Unit 2: Multi-Digit Multiplication
4th Grade Math

35 Class Meetings

Written September 2024

Essential Questions

- How does understanding place value help us multiply large numbers?
- What strategies can we use to solve multi-digit multiplication problems efficiently?
- How does understanding patterns in multiplication help us solve real-world problems?

Enduring Understandings with Unit Goals

EU 1: Understanding that in multiplicative comparison one quantity is multiplied a certain number of times to equal another quantity.

- Distinguish multiplicative comparison from additive comparison.
- Solve multiplicative comparison problems with a larger unknown.
- Solve multiplicative comparison problems with a smaller unknown.
- Solve multiplicative comparison problems with an unknown multiplier.
- Interpret a multiplication equation as a comparison.

EU 2: Utilizing an understanding of place value as a foundation for multiplying larger multi-digit numbers.

- Multiply 10, 100, and 1,000 by one- and two-digit numbers
- Multiply multiples of 10, 100, and 1,000 by one-digit numbers.
- Estimate multi-digit products by rounding numbers to their largest place value
- Multiply two-, three-, and four-digit numbers by one-digit numbers using a variety of strategies
- Multiply two-, three-, and four-digit numbers by one-digit numbers and assess the reasonableness of the product.

EU 3: Multiplying larger numbers requires utilizing multiple strategies and applications of properties.

- Multiply two-digit multiples of 10 by two-digit multiples of 10.
- Estimate multi-digit products by rounding numbers to their largest place value.
- Multiply two-digit multiples of 10 by two-digit numbers.
- Multiply two-digit numbers by two-digit numbers using a variety of strategies including four partial products.
- Multiply two-digit by two-digit numbers using two partial products and assess the reasonableness of the product.

EU 4: Understanding how to extract relevant details from word problems involving multiplication is essential for creating a mathematical equation to solve it.

- Abstract the formulas for area and perimeter and apply those formulas to real-world word problems involving multiplication.
- Solve two-step word problems involving multiplication, addition, and subtraction.

Unit 2: Multi-Digit Multiplication
4th Grade Math

35 Class Meetings

Written September 2024

Standards

Common Core State Standards:

- **CCSS.Math.4.MD.A.3:** Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
- **CCSS.Math.4.NBT.B.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.
- **CCSS.Math.4.OA.A.1:** 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. Represent verbal statements of multiplicative comparisons as multiplication equations.
- **CCSS.Math.4.OA.A.2:** Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
- **CCSS.Math.4.OA.A.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 letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.

Competency 2: Speak to diverse audiences in an accountable manner.

Competency 3: Develop the behaviors needed to interact and contribute with others on a team.

Competency 4: Analyze and solve problems independently and collaboratively.

Competency 5: Be responsible, creative, and empathetic members of the community.

Unit Content Overview

1. **Multiplicative Comparison**
   - Understand the concept of multiplicative comparison.
   - Use multiplication to solve comparison problems.
   - Interpret multiplication equations in comparison contexts.
   - Apply reasoning to solve real-world problems.
   - Model and explain comparisons visually.
   - Use estimation to check the reasonableness of answers.

2. **Place Value as a Foundation for Multi-digit Multiplication**
   - Explain the value of digits in multi-digit numbers.
   - Break down multi-digit numbers into their place value components to simplify multiplication problems.

Unit 2: Multi-Digit Multiplication
4th Grade Math
35 Class Meetings

Written September 2024

- Accurately solve up to four-digit by one-digit multiplication problems.
- Apply the distributive property to break apart numbers and multiply.
- Round numbers and estimate products to ensure reasonability.
- Apply understanding of multi-digit multiplication to solve real world problems.
- Identify and use patterns to make multiplication more efficient.

3. **Multiplying Larger Numbers**
   - Apply various strategies like array models commutative, associative, and distributive properties to multiply multi-digit by multi-digit problems
   - Communicate reasoning and solution methods for how problems were solved

4. Solving Word Problems
   - Recognize situation in real life that require multiplication
   - Distinguish between multiplication and other operations when interpreting word problems
   - Disregard irrelevant information in word problems
   - Apply different strategies to solve multiplication word problems

Vocabulary and Key Terms: factor, product, multiplication, partial products, area model, distributive property, standard algorithm, estimate, place value, regrouping, array, multiple, equation, operation, algorithm, carry over, decompose, multiply, commutative property, associative property, rounding, place value, compatible numbers

Interdisciplinary Connection:

- ELA

Daily Learning Objectives with *TWPS*

Students will be able to…

- Distinguish between additive and multiplicative comparisons.
  - *Which is closer to 100: 9 x 11 or 8 x 12?*
- Explain how one quantity is multiplied compared with another.
  - *Would you rather have 10 groups of 4 pencils or 8 groups of 5 pencils?*
- Solve word problems involving multiplicative comparisons by using multiplication equations.
  - *Guess My Rule: Multiplication Mindfulness*
- Translate phrases like “4 times as many” or “3 times as many” into multiplication equations.
  - *If you had to choose between 25x2 or 50x1, which you pick?*
- Demonstrate an understanding of multiplicative comparison to solve everyday problems that include comparing lengths, distances, and quantities.
  - *What Comes Next? Number Forms*
- Represent multiplicative comparisons using drawings, diagrams, and number lines to deepen their understanding. **
  - *Which One Doesn't Belong? Colorful Calculations*
  - *Same & Different: Field Fun*
- Estimate and round to ensure that their solutions to comparison problems make sense.
  - *What Comes Next? Extra Eggs*

Unit 2: Multi-Digit Multiplication
4th Grade Math

35 Class Meetings

Written September 2024

- Explain the value of digits in multi-digit numbers (up to thousands) and how the place represents ten time the value to its right. **
    - *Mobile Math: Find the Values*
    - *Math in Our World: Character Cards*
- Break down multi-digit numbers into their place value components to simplify multiplication problems. **
    - *Would You Rather? Chicken Coops*
    - *Math in Our World: Making Signs*
- Identify patterns, like the power of 10, to make multiplication more efficient.
    - *Guess My Rule: Mostly Composites*
- Use array models to accurately solve multi-digit multiplication problems.
    - *Would You Rather? Long & Tall*
- Use partial products as a strategy to solve multi-digit multiplication problems.
    - *Multiply by breaking apart numbers (decompose) or multiply by keeping numbers whole?*
- Apply the distributive property to break apart numbers and multiply each part separately.
    - *Math in Our World: Kindness Contest*
- Use the standard algorithm to solve multi-digit multiplication problems.
    - *Which One Doesn't Belong? Numbers*
- Round numbers to estimate products to ensure that solution to standard algorithm is reasonable and accurate.
    - *Same & Different: Crayon Cohorts*
- Solve real world word problems using strategies that have been taught. ***
    - *Would You Rather? Marker Mates*
    - *What Comes Next? Array Hurray*
    - *Same & Different: 4 & 8*
- Use array models to accurately solve multi-digit by multi-digit multiplication problems.
    - *Mobile Math: What's Missing?*
- Apply the distributive property to solve multi-digit by multi-digit multiplication problems.
    - *Which One Doesn't Belong? Triangles*
- Apply the commutative property to solve multi-digit by multi-digit multiplication problems.
    - *Same & Different: Tile Patterns*
- Apply the associative property to solve multi-digit by multi-digit multiplication problems.
    - *Math in Our World: Pet Races*
- Compare and choose efficient strategies depending on the context.
    - *Mobile Math: Heavy Weights?*
- Understand and explain how properties are used in the multiplication process (e.g., decomposing numbers using the distributive property).
    - *Same & Different: Dip-Dyed Arrays*
- Identify key information in word problems and represent it mathematically using equations and visual models.
    - *Would You Rather? Marble Collection*
- Develop strategies for mental math when multiplying larger numbers.
    - *Mobile Math: Balance the Triangle*
- Recognize situations in real life that require multiplication, such as repeated addition, arrays, area, and equal groupings.
    - *What Comes Next? Stacking Boxes*

Unit 2: Multi-Digit Multiplication
4th Grade Math

35 Class Meetings

Written September 2024

- Distinguish between multiplication and other operations (e.g., addition, subtraction, division) when interpreting word problems.
    - *Math in Our World: Planning a Garden*
- Practice reading word problems carefully to identify important details, such as quantities, units, and relationships between numbers.
    - *Guess My Rule: Rectangles*
- Disregard irrelevant information in problems and focus on what is necessary for solving the problem.
    - *Math in Our World: Gaming Map*
- Translate word problems into multiplication equations and expressions, representing them using variables and numbers.
    - *Same & Different: Broken Rectangles*
- Explain their equation setup, connecting the components of the word problem to the multiplication equation.
    - *Would You Rather? Victory Pizza*
- Apply different strategies (e.g., standard algorithm, area models, distributive property) to solve multiplication word problems.
    - *Math in Our World: Exercise by the Numbers*
- Solve word problems that require more than one step, combining multiplication with other operations such as addition, or subtraction.
    - *Would You Rather? Raffle Logic*

Instructional Strategies/Differentiated Instruction

- Whole group instruction
- Paragraph frames and sentence starters
- Teacher modeling
- Think-write-pair-share and small-group discussions
- Graphic organizers
- Accountable talk
- Homework
- Word walls with visuals
- Small group instruction
- Visual exemplars with teacher and student critiques
- Text and video chunking
- Spiraling back to guiding questions

EL Differentiation Strategies

- Word Banks and Word Walls with visuals
- TWPS (Think, write, pair, share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit teacher modeling
- Key vocabulary
- Graphic organizers
- Strategic Grouping
- Non-verbal assessments

Unit 2: Multi-Digit Multiplication
4th Grade Math

35 Class Meetings

Written September 2024

Assessments

FORMATIVE ASSESSMENTS:

- Do Now
- Academic Discourse
- Exit Slips
- Accountable Talk Discussions
- Completed notes
- Homework
- Performance Task -- "Lemonade Stand" Performance Task
  - Teacher's rubric/scoring guide

SUMMATIVE ASSESSMENTS:

- Quiz: Multiplicative Comparisons, Multi-digit by Single-digit Multiplication, Multi-digit by Multi-digit Multiplication (EU1, EU2, and EU3)
- IAB
- Unit Task: "Lemonade Stand" Performance Task (EU1, EU2 and EU3)

Unit Task

Unit Task Name: "Lemonade Stand" Performance Task

- **Description:** Each student is responsible for planning a lemonade stand. They must calculate how much to spend on ingredients, how much to charge, and how much profit they will make based on sales. Prices of ingredients will be provided along with various amounts of costumers with which the student must plan for.

Evaluation: Teacher's Scoring Guide

Unit Resources

- Google Classroom
- Pear Assessment
- Math In Focus
- Math Antics
- State Common Core Standards Transition Tasks
- Match Fishtank
- Worksheets
- Individual White boards
- Interactive notebook
- Laptops
- SBAC Prep Online