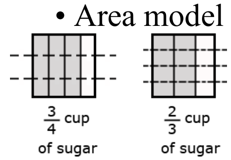
Grade: 5 **Unit 3 –Numbers and Operations with Multiplication and Division Using Fractions**	**Subject: Math** • **Time Frame: 25 days** • **Domains: Number and Operations – Fraction** • **Measurement and Data**	
Standards	Content Standards: 5.NF.1, 5.NF.2, 5.NF.3, 5.NF.4, 5.NF.4a, 5.NF.b, 5.NF.5, 5.NF.5a, 5.NF.5b, 5.NF.6, 5.NF.7, 5.NF.7a, 5.NF.5b, 5.NF.5c, 5.MD.2 http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf	Practice Standards: MP 1, 2, 3, 4, 5, 6, 7, 8
Enduring Understandings	1. Connect multiplying by 1/n to dividing by *n*, and use this idea to make multiplicative comparisons. 2. Interpret a/b times a quantity as *a* of *b* equal parts of that quantity. 3. Multiply a whole number by a fraction to produce a fraction. 4. Multiply any two fractions. 5. Compare and apply strategies for multiplying and dividing fractions. 6. Add, subtract, compare, divide and multiply fractions to solve word problems. 7. Predict the size of a product relative to the size of one factor based on the size of the other factor. 8. Relate division by a unit fraction or whole number to multiplication.	
Essential Questions	1. How do we add and subtract fractions with unlike denominators? 2. What happens when we multiply a whole number by a fraction? 3. What happens when we multiply a fraction by a fraction? 4. How does the size of a factor influence the size of a product? 5. How can we divide with fractions and what does our quotient represent? 6. Why display data in different ways?	

Vocabulary	unsimplify, n-split, comparison bars, multiplicative comparison, factor, product, area model for multiplication, fraction-bar model for multiplication, Multiply and Simplify Method, Simplify and Multiply Method, Unit Fraction Method, Associative Property, Commutative Property, Distributive Property, decimal fraction, dividend, divisor, quotient,

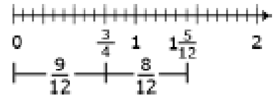
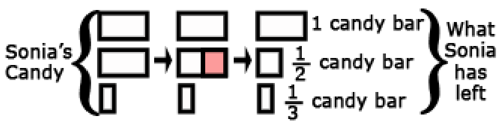
Priority and Supporting CCSS	Explanations and Examples*
5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. ***For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)***	**5.NF.1** Students should apply their understanding of equivalent fractions developed in fourth grade and their ability to rewrite fractions in an equivalent form to find common denominators. They should know that multiplying the denominators will always give a common denominator but may not result in the smallest denominator. Examples: • $\frac{2}{5}+\frac{7}{8}=\frac{16}{40}+\frac{35}{40}=\frac{51}{40}$ • $3\frac{1}{4}-\frac{1}{6}=3\frac{3}{12}-\frac{2}{12}=3\frac{1}{12}$
5.NF.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 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.***	**5.NF.2** Examples: Jerry was making two different types of cookies. One recipe needed ¾ cup of sugar and the other needed $\frac{2}{3}$cup of sugar. How much sugar did he need to make both recipes? • Mental estimation: ○ A student may say that Jerry needs more than 1 cup of sugar but less than 2 cups. An explanation may compare both fractions to ½ and state that both are larger than ½ so the total must be more than 1. In addition, both fractions are slightly less than 1 so the sum cannot be more than 2. • Area model

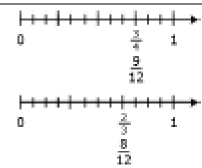
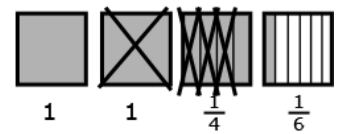
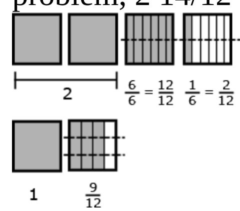


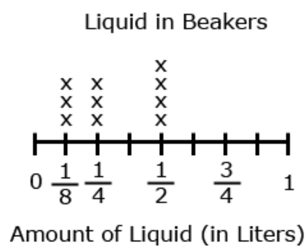
$\frac{3}{4}=\frac{9}{12}$ $\frac{2}{3}=\frac{8}{12}$ $\frac{3}{4}+\frac{2}{3}=\frac{17}{12}=\frac{12}{12}+\frac{5}{12}=1\frac{5}{12}$

• Linear model

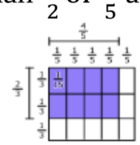
*Source – Connecticut Core Standards for Mathematics as adapted from the Arizona Academic Content Standards

	Solution: 
	Example: Using a bar diagram • Sonia had 2 1/3 candy bars. She promised her brother that she would give him ½ of a candy bar. How much will she have left after she gives her brother the amount she promised?  Now students need to use equivalent fractions to find the total of 1 + ½ + 1/3. If Mary ran 3 miles every week for 4 weeks, she would reach her goal for the month. The first day of the first week she ran 1 ¾ miles. How many miles does she still need to run the first week? ○ Using addition to find the answer:1 ¾ + n = 3 ○ A student might add 1 ¼ to 1 ¾ to get to 3 miles. Then he or she would add 1/6 more. Thus 1 ¼ miles + 1/6 of a mile is what Mary needs to run during that week. ○ Example: Using an area model to subtract • This model shows 1 ¾ subtracted from 3 1/6 leaving 1 + ¼ + 1/6 which a student can then change to 1 + 3/12 + 2/12 = 1 5/12.

	 $3\frac{1}{6}$ and 1 ¾ can be expressed with a denominator of 12. Once this is done a student can complete the problem, 2 14/12 – 1 9/12 = 1 5/12. • This diagram models a way to show how $3\frac{1}{6}$ and 1 ¾ can be expressed with a denominator of 12. Once this is accomplished, a student can complete the problem, 2 14/12 – 1 9/12 = 1 5/12. 
	Estimation skills include identifying when estimation is appropriate, determining the level of accuracy needed, selecting the appropriate method of estimation, and verifying solutions or determining the reasonableness of situations using various estimation strategies. Estimation strategies for calculations with fractions extend from students' work with whole number operations and can be supported through the use of physical models. Example: • Elli drank $\frac{3}{5}$ quart of milk and Javier drank $\frac{1}{10}$ of a quart less than Ellie. How much milk did they drink all together? Solution:

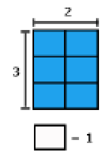
	• $\frac{3}{5}-\frac{1}{10}=\frac{6}{10}-\frac{1}{10}=\frac{5}{10}$ This is how much milk Javier drank • $\frac{3}{5}+\frac{5}{10}=\frac{6}{10}+\frac{5}{10}=\frac{11}{10}$ Together they drank $1\frac{1}{10}$ quarts of milk This solution is reasonable because Ellie drank more than ½ quart and Javier drank ½ quart so together they drank slightly more than one quart.
5.MD.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.***	**5.MD.2** Ten beakers, measured in liters, are filled with a liquid.  The line plot above shows the amount of liquid in liters in 10 beakers. If the liquid is redistributed equally, how much liquid would each beaker have? (This amount is the mean.) Students apply their understanding of operations with fractions. They use either addition and/or multiplication to determine the total number of liters in the beakers. Then the sum of the liters is shared evenly among the ten beakers.

Priority and Supporting CCSS	Explanations and Examples*
5.NF.3 Interpret a fraction as division of the numerator by the denominator (*a*/*b* = *a* ÷ *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?***	**5.NF.3** Students are expected to demonstrate their understanding using concrete materials, drawing models, and explaining their thinking when working with fractions in multiple contexts. They read 3/5 as "three fifths" and after many experiences with sharing problems, learn that 3/5 can also be interpreted as "3 divided by 5." Examples: • Ten team members are sharing 3 boxes of cookies. How much of a box will each student get? • When working this problem a student should recognize that the 3 boxes are being divided into 10 groups, so s/he is seeing the solution to the following equation, 10 x *n* = 3 (10 groups of some amount is 3 boxes) which can also be written as n = 3 ÷ 10. Using models or diagram, they divide each box into 10 groups, resulting in each team member getting 3/10 of a box. • Two afterschool clubs are having pizza parties. For the Math Club, the teacher will order 3 pizzas for every 5 students. For the student council, the teacher will order 5 pizzas for every 8 students. Since you are in both groups, you need to decide which party to attend. How much pizza would you get at each party? If you want to have the most pizza, which party should you attend? • The six fifth grade classrooms have a total of 27 boxes of pencils. How many boxes will each classroom have to use? Students may recognize this as a whole number division problem but should also express this equal sharing problem as $\frac{27}{6}$. They explain that each classroom gets $\frac{27}{6}$ boxes of pencils and can further determine that each classroom get $4\frac{3}{6}$ or $4\frac{1}{2}$ boxes of pencils.

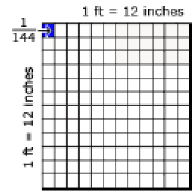
5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. **a. Interpret the product (*a*/*b*) × *q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a* × *q* ÷ *b*. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (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 fraction products as rectangular areas.**	**5.NF.4** 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) Example: • In solving the problem $\frac{2}{3}$x $\frac{4}{5}$, 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 $\frac{4}{5}$, and 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.

Examples:

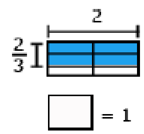
- Rectangle with dimensions of 2 and 3 showing that 2 x 3 = 6.



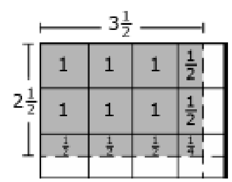
- Larry knows that $\frac{1}{12} \times \frac{1}{12}$ is $\frac{1}{144}$. To prove this he makes the following array.



- Rectangle with dimensions of 2 and $\frac{2}{3}$ showing that 2 x 2/3 = 4/3

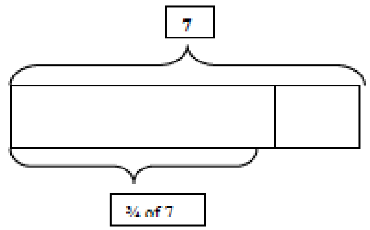


- $2\frac{1}{2}$ groups of $3\frac{1}{2}$:



Technology Connections:

- Create story problems for peers to solve using digital tools.
- Use a tool such as Jing to digitally communicate story problems.

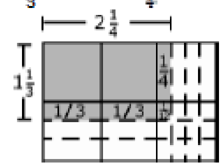
5.NF.5 Interpret multiplication as scaling (resizing) by: **a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.** **b. Explaining why multiplying a given number by a fraction greater than 1 results 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* = (*n*×*a*)/(*n*×*b*) to the effect of multiplying *a*/*b* by 1.**	**5.NF.5** Examples: • $\frac{3}{4} \times 7$ is less than 7 because 7 is multiplied by a factor less than 1 so the product must be less than 7.  • $2\frac{2}{3}$ x 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. • $\frac{3}{4} = \frac{5 \times 3}{5 \times 4}$ because multiplying $\frac{3}{4}$ by $\frac{5}{5}$ is the same as multiplying by 1.
5.NF.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.NF.6**

Examples:

- Evan bought 6 roses for his mother. $\frac{2}{3}$ of them were red. How many red roses were there?
  - Using a visual, a student divides the 6 roses into 3 groups and counts how many are in 2 of the 3 groups.

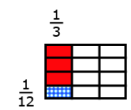
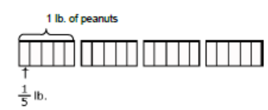
  - A student can use an equation to solve.
    $\frac{2}{3} \times 6 = \frac{12}{3} = 4$ red roses

- 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?
  - 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:

- First, I am going to multiply $2\frac{1}{4}$ by 1 and then by $\frac{1}{3}$.
- When I multiply $2\frac{1}{4}$ by 1, it equals $2\frac{1}{4}$.
- Now I have to multiply $2\frac{1}{4}$ by $\frac{1}{3}$.
- $\frac{1}{3}$ times 2 is $\frac{2}{3}$.
- $\frac{1}{3}$ times $\frac{1}{4}$ is $\frac{1}{12}$.
- So the answer is $2\frac{1}{4} + \frac{2}{3} + \frac{1}{12}$ or $2\frac{3}{12} + \frac{8}{12} + \frac{1}{12} = 2\frac{12}{12} = 3$

Priority and Supporting CCSS	**Explanations and Examples***
5.NF.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 (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 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?*** ******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.NF.7** 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. Division: 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.  • How much rice will each person get if 3 people share 1/2 lb of rice

	equally? $$\frac{1}{2} \div 3 = \frac{3}{6} \div 3 = \frac{1}{6}$$ • 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.

Resources
Math Expressions–Unit 3, Lessons 1-14 (Pages 187A – 292) Soar to Success Math Intervention Mega Math Destination Math Common Core Mathematics-Newmark Learning- Units-1 Xtramath.org Connecticut State Department of Education http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=320872

Unit Assessments
Unit Test Formative Assessments Quick Quizzes Performance Task **Alternate Assessments from other sources:** :http://3-5cctask.ncdpi.wikispaces.net/5.NF.1-5.NF.2, http://3-5cctask.ncdpi.wikispaces.net/5.NF.3-5.NF.7, http://3-5cctask.ncdpi.wikispaces.net/5.MD.2 **https://grade5commoncoremath.wikispaces.hcpss.org/Assessing+5.NF.1** **https://grade5commoncoremath.wikispaces.hcpss.org/Assessing+5.NF.2** **https://grade5commoncoremath.wikispaces.hcpss.org/Assessing+5.NF.3** **https://grade5commoncoremath.wikispaces.hcpss.org/Assessing+5.MD.2**

Technology: Videos, Websites, Links
www.learnzillion.com https://grade5commoncoremath.wikispaces.hcpss.org/5.NF.1 https://grade5commoncoremath.wikispaces.hcpss.org/5.NF.2 https://grade5commoncoremath.wikispaces.hcpss.org/5.NF.3 https://grade5commoncoremath.wikispaces.hcpss.org/5.NF.4 https://grade5commoncoremath.wikispaces.hcpss.org/5.NF.5 https://grade5commoncoremath.wikispaces.hcpss.org/5.NF.6 https://grade5commoncoremath.wikispaces.hcpss.org/5.NF.7 https://grade5commoncoremath.wikispaces.hcpss.org/5.MD.2