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Character, Excellence, Service

4th Grade Mathematics

Unit Overview

This unit lays a strong foundation for the year and is designed to:

1) Provide ample time for students to learn and practice until perfect their classroom rules, rituals, routines and procedures
2) Introduce students to the eight mathematical practices and provide opportunities for them to apply these practices
3) Build upon 3rd grade multiplication skills through exploring factors and multiples
4) Extend place value concepts and connect place value to real world applications

Students will begin this unit by building upon their work with multiplication in 3rd grade by developing an understanding of multiples and factors. These concepts, along with the terms "prime" and composite," are new in grade 4 and lay the foundation for their future work this year with fractions. As a result, this unit is designed to allow for ample time to develop and apply these concepts as students dive deeper into "making sense of numbers."

After the first few weeks, the focus of this unit shifts to delve deeper into place value so that students develop and apply efficient strategies to add, subtract and round multi-digit whole numbers. Students will apply concepts of multiplying or dividing by multiples of 10 to deepen their understanding of how the base-ten number system works, by recognizing that values increase by ten as you move left across a number, and decrease by ten as you move right—or, that a digit to the right represents 1/10 of the value of the digit to its left. With this understanding, students will be able to represent any given number in a variety of ways and will recognize that one representation of a number's value may be more efficient than another based on the context in which the number is being used.

Prerequisite Skills	**Vocabulary**			**Mathematical Practices**

Prerequisite Skills

1) Set up a number line with accurate and equal spacing
2) Know that an array can be used to represent a number
3) Know how to create an array
4) Fluently add and subtract numbers 1-12
5) Multiplication and division fact fluency through 12s
6) Skip count with fluency
7.) Division fact fluency through 12s
8.) Multiplication fluency through 12s
9.) Demonstrate basic multiplication problems as repeated addition or visually as "groups of"
10.) Decompose multi-digit numbers based on place value
11.) Represent multi-digit numbers using base ten blocks

Vocabulary

Mathematician	Data	Equation
Perseverance	Line Plot	Data
Model	Multiples	Product
Precision	Factors	Array
Reason	Prime	Compute
Model	Composite	Calculate
Critique	Quantity	Dimensions
Justify	Number Line	Row/Horizontal
Place Value	Digit	Column/Vertical
Multiplicative	Comparison	Round
Sum	Difference	Algorithm

Mathematical Practices

MP.1: Make sense of problems and persevere in solving them

MP.2: Reason abstractly and quantitatively

MP.3: Construct viable arguments and critique the reasoning of others

MP.4: Model with mathematics

MP.5: Use appropriate tools strategically

MP.6: Attend to precision

MP.7: Look for and make use of structure

MP.8: Look for and express regularity in repeated reasoning

Common Core State Standards

4.OA.5 Patterns

4.MD.4: Represent and interpret data
4.OA.4: Gain familiarity with factors and multiples

4.OA.1. Multiplication as comparison
4.NBT.1: Place value
4.NBT.2: Read, write, compare numbers in various forms
4.NBT.3: Round whole numbers
4.NBT.4: Add and subtract whole numbers

Additional Standards (10%)

Supporting Standards (20%)

Major Standards (70%)

According to the PARCC Model Content Framework,
Standard 4.MD.1 presents an opportunity for connections among standards:
"The work that students do with units of measure (4.MD.1-2) can be connected to the idea of "times as much" in multiplication (4.OA.1)."

Progression of Skills

3rd Grade	4th Grade	5th Grade
N/A	**4.NBT.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.	5.NBT.1: Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right **and 1/10 of what it represents in the place to its left**.
N/A	**4.NBT.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.	5.NBT.3: **Compare two decimals** to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
3.NBT.1: Use place value understanding to **round whole numbers to the nearest 10 or 100**.	**4.NBT.3:** Use place value understanding to **round multi-digit whole numbers to any place**.	5.NBT.4: Use place value understanding to **round decimals to any place**.
3.NBT.2: Fluently add and subtract within 1000 using place value strategies and algorithms	**4.NBT.4: Fluently add and subtract multi-digit whole numbers** using the standard algorithm.	5.NBT.5: Fluently multiply multi-digit whole numbers using the standard algorithm.

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Big Ideas	Students Will…	
	Know/Understand	**Be Skilled At…**
• What are the eight mathematical practices and how do I apply them? • Will the factors of a given number also be factors of that number's multiples? Will the multiples of a number have all of its same factors? Explain • What is the relationship between the base-ten number system and place value? How does the value of a digit change depending on its location within a number? • How does the value of a digit help us compare numbers? How does comparing numbers help with problem solving? • Why is the number 1 neither prime nor composite? • What strategies can I use to assess the reasonableness of my work and the work of others?	• Attending to precision means to use clear and precise language when we reason about math verbally and in writing. Precision also refers to how mathematicians use their tools (i.e. being precise when measuring with a ruler) and when they set up problems for computations (lining up digits, checking for accuracy, etc.) • The x-axis of a line plot represents the possible values of a data set, while the symbols (typically Xs) above the x-axis represent how many of each value. In a data set about numbers of siblings, the x-axis represents the possible number of siblings a student may have. Each X symbol stacked above the numbers along this axis represent each student. If there are 4 Xs above the number "2" that means that 4 students in the class have 2 siblings • That a whole number is a multiple of each of its factors. • Factor pairs are two whole numbers that multiply together to get one product. • Prime numbers are those that have exactly one factor pair (its factor pair will always include itself and the number 1); composite numbers have more than one pair of factors • The number one is neither prime nor composite • All even numbers greater than 2 are multiples of 2, and are therefore composite • All numbers ending in 0 or 5 are multiples of 5 • The names and values of each place in a multi-digit number up to one million • In a multi-digit number, a digit in one place represents 10 times what it represents in the place to its right. Similarly, it represents 10 times less what it represents in the place to its left • Where to place commas in a multi-digit number and how to use commas to correctly read a multi-digit number • Multiplying by 10 increases a number's value and shifts its place one position one position to the left. Dividing by 10 decreases a number's value and shifts its place one position to the right. • A multi-digit number can be rounded to any place	Determining whether a given whole number in the range of 1-100 is a factor or multiple of another given number • Determining whether a given number in the range of 1-100 is either prime or composite • Explaining why the number 1 is neither prime nor composite, based on the definitions of these two terms • Explaining the common misconception that the number 2 is a composite number because it is even (based on the properties of odd/even numbers and multiplication – why is this a common misconception?); explain why the number 2 is actually prime and why "even" does not mean "composite" • Using various place value models (number lines, hundreds charts) to reason about and round numbers • Reading whole numbers up to one million in base-ten numerals, expanded, standard and word form. • Writing whole numbers up to one million in base-ten numerals, expanded, standard and word form. • Multiplying and dividing numbers by multiples of ten • Representing any given digit in a multi-digit number in various ways, e.g. the digit 5 in 45, 306 can be reported as 5,000 ones or 500 tens, or 50 hundreds, or 5 thousands • Looking for and making use of structure, i.e. by recognizing a pattern in the number of zeroes when multiplying or dividing by multiples of 10. Applying this structure to multiply or divide by multiples of 10 without using the standard algorithm • Using the symbols <, >, and = to record the correct relationship between two numbers up to one million. • Adding and subtracting multi-digit numbers using the standard algorithm • Checking the reasonableness of their answer using various strategies (inverse operations, estimation, etc.) Justifying their reasoning and critiquing the reasoning of others by using manipulatives, models and drawings

Unit Sequence

Lesson	Student Friendly Objective SWBAT…	Key Points/Teaching Tip	Exit Ticket	Instructional Resources

1
 	
2
 	
3
 	
4
 	
5
	Learn the expectations and practices of a 5th grade mathematician.	**I. Classroom Rituals, Rules and Procedures**
		➢ General Classroom Rules and Procedures
		➢ Math specific procedures
		   o Do Nows and Fluency drills/ instructional protocol
		   o Handling Math Manipulative
		   o Organizing Math Materials (binders, notes, book, etc)
		
		II. Building a Math Culture
		➢ Get to Know your Fellow Mathematicians
		➢ We celebrate mistakes (culture of error)
		   o Use low risk games like "Make 10" with cards; "Find the Pattern"; or "Which doesn't belong"
		
		III. Writing and Speaking Like a Mathematician
		➢ Accountable Talk Protocols
		➢ Writing Mathematical Arguments
		
		IV. Investigating the Mathematical Practices
		➢ Define and explain the mathematical practices based on illustrated examples of each (i.e. in a gallery walk format). Collaborate with peers in small groups to create a poster to illustrate/represent your assigned mathematical practice.
		
		V. Pre-Assessments & Goal Setting
		➢ Assign fluency levels
		➢ Set class & individual goals
		   o Build an "I can" attitude towards math
		
		Note: All of these activities should be embedded in content, through reviewing critical pre-requisite 3rd grade skills for this unit: 3.OA.6 (division as an unknown factor), 3.OA.7 (fluently multiply and divide within 100) and 3.NBT.2 (fluently add and subtract within 1000)
				"Getting to Know Your Fellow Mathematicians" (Appendix C)
				
				"Vans for a Field Trip" (Appendix C)
				
				"Art Teacher" (Appendix C)

6	Represent and solve multiplicative comparisons using models and equations.	• The emphasis of this objective is to represent real world situations with symbols and **variables.** Emphasize the words in the problems with pictures and counters.	Represent the below word problem using an equation. *The cost of buying a movie is 4 times the cost of renting a movie. It costs $20 to buy a movie. What is the cost of renting a movie, r?* B.) For the above problem, create a bar diagram to model how you would solve the equation.	My Math Chapter 3 Lesson 3 "Multiplicative Riddle" (Appendix C) **Exit Ticket: 4.1_L6**
7	Distinguish between multiplicative and additive comparisons.	• Apply understanding of inverse operations to demonstrate how multiplicative comparisons can be represented in equations using both/either multiplication and division, while additive comparisons can be represented in equations using both/either subtraction and or addition	Write an equation to represent and solve the following multiplicative comparison: *Sandra raised $15 for the PTA, and Nita raised $45. How many times (t) more money did Nita raise as compared to Sandra?* B.) Can a multiplicative comparison always be rewritten as an additive comparison? Can an additive comparison always be re- written as a multiplicative comparison? Explain	My Math Chapter 3 Lesson 4 *Modify resources as necessary to include writing one equation in a variety of ways to demonstrate the inverse relationship between multiplication/division and between addition and subtraction* **Exit Ticket: 4.1_L7**

| 8 | Investigate and define prime and composite numbers by creating arrays to illustrate how to build a number. | • This exploratory, hands-on lesson is strategically designed to come before students receive explicit instruction on factors and multiples so they can conceptualize how numbers are structured without using the mathematical language of factors. When students then learn about factors and multiples, they can visualize these numbers and their arrays.
• Students investigate whether numbers are prime or composite by building rectangles (arrays) with the given area and finding which numbers have more than two rectangles (e.g. 7 can be made into only 2 rectangles, 1 x 7 and 7 x 1, therefore it is a prime number)
• Evaluate special cases: the numbers 1 and 2 – justify the reasoning for your classification of these two numbers.
• Make observations and draw conclusions about any potential relationships between odd/even numbers and prime/composite numbers. | Alan explained that the below sequence of numbers are a pattern of prime numbers because they are all odd. Is he correct? Why or why not?

3, 5, 7, 9, 11, 13 | "Investigating Prime and Composite" (Appendix C)

http://learnzillion.com/lessons/786-determine-if-a-number-is-prime-or-composite-using-area-models

Exit Ticket: 4.1_L8 |

9	Describe the relationship between factors, factor pairs and products. Identify factors of a given number in the range of 1-100.	• Now encourage students to use the formal definitions of prime and composite through reasoning about each number's factor pairs	1) List all the factor pairs of 24. Afterward, explain which numbers are prime and which are composite and how you know as your create your list of factor pairs. 2) Miguel says that the smallest factor of any given number is also a factor of each of its other factors. Is he right? Explain and provide an example to support your thinking:	"Find the Factor" "Prime Number Hunt" "Factor Game" (Appendix C) http://learnzillion.com/lessons/782-find-all-factor-pairs-using-a-rainbow-factor-line **Exit Ticket: 4.1_ L9**
10	Use different strategies to list multiples of a given number and to determine whether or not that number is a multiple of another.	• Most important 4th grade strategies for determining multiplies are multiplication and skip counting • Provide opportunities for students to explore and explain whether or not a given number is a multiple of another	Garrett and Erin were playing a game on a numbered game board. A section of their game board is shown below In the game, players have to cover numbers that are multiples of **both** 2 and 3. Erin covered the number 36. Does this follow the rules? Explain why or why not. <table><tr><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>15</td><td>16</td><td>17</td><td>18</td></tr><tr><td>25</td><td>26</td><td>27</td><td>28</td></tr><tr><td>35</td><td>36</td><td>37</td><td>38</td></tr></table>	"Finding Multiples" "The Product Game" "Common Multiples" (Appendix C) http://learnzillion.com/lessons/781-determine-multiples-of-a-number-using-area-models http://learnzillion.com/lessons/799-find-multiples-by-using-a-number-line **Exit Ticket: 4.1_ L10**

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11	Analyze relationships between numbers using the terms "prime," "composite," "factors," and "multiples." Deduce patterns	• Encourage students to look for patterns in order to deduce that: • all even numbers are multiples of 2 • all even numbers that can be halved twice (with a whole number result) are multiples of 4 • all numbers ending in 0 or 5 are multiples of 5	Circle true or false to the below statement a) *True or False* All even numbers are multiples of two. b) *True or False* All numbers that end in zero are odd. c) *True or False* All even numbers that can be halved twice are multiples of four. d) *True or False* All numbers ending in 3 are multiples of 3.	My Math Chapter 8 Lessons 1-2 "Prime vs. Composite" (Appendix C) "Sieve of Eratosthenes" (Appendix C) **Exit Ticket: 4.1_ L11**
12	Explain how understanding the concepts of number relationships apply to real world situations and therefore, help us solve real world problems.	• Students should justify your answers by making explicit connections to prime/composite numbers, and factors/multiples.	You have 24 students and want to give the option of different ways to set up the desks so that students can vote on the first days of school. As the teacher, you make several arrays of 24 to show how the students' desk can be arranged. Draw all the possible ways the desks can be arranged.	"Creating Arrays!" (Appendix C) "How Many Desks" (Appendix C) <u>My Math</u> Chapter 1 pg. 11- 22 Chapter 8 pgs. 491- 498 **Exit Ticket: 4.1_ L12**
13	**Mid-Unit Performance Task** Gourmet Chocolates (Appendix C)			

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| 14 | Determine/explain the value of any given digit based on its placement within a multi-digit number and report values by using any combination of ones, tens, and hundreds.

Infer and explain the relationship between one place value and the value to its left and right | • Pacing: 2 days
• Students must deduce the relationship through repeated observations; it should not be explicitly taught

• Illustrate the difference between ones, tens, hundreds, thousands, etc. up to one million using base-ten blocks and number lines. | 1. Karin represented the value of the "9" in 3,942 in a variety of ways below. Circle the values that are equivalent to the value of the 9 in 3,942.

9 ones
900 ones
9000 ones
900 tens
90 tens
9 hundreds | My Math Chapter 1, Lesson 1

"Relative Value of Places" (Appendix C)

Engage NY Module 1, Lesson 2 (Appendix C)

http://www.k-5mathteachingresources.com/support-files/place-value-problems.pdf

Exit Ticket: 4.1_ L14-15 |
| 15 | | | 2. Mark says "the digit 3 in 3,942 has the same value as the digit 3 in 31,942 because in both cases the 3 is in the largest place value.

Is he correct? Explain why or why not and

Use visuals and or place value models to

Support your explanation: | |

| 16 | Deconstruct multi-digit numbers in order to compare a specific digit's value when it is located in different place holders in different numbers. | In order to prepare students for tomorrow's lesson on reporting numbers in various forms, use today's lesson as an opportunity **to prep students for expanded form by decomposing multi-digit numbers into their individual place values** (see example below) | . Evaluate the value of the "7" in the number 3,740 and the "7" in the number 740. Model your reasoning using base ten blocks and a place value chart. | http://www.illustrativemathematics.org/illustrations/459
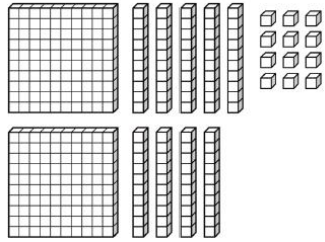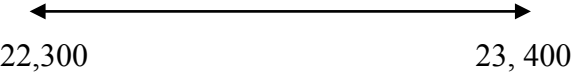
"Number Scramble" (Appendix C)

Exit Ticket: 4.1_ L16 |
|---|---|---|---|---|
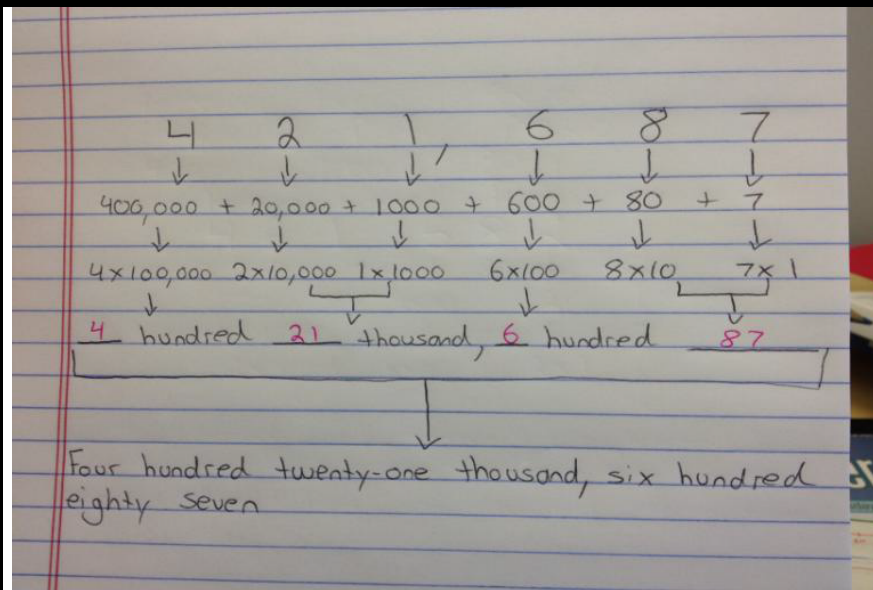
*Model for students by starting in the ones place and moving to the left (they may follow along using place value charts and base ten blocks)

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17	Match and write numbers written in number names, expanded forms, and base-ten blocks.	• Pacing: UP TO 2 days (depending on student data; may only need 1) • Engage NY lesson 3 emphasizes the importance of precision when placing commas in multi-digit numbers • Explain how and why one number can be represented in a variety of ways, based on place value concepts. • Read and write multi-digit numbers in base-ten number form, expanded form, and number name form. • Make a hypothesis about which type of form is best for reporting numbers in certain real world contexts, then write numbers in all three forms to determine which forms are best suited for specific contexts	1) Look at the base ten blocks below. Key ▢ = 1 Write this value in : Standard Form: _____ Word Form: _____ Expanded Form: 3) Instead of saying 12,456 people watched the World Cup, Celina said that 10,000 + 2,000+ 400+50+6 people watched the World Cup. What is wrong with her statement?	Engage NY Module 1 Lessons 3 - 4 (Appendix C) http://learnzillion.com/lessons/520-read-and-write-numbers-with-zeros Additional Practice: My Math Chapter 1, Lesson 2 http://www.k-5mathteachingresources.com/support-files/numeral-word-expanded-form.pdf **Exit Ticket: 4.1_ L17**
18				
19	Explain and illustrate the concept of rounding using a ruler, hundreds charts and a number line.		1. Use the number line to justify how you would round 22,368 to the nearest hundred. ←————————————→ 22,300 23, 400	My Math Chapter 1, Lesson 5 **Exit Ticket: 4.1_ L19**

20	Round multi-digit numbers to any place value and analyze the impact of rounding to certain place values.	• Make a hypothesis about what effect place value has on rounding numbers, test that hypothesis and construct a mathematical statement about the effects of rounding to a larger or smaller place value • Focus on the difference of rounding the wrong place value in a real world context.	Martha and Jin were counting the money they made at their lemonade stand this summer. After they counted, they each estimated how much money they made. Martha said they made about $2,400 and Jin said they made about $2,000. The actual amount they made was $2,415. Even though their estimates are different, Jin's dad said they are both correct. a. How are Martha's and Jin's thinking both correct? Explain what happened and use visuals to support your thinking. b. In this case, whose estimate is the best? Support your reasoning with vocabulary and reasoning	Engage NY Lessons 10-11 (Appendix C) **Exit Ticket: 4.1_ L20**
21	Apply place value understanding to compare and order multi-digit numbers	• Encourage students to also apply their rounding strategies to reason about the size and values of these numbers before	Baseball stadiums have different numbers of seats. Arrange these three stadiums in order from **least** to **greatest** numbers of seats by filling in the names of the stadiums in the blanks. San Francisco Giants' stadium: 41,915 seats — Washington Nationals' stadium: 41,888 seats — San Diego Padres' stadium: 42,445 seats [ ] < [ ] < [ ]	My Math Chapter 1 Lessons 3-4 http://learnzillion.com/lessons/521-compare-numbers-using-the-symbols-and- **Exit Ticket: 4.1_ L21**

22	**Flex Day (Instruction Based on Data)** **Recommended Resources:** "Number Riddles" (Appendix C) "Ticket Master" (Appendix C) "Sensible Rounding" (Appendix C) "Superbowl Numbers" (Appendix C) "NFL Salaries" (Appendix C) "Nice Numbers" (Appendix C) My Math Chapter 1 Review and Reflect (Pages 49 – 52)			
23	Apply rounding and estimation strategies to estimate sums and differences	• Encourage students to reason about possible real world prices for objects they buy at the store. Ie Snacks, soda, etc and link that to strategies for rounding and estimating. • For remediation/re-teach, consider using My Math Chapter 2 Lesson 3	A teacher asked her students to use estimation to decide if the sum of the problem below is closer to 4,000 or 5,000. One student replied that she thinks the sum is closer to 4,000. She used the estimation shown below to support her reasoning. $496 + 1{,}404 + 2{,}605 + 489 =$ $0 + 1{,}000 + 3{,}000 + 0 = 4{,}000$ Is the student's reasoning correct? In the space below, use numbers and words to explain why or why not.	My Math Chapter 2, Lesson 4 http://www.oswego.org/ocsd-web/games/Estimate/estimate.html http://www.beaconlearningcenter.com/WebLessons/LetsGoShopping/default.htm **Exit Ticket:** **4.1_ L23**
24	Apply your understanding of place value to explain the mathematical processes of finding a sum.		The chart below shows Michael's work in finding the sum of 3892 + 1567. In the "explanation" column, use precise place value language to describe what Michael is doing at each step of the way. 	"Making Sense of the Algorithm" (Appendix C) Engage NY Module 1, Lesson 11 (Appendix C) **Exit Ticket:** **4.1_ L24**

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25	Make sense of, represent and persevere in solving multi-step real world problems involving multi-digit addition		Model the problem with a tape diagram. Solve and write your answer as a statement. In January, Scott earned $8,999. In February, he earned $2,387 more than in January. In March, Scott earned the same amount as in February. How much did Scott earn altogether during those three months? Is your answer reasonable? Explain.	Engage NY Module 1, Lesson 12 (Appendix C) Additional Practice: My Math Chapter 2, Lesson 5
26 27	Connect the standard algorithm for subtraction to place value strategies	• Pacing: 2 days	Draw a tape diagram to represent the following problem. Use numbers to solve. Write your answer as a statement. Check your answer. What number must be added to 1,575 to result in a sum of 8,625?	"Making Sense of the Algorithm" (Appendix C) Engage NY Module 1, Lessons 13 - 15 (Appendix C)
28	Apply the standard algorithm to fluently subtract multi-digit numbers. Apply your understanding of place value to explain the mathematical processes of finding a difference	**Hook:** Sometimes, when we subtract one number from another number we "regroup," and sometimes we don't. For example, if we subtract 8 from 375, we can "regroup" by converting a ten to 10 ones: $$\begin{array}{r} 6\ 15 \\ 3\cancel{7}\cancel{5} \\ -\quad 8 \\ \hline 367 \end{array}$$ Find a 3-digit number to subtract from 375 so that ...	1) Find the difference. Solve for X. 　$7, 903 - 4,192 = X$ 2) Phillipe had $2,010 in his savings account. He bought a new bike for his brother's birthday that cost $989. How much money does he have left in his savings account after buying his brother's birthday present? Show your work.	My Math Chapter 2 Lessons 6-7 **Exit Ticket: 4.1_ L24** **Exit Ticket: 4.1_ L28**