NEW MEXICO
Public Education Department

## 5.NBT: NUMBER & OPERATIONS IN BASE 10

**Cluster Statement:** Understand the place value system.

**Major Cluster** This standard represents major work for this grade. As a reminder, 65-85% of instructional time over the course of the year should be focused on the major work of the grade.

| Standard Text | Standards for Mathematical Practice | Students who Demonstrate Understanding Can: |
|---|---|---|
| **5.NBT.A.1**<br>**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.** | SMP 2: Students can reason abstractly and quantitatively by understanding the relationship between adjacent places in both whole numbers and decimals to reinforce conceptual understanding of individual places as well as the magnitude of a number across place values on both sides of the decimal point.<br><br>SMP 7: Students can look for and make use of structure by attending to and understanding the relationship between adjacent place values in both whole numbers and decimals. | • Explain 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.<br><br>**Depth of Knowledge:** 1<br><br>**Bloom's Taxonomy:** Understand |

| Standard Text | Standards for Mathematical Practices: | Students who can Demonstrate Understanding Can: |
|---|---|---|
| **5.NBT.A.2**<br>**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.** | SMP 7: Students can look for and make use of structure by identifying and using patterns when multiplying decimals. | • Represent powers of 10 using whole number exponents.<br>• Translate between powers of 10 written as 10 raised to a whole number exponent, the expanded form, and standard notation.<br>• Explain the patterns in the number of zeros of the product when multiplying a number by powers of 10.<br>• Explain the relationship of the placement of the decimal point when a decimal is multiplied or divided by a power of 10.<br><br>**Webb's Depth of Knowledge:** 1<br><br>**Bloom's Taxonomy:** Understand, Apply |
| **Standard Text**<br><br>**5.NBT.A.3: Read, write, and compare decimals to thousandths**<br>• 5.NBT.A.3a: Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000).<br>• 5.NBT.A.3a: Compare two decimals to the thousandths based on the meanings of the digits in each place, using >,=,< symbols to record results of comparisons. | **Standards for Mathematical Practices:**<br><br>SMP 5: Students can use appropriate tools strategically by selecting a combination of tools such as a number line, writing an equation, and/or using a graphical representation to solve place value problems and determine which tool is most efficient to represent a solution. | **Students who Demonstrate Can:**<br><br>• Read and write decimal to thousandths using base-ten numerals, number names, and expanded form.<br>• Use >, =, and < symbols to record the results of comparisons between decimals.<br>• Compare two decimals to the thousandths, based on the place value of each digit.<br>• Use knowledge of base ten and place value to round decimals to any place.<br><br>**Depth of Knowledge:** 1<br><br>**Bloom's Taxonomy:** Understand, Analyze |

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| Standard Text | Standards for Mathematical Practice | Students Who Demonstrate Understanding Can: |
|---|---|---|
| **5.NBT.A.4:** Use place value understanding to round decimals to any place | SMP 7: Students can look for and make sure of structure to understand the connection between rounding decimals and whole numbers. | • Explain why the value of digits depends on its place.<br>• Round decimals to any place. |
| **Previous Learning Connections** | **Current Learning Connections** | **Future Learning Connections** |
| • 4.NBT.A.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. For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.<br>• 4.NF.C.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100 and use this technique to add two fractions with respective denominators 10 and 100. * For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.<br>• 4.NF.C.6 Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.<br>• 4.NF.C.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model. | • 5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm.<br>• 5.NBT.B.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.<br>• 5.NBT.B.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. | • 6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.<br>• 6.NS.B.3Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.<br>• 6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents. |
| **Clarification Statement:**<br><br>5.NBT.A.1: Students extend their understanding of the base-ten system to the relationship between adjacent | | |

places, how numbers compare, and how numbers round for decimals to thousandths. This standard 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. Based on the base-10 system, digits to the left are 10 times as great as digits to the right; likewise, digits to the right are 1⁄10th of digits to the left.

5.NBT.A.2: Multiplying by a power of 10 shifts the digits of a whole number or decimal that many places to the left. Patterns in the number of 0s in products of a whole number and a power of 10 and the location of the decimal point in products of decimals with powers of 10 can be explained in terms of place value. Because students have developed their understandings of and computations with decimals in terms of multiples rather than powers, connecting the terminology of multiples with that of powers affords connections between understanding of multiplication and exponentiation. (Progressions for the CCSSM, Number and Operation in Base Ten, CCSS Writing Team, April 2011, page 16) This standard includes multiplying by multiples of 10 and powers of 10, including 102 which is 10 x 10=100, and 103 which is 10 x 10 x 10=1,000. 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 should reason that the exponent above the 10 indicates how many places the decimal point is moving (not just that the decimal point is moving but that you are multiplying or making the number 10 times greater three times) when you multiply by a power of 10. Since we are multiplying by a power of 10 the decimal point moves to the right.

5.NBT.A.3: This standard reference expanded form of decimals with fractions included and comparing decimals builds on work from fourth grade. This standard refers to rounding. Students should go beyond simply applying 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 to support their work with rounding. Students should use benchmark numbers to support this work. Benchmarks are convenient numbers for comparing and rounding numbers. 0., 0.5, 1, 1.5 are examples of benchmark numbers.

5.NBT.A.4: Students have a deep understanding of place value and number sense by explaining and give reasons about the answers they get when they round. Students should have numerous experiences using a number line to support their work with rounding. When rounding a decimal to a given place, students may identify the two possible answers, and use their understand of place value to compare the given number to the possible answers.

**Common Misconceptions**

- Students may try to extend a shallow understanding of whole number place value to decimal place.
- Students may think the more digits in the number the greater the number.
- Students can confuse the language describing the relationship between place values for whole numbers and decimal numbers. 5
- Students memorize a rule of “adding zeros” to make the powers of 10 and then misapply this “rule”.

**Multi-Layered System of Supports (MLSS)/Suggested Instructional Strategies**

**Pre-Teach**

Pre-teach Targeted: *What pre-teaching will prepare students to productively struggle with the mathematics for this cluster within your HQIM?*

- For example, some learners may benefit from targeted pre-teaching that rehearses prior learning when studying understanding the place value system because students are extending prior knowledge of place value from previous years to include place value patterns, reading, writing, and comparing decimal numbers, and rounding decimals.

Pre-teach Intensive: *What critical understandings will prepare students to access the mathematics for this cluster?*

- 4.NBT.A.2: This standard provides a foundation for work with understanding the place value system because reading and writing whole numbers in expanded notation reinforces understanding of the value of each digit in a number and how those values relate to one another. If students have unfinished learning within this standard, based on assessment data, consider ways to provide intensive pre-teaching support prior to the start of the unit to ensure students are ready to access grade level instruction and assignments.

**Core Instruction**

*Access*

Interest: *How will the learning for students provide multiple options for recruiting student interest?*

- For example, learners engaging with understanding the place value system benefit when learning experiences include ways to recruit interest such as providing contextualized examples to their lives because students apply place value concepts in a variety of real-life contexts, such as money and measurement. Developing conceptual understanding through models and relevant realistic tasks will reinforce the meaning of whole number and decimal place values and their relationships.

*Build*

Effort and Persistence: *How will the learning for students provide options for sustaining effort and persistence?*

- For example, learners engaging with understanding the place value system benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that is frequent, timely, and specific because place value understanding requires a high level of precision. Timely, specific feedback from both teachers and peers will reduce student confusion and misconceptions.

Language and Symbols: *How will the learning for students provide alternative representations to ensure accessibility, clarity and comprehensibility for all learners? (e.g., a graph illustrating the relationship between two variables may be informative to one learner and inaccessible or puzzling to another; picture or image may carry very different meanings for learners from differing cultural or familial backgrounds)*.

- For example, learners engaging with understanding the place value system benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as making connections to previously learned structures because students in fifth grade are extending their knowledge of whole number place value to working with decimal numbers. They will be working with understanding the relationship between places both to the left *and* to the right of a given place value.

Expression and Communication: *How will the learning provide multiple modalities for students to easily express knowledge, ideas, and concepts in the learning environment?*

- For example, learners engaging with understanding the place value system benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as concept mapping tools, such as a place value chart or number lines because using structural models will help students develop an understanding of the individual places, the magnitude of a number and the relationship between adjacent places.

*Internalize*

Comprehension: *How will the learning for students' support transforming accessible information into usable knowledge, knowledge that is accessible for future learning and decision-making?*

- For example, learners engaging with understanding the place value system benefit when learning experiences attend to students by intentionally building connections to prior understandings and experiences; relating important information to the learning goals; providing a process for meaning making of new learning; and, applying learning to new contexts such as incorporating explicit opportunities for review and practice because students require multiple opportunities to build on previously learned and new concepts. In addition, encouraging students to explain their thinking process around solving place value problems will improve their understanding.

**Re-teach**

Re-teach Targeted: *What formative assessment data (e.g., tasks, exit tickets, observations) will help identify content needing to be revisiting during a unit?*

- For example, students may benefit from re-engaging with content during a unit on understanding the place value system by clarifying mathematical ideas and/or concepts through a short mini lesson because students may benefit from additional modeling. Provide a variety of experiences and activities in which students model and write base-ten numerals on a place value chart. Modeling reading the decimal numbers correctly will support the meaning of number place value.

**Re-teach Intensive:** *What assessment data will help identify content needing to be revisited for intensive interventions?*

- For example, some students may benefit from intensive extra time during and after a unit understanding the place value system by <addressing conceptual understanding because students require both concrete experiences and written activities to build their comprehension of decimals.

**Extension Ideas**

*What type of extension will offer additional challenges to 'broaden' your student's knowledge of the mathematics developed within your HQIM?*

For example, some learners may benefit from an extension such as the application of and development of abstract thinking skills when studying understanding the place value system because it leads the students to more generalized thinking about place patterns. Use question stems to help students make connections, for example, "What do you notice about…?" "Why do you think that works?" "Will that always be true when you…?" "Can you find an example of when that is not true?"

**Culturally and Linguistically Responsive Instruction:**

**Validate/Affirm:** How can you design your mathematics classroom to intentionally and purposefully legitimize the home culture and languages of students and reverse the negative stereotypes regarding the mathematical abilities of students of marginalized cultures and languages?
**Build/Bridge:** How can you create connections between the cultural and linguistic behaviors of your students' home culture and language the culture and language of school mathematics to support students in creating mathematical identities as capable mathematicians that can use mathematics within school and society?

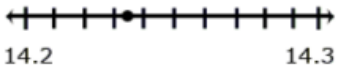
Building Procedural Fluency from Conceptual Understanding: Instruction should build from conceptual understanding to allow students opportunities to make meaning of mathematics before focusing on procedures. When new learning begins with procedures it privileges those with strong prior familiarity with school mathematics procedures for solving problems and does not allow learning to build for more methods for solving tasks that occur outside of school mathematics. For example, when studying understanding the place value system the types of mathematical tasks are critical because building conceptual understanding for place value is essential to fifth grade mathematics. For example, when multiplying 32 x 1000, students should understand that the product represents 32 groups of 1000, or "thirty-two thousands," which is written as 32,000. When teachers focus on the procedure of "adding zeros," students miss the opportunity to build the conceptual understanding which is critical for working with decimals.

**Standards Aligned Instructionally Embedded Formative Assessment Resources:**

*Source:* PARCC Released Item 2018

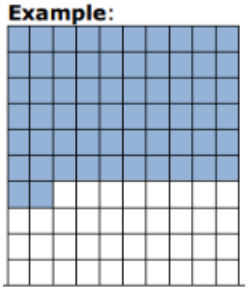
Round 14.235 to the nearest tenth.

- Students recognize that the possible answer must be in tenths thus, it is either 14.2 of 14.3. They then identify that 14.235 is closer to 14.2 (14.20) than to 14.3 (14.30).




Students should use numbers to support this work. Benchmarks are convenient numbers for comparing and rounding numbers. 0, 0.5, 1, 1.5 are examples of benchmark numbers.

**Example:**



Which benchmark number is the best estimate of the shaded amount in the model to the left?

Explain your thinking.

*http://www.dusd.net/cgi/files/2013/04/5th-flipbook.pdf

**Resource 2**

Which numbers or expressions have the same value as twenty-nine thousandths?

Select **two** correct answers.

A. 0.29

B. 2.9

C. 0.029

D. $2 \times \frac{1}{10} + 9 \times \frac{1}{1000}$

E. $2 \times \frac{1}{10} + 9 \times \frac{1}{100}$

F. $2 \times \frac{1}{100} + 9 \times \frac{1}{1000}$

Answer Key

C and F

| Relevance to families and communities: | Cross-Curricular Connections: |
|---|---|
| During a unit focused on understanding the place value system, consider options for learning from your families and communities the cultural and linguistic ways this mathematics exists outside of school to create stronger home to school connections for students, for example, learning about the different ways decimals are used in the home and community can a be a great way to connect schools tasks with home tasks. | STEM: Using given or collected data, round numbers to a given whole number or decimal place to solve real-world problems.<br><br>Science: Provide students opportunities to take precise measurements. Have students round these measurements to the nearest tenth, hundredth, or thousandths. |