Unit 2: Domain: Numbers and Operations in Base Ten

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Marking Period 2**
Length: **13-14 Weeks**
Status: **Published**

Unit Overview

During this unit, students will generalize place value understanding for multi-digit whole numbers and use place value understanding and properties of operations to perform multi-digit arithmetic. Students will develop an understanding with multi-digit multiplication and develop an understanding of dividing to find quotients involving multi-digit dividends. Students will develop an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers.

Standards

MA.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.
MA.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.
MA.4.NBT.A.1	Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.
MA.4.NBT.A.2	Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
MA.4.NBT.A.3	Use place value understanding to round multi-digit whole numbers to any place.
MA.4.NBT.B.4	Fluently add and subtract multi-digit whole numbers using the standard algorithm.
MA.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.
MA.4.NBT.B.6	Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Essential Questions

- How are addition and subtraction of multi-digit numbers related to single-digit addition and subtraction facts and base-ten and place value concepts?

- How are addition and subtraction of multi-digit numbers related to single-digit addition and subtraction facts and base-ten and place value concepts?
- How can using patterns and basic division facts help you find the inverse relationship to recall quotients?
- How does the position of a digit determine its value?
- How is division related to repeated subtraction, and how is it the inverse of multiplication?

Application of Knowledge and Skills...

Students will know that...

- Any number, measure, numerical expression, algebraic expression, or equation can be represented in an infinite number of ways that have the same value
- Mathematical content and practices can be applied to solve problems
- Numbers can be approximated by numbers that are close. Numerical calculations can be approximated by replacing numbers with other numbers that are close and easy to compute with mentally. Some measurements can be approximated using known referents as the unit in the measurement process
- Numbers, expressions, measures, and objects can be compared and related to other numbers, expressions, measures, and objects in different ways
- Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways. For some relationships, mathematical expressions and equations can be used to describe how members of one set are related to members of a second set
- The base-ten numeration system is a scheme for recording numbers using digits 0-9, groups of ten, and place value
- There are multiple interpretations of addition, subtraction, multiplication, and division of rational numbers, and each operation is related to other operations
- There is more than one algorithm for each of the operations with rational numbers. Some strategies for basic facts and most algorithms for operations with rational numbers, both mental math and paper and pencil, use equivalence to transform calculations into simpler ones

Students will be skilled at...

- Adding numbers to hundreds and thousands with and without regrouping
- Applying a variety of methods to add and subtract whole numbers mentally
- Breaking apart numbers and use arrays to multiply
- Comparing whole numbers through hundred thousands
- Discovering and using patterns to multiply by multiples of 10
- Dividing whole numbers by 1-digit divisors resulting in quotients with remainders
- Estimating quotients of multi-digit division problems using multiplication facts and place-value concepts
- Learning how digits within a multi-digit whole number relate to each other by their place value

- Multiplying 2-, 3-, and 4 digit numbers by 1-digit numbers using the standard algorithm and estimating to check for reasonableness
- Multiplying 2-digit numbers by 1-digit numbers using paper-and-pencil methods
- Multiplying 2-digit numbers by 1-digit numbers using the standard algorithm and estimating to check for reasonableness
- Reading and writing 3-digit and 4-digit numbers
- Recording division as repeated subtraction
- Recording multiplication using an expanded algorithm
- Rounding to estimate solutions to multiplication problems involving two 2-digit numbers
- Rounding to estimate solutions to multiplication problems involving two 2-digit numbers
- Rounding whole numbers to estimated sums and differences
- Subtracting numbers to thousands with and without regrouping
- Subtracting numbers with zeros to thousands
- Using an expanded algorithm to multiply two-digit numbers by two-digit numbers to find the product
- Using an expanded algorithm to multiply two-digit numbers by two-digit numbers to find the product
- Using arrays to multiply 2-digit numbers by multiples of 10
- Using arrays to multiply by 10 and 100
- Using arrays to multiply two-digit numbers by two-digit numbers to find the product
- Using basic facts and patterns of zeros to solve division problems with 3-digit dividends and 1-digit divisors
- Using basic multiplication facts and number patterns to multiply by multiples of 10 and 100
- Using compatible numbers and rounding to estimate quotients
- Using compatible numbers and rounding to estimate solutions to multiplication problems involving two 2-digit numbers
- Using compensation to multiply numbers mentally
- Using grids and patterns to multiply 2-digit numbers and multiples of 10
- Using partial products to multiply 2-digit numbers by 2-digit numbers and finding the product
- Using place value to understand the algorithm of long division
- Using rounding to estimate solutions to multiplication problems
- Using the standard algorithm to divide 3-digit numbers by 1-digit numbers
- Using the standard algorithm to divide a two-digit number by a one-digit number
- Using the standard algorithm to multiply 3- and 4-digit numbers by 1-digit numbers
- Using words and models to represent multiplication and division problems accurately

Assessments

- Basic Facts Timed Tests
- Benchmark Tests
- End of Year Test (administered after completing program)
- Placement Test (administered prior to beginning 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) - please see Domain 1 unit for individual directions for each station activity

- **Display the Digits**
- **Toss and Talk**
- **Clip and Cover**
- **Think Together**
- **Teamwork**
- **Display the Digits**
- **Quick Questions**

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

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

Projects - There is a math project for each topic (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.

- Play SCOOT for certain sections or review for topic tests
- Task cards and use answer sheets for assessment

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 3**
  - **Below level students:**
    - Students experiencing difficulty comparing numbers will benefit from numerous opportunities designed to reinforce understanding of place-value concepts.
      - Have students record numbers in a place-value chart and then use the chart to give the value of each digit.
      - Ask students to create a model of a number with place-value blocks and then use the model to write the number in expanded form.
  - **Students with special needs:**
    - Review with special needs students the base-ten relationship between each place value.
    - Have students use place-value blocks to model the connection between each place value. Tell them to take a handful of unit cubes and determine how many tens rods they can exchange the cubes for. Repeat with tens rods and hundreds flats.
  - **ELL**
    - Having students orally translate the standard form of a number into word form will help them remember place values.
    - **Emerging:** Focus on one place-value period at a time. Emphasize how the names in the ones period (ones, tens, and hundreds) relate to the names in the other periods. When discussing periods other than the ones period, use numbers such as 592,000 and 839,000,000,with zeros in the other periods to emphasize the period you are examining.
    - **Expanding:** Write numbers in the place value chart and in word form, leaving out parts of the word form. Have students use the chart to help them complete the word form.
  - **Advanced/Gifted:**
    - Students who have mastered ordering numbers up to hundred thousands may enjoy playing a game involving millions.
      - Prepare a set of 26 to 30 index cards with a different number (thousand, ten thousand, hundred thousand, million) written on each card. Groups of students

mix up the cards and hand them out to each player in equal piles. Students turn over the first card. The student with the greatest card gets everyone else's card. The game ends when one student has all of the cards.

- **Topic 4**
  - **Below level students:**
    - Students may memorize the algorithms and think every problem should use the same algorithm when changing a problem to use mental math. Students must understand that they need to analyze the problem to decide which algorithm to use.
    - Provide students with numerous problems that require the use of each technique. Have students look for similarities in the problems that use the same algorithm. Write clues to help students decide how to categorize future problems.
  - **Students with special needs:**
    - Review with special needs students how to use the estimate to help check their answer to an addition or subtraction problem. If their answer is not near the estimate, they should check their work.
    - Be sure these students estimate first for every problem.
  - **ELL**
    - Repeated oral language practice of the terms that describe mental math will help English learners remember and understand the steps.
    - **Emerging:** Have students define the words commute, associate, break apart, and compensate. Then have them compare the definitions with the math terms Commutative Property, Associative Property, breaking apart, and compensation. Discuss how the words relate to the mathematical definitions.
    - **Expanding:** Have students write the following on index cards, one per card: breaking apart, compensation, counting on, Commutative Property, and Associative Property. Model a problem on the board. Have students hold up the appropriate card to describe each step.
    - **Bridging:** Have students practice completing mental math problems without writing any notes. Have them use proper terminology when describing how they solved the problem.
  - **Advanced/Gifted:**
    - Students who quickly grasp how to estimate sums and differences can investigate how to determine if their estimated sum or difference is an overestimate or an underestimate.
    - Discuss what the words overestimate and underestimate mean. Have students first brainstorm their meaning before giving them a formal definition.

- **Topic 5**
  - **Below level students:**
    - If students are still struggling with their basic multiplication facts, give them plenty of opportunities to practice them using a variety of means including flashcards, games, place-value blocks, and drawings.
  - **Students with special needs:**
    - Students with special needs benefit from concrete models and use of manipulatives. Although the compensation method describe in Lesson 4 is mental math strategy, allow special-needs students to model problems with place-value blocks. The goal is for them to understand and remember the process.
    - Repeat and reinforce the key vocabulary in this topic as well as the general vocabulary of multiplication, including words such as factor and product.

- When modeling how to multiply multiples of 10 and 100, write the numbers representing the basic facts in one color and the zeros in another color.

- **ELL**
  - The meaning of the names of the two multiplication strategies presented in this topic can help students remember what to do to apply each one. Reinforce the meanings of these terms throughout the topic.
  - **Emerging:** Discuss the terms break apart and compensation. Break apart a figure made from interlocking blocks or snap cubes. Ask students for examples of other items that can be broken apart. Explain examples of other items that can be broken apart. Explain that compensation also means to make up for something or to give back. Ask students to describe what they are making up for when solving by compensation.
  - **Expanding:** Write each of the following terms on a separate index card: array, multiple, break apart, round partial products, and compensate. Have students write problems, number sentences, and/or models to illustrate each term.
  - **Bridging:** Write a word problem on the board. Have a student volunteer describe how to solve describe how to solve the problem using either strategy: break apart or compensation. Repeat with additional problems.

- **Advanced/Gifted:**
  - Introduce advanced/gifted students to another mental-math strategy that involves doubling one factor and halving the other. For example, to find 5x14, think 10x7-70. That is, double the 5 and halve the 14. Have students practice this strategy on other problems and use arrays to show why it works.
  - Have students explore products that yield the same estimate. For example, have students use rounding to estimate 6x37, 6x38, and 6x43. Then ask them to generate other multiplication problems that have the same estimated product as the one for 6x37.

- **Topic 6**
  - **Below level students:**
    - If students are struggling with basic multiplication facts, give them opportunities for practice using flashcards, games, manipulatives, and drawings.
    - When multiply a 2, 3, or 4-digit number, encourage students to first estimate the product, then compare their actual answer to their estimate. Estimating before computing the actual answer will give students a sense of the size of the product which can help them recognize whether or not they made a computational error.
  - **Students with special needs:**
    - Review with special-needs students the relationship between repeated addition and multiplying to join equal groups.
    - Start with tactile objects, such as boxes of crayons, sets of paper clips, or other plentiful classroom supplies that can be organized into groups. Then, model for students the relationship between the tactile representation and the operation diagrams for multiplication.
    - Repeat this daily, remembering to use consistent math language, using terms such as equal groups, times, and multiply.

  - **ELL**
    - Repeated oral-language practice of the terms that are used in the expanded and traditional multiplication algorithms will help English learners remember and understand the steps.
    - **Emerging:** Emphasize the actions of the expanded algorithm: break apart into tens and ones, multiply to find the partial products, and add the partial products to find the

product.
    - **Expanding:** Write the words break apart and product on the board. Read each word together with students and help students come up with real world examples for each. Relate these examples to the words' mathematical definitions.
    - **Bridging:** Write the words factor, partial products, and product on the board. Model the expanded algorithm for multiplication, having students identify where each of these terms is applied.

- **Advanced/Gifted:**
    - Have students explore problems such as 3 x 507, 9 x 606, and 5 x 201. Ask them to describe a general pattern for these problems and to explain how they can find the products mentally.
    - Challenge students to determine the smallest possible product when multiplying a 3-digit number by a nonzero 1-digit number. Then ask them to find the largest possible product.

- **Topic 7**
    - **Below level students:**
        - Fluency with basic multiplication facts forms part of the basis for multiplying with multi-digit numbers and estimating products. As needed, provide a variety of opportunities for students to develop mastery of the basic facts through the use of manipulatives, drawings, flashcards, and number games.
        - Understanding the concept and rules of rounding is also part of the basis for one way of estimating products. Provide students who are performing below level with extensive practice rounding numbers.
    - **Students with special needs:**
        - To help students write the correct number of zeros in the product when multiplying multiples of 10, have them write the zeros in the factors and the product the same color.
        - Students may find it helpful to refer to a number line to choose the best rounded number or compatible number to use for estimating a product. Label the number line with 25 and multiples of 10 to 100. Then have students locate an actual fact on the line and determine which labeled point on the number line it is closest to. Remind them that a number that is halfway between two multiples of 10 rounds up.

    - **ELL**
        - Using informal language to paraphrase math terms will help English learners understand and remember the concepts being taught.
        - **Emerging:** Write these terms on the board along with an informal language equivalent: estimate - find about how much, round - use the closer ten, compatible - work together easily, Discuss the math terms with students.
        - **Expanding:** Demonstrate using informal language to paraphrase statements about estimating products, such as Estimate the product of 28x53 paraphrased as Find about how much the product of 28x53 is, Make statements using the math terms estimate, round, and compatible, and have students paraphrase them.
        - **Bridging:** Have students work in pairs to estimate products. Have one student explain his or her work to the other using math terminology and paraphrasing.

    - **Advanced/Gifted:**
        - Challenge students to multiply three factors that are multiples of 10 and 100, such as 30 x 400 x 20. Have them explain any patterns they notice with the zeros.
        - If students are particularly adept at estimating, encourage them to look at the rounded or compatible factors used and try to determine if the estimate is greater than or less than

the actual product.

- **Topic 8**
  - **Below level students:**
    - Allow students who are performing below level to experiment with the different methods for multiplication until they find the one with which they are most proficient.
    - Allow students to use number lines or place-value blocks to help them round when estimating. Encourage them to estimate before multiplying so as to get a sense of the magnitude of the product.
  - **Students with special needs:**
    - Multiplying with arrays is a powerful method for students with special needs as it is a concrete representation of the process of multiplication. Allow students to form arrays by drawing them on grid paper for as long as necessary. Connect this model to the standard algorithm, clearly explaining what each section of the model represents.
    - Encourage students to estimate answers before multiplying. This will give them a sense of the size of the actual answer. Allow students to draw arrays or use base-ten materials to estimate if necessary.
  - **ELL**
    - Provide students with numerous opportunities to talk through the steps of multiplying. Repeated oral language practice will help English learners remember the sequence of steps.
    - **Emerging:** Walk students through the process of multiplying with the standard algorithm. Write each step (such as multiplying ones) in a different color. Write the results of the step in the same color.
    - **Expanding:** Have student pairs explain the steps for using an array and the expanded algorithm to multiply two 2-digit numbers. Make sure they use the terms factor, product, and partial product.
    - **Bridging:** Have students make note cards that list each step for the standard algorithm. (Multiply the ones. Regroup the ones as tens, if necessary. Multiply the tens. Regroup the tens as hundreds, if necessary. Add the partial product.)
  - **Advanced/Gifted:**
    - Challenge students to find 24x30 mentally. As with the array model, they can break apart one factor into tens and ones: 30x24=(30x20)+(30x4)=600+120=720. Repeat with 20x18 and 40x21
    - Students can pick a range of numbers, such as 2,000 to 3,000, and then challenge one another to find two 2-digit numbers who product falls within that range.

- **Topic 9**
  - **Below level students:**
    - Below-level students may have difficulty comprehending the special quotients that relate to zero. Show these students that a calculator is capable of dividing zero. Show these students that a calculator is capable of dividing zero by any number, but is not capable of dividing any number by zero.
    - Provide students who are performing below level with extended practice by writing many division sentences that contain zero. Have students answer each problem with either zero or can't be done.
  - **Students with special needs:**
    - Review with students how division can be thought of as separating items into equal groups or as repeated subtraction. Point out that both models use the same idea. During repeated subtraction, each time a number is subtracted, one equal group is taken away.

- Use tactile objects, such as paper clips, to demonstrate multiple division facts. Use both the equal group model and the repeated-subtraction model for each fact.

- **ELL**
  - Having students understand that multiplication and division have an inverse relationship will help them use related multiplication sentences to answer division problems.
  - **Emerging:** Write on the board Inverse Operations. Discuss the concept of inverse operations by relating it to everyday life, such as the act of putting on a sweater and then taking it off, or checking out a book from the library and then returning it. Relate the first action to addition and the second action to subtraction.
  - **Expanding:** Discuss the meanings of related number sentences. Write 5x3=15 and 15÷5=3 on the board. Point out that the multiplication sentence joins 5 equal groups of 3 items for a total of 15 items. Inversely, the division sentence takes the total of 15 items and breaks them into 5 equal groups with 3 items in each group.

- **Advanced/Gifted:**
  - Students who gain quick understanding of relating multiplication and division should practice the concept by changing multiplication sentences into division sentences and vice versa.
  - Provide students with different multiplication and division sentences. Have them convert the number sentence by only erasing the equal sign and the operation sign. Students should create a new correct number sentence using the opposite operation.

- **Topic 10**
  - **Below level students:**
    - Comprehending the meaning of the numbers in the division algorithm is important for students to be able to divide.
    - Provide students who are performing below level with practice using manipulatives, such as counters.
  - **Students with special needs:**
    - Reviewing the concept of division with 1-digit divisors with tactile objects or using written language will help hearing impaired students grasp the concept of division by 1-digit divisors.
    - Begin by displaying the problem 25÷3 on the board. Model how to solve the problem using two-color counters and repeated subtraction. Have students record the associated subtraction sentences and the quotient.

  - **ELL**
    - Repeated oral language practice of the terms that are used in the division algorithms will help English learners remember and understand the steps.
    - **Emerging:** Display the problem 34÷8=4 R2 on the board. Have students copy the problem and label its part with the terms quotient, dividend, divisor, and remainder. Have pairs of students compare their labeling, talking through any discrepancies.
    - **Expanding:** Display a division pattern and have students point out the basic fact, divisor, dividend, and quotient for each number sentence. Have students create sentences to describe the division algorithm, such as: There are 21 tens in the dividend. When this is divided by 7, there are 3 tens in the quotient.
    - **Bridging:** Assign each group a divisor from 2 to 9. Have groups use counters to model and record division exercises using their divisor and the dividends 12 through 20. Have students discuss each

  - **Advanced/Gifted:**

- Students who gain quick understanding of dividing with remainders can practice writing stories that include this kind of division.
- Discuss with students types of problems when the remainder should be ignored and types of problems when the remainder is the answer.

Integrated/Cross-Disciplinary Instruction

Reading and Writing: The Math Concept Readers allow the student to read the story at different levels- above level, on level, and below level. Complete the Think and Respond and Write Math questions at the conclusion of each book.

Topic 3: Social Studies: Sacramento- ordering three other cities in California from largest to smallest - pg 63E

Topic 4: Social Studies: U.S. Cities - researching and mapping the distances if Washington, D.C, Los Angeles, Mexico City, and Seattle - pg 87E

Topic 5: Social Studies: National Parks - researching the daily entrance fee for three national parks and calculating the total cost of a 7-day stay at each park - pg 113E

Topic 6: Social Studies: Skyscrapers - designing their own skyline of skyscrapers - pg 135E

Topic 7: Science: Water - research how much water is used for various household activities - pg 163E

Topic 8: Social Studies: Pike's Peak Cog Railway- determining how many seats and cost for adults in a train car - pg 183E

Topic 9: Art: Chumash: drawing designs on paper from the Chumash - pg 203E

Topic 10: Science: Birds - conducting a survey of your favorite local animal - 225E

Resources

Topics Categories in book form:

Topic 3: Place Value

Topic 4: Addition and Subtraction of Whole Numbers

Topic 5: Number Sense: Multiplying by 1-Digit Numbers

Topic 6: Developing Fluency: Multiplying by 1-Digit Numbers

Topic 7: Number Sense: Multiplying by 2-Digit Numbers

Topic 8: Developing Fluency: Multiplying by 2-Digit Numbers

Topic 9: Number Sense: Dividing by 1-Digit Divisors

Topic 10: Developing Fluency: Dividing by 1-Digit Divisors

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.