NEW MEXICO
Public Education Department

4.NBT: NUMBER & OPERATIONS IN BASE TEN

Cluster Statement: B: Use place value understanding and properties of operations to perform multi-digit arithmetic.

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:** • Fluently use standard algorithm to add multi-digit whole numbers • Fluently use the standard algorithm to subtract multi-digit whole numbers **Depth Of Knowledge:** 1,2 **Bloom's Taxonomy:** Apply
4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.	SMP6: Students can attend to precision when they carefully regroup when adding and subtracting.	
Standard Text	**Standard for Mathematical Practices**	**Students who demonstrate understanding can:** • Explain the role of place value and the properties of operations when multiplying multi-digit numbers • Solve multi-digit multiplication problems **Depth Of Knowledge:** 1,2 **Bloom's Taxonomy:** Apply, Understand
4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	SMP3 Students can construct viable arguments and critique the reasoning of others by explaining their strategy for multiplying multi-digit numbers.	

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<table>
<tr>
<td>Standard Text

4.NBT.B.6
Find whole-number quotients and remainders with up to four-digit dividends and one-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.</td>
<td>Standard for Mathematical Practices

SMP3: Students can construct viable arguments and critique the reasoning of others by explaining their calculations using equations, rectangular arrays, AND/OR area models.</td>
<td>Students who demonstrate understanding can:
• Find whole number quotients with up to 4-digit dividends and 1-digit divisors using strategies based on place value, properties of the operations, AND/OR the relationship between multiplication and division Students can successfully use one of the following:
• Illustrate division with equations
• Illustrate division with rectangular arrays
• Illustrate division with area models

Depth Of Knowledge: 1,2

Bloom’s Taxonomy: Understand</td>
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<tr>
<td><u>Previous Learning Connections</u>
• Connect to fluently adding and subtracting within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction (2.NBT.5)
• Connect to adding and subtracting within 1,000 using concrete models or drawings (2.NBT.7)
• Connect to fluently adding and subtracting within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction (3.NBT.2)
• Connect to multiplying one-digit whole numbers by multiples of 10 in the range 10–90, for example, 9 × 80 and 5 × 60 (3.NBT.3)</td>
<td><u>Current Learning Connections</u>
• Connect to recognizing that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. (4.NBT.1)
• Connect to finding whole-number quotients and remainders with up to four-digit dividends and one-digit divisors (4.NBT.6)</td>
<td><u>Future Learning Connections</u>
• Connect to fluently multiplying multi-digit whole numbers using the standard algorithm (5.NBT.5)
• Connect to finding quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies (5.NBT.6)
• Connect to adding, subtracting, multiplying, and dividing decimals to hundredths, using concrete models or drawings and strategies (5.NBT.7)
• Connect to explaining patterns in the number of zeros of the product when multiplying a number by powers of 10 (5.NBT.2)</td>
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<tr>
<td colspan="3">Clarification Statement:
4.NBT.B.4: The standard requires students to add and subtract multi-digit whole numbers using the standard algorithm. Students who struggle with the algorithm needs more experience with hands-on materials. Scaffolding students with place value understanding will help students with regrouping misconceptions.</td>
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</table>

4.NBT.B.5: This standard requires students to **multiply** up to **4 digits by 1 digit** and **2 digits by 2-digit** numbers using place value AND the properties of operations. Students may calculate using equations, **rectangular arrays**, AND/OR **area models**. P**roperties of operations: commutative, associative, distributive**. Previous grade level standards focused on using place value and properties of operations. Also, students often do not notice the need of borrowing and just take the smaller digit from the larger one. Emphasize place value and the meaning of each of the digits. Specific strategies or students having difficulty with lining up similar place values in numbers as they are adding and subtracting.

4.NBT.B.6: General methods for computing **quotients** of **multi-digit numbers and one-digit numbers** rely on the same understandings as for multiplication, but cast in terms of division. One component is quotients of **multiples of 10, 100, or 1000** and one-digit numbers. Another component of understanding general methods for multi-digit division computation is the idea of **decomposing** the **dividend** into like base-ten units and finding the quotient unit by unit, starting with the largest unit and continuing on to smaller units. As with multiplication, this relies on the distributive property. This work can be done through methods such as **partial quotients** or **area model for division**.

Common Misconceptions

- Students may confuse the role of place-value when "regrouping". In addition, students may add 35 + 19 and say the answer is 414. They may add 9 and 5 to get 14 then add 3 and 1 to get 4 and put them together. In subtraction, students may flip numbers in the subtrahend and minuend to make the numbers work to subtract. For example, for 51-27, a student may think you cannot do 1-7 and may flip it to be 7-1, then subtract 5-2 to get 3, then state the answer is 36.
- Students DO NOT use the standard algorithm to divide in 4th grade. Some students may struggle to recognize the place value inherent in multiplication. Do not rush to teach the algorithm, as a knowledge of where the numbers come from is necessary for a full understanding of the algorithm.
- Students DO NOT use the standard algorithm to divide in 4th grade. The standard algorithm is a 6th grade standard. 4th grade should focus on place value, properties, models, etc., to multiply multi-digit numbers. Students who have been taught the algorithm may not understand the importance of place value. They may misapply the algorithm and get a number that does not make sense. It is important to ensure a full understanding of the importance of place value before even considering the algorithm for multiplication or division.

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 place value understanding and properties of operations to perform multi-digit arithmetic because reviewing models used prior to grade 4 will help students move to adding and subtracting using the standard algorithm. Students can use place value models they used for adding and subtracting as they create place value models when multiplying and dividing.

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

- 3.NBT.A.2: This standard provides a foundation for work with place value understanding and properties of operations to perform multi-digit arithmetic because being able to fluently add and subtract within 1000 using the properties of operations and/or the relationship between addition and subtraction is the foundation for accuracy and understanding of the algorithm. 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 using place value understanding and properties of operations to perform multi-digit arithmetic benefit when learning experiences include ways to recruit interest such as providing choices in their learning such as choosing strategies to demonstrate understanding because students are applying and extending their knowledge of place value and properties of operations to reach fluency when performing multi-digit arithmetic.

Build

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

- For example, learners engaging with using place value understanding and properties of operations to perform multi-digit arithmetic benefit when learning experiences attend to students attention and affect to support sustained effort and concentration such as displaying the learning goals in multiple ways because using multiples strategies, based on place value and properties of operations demonstrates fluency with multi-digit arithmetic.

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 using place value understanding and properties of operations to perform multi-digit arithmetic benefit when learning experiences attend to the linguistic and nonlinguistic representations of mathematics to ensure clarity can comprehensibility for all learners such as pre-teaching vocabulary and symbols, especially in ways that promote connection to the learners' experience and prior knowledge because it is important for students to make connections to previous work with using models to solve addition and subtraction problems as they may use the same models can be used to explain their thinking when multiplying and dividing based on place value and properties of operations.

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 using place value understanding and properties of operations to perform multi-digit arithmetic 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 using multiple strategies to explain thinking develops fluency.

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 using place value understanding and properties of operations to perform multi-digit arithmetic 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 provide tasks with multiple entry points and optional pathways because multiple entry points will allow students at various readiness levels experience success and optional pathways to demonstrate understanding pushes students to a deeper 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 using place value understanding and properties of operations to perform multi-digit arithmetic by providing specific feedback to students on their work through a short mini-lesson because focusing on solidifying place value understanding will help students when adding and subtracting using the standard algorithm.

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 on using place value understanding and properties of operations to perform multi-digit arithmetic by confronting student misconceptions because identifying and correcting misconceptions with place value understanding is crucial to students being successful with adding and subtracting using the standard algorithm as well as using place value understanding to multiply and divide whole numbers.

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 open ended tasks linking multiple disciplines when studying using place value understanding and properties of operations to perform multi-digit arithmetic because through working with adding, subtracting, multiplying, and dividing in various curriculum areas, students will not only make connections between math and the real world, but they will also see the value of math in life.

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 (Goal Setting): Setting challenging but attainable goals with students can communicate the belief and expectation that all students can engage with interesting and rigorous mathematical content and achieve in mathematics. Unfortunately, the reverse is also true, when students encounter low expectations through their interactions with adults and the media, they may see little reason to persist in mathematics, which can create a vicious cycle of low expectations and low achievement. For example, when studying using place value understanding and properties of operations to perform multi-digit arithmetic goal setting is critical because when students reach goals with adding, subtracting, multiplying, and dividing they realize success which increases math confidence. Multi-digit arithmetic success relies on fluency, and many students may need to continue to work toward fluency.

Standards Aligned Instructionally Embedded Formative Assessment Resources:

*Source***:** http://tasks.illustrativemathematics.org/content-standards/4/NBT/B/tasks/1189

Standard: 4.NBT.B

Task: To Regroup or Not to Regroup

Task

Sometimes when we subtract one number from another number we "regroup," and sometimes we don't. For example, if we subtract 38 from 375, we can "regroup" by converting a ten to 10 ones:

$$\begin{array}{r} {}^{6}\not{3}\,{}^{15}\not{7}\not{5} \\ -\ 38 \\ \hline 337 \end{array}$$

Find a 3-digit number to subtract from 375 so that:

a. You don't have to use regrouping.

b. You would naturally use regrouping from the tens to the ones place.

c. You would naturally use regrouping from the hundreds place to the tens place.

d. You would naturally use regrouping in all places.

In each case, explain how you chose your numbers and complete the problem.

This type of assessment question requires students to think in different ways that are not procedural. Students can use different strategies to finding a number that meets each criterion. SMP 7 would apply with this task because students would find strategy and begin to see pattern emerge within work. This task could be used at

end of unit, however students that struggle can still determine answers using manipulatives or visual models. Those that struggle might have to go back to visual models or manipulatives to help with subtraction.	
Relevance to families and communities: During a unit focused on using place value understanding and properties of operations to perform multi-digit arithmetic, 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, possible examples include: students look for ways they use arithmetic outside of school, students ask family members and/or friends how they use arithmetic in their everyday lives, students look for examples of arithmetic in their daily lives. Students can share their findings with class by: having conversations, creating written and/or visuals in print or non-print formats. As students share with each other, they will make connections.	**Cross-Curricular Connections:** Social Studies: Consider giving students an opportunity to study and compare populations in various geographic areas within the state, country, or world. Students can use their understanding of place value to solve real-world problems that require them to compare populations using addition and subtraction.