grid will be provided to display data on bar graphs or line graphs.

| Key Concepts | Key Vocabulary |
|---|---|
| Organize, display, and answer questions based on data. | data, tallies, tables, charts, pictographs, bar graphs, line graphs, title, scale, labels, grid |

| Competencies |
|---|
| *Describe what students should be able to do (key skills) as a result of this instruction* |

- Connect appropriate graph to a set of class survey data
- Extract information from graphs
- Critique graph choice
- Create survey, collect data and graph results using the appropriate graphing tool

| 2.4 Measurement, Data and Probability |
|---|
| **Domain:** (A) Measurement and Data |
| **Standard: CC.2.4.5.A.4 Solve problems involving computation of fractions using information provided in a line plot.** |
| **Anchor Descriptor: M05.D-M.2.1** Organize, display, and answer questions based on data. |

- **M05.D-M.2.1.1** Solve problems involving computation of fractions by using information presented in line plots.

| Key Concepts | Key Vocabulary |
|---|---|
| Organize, display, and answer questions based on data. | line plots |

| **Competencies** |
|---|
| *Describe what students should be able to do (key skills) as a result of this instruction* |

- Students will be able to use line plots to display data using factions (¼, ½ , ¾)
- Students will be able to calculate total amounts given a line plot using fractional terms
- Create a line plot to determine how many whole pencils a class would have given the length of used pencils

| 2.4 Measurement, Data and Probability |
|---|
| **Domain:** (A) Measurement and Data |
| **Standard: CC.2.4.5.A.5 Apply concepts of volume to solve problems and relate volume to multiplication and to addition.** |
| **Anchor Descriptor: M05.D-M.3.1** Use, describe, and develop procedures to solve problems involving volume. |

- **M05.D-M.3.1.1** 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. Formulas will be provided.
- **M05.D-M.3.1.2** Find volumes of solid figures composed of two non-overlapping right rectangular prisms.

| Key Concepts | Key Vocabulary |
|---|---|
| Use, describe, and develop procedures to solve problems involving volume. | solid figures, volume, volume formulas ($V = l \times w \times h$ and $V = B \times h$) |

| **Competencies** |
|---|
| *Describe what students should be able to do (key skills) as a result of this instruction* |

- Students will understand that volume is measured in cubes (1unit by 1 unit by 1 unit)
- Students will be able to use the formulas for volume
- Students will be able to calculate volume for solid figures
- Use estimation to determine the volume capacity of two containers
- Compare the number of "cubes" needed to fill to different shaped containers