Grade 3 Math Unit 1 - Number and Operations in Base Ten

UNIT OVERVIEW

Grade 3 Math instruction centers around 4 Critical Focus Areas. This unit will address **Critical Focus Area #1**, Developing understanding of multiplication and division and strategies for multiplication and division within 100. Additionally, the content in this unit goes beyond the critical focus areas to address multi-step problems. (See Connections for explanation)

It will include 2 clusters:
-Understand place value understanding and properties of operations to perform multi-digit arithmetic. (A range of algorithms may be used.) * (See Connections for explanation)
- Solve problems involving the four operatiosn, and identify and explain patterns in arithmetic.

STANDARDS

CC_Common Core State Standards - Mathematics (2010) - Grade 3
Domain 3.OA Operations and Algebraic Thinking
Cluster Statement: Solve problems involving the four operations, and identify and explain patterns in arithmetic.
Standard 3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations.

Domain 3.NBT Number and Operations in Base Ten
Cluster Statement: Use place value understanding and properties of operations to perform multi-digit arithmetic.
Standard 3.NBT.1 Use place value understanding to round whole numbers to the nearest 10 or 100.
Standard 3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

CONTENT ELABORATION

3.NBT.1	This standard refers to place value understanding, which expands beyond an algorithm or procedure for rounding. The expectation is that students have a deep understanding of place value and number sense and can explain and reason about the answers they get when they round. Students should have numerous experiences using a number line and a hundreds chart as tools to support their work with rounding. Students learn when and why to round numbers. They identify possible answers and halfway points. Then they narrow where the given number falls between the possible answers and halfway points. They also understand that by convention if a number is exactly at the halfway point of the two possible answers, at this level the number is rounded up. **MP.5, MP.7, MP.8** should be emphasized.
3.NBT.2	This standard refers to fluency, which means accuracy, efficiency (using a reasonable number of steps and time) and flexibility (using strategies such as the distributive property). The word algorithm refers to a procedure or a series of steps. There are other algorithms other than the standard/traditional algorithm. Third grade students should have experiences beyond the standard/traditional algorithm. Problems should include both vertical and horizontal forms, including opportunities for students to apply the commutative and associative properties. Students explain their thinking and show their work using strategies and algorithms, and verify that their answer is reasonable. **MP.2, MP.7, MP.8** should be emphasized.
3.OA.9	**3.OA.9** calls for students to examine arithmetic patterns involving addition and multiplication. In this unit students will focus on addition. Arithmetic patterns are patterns that change by the same rate, such as adding the same number. This standard also mentions identifying patterns related to the properties of operations. For example, on a addition chart, the sums in each row and column increase by the same amount. In an addition table, ask what patterns they notice. Have students explain why the pattern works this way. **MP.1, MP.2, MP.3, MP.6, MP.7** should be emphasized.

UNIT VOCABULARY

digit	Commutative Property of Addition	estimate
expanded form	Identity Property of Addition	reasonable
place value	Associative Property of Addition	regroup
standard form	mental math	unknown
word form	parentheses	bar diagram
round	pattern	inverse operation

BIG IDEAS

ENDURING UNDERSTANDINGS

Numbers and Operations In Base 10 Place Value and Rounding...

- Place value is crucial when operating with numbers.
- Estimation helps us see whether or not our answers are reasonable.
- Using rounding is an appropriate estimation strategy for solving problems and estimating.
- Rounded numbers are approximate and not exact.

Addition and Subtraction...

- Addition and subtraction are inverse operations; one undoes the other.
- We can verify the results of our computation by using the inverse operation.
- Adding zero to a number or subtracting zero from a number does not change the original amount.
- Addition means the joining of two or more sets that may or may not be the same size. There are several types of addition problems, see chart in *CCSS Table 1*
- The counting up strategy can be used to make change.
- Subtraction has more than one meaning. It not only means the typical “take away” operation, but also can denote finding the difference between sets. Different subtraction situations are describe in *CCSS Table 1*

ESSENTIALS QUESTIONS

Choose a few questions based on the needs of your students

- How can numbers be expressed, ordered and compared?
- How can place value help me add larger numbers?
- How are the operations of subtraction and addition related?

CONNECTIONS

In Critical Focus Area #1, students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and divsion problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

Standards for Mathematical Practice (SMP)

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 (Deductive reasoning)
MP.8 Look for and express regularity in repeated reasoning (Inductive Reasoning)

Use place value understanding and properties of operations to perform mulit-digit arithmetic		
	CONTENT	**SKILLS**
3.NBT.1	Round whole numbers to 10 and 100	Round whole numbers to 10 and 100 1. Know when and why to round numbers 2. When rounding, identify possible answers and halfway points 3. When rounding, narrow where the given number falls between the possible answers and halfway point 4. Understand that if a number is exactly at the halfway point of the two possible answers, the number is rounded up 5. Use tools to support rounding work; such as a number line or hundreds chart 6. Explain and reason about answer when rounding
3.NBT.2	Add and subtract numbers within 1000 using multiple strategies	Add and subtract numbers within 1000 using multiple strategies 1. Solve problems in both vertical and horizontal forms 2. Apply Commutative, Associative, and Zero Properties 3. Add within 1000 using various strategies such as: making tens, making landmark or friendly numbers, double / near-doubles, breaking each number into its place value and adding up in chunks 4. Subtract within 1000 using various strategies such as: adding up, removal, place value and negative numbers, adjusting one number to create an easier problem and keeping a constant difference 5. use the standard/traditional algorithms to add and subtract within 1000 6. use estimation to verify answer is reasonable
Solve problems involving the four operations, and identify and explain patterns in arithmetic		
	CONTENT	**SKILLS**

3.OA.9	In an addition table, identify patterns and explain why they work that way	In an addition table, identify patterns and explain why they work that way 1. Investigate and explain why any sum of two even numbers is even 2. Investigate and explain why any sum of two odd numbers is even 3. Investigate and explain why any sum of an even number and an odd number is odd 4. Investigate and explain why any double fact (2 addends the same) fall on a diagonal line in an addition table 5. Identify and explain the Commutative Property of Addition in the table 6. Identify and explain the Identity Property of Addition in the table 7. Identify examples and explain how addition and subtraction are related using the table

UNIT RESOURCES

1. Common Core Model Curriculum
2. Mc-Graw Hill, **My Math** Chapters 1-3
3. Hands-on Standards Number & Operations Lessons #2,3,4,& 9, Algebra lessons # 5,7, & 11
4. Deb Diller Math Work Stations materials & process
5. Georgia Math Frameworks, Grade 3 Unit 1
6. United Streaming: Discovering Math: Beginner Arithmetic, Math Mastery: Addition, Math Mastery: Subtraction
7. Make a hundred http://www.utdanacenter.org/mathtoolkit/instruction/lessons/3_hundred.php
8. Literature such as: Even Steven and Odd Todd by Kathryn Cristaldi; 12 Ways to Get to 11 by Eve Merriam; A Million Fish...More or Less by Patricia McKissack; Grandma Went to Market: A Round-the-World Counting Rhyme by Stella Blackstone, David Schwartz; If You Made A Million, etc.
9. **Number Talks** by Sherry Parrish