Emphasis: Understanding Volume	Fifth Grade

Students expand their understanding of geometric measurement and spatial structuring to include volume as an attribute of three-dimensional space. In this Emphasis students develop this understanding using concrete models to discover strategies for finding volume, whereas in another Emphasis area **(IDENTIFY),** students generalize this understanding in real-world problems and apply strategies and formulas. Volume is addressed in two areas because it is a major emphasis in Grade 5.

The connection to multiplication and addition provides an opportunity for students to start the year off by applying the multiplication and addition strategies they learned in previous grades in a new, interesting context.

Common Core State Standards for Mathematical Content	**Academic Vocabulary:**

Measurement and Data – 5.MD

5.MD.01

C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

convert, measurement, measurement system, standard measurement unit, conversion factor

  3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

      a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume can be used to measure volume.

      b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have volume of *n* cubic units.

  4. Measure volumes by counting unit cubes, using cubic *cm*, cubic *in*, cubic *ft*, and improvised units.

Mathematical Practices
3. Construct viable arguments and critique the reasoning of others

7. Look for and make use of structure.

P.A.S.S. Gap

4.1.b Develop and use the formula for perimeter and area of a square and rectangle to solve application problems.

CLARIFICATIONS from evidence tables from PARCC:
5.MD.3
None.
5.MD.4
Tasks assess conceptual understanding of volume (see 5.MD.3) as applied to a specific situation – not applying a volume formula.

Comments:

Emphasis: Developing multiplication and division strategies	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:
Number and Operations in Base Ten – 5.NBT B. Perform operations with multi-digit whole numbers and with decimals to hundredths. 5. Fluently multiply multi-digit whole numbers using the standard algorithm. 6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. P.A.S.S. Gap 2.1.d Identify and apply factors, multiples, prime, and composite numbers in a variety of problem-solving situations (e.g., build rectangular arrays for numbers 1-100 and classify as prime or composite, use common factors to add fractions).	5.NBT.05 standard algorithm , product 5.NBT.06 area model, dividend, divisor, equation, rectangular array, quotient
CLARIFICATIONS from evidence tables from PARCC: 5.NBT.05 i) Tasks assess fluency implicitly, simply in virtue of the fact that there are two substantial computations on the EOY. Tasks need not be timed. ii) The given factors are such as to require an efficient/standard algorithm (e.g.). Factors in the task do not suggest any obvious ad hoc or mental strategy (as would be present for example in a case such as 7264871×7250400). iii) Tasks do not have a context. iv) For purposes of assessment, the possibilities are 3-digit X 4-digit. 5.NBT.06 i) Tasks do not require students to illustrate or explain. ii) Tasks involve 3- or 4-digit dividends and one- or two-digit divisors.	**Mathematical Practices** 1. Make sense of problem and persevere in solving them. 8. Look for and express regularity in repeated reasoning.

Comments:

Emphasis: Using equivalency to add and subtract fractions with unlike denominators.	**Fifth Grade**
Description of Progression	

Common Core State Standards for Mathematical Content	**Academic Vocabulary:**

Number and Operations –Fractions-5.NF
 	
A. Use equivalent fractions as a strategy to add and subtract fractions.
  1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*
 	
  2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result from 2/5 + 1/2 = 3/7, by observing the 3/7 < 1/2.*
	5.NF.01
	
	denominator, equivalent, fraction, mixed number, common denominators, numerator, unlike denominators, difference
	
	5.NF.02
	
	benchmark, equation, estimate, fraction, fraction model, reasonableness, whole, addition, subtraction, improper fraction, sum

CLARIFICATIONS from evidence tables from PARCC: 5.NF.01 Solve word problems involving addition and subtraction of fractions referring to the same whole, in cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. 5.NF.02 i) The situation types are those shown in Table 2, p. 9 of Progression for Operations and Algebraic Thinking, sampled equally. ii) Prompts do not provide visual fraction models; students may at their discretion draw visual fraction models as a strategy.	**Mathematical Practices** 2. Reason abstractly and quantitatively. 4. Model with mathematics.
Comments:	

Emphasis: Expanding understanding of place value to decimals	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:

Number and Operations in Base Ten – 5.NBT
 	
A. Understand the place value system.
  1. Recognize that in a multi-digit number a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represent in the place to its left.
  2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. Use whole-number exponents to denote powers of 10.
  3. Read, write, and compare decimals to thousandths.
    a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
	5.NBT.01
	
	equivalent, place, place value
	
	5.NBT.02
	
	decimal, decimal point, exponent, powers of ten
	
	5.NBT.03
	
	compare, equal to (=), expanded form, greater than (>), hundredths, less than (<), numeral, tenths, thousandths

CLARIFICATIONS from evidence tables from PARCC: 5.NBT.01 i) Tasks have "thin context" or no context. ii) Tasks involve the decimal point in a substantial way (e.g., by involving a comparison of a tenths digit to a thousandths digit or a tenths digit to a tens digit). 5.NBT.02 The explanation aspect of 5.NBT.2 is not assessed here. 5.NBT.03 i) Tasks assess conceptual understanding, e.g. by including a mixture (both within and between items) of expanded form, number names, and base ten numerals. ii) Tasks have "thin context" or no context.	**Mathematical Practices** 6. Attend to precision. 7. Look for and make use of structure.
Comments:	

Emphasis: Understanding the concept of multiplying fractions by fractions	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:

Number and Operations – Fractions – 5.NF
 	
B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
  3. Interpret a fraction as division of the numerator by the denominator (a/b = a x b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, 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?*
  4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by fraction.
    a. Interpret the product (a/b) x q as a part of a partition of q into b equal parts; equal parts; equivalently, as the result of a sequence of operations a x q ÷ b. *For example, use a visual fraction model to show (2/3) x 4 = 8/3, and create a story context for this equation. Do the same with (2/3) x (4/5) = 8/15. (In general, (a/b) x (c/d) = ac/bd.)*
    b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fractions products as rectangular areas.
	5.NF.03
	
	interpret
	
	5.NF.04
	
	area, operations rectangle, sequence side, lengths unit squares
	
	Mathematical Practices
	1. Make sense of problems and persevere in solving them.
	4. Model with mathematics.
	
	5. Use appropriate tools strategically.

CLARIFICATIONS from evidence tables from PARCC: 5.NF.03 i) Tasks do not have a context. ii) Prompts do not provide visual fraction models; students may at their discretion draw visual fraction models as a strategy.	

iii) Note that one of the italicized examples in standard 5.NF.3 is a two-prompt problem.	
5.NF.04.a i) Tasks require finding a fractional part of a whole number quantity. ii) The result is equal to a whole number in 20% of tasks; these are practice – forward for MP.7 iii) Tasks have "thin context" or no context. 5.NF.04.b i) 50% of the tasks present students with the rectangle dimensions and ask students to find the area; 50% of the tasks give the fractions and the product and ask students to show a rectangle to model the problem.	
Comments:	

Emphasis: Understanding the concept of multiplying fractions by fractions	Fifth Grade

Description of Progression

Common Core State Standards for Mathematical Content	Academic Vocabulary:
Number and Operations – Fractions – 5.NF	5.NF.03
B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	interpret

Common Core State Standards for Mathematical Content

Number and Operations – Fractions – 5.NF

B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
  3. Interpret a fraction as division of the numerator by the denominator (a/b = a x b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, 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?*
  4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by fraction.
      a. Interpret the product (a/b) x q as a part of a partition of q into b equal parts; equal parts; equivalently, as the result of a sequence of operations a x q ÷ b. *For example, use a visual fraction model to show (2/3) x 4 = 8/3, and create a story context for this equation. Do the same with (2/3) x (4/5) = 8/15. (In general, (a/b) x (c/d) = ac/bd.)*
      b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fractions products as rectangular areas.

Academic Vocabulary:

5.NF.03

interpret

5.NF.04

area, operations rectangle, sequence side, lengths unit squares

Mathematical Practices
1. Make sense of problems and persevere in solving them.
4. Model with mathematics.

5. Use appropriate tools strategically.

CLARIFICATIONS from evidence tables from PARCC:

5.NF.03

Comments:

Emphasis: Comparing and rounding decimals	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:

Number and Operations in Base Ten – 5.NBT
 	
A. Understand the place value system.
 	
  3. Read, write, and compare, decimals to thousandths.
 	
    b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
 	
  4. Use place value understanding to round decimals to any place.
	5.NBT.03
	
	compare, equal to (=), expanded form, greater than (>), hundredths, less than (<), numeral, tenths, thousandths
	
	5.NBT.04
	
	round

CLARIFICATIONS from evidence tables from PARCC:	**Mathematical Practices** 6. Attend to precision
	7. Look for and make use of structure.
Comments:	

Emphasis: Interpreting multiplying fractions as scaling	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:
Number and Operations – Fractions – 5.NF B. Apply and extend previous understanding of multiplication and division to multiply and divide fractions. 　5. Interpret multiplication as scaling (resizing), by: 　a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. 　b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (nxa)/(nxb) to the effect of multiplying a/b by 1. 　6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fractions models or equations to represent the problem.	5.NF.05 factor, scaling 5.NF.06 multiplication, division, product, quotient, reciprocal
	Mathematical Practices 2. Reason abstractly and quantitatively. 4. Model with mathematics. 6. Attend to precision.
CLARIFICATIONS from evidence tables from PARCC:	
Comments:	

Emphasis: Developing the concept of dividing unit fractions	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:
Number and Operations – Fractions – 5.NF	5.NF.07
B. Apply and extend previous understandings of division to multiply and divide fractions.	unit fraction, multiplication, division, product, quotient, reciprocal

7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.
 	
  a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 X (1/5) = 4.*
  b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*
 	
NOTE: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.
	Mathematical Practices
	1. Make sense of problems and persevere in solve them.
	
	2. Reason abstractly and quantitatively.

CLARIFICATIONS from evidence tables from PARCC:	
Comments:	

Emphasis: Solving problems involving volume	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:
Measurement and Data – 5. MD C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. 5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.	5.MD.05 area, base, edge, length, height, width, rectangular, prism, right rectangular prism, solid figure, formula

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
 	
  b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
 	
  c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping parts, apply this technique to solve real world problems.
	Mathematical Practices
	5. Use appropriate tools strategically.
	7. Look for and make use of structure.
	
	8. Look for and express regularly in repeated reasoning.

CLARIFICATIONS from evidence tables from PARCC:	
Comments:	

Emphasis: Performing operations with decimals	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:
Number and Operations in Base Ten – 5.NBT B. Perform operations with multi-digit whole numbers and with decimals to hundredths. 7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; related the strategy to w written method and explain the reasoning used. **Measurement and Data – 5.MD**	5.NF.07 unit fraction, multiplication, division, product, quotient, reciprocal 5.MD.01 convert, measurement, measurement system, standard measurement unit, conversion factor
A. Convert like measurements units within a given measurement system. 1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.	**Mathematical Practices** 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others.
CLARIFICATIONS from evidence tables from PARCC:	
Comments:	

Emphasis: Classifying two-dimensional geometric figures	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:

Geometry – 5.G
 	
B. Classify two-dimensional figures into categories based on their properties.
 	
   3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*
 	
   4. Classify two-dimensional figures in a hierarchy based on properties.
	5.G.03
	
	attribute, category, rectangle, right angle, square, two-dimensional figure, triangle, rhombus, polygon, trapezoid
	
	5.G.04
	
	classify, properties

	Mathematical Practices 3. Construct viable arguments and critique the reasoning of others.
CLARIFICATIONS from evidence tables from PARCC:	7. Look for and make sure of structures.
Comments:	

Emphasis: Solving problems with fractional quantities	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:

Number and Operations — Fractions —5.NF
 	
B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
 	
    7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.
 	
      c. Solve real world problems involving division of unit fractions by
 	
non-zero whole numbers and division of whole numbers by unit fractions,
 	
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 1/2lb
 	
Of chocolate equally? How many 1/3 cup servings are in 2 cups of raisins?
 	
NOTE: Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.
	5.NBT.07
	
	associative property of addition and
	
	multiplication, commutative property of
	
	addition and multiplication , distributive
	
	property, properties of operations
	
	5.MD.02
	
	data set, line plot

	Mathematical Practices 2. Reason abstractly and quantitatively. 5. Use appropriate tools strategically.
Measurement and Data – 5.MD B. Represent and interpret data. 2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *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.*	
CLARIFICATIONS from evidence tables from PARCC:	
Comments:	

Emphasis: Representing algebraic thinking	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content
 	
Operations and Algebraic Thinking – 5.OA
A. Write and interpret numerical expressions.
   1. Use parentheses, brackets, or braces in numerical expressions, and evaluate with these symbols.
   2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example express the calculation "add 8 and 7, the multiply by 2" as 2 x (8 + 7). Recognize that 3 X (18932 + 921) is three time as large as 18932 + 921, without having to calculate the indicated sum or product.*
	Academic Vocabulary:
	
	5.OA.1
	braces, brackets, evaluate, expressions, parentheses, symbol
	
	5.OA.2
	add, difference, divide, multiply, product. Quotient, subtract, sum, interpret, associative property of addition and multiplication commutative property of addition and multiplication

	Mathematical Practices
CLARIFICATIONS from evidence tables from PARCC:	6. Attend to precision.
Comments:	

Emphasis: Exploring the coordinate plane	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:
Operations and Algebraic Thinking – 5.OA B. Analyze patterns and relationships. 3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the "add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*	5.OA.3 coordinate plane, graph, numerical pattern, ordered pair, rule, sequence, term 5.G.01 axes, coordinates, coordinate system, intersection, line, origin, ordered pair, perpendicular, place, x-axis, x-coordinate, y-axis, y-coordinate

Geometry – 5.G
A. Graph points on the coordinate plane to solve real-world and mathematical problems.
   1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).
   2. 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.
	Mathematical Practices
	4. Model with mathematics.
	
	6. Attend to precision.

CLARIFICATIONS from evidence tables from PARCC:	
Comments:	

Emphasis: Finalizing multiplication and division with whole numbers	Fifth Grade
Description of Progression	

Common Core State Standards for Mathematical Content	Academic Vocabulary:

Number and Operations in Base Ten – 5.NBT
B. Perform operations with multi-digit whole numbers and with decimals to hundredths. .
    5. Fluently multiply multi-digit whole numbers using the standard algorithm.
    6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
	Mathematical Practices
	1. Make sense of problem and persevere in solving them.
	8. Look for and express regularity in repeated reasoning.

CLARIFICATIONS from evidence tables from PARCC:	
Comments:	