Unit 2: Domain: Operations and Algebraic Thinking

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Marking Period 2**
Length: **10-11 Weeks**
Status: **Published**

Unit Overview

In this unit, students will multiply and divide within 100. They will represent and solve problems using multiplication and division. An understanding of the properties of multiplication and the relationship between multiplication and division will enhance their knowledge within this topic. Finally they will solve problems involving the four operations, and identify and explain patterns in arithmetic.

Standards

MA.3.OA.A.1	Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.
MA.3.OA.A.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.
MA.3.OA.A.3	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
MA.3.OA.A.4	Determine the unknown whole number in a multiplication or division equation relating three whole numbers.
MA.3.OA.B.5	Apply properties of operations as strategies to multiply and divide.
MA.3.OA.B.6	Understand division as an unknown-factor problem.
MA.3.OA.C.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 one-digit numbers.
MA.3.OA.D.8	Solve two-step word problems using the four operations. 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.
MA.3.OA.D.9	Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.
MA.3.NBT.A.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.

Essential Questions

- How are multiplication and division related?

- How can we use models to represent mathematical relationships?
- How do mathematical ideas interconnect and build on one another?
- How do multiplication and division help me solve problems?
- How do operations affect numbers?
- What makes a computational strategy both effective and efficient?

Application of Knowledge and Skills...

Students will know that...

- any number, expression, or equation can be represented in an infinite number of ways that have the same value.
- equivalent numbers can be used to simplify calculations.
- math can be used to describe how numbers or objects repeat in predictable ways.
- math can be used to describe how one set of numbers is related to another set of numbers.
- mathematics content and practices can be applied to solve problems.
- properties are relationships or rules that are always true about a given set of numbers.
- the operations of addition, subtraction, multiplication, and division are related to each other.
- there is more than one way to solve a problem for each operation.
- variables, expressions, and equations are ways to represent information in math.

Students will be skilled at...

- relating multiplication to division.
- simplifying multiplication by breaking apart large arrays into smaller arrays (Distributive Property)
- solving division facts with divisors of 2 - 9.
- use models and multiplication tables to solve division problems.
- use multiplication and division facts to solve problems.
- using basic multiplication facts and number patterns to multiply by multiples of 10.
- using known facts and doubles to find products.
- using models to solve division problems
- using objects, pictures, and multiplication to solve problems.
- using patterns and fact families to divide with 0 and 1.
- using patterns, basic facts and properties to multiply.
- using the Associative Property of Multiplication to multiply 3 numbers.
- using the Commutative Property of Multiplication.
- working with multiplication and division equations.

- writing and solving number stories involving division.
- writing math stories for given multiplication facts.
- writing multiplication number sentences for given equal group situations
- writing multiplication sentences for arrays and using arrays to find products.

Assessments

- Basic Facts Timed Tests
- Benchmark Tests
- End of Year Test-administered after completing program
- Placement Test-administered prior to delivering program
- Task Cards
- Topic Math Projects
- Topic Quick Checks
- Topic Tests

Activities

Problem of the Day-Present a daily problem that serves as a review from the previous day's lesson.

Vocabulary - Have students create a chart for each new vocabulary word that includes the word's meaning and an example or use vocabulary cards as flash card game

Station activities- Each section has center activities to reinforce skill (leveled)

- Clip and Cover- Students answer questions and try to cover four spaces in a row on a gameboard to win.
- Display the Digits- Students answer the problem and display the tile that represents the answer.
- Quick Questions- Toss number cubes and answer questions.
- Team Work- Students in turn explain the steps in a multi-step process.
- Think Together- Students choose and discuss answers to problems.
- Tic Tac Toe- Students use algebra to compute solutions to problems.
- Toss and Talk- Students toss number cubes and explain how to solve resulting problems.

STEM - Certain sections have Going Digital integrating technology and the use of calculators such as:

- Factoid Activities within Topic Opening Math Projects
- Meanings of Multiplication, p 119
- Using Known Facts, p 161

Interactive Learning - Problem-Based Interactive learning activities at the beginning of each topic

Topic Opener Projects - There is a math project for each topic (Topic 4-8). See Cross-Disciplinary instruction for projects and page numbers.

Practice work - Communicator practice can be done using Independent work and problem- solving practice problems in each section.

Ticket to Leave - Quick Checks on each sections

Activities to Differentiate Instruction

General strategies for modification of this curriculum for students with special needs, ELL, and gifted learners:

- **General strategies:**
  - preferential seating
  - manipulatives
  - modified workbook pages
  - practice or enrich homework pages
- **Center activities** - There are leveled center activities for each section. There is a separate activity for "Intervention", and then "On-Level" and "Advanced" are in spiral book.
- **Leveled practice pages** - There are three leveled (Reteaching, Practice, and Enrichment) sheets that can be used for practice or homework.
- **Math Concept Readers:** These readers allow the student to read the story at different levels- above level, on level, and below level. (also available on line with audio) Complete the Think and Respond and Write Math questions at the conclusion of each book.
- **Assessment**- Using Quick Check Review can determine differentiated instruction levels using sample answers and using the rubric at the Close/ Assess and Differentiate section in the teacher edition.

Content specific modification for students with special needs, ELL, and gifted learners:

- **Topic 4**
  - **Below level students:**
    - Drawing a picture to represent situations will help students identify and extend a pattern.
      - Ask students to draw nests with each containing an equal number of eggs. Have students make a table with rows labeled Number of Nests and Number of Eggs. Ask students to use their drawings to complete the table and identify the pattern.
      - Ask students to draw bracelets with each containing an equal number of beads.

Have them make a table with rows labeled Number of Bracelets and Number of Beads. Then have students use their drawings to complete the table and identify the pattern.

- **Students with special needs:**
  - Special-needs students will benefit from using concrete objects to form arrays. They can then use each physical array to write and solve multiplication sentences.
    - Display an empty egg carton to students. Have them count the rows and the columns. Ask students to write a multiplication sentence to find the total number of openings.
    - Arrange students in rows and columns to form an array. Then have classmates write the multiplication sentence they have modeled.

- **ELL**
  - Repeated oral language practice with the terms used in traditional multiplication algorithms will help English learners remember the structure of such problems.
    - Read aloud the following story problem: I have 4 dogs. They like to play with bones. I bought 3 bones for each dog. How many bones did I buy? Ask volunteers to go to the board and write both an addition sentence and a multiplication sentence that represent the problem. Have other students identify the addends, sum, factors, and product in the problems.

- **Advanced/Gifted:**
  - Challenge students to find all of the possible different arrays for a given product. Different arrays are arrays that have different numbers of rows.
    - Have students draw all of the possible different arrays that each contain 12 objects. How many different arrays for 12 are possible? (6)
    - Have students write a number sentence for each of the six different arrays. Discuss how these number sentences all have the same product, 12.

- **Topic 5**
  - **Below level students:**
    - Using models and drawing pictures will help below-level students identify and extend patterns.
      - On a sheet of paper, have students draw five large circles and then place 2 counters in each circle. Ask students to make a table, labeling the columns Number of Groups and Total Number of Counters. Have students use their model to complete the table.
      - What pattern do you see? (There are 2 more counters for each new group.) How can you use the pattern to find the number of counters in 8 groups? (There are 10 counters in 5 groups. Skip count by 2 three more times: 12, 14, 16; 8x2=16).
      - Repeat with 0, 1, and 5 counters in each group.
  - **Students with special needs:**
    - Students with special needs will benefit from using concrete models to form arrays. They can then use physical arrays to write and solve multiplication sentences.
      - Ask two volunteers to stand in front of the class. How many fingers do these students have? (20) Have students use counters to model the arrays 2 x 10 and 4 x 5
      - Then ask a volunteer to write the corresponding multiplication sentences on the board. (2x10=20, 4x5=20).

  - **ELL**
    - Repeated oral language practice with the terms used in multiplication will help English

learners identify and use patterns and models to find products.
    - Ask a volunteer to stand in front of the class. How many feet does this students have? (2) Write 1x2=2 on the board. Have additional volunteers come to the front of the class. Ask students to skip count to find the total number of feet, and write multiplication sentences involving multiples of 2. On the board, have students complete a table of the 2s facts. Ask students to describe any pattern they see. Students should include the words factor, product, and pattern in their descriptions.

- **Advanced/Gifted:**
    - Challenge students to use reasoning to identify a missing factor.
        - have a students place 30 counters in a row.
        - Invite a second students to arrange the counters in 5 equal rows. Have classmates write a multiplication sentence that illustrates the array. (5x6=30)
        - Ask another student to arrange the counters in 3 equal rows. Have students write a multiplication sentence that illustrates this array (3x10=30).

- **Topic 6**
    - **Below level students:**
        - Making a list of the steps to follow when breaking apart a multiplication fact into simpler facts will reinforce below-level students' understanding of the process.
            - Display 24 counters arranged in 8 rows of 3 counters. Ask students how to split the counters into two equal groups. (Two groups with 4 rows of 3 counters in each) Have students write a multiplication sentence that describes each group. (4x3=12). Then have them add the products (12 +12 =24) What is 8x3? (24)
            - Have students make a list of the steps they would follow to find 8x6 by breaking apart the fact into simpler facts.
    - **Students with special needs:**
        - Providing special needs students with visual models of a multiplication fact will help them recognize how the fact can be broken into already known facts.
            - Display 3 rows of 8 counters to students. Have them separate the display into 2 rows of 8 and 1 row of 8. Ask students to name the multiplication fact represented by each group. After they add the products, have them name the product of 3x8
            - Have a group fo 24 students form 4 equal rows. Have the students count off to find their total. Then separate them into two groups with 2 equal rows in each group. Again have the students count off to find the total.

    - **ELL**
        - Repeated oral language practice with the terms that are used to indicate quantities, such as double and pair, will help English learners break multiplication facts into simpler or already known facts.
            - Write the homophones pair and pear on the board and discuss their meanings. Explain to students that a pair of items is a group of two. Ask them to draw pictures of things they have a pair of, such as shoes or mittens.
            - Write the word double on the board. Explain that the term means "twice as many". Write 6x2 on the board. Ask a student to name the product. Explain that 12 is the double of 6. Have students name the double of other numbers.

    - **Advanced/Gifted:**
        - Challenge students to use reasoning to identify various ways of breaking apart a fact into simpler facts.

        - Write 6x8 on the board. Challenge students to list different ways the fact can be broken into simpler facts. (3x8) + (3x8), (1x8) + (5x8), (6x4) + (6x4), (6x5)+(6x3)
        - Write two simpler facts on the board and have students identify the single fact that they represent, such as (2x5)+(5x5)=(7x5)

- **Topic 7**
    - **Below level students:**
        - Students experiencing difficulty in understanding the meaning of division will benefit from numerous opportunities designed to reinforce understand of division as sharing.
        - Provide students with opportunities using tactile objects to reinforce dividing a whole number into equal groups. As you demonstrate, use terminology such as divide, division, and equal groups.
    - **Students with special needs:**
        - Repeated use of counters will help special needs student grasp the concept of division as repeated subtraction. Write a division sentence on the chalkboard such as 12÷2=? Have students model the division by taking away 2 counters at a time. Then students count the groups of 2 to find the answer.
        - Write the matching subtraction sentence on the chalkboard as each group of counters is subtracted.
        - To accommodate students with visual impairment, implement verbal repetition of multiplication and division facts throughout the lessons. Students may benefit from working with a partner or small groups for activities.

    - **ELL**
        - Repeated oral language practice with the terms used in division will help English learners understand division concepts.
            - Write a division problem on the board such as 10÷5. Have students draw a picture to illustrate the division. Then have the describe the picture and say the division problem aloud: Ten divided by 5 is equal to 2.

    - **Advanced/Gifted:**
        - Students who quickly master the concept of division can practice writing division stories about classroom activities and sharing them with partners to solve.
        - Provide a shoebox and index cards for students to write their division stories. Students can put their stories in the shoebox for others to solve.

- **Topic 8**
    - **Below level students:**
        - Students experiencing difficult in writing fact families will benefit from numerous opportunities designed to reinforce understanding of how division and multiplication are related.
            - Write the numbers 3, 4, and 12 on the chalkboard and ask a volunteer to write a multiplication sentence using those numbers. Then have another student write a different multiplication sentence using the same numbers.
            - Repeat the activity, asking students to write two division sentences using the numbers. How are these multiplication and division facts alike? (They all use the same numbers)
    - **Students with special needs:**
        - Repeated use of counters will help special needs students grasp the concept of relating division facts to multiplication facts.
            - Write this division fact on the board: 14÷7=2. Have students model equal

sharing by using counters.
        - Next, write 7x2 =14 on the chalkboard. Have students model the multiplication sentence using an array. Relate the two number sentences by drawing arrows to connect the same numbers in each.

- **ELL**
    - Repeated oral language practice with the terms used in division will help English learners understand division concepts.
        - Write the words dividend, divisor, and quotient on the chalkboard. Read each word together. Then have students label the division sentence 10÷2=5 with the correct terms.

- **Advanced/Gifted:**
    - Students who quickly master division facts can learn how to use this knowledge to complete these activities:
        - Write a fact family on the chalkboard with one number missing. Ask students to find the missing number in the fact family.
        - Encourage students to write fact families using 8 or 9 as a factor.

Integrated/Cross-Disciplinary Instruction

Reading and Writing: The Worldscapes Readers present math problems to be solved within the context of nonfiction text. Think and Respond and Write Math questions can be found at the conclusion of the books.

Topic 4: Science: Below Zero- Use multiplication to solve problems about armadillos. Compare responses.

Topic 5: Science: Keeping Count- Groups create posters using data. Each poster will represent the times tables for specific facts. The posters can be further used to write multiplication problems.

Topic 6: Social Studies: Below Zero- Students practice their multiplication skills using data concerning trains and cars. They will determine total numbers of cars and create their own multiplication sentences containing trains and cars.

Topic 7: Science: Surviving the Odds- Students will examine data concerning the Apollo missions to the moon and write division problems related to the total number of astronauts, the number on each mission, and the number of missions. They will write division sentences for their problems.

Topic 8: Art: Rainforest Math- Students will use square tiles to create mosaic pattern designs. They will then transfer their designs to rid paper. They will use these arrays to write multiplication and division

sentences.

Resources

Topics Categories in book form:

Topic 4: Meanings of Multiplication

Topic 5: Multiplication Facts: Use Patterns

Topic 6: Multiplication Facts: Use Known Facts

Topic 7: Meanings of Division

Topic 8: Division Facts

Master Enrichment pages

Master Reteaching pages

Master Practice pages

Student Edition workbook

On line Resources available at www.pearsonrealize.com

- Teacher Edition (TE) Textbook
- Student Edition (SE) Textbook
- Tests on line
- Concepts videos
- Math Tools

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.