Gateway Regional School District

Atlas

Unit Plan

3.4 Relating Multiplication to Division

Chester / Littleville Elementary / Grade 3 / Mathematics

Week 15 - Week 19 | 4 Curriculum Developers | Last Updated: Mar 19, 2024 by LeBlanc, Deanna

Style Guide

What is the purpose of the unit? What are the major take-aways?

Standards

MA: Mathematics (2017)
MA: Grade 3
Operations & Algebraic Thinking

3.OA Represent and solve problems involving multiplication and division.

- [x] 4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. Show Details
- [x] 2. Interpret whole-number quotients of whole numbers, e.g., 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. Show Details
- [x] 3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities. Show Details

3.OA Understand properties of multiplication and the relationship between multiplication and division.

- [x] 5. Apply properties of operations to multiply. Show Details
- [x] 6. Understand division as an unknown-factor problem. Show Details

3.OA Multiply and divide within 100.

- [x] 7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two single-digit numbers and the related division facts. For example, the product 4 x 7 = 28 has related division facts 28 ÷ 7 = 4 and 28 ÷ 4 = 7.

3.OA Solve problems involving the four operations, and identify and explain patterns in arithmetic.

- [x] 8. Solve two-step word problems using the four operations for problems posed with whole numbers and having whole number answers. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. Show Details
- [x] 9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. Show Details

Number & Operations in Base Ten

3.NBT Use place value understanding and properties of operations to perform multi-digit arithmetic. Show Details

- [x] 2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- [x] 3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

Measurement & Data

3.MD Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

- [x] 7. Relate area to the operations of multiplication and addition.
- [x] 7c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.

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Enduring Understandings

1. Multiplication and Division are Inversely Related:
Students will understand that multiplication and division are inverse operations. They will learn that knowing the result of a multiplication fact (e.g., 8 × 5 = 40) helps them to solve the related division facts (e.g., 40 ÷ 5 = 8 and 40 ÷ 8 = 5).

2. Understanding Division as Finding an Unknown Factor:
Students will grasp that division problems can be understood as finding an unknown factor in a multiplication equation. For example, if one knows that 6 times a number equals 24, they can also understand that 24 divided by 6 gives the unknown number.

3. Fluency with Facts:
Students will become fluent with multiplication and division facts within 100. They will aim to know all products of two one-digit numbers and their related division facts by memory, realizing that this knowledge simplifies more complex mathematical problems.

4. Properties of Operations as Tools:
Students will recognize how to apply properties of operations (such as commutative, associative, and distributive) to understand and solve multiplication and division problems efficiently, and to comprehend patterns in math.

5. Solving Multi-Step Word Problems:
Students will learn to solve two-step word problems that involve multiplication and/or division, using equations with a letter to represent the unknown quantity. They will practice assessing the reasonableness of answers through mental math and estimation strategies.

6. Recognizing and Explaining Patterns:
Students will identify patterns in the multiplication and addition tables and explain them using the properties of operations. They will realize that recognizing arithmetic patterns can simplify problem-solving and that patterns are the foundation of mathematical understanding.

Essential Questions

1. **How are multiplication and division related to each other?**
- This question prompts students to think about the inverse relationship between multiplication and division and sets the stage for understanding how knowing one can help with the other.

2. **How can we use multiplication to solve division problems, and vice versa?**
- This question encourages students to apply their knowledge of one operation to facilitate the other and to see them as two sides of the same coin.

3. **Why is it important to know multiplication facts from memory, and how does it help with division?**
- This questions the rationale behind knowing multiplication facts by heart and how it simplifies solving division problems.

4. **How can understanding the properties of operations help us multiply and divide more efficiently?**
- Students focus on the commutative, associative, and distributive properties, which are key to developing strategies for fluent multiplication and division.

5. **How can division problems be thought of as an unknown-factor problem in multiplication?**
- This question asks students to reconceptualize division problems in the context of finding a missing factor in a multiplication equation, thereby deepening their understanding of the operations' connection.

6. **How can we use what we know about multiplication and division to solve two-step word problems?**
- Students are challenged to apply their operational understanding in a real-world context, integrating other operations to find solutions.

7. **What strategies can we use to estimate and check the reasonableness of our answers when we multiply and divide?**
- This question is about encouraging the use of mental computation and estimation strategies such as rounding, to make reasonable checks on their multiplication and division answers.

8. **How can identifying patterns in addition, subtraction, multiplication, and division help us with more complex math problems?**
- This question leads students to seek and explain patterns in operations, which builds a foundation for recognizing and applying these patterns to simplify calculations.

9. **What happens to the results when we multiply or divide numbers in a pattern, such as a number sequence or a place in the

multiplication table?**
- Here, students are asked to explore and explain the effects of multiplication and division within arithmetic patterns.

Content

This unit introduces students to the concept of division and its relationship to multiplication.
Previously, students learned that multiplication can be understood in terms of equal-size groups. The expression 5×25×2 can represent the total number of objects when there are 5 groups of 2 objects, or when there are 2 groups of 5 objects.
Here, students make sense of division also in terms of equal-size groups. For instance, the expression 30÷530÷5 can represent putting 30 objects into 5 equal groups, or putting 30 objects into groups of 5. They see that, in general, dividing can mean finding the size of each group, or finding the number of equal groups.

Students use the relationship between multiplication and division to develop fluency with single-digit multiplication and division facts. They continue to reason about products of two numbers in terms of the area of rectangles whose side lengths represent the factors, decomposing side lengths and applying properties of operations along the way.

As they multiply numbers greater than 10, students see that it is helpful to decompose the two-digit factor into tens and ones and distribute the multiplication. For instance, to find the value of 26×326×3, they can decompose the 26 into 20 and 6, and then multiply each by 3.

Toward the end of the unit, students solve two-step problems that involve all four operations. In some situations, they work with expressions that use parentheses to indicate which operation is completed first (for example: 276+(45÷5)=?
Throughout the unit
Some of the warm-ups early in the unit continue to address fluent addition and subtraction within 1,000. The rest of the warm-ups are designed to develop fluency with multiplying and dividing within 100. Students initially work visually with multiplication of a multiple of ten by a single-digit whole number, then transition to working with expressions and equations. Warm-ups in the unit are also used to introduce and reinforce important ideas like the relationship between multiplication and division and using properties of operations as strategies to multiply and divide.
Here is a sampling of the warm-ups in the unit.

lesson 3	lesson 7	lesson 8	lesson 10
Number Talk 120+120 121+119 125+115 129+111	How Many Do You See?	Number Talk 4×10 40÷4 40÷10 60÷6	How Many Do You See?

Skills

Section A Goals
- Represent and solve “how many groups?” and “how many in each group?” problems.

Section B Goals
- Understand division as a missing-factor problem.
- Use properties of operations to develop fluency with single-digit multiplication facts, and their related division facts.

Section C Goals
- Use properties of operations and place value understanding to develop strategies to multiply within 100 and to multiply one-digit numbers by a multiple of 10.

Section D Goals
- Use properties of operations, place value understanding, and the relationship between multiplication and division to divide within 100.

How will you gauge student learning?

Assessments

3.4 End of Unit Assessment | Summative | Written Test

Grade3-4-End-of-Unit-Assessment-assessment.pdf

8 State Standards Assessed

How will students learn?

Learning Activities

Section 1:
In this section, students encounter situations involving the questions “how many in each group?” and “how many groups?” They make sense of division in terms of finding the answers to these questions.
The focus here is on interpreting descriptions, diagrams, and expressions that represent division situations. Students see that the same diagram or expression can represent different questions. For example, the expression 6÷26÷2 can represent two different questions about 6 blocks being put into stacks of 2 or into 2 equal stacks.

Later, students generalize their observations about division situations and interpret division expressions without a context.

Section 2:
In this section, students explicitly relate division to the missing factor in a multiplication equation. For example, the quotient in 30÷6=−−−−−− 30÷6=_ is the missing factor in −−−−−−×6=30_×6=30. They use this insight and their knowledge of multiplication facts to identify division facts.
To develop fluency, students reason about patterns in a multiplication table and notice that multiplication is commutative. For instance, if they know the value of 4×74×7, they also know that of 7×47×4.
Students also reason about the product of two factors by decomposing one of the factors. For instance, to find the value of 7×37×3, they can decompose the 7 into 5 and 2 and find the value of (5×3)+(2×3)(5×3)+(2×3). Visually, the product can be represented by the area of a 7-by-3 rectangle that has been decomposed into two rectangles that are 5 by 3 and 2 by 3.

This line of reasoning develops students' intuition for the distributive property of multiplication. (Note that students are not expected to know the names of the properties of operations.)

Section 3:
In this section, students use various strategies based on place value and properties of operations to multiply larger numbers.
Students first multiply one-digit numbers and multiples of 10 and observe the associative property of multiplication. They interpret 3×203×20 to mean 3 groups of 2 tens, which is 6 tens. This means 3×203×20 can be evaluated by finding 3×2×103×2×10 or 6×106×10.
These insights enable students to then multiply other one- and two-digit factors (not limited to multiples of 10) and find products within 100.
The representations used here (base-ten blocks, gridded rectangles, and ungridded diagrams) encourage students to also use their understanding of place value and to decompose two-digit factors into tens and ones as they multiply.

Differentiated Instruction

Technology Integration

21st Century Skills

Positive Behavior

CASEL

Collaborative for Academic, Social, and Emotional Learning

Resources

Teacher Notes and Reflections