4th Grade Unit 2 Mathematics

Dear Parents,

The Mathematics Georgia Standards of Excellence (MGSE), present a balanced approach to mathematics that stresses understanding, fluency, and real world application equally. Know that your child is not learning math the way many of us did in school, so hopefully being more informed about this curriculum will assist you when you help your child at home.

Below you will find the standards from Unit Two in bold print and underlined. Following each standard is an explanation with student examples. Please contact your child's teacher if you have any questions.

OA.1 Understand that a multiplicative comparison is a situation in which one quantity is multiplied by a specified number to get another quantity.

a. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.

b. Represent verbal statements of multiplicative comparisons as multiplication equations.

This standard requires students to interpret multiplication equations as a comparison. A *multiplicative comparison* is a situation in which one quantity is multiplied by a specified number to get another quantity (e.g., "*a* is *n* times as much as *b*"). Students should be able to identify and verbalize which quantity is being multiplied and which number tells how many times. In this standard, students will be given opportunities to write and identify equations and statements for multiplicative comparisons.

Examples:

5 x 8 = 40: Sally is five years old. Her mom is eight times older. How old is Sally's Mom?

5 x 5 = 25: Sally has five times as many pencils as Mary. If Sally has 5 pencils, how many does Mary have?

OA.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a symbol or letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

The focus in this standard is to have students use and discuss various strategies. It refers to estimation strategies, including using compatible numbers (numbers that sum to 10 or 100) or rounding. Problems should be structured so that all acceptable estimation strategies will arrive at a reasonable answer.

Example 1:

On a vacation, your family travels 267 miles on the first day, 194 miles on the second day, and 34 miles on the third day. How many total miles did they travel?

Some typical estimation strategies for this problem are shown below.

Student 1	**Student 2**	**Student 3**
I first thought about 267 and 34. I noticed that their sum is about 300. Then I knew that 194 is close to 200. When I put 300 and 200 together, I get 500.	I first thought about 194. It is really close to 200. I also have 2 hundreds in 267. That gives me a total of 4 hundreds. Then I have 67 in 267 and the 34. When I put 67 and 34 together that is really close to 100. When I add that hundred to the 4 hundreds that I already had, I end up with 500.	I rounded 267 to 300. I rounded 194 to 200. I rounded 34 to 30. When I added 300, 200, and 30, I know my answer will be about 530.

Example 2:
Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Max brings in 3 boxes with 6 bottles of water in each box. Sarah brings in 6 boxes with 6 bottles of water in each box. About how many bottles of water still need to be collected?

Student 1
First I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 plus 36 is about 50. I'm trying to get to 300. 50 plus another 50 is 100. Then I need 2 more hundreds. So we still need 250 bottles.

Student 2
First I multiplied 3 and 6 which equals 18. Then I multiplied 6 and 6 which is 36. I know 18 is about 20 and 36 is about 40. 40 + 20 = 60. 300 – 60 = 240, so we need about 240 more bottles.

This standard also references interpreting remainders. Remainders should be put into context for interpretation. Ways to address remainders:

- Remain as a left over
- Partitioned into fractions or decimals
- Discarded leaving only the whole number answer
- Increase the whole number answer up one
- Round to the nearest whole number for an approximate result

Example:
Write different word problems involving **44 ÷ 6 = ?** where the answers are best represented as:

- Problem A: 7
- Problem B: 7 r 2
- Problem C: 8
- Problem D: 7 or 8
- Problem E: $7\ {}^{2}/_{6}$

Possible solutions:
Problem **A: 7**
Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches did she fill? 44 ÷ *6 = p; p = 7 r 2. Mary can fill 7 pouches completely.*

Problem **B: 7 r 2**
Mary had 44 pencils. Six pencils fit into each of her pencil pouches. How many pouches could she fill and how many pencils would she have left? 44 ÷ *6 = p; p = 7 r 2; Mary can fill 7 pouches and have 2 left over.*

Problem **C: 8**
Mary had 44 pencils. Six pencils fit into each of her pencil pouches. What would be the fewest number of pouches she would need in order to hold all of her pencils? 44 ÷ *6 = p; p = 7 r 2; Mary needs 8 pouches to hold all of the pencils.*

Problem **D: 7 or 8**
Mary had 44 pencils. She divided them equally among her friends before giving one of the leftovers to each of her friends. How many pencils could her friends have received? 44 ÷ *6 = p; p = 7 r 2; Some of her friends received 7 pencils. Two friends received 8 pencils.*

Problem **E:** $\mathbf{7^{2}/_{6}}$
Mary had 44 pencils and put six pencils in each pouch. What fraction represents the number of pouches that Mary filled? 44 ÷ *6 = p; p =* $\mathbf{7}^{2}/_{6}$

Example:
There are 128 students going on a field trip. If each bus holds 30 students, how many buses are needed? *(128 ÷ 30 = b; b = 4 R 8; They will need 5 buses because 4 buses would not hold all of the students.)*
Students need to realize in problems, such as the example above, that an extra bus is needed for the 8 students that are left over. 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.

NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

Students build on their understanding of addition and subtraction, their use of place value, and their flexibility with multiple strategies to make sense of the standard algorithm. They continue to use place value in describing and justifying the processes they use to add and subtract.
When students begin using the standard algorithm, their explanation may be quite lengthy. After much practice with using place value to justify their steps, they will develop fluency with the algorithm. Students should be able to explain why the algorithm works.

Example:

$$\begin{array}{r} 3892 \\ \underline{+\ 1567} \end{array}$$

Student explanation for this problem:

1. Two ones plus seven ones is nine ones.
2. Nine tens plus six tens is 15 tens.
3. I am going to write down five tens and think of the10 tens as one more hundred.(*Denotes with a 1 above the hundreds column*).
4. Eight hundreds plus five hundreds plus the extra hundred from adding the tens is 14 hundreds.
5. I am going to write the four hundreds and think of the 10 hundreds as one more 1000. (*Denotes with a 1 above the thousands column*).
6. Three thousands plus one thousand plus the extra thousand from the hundreds is five thousand.

Example:

$$\begin{array}{r} 3546 \\ \underline{-\ \ 928} \end{array}$$

Student explanations for this problem:

1. There are not enough ones to take 8 ones from 6 ones so I have to use one ten as 10 ones. Now I have 3 tens and 16 ones. (*Marks through the 4 and denotes with a 3 above the 4 and writes a 1 above the ones column to be represented as 16 ones.*)
2. Sixteen ones minus 8 ones is 8 ones. (*Writes an 8 in the ones column of the answer.*)
3. Three tens minus 2 tens is one ten. (*Writes a 1 in the tens column of the answer.*)
4. There are not enough hundreds to take 9 hundreds from 5 hundreds so I have to use one thousand as 10 hundreds. (*Marks through the 3 and denotes with a 2 above it. Writes down a 1 above the hundreds column.*) Now I have 2 thousands and 15 hundreds.
5. Fifteen hundreds minus 9 hundreds is 6 hundreds. (*Writes a 6 in the hundreds column of the answer*.)
6. I have 2 thousands left since I did not have to take away any thousands. (*Writes 2 in the thousands place of the answer.*)

<u>NBT.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</u>

******Primary focus on 2 digit by 1 digit multiplication in this unit.******

This standard calls for students to multiply numbers using a variety of strategies. **Use of the standard algorithm for multiplication is an expectation in the 5th grade.**

Example:

There are 25 dozen cookies in the bakery. What is the total number of cookies at the bakery?

Student 1	Student 2	Student 3
25 × 12 I broke 12 up into 10 and 2. 25 × 10 = 250 25 × 2 = 50 250 + 50 = 300	25 × 12 I broke 25 into 5 groups of 5. 5 × 12 = 60 I have 5 groups of 5 in 25. 60 × 5 = 300	25 × 12 I doubled 25 and cut 12 in half to get 50 × 6. 50 × 6 = 300

Example:

What would an area model of 74 x 38 look like?

	70	4
30	70x30=2,100	4x30=120
8	70x8=560	4x8=32

Add all of the partial product to get the final product: 2,100 + 560 + 120 + 32 = 2,812

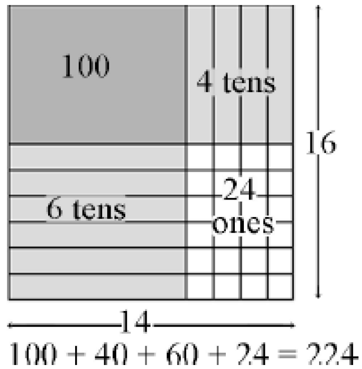
Examples:

To illustrate 154 × 6, students use base 10 blocks or drawings to show 154 six times. Seeing 154 six times will lead them to understand the distributive property,

$$154 \times 6 = (100 + 50 + 4) \times 6$$
$$= (100 \times 6) + (50 \times 6) + (4 \times 6)$$
$$= 600 + 300 + 24 = 924.$$

The area model below shows the partial products for 14 x 16 = 224.
Using the area model, students first verbalize their understanding:

- 10 × 10 is 100
- 4 × 10 is 40
- 10 × 6 is 60, and
- 4 × 6 is 24.



Students use different strategies to record this type of thinking.
Students explain this strategy and the one below with base 10 blocks, drawings, or numbers.

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   25
×  24
 400 (20 × 20)
 100 (20 × 5)
   80 (4 × 20)
+ 20 (4 × 5)
 600
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NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-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.

******Primary focus on 2 digit by 1 digit division in this unit.******

In fourth grade, students build on their third grade work with division within 100. Students need opportunities to develop their understandings by using problems in and out of context.

Example:
A 4th grade teacher bought 4 new pencil boxes. She has 260 pencils. She wants to put the pencils in the boxes so that each box has the same number of pencils. How many pencils will there be in each box?

- **Using Base 10 Blocks:** Students build 260 with base 10 blocks and distribute them into 4 equal groups. Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50.
- **Using Place Value:** 260 ÷ 4 = (200 ÷ 4) + (60 ÷ 4)
- **Using Multiplication:** 4 × 50 = 200, 4 × 10 = 40, 4 × 5 = 20; 50 + 10 + 5 = 65; so 260 ÷ 4 = 65

This standard also calls for students to explore division through various strategies.

Example:

There are 592 students participating in Field Day. They are put into teams of 8 for the competition. How many teams get created?

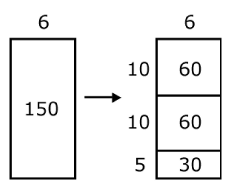
Student 1	**Student 2**	**Student 3**
592 divided by 8 There are 70 eights in 560. 592 – 560 = 32 There are 4 eights in 32. 70 + 4 = 74	592 divided by 8 I know that 10 eights is 80. If I take out 50 eights that is 400. 592 − 400 = 192 I can take out 20 more eights which is 160. 192 − 160 = 32 There are 4 eights in 32. I have none left. I took out 50, then 20 more, then 4 more. That’s 74.	I want to get to 592. 8 × 25 = 200 8 × 25 = 200 8 × 25 = 200 200 + 200 + 200 = 600 600 – 8 = 592 I had 75 groups of 8 and took one away, so there are 74 teams.

Example:

Using an Open Array or Area Model

After developing an understanding of using arrays to divide, students begin to use a more abstract model for division. This model connects to a recording process that will be formalized in the 5th grade.

150 ÷ 6



Students make a rectangle and write 6 on one of its sides. They express their understanding that they need to think of the rectangle as representing a total of 150.

1. Students think, “6 times what number is a number close to 150?” They recognize that 6 × 10 is 60 so they record 10 as a factor and partition the rectangle into 2 rectangles and label the area aligned to the factor of 10 with 60. They express that they have only used 60 of the 150 so they have 90 left.
2. Recognizing that there is another 60 in what is left, they repeat the process above. They express that they have used 120 of the 150 so they have 30 left.
3. Knowing that 6 × 5 is 30, they write 30 in the bottom area of the rectangle and record 5 as a factor.
4. Student express their calculations in various ways:

    a.
    150
    −60 (6 × 10)
    90
    −60 (6 × 10)
    30
    −30 (6 × 5)
    0

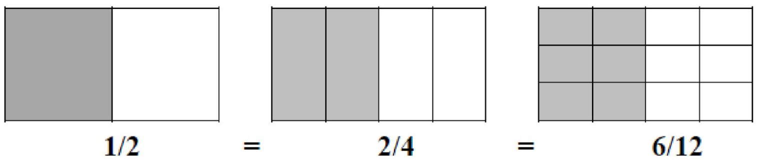
    150 ÷ 6 = 10 + 10 + 5 = 25

    b. 150 ÷ 6 = (60 ÷ 6) + (60 ÷ 6) + (30 ÷ 6) = 10 + 10 + 5 = 25

<u>NF.1 Explain why two or more fractions are equivalent *a*/*b* = (*n* × *a*)/(*n* × *b*), ex; *1/4 = (3x1)/(3x4)* by using visual fraction models. Focus attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.</u>

This standard addresses equivalent fractions by first having students use visual models such as fraction bars, Cuisenaire rods, or pattern blocks to create equivalent fractions. Students will then examine the idea that equivalent fractions can be created by multiplying both the numerator and denominator by the same number or by dividing a shaded region into various parts.

Example:



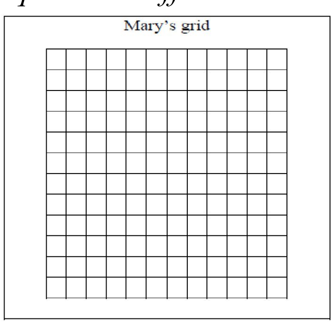
<u>NF.2 Compare two fractions with different numerators and different denominators, e.g., by using visual fraction models, by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions.</u>

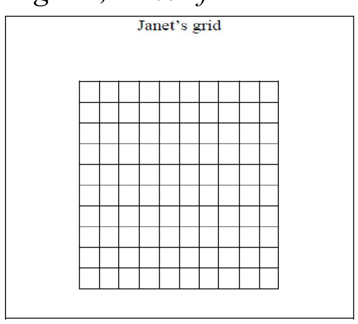
This standard calls for students to compare fractions by creating visual fraction models or finding common denominators or numerators using a variety of strategies. Students' experiences should focus on visual fraction models rather than algorithms. Students should learn to draw fraction models to help them compare. Students must also recognize that they must consider the size of the whole when comparing fractions (i.e., 1/2 of an individual sized pizza is very different from 1/2 of a large pizza).

Example:

Mary used a 12 × 12 grid to represent 1 and Janet used a 10 × 10 grid to represent 1. Each girl shaded grid squares to show ¼. How many grid squares did Mary shade? How many grid squares did Janet shade? Why did they need to shade different numbers of grid squares?

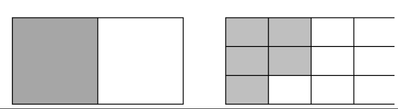
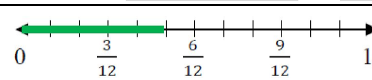
Possible solution: Mary shaded 36 grid squares; Janet shaded 25 grid squares. The total number of little squares is different in the two grids, so ¼ of each total number is different.





Example:

There are two cakes on the counter that are the same size. One-half of the first cake is left, but 5/12 of the second cake is left. Which cake has more left?

Student 1: ***Area Model*** The first cake has more left over. The second cake has 5/12 left which is smaller than 1/2.	
Student 2: ***Number Line Model*** The first cake has more left over: 1/2 is greater than 5/12.	
Student 3: ***Verbal Explanation*** I know that 6/12 equals 1/2, and 5/12 is less than 6/12. Therefore, the second cake has less left over than the first cake. The first cake has more left over.	