# Topic Proficiency Scale

**Domain:** Numbers and Operations in Base Ten  
**Topic:** Division of Whole Numbers  
**Critical Area:** Whole Number Operations

### 4.0
I know all of the Simple and Complex Learning Goals and my understanding goes beyond the grade level target.

### COMPLEX

#### 3.0
I know all of the Simple and Complex Learning Goals.

- **C1:** Solve and justify word problems involving division *(using a fraction bar)* of whole numbers leading to answers in the form of fractions or mixed numbers *(e.g., by using visual fraction models or equations to represent the problem).*  
  (5.NF.3)

- **C2:** Solve and justify the use of strategies to calculate whole-number quotients with up to four-digit dividends and two-digit divisors *(Illustrate with equations, rectangular arrays, and/or area models. Calculate using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.)*  
  (5.NBT.6)

### 2.5
I know all of the Simple Learning Goals plus some of the Complex Learning Goals.

### SIMPLE

#### 2.0
I know all of the Simple Learning Goals.

- **S1:** Interpret a fraction as division of the numerator by the denominator.  
  (5.NF.3)

- **S2:** Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors using strategies *(i.e., place value, the properties of operations, and/or the relationship between multiplication and division.)*  
  (5.NBT.6)

**Academic Vocabulary:** N/A

### 1.0
I know some of the Simple Learning Goals.

#### 0.5
Not applicable.

#### 0.0
No evidence of knowing the Learning Goals.
### Topic Proficiency Scale

**Domain:** Numbers and Operations in Base Ten  
**Topic:** Division of Whole Numbers  
**Critical Area:** Whole Number Operations

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td>4.0</td>
<td>I know all of the Simple and Complex Learning Goals and my understanding goes beyond the grade level target.</td>
</tr>
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</table>
| **COMPLEX**  
3.0 | I know all of the Simple and Complex Learning Goals. |
| | C1: Solve and justify word problems involving division (using a fraction bar) of whole numbers leading to answers in the form of fractions or mixed numbers (e.g., by using visual fraction models or equations to represent the problem). (5.NF.3) |
| | C2: Solve and justify the use of strategies to calculate whole-number quotients with up to four-digit dividends and two-digit divisors (Illustrate with equations, rectangular arrays, and/or area models. Calculate using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.). (5.NBT.6) |
| 2.5 | I know all of the Simple Learning Goals plus some of the Complex Learning Goals. |
| **SIMPLE**  
2.0 | I know all of the Simple Learning Goals. |
| | S1: Interpret a fraction as division of the numerator by the denominator. (5.NF.3) |
| | S2: Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors using strategies (i.e., place value, the properties of operations, and/or the relationship between multiplication and division). (5.NBT.6) |
| 1.0 | I know some of the Simple Learning Goals. |
| 0.5 | Not applicable. |
| 0.0 | No evidence of knowing the Learning Goals. |

**Academic Vocabulary:** N/A

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© Farmington Municipal Schools - 5th Grade NMCCSS Math  
Revised May, 2017
### Success Criteria

**Topic: Division of Whole Numbers**

**Teacher Notes:**
- Students may be assessed by solving multi-step real-world problems involving division, explain reasoning, and justify conclusions. (5.NBT.6)
- Students can explain by using words, drawings, and/or strategies to demonstrate their understanding of how to find whole-number quotients. (5.NBT.6)

### Guiding Questions toward Mastery:
1. Describe the problem in your own words?
2. What is the relationship of the quantities?
3. How did you test whether your approach worked?
4. What are ways to represent the quantities?

<table>
<thead>
<tr>
<th>COMPLEX</th>
<th>Mastery of Learning Goals:</th>
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| 3.0 I know all of the Simple and Complex Learning Goals | - Recognize an improper fraction, and convert it to a mixed number.  
- When reading a word problem with 2 whole numbers, identify which digit is the numerator (dividend) and which is the denominator (divisor).  
  - For Example: If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?  
- Identify between what two whole numbers a fraction or mixed number falls between on a number line.  

Students extend their previous work to expressing the quotient of a division problem as a fraction or mixed number. Real-life problems present situation and contexts in which expressing the remainder as a fraction makes sense. Using concrete materials such as fraction pieces and area models will help students to understand what the “leftover” fraction represents.

Fifth grade student should connect fractions with division, understanding that $5 \div 3 = 5/3$. Students should explain this by working with their understanding of division as equal sharing.

How to share 5 objects equally among 3 shares:  
$5 \div 3 = 5 \times \frac{1}{3} = \frac{5}{3}$  

If you divide 5 objects equally among 3 shares, each of the 5 objects should contribute 1/3 of itself to each share. Thus each share consists of 5 pieces, each of which is 1/3 of an object, so each share if $5 \times \frac{1}{3} = \frac{5}{3}$ of an object.

Students are expected to demonstrate their understanding using concrete materials, drawing models, and explaining their thinking when working with fractions in multiple contexts. They read 3/5 as “three fifths” and after many experiences with sharing problems, learn that 3/5 can also be interpreted as “3 divided by 5.”
**Success Criteria**

**Topic: Division of Whole Numbers**

**Continued**

Examples:

Ten team members are sharing 3 boxes of cookies. How much of a box will each student get?

When working this problem a student should recognize that the 3 boxes are being divided into 10 groups, so s/he is seeing the solution to the following equation, \(10 \times n = 3\) (10 groups of some amount is 3 boxes) which can also be written as \(n = 3 \div 10\).

Using models or diagrams, they divide each box into 10 groups, resulting in each team member getting \(3/10\) of a box.

**Boxes of cookies**

```
  1  1  1  1  1  1  1  1  1  1
10 10 10 10 10 10 10 10 10 10
```

*Each team member will get 1/10 of each box of cookies. 3 \(\div\) 10 = 3/10 = 3/10*
Solve and justify the use of strategies to calculate whole-number quotients with up to four-digit dividends and two-digit divisors (Illustrate with equations, rectangular arrays, and/or area models. Calculate using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division.). (5.NBT.6)

It would be very helpful to read over the Standards related to division from grades 3 and 4 in order to understand students’ previous experiences developing understanding of the meaning of division through the use of partitive and measurement models for division. Because this is students’ first experience with two-digit divisors, building on earlier work will help students develop understanding of what is happening when they divide and apply this to more difficult division examples. It is not expected that students will master a particular strategy or division procedure (i.e., equations, rectangular arrays, and/or area models). It is important for students to use the strategy that makes the most sense to them. Students are NOT expected to know a standard algorithm for division until Grade 6. Expecting the standard algorithm at this point may hinder understanding. The most compatible numbers and partial products will make sense for most students and is an acceptable goal for Grade 5.

Teaching the standard algorithm for long division in not an effective use of time for Grade 5.

- Calculate division problems using one of the strategies (i.e., equations, rectangular arrays, and/or area models).

Example: 9984 ÷ 64
An area model for division is shown below. As the student uses the area model, s/he keeps track of how much of the 9984 is left to divide.

Example: There are 1,716 students participating in Field Day. They are put into teams of 16 for the competition. How many teams get created? If you have left over students, what do you do with them?

Student 1
1,716 divided by 16
There are 100 16’s in 1,716.
1,716 – 1,600 = 116
I know there are at least 6 16’s.
116 – 96 = 20
I can take out at least 1 more 16.
20 – 16 = 4
There were 107 teams with 4 students left over. If we put the extra students on different teams, 4 teams will have 17 students.

Student 2
1,716 divided by 16.
There are 100 16’s in 1,716.
Ten groups of 16 is 160. That’s too big.
Half of that is 80, which is 5 groups.
I know that 2 groups of 16’s is 32.
I have 4 students left over.

Student 3
1,716 ÷ 16 =
I want to get to 1,716.
I know that 100 16’s equals 1,600
I know that 5 16’s equals 80
1,600 + 80 = 1,680
Two more groups of 16’s equals 32, which gets us to 1,712
I am 4 away from 1,716
So we had 100 + 6 + 1 = 107 teams
Those other 4 students can just hang out

Student 4
How many 16’s are in 1,716?
We have an area of 1,716. I know that one side of my array is 16 units long. I used 16 as the height. I am trying to answer the question what is the width of my rectangle if the area is 1,716 and the height is 16. 100 + 7 = 107 R 4

100
16
100 x 16 = 1,600
7 x 16 = 112
1,716 - 1,600 = 116
116 - 112 = 4
### Mathematical Practices:
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Attend to precision.
6. Look for a make use of structure.
7. Look for and express regularity in repeated reasoning.

### District Resources:
- [TLL.net](#) quizbuilder
- MyMath: Lessons 4.1; 4.2; 4.3; 4.5
- Other recommended resources:
  - NewMark Learning Common Core Math
  - Test Smart Common Core
  - Finish Line Mathematics for the Common Core
  - OnCore Math
  - Envision Math

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**Success Criteria**

**Topic: Division of Whole Numbers**

**Continued**

**Example:**

Using expanded notation: 2682 ÷ 21

- Using understanding of the relationship between 100 and 21, a student might think:
  - I know that 100 divided by 21 is 5 so 200 divided by 21 is 9 and 2000 divided by 21 is 90.
  - 600 divided by 21 has to be 24.
  - Since 3 x 21 is 63, I know that 80 divided by 21 is 3 with a remainder of 9.
  - I can't divide 2 by 21 so 2 plus the 5 leaves a remainder of 7.
  - 80 + 24 + 3 = 107. So, the answer is 107 with a remainder of 7.

Using an equation that relates division to multiplication, 21 x n = 2682, a student might estimate the answer to be slightly larger than 100 because 21 x 100 = 2100.

**Example:**

968 ÷ 21

Using base ten models, a student can represent 962 and use the models to make an array with one dimension of 21. The student continues to make the array until no more groups of 21 can be made. Remainders are not part of the array.
Exemplar:

A teacher drew an area model to find the value of 6,986 ÷ 8.

Teacher’s Model for 6,986 ÷ 8

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<tbody>
<tr>
<td>8</td>
<td>M</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Q</td>
</tr>
</tbody>
</table>

The numbers in the model's boxes are the dividends. Along the top are quotients. M ÷ 8 = 800, so 800 x 8 = M = 6400. N = 560 ÷ 8 = 70. To find Q, I have to add my dividends so far and subtract them from the total dividend.

6986 - (6400 + 560) = 26. 26 cannot be evenly divided by 8. 24 can, so I use 24 = Q which makes P = 3 and R = 2. The final quotient is 873 R2 or 873 2/8. I can multiply to check my answer, 873 x 8 + 2 = 6986. The 2 added is the remainder.