



San Diego Unified School District

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Instructional Module to Enhance the Teaching of

HARCOURT

**Math**

California Edition

**Grade 4**

**Module 3 - Modified**

UNDERSTAND NUMBERS AND OPERATIONS

— WORK IN PROGRESS —

**MODULE 3 – UNDERSTAND NUMBERS AND OPERATIONS**

Modules represent individual units of study that lead to the 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 their mathematical thinking by using words, numbers, symbols, graphs and charts and translate between 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 use equations and variables to represent and express generalizations of patterns.
- Students understand that expressions on either side of an equation or inequality represent a quantity.
- Students understand that when the expressions on both sides of the equation are equal, operations on one side of the equation need to be repeated on the other side to maintain equality.
- Students use benchmark numbers and familiar real world contexts to understand and estimate numbers of greater magnitude.

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

- *\*What are benchmark numbers, and how can I use them to help make reasonable estimates about numbers of greater magnitude?*
- *\*How do I use the base-ten system to determine the value of individual digits that make up a number?*
- *\*What are equivalent forms for expressing numbers?*
- How do I read, write and identify the value of digits in numbers through hundred thousands?
- How can my understanding of place value help me develop strategies to order and compare numbers through millions?
- What are strategies I can explain and use for rounding numbers?
- How can I use what I know about rounding and benchmark numbers to estimate sums and differences?
- How can I use the strategies of “breaking apart”\*, making combinations ten\*, and using numbers in expanded form\* to add and subtract?
- *\*How do I use my understanding of place value and subtraction to solve problems that involve regrouping and zeros?*
- How do I evaluate addition and subtraction expressions using parentheses and translate the expression into words?
- How do I identify the sequence of operations in a word problem before placing the parentheses in the expression?
- How can I find a rule from an input/output table and represent the rule by writing an equation that includes variables?
- How can I show and explain what happens to the relationship of the two sides of an equation when an equal amount is added or subtracted to each side?

*\* Presented in previous grade(s)*

**Resources:** Van de Walle: Chapters 12 & 22 (pp. 178-199 & 420-427); *Mathematics Sourcebook: Number & Addition/Subtraction* (pp. 7-13 & 14-26)

**Harcourt UNIT 1:****UNDERSTAND NUMBERS AND OPERATIONS****Module 3: 5 WEEKS**

<p style="text-align: center;"><b><u>Place Value and Number Sense</u></b></p> <p>Lesson 1: Using Benchmark Numbers  Lesson 2: Understand Place Value  Lesson 3: Place Value Through Hundred Thousands  Lesson 4: Place Value Through Millions  Lesson 5: Place Value Through Millions</p>	<p style="text-align: center;"><b><u>Compare and Order Numbers</u></b></p> <p>Lesson 1: Ordering Numbers  Lesson 2: Comparing Numbers  Lesson 3: Rounding Using Number Lines  Lesson 4: Round Numbers Through Hundred Thousands  Lesson 5: Identifying and Relating Decimals  Lesson 6: Rounding Decimals</p>
<p style="text-align: center;"><b><u>Add and Subtract Numbers</u></b></p> <p>Lesson 1: Estimate Sums and Differences  Lesson 2: Using Mental Math Strategies  Lesson 3: Subtraction across Zeros  Lesson 4: Add and Subtract Numbers  Lesson 5: Add and Subtract Large Numbers  Lesson 6: Subtract Greater Numbers  Lesson 7: Add and Subtract Greater Numbers</p>	<p style="text-align: center;"><b><u>Algebra: Use Addition and Subtraction</u></b></p> <p>Lesson 1: Equations with Parentheses  Lesson 2: Writing Expressions w/Parentheses  Lesson 3: Exploring Repeating Patterns  Lesson 4: Comparing Input/Output Tables  Lesson 5: Exploring Growth Patterns  Lesson 6: Add Equals to Equals</p>

**Notes to the teacher:**

- The numbers that are used in this module are based on the standards for the grade. They may or may not reflect your students' number sense understanding. Adjust the numbers where necessary to give all students access to the learning. It is sometimes necessary to give different numbers to different students so that each student is challenged within their "zone of proximal development".
- Since you are teaching to the "Purpose" of the lessons, you may need to adjust the lessons to accommodate for your students' prior knowledge. You know your students; the lessons in this module are only a guide to help you organize your teaching.
- Many of the **Explores** in this module pose questions with multiple answers. Your students will develop their higher level thinking skills by solving these problems. It is your role to encourage the exploration needed to do these tasks. To do this, you will need to pose many questions to the students throughout the lesson in order to push their thinking.

**HM UNIT 1: UNDERSTAND NUMBERS AND OPERATIONS**

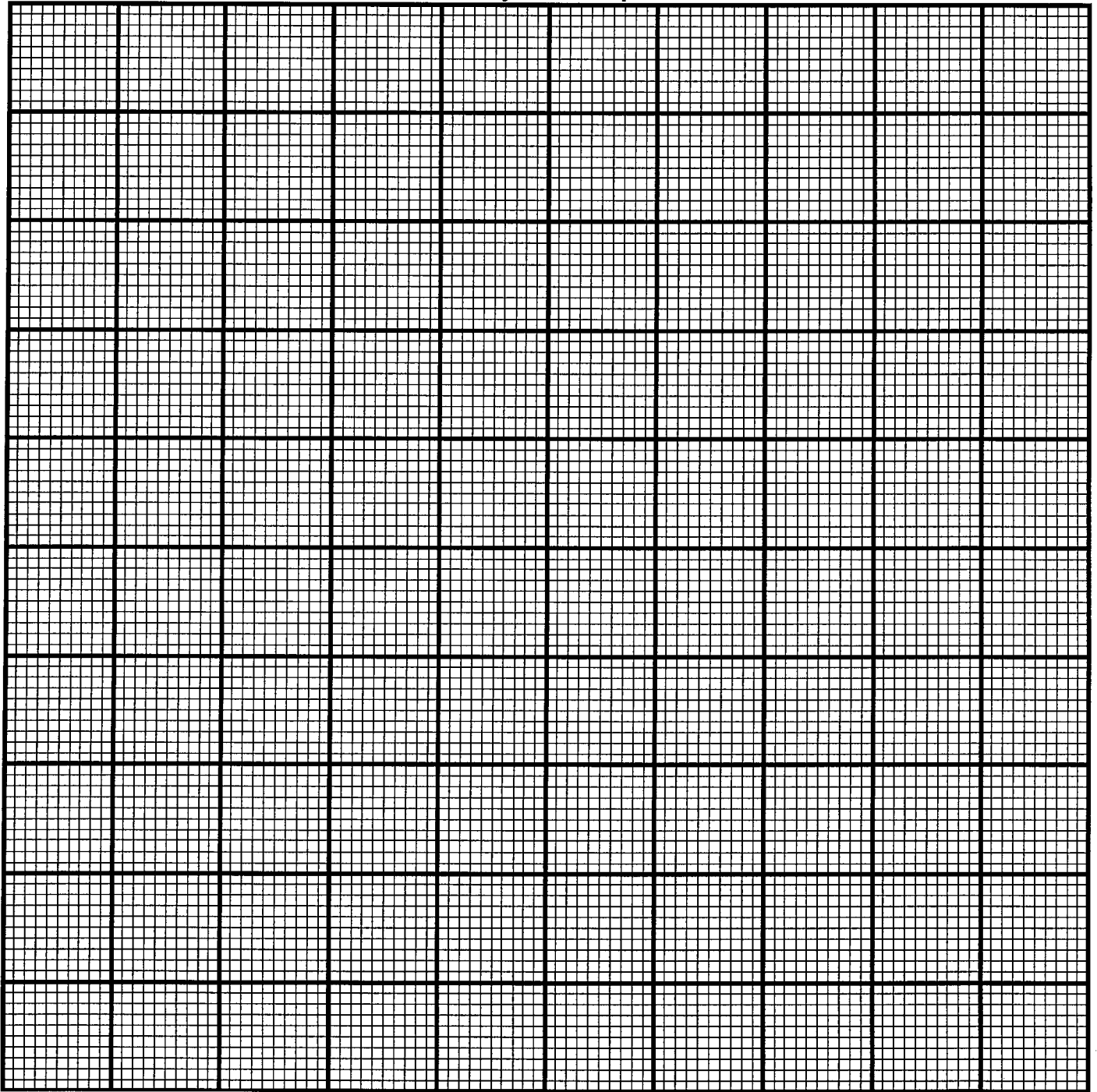
<p><b><u>Day 1:</u></b> <b><u>Place Value and Number Sense</u></b></p> <p>Lesson 1.1 Benchmark Numbers</p>	<p><b><u>Day 2:</u></b></p> <p>Lesson 1.2 Place Value Through Hundred Thousand</p>	<p><b><u>Day 3:</u></b></p> <p>Lesson 1.3 Place Value Through Hundred Thousands</p>	<p><b><u>Day 4:</u></b></p> <p>Lesson 1.4 Place Value Through Millions</p>	<p><b><u>Day 5:</u></b></p> <p>Lesson 1.4 cont. Place Value Through Millions</p>
<p><b><u>Day 6:</u></b> <b><u>Compare and Order Numbers</u></b></p> <p>Lesson 2.1 Place Value to Order Numbers</p>	<p><b><u>Day 7:</u></b></p> <p>Lesson 2.1 Compare Numbers using Number Lines</p>	<p><b><u>Day 8:</u></b></p> <p>Lesson 2.4 Rounding Using Number Lines</p>	<p><b><u>Day 9:</u></b></p> <p>Lesson 2.4 Rounding Numbers Through Hundred Thousand</p>	<p><b><u>Day 10:</u></b></p> <p>Identifying and Relating Decimals</p>
<p><b><u>Day 11:</u></b></p> <p>Rounding Decimal Numbers on Number Lines</p>	<p><b><u>Day 12:</u></b> <b><u>Add and Subtract Numbers</u></b></p> <p>Lesson 3.1 Estimate Sums and Differences</p>	<p><b><u>Day 13:</u></b></p> <p>Lesson 3.2 Use Mental Math Strategies</p>	<p><b><u>Day 14:</u></b></p> <p>Lesson 3.4 Subtraction across Zeros</p>	<p><b><u>Day 15:</u></b></p> <p>Lesson 3.3 Add and Subtract Numbers</p>
<p><b><u>Day 16:</u></b></p> <p>Lesson 3.4 (cont.) Add and Subtract Large Numbers</p>	<p><b><u>Day 17:</u></b></p> <p>Lesson 3.5 Subtract Greater Numbers</p>	<p><b><u>Day 18:</u></b></p> <p>Lesson 3.6 Add and Subtract Greater Numbers</p>	<p><b><u>Day 19:</u></b> <b><u>Algebra: Use Addition and Subtraction</u></b></p> <p>Lesson 4.1 Equations with Parentheses</p>	<p><b><u>Day 20:</u></b></p> <p>Lesson 4.2 Writing Expressions with Parentheses</p>
<p><b><u>Day 21</u></b></p> <p>Lesson 4.5 Exploring Repeating Patterns</p>	<p><b><u>Day 22:</u></b></p> <p>Lesson 4.5 Comparing Input/Output Tables</p>	<p><b><u>Day 23:</u></b></p> <p>Lesson 4.5 Exploring Growth Patterns</p>	<p><b><u>Day 24:</u></b></p> <p>Lesson 4.6 Add Equals to Equals</p>	<p><b><u>Day 25:</u></b></p> <p>Benchmark Assessment 1</p>

DAY 1  
UNIT 1: LESSON 1.1, pp. 2-3

<p><b>MATERIALS:</b></p>	<ul style="list-style-type: none"> <li>• “How many small squares?” one for the class. (Included with module)</li> <li>• A chapter book for each pair of students</li> </ul>															
<p><b>LESSON FOCUS:</b></p>	<p><b>Using Benchmark Numbers</b></p>															
<p><b>CALIFORNIA STANDARDS:</b></p>	<p><b>Number Sense:</b>  <b>2.1</b> Estimate and compute the sum or difference of whole numbers and positive decimals to two places.  <b>Mathematical Reasoning:</b>  <b>1.1</b> Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.</p>															
<p><b>PURPOSE OF LESSON/ ESSENTIAL QUESTION:</b></p>	<ul style="list-style-type: none"> <li>• What are benchmark numbers, and how can I use them to help make reasonable estimates about numbers of greater magnitude?</li> </ul>															
<p><b>LAUNCH:</b></p> <p>What numbers are easier to count by?</p> <table style="margin-left: 40px;"> <tr> <td style="padding-right: 10px;">5</td> <td style="text-align: center;">or</td> <td style="padding-left: 10px;">7</td> </tr> <tr> <td style="padding-right: 10px;">10</td> <td style="border-left: 1px solid black; border-right: 1px solid black; height: 100px;"></td> <td style="padding-left: 10px;">13</td> </tr> <tr> <td style="padding-right: 10px;">25</td> <td></td> <td style="padding-left: 10px;">27</td> </tr> <tr> <td style="padding-right: 10px;">50</td> <td></td> <td style="padding-left: 10px;">43</td> </tr> <tr> <td style="padding-right: 10px;">100</td> <td></td> <td style="padding-left: 10px;">113</td> </tr> </table> <p>What makes the numbers on the left easier? Why would you use them?</p>	5	or	7	10		13	25		27	50		43	100		113	<ul style="list-style-type: none"> <li>• Exhibit: <b>How Many Small Squares?</b> sheet</li> <li>• Point to the smallest square. This is the square they will be counting.</li> </ul> <p><b>Questions:</b></p> <ul style="list-style-type: none"> <li>• <i>How many small squares do you think are on this paper?</i></li> <li>• <i>Is there anything on the paper that would be helpful in making a close estimate?</i></li> </ul> <p><b>Note:</b> The purpose of this <b>Launch</b> is to help students think about how to estimate, not to find the actual number of squares on the sheet. You do not need to calculate the number at this time, simply come up with a few strategies.</p> <ul style="list-style-type: none"> <li>• Put the term “<b>benchmark number</b>” on board and state to the students that we call an amount that gives us a reference to compare to larger amount a <b>benchmark number</b>. Have students discuss how this helped them think about the previous problem.</li> </ul>
5	or	7														
10		13														
25		27														
50		43														
100		113														
<p><b>EXPLORE:</b></p> <p>Chapter Book or Newspaper Page</p>	<p><b>Question:</b> “If you were being charged by the letter to reprint the first 11 pages of your book in gold lettering, how many letters do you estimate you would be charged for?”</p> <p>Ask partners to find a way to estimate the number of letters in their book using their own benchmarks.</p> <p><b>Note:</b> It may be that students use the benchmark of letters in one square inch, one line, or some other way and apply it to the rest of the pages. The purpose of this explore is for the students to explore a method, not for you to tell them how to find the estimate. If some students are stuck after a few minutes, stop the class and ask for examples of how others might be attempting to solve the</p>															

	<p>problem.                  Choose one or two partner teams to share out during the <b>Summarize</b>.  <b>Scaffold:</b>                  • Decrease or Increase the number of pages to be printed in gold.</p> <p><b>Extensions:</b>                  • Give a price per letter to reprint the chapter book in gold lettering (e.g., 5¢, 7¢, 13¢ per letter, these numbers were chosen for their complexity).</p>
<p><b>SUMMARIZE:</b></p>	<p><b>Revisit the Essential Question:</b>  <i>What are benchmark numbers, and how can I use them to help make reasonable estimates about numbers of greater magnitude?</i></p> <p>Choose partners to share with the class their strategy for using a benchmark to answer the question. Partners should show all of their written work as steps they took to estimate the answer.</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"> <li>• <i>Why did you decide to use that benchmark?</i></li> <li>• <i>How did using the benchmark help you answer the question?</i></li> <li>• <i>How did you account for any pictures in the book?</i></li> </ul>
<p><b>PRACTICE/                  HOMEWORK:</b></p>	<p>p.3 (2-5) Students must write down their estimates as well as their reasoning about how they came up with a reasonable estimate</p>

### How Many Small Squares?



DAY 2  
UNIT 1: LESSON 1.2, pp. 4-5

<b>MATERIALS:</b>	<ul style="list-style-type: none"> <li>• One Place Value Chart per group p. TR11</li> <li>• One set of digit cards per group, marked 0 – 9 (included after page 13 of module)</li> </ul>
<b>LESSON FOCUS:</b>	<b>Understand Place Value Through Hundred Thousand</b>
<b>CALIFORNIA STANDARDS:</b>	<p><b>Number Sense:</b></p> <p><b>1.0</b> Students understand the place value of whole numbers and decimals to two decimal places and how whole numbers and decimals relate to simple fractions.</p> <p><b>3.1</b> Demonstrate an understanding of, and the ability to use, standard algorithms for the addition and subtraction of multidigit numbers.</p> <p><b>Mathematical Reasoning:</b></p> <p><b>2.3</b> Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.</p>
<b>PURPOSE OF LESSON/ ESSENTIAL QUESTIONS:</b>	<ul style="list-style-type: none"> <li>• How do I use the base-10 system to determine the value of individual digits that makes up a number?</li> <li>• What are equivalent forms of expressing numbers?</li> <li>• How do I read, write and identify the value of digits in numbers through hundred thousands?</li> <li>• How can my understanding of place value help me develop strategies to order and compare numbers through millions?</li> </ul>
<b>LAUNCH:</b>  TR11, Spinners & paperclips or Digit Cards	<ul style="list-style-type: none"> <li>• Display a place value chart labeled from ones through hundred thousands. Students can make individual charts in journals or use the ones from TR11.</li> <li>• Discuss what they know about the chart and what they know about the relationship between the places (e.g., each position is ten times the position to its immediately right).</li> <li>• Divide the students into groups of four. Each pair of students will be a team that plays against the other. Give the groups a spinner to label from 0 – 9 or give the groups the 0 – 9 digit cards.</li> </ul>

<p><b>EXPLORE:</b></p>	<p>Students will play a game called <b>Make it Greatest</b>. The object of the game is to build a six-digit number that is greater than the opponents' in each round. Three rounds are played to determine a winning team.</p> <ol style="list-style-type: none"> <li>1. One team randomly generates a digit from 0 – 9.</li> <li>2. The team decides which position the digit should be written on their "Place Value" chart and writes it there. A "0" in the hundred thousands place is not allowed. Alternate so the other team does the same.</li> <li>3. After 6 digits have been placed on each chart, the teams must rewrite the number as a sum based on the place value of each of the digits.</li> <li>4. Play this three times before declaring a winning team who built a larger number more often.</li> </ol> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><i>Example:</i></p> <math display="block">  \begin{array}{r}  800,000 \\  90,000 \\  3,000 \\  + 100 \\  20 \\  \hline  4 \\  \hline  893,124  \end{array}  </math> </div> <ul style="list-style-type: none"> <li>• <b>Extensions:</b> Ask that teams write the number using values other than just the place value positions on their chart (e.g., 90,000 = 80,000 + 10,000). This extension can be used to determine if students understand what numbers such as 90,000 represent.</li> </ul>
<p><b>SUMMARIZE:</b></p>	<p><b>Revisit the Essential Questions:</b></p> <p><i>How do I use the base-10 system to determine the value of individual digits that makes up a number?</i></p> <p><i>What are equivalent forms of expressing numbers?</i></p> <p><i>How do I read, write and identify the value of digits in numbers through hundred thousands?</i></p> <p><i>How can my understanding of place value help me develop strategies to order and compare numbers through millions?</i></p> <p>Ask two student teams to explain to the class what their strategies were for finding a winning number.</p> <p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"> <li>• <i>What did you take into consideration when building your number to make it the largest number possible?</i></li> <li>• <i>What is the largest number possible? How do you know? How far away is yours from it? How can you find out?</i></li> <li>• <i>What strategies would you advise others to use to win this game?</i></li> <li>• <i>What would your number be if you increased/decreased it by 100? 1,000? 100,000? 101,000? Etc.</i></li> <li>•</li> </ul>
<p><b>PRACTICE/ HOMEWORK:</b></p>	<p>Ask students to choose <b>two</b> problems from p. 5 (13 – 18) and rewrite the numbers in expanded form and word form first. They will then need to compare the numbers to find their difference.</p>

DAY 3  
UNIT 1: LESSON 1.3, pp. 6-7

<b>MATERIALS:</b>	<ul style="list-style-type: none"> <li>• One Place Value Chart per group p. TR11</li> <li>• One set of digit cards per group, marked 0 – 9 (included after page 13)</li> </ul>
<b>LESSON FOCUS:</b>	<b>Understand Place Value Through Hundred Thousands (cont.)</b>
<b>CALIFORNIA STANDARD:</b>	<p><b>Number Sense:</b></p> <p><b>2.0</b> Students understand the place value of whole numbers and decimals to two decimal places and how whole numbers and decimals relate to simple fractions.</p> <p><b>3.1</b> Demonstrate an understanding of, and the ability to use, standard algorithms for the addition and subtraction of multidigit numbers.</p> <p><b>Mathematical Reasoning:</b></p> <p><b>2.3</b> Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.</p>
<b>PURPOSE OF LESSON/ ESSENTIAL QUESTIONS:</b>	<ul style="list-style-type: none"> <li>• How do I use the base-10 system to determine the value of individual digits that makes up a number?</li> <li>• What are equivalent forms of expressing numbers?</li> <li>• How do I read, write and identify the value of digits in numbers through hundred thousands?</li> <li>• How can my understanding of place value help me develop strategies to order and compare numbers through millions?</li> </ul>
<b>LAUNCH:</b>	<p>Today is the second day playing a place value game. The difference is that today the students will try to make the least number possible to win a round of the game.</p> <p>Students will use the same team charts, as well as the same random number spinners/cards.</p> <p>Organize the students in the same partner groups, but switch their opponents.</p>

