



San Diego Unified School District

Instructional Module to Enhance the Teaching of

HARCOURT

Math

California Edition

Grade 5

Module 2 - Modified

Place Value and Addition and Subtraction of
Whole Numbers and Decimals

— WORK IN PROGRESS —

MATHEMATICS CURRICULUM MAP – GRADE 5

MODULE 2 – Place Value and Addition and Subtraction of Whole Numbers and Decimals Modules represent individual units of study that lead to essential learnings

THREADS THROUGHOUT THE YEAR:

The threads represent ongoing learning opportunities in which students should be actively engaged throughout all units of inquiry during the entire school year. These items should not be isolated to any one particular unit of inquiry.
Students will:

- Develop understanding of numbers and the number system and use their understanding to solve problems and recognize reasonable results.
- Develop understanding of and fluency in basic computation and procedural skills.
- Use mathematical reasoning to solve problems.
- Communicate mathematical thinking by using words, numbers, symbols, graphs and charts and translate between the different representations
- Use equations and variables to express generalizations of patterns and relationships.
- Develop logical thinking to analyze evidence and build arguments to support or refute a hypothesis.
- Make connections among mathematical ideas and between other disciplines.
- Develop and use strategies, skills, and concepts to solve problems.
- Use appropriate tools, including technology, as vehicles to learn mathematical concepts.

These are essential learnings that represent bigger ideas/concepts:

- Students understand that the base 10 pattern of place value with whole numbers extends into decimals.
- Students use exponential notation of powers of ten to represent large numbers.
- Students determine the value of each digit in a number by its position within the number in relationship to the decimal point.
- Students use place value to order and compare decimals and use rounding strategies to break apart or build up whole numbers and decimals into numbers that are easier to work with.
- Students use rounded numbers to estimate calculations mentally and determine reasonableness of answers.

These are essential questions that learners ask themselves in order to achieve the essential learnings:

- How do I use patterns and pictorial representations to model the place value of digits from ten thousandths up to a million?
- How do I use *patterns of multiples of ten to compute with large numbers?
- How do I use exponents to represent repeated multiplication by ten?
- How do I recognize and represent the value of a digit to the billions place?
- How do I translate between the standard, expanded, and word form of a number?
- *How do I use my understanding of place value and the number system to compare and order large numbers and decimals?
- *How do I translate between the different representations (base-ten materials, fractions, decimals and words) to show and explain the relationship between tenths, hundredths and thousandths?
- How do I compare and order decimal numbers larger than 1 and write number sentences with comparison symbols to represent their relationships?
- *How do I use rounding strategies with decimals and whole numbers to estimate and to determine the reasonableness, but not the accuracy, of answers?
- How do I determine when I need an exact answer or when an estimate is more appropriate?
- *How do I use my understanding of adding and subtracting whole numbers to add and subtract decimals efficiently?

- Presented in previous grades

Resources: Van de Walle: Chapter 17 (pp. 280-288); Mathematics Source Book: Decimals (pp. 71-78)

Module Calendar

<p><u>Day 1:</u> <u>Chapters 1 and 2:</u> <u>Add and Subtract</u> <u>Whole Numbers</u> <u>and Decimals</u></p> <p>Lesson 1.1</p> <p>Understand and Represent Millions</p>	<p><u>Day 2:</u></p> <p>Lesson 1.1</p> <p>Understand and Represent Millions</p>	<p><u>Day 3:</u></p> <p>Lesson 1.2</p> <p>Millions and Billions</p>	<p><u>Day 4:</u></p> <p>Lesson 1.2</p> <p>Millions and Billions</p>	<p><u>Day 5:</u></p> <p>Lessons 1.3 and 1.4</p> <p>Compare and Order Whole Numbers</p>
<p><u>Day 6:</u></p> <p>Lesson 2.1</p> <p>Tenths and Hundredths</p>	<p><u>Day 7:</u></p> <p>Lesson 2.2</p> <p>Thousandths and Ten-Thousandths</p>	<p><u>Day 8:</u></p> <p>Lesson 2.3</p> <p>Equivalent Decimals</p>	<p><u>Day 9:</u></p> <p>Lesson 2.4</p> <p>Compare and Order Decimals</p>	<p><u>Day 10:</u> <u>Chapters 3 and 4:</u> <u>Add and Subtract</u> <u>Whole Numbers</u> <u>and Decimals</u></p> <p>Lesson 3.1 and 4.1</p> <p>Estimation Rounding Whole Numbers and Decimals</p>
<p><u>Day 11:</u></p> <p>Lesson 3.2 and 4.2</p> <p>Estimation: Sums and Differences of Whole Numbers and Decimals</p>	<p><u>Day 12:</u></p> <p>Lesson 4:5</p> <p>Problem Solving: Estimate or Find Exact Answer</p>	<p><u>Day 13:</u></p> <p>Lesson 3.4 and 4.3</p> <p>Computation: Add and Subtract Greater Numbers and Decimals</p>	<p><u>Day 14:</u></p> <p>Lesson 4:4</p> <p>Zeros in Subtraction</p>	<p><u>Day 15:</u></p> <p>Free Choice Lesson</p> <p>Performance Assessment: "Lunch and a Movie"</p>

DAY 1
UNIT 1: WHOLE NUMBERS AND DECIMALS
Chapter 1: Lesson 1.1, pp. 2-3

(Part 1 of 2-day lesson)

MATERIALS:	Transparency and 10 paper copies for each pair of TR3; tape; book: <i>How Much Is a Million?</i> by David Schwartz
LESSON FOCUS:	Hands on: Understand Millions
CALIFORNIA STANDARDS:	<p>Number Sense:</p> <p>1.0: Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers.</p> <p>1.1: Estimate, round and manipulate very large and very small numbers.</p> <p>Mathematical Reasoning is embedded.</p>
PURPOSE OF LESSON/ ESSENTIAL QUESTION:	<ul style="list-style-type: none"> • How do I use patterns and pictorial representations to model the place value of numbers to a million?
<p>LAUNCH:</p> <p><i>Student books not necessary.</i></p>	<p>“How Much is a Million?”</p> <p>Discuss concept of a million—students give examples of “groups of a million.”</p> <p>Ex: More than a million people live in San Diego.</p> <p>Read aloud: <i>How Much Is a Million?</i></p> <p>Use transparency of TR 3 and cut out the unit, tens strip, and hundred piece. Arrange them on the overhead starting on the right with the unit square. Display the same pattern on chart paper.</p> <ul style="list-style-type: none"> • Ask students to build the same pattern and privately make mathematical observations about the shape, area, and dimensions of the pattern, and then share two observations with a partner. • Discuss and chart observations with the whole class. “<i>What do you notice that changes or stays the same about the pattern?</i>” <p>Students will have opportunities to make more observations when they make and analyze a table and during the Summary. Below are some ideas that may surface:</p> <ul style="list-style-type: none"> – Area: 1, 10, 100. Each piece has ten of the piece before it. The next piece will have ten of the 100’s, which is 1000. If you go from right to left, each piece is ten times as big, and if you go left to right, each piece is one tenth of the piece before it. – Shape: Square, rectangle, square, so the next shape will be a rectangle. <p>Dimensions: 1x1, 1x10, 10 x 10, so the next will be 10 x100. If students don’t notice that the side is multiplied by 10 to form the rectangle and the top is multiplied by 10 to form a square, it may come up in the Summary.</p>

<p>EXPLORE:</p> <p><i>Focus on:</i></p> <ul style="list-style-type: none"> • “Doing Mathematics” • Communication • Representation. 	<p>Read: Explore problem, p. 2, to students: “There are at least one million different species of insects; including beetles, butterflies, ants and bees.”</p> <p>Partner Work:</p> <ul style="list-style-type: none"> • The Task: <i>If each small square on this 10 x 10 grid paper represents one species of insect, determine how many sheets it would take to represent a thousand species of insects (students use private think time and then explain to a partner how they decided).</i> • After partners determine the number of paper grids they will need, they tape them together and hang them on a wall. They will later use them to form the grid of 10,000 that would come after 1,000 in the pattern (shape, dimensions and area need to fit the pattern). • Partners or groups use the grid pattern and the table below to determine the shape, dimensions, and area of the next pieces in the pattern, including the one representing a million species of insects. Have students complete the following table. <table border="1" data-bbox="516 814 1440 1129"> <thead> <tr> <th>Sheets of Grid Paper</th> <th>Total Species of Insects (Area)</th> <th>Shape of Paper</th> <th>Dimensions of Paper</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>100</td> <td>square</td> <td>10 x 10</td> </tr> <tr> <td>10</td> <td>1000</td> <td></td> <td></td> </tr> <tr> <td>100</td> <td>10,000</td> <td></td> <td></td> </tr> <tr> <td>1000</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>square</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Sheets of Grid Paper	Total Species of Insects (Area)	Shape of Paper	Dimensions of Paper	1	100	square	10 x 10	10	1000			100	10,000			1000						square					
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1	100	square	10 x 10																										
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		square																											
<p>SUMMARIZE:</p> <p><i>Focus conversation around the Essential Question(s) for this lesson</i></p>	<p><i>How do I use patterns and pictorial representations to model the place value of digits to a million?</i></p> <ul style="list-style-type: none"> • Some possibilities when discussing the paper pattern: <ul style="list-style-type: none"> – Hang a thousand strip grid to the left of the hundred grid. – “Do we have enough thousand strips left to make the next piece? How do you know?” – Describe the piece after the 10,000 grid. “How much space will the 10,000 grid use?” – “Do we have room to hang the millions grid in this pattern on our wall? How could you find out?” • Discuss the patterns in the table that students noticed and ask them to make connections between patterns in the table and patterns in the grid model: <ul style="list-style-type: none"> – Shape and number of zeros should emerge if they didn’t earlier. Ask how the number of papers is related to the change in area. 																												

	<p>– <i>“What do you notice about the patterns in the first 2 columns?”</i> The number of zeros is two less than the number of sheets of grid paper, and the number of papers is multiplied by 100 to get the area. Both columns also increase by a factor of 100.</p> <p>– <i>“Is there a way to look at the number representing the area and tell whether the piece will be a rectangle or square?”</i> All the pieces with areas containing an even number of zeros are square.</p> <p>Post questions for students to think about during the unit.</p>
HOMEWORK/ PRACTICE:	Mixed Review and Test Prep., p. 3. Practice # 1 & 3

DAY 2
 UNIT 1: WHOLE NUMBERS AND DECIMALS
 Chapter 1: Lesson 1.1 pp. 2-3

(Part 2 of a 2-day lesson)

MATERIALS:	Pattern from Day 1, ones to 10,000 on the wall: Problem Solving Worksheet 1.1 (optional)																																
LESSON FOCUS:	Understand and represent the relative size of numbers to a million and represent them using exponents.																																
CALIFORNIA STANDARDS:	<p>Number Sense: 1.0: Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers. 1.1: Estimate, round and manipulate very large and very small numbers. Mathematical Reasoning is embedded.</p>																																
PURPOSE OF LESSON/ ESSENTIAL QUESTIONS:	<ul style="list-style-type: none"> • How do I use patterns and pictorial representations to model the place value of digits to a million? • How do I use patterns of multiples of ten to compute with large numbers and decimals? • How do I use exponents to represent repeated multiplication by ten? <p>Note: Exponents are explored in Module 7. Exploring the powers of ten in our base ten system is an opportunity to introduce and use exponents.</p>																																
<p>LAUNCH:</p> <p><i>Student books not necessary.</i></p>	<p>Homework: Students discuss solutions to #1, p. 3: "How many groups of 100 are in 1,000,000?"</p> <ul style="list-style-type: none"> • Record different solution paths and ask students to make connections between the grid pattern that is posted as well as the patterns they saw in the chart. • 100 times 10 x 10 x 10 x 10 is 1,000,000. • Introduce exponents as a short cut to represent the number of times you are multiplying the number by itself. A shorter way to write ten times itself four times is using exponents (10^4) • Refer to the base-ten pattern on the wall. The hundred piece is 10 x 10. • Move to 1,000. Have students break the dimensions of 100 x 10 into factors of 10 and write it using exponents (10^3). <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 15%;">Area of Grid</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;">1000</td> <td style="width: 15%;">100</td> <td style="width: 15%;">10</td> <td style="width: 15%;">1</td> </tr> <tr> <td>Shape</td> <td></td> <td></td> <td></td> <td>rectangle</td> <td>square</td> <td>rectangle</td> <td>square</td> </tr> <tr> <td>Dimensions</td> <td></td> <td></td> <td></td> <td>10 x 100</td> <td>10 x 10</td> <td>1 x 10</td> <td>1 x 1</td> </tr> <tr> <td>Factors of 10 and Exponents</td> <td></td> <td></td> <td></td> <td>10 x 10 x 10 = 10^3</td> <td>10 x 10 = 10^2</td> <td>1 x 10</td> <td></td> </tr> </table>	Area of Grid				1000	100	10	1	Shape				rectangle	square	rectangle	square	Dimensions				10 x 100	10 x 10	1 x 10	1 x 1	Factors of 10 and Exponents				10 x 10 x 10 = 10^3	10 x 10 = 10^2	1 x 10	
Area of Grid				1000	100	10	1																										
Shape				rectangle	square	rectangle	square																										
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<p>EXPLORE:</p> <p><i>Focus on:</i></p> <ul style="list-style-type: none"> • “Doing Mathematics” • Communication • Representation. 	<p>Partner/Group Work:</p> <ul style="list-style-type: none"> • Have students use the pattern to complete the next three columns in the table. <p>Partner Work:</p> <ul style="list-style-type: none"> • Practice, p. 3, #2. <ul style="list-style-type: none"> – Students record the path to their solution numerically. – Write an equivalent path using exponents. – Use tables and the base ten grid pattern as tools.
<p>SUMMARIZE:</p> <p><i>Focus conversation around the Essential Questions for this lesson</i></p>	<ul style="list-style-type: none"> • <i>How do I use patterns and pictorial representations to model the place value of digits to a million?</i> • <i>How do I use patterns of multiples of ten to compute with large numbers?</i> • <i>How do I use exponents to represent repeated multiplication by ten?</i> <ul style="list-style-type: none"> • Fill out the table and discuss patterns the students describe. <ul style="list-style-type: none"> – Call students’ attention to the pattern with the exponents going from the left to the right. (<i>The exponents are 6,5,4,3,2. Students will naturally suggest 10^1 and 10^0 for the ten’s place and one’s place.</i>) – Fill in the exponential representation for tens and ones. • Discuss solutions to #2 and help students record the numerical path that matches their thinking. Record the equations again using exponents for multiples of ten. <p>Display: “<i>Sammy wrote $10^3 = 30$. What was the error in his thinking about exponents?</i>”</p> <ul style="list-style-type: none"> • Students write an explanation before class discussion <p>LESSON QUIZ 1.1: T.E. p. 3: Choose one of the three problems.</p> <ul style="list-style-type: none"> • Represent the solution path using exponents.
<p>HOMEWORK/ PRACTICE:</p>	<ul style="list-style-type: none"> • Choose one problem from ASSESS: DISCUSS, WRITE. <p>Or</p> <p>Problem Solving worksheet 1.1, T.E. p.3. #4.</p> <ul style="list-style-type: none"> • Write solution paths using exponents.

DAY 3

UNIT 1: WHOLE NUMBERS AND DECIMALS

Chapter 1: Lesson 1.2, pp. 4-7

(Part 1 of 2 Day Lesson)

MATERIALS:	TR 5 place value charts for each student and a transparency; 10 index cards for each student;
LESSON FOCUS:	Millions and Billions
CALIFORNIA STANDARDS:	<p>Number Sense:</p> <p>1.0: Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers.</p> <p>1.1: Estimate, round and manipulate very large and very small numbers.</p> <p>Mathematical Reasoning is embedded.</p>
PURPOSE OF LESSON/ ESSENTIAL QUESTION(S):	<ul style="list-style-type: none"> • How do I recognize and represent the value of a digit to the billions place? • How do I translate between standard, expanded and word form of a number?
<p>LAUNCH:</p> <p><i>Student books not necessary.</i></p>	<p>Read aloud MOONWALK, p. 4.</p> <ul style="list-style-type: none"> • Students record the number from the situation into their place value chart, TR5, as it is read aloud: "726 million, 300 thousand." • Introduce the term period (p. 4) and ask students to look for a pattern on the place value chart—what is the same and what changes? Ones, tens, hundreds are repeated in every period, but the name of the period changes. • Have students write the number again, this time without using the chart. Use the commas to signal the name of each period (thousands, millions, billions) and read the number aloud to a partner. • Display 3187906129 and ask the students to try to read it. <i>What makes it hard to read this number?</i> • Write the number in the place value chart pattern and add the commas after every repetition of ones, tens, hundreds. Partners, and then whole class, read the numbers using the commas as signals. Ask students how commas helped them read the number. • Record 23,409 in a place value chart. Under the ones place record 1×9, then 10×0. Ask the students to tell you the expression that will give the value of the four in the number (4×100), the three ($3 \times 1,000$) and the two ($2 \times 10,000$). • Students record the following number in their place-value chart as you dictate it: "Six billion, nine million, four hundred twenty-one thousand." • Students record the value of the 6, the 9, the 4, the 2 and the 1 using multiplication expressions. • Record the different representations of the number on the overhead place-value chart and have students determine the correct one in their groups.

<p>EXPLORE:</p> <p><i>Focus on:</i></p> <ul style="list-style-type: none"> • “Doing Mathematics”; • Communication and Representation. 	<ul style="list-style-type: none"> • Display the chart below: <table border="1" data-bbox="526 281 1424 525"> <thead> <tr> <th>Standard Form</th> <th>Expanded Form</th> <th>Word Form</th> </tr> </thead> <tbody> <tr> <td>6,009.421.000</td> <td>6,000,000,000 + 9,000,000 + 400,000 + 20,000 + 1,000</td> <td>Six billion, nine million, four hundred twenty-one thousand</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Students write the digits 0-9 on their index cards and mix the two sets together. • Partners each draw ten cards and build the largest number possible with their cards. The second round they build the smallest number possible. • Students record their numbers in Standard and Expanded form, using the place-value chart for scaffolding. • Instead of writing the word form, partners read the number aloud. • Each table group selects the standard form of either the largest or smallest number at their table and records it on the class chart for use during the Summary. • Save the cards for use in other lessons and routines. <p>Practice and Problem Solving p. 6-7 (36, 38, 39).</p>	Standard Form	Expanded Form	Word Form	6,009.421.000	6,000,000,000 + 9,000,000 + 400,000 + 20,000 + 1,000	Six billion, nine million, four hundred twenty-one thousand						
Standard Form	Expanded Form	Word Form											
6,009.421.000	6,000,000,000 + 9,000,000 + 400,000 + 20,000 + 1,000	Six billion, nine million, four hundred twenty-one thousand											
<p>SUMMARIZE:</p> <p><i>Focus conversation around the Essential Questions for this lesson.</i></p>	<p><i>How do I recognize the value of a digit to the billions place? How do I translate between the standard, expanded, and word form of a number?</i></p> <ul style="list-style-type: none"> • Ask students to determine the largest and smallest number on the chart. “How did you decide?” • Discuss problems 36, 38 and 39. • Underline one digit in each of the numbers on the chart and ask each table group to determine and record the value of the underlined digits. Emphasize the multiplication of the digit by the place value. Have different groups start with different digits so they will all be completed; there won’t be time for all groups to do all of the problems. • Each group explains their strategy for their starting digit and the class agrees or presents an argument for a different answer. 												
<p>HOMEWORK/ PRACTICE:</p>	<p>P. 6: (14, 18, 23, and 27).</p>												

DAY 4

UNIT 1: WHOLE NUMBERS AND DECIMALS

Chapter 1: Lesson 1.2, pp. 2-3

(Part 2 of 2 Day Lesson)

MATERIALS:	TR 5 place value charts for each student (in plastic sleeve) and a place value transparency; enough salt to fill one 8 ounce cup; an 8 oz paper cup for each student.
LESSON FOCUS:	Millions and Billions
CALIFORNIA STANDARDS:	<p>Number Sense:</p> <p>1.0: Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers.</p> <p>1.1: Estimate, round and manipulate very large and very small numbers.</p> <p>Mathematical Reasoning is embedded.</p>
PURPOSE OF LESSON/ ESSENTIAL QUESTION:	<ul style="list-style-type: none"> • How do I recognize and represent the value of a digit to the billions place?
<p>LAUNCH:</p> <p><i>Student books not necessary.</i></p>	<p>Alternative Teaching Strategy (Modified), T.E. p. 2B—a million grains of salt—represent the concept of a million and use understanding of place value to determine the relationship to a billion.</p> <ul style="list-style-type: none"> • Show the students a cup of salt and tell them that there are approximately one million grains of salt in the cup. • Display and read the problem: <i>“If the cup holds about a million grains of salt, how could you determine the number of cups it would take to hold about a billion grains of salt?”</i> • Have students predict if they think the number of cups needed to hold a billion grains of salt would fit on the student desks in the classroom.
<p>EXPLORE:</p> <p><i>Focus on:</i></p> <ul style="list-style-type: none"> • “Doing Mathematics”; • Communication and Representation. 	<p><i>“If the cup holds about a million grains of salt, how could you determine the number of cups it would take to hold about a billion grains of salt?”</i></p> <p><i>“Will the cups needed to hold a billion grains of salt fit on the desks in the classroom?” Justify your answer.</i></p> <ul style="list-style-type: none"> • Work in private think time, then partners and small groups. • Students use their place value chart, grid pattern, and tables to determine the number of cups ($1,000,000 \times 10 \times 10 \times 10$ or $1,000,000 \times 1,000 = 1\text{ billion}$. 1,000 cups with a million grains of salt would equal a billion grains of salt). • Students solve and explain their reasoning and the path to their solution using different representations: <ul style="list-style-type: none"> – Sketches/diagrams – Words – Equations (and equivalent equations using exponents).

	<ul style="list-style-type: none"> • Circulate and encourage students to use what they know to access the problem. Help them start with a simpler problem if needed: <ul style="list-style-type: none"> – “What if a container held 100 M&M’s? How would you find out how many containers it would take to hold 10,000?” – “How could you use the grid pattern, tables, and place value chart to help?” • Select groups to record their solutions on the board or chart paper for use during the Summary. • When groups have written their solution paths and explained their reasoning, have them work on estimating how many cups would fit on the desks. “How can you efficiently use the 4 cups to estimate the number of cups that will fit on one desk?”
<p>SUMMARIZE: Focus conversation around the Essential Question for this lesson</p>	<p><i>How do I recognize and represent the value of a digit to the billions place?</i></p> <ul style="list-style-type: none"> • Discuss solution paths. If students use the place value chart to solve the problem, ask how that relates to the grid pieces in the pattern and the table of the pattern. <p>Lesson Quiz 1.1, T.E. p.3 #1. Copy problems 2 and 3 for homework.</p>
<p>HOMEWORK/ PRACTICE:</p>	<p>Lesson Quiz 1.1, # 2 and 3. Include reasoning and numerical path to solution. Represent the numerical path using exponents.</p>