Major areas tested on 4th grade MEAP (from the 3rd grade GLCEs)

1) basic multiplication and division situations and fact families (green)
2) basic concepts of fractions (blue)
3) area and perimeter of squares and rectangles (yellow)
4) continued work with 2-D and 3-D shapes

GLCEs in grey will not be tested on the MEAP because they moved to a higher grade in the CCSS.

GLCE	GLCE Grade	CALC	GLCE Descriptor	Match to CCSS	
N.ME.03.01	3rd	N	Read and write numbers to 10,000	N	
N.ME.03.02	3rd	N	Identify place value of digit in a number	4th	
N.ME.03.03	3rd	N	Compare and order numbers up to 10,000.	4th	
N.ME.03.05	3rd	N	Know that even numbers end in 0, 2, 4, 6 or 8	3rd	
N.FL.03.06	3rd	N	Add and subtract thru 999 w/regrouping, 9,999 w/o	3rd	
N.FL.03.07	3rd	N	Estimate sum / difference of two 3-digit numbers	3rd	
N.FL.03.08	3rd	N	Use strategies to mentally + and - two-digit numbers		
N.MR.03.10	3rd	N	Recognize multiplication and division situations	3rd	core
N.MR.03.15	3rd	Y	Identify operation for problem and solve	3rd	core
N.MR.03.09	3rd	N	Use x and ÷ fact families to show inverse relationship	3rd	core
N.FL.03.11	3rd	N	Find products to 10 X 10 and related quotients	3rd	core
N.MR.03.12	3rd	Y	Find solutions to open sentences that use x and ÷	3rd	
N.MR.03.14	3rd	Y	Solve division problems involving remainders	4th	core
N.ME.03.16	3rd	N	Understand meaning & terminology of fractions	3rd	core
N.ME.03.17	3rd	N	Recognize, name and use equivalent fractions	3rd	core
N.ME.03.18	3rd	N	Place & compare fractions on number line	3rd	core
N.ME.03.19	3rd	N	Understand fraction as sum of unit fractions	4th	
N.MR.03.20	3rd	N	Model +, - of fractions on number line	4th	
N.ME.03.21	3rd	Y	Understand meaning of 0.50 & 0.25 related to money	4th	
M.UN.03.01	3rd	Y	Use common measures of length, weight, time	3rd	
M.UN.03.02	3rd	Y	Measure in mixed units within measurement system	3rd	
M.UN.03.03	3rd	Y	Use relationships between sizes of standard units	2nd	
M.UN.03.04	3rd	N	Know benchmark temperatures; compare cooler/warmer	N	
M.UN.03.05	3rd	Y	Calculate area and perimeter of square & rectangle	3rd	core
M.UN.03.06	3rd	N	Find area of region by covering & counting sq. units	3rd	core
M.UN.03.07	3rd	N	Distinguish between units of length, area in context	3rd	core
M.TE.03.09	3rd	N	Estimate perimeter & area of square & rectangle	3rd	core
M.PS.03.13	3rd	Y	Solve problems about perimeter/area of rectangles	3rd	core
M.UN.03.08	3rd	N	Compare relative sizes of square inch & square cm	3rd	
M.PS.03.10	3rd	Y	Add and subtract lengths, weights and times	3rd	
M.PS.03.11	3rd	Y	Add and subtract money in dollars and cents	3rd	
M.PS.03.12	3rd	Y	Solve problems involving money, length and time	3rd	core

G.GS.03.01	3rd	N	Identify points, line segments, lines and distance	4th	core
G.GS.03.02	3rd	N	Identify perpendicular lines and parallel lines	4th	core
G.GS.03.03	3rd	N	Identify parallel faces of rectangular prisms	4th	core
G.GS.03.04	3rd	N	Identify, describe, compare, classify 2-D shapes	3rd	core
G.GS.03.06	3rd	N	Identify, describe, classify familiar 3-D solids	1st, 2nd	core
G.SR.03.05	3rd	N	Compose and decompose triangles and rectangles	1st	core
G.SR.03.07	3rd	N	Show front/top/side views of solids built w/ cubes	6th	
D.RE.03.01	3rd	N	Read & interpret horizontal and vertical bar graphs	3rd	
D.RE.03.02	3rd	N	Read scales on axes. Identify the max, min, range	3rd	
D.RE.03.03	3rd	Y	Solve problems using bar graphs, compare graphs	3rd	

Diagnostic Assessment for Core 3rd grade GLCEs

1. Your class is having a pizza party. You buy 3 pizzas. Each pizza has 6 slices. How many slices is that altogether?

   ____

   Write this as a number sentence: ______________________

2. Ted has 15 candy bars. He wants to put them into 5 bags so there are the same number of candy bars in each bag. How many candy bars should go in each bag?

   ____

   Write this as a number sentence: ______________________

3. Beth has 4 packs of crayons. Each pack has 10 crayons in it. She also has 6 extra crayons. How many crayons does Beth have altogether?

   ○ A 20 crayons
   ○ B 34 crayons
   ○ C 40 crayons
   ○ D 46 crayons

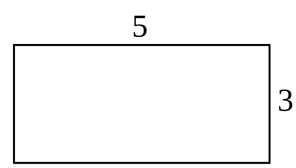
4. Estimate the answer: 317 + 495 ________

   ○ A 500
   ○ B 600
   ○ C 700
   ○ D 800

5. On Tuesday, you play soccer after school for 25 minutes. On Wednesday, you play soccer for 45 minutes. How much time did you play altogether on Tuesday and Wednesday?

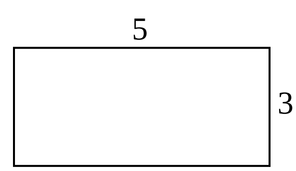
○ A 60 minutes
○ B 65 minutes
○ C 70 minutes
○ D 80 minutes

6. Find the area of this rectangle:



○ A 8
○ B 15
○ C 16
○ D 30

6. Find the perimeter of this rectangle:

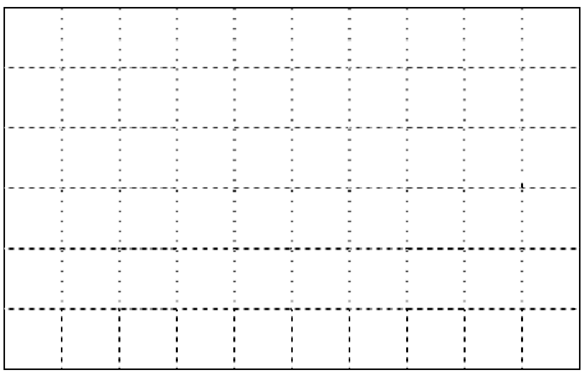


○ A 13
○ B 15
○ C 16
○ D 20

7. A scientist is studying dune grass on Lake Michigan. She needs to count the number of grass plants in a small, rectangular plot that is 10 feet on one side and 6 feet on the other side.

Because there are so many plants, she puts a grid of squares over the plot to make it easier to count. Each square is 1 square foot.

It looks like this:



What is the area of the whole rectangular plot? ____________________

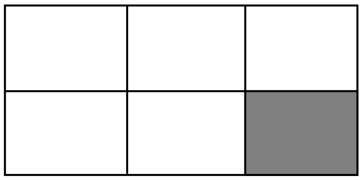
62 +8	78 +16	256 +305
42 -27	86 -7	563 -415

2×8 ______ 5×4 ______ 7×3 ______

4×9 ______ 6×7 ______ 8×5 ______

25 ÷ 5 ______ 18 ÷ _____ = 6 32 ÷ 8 ______

8. There is one brownie left in this pan.
What fraction of the whole pan of brownies is that?



____

9. Circle the larger fraction $\frac{1}{3}$ or $\frac{1}{6}$

Draw a picture to explain your answer.

10. Your class had a pizza party. Most of the pizza was eaten, but there is $\frac{2}{8}$ of one pizza left and $\frac{5}{8}$ of another pizza left. You put them into the same pizza box. How much of a pizza do you have altogether?

____

11. Which fraction is the same as $\frac{1}{4}$?

○ A $\frac{4}{1}$

○ B $\frac{2}{8}$

○ C $\frac{2}{5}$

○ D $\frac{4}{8}$

3^{rd} Grade Critical Areas and Teaching Strategies

Multiplication & Division – concepts & single-digit combinations

1) Concepts of multiplication and division need to be understood through problem situations.
2) Fact family relationships are developed by solving many problems. Students often develop strategies for quickly producing a fact.
3) Fluency comes gradually.
4) Number sentences should always be written when solving problems – even if they can be solved by alternative methods (e.g. repeated adding) – to connect the symbols to the operations. Some problems involve "missing factors" such as *5 people will ride in each car. How many cars do we need for 35 people?* 5 x ___ = 35.

Students develop an understanding of the concepts of multiplication and division by working well-structured problems. All of these can be worked out with manipulatives at an early age.

Multiplication: Equal groups

Megan has 5 bags of cookies. There are 3 cookies in each bag. How many cookies does Megan have all together?

Division: Two related situations

Partitive Division – Partitioning the total number of objects into a given number of groups. *Megan has 15 cookies. She put the cookies into 5 bags with the same number of cookies in each bag.* How many cookies are in each bag? (The number of objects in each group is unknown).

Measurement Division – "Measuring" a total amount using a "standard." *Megan has 15 cookies. She puts 3 cookies in each bag. How many bags can she fill?* (The number of objects in each group is the standard; the number of groups is unknown)

There are several different types of multiplication problems, all of which involve equal number of groups:

1) rate problems: *I eat 3 bananas a day. How many have I eaten after 5 days?*
2) price problems: *One piece of candy costs 5 cents. How much does 8 pieces cost?*
3) multiplicative comparison problems (*My mom is 6 times older than I am. I am 7 years old. How old is my mom?*) The CCSS leaves these kinds of problems until 4^{th} grade, recognizing that this concept is different from repeated addition.
4) Area and array problems (*There are 4 rows of desks in a classroom with 8 desks in each row. How many desks are there altogether?*) Connecting area to multiplication is critical. This is another critical area for 3^{rd} grade. See below.
5) Combination problems (*At the ice cream store they sell 7 flavors of ice cream and 3 different kinds of cones. How many different combinations of one flavor and one kind of*

cone are there?) Students may have to draw out all the combinations to see that this is a multiplication problem.

When students are given these kinds of problems and asked to work them in any way they can (and given manipulatives), they generally use these kinds of strategies:

- Skip counting with smaller numbers, then counting on
- Strategies for deriving facts, such as knowing doubles, “double - doubles” for multiplying by 4, “times ten then 1/2” for multiplying by 5, etc.
- Some combinations are easier to remember, such as the square numbers. A strategy based on the square numbers is the “off 1” strategy: the product of the two numbers “around” another (6 and 4 are “around” 5) is one less than the square of the middle number.
- Knowing the fact families for products of numbers results in knowing the division facts.

Teaching strategy for developing fluency with fact families

1. **Assess what the student knows:** Find out which combinations the student knows already by using the fluency assessment. Then have them cross off the known combinations on the 10x10 chart. Focus on the unknown ones.

2. **Reinforce strategies they know:** Listen for any patterns or strategies they use as you quiz them on known combinations. Build on those strategies (e.g. skip counting by 2's or 5's along the 100's chart can help them learn some of the higher 2's or 5's they might not know off-hand, like 2 x 8 or 5 x 9). Get them to verbalize any strategies they already use, such as using a known combination to find an unknown one (e.g. 5 x 9 = 5 x 8 + 5). Let them know that it's good to use strategies, and that some students can use them as fast as if they had memorized the combination.

3. **Use well-structured problems to focus on concepts:** Provide lots of everyday problems (ones where the operation is obvious - see pp. 13-15) that require the use of number combinations they don't know but that can build on ones they do know. This also ensures that they understand the concepts of multiplication and division. Allow the use of drawings for figuring out these problems, but always have them write the number sentence to go with each one.

> The concept of multiplication is counting the number of objects in groups of equal size. This can be modeled by skip counting (repeated addition). For example, Karen has 5 bunches of flowers. Each bunch has 4 flowers in it. How many flowers does she have altogether?
>
> Division is related to multiplication. If Karen has 20 flowers and wants to put them in bunches of 4 flowers each, how many bunches could she make? (how many groups?) Or we could ask: Karen has 20 flowers and wants to put them into 5 bunches. How many flowers would be in each bunch? (how many in a group?)

4. **Use representations** of multiplication and division, such as skip counting on the number line and the use of array and area models. Sometimes new contexts or visual models trigger better memory storage. Create alternative versions of these problems that use the division facts within the fact family as well as the multiplication fact. Ensure that students understand that multiplication combinations represent fact families that also include two related division statements.

5. **Introduce new strategies as needed**, such as the "squares minus one" strategy and the finger strategy for 9's. It's better to have students show each other what strategies they use than for you to try to force students to use particular strategies.

6. **Use fluency games and multiple real-world problems:** Have them play fluency games, such as the product game at illuminations.nctm.org, or board games, games with cards or dice. These provide practice in an agreeable way, and some encourage students to determine number combinations quickly (efficiently) because of the competition built into the game. Use many real-world problems to emphasize the relevance and need for being fluent.

Multiplication and division fluency

1. Find the number that makes each sentence true:

   7 x _____ = 42 27 ÷ _____ = 3

2. Fill in the blank to finish each number pattern.

   0, 6, 12, 18, _____, 30, _____

   0, 9, 18, _____, _____

4 x 7 =	3 x 6 =	8 x 4 =	3 x 8 =
3 x 9 =	5 x 10 =	7 x 5 =	8 x 7 =
6 x 8 =	8 x 5 =	3 x 5 =	6 x 5 =
4 x 9 =	9 x 8 =	6 x 10 =	8 x 9 =
8 x 6 =	5 x 9 =	7 x 9 =	4 x 9 =
6 x 3 =	4 x 8 =	9 x 6 =	9 x 7 =
6 x 9 =	5 x 6 =	6 x 7 =	7 x 6 =

3. What multiplication fact can help you solve 56 ÷ 7 ? ____________

4. What multiplication fact can help you solve 28 ÷ 4 ? ____________

35 ÷ 7 = _____ 54 ÷ 9 = _____ 42 ÷ 6 = _____

21 ÷ 7 = _____ 64 ÷ 8 = _____

7 x 3 =	8 x 4 =	9 x 5 =	6 x 9 =
7 x 7 =	8 x 9 =	4 x 6 =	7 x 6 =
8 x 2 =	8 x 3 =	7 x 4 =	5 x 3 =
4 x 10 =	8 x 6 =	4 x 8 =	8 x 7 =
5 x 8 =	8 x 8 =	7 x 8 =	5 x 7 =
9 x 4 =	5 x 5 =	6 x 7 =	9 x 6 =
6 x 2 =	3 x 7 =	9 x 8 =	9 x 9 =

Fill out the multiplication chart below, then circle the number combinations that are hard for you to remember.

x	2	3	4	5	6	7	8	9	10
2	4								
3									
4									
5									
6									
7									
8									
9									
10									

Write a strategy or clue for remembering each combination that is hard for you.

Some strategies for multiplying

x 0	any number times zero is zero
x 1	any number times 1 is itself
x 2	doubles – skip count by 2's – all the even numbers
x 3	skip count by 3's
x 4	double doubles
x 5	times 10, then half (e.g. 6 x 5 is 6 x 10, then half of that)
x 6, 7, 8	many of these are found by the commutative property (e.g. 6 x 4 = 4 x 6 – then use the strategy for 4's)
squares	these are easy and fun to remember
near neighbors	square - 1 (for any two numbers that are off by two, take the square of the number between them, then subtract 1, e.g. 7 x 5 = 6 x 6 - 1)
x 9	the finger method, or remember that the sum of all multiples of 9 is 9. (18 is 1+8, 27 is 2+7, 36 is 3+6 etc.)

Fluency games

Multiplication war

Two students play this card game, sitting across from each other. Each student has half of the deck of cards, which they hold face down. They each turn one card up and put it on the table at the same time, then the first person who says the product of the two cards gets those cards. (Face cards count as 10.)

The play continues until one player has all the cards.

Be careful how you match kids up, or the game ends quickly!

Students who need work on adding can play this game by shouting out the sum of the two cards.

The Product Game and Factor Game

Two good online practice games:

http://illuminations.nctm.org/ActivityDetail.aspx?ID=29

http://illuminations.nctm.org/ActivityDetail.aspx?ID=64

You can easily make a board game out of the Product Game if getting online is not easy.

Rollette

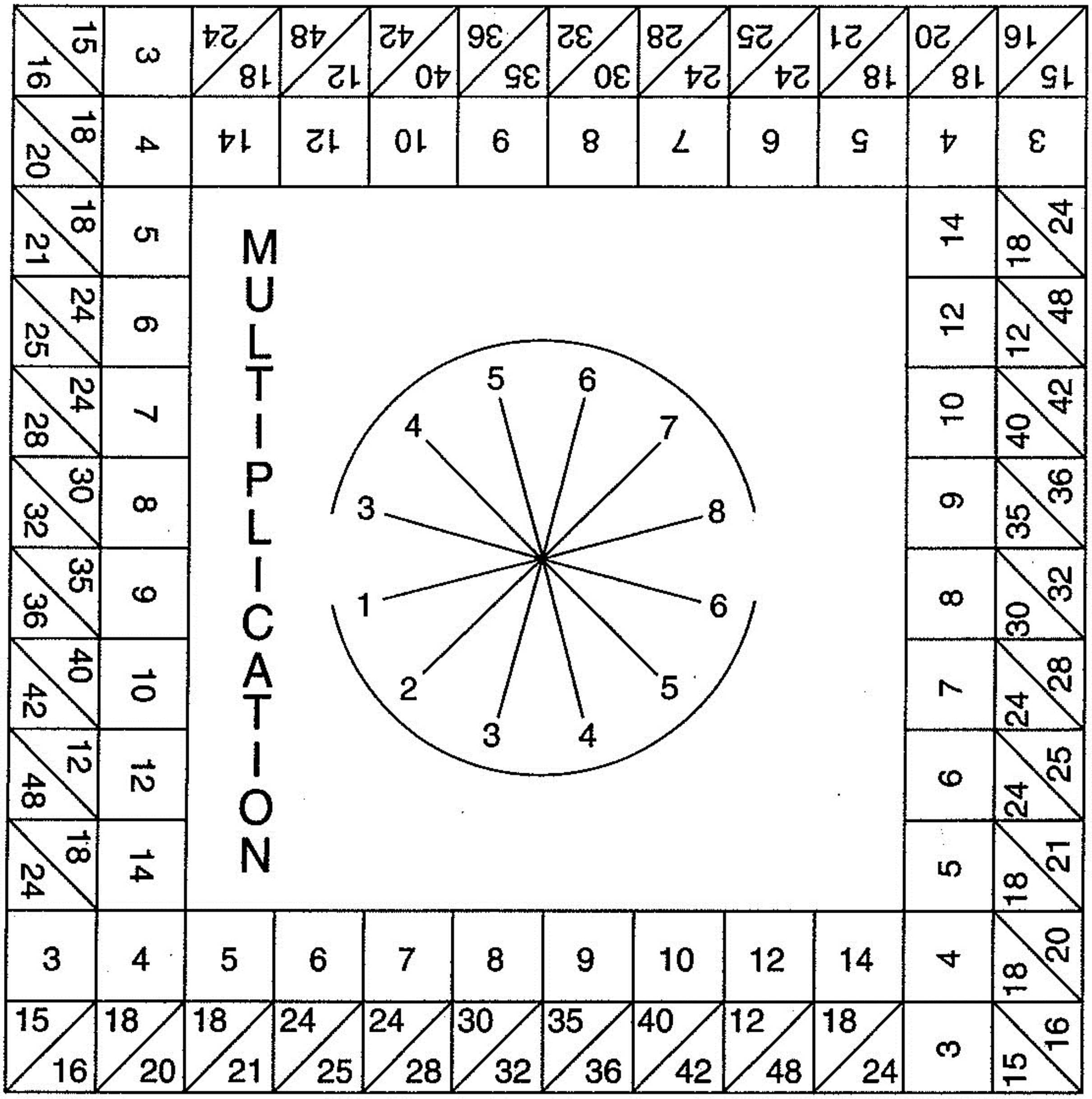
Four students play this game, taking turns. The player whose turn it is rolls two dice – one is a standard die with 1-6, the other is a number cube marked with 3-8. They then mark off the space on their game board that corresponds to the product (see next page). The first person to mark out all facts on his or her side of the board is the winner.

If another student thinks the player's product is wrong, he or she can challenge. If the challenging player wins, they can mark off any additional product on their board.

The game can be played with two number cubes marked 4-9 for more challenge. Create your own game board for this.

There are lots of computer fluency games at http://multiplication.com

For middle and high school students, use problems everyday that arise from content classes. For example, ask students to figure out how many pages of a book they would read in two weeks if they read 9 pages each night. Ask them to figure out how many generations of Americans (20 years/generation) have been born since the Civil War. Don't let them use calculators - just let them work at it until they get an answer.



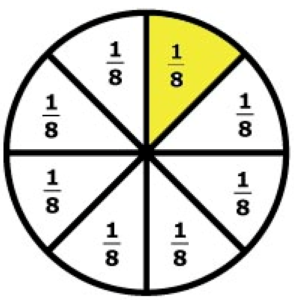
From *Teaching Learners Who Struggle with Mathematics: Systematic Intervention and Remediation*, 2nd Ed., by Sherman, Richardson and Yard. Published by Merrill/Pearson, 2009. **Buy the book!** It contains a wealth of good suggestions in it for helping struggling

Basic Fraction Concepts

By the end of 3rd grade, students should have learned these fundamentals of fractions:

1. A fraction is a part of a whole. When a whole is divided into equal-sized pieces, a fraction of the whole is one or more of those pieces. The numerator of the fractions tells how many pieces there are, and the denominator tells how many pieces the whole was divided into.

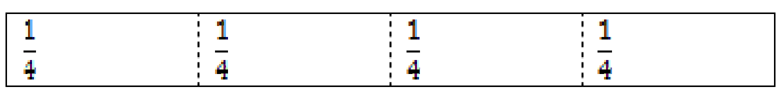
For example, a pizza cut into 8 slices can represent eighths. One slice is 1/8. 4 slices is 4/8.



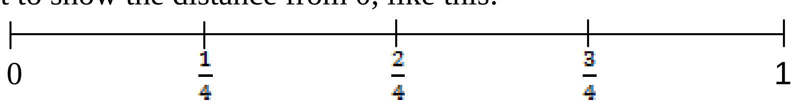
2. Manipulatives and drawings are good ways of representing fractions. Circle fractions can be used as direct models of pizza slices (like the drawing to the left.) Other representations include bar models (think about 1/8 of a Tootsie Roll) and area models (1/8 of a pan of brownies cut 4x2). Fraction representations are used extensively to compare and order fractions.

3. Rulers are marked to show fractions of one inch. Number lines can be drawn to show that fractions are numbers between integers.

Students may have difficulty knowing where fractions are on a number line because their first introduction to fractions is often with paper folding, where we often write the fraction name in the middle of the segment, like this:

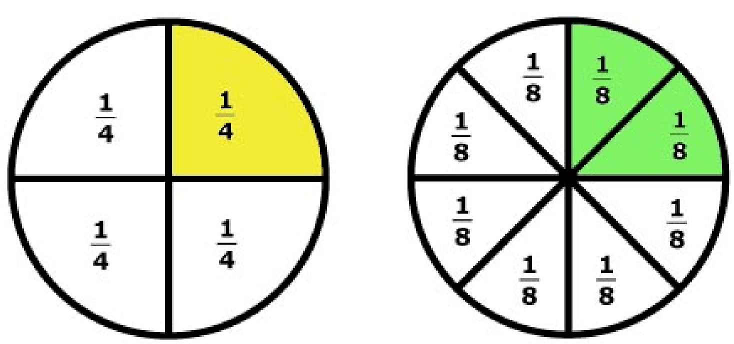


Fraction bars are labeled like this too. However, on a number line, the fraction is placed at the end of the segment to show the distance from 0, like this:



4. Fractions can also be used to represent parts of a set of object. For example, if there are 10 red M&M's in a bag of 50 M&M's, then the fraction of red M&M's is 10/50.

5. Equivalent fractions are the same size (the same total amount of the whole) but they are divided into different numbers of pieces. For example, if you cut a pizza into fourths, one section would be 1/4. If you cut a pizza of the same size into eighths, two sections of that pizza would be 2/8. Both of these sections are the same size.



6. Equivalent fractions can be found by “scaling up” or “scaling down.” This makes sense when you think of a fraction as part of a set of objects. In the M&M example above, if there is always the same fraction of red M&M's in every bag, then a bag of 25 (half the original bag) would have 5 red M&M's (half the original amount). The fraction is 5/25, which is equivalent to 10/50. In this case, we have scaled down by a factor of 2, or divided both the part and the whole by 2. In a bag of 100 M&M's, there would be 20 red M&M's, scaling up by a factor of 2 - multiplying both the part and the whole by 2. Students need to be able to “Recognize, name and use equivalent fractions with denominators 2, 4, and 8, using strips as area models.” (N.ME.03.17) “Strips as area models” means using the folded paper strips or fraction bars.