

4.NBT: NUMBER & OPERATIONS IN BASE TEN

Cluster Statement: A: Generalize place value understanding for multi-digit whole numbers.

Major Cluster (Students should spend the large majority of their time (65-85%) on the major work of the grade/course. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.)

Standard Text	Standard for Mathematical Practices	Students who demonstrate understanding can:
<p>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 $700 \div 70 = 10$ by applying concepts of place value and division.</p>	<p>SMP 2: Students can reason abstractly and quantitatively by making sense of quantities and their relationships in problem situations.</p>	<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> Recognize that $700 \div 70 = 10$ by applying concepts of place value and division Understand that a quantitative relationship exists between the digits in place value positions of a multi-digit number. Explain that a digit in one place represents ten times what it would represent in the place to its right.
		Depth Of Knowledge: 1,2
		Bloom's Taxonomy: Understand
<p>4.NBT.A.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.</p>	<p>SMP 3: Students can construct viable arguments and critique the reasoning of others by explain their thinking when comparing numbers and critique the reasoning of their peers explanations.</p> <p>SMP 6: Students can attend to precision when comparing two numbers.</p>	<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> Explain the difference between standard, word, and expanded forms. Read multi-digit whole numbers using base-ten numerals, number names, and expanded form. Write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers and write the comparison using symbols.
		Depth Of Knowledge: 1,2

		Bloom's Taxonomy: Apply
<p>Standard Text</p> <p>4.NBT.A.3 Use place value understanding to round multi-digit whole numbers to any place.</p>	<p>Standard for Mathematical Practices</p> <p>SMP3: Students can construct viable arguments and critique the reasoning of others by explaining how they rounded whole numbers to a given place using place value understanding.</p>	<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> • Explain the role of place value when rounding whole numbers • Round multi-digit whole numbers to any place.
		<p>Depth Of Knowledge: 1,2</p>
		<p>Bloom's Taxonomy: Apply</p>
<p>Previous Learning Connections</p> <ul style="list-style-type: none"> • Connect to understanding that the three digits of a three-digit number represent amounts of hundreds, tens, and ones (2.NBT.1) • Connect to reading and writing numbers to 1,000 using base-ten numerals, number names and expanded form (2.NBT.3) • Connect to comparing two three-digit numbers based on meanings of the hundreds, tens, and one's digits, using $>$, $=$, and $<$ symbols to record the results of comparisons. (2.NBT.4) • Connect to using place value understanding to round two-digit and three-digit numbers to the nearest 10 and 100 (3.NBT.1) • Connect to multiplying one-digit whole numbers by multiples of ten (3.NBT.3) 	<p>Current Learning Connections</p> <ul style="list-style-type: none"> • Connect to multiplying a whole number up to four digits by a one-digit whole number, and multiply two two-digit numbers using strategies based on place value (4.NBT.5) • Connect to finding whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value (4.NBT.6) 	<p>Future Learning Connections</p> <ul style="list-style-type: none"> • Connect to recognizing that in a multi-digit number, a digit in one place represent 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. (5.NBT.1) • Connect to explaining patterns in the numbers of zeros of the product when multiplying a number by powers of 10 (5.NBT.2) • Connect to reading, writing, and comparing decimals to thousandths. (5.NBT.3) • Connect to using place value understanding to round decimals to hundredths (5.NBT.4)

Clarification Statement:

4.NBT.A1: This standard calls for students to extend their understanding of **place value** related to **multiplying** and **dividing** by **multiples of 10**. In this standard, students should reason about the magnitude of digits in a number. Students should be given opportunities to reason and **analyze** the **relationships** of numbers that they are working with.

4.NBT.A2: This standard requires students to **read** and **write multi-digit whole numbers** using **numerals (standard form), word form, and expanded form**. It also requires students to **compare** 2 multi-digit whole numbers (based on place value meaning) using the symbols $<$, $>$, $=$. Be mindful when teaching not to teach a number is larger because it has more digits or a number is smaller because it has fewer digits. This will confuse students when they move into comparing decimal numbers.

4.NBT.A3: The standard requires students to use **place value** to **round** with any given **whole number** to any given place value. The standard focuses on using place value. Students need to use **visual model** or **manipulatives** when learning to round numbers so they understand the mathematical reasoning for rounding up or down. A **number line** may be a good visual when rounding.

Common Misconceptions

- Students may struggle with numbers such as one thousand two. Many students will understand the 1000 and the 2 but then instead of placing the 2 in the ones place, students will write the numbers as they hear them, 10002 (ten thousand two).
- Students often assume that the first digit of a multi-digit number indicates the "greatness" of a number. The assumption is made that 954 is greater than 1002 because students are focusing on the first digit instead of the number as a whole.
- Students may get confused when rounding to specific place values. For example, when asked to round 712 to the nearest ten, they may round to the nearest hundred. Students need work with number line and other mathematical tools to help build this understanding of rounding.

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 analyzes common misconceptions when studying generalizing place value understanding for multi-digit whole numbers because students are working with multiples of ten moving from one place value to another. Students that are taught to "just add a zero" when multiplying by ten will not understand mathematically why this works. Similarly, with rules for rounding, students need to understand why we round up from 5 and up. Knowing this rule does not help them, but visually seeing which number is closer will help with rounding.

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

- 2.NBT.A.1: This standard provides a foundation for work with generalizing place value understanding for multi-digit whole numbers because this standard build student understanding of place values and values of these numbers up to the hundreds place. 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

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

- For example, learners engaging with generalizing place value understanding for multi-digit whole numbers benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that emphasizes effort, improvement, and achieving a standard rather than on relative performance because students are working with very large numbers, most of which are very abstract, and will need support and guidance through work with these large numbers.

Build

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

- For example, learners engaging with generalizing place value understanding for multi-digit whole numbers benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as providing feedback that emphasizes effort, improvement, and achieving a standard rather than on relative performance because students are working with very large numbers, most of which are very abstract, and will need support and guidance through work with these large numbers.

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 generalizing place value understanding for multi-digit whole numbers benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as highlighting structural relations or make them more explicit because students can begin to see patterns in the symbols thus constructing meaning.

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 generalizing place value understanding for multi-digit whole numbers benefit when learning experiences attend to the multiple ways students can express knowledge, ideas, and concepts such as solving problems using a variety of strategies because students can express their learning in different ways and share these thoughts and ideas.

Internalize

Self-Regulation: How will the design of the learning strategically support students to effectively cope and engage with the environment?

- For example, learners engaging with generalizing place value understanding for multi-digit whole numbers benefit when learning experiences set personal goals that increase ownership of learning goals and support healthy responses and interactions (e.g., learning from mistakes), such as supporting students with metacognitive approaches to frustration when working on mathematics because students can become frustrated without beginning to work on a problem, but through encouragement and support students can change their thinking about math work and their thinking when beginning a math problem.

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 generalizing place value understanding for multi-digit whole numbers by revisiting student thinking through a short mini-lesson because targeting revisiting of student thinking will allow the teacher to correct misconceptions and/or give more help with conceptual understanding.

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 generalizing place value understanding for multi-digit whole numbers by revisiting student thinking by addressing conceptual understanding because conceptual understanding needs to be built with manipulatives or visual models.

Extension

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 opportunity to understand concepts more quickly and explore them in greater depth than other students when studying generalizing place value understanding for multi-digit whole numbers because students need extensive practice to become fluent with multi-digit numbers, including manipulating them and using them in different contexts.

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?

Equity Based Practice (Eliciting and Using Evidence of Student Thinking): Eliciting and using student thinking can promote a classroom culture in which mistakes or errors are viewed as opportunities for learning. When student thinking is at the center of classroom activity, "it is more likely that students who have felt evaluated or judged in their past mathematical experiences will make meaningful contributions to the classroom over time. For example, when studying generalizing place value understanding for multi-digit whole numbers eliciting and using student thinking is critical because students need to work with very abstract numbers. Students will need to manipulate these numbers by understanding movement between place values and rounding numbers. This work is best done with students working together on tasks to explain and expand thinking through discourse. The teacher can further discourse by asking prompting questions or extending thinking through questions.

Standards Aligned Instructionally Embedded Formative Assessment Resources:

Source: Cognia Testlet for Grade 4- Numbers and Operations in Base Ten

Standard: 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.

Learning Targets: I can write numbers in number form given the expanded and word forms. I can compare multi-digit whole numbers. I can relate the value of the same digit in two numbers.

1. The number of people that live in Madison's town is shown in expanded form.
 $400,000 + 2,000 + 700 + 9$
- The number of people that live in Keisha's town is four hundred twenty-seven thousand nineteen.
- Write the number of people in Madison's town in number form.
 - Write the number of people in Keisha's town in number form.
 - Compare the numbers in parts (a) and (b) using $<$, $>$, or $=$.
 - How many times greater is the value of the 2 in the number of people that live in Keisha's town than the value of the 2 in the number of people that live in Madison's town? Show your work or explain how you know.

This type of assessment question requires students to determine number form, comparing numbers, and comparing place values within two different numbers. This task uses SMP 1 because students have to determine which information is needed to answer each step in the problem. This task can be used as independent end of unit assessment. It could also be used in smaller chunks throughout a week of instruction to help drive instruction.

Relevance to families and communities:

During a unit focused on generalizing place value understanding for multi-digit whole numbers, 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, students can gather information from home about ways that parents would use rounding in everyday life. These examples can be shared and explored as tasks that directly relate back to home and culture.

Cross-Curricular Connections:

Science: Study of planets' distance from the sun may present an opportunity to connect to concepts of base-10 and place value.

Social Studies: Study of populations (state, country, and world) may present an opportunity to connect to concepts of base-10 and place value.