Grade 5 Math Unit 1 - Numbers and Operations in Base Ten

UNIT OVERVIEW

Grade 5 instruction time centers around 3 Critical Areas of Focus. This unit is connected to Focus Area #2, Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations.
(See Connections for explanation)

The work in this unit addresses these clusters:
-Understand the place value system
- Perform operations with multi-digit whole numbers using the standard algorithm

Students will be able to recognize and identify place value using names of both whole numbers and decimals. Students will be able to read, write and compare decimals to the thousandths. Mixed operations will be used in working with whole numbers as well as decimals

STANDARDS

CC_Common Core State Standards - Mathematics (2010) - Grade 5
Domain 5.NBT Number and Operations in Base Ten
Cluster Statement: Understand the place value system.
Standard 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.
Standard 5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
Standard 5.NBT.3 Read, write, and compare decimals to thousandths.
5.NBT.3.a Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
5.NBT.3.b Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

Cluster Statement: Perform operations with multi-digit whole numbers and with decimals to hundredths.
Standard 5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

CONTENT ELABORATIONS

5.NBT.1	5.NBT.1 calls for students to reason about the magnitude of numbers. Students should work with the idea that the tens place is ten times as much as the ones place, and the ones place is 1/10th the size of the tens place. In fourth grade, students examined the relationships of the digits in numbers for whole numbers only. This standard extends this understanding to the relationship of decimal fractions. Students use base ten blocks to manipulate and investigate the place value relationships. They use their understanding of unit fractions to compare decimal places and fractional language to describe those comparisons. To extend the place value understanding of the relationships of digits in whole numbers to decimals, students use a model of one unit; they cut it into 10 equal pieces, shade in, or describe 1/10 of that model using fractional language. ("This is 1 out of 10 equal parts. So it is 1/10. I can write this using 1/10 or 0.1"). They repeat the process by finding 1/10 of a 1/10 (e.g., dividing 1/10 into 10 equal parts to arrive at 1/100 or 0.01) and can explain their reasoning. ("0.01 is 1/10 of 1/10 thus is 1/100 of the whole unit.") **MP.2, MP.6, MP.7 should be emphasized.**
5.NBT.2	5.NBT.2 includes multiplying by multiples of 10 and powers of 10. Students should have experiences working with connecting the pattern of the number of zeros in the product when you multiply by powers of 10. Students need to be provided with many opportunities to explore this concept and come to this understanding; this should not just be taught procedurally. **MP.2, MP.6, MP.7 should be emphasized.**
5.NBT.3a	5.NBT.3a references expanded from of decimals with fractions included. Students should build on their work from fourth grade, where they worked with both decimals and fractions interchangeably. Expanded form is included to build upon work in 5.NBT.2 and deepen students' understanding of place value. Students build on the understanding they developed in fourth grade to read, write and compare decimals to thousandths. They connect their prior experiences with using decimal notation for fractions and addition of fractions with denominators of 10 and 100. They use concrete models and number lines to extend this understanding to decimals to the thousandths. Models may include base ten blocks, place value charts, grids, pictures, drawings, manipulatives, etc. They read decimals using fractional language and write decimals in fractional form, as well as in expanded notation. This investigation leads them to understanding equivalence of decimals (0.08 = 0.80 = 0.800).
5.NBT.3b	Comparing decimals builds on work from grade 4. Some equivalent forms of 0.72: 72/100 7/10 + 2/100 7 x (1/10) + 2 x (1/100) 0.70 + 0.02 70/100 + 2/100 .720 Students need to know the size of the decimal numbers and relate them to common benchmarks such as 0, 0.5, (0.50 and 0.500) and 1. Comparing tenths to tenths, hundredths to hundredths and thousandths to thousandths is simplified if students use their understanding of fractions to compare decimals. **MP.2, MP.4, MP.5, MP.6, MP.7 should be emphasized**.
5.NBT.5	**5.NBT.5** refers to fluency which means students select and use a variety of methods and tools to compute. They work flexibly with basic number combinations and use visual models, benchmarks, and equivalent forms. They are accurate and efficient (use a reasonable amount of steps) and flexible (use strategies such as the distributive property or breaking numbers apart. They also use strategies according to the numbers in the problem, 26 x 4 may lend itself to (25 x 5) + 4 where as another problem might lend itself to making an equivalent problem; 32 x 4 = 64 x 2). In prior grades, students used various strategies to multiply. Students can continue to use these different strategies as long s they are efficient, but must also understand and be able to use the standard algorithm. In applying the standard algorithm, students recognize the importance of place value. The size of numbers should not exceed three-digit by a two-digit factor. **MP.2, MP.6, MP.7, MP.8 should be emphasized.**

UNIT VOCABULARY

place value chart	decimal	power
period	decimal point	squared
place	equivalent decimals	cubed
place value	exponent	powers of ten
standard form	prime factorization	Distributive Property

standard form	prime factorization	Distributive Property
expanded form	base	compatible numbers

BIG IDEAS

ENDURING UNDERSTANDINGS

-Multiplication may be used to find the total number of objects when objects are arranged in equal groups.
- One of the factors in multiplication indicates the number of objects in a group and the other factor indicates the number of groups.
- Products may be calculated using invented strategies.
- Unfamiliar multiplication problems may be solved by using known multiplication facts and properties of multiplication and division. For example, 8 x 7 = (8 x 2) + (8 x 5) and 18 x 7 = (10 x 7) + (8 x 7).
- Multiplication may be represented by rectangular arrays/area models.

ESSENTIALS QUESTIONS

Choose the a few questions based on the needs of your students

- How does the position of a digit relate to its value?
- What strategies can be used to multiply whole numbers?

CONNECTIONS

In **Critical Focus Area #2**, students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number) to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

This unit is connected to:
4.NBT.5-6 and **4.NF.7**

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)

Students need to have a firm grasp of place value for future work with computing with numbers, exponents and scientific notation.

Understand Place Value

	CONTENT	SKILLS
5.NBT.1	Recognize the relationship between place values in both whole numbers and decimals	Recognize the relationship between place values in both whole numbers and decimals 1. justify and explain how the value of a digit in a whole number would change if it moved one place; either to the right or to the left 2. use models and fractional language to describe 1/10 of 1 3. write 1/10 as 0.1 and explain reasoning 4. use models and fractional language to find 1/10 of 1/10 5. write 1/100 as 0.01 and explain reasoning 6. write 1/1000 as 0.001 and explain reasoning
5.NBT.2	Explain patterns when multiplying and dividing whole numbers and decimals by powers of ten	Explain patterns when multiplying and dividing whole numbers and decimals by powers of ten 1. Identify the pattern of the number of zeros in the product when multiplying by powers of 10 2. Reason that the exponent above the 10 indicates how many places the decimal point is moving to the right when multiplying by a power of 10 3. Reason that the exponent above the 10 indicates how many places the decimal point is moving to the left when dividing by a power of 10 4. Relate the above work to fractions (e.g., 3.5 ÷ 10 = 0.35 or 350 x 1/100 or 35 x 1/10
5.NBT.3a	Read and write decimals to the thousandth	Read and write decimals to the thousandth 1. Read decimals using fractional language 2. Write decimals in fractional form 3. Read and write decimals using expanded form 4. Identify multiple equivalent forms for a decimal

5.NBT.3b	Compare two decimals to thousandths	Compare two decimals to thousandths 1. Relate decimals to common benchmarks such as 0, 0.5, (0.50 and 0.500) and 1 2. Use fractional language to compare decimals (e.g., 0.25 and 0.17, a student might think, "25 hundredths is more than 17 hundredths." 3. Use >, < and = symbols to compare decimals

Perform operations with multi-digit whole numbers and with decimals to hundredths

	CONTENT	**SKILLS**
5.NBT.5	Perform operations with multi-digit whole numbers and with decimals to hundredths	Perform operations with multi-digit whole numbers and with decimals to hundredths 1. Accurately multiply multi-digit numbers 2. Efficiently multiply multi-digit numbers (using a reasonable amount of steps and time) 3. Use a variety of strategies to multiply multi-digit numbers 4. Use place value to justify and explain why the steps work in the standard algorithm for multiplication of multi-digit numbers 5. Proficiently use the standard algorithm to multiply multi-digit numbers

UNIT RESOURCES

Common Core Model Curriculum
Hands on Standards - Number & Operations, Grade 3/4 lessons 1, 2, 9, 14, 22, 23
Manipulatives - Base Ten Blocks, Ten Frames
McGraw-Hill, **My Math** Chapters 1-2
Number Talks by Sherry Parrish
Georgia Math frameworks, Grade 5 Units 1-2
IXL - http://www.ixl.com/math/standards/common-core/grade-5
Math Playground/Common Core http://www.mathplayground.com/common_core_state_standards_for_mathematics_grade_5.html
Educational games connected to CCS