North Carolina Department of Public Instruction
**INSTRUCTIONAL SUPPORT TOOLS**
FOR ACHIEVING NEW STANDARDS

***3rd Grade Mathematics*** ● Unpacked Contents
For the new Standard Course of Study that will be effective in all North Carolina schools in the 2017-18 School Year.

This document is designed to help North Carolina educators teach the 3rd Grade Mathematics Standard Course of Study. NCDPI staff are continually updating and improving these tools to better serve teachers and districts.

**What is the purpose of this document?**
The purpose of this document is to increase student achievement by ensuring educators understand the expectations of the new standards. This document may also be used to facilitate discussion among teachers and curriculum staff and to encourage coherence in the sequence, pacing, and units of study for grade-level curricula. This document, along with on-going professional development, is one of many resources used to understand and teach the NC SCOS.

**What is in the document?**
This document includes a detailed clarification of each standard in the grade level along with a *sample* of questions or directions that may be used during the instructional sequence to determine whether students are meeting the learning objective outlined by the standard. These items are included to support classroom instruction and are not intended to reflect summative assessment items. The examples included may not fully address the scope of the standard. The document also includes a table of contents of the standards organized by domain with hyperlinks to assist in navigating the electronic version of this instructional support tool.

**How do I send Feedback?**
Please send feedback to us at feedback@dpi.state.nc.us and we will use your input to refine our unpacking of the standards. Thank You!

**Just want the standards alone?**
You can find the standards alone at http://www.ncpublicschools.org/curriculum/mathematics/scos/.

## North Carolina Course of Study – 3rd Grade Standards

Standards for Mathematical Practice

| Operations & Algebraic Thinking | Number & Operations in Base Ten | Number & Operations-Fractions | Measurement & Data | Geometry |
|---|---|---|---|---|
| *Represent and solve problems involving multiplication and division.*<br>**NC.3.OA.1**<br>**NC.3.OA.2**<br>**NC.3.OA.3**<br>*Understand properties of multiplication and the relationship between multiplication and division.*<br>**NC.3.OA.6**<br>*Multiply and divide within 100.*<br>**NC.3.OA.7**<br>*Solve two-step problems.*<br>**NC.3.OA.8**<br>*Explore patterns of numbers.*<br>**NC.3.OA.9** | *Use place value to add and subtract.*<br>**NC.3.NBT.2**<br>*Generalize place value understanding for multi-digit numbers.*<br>**NC.3.NBT.3** | *Understand fractions as numbers.*<br>**NC.3.NF.1**<br>**NC.3.NF.2**<br>**NC.3.NF.3**<br>**NC.3.NF.4** | *Solve problems involving measurement.*<br>**NC.3.MD.1**<br>**NC.3.MD.2**<br>*Represent and interpret data.*<br>**NC.3.MD.3**<br>*Understand the concept of area.*<br>**NC.3.MD.5**<br>**NC.3.MD.7**<br>*Understand the concept of perimeter.*<br>**NC.3.MD.8** | *Reason with shapes and their attributes.*<br>**NC.3.G.1** |

## Standards for Mathematical Practice

| Practice | Explanation and Example |
|---|---|
| 1. Make sense of problems and persevere in solving them. | In third grade, mathematically proficient students know that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. Third grade students may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, “Does this make sense?” Students listen to other students’ strategies and are able to make connections between various methods for a given problem. |
| 2. Reason abstractly and quantitatively. | Mathematically proficient third grade students should recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. |
| 3. Construct viable arguments and critique the reasoning of others. | In third grade, mathematically proficient students may construct arguments using concrete referents, such as objects, pictures, and drawings. They refine their mathematical communication skills as they participate in mathematical discussions that the teacher facilities by asking questions such as “How did you get that?” and “Why is that true?” They explain their thinking to others and respond to others’ thinking. |
| 4. Model with mathematics. | Mathematically proficient students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart, list, or graph, creating equations, etc. Students require extensive opportunities to generate various mathematical representations and to both equations and story problems, and explain connections between representations as well as between representations and equations. Students should be able to use all of these representations as needed. They should evaluate their results in the context of the situation and reflect on whether the results make sense. |
| 5. Use appropriate tools strategically. | Mathematically proficient third grader students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use graph paper to find all the possible rectangles that have a given perimeter. They compile the possibilities into an organized list or a table, and determine whether they have all the possible rectangles. |
| 6. Attend to precision. | Mathematically proficient third grader students develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and in their own reasoning. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the area of a rectangle they record their answers in square units. |
| 7. Look for and make use of structure. | In third grade mathematically proficient students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to multiply and divide (commutative and distributive properties). |
| 8. Look for and express regularity in repeated reasoning. | Mathematically proficient students in third grade should notice repetitive actions in computation and look for more shortcut methods. For example, students may use the distributive property as a strategy for using products they know to solve products that they don’t know. For example, if students are asked to find the product of 7 x 8, they might decompose 7 into 5 and 2 and then multiply 5 x 8 and 2 x 8 to arrive at 40 + 16 or 56. In addition, third graders continually evaluate their work by asking themselves, “Does this make sense?” |

Return to Standards

***Represent and solve problems involving multiplication and division.***

**NC.3.OA.1** For products of whole numbers with two factors up to and including 10:

- Interpret the factors as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition, decomposing a factor, and applying the commutative and associative properties.

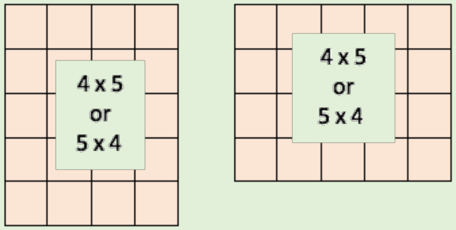
## Clarification

In this standard, students develop an initial understanding of multiplication of whole numbers. Students recognize multiplication as a means to determine the total number of objects (product) when there are a specific number of groups (factor) with the same number of objects in each group (factor). Multiplication requires students to think in terms of groups of things rather than individual things. Students learn that the multiplication symbol ‘x’ means “groups of” and problems such as 5 x 7 refer to 5 groups of 7.

Students build on their work with repeated addition and rectangular arrays from Second Grade. They also begin applying properties of multiplication.

The commutative property (order property) states that the order of numbers does not matter when you are adding or multiplying numbers.

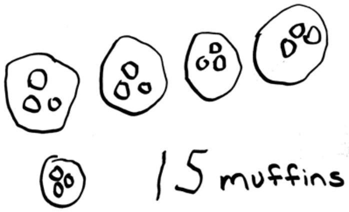
**For example:** If a student knows that 5 x 4 = 20, then they also know that 4 x 5 = 20. There is no “fixed” way to write the dimensions of an array as rows x columns or columns x rows. Students should have flexibility in being able to describe both dimensions of an array.



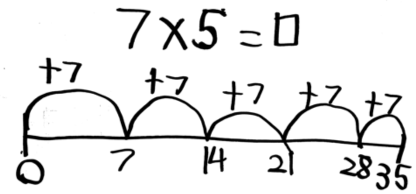
Students are introduced to the distributive property of multiplication, through decomposing a number, as a strategy for solving multiplication problems.

## Checking for Understanding

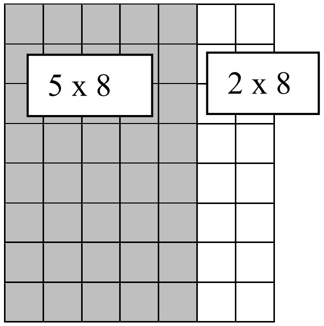
Jim purchased 5 packages of muffins. Each package contained 3 muffins. How many muffins did Jim purchase?



Sonya earns $7 a week pulling weeds. After 5 weeks of work, how much has Sonya worked? Write an equation and find the answer.



Joe has seven boxes of markers and each box has eight markers. Show how you could determine how many markers Joe has by decomposing a factor.



Return to Standards

***Represent and solve problems involving multiplication and division.***

**NC.3.OA.2** For whole-number quotients of whole numbers with a one-digit divisor and a one-digit quotient:

- Interpret the divisor and quotient in a division equation as representing the number of equal groups and the number of objects in each group.
- Illustrate and explain strategies including arrays, repeated addition or subtraction, and decomposing a factor.

**Clarification**

This standard focuses on two distinct models of division: partition models (fair share) and measurement (repeated subtraction) models.

Partition models provide students with a total number and the number of groups. These models focus on the question, “How many objects are in each group so that the groups are equal?”

Measurement (repeated subtraction) models provide students with a total number and the number of objects in each group. These models focus on the question, “How many equal groups can you make?”

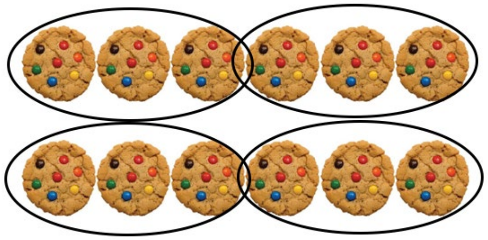
**Checking for Understanding**

Partition model:

There are 12 cookies on the counter. If you are sharing the cookies equally among three bags, how many cookies will go in each bag?

Measurement model:

There are 12 cookies on the counter. If you put 3 cookies in each bag, how many bags will you fill?



**Describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.**

For example, interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.

Return to Standards

**Represent and solve problems involving multiplication and division.**

**NC.3.OA.3** Represent, interpret, and solve one-step problems involving multiplication and division.

- Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.
- Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, repeated subtraction and/or equations with a symbol for the unknown number to represent the problem.

**Clarification**

In this standard, students apply strategies to various multiplication and division situations to solve word problems.

Students should use a variety of representations for creating and solving one-step word problems.

The table gives examples of a variety of problem solving contexts, in which students need to find the product, the group size, or the number of groups. Students should be given ample experiences to explore all of the different problem structures.

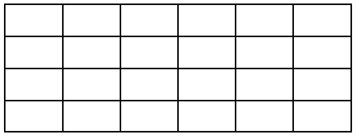
Students in third grade should use a variety of pictures, such as stars, boxes, flowers to represent unknown numbers. Letters are also introduced to represent unknowns in third grade.

**Checking for Understanding**

Multiplication:

There are 24 desks in the classroom. If the teacher puts 6 desks in each row, how many rows are there?

*This task can be solved by drawing an array by putting 6 desks in each row. This is an array model.*



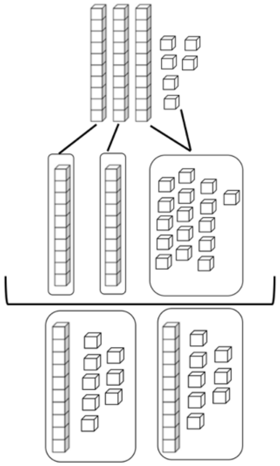
*This task can also be solved by drawing pictures of equal groups.*
*4 groups of 6 equals 24 objects*

*A student can also reason through the problem mentally or verbally, "I know 6 and 6 are 12. 12 and 12 are 24. Therefore, there are 4 groups of 6 giving a total of 24 desks in the classroom."*

---

Partition model of division: where the size of the groups is unknown:

The bag has 36 hair clips, and Laura and her friend want to share them equally. How many hair clips will each person receive?



*36 hair clips are represented with base ten blocks*

*Each girl receives 1 ten when 2 tens are divided evenly among them. There are 1 ten and 6 ones left. The ten is decomposed into ten ones.*

*Each girl receives 8 ones along with the 1 ten.*

*Each girl receives 18 hair clips.*

**Represent and solve problems involving multiplication and division.**

**NC.3.OA.3** Represent, interpret, and solve one-step problems involving multiplication and division.

- Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.
- Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, repeated subtraction and/or equations with a symbol for the unknown number to represent the problem.

**Clarification**

**Checking for Understanding**

---

Measurement model of division: where the number of groups is unknown

Max the monkey loves bananas. Molly, his trainer, has 24 bananas. If she gives Max 4 bananas each day, how many days will the bananas last?

| Starting | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 |
|---|---|---|---|---|---|---|
| 24 | 24 – 4 = 20 | 20 – 4 = 16 | 16 – 4 = 12 | 12 – 4 = 8 | 8 – 4 = 4 | 4 – 4 = 0 |

*The bananas will last for 6 days.*

## Multiplication & Division Situations

| | **Unknown Product**<br>**3 x 6 = ?** | **Group Size Unknown (How many in each group?" Division)**<br>**3 x ? = 18 and 18 ÷ 3 = ?** | **Number of Groups Unknown ("How many groups?" Division)**<br>**? x 6 = 18 and 18 ÷ 6 = ?** |
|---|---|---|---|
| **Equal Groups** | There are 3 bags with 6 plums in each bag. How many plums are there in all?<br>*Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether? | If 18 plums are shared equally into 3 bags, then how many plums will be in each bag?<br>*Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be? | If 18 plums are to be packed 6 to a bag, then how many bags are needed?<br>*Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have? |
| **Arrays & Area** | There are 3 rows of apples with 6 apples in each row. How many apples are there?<br>*Area example*. What is the area of a 3 cm by 6 cm rectangle? | If 18 apples are arranged into 3 equal rows, how many apples will be in each row?<br>*Area example*. A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it? | If 18 apples are arranged into equal rows of 6 apples, how many rows will there be?<br>*Area example*. A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it? |

Return to Standards

**Understand properties of multiplication and the relationship between multiplication and division.**
**NC.3.OA.6** Solve an unknown-factor problem, by using division strategies and/or changing it to a multiplication problem.

| **Clarification** | **Checking for Understanding** |
|---|---|
| This standard calls for students to use the relationship between multiplication and division in order to solve problems. Students can begin thinking about division in terms of finding a missing factor when:<br>• Students have developed an understanding of the meaning of multiplication (in terms of finding the total number of objects (product) when there are a specific number of groups (factor) with the same number of objects in each group (factor).<br>• They understand the relationship between multiplication and division<br><br>Since multiplication and division are inverse operations, students are expected to explain their processes of solving division problems that can also be represented as unknown factor multiplication problems.<br><br>Students extend work from earlier grades with their understanding of the meaning of the equal sign as “the same amount as” to interpret an equation with an unknown. When given 4 x ? = 40, they might think:<br>• 4 groups of some number is the same as 40<br>• 4 times some number is the same as 40<br>• I know that 4 groups of 10 is 40 so the unknown number is 10. The missing factor is 10 because 4 times 10 equals 40. | Sarah did not know the answer to 63 divided by 7.<br>Is each of the following an appropriate way for Sarah to think about the problem?<br>Explain why or why not with a picture or words for each one.<br>• “I know that 7 x 9 = 63, so 63 divided by 7 must be 9.”<br>• “I know that 7x10 = 70. If I take away a group of 7, that means that I have 7x9 = 63. So, 63 divided by 7 is 9.”<br>• “I know that 7x5 is 35. 63 minus 35 is 28. I know that 7x4 = 28. So, if I add 7x5 and 7x4 I get 63. That means that 7x9 is 63, or 63 divided by 7 is 9.” |

Return to Standards

**Multiply and divide within 100.**

**NC.3.OA.7** Demonstrate fluency with multiplication and division with factors, quotients and divisors up to and including 10.

- Know from memory all products with factors up to and including 10.
- Illustrate and explain using the relationship between multiplication and division.
- Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

**Clarification**

This standard calls for students to be fluent with multiplication and division. Students are fluent when they display accuracy, efficiency, and flexibility. Students develop fluency by understanding and internalizing the relationships that exist between and among numbers. By studying patterns and relationships in multiplication facts and relating multiplication and division, students build a foundation for fluency with multiplication and division facts. The focus of this standard extends beyond the traditional notion of *fact families*, by having students explore the inverse relationship of multiplication and division.

“Know from memory” should focus on ample experiences working with manipulatives, pictures, arrays, word problems, and numbers to internalize the basic facts. Traditional flash cards or timed tests have not been proven as effective instructional strategies for developing fluency. Rather, numerous experiences with breaking apart actual sets of objects and developing relationships between numbers help children internalize parts of number and develop efficient strategies for fact retrieval.

Strategies students may use to attain fluency include:

- Multiplication by zeros and ones
- Doubles (2s facts), Doubling twice (4s), Doubling three times (8s)
- Tens facts (relating to place value, 5 x 10 is 5 tens or 50)
- Five facts (half of tens)
- Skip counting (counting groups of __ and knowing how many groups have been counted)
- Square numbers (ex: 3 x 3)
- Nines (10 groups less one group, e.g., 9 x 3 is 10 groups of 3 minus one group of 3)
- Decomposing into known facts (6 x 7 is 6 x 6 plus one more group of 6)
- Commutative Property of Multiplication
- Fact families (Ex: 6 x 4 = 24; 24 ÷ 6 = 4; 24 ÷ 4 = 6; 4 x 6 = 24)
- Missing factors

Students should have exposure to multiplication and division problems presented in both vertical and horizontal forms. Equations in the form of a x b = c and c = a x b should be used interchangeably, with the unknown in different positions.

**Checking for Understanding**

CC Elementary has 40 third graders. They are taking a field trip to a museum and want to have students in equal groups during the tour. What groups could they make?

- Use your tiles or grid paper to show a model of how they could make the groups.
- Draw a picture of your solutions. For each solution, write an equation.
- Write a sentence to explain how you solved the problem.

---

Bob knows that 2 × 9 = 18. How can he use that fact to determine the answer to the following question: 18 people are divided into pairs in P.E. class? How many pairs are there? Write a division equation and explain your reasoning.

---

Mr. Nala’s class is making a garden. They bought 40 tomato plants. They want them in rows that have the same number of plants. There needs to be between 2 and 10 plants in each row.

- Use your tiles to show a model of how they could make the garden. For each solution, write an equation.
- Write a sentence to explain how you solved the problem.

Return to Standards

| ***Solve two-step problems.***<br>**NC.3.OA.8** Solve two-step word problems using addition, subtraction, and multiplication, representing problems using equations with a symbol for the unknown number. | |
|---|---|
| **Clarification** | **Checking for Understanding** |
| This standard refers to two-step word problems using the addition, subtraction, and multiplication only. The size of the numbers should be limited to related 3rd grade standards (e.g., 3.OA.7 and 3.NBT.2). Adding and subtracting numbers should include numbers within 1,000, and multiplying numbers should include single-digit factors and products less than 100.<br>This standard calls for students to represent problems using equations with a letter to represent unknown quantities. | Mike runs 2 miles a day. His goal is to run 25 miles. After 5 days, how many miles does Mike have left to run in order to meet his goal? Write an equation and find the solution (2 x 5 + m = 25).<br>Ms. Jones's class is trying to earn $130 to provide food for the rescue animals at the local shelter. They already earned $90 at a penny drive. The class has two ways they could raise the rest of the money. They could sweep the lunch room for $10 per week or pick up trash in the school yard for $8 per week. Which job should the class do to earn the money the fastest?<br>• Explain your solution using pictures, numbers, or words.<br>• Write an equation for how you started the problem. Be sure to include the number of weeks required for each job. |

Return to Standards

**Explore patterns of numbers.**
**NC.3.OA.9** Interpret patterns of multiplication on a hundreds board and/or multiplication table.

## Clarification

This standard calls for students to examine patterns of multiplication. The ability to recognize and explain patterns in mathematics leads students to developing the ability to make generalizations, a foundational concept in algebraic thinking.

Students need ample opportunities to observe and identify important numerical patterns related to operations. They should build on their previous experiences with properties related to addition and subtraction to investigate multiplication and division patterns. Students investigate multiplication tables in search of patterns and explain why these patterns make sense mathematically.

- The multiples of 4, 6, 8, and 10 are all even because they can all be decomposed into two equal groups.
- The doubles (multiples of 2) in a multiplication table fall on horizontal and vertical lines.
- On a multiplication chart, the products in each row and column increase by the same amount (skip counting).
- The multiples of any number fall on a horizontal and a vertical line due to the commutative property.
- All the multiples of 5 end in a 0 or 5 while all the multiples of 10 end with 0. Every other multiple of 5 is a multiple of 10.

## Checking for Understanding

What do you notice about the shaded numbers in the multiplication table?

*When one changes the order of the factors they will still get the same product, such as 6 x 5 = 30 and 5 x 6 = 30.*

| **x** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 0 | 0 | 0 | 0 | 0 | **0** | 0 | 0 | 0 | 0 |
| **1** | 0 | 1 | 2 | 3 | 4 | 5 | **6** | 7 | 8 | 9 | 10 |
| **2** | 0 | 2 | 4 | 6 | 8 | 10 | **12** | 14 | 16 | 18 | 20 |
| **3** | 0 | 3 | 6 | 9 | 12 | 15 | **18** | 21 | 24 | 27 | 30 |
| **4** | 0 | 4 | 8 | 12 | 16 | 20 | **24** | 28 | 32 | 36 | 40 |
| **5** | 0 | 5 | 10 | 15 | 20 | 25 | **30** | 35 | 40 | 45 | 50 |
| **6** | **0** | **6** | **12** | **18** | **24** | **30** | **36** | **42** | **48** | **54** | **60** |
| **7** | 0 | 7 | 14 | 21 | 28 | 35 | **42** | 49 | 56 | 63 | 70 |
| **8** | 0 | 8 | 16 | 24 | 32 | 40 | **48** | 56 | 64 | 72 | 80 |
| **9** | 0 | 9 | 18 | 27 | 36 | 45 | **54** | 63 | 72 | 81 | 90 |
| **10** | 0 | 10 | 20 | 30 | 40 | 50 | **60** | 70 | 80 | 90 | 100 |

---

What do you notice about the pattern on the hundreds chart?

*All of the shaded numbers are multiples of three. I can figure that out because if I start at 3 and count over three, I land on 6. That's like 3 + 3. If I go over three more, that's 9 or 3 + 3 + 3. I can keep adding three, or I can write multiplication problems instead like 3 x 2 or 3 x 3.*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | **3** | 4 | 5 | **6** | 7 | 8 | **9** | 10 |
| 11 | **12** | 13 | 14 | **15** | 16 | 17 | **18** | 19 | 20 |
| **21** | 22 | 23 | **24** | 25 | 26 | **27** | 28 | 29 | **30** |
| 31 | 32 | **33** | 34 | 35 | **36** | 37 | 38 | **39** | 40 |
| 41 | **42** | 43 | 44 | **45** | 46 | 47 | **48** | 49 | 50 |
| **51** | 52 | 53 | **54** | 55 | 56 | **57** | 58 | 59 | **60** |
| 61 | 62 | **63** | 64 | 65 | **66** | 67 | 68 | **69** | 70 |
| 71 | **72** | 73 | 74 | **75** | 76 | 77 | **78** | 79 | 80 |
| **81** | 82 | 83 | **84** | 85 | 86 | **87** | 88 | 89 | **90** |
| 91 | 92 | **93** | 94 | 95 | **96** | 97 | 98 | **99** | 100 |

Return to Standards

***Use place value to add and subtract.***

**NC.3.NBT.2** Add and subtract whole numbers up to and including 1,000.

- Use estimation strategies to assess reasonableness of answers.
- Model and explain how the relationship between addition and subtraction can be applied to solve addition and subtraction problems.
- Use expanded form to decompose numbers and then find sums and differences.

**Clarification**

In this standard, students build on work in previous grades regarding strategies based on place value, the properties of operations, and relating addition to subtraction. Students should be able to use the expanded form of a number to calculate sums and differences. Students explain their thinking and show their work and verify that their answer is reasonable.

Problems should include both vertical and horizontal forms, including opportunities for students to apply the commutative and associative properties.

Estimation strategies 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. For this standard, estimation strategies include, but are not limited to:

- front-end estimation with adjusting (using the highest place value and estimating from the front end, making adjustments to the estimate by taking into account the remaining amounts),
- rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values),

The standard algorithm of carrying or borrowing is neither an expectation nor a focus in Third Grade. Students develop and use strategies for addition and subtraction in Grades K-3.

**Checking for Understanding**

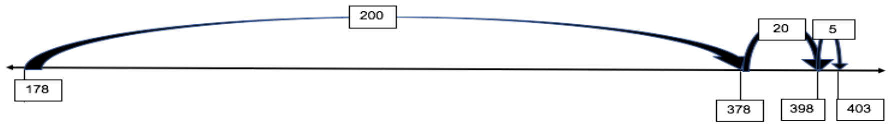
There are 178 fourth graders and 225 fifth graders on the playground. What is the total number of students on the playground?

*Possible responses:*

| Student A | Student B | Student C |
|---|---|---|
| *100 + 200 = 300*<br>*70 + 20 = 90*<br>*8 + 5 = 13*<br>*300 + 90 + 13 = 403 students* | *I added 2 to 178 to get 180.*<br>*I added 220 to get 400.*<br>*I added the 3 left over to get 403.* | *I know the 75 plus 25 equals 100.*<br>*Then I added 1 hundred from 178 and 2 hundreds from 275.*<br>*I had a total of 4 hundreds and I had 3 more left to add.*<br>*So, I have 4 hundreds plus 3 more which is 403.* |

Student D

*178 + 225 = ?*
*178 + 200 = 378*
*378 + 20 = 398*
*398 + 5 = 403*



Return to Standards

**Generalize place value understanding for multi-digit numbers.**

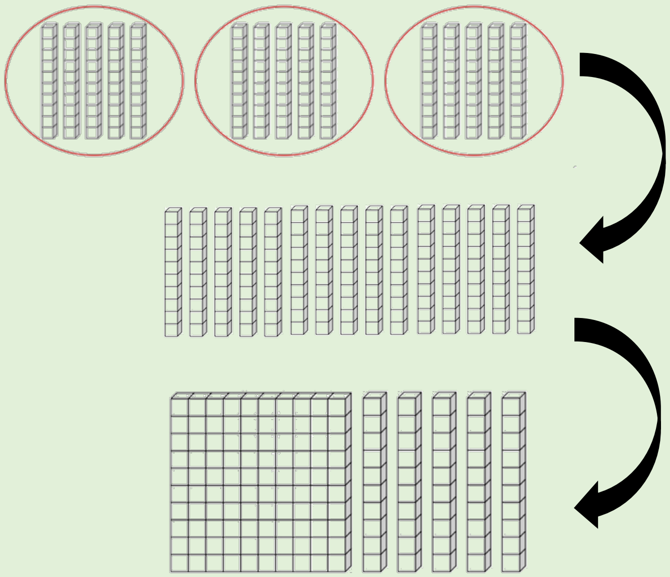
**NC.3.NBT.3** Use concrete and pictorial models, based on place value and the properties of operations, to find the product of a one-digit whole number by a multiple of 10 in the range 10–90.

**Clarification**

In this standard, students extend on their work in multiplication by applying understanding of place value. The special role of 10 in the base-ten system is important in understanding multiplication of one-digit numbers with multiples of 10.

Using the properties of operations (commutative, associative, and distributive) and place value, students are able to explain their reasoning.

**For example:**
The product 3 × 50 can be represented as 3 groups of 5 tens, which is 15 tens, which is 150.



**Checking for Understanding**

Max is trying to decide if he should go to Fast Foods, Green Groceries, or Super Store to buy biscuits for the school picnic.

For $25, Max can buy:

- 60 five-packs of biscuits from Fast Foods.
  or
- 30 six-packs of biscuits from Green Groceries.
  or
- 40 eight-packs of biscuits from Super Store.

Where should Max go to buy biscuits? Use pictures, numbers, words, or equations to explain your reasoning.

Return to [Standards]

## Number and Operations—Fractions

***Understand fractions as numbers.***

**NC.3.NF.1** Interpret unit fractions with denominators of 2, 3, 4, 6, and 8 as quantities formed when a whole is partitioned into equal parts;

- Explain that a unit fraction is one of those parts.
- Represent and identify unit fractions using area and length models.

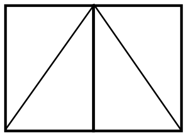
**Clarification**

In this standard, students are expected to explain that a unit fraction represents one part of an area or length model of a whole that has been equally partitioned into 2, 3, 4, 6, or 8 parts. Area models may include rectangles, circles, or other 2-dimensional objects that can be partitioned into equal sized pieces. The most common length model is a number line. A unit fraction is a term that identifies the size of 1 fractional piece in a whole.

**For example:**
$\frac{1}{3}$ is the unit fraction that identifies a whole being divided into 3 equal pieces. Just as there are 3 one-inch units in the length of 3 inches, there are 3 units of $\frac{1}{3}$ in the fraction $\frac{3}{3}$.

**Checking for Understanding**

Tameka has a piece of paper like the one shown below. She colors in one of the triangles. How much of the paper has she colored?



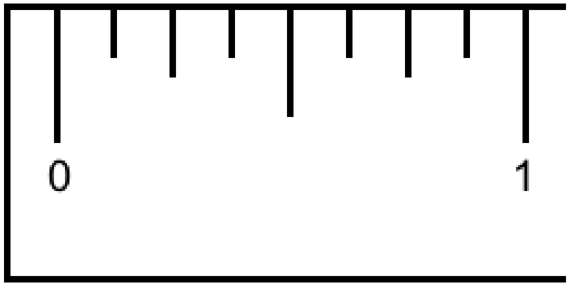
---

Label the first section of the ruler, between 0 and 1 inch, to show how it is partitioned into 8 parts.

Partition the section between 0 and 1 into fourths.

Partition the section between 0 and 1 into halves.

What did you notice about the size of the pieces each time you partitioned the ruler?

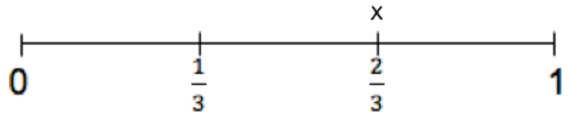
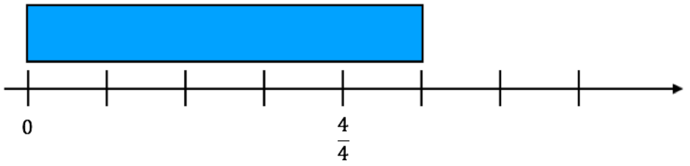


Return to [Standards]

***Understand fractions as numbers.***

**NC.3.NF.2** Interpret fractions with denominators of 2, 3, 4, 6, and 8 using area and length models.

- Using an area model, explain that the numerator of a fraction represents the number of equal parts of the unit fraction.
- Using a number line, explain that the numerator of a fraction represents the number of lengths of the unit fraction from 0.

| **Clarification** | **Checking for Understanding** |
|---|---|
| While working on NC.3.NF.2 students build off of the work in NC.3.NF.1 to represent fractions with area and length models. Students are also expected to explain that fractions are composed of multiple iterations of the same unit fraction. | Mrs. Turner says to the class, “Last weekend I saw a garden. The garden had equal sized sections and the following flowers: 3/8 of the garden had red roses, 1/8 of the garden had purple tulips, and 4/8 of the garden had yellow sunflowers. Draw a picture of the garden and label the different parts. Write an explanation how you determined how to label the sunflowers.<br>Mike runs on a straight road for 1 mile. Mike stops 2/3 of the way down the road to stretch. Draw a number line that shows where Mike stopped to stretch. Write an explanation about how you knew where to mark where Mike stopped to stretch on the number line.<br>*Possible student response:*<br><br> <br>Brandi is making hair bows. Each hair bow takes ¼ of a yard of ribbon to make. This is what she bought at the store:<br><br> <br>If she uses all the ribbon, how many bows can she make? |

Return to Standards

***Understand fractions as numbers.***

**NC.3.NF.3** Represent equivalent fractions with area and length models by:

- Composing and decomposing fractions into equivalent fractions using related fractions: halves, fourths and eighths; thirds and sixths.
- Explaining that a fraction with the same numerator and denominator equals one whole.
- Expressing whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

**Clarification**

Students are expected to use area and length models to compose and decompose fractions into equivalent fractions using related fractions: halves, fourths, eighths, thirds, and sixths. Related fractions are fractions in which one denominator is a multiple of the others; thirds and sixths are related fractions, while fourths and sixths are not related fractions.

NC.3.NF.3 also calls for students to explain that fractions with the same numerator and denominator equal one whole. Renaming fractions with the same numerator and denominator as one whole without a model is not sufficient for this standard.

The standard also expects students to express whole numbers as fractions. This work is limited to whole numbers less than 4 (see example in Checking for Understanding).

Expressing whole numbers as fractions lay the groundwork for seeing a fraction as a division problem, e.g., the fraction 4/2 represents 4 pieces that are a half each that equal 2 wholes. This standard is the building block for later work in Grade 5 where students divide a set of objects into a specific number of groups.

Please note that the term “improper fraction” can cause developmental misconceptions. “This term can be a source of confusion as the word improper implies that this representation is not acceptable, which is not the case at all--in fact, it is often the preferred representation in algebra. Instead, try not to use the phrase and instead use “fraction” or “fraction greater than 1.” (Van deWalle, Karp, Bay-Williams, 2019)

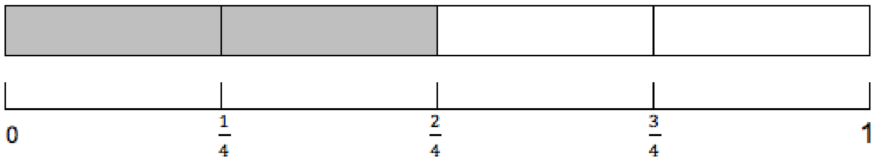
**Checking for Understanding**

Finlay and Peyton were talking about the fraction ½ and equivalent fractions. Finlay drew a rectangle and a number line to show how many fourths were equal to one-half, while Peyton drew a rectangle and a number line to show how many eighths were equal to one-half. Draw pictures that match what Finlay and Peyton each drew. Write an explanation to support your pictures.

*Possible student response:*

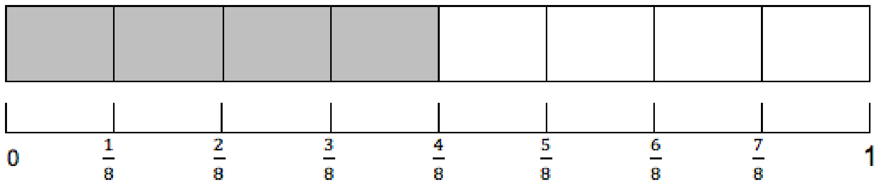
Finlay

> *I shaded in half of my picture. I knew that if I split each half into 2 parts I would get fourths. I found that 2/4 = ½. I then drew a number line to see if it worked there and it did.*



Peyton

> *I started by shading half the rectangle and marking ½ on the number line. Then I divided each half into 4 equal sections to give me 8 sections in my rectangle and 8 sections of my number line. I found that when 4/8 of the rectangle is shaded that is the same as half of the rectangle so 4/8 = ½. On the number line when I jump by 8ths to 4/8, 4/8 is also at the same point as ½.*



***Understand fractions as numbers.***

**NC.3.NF.3** Represent equivalent fractions with area and length models by:

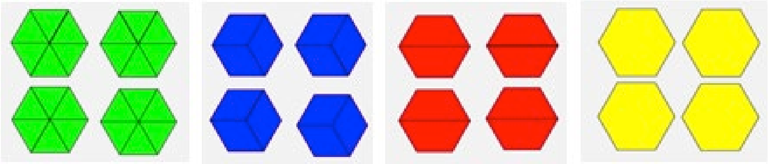
- Composing and decomposing fractions into equivalent fractions using related fractions: halves, fourths and eighths; thirds and sixths.
- Explaining that a fraction with the same numerator and denominator equals one whole.
- Expressing whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

**Clarification**

**Checking for Understanding**

Mrs. Floyd has a lot of hexagon shaped pies. She takes 4 pies and cuts each pie into sixths. She takes 4 pies and cuts each pie into halves. She takes 4 pies and cuts each pie into thirds. Then she takes 4 pies and leaves them whole. For each set of pies use pattern blocks to make a model how she cut the 4 pies. Then write a fraction equal to 4 to show the number of pieces compared to the size of each piece.

*Possible student response:*



*The fraction for pies cut into 6ths would be 24 pieces where 1 whole is divided into 6ths so the fraction is* $\frac{24}{6}$ *= 4.*

*The fraction for pies cut into 3rds would be 12 pieces where 1 whole is divided into 3rds so the fraction is* $\frac{12}{3}$ *= 4.*

*The fraction for pies cut into halves would be 8 pieces where 1 whole is divided into halves so the fraction is* $\frac{8}{2}$ *= 4.*

*The fraction for pies left whole would be 4 pieces where 1 whole is still 1 whole so the fraction is* $\frac{4}{1}$ *= 4.*

Return to Standards

***Understand fractions as numbers.***

**NC.3.NF.4** Compare two fractions with the same numerator or the same denominator by reasoning about their size, using area and length models, and using the >, <, and = symbols. Recognize that comparisons are valid only when the two fractions refer to the same whole with denominators: halves, fourths and eighths; thirds and sixths.

**Clarification**

This standard involves comparing fractions with or without area and length fraction models including number lines. Experiences should encourage students to reason about the size of pieces, the fact that 1/3 of a cake is larger than 1/4 of the same cake. Since the same cake (the whole) is split into equal pieces, thirds are larger than fourths.

In this standard, students should also reason that comparisons are only valid if the wholes are identical. For example, ½ of a large pizza is a different amount than ½ of a small pizza.  Students should be given opportunities to discuss and reason about which ½ is larger.

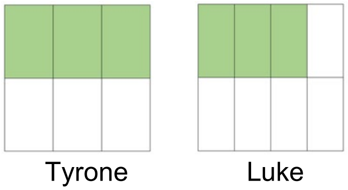
Students also see that for unit fractions, the one with the larger denominator is smaller, by reasoning, for example, that in order for more (identical) pieces to make the same whole, the pieces must be smaller. From this, students reason that for fractions that have the same numerator, the fraction with the smaller denominator is greater. For example, 2/4 > 2/8, because 1/8 < 1/4, so 2 lengths of 1/8 are less than 2 lengths of 1/4.

**Checking for Understanding**

Luke and Tyrone each buy a medium pizza. Luke has his pizza cut into 8 pieces while Tyrone has his pizza cut into 6 pieces. If they each eat 3 pieces, who ate more? Draw a picture and write an explanation about how you know you are correct.

*Possible student response:*

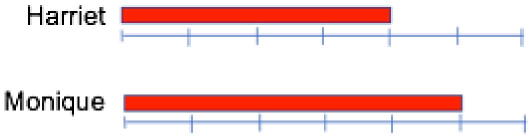
> *I drew rectangles that were the same size. Luke ate less than half of his pizza, while Tyrone at exactly half of his pizza. Tyrone ate more than Luke.*



---

Harriet and Monique are each eating a piece of licorice. Harriet eats 4/6 of her piece while Monique eats 5/6 of her piece. Who ate less? Draw a picture and write an explanation about how you determined who ate a smaller amount?

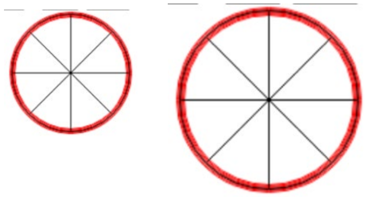
*Possible student response:*



---

Mr. Tobias bought a small cake and Mrs. Kalvicky bought a medium cake. They each ate 1/8 of their cake. Did they eat the same amount? Draw a picture and write an explanation about how you determined your answer.

*Possible student response:*

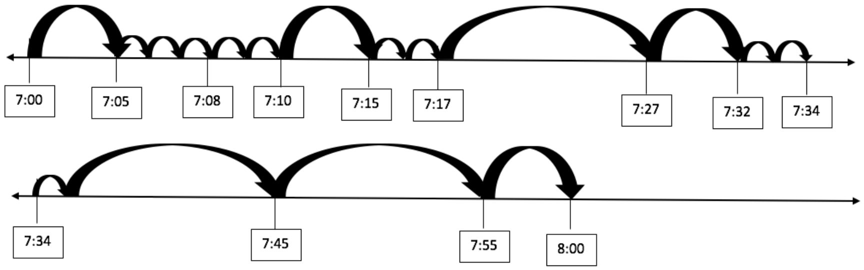


*Even though both cakes are cut into eighths, Mrs. Kalvicky has a larger cake so 1/8 of her cake is larger than 1/8 of the cake that Mr. Tobias has. I can't compare eighths when the wholes are different sizes.*

Return to Standards

## Measurement and Data

**Solve problems involving measurement.**
**NC.3.MD.1** Tell and write time to the nearest minute. Solve word problems involving addition and subtraction of time intervals within the same hour.

| Clarification | Checking for Understanding |
|---|---|
| In this standard, students will be able to tell time to the nearest minute, and determine elapsed time, including solving word problems. The expectation for third grade, is that students determine elapsed time within the same hour. Students are not expected to determine elapsed time over the hour. Specifically, problems such as finding the time that is 45 minutes before 3:30 p.m. are not appropriate since it would require students to cross over the hour.<br>When solving word problems involving time intervals, students should use strategies for addition and subtraction to find an end time, amount of time passed, or a start time within an hour. Students should use tools such as clocks, time lines, and tables to solve problems. | At 7:00 a.m. Candace wakes up to go to school. It takes her 8 minutes to shower, 9 minutes to get dressed and 17 minutes to eat breakfast. How many minutes does she have until the bus comes at 8:00 a.m.? Use the number line to help solve the problem.<br>*Possible response:*<br> |

Return to Standards

**Solve problems involving measurement.**

**NC.3.MD.2** Solve problems involving customary measurement.

- Estimate and measure lengths in customary units to the quarter-inch and half-inch, and feet and yards to the whole unit.
- Estimate and measure capacity and weight in customary units to a whole number: cups, pints, quarts, gallons, ounces, and pounds.
- Add, subtract, multiply, or divide to solve one-step word problems involving whole number measurements of length, weight, and capacity in the same customary units.

**Clarification**

In this standard, students reason about the units of length, capacity and weight using customary units. Students need to develop a basic understanding of the size and weight of customary units and apply this understanding when estimating and measuring.

Students are not expected to convert between units. The focus is on measuring and also reasoning as they estimate, using benchmarks to measure length, weight, and capacity.

Word problems should only be one-step and include the same unit. The number range for these tasks should match the number size described in the OA and NBT standards.

**Checking for Understanding**

Use a ruler and measure 5 objects in the classroom in inches. If objects have measurements that are not whole inches, measure to the half or quarter inch.

*Possible response:*
*Red crayon: 4 and ¼ inches*
*Length of math book: 11 inches*
*Piece of journal paper: 10 and ½ inches*

---

Estimate the following:
The amount of water in a bathtub
400 cups 400 quarts 400 gallons

---

For each container estimate or measure its capacity in cups, pints, quarts, or gallons.

| Container | Estimate | Actual Measurement |
|---|---|---|
| 3 large milk containers at the store | | |
| Trash can | | |
| Small milk container in the cafeteria | | |

---

20 cups of water come out of the faucet into a sink each minute. How much water is in the sink after 6 minutes?

Return to Standards

**Represent and interpret data.**
**NC.3.MD.3** Represent and interpret scaled picture and bar graphs:

- Collect data by asking a question that yields data in up to four categories.
- Make a representation of data and interpret data in a frequency table, scaled picture graph, and/or scaled bar graph with axes provided.
- Solve one and two-step "how many more" and "how many less" problems using information from these graphs

**Clarification**

In this standard, students will interact with data through data collection, creation of a scaled picture or bar graph, and interpretation of data. Students should understand how to formulate a question that provides them with categorical data, which is data that can be grouped into categories. Students should be able to choose an appropriate representation of the categorical data and create the representation. Students will create scaled picture graphs and scaled bar graphs. Graphs should include a title, categories, category label, key, and data. Once graphs are created, students should be able to solve simple one and two-step problems using the information in the graphs.

Scaled picture graphs have pictures that represent more than 1 data point. Scaled bar graphs have a scale on the y-axis in which the labels do not include every number. Both of these scaled types of graphs could include data that includes half of an object on picture graphs or bar graphs in which a bar is in between labels.

**Checking for Understanding**

Maria wanted to know what flavor of juice the people in her class like the most. She asked each person in her class, "Which of these four flavors is your favorite type of juice?" She kept track of the votes on a frequency table.

| Flavor | People |
|---|---|
| Grape | 卌 |
| Cherry | 卌 卌 \| |
| Apple | 卌\|\| |
| Orange | \|\| |

| Flavor | People |
|---|---|
| Grape | 5 |
| Cherry | 11 |
| Apple | 7 |
| Orange | 2 |

---

Nancy and Juan read the following amount of books during the summer.

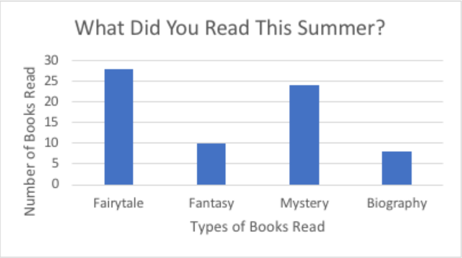
- How many books did they read together?
- How many more books did Juan read compared to Nancy?
- Sarah read more books than Nancy but less books than Juan. How many books could Sarah have read?

| Number of Books Read | |
|---|---|
| Nancy | ✧ ✧ ✧ ✧ ✧ |
| Juan | ✧ ✧ ✧ ✧ ✧ ✧ ✧ ✧ |
| ✧ = 5 Books | |

---

As a class we are going to design a survey to collect data from all of the third grade students in the school about the types of books they read this summer. You will take the data from a table and make it into a scaled bar graph. Then write and solve two math problems that compare the values in your graph.

*Possible response:*



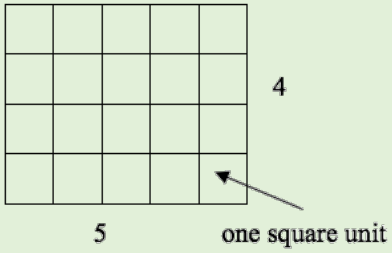
Return to Standards

**Understand the concept of area.**
**NC.3.MD.5** Find the area of a rectangle with whole-number side lengths by tiling without gaps or overlaps and counting unit squares.

**Clarification**

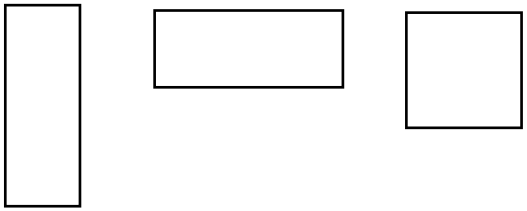
This standard calls for students to explore the area as the covering of a region with unit squares. Students should understand that a unit square is a square with side length 1 unit and has one square unit of area and should be able to make connections between the number of squares it takes to cover an area and the dimensions of the rectangle.

Students should be able to count the square units to find the area. Units could include metric, customary, or non-standard square units.

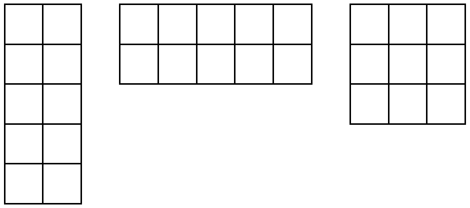
> **For example:** In the figure below, there are 20 square units. Each square unit is a square with the side length of 1 unit. The rectangle is 5 units long and 4 units wide.
>
> 
>

**Checking for Understanding**

Use the square tiles and find the area of the shapes below.
Which rectangle is the largest?



*Possible response:*



*The left and middle rectangles are 10 square units. The right rectangle is 9 square units. The left and middle rectangles are the largest.*

Return to Standards

**Understand the concept of area.**

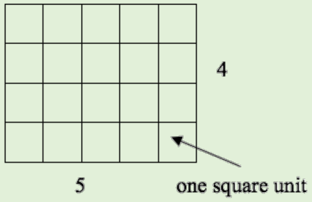
**NC.3.MD.7** Relate area to the operations of multiplication and addition.

- Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.
- Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving problems and represent whole-number products as rectangular areas in mathematical reasoning.
- Use tiles and/or arrays to illustrate and explain that the area of a rectangle can be found by partitioning it into two smaller rectangles, and that the area of the large rectangle is the sum of the two smaller rectangles.

**Clarification**

In this standard, students build on their understanding of area. Students begin with unit squares and connect unit squares to side lengths. Students should understand and explain why multiplying the side lengths of a rectangle yields the same measurement of area as counting the number of tiles (with the same unit length) that fill the rectangle's interior. Students who multiply the dimensions to find the area without providing a clear reason why multiplying works have not met the expectation for this standard.

**For example:** In this rectangle, there are 4 rows of 5 units squares, or 5 columns of 4 unit squares. Students should tile rectangle to find that there are 20 square units, then multiply the side lengths to show it is the same.

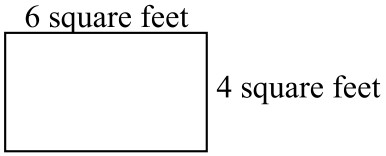


4 x 5 = 20
5 x 4 = 20

This standard also addresses using multiplication to determine area in problem solving. Students will also be expected to determine the possible dimensions of a rectangle when the area is given.

**Checking for Understanding**

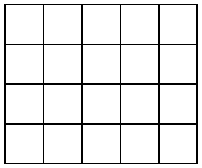
Sam wants to tile the bathroom floor using 1 foot tiles. How many square foot tiles will he need?



---

You have a rectangle that is 5 inches by 4 inches. Explain why multiplying the dimensions of the rectangle is an appropriate strategy to find the area.

*Possible responses:*



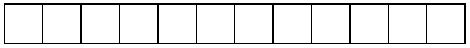
*Student A: I know that I have 5 columns and 4 rows.*
*I added the number 5, 4 times.*
*5+5+5+5 = 20. That is the same as 5x4 which is 20. Since I got the same answer when I added 5+5+5+5 and 5x4*

*Student B: I counted all of the squares and there were 20. I know that 5x4 is 20 so I get the correct answer.*

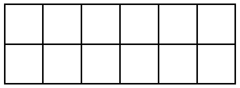
---

The area of a rectangular playpen for a guinea pig is 12 square yards. What are the possible dimensions of the playpen?

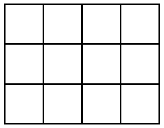
*Possible response:*



1 x 12



2 x 6



3 x 4

**Understand the concept of area.**
**NC.3.MD.7** Relate area to the operations of multiplication and addition.

- Find the area of a rectangle with whole-number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.
- Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving problems and represent whole-number products as rectangular areas in mathematical reasoning.
- Use tiles and/or arrays to illustrate and explain that the area of a rectangle can be found by partitioning it into two smaller rectangles, and that the area of the large rectangle is the sum of the two smaller rectangles.

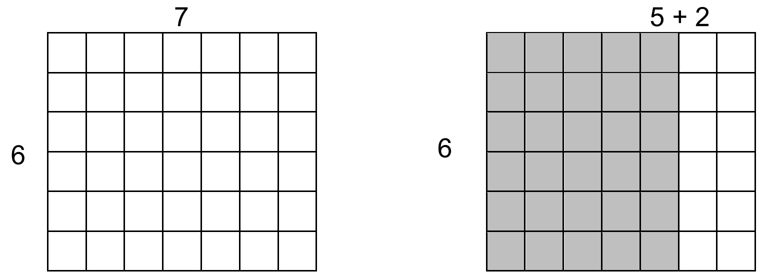
**Clarification**

In this standard, students also connect area of a rectangle to the area model used to represent multiplication. This connection extends students' understanding of the distributive property.

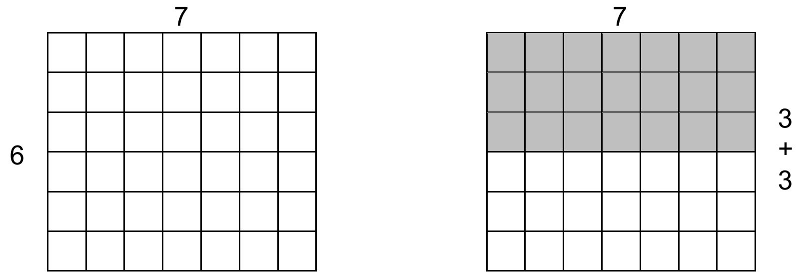
When students explain that they can find the area of a rectangle by breaking it into two smaller rectangles, every dimension of the rectangle that they partition should be equal to or less than 10.

**Checking for Understanding**

You buy a rectangular carton of candy that has 7 columns and 6 rows. Find two different ways to split the rectangle.



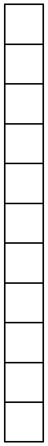
7 x 6 = (5 x 6) + (2 x 6)



7 x 6 = (7 x 3) + (7 x 3)

Return to Standards

**Understand the concept of perimeter.**
**NC.3.MD.8** Solve problems involving perimeters of polygons, including finding the perimeter given the side lengths, and finding an unknown side length.

| **Clarification** | **Checking for Understanding** |
|---|---|
| In this standard, students develop an understanding of the concept of perimeter. Students calculate the perimeter of polygons through addition and also recognize the patterns that exist when finding the sum of the lengths and widths of rectangles. When students are presented with a perimeter and some side lengths, students are able to determine an unknown side length. Students are also expected to find the possible side lengths of a rectangle when given the total perimeter. | You have 24 feet of fencing. What are the possible dimensions you can have for a rectangular fenced in area?<br>*Possible response:*<br>*The tallest and skinniest rectangle is 11 feet tall and 1 foot wide so it is 11 by 1. I then realized I could make shorter rectangles with the same perimeter. When I made one that was 10 tall the width was 2 so the dimensions were 10 by 2. I continued to do that so I had rectangles that were 9 by 3, 8 by 4, a 7 by 5, and 6 by 6.*<br> |

Return to Standards

# Geometry

**Reason with shapes and their attributes.**

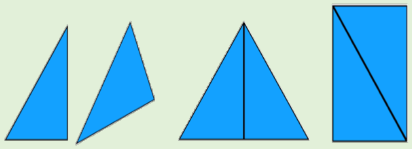
**NC.3.G.1** Reason with two-dimensional shapes and their attributes.

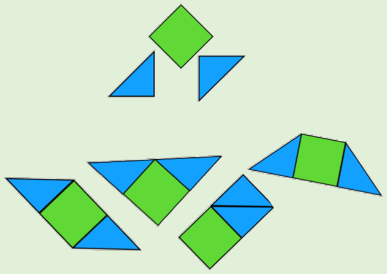
- Investigate, describe, and reason about composing triangles and quadrilaterals and decomposing quadrilaterals.
- Recognize and draw examples and non-examples of types of quadrilaterals including rhombuses, rectangles, squares, parallelograms, and trapezoids.

## Clarification

In this standard, students explore with triangles and quadrilaterals. Students move beyond identifying and classifying triangles and quadrilaterals to manipulating two or more shapes to create other triangles and quadrilaterals. Students should be able to describe the shapes they have composed using informal geometric terminology and understand the relationship between the components of the new shape.

**For example:**
Students can manipulate two right triangles to create another triangle. They can also manipulate the triangles to compose a rectangle.





Students can manipulate a square and two triangles to create a variety of triangles and quadrilaterals. Students should be able to describe the composite shapes using attributes of triangles and quadrilaterals.

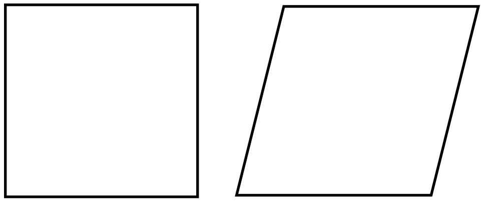
Students examine the properties of quadrilaterals and determine whether or not a shape is a quadrilateral. Students understand that a quadrilateral must be a closed figure with four straight sides and four angles and should be able to describe the characteristics of quadrilaterals including details about the angles and the relationship between opposite sides. Students should able to sort geometric figures and identify squares, rectangles, rhombuses, parallelograms, and trapezoids as quadrilaterals.

Note: North Carolina has adopted the exclusive definition for a trapezoid. A trapezoid is a quadrilateral with *exactly* one pair of parallel sides.

## Checking for Understanding

Draw a picture of a square. Draw a picture of a rhombus.
How are they alike? How are they different?

*Possible response:*



*A square and a rhombus both have 4 sides. All four sides are the same length. A square has four equal angles, and a rhombus does not. The opposite angles are equal.*

Return to Standards