Fifth Grade Quarter 3

Module 4: Multiplication and Division of Fractions and Decimal Fractions - Part 2, Topics E-H

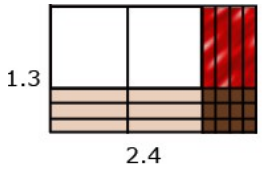
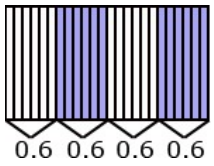
Approximately 21 Days - Begin around January 4th

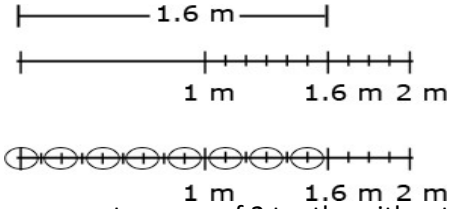
Grade 5's Module 4 extends student understanding of fraction operations to multiplication and division of both fractions and decimal fractions. Work proceeds from interpretation of line plots which include fractional measurements to interpreting fractions as division and reasoning about finding fractions of sets through fraction by whole number multiplication. The module proceeds to fraction by fraction multiplication in both fraction and decimal forms. An understanding of multiplication as scaling and multiplication by n/n as multiplication by 1 allows students to reason about products and convert fractions to decimals and vice versa. Students are introduced to the work of division with fractions and decimal fractions. Division cases are limited to division of whole numbers by unit fractions and unit fractions by whole numbers. Decimal fraction divisors are introduced and equivalent fraction and place value thinking allow student to reason about the size of quotients, calculate quotients and sensibly place decimals in quotients. Throughout the module students are asked to reason about these important concepts by interpreting numerical expressions which include fraction and decimal operations and by persevering in solving real-world, multistep problems which include all fraction operations supported by the use of tape diagrams.

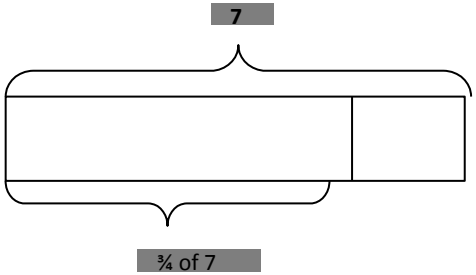
Major Clusters:	**5.NBT.B - Perform operations with multi-digit whole numbers and with decimals to hundredths.** **5.NF.B - Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.**
Supporting Clusters:	5.OA.A - Write and interpret numerical expressions. 5.MD.A - Convert like measurement units within a given measurement system.
Vocabulary	Decimal divisor, simplify

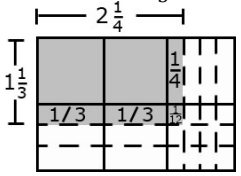
Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
5.OA	A	1	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. *5.MP.1.* Make sense of problems and persevere in solving them. *5.MP.5,* Use appropriate tools strategically. *5.MP.8.* Look for and express regularity in repeated reasoning.	This standard builds on the expectations of third grade where students are expected to start learning the conventional order. Students need experiences with multiple expressions that use grouping symbols throughout the year to develop understanding of when and how to use parentheses, brackets, and braces. First, students use these symbols with whole numbers. Then the symbols can be used as students add, subtract, multiply and divide decimals and fractions. **Examples**: • (26 + 18) ÷ 4 Answer: 11 • {[2 x (3+5)] - 9} + [5 x (23-18)] Answer: 32 • 12 - (0.4 x 2) Answer: 11.2	**Engage NY** M4 Lessons 25-33 **enVision** Topic 8

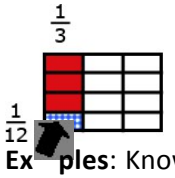
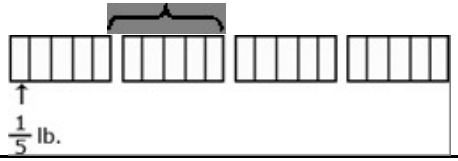
Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
				• (2 + 3) x (1.5 - 0.5) Answer: 5 • $6-\frac{1}{2}+\frac{1}{3}$ Answer: 5 1/6 • { 80 [2 x (3 ½ + 1 ½)] }+ 100 Answer: 108 To further develop students' understanding of grouping symbols and facility with operations, students place grouping symbols in equations to make the equations true or they compare expressions that are grouped differently. **Examples**: • 15 - 7 - 2 = 10 → 15 - (7 - 2) = 10 • 3 x 125 ÷ 25 + 7 = 22 → [3 x (125 ÷ 25)] + 7 = 22 • 24 ÷ 12 ÷ 6 ÷ 2 = 2 x 9 + 3 ÷ ½ → 24 ÷ [(12 ÷ 6) ÷ 2] = (2 x 9) + (3 ÷ ½) • Compare 3 x 2 + 5 and 3 x (2 + 5) • Compare 15 - 6 + 7 and 15 - (6 + 7)	
5.OA	A	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, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 +921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.* *5.MP.1.* Make sense of problems and persevere in solving them. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.7.* Look for and make use of structure. *5.MP.8.* Look for and express regularity in repeated reasoning.	Students use their understanding of operations and grouping symbols to write expressions and interpret the meaning of a numerical expression. **Examples**: • Students write an expression for calculations given in words such as "divide 144 by 12, and then subtract 7/8." They write (144 ÷ 12) - 7/8. • Students recognize that 0.5 x (300 ÷ 15) is ½ of (300 ÷ 15) without calculating the quotient. Students use tape diagrams to represent simple expressions. **Example:** • Show a tape diagram to represent 3 times the sum of 26 and 4.  26 + 4	**Engage NY** M4 Lessons 32-33 **enVision** Topic 8
5.NBT	**B**	**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	This standard requires students to extend the models and strategies they developed for whole numbers in grades 1-4 to decimal values. Before students are asked to give exact answers, they should estimate answers based on their understanding of operations and the value of the	**Engage NY** M4 Lessons 13-20, 25-31

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes &Resources
			relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.3.* Construct viable arguments and critique the reasoning of others. *5.MP.4.* Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.7.* Look for and make use of structure.	numbers. **Example**: • 6 x 2.4 o A student might estimate an answer between 12 and 18 since 6 x 2 is 12 and 6 x 3 is 18. Another student might give an estimate of a little less than 15 because s/he figures the answer to be very close, but smaller than 6 x 2 ½ and think of 2 ½ groups of 6 as 12 (2 groups of 6) + 3 (½ of a group of 6). **Example**: An area model can be useful for illustrating products.  2.4 x 1.3 .12 .60 .40 + 2.00 3.12 Students should be able to describe the partial products displayed by the area model. For example, "3/10 times 4/10 is 12/100. 3/10 times 2 is 6/10 or 60/100. 1 group of 4/10 is 4/10 or 40/100. 1 group of 2 is 2." **Example**: Finding the number in each group or share • Students should be encouraged to apply a fair sharing model separating decimal values into equal parts such as  **Example**: Find the number of groups • Joe has 1.6 meters of rope. He has to cut pieces of rope that are 0.2 meters long. How many can he cut?	**enVision** Topic 1,2,4,6,7

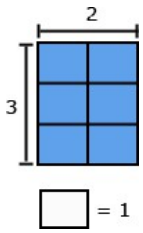
Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
				• To divide to find the number of groups, a student might: o draw a segment to represent 1.6 meters. In doing so, s/he would count in tenths to identify the 6 tenths, and be able identify the number of 2 tenths within the 6 tenths. The student can then extend the idea of counting by tenths to divide the one meter into tenths and determine that there are 5 more groups of 2 tenths.  o count groups of 2 tenths without the use of models or diagrams. Knowing that 1 can be thought of as 10/10, a student might think of 1.6 as 16 tenths. Counting 2 tenths, 4 tenths, 6 tenths, . . .16 tenths, a student can count 8 groups of 2 tenths. o Use their understanding of multiplication and think, "8 groups of 2 is 16, so 8 groups of 2/10 is 16/10 or 1 6/10." Technology Connections: Create models using Interactive Whiteboard software (such as SMART Notebook)	
5.NF	**B**	**4 a**	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. 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 $a \times q \div b$. *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* $(2/3) \times (4/5) = 8/15$. *(In general,* $(a/b) \times (c/d) = ac/bd$.*)* *5.MP.1.* Make sense of problems and	Students are expected to multiply fractions including proper fractions, improper fractions, and mixed numbers. They multiply fractions efficiently and accurately as well as solve problems in both contextual and non-contextual situations. • As they multiply fractions such as 3/5 x 6, they can think of the operation in more than one way. 3 x (6 ÷ 5) or (3 x 6/5) (3 x 6) ÷ 5 or 18 ÷ 5 (18/5) • Students create a story problem for 3/5 x 6 such as: Isabel had 6 feet of wrapping paper. She used 3/5 of the paper to wrap some presents. How much does she have left? Every day Tim ran 3/5 of mile. How far did he run after 6 days? (Interpreting this as 6 x 3/5)	**Engage NY** M4 Lessons 13-20 **enVision** Topic 11

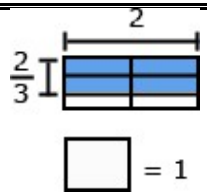
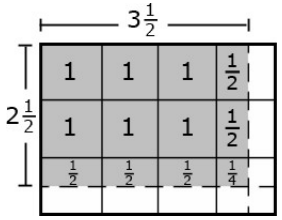
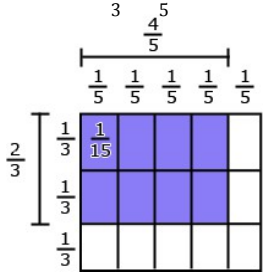
Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
			persevere in solving them. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.3.* Construct viable arguments and critique the reasoning of others. *5.MP.4.* Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure. *5.MP.8.* Look for and express regularity in repeated reasoning.	Technology Connections: • Create story problems for peers to solve using digital tools. Use a tool such as Jing to digitally communicate story problems.	
5.NF	**B**	**5** **a** **b**	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 $a/b = (n\times a)/(n\times b)$ to the effect of multiplying a/b by 1. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.4.* Model with mathematics. *5.MP.6.* Attend to precision.	• $\frac{3}{4} \times 7$ is less than 7 because 7 is multiplied by a factor less than 1 so the product must be less than 7.  • $2\frac{2}{3} \times 8$ must be more than 8 because 2 groups of 8 is 16 and $2\frac{2}{3}$ is almost 3 groups of 8. So the answer must be close to, but less than 24. $\frac{3}{4} = \frac{5\times3}{5\times4}$ because multiplying $\frac{3}{4}$ by $\frac{5}{5}$ is the same as multiplying by 1.	**Engage NY** M4 Lessons 21-24 **enVision** Topic 11

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
			5.MP.7. Look for and make use of structure.		
5.NF	**B**	**6**	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *5.MP.1*. Make sense of problems and persevere in solving them. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.3.* Construct viable arguments and critique the reasoning of others. *5.MP.4.* Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure. *5.MP.8.* Look for and express regularity in repeated reasoning.	• Evan bought 6 roses for his mother. $\frac{2}{3}$ of them were red. How many red roses were there? o Using a visual, a student divides the 6 roses into 3 groups and counts how many are in 2 of the 3 groups.  o A student can use an equation to solve. $\frac{2}{3} \times 6 = \frac{12}{3} = 4$ red roses • Mary and Joe determined that the dimensions of their school flag needed to be $1\frac{1}{3}$ ft. by $2\frac{1}{4}$ ft. What will be the area of the school flag? o A student can draw an array to find this product and can also use his or her understanding of decomposing numbers to explain the multiplication. Thinking ahead a student may decide to multiply by $1\frac{1}{3}$ instead of **2** $\frac{1}{4}$  The explanation may include the following: o First, I am going to multiply $2\frac{1}{4}$ by 1 and then by $\frac{1}{3}$ o When I multiply $2\frac{1}{4}$ by 1, it equals $2\frac{1}{4}$ o Now I have to multiply $2\frac{1}{4}$ by $\frac{1}{3}$ o $\frac{1}{3}$ times 2 is $\frac{2}{3}$ o $\frac{1}{3}$ times $\frac{1}{4}$ is $\frac{1}{12}$ o So the answer is $2\frac{1}{4} + \frac{2}{3} + \frac{1}{12}$ or $2\frac{3}{12} + \frac{8}{12} + \frac{1}{12} = 2\frac{12}{12} = 3$	**Engage NY** M4 Lessons 13-24 This standard also addressed in Module 5. **enVision** Topic 11

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
5.NF	**B**	**7** **a** **b** **c**	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (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.) 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 (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.* 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.* 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	In fifth grade, students experience division problems with whole number divisors and unit fraction dividends (fractions with a numerator of 1) or with unit fraction divisors and whole number dividends. Students extend their understanding of the meaning of fractions, how many unit fractions are in a whole, and their understanding of multiplication and division as involving equal groups or shares and the number of objects in each group/share. In sixth grade, they will use this foundational understanding to divide into and by more complex fractions and develop abstract methods of dividing by fractions. **Example**: Knowing the number of groups/shares and finding how many/much in each group/share • Four students sitting at a table were given 1/3 of a pan of brownies to share. How much of a pan will each student get if they share the pan of brownies equally? The diagram shows the 1/3 pan divided into 4 equal shares with each share equaling 1/12 of the pan.  **Examples**: Knowing how many in each group/share and finding how many groups/shares • Angelo has 4 lbs of peanuts. He wants to give each of his friends 1/5 lb. How many friends can receive 1/5 lb of peanuts? A diagram for 4 ÷ 1/5 is shown below. Students explain that since there are five fifths in one whole, there must be 20 fifths in 4 lbs. 1 lb. of peanuts  	**Engage NY** M4 Lessons 25-31 **enVision** Topic 11

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
			using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* *5.MP.1.* Make sense of problems and persevere in solving them. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.3.* Construct viable arguments and critique the reasoning of others. *5.MP.4.* Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure. *5.MP.8.* Look for and express regularity in repeated reasoning.	• How much rice will each person get if 3 people share 1/2 lb of rice equally? $\frac{1}{2} \div 3 = 6 \div \frac{3}{1} = 6$ $\frac{1}{\ }$ o A student may think or draw ½ and cut it into 3 equal groups then determine that each of those part is 1/6. A student may think of ½ as equivalent to 3/6. 3/6 divided by 3 is 1/6.	
5.MD	A	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. *5.MP.1.* Make sense of problems and persevere in solving them. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision.	In fifth grade, students build on their prior knowledge of related measurement units to determine equivalent measurements. Prior to making actual conversions, they examine the units to be converted, determine if the converted amount will be more or less units than the original unit, and explain their reasoning. They use several strategies to convert measurements. When converting metric measurement, students apply their understanding of place value and decimals.	**Engage NY** M4 Lessons 13-20 **enVision** Topic 13

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
Module 5: Addition and Multiplication with Volume and Area **Approximately 25 Days - Begin around February 1st** In this 25-day Module, students work with two- and three-dimensional figures. Volume is introduced to students through concrete exploration of cubic units and culminates with the development of the volume formula for right rectangular prisms. The second half of the module turns to extending students' understanding of two-dimensional figures. Students combine prior knowledge of area with newly acquired knowledge of fraction multiplication to determine the area of rectangular figures with fractional side lengths. They then engage in hands-on construction of two-dimensional shapes, developing a foundation for classifying the shapes by reasoning about their attributes. This module fills a gap between Grade 4's work with two-dimensional figures and Grade 6's work with volume and area.					
Major Clusters:			**5.NF.B - Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.** **5.MD.C - Geometric measurement: understand concepts of volume and relate volume to multiplication and addition.**		
Supporting Clusters:			5.G.B - Classify two-dimensional figures into categories based on their properties.		
Vocabulary			Base, bisect, cubic units, height, hierarchy, unit cube, volume of a solid		
5.NF	**B**	**4 b**	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. 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 fraction products as rectangular areas. *5.MP.1.* Make sense of problems and persevere in solving them. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.3.* Construct viable arguments and critique the reasoning of others.	Students are expected to multiply fractions including proper fractions, improper fractions, and mixed numbers. They multiply fractions efficiently and accurately as well as solve problems in both contextual and non-contextual situations. **Examples**: Building on previous understandings of multiplication • Rectangle with dimensions of 2 and 3 showing that 2 x 3 = 6.  • Rectangle with dimensions of 2 and 2/3 showing that 2 x 2/3 = 4/3	**Engage NY** M5 Lessons 10-15 **enVision** Topic 11

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
			5.MP.4. Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure. *5.MP.8.* Look for and express regularity in repeated reasoning.	 • $2\frac{1}{2}$ groups of $3\frac{1}{2}$:  In solving the problem $\frac{2}{3} \times \frac{4}{5}$, students use an area model to visualize it as a 2 by 4 array of small rectangles each of which has side lengths 1/3 and 1/5. They reason that 1/3 x 1/5 = 1/(3 x 5) by counting squares in the entire rectangle, so the area of the shaded area is (2 x 4) x 1/(3 x 5) = $\frac{2 \times 4}{3 \times 5}$. They can explain that the product is less than $\frac{4}{5}$ because they are finding $\frac{2}{3}$ of $\frac{4}{5}$. They can further estimate that the answer must be between $\frac{2}{5}$ and $\frac{4}{5}$ because $\frac{2}{3}$ of $\frac{4}{5}$ is more than $\frac{1}{2}$ of $\frac{4}{5}$ and less than one group of $\frac{4}{5}$  The area model and the line segments show that the area is the same quantity as the product of the side lengths. • Larry knows that $\frac{1}{12} \times \frac{1}{12}$ is $\frac{1}{144}$. To prove this he makes the	

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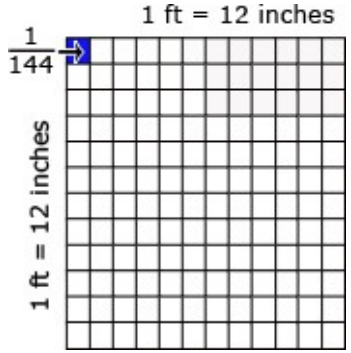
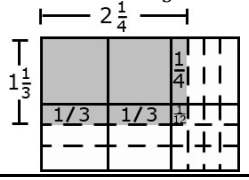
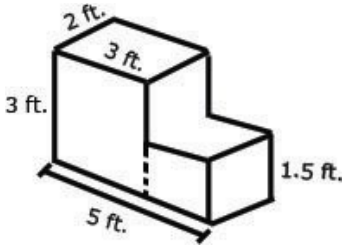
				following array.  Technology Connections: • Create story problems for peers to solve using digital tools.	
5.NF	**B**	**6**	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *5.MP.1*. Make sense of problems and persevere in solving them. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.3.* Construct viable arguments and critique the reasoning of others. *5.MP.4.* Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure. *5.MP.8.* Look for and express regularity in repeated reasoning.	Use a tool such as Jing to digitally communicate story problems. • Evan bought 6 roses for his mother. $\frac{2}{3}$ of them were red. How many red roses were there? o Using a visual, a student divides the 6 roses into 3 groups and counts how many are in 2 of the 3 groups.  o A student can use an equation to solve. $\frac{2}{3} \times 6 = \frac{12}{3} = 4$ red roses • Mary and Joe determined that the dimensions of their school flag needed to be $1\frac{1}{3}$ ft. by $2\frac{1}{4}$ ft. What will be the area of the school flag? o A student can draw an array to find this product and can also use his or her understanding of decomposing numbers to explain the multiplication. Thinking ahead a student may decide to multiply by $1\frac{1}{3}$ instead of **2** $\frac{1}{4}$  	**Engage NY** M5 Lessons 10-15 **enVision** Topic 11

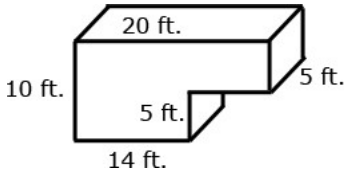
Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
				The explanation may include the following: o First, I am going to multiply $2\frac{1}{4}$ by 1 and then by $\frac{1}{3}$ o When I multiply $2\frac{1}{4}$ by 1, it equals $2\frac{1}{4}$ o Now I have to multiply $2\frac{1}{4}$ by $\frac{1}{3}$ o $\frac{1}{3}$ times 2 is $\frac{2}{3}$ o $\frac{1}{3}$ times $\frac{1}{4}$ is $\frac{1}{12}$ o So the answer is $2\frac{1}{4} + \frac{2}{3} + \frac{1}{12}$ or $2\frac{3}{12} + \frac{8}{12} + \frac{1}{12} = 2\frac{12}{12} = 3$	
5.MD	**C**	**3** **a** **b**	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, and 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 a volume of *n* cubic units. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.4.* Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure.	Students' prior experiences with volume were restricted to liquid volume. As students develop their understanding volume they understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. This cube has a length of 1 unit, a width of 1 unit and a height of 1 unit and is called a cubic unit. This cubic unit is written with an exponent of 3 (e.g., in^3, m^3). Students connect this notation to their understanding of powers of 10 in our place value system. Models of cubic inches, centimeters, cubic feet, etc., are helpful in developing an image of a cubic unit. Student's estimate how many cubic yards would be needed to fill the classroom or how many cubic centimeters would be needed to fill a pencil box.	**Engage NY** M5 Lessons 1-9 **enVision** Topic 12
5.MD	**C**	**4**	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.4.* Model with mathematics. *5.MP.5.* Use appropriate tools strategically.	Students understand that same sized cubic units are used to measure volume. They select appropriate units to measure volume. For example, they make a distinction between which units are more appropriate for measuring the volume of a gym and the volume of a box of books. They can also improvise a cubic unit using any unit as a length (e.g., the length of their pencil). Students can apply these ideas by filling containers with cubic units (wooden cubes) to find the volume. They may also use	**Engage NY** M5 Lessons 1-9 **enVision** Topic 12

<table>
<tr><th>Domain</th><th>Cluster</th><th>Standard</th><th>Arizona's College and Career Ready Standards</th><th>Explanations & Examples</th><th>Notes & Resources</th></tr>
<tr><td></td><td></td><td></td><td>5.MP.6. Attend to precision.</td><td>drawings or interactive computer software to simulate the same filling process.
Technology Connections:
http://illuminations.nctm.org/ActivityDetail.aspx?ID=6</td><td></td></tr>
<tr><td>5.MD</td><td>C</td><td>5
a
b
c</td><td>Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
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 × w × h and V = b × 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 right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

5.MP.1. Make sense of problems and persevere in solving them.
5.MP.2. Reason abstractly and quantitatively.
5.MP.3. Construct viable arguments and critique the reasoning of others.</td><td>Students need multiple opportunities to measure volume by filling rectangular prisms with cubes and looking at the relationship between the total volume and the area of the base. They derive the volume formula (volume equals the area of the base times the height) and explore how this idea would apply to other prisms. Students use the associative property of multiplication and decomposition of numbers using factors to investigate rectangular prisms with a given number of cubic units.
Examples:
• When given 24 cubes, students make as many rectangular prisms as possible with a volume of 24 cubic units. Students build the prisms and record possible dimensions.
<table>
<tr><th>Length</th><th>Width</th><th>Height</th></tr>
<tr><td>1</td><td>2</td><td>12</td></tr>
<tr><td>2</td><td>2</td><td>6</td></tr>
<tr><td>4</td><td>2</td><td>3</td></tr>
<tr><td>8</td><td>3</td><td>1</td></tr>
</table>
• Students determine the volume of concrete needed to build the steps in the diagram below.
 

• A homeowner is building a swimming pool and needs to calculate the volume of water needed to fill the pool. The design of the pool is shown in the illustration below.</td><td>Engage NY
M5 Lessons 4-9

enVision
Topic 12</td></tr>
</table>

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
			5.MP.4. Model with mathematics. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure. *5.MP.8.* Look for and express regularity in repeated reasoning.		
5.G	B	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.* *5.MP.2.* Reason abstractly and quantitatively. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure.	Geometric properties include properties of sides (parallel, perpendicular, congruent), properties of angles (type, measurement, congruent), and properties of symmetry (point and line). **Example**: • If the opposite sides on a parallelogram are parallel and congruent, then rectangles are parallelograms • A sample of questions that might be posed to students include: o A parallelogram has 4 sides with both sets of opposite sides parallel. What types of quadrilaterals are parallelograms? o Regular polygons have all of their sides and angles congruent. Name or draw some regular polygons. o All rectangles have 4 right angles. Squares have 4 right angles so they are also rectangles. True or False? o A trapezoid has 2 sides parallel so it must be a parallelogram. True or False? Technology Connections: http://illuminations.nctm.org/ActivityDetail.aspx?ID=70	**Engage NY** M5 Lessons 16-21 **enVision** Topic 15
5.G	B	4	Classify two-dimensional figures in a hierarchy based on properties. *5.MP.2.* Reason abstractly and quantitatively. *5.MP.3.* Construct viable arguments and critique the reasoning of others. *5.MP.5.* Use appropriate tools strategically. *5.MP.6.* Attend to precision. *5.MP.7.* Look for and make use of structure.	Properties of figure may include: • Properties of sides—parallel, perpendicular, congruent, number of sides • Properties of angles—types of angles, congruent **Examples**: • A right triangle can be both scalene and isosceles, but not equilateral. • A scalene triangle can be right, acute and obtuse. • Triangles can be classified by: Angles o Right: The triangle has one angle that measures 90º.	**Engage NY** M5 Lessons 16-21 **enVision** Topic 15

Domain	Cluster	Standard	Arizona's College and Career Ready Standards	Explanations & Examples	Notes & Resources
				o Acute: The triangle has exactly three angles that measure between 0º and 90º. o Obtuse: The triangle has exactly one angle that measures greater than 90º and less than 180º. Sides o Equilateral: All sides of the triangle are the same length. o Isosceles: At least two sides of the triangle are the same length. o Scalene: No sides of the triangle are the same length.