

Experiences with Place Value

Standards addressed by these experiences:

- 4.NBT.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.
- 4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form.

Pose the following problem to students:

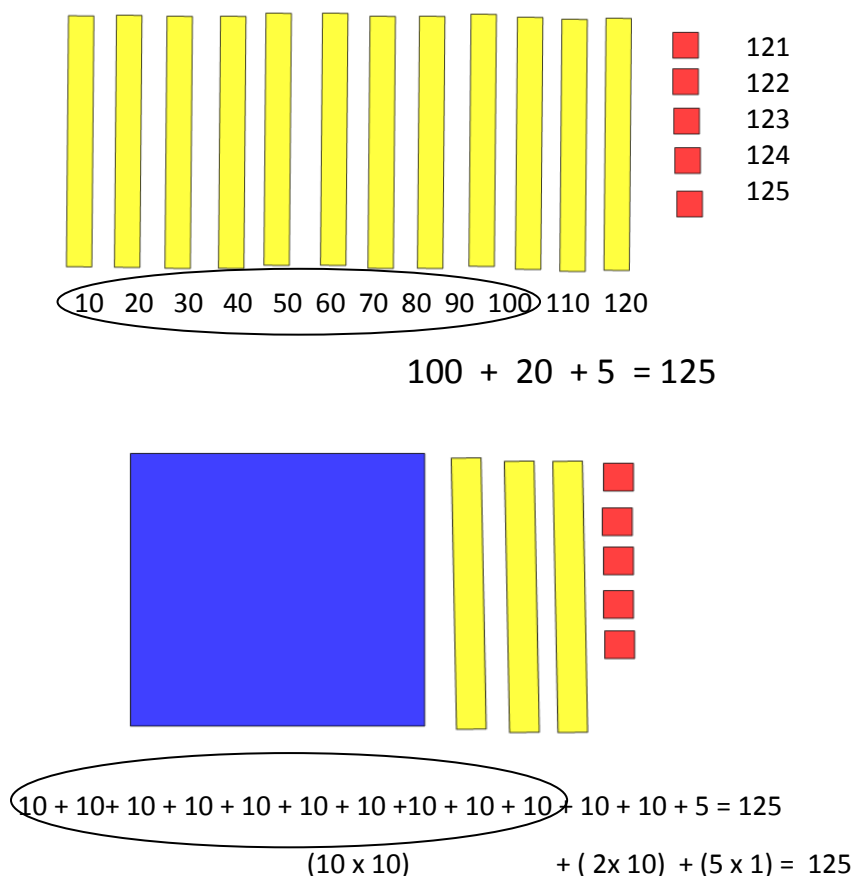
Write the number 125 on the board and ask students: “How many tens are in this number?”

Post all answers on the board (Most students will say there are 2 tens)

Encourage students to create an argument and critique each other's thinking. If no one says that there are 12 tens, then give them this scenario:

What if I asked you to build this number with the base 10 blocks- how would you build it? (Give them a container of base 10 blocks- but only 10s and ones- no hundreds) If they says they can't build it because they don't have a 100 block – tell them you are sorry, but you lent all your hundred's blocks to the teacher next door and these are the only blocks you have. Ask them to brain storm as a class if they could still build the number with just the tens and ones. When someone has a solution, have them share (they will need 12 tens and 5 ones), and repose the question: So how many tens are actually in the number 125? Hopefully they will see that there are actually 12 tens not just 2. You could then say that you found a hundred block and how would the number look if we used the 100 block to build it. Have students compare the two representations and then have them write the number sentences (the notation) for both representations.

To connect this to the expanded form- label students counting. Help them see the 10 groups of 10 in the 12 groups of 10. Some notations could look like this:



Ask: Is this true or false? $(10 \times 10) + (2 \times 10) + 5 = (12 \times 10) + (5 \times 1) = (1 \times 100) + (2 \times 10) + (5 \times 1) = 125$

Then have a True/False conversation with students about these different expanded forms to see if they agree that they are all equivalent representations of the same number.

- You can pose this scenario with many different numbers and have discussions about how many tens in the number. You could also pose it with four-digit numbers and ask how many hundreds are in the number (i.e. in 1534, there are 15 hundreds and 153 tens). The big idea here is that students need to see that a digit in one place is 10 times as much as the digit to its right. This is revealed to students when they see that there are 10 groups of 10 (10×10) plus some more groups of ten in the number.
- Other ideas for engaging students in discussions around these standards are to show students a number and have them build it numerous different ways with the base 10 blocks. Have them record their different representations with number sentences. This will engage students in writing the expanded form of numbers in multiple different ways. Have students share the different ways they made the number.
- You could bring in the second part of 4.NBT.2 (Compare two multi-digit numbers based on the meanings of the digits in each place, using $>$, $=$, $<$ symbols to record the results of comparisons), by giving each student a different number to build in more than one way and then pair students up and have them compare their numbers using the symbols based on their expanded form. Challenge them to use their expanded notation to prove that one number is greater or less than another.

Other base 10 activities to try:

What Number am I?

Pose these base ten riddles to your students and ask them to use base 10 materials to help solve them.

- I have 33 ones and 5 tens. What number am I?
- I have 3 hundreds, 12 tens, and 7 ones. What number am I?
- I have 40 ones and 4 hundreds. What number am I?
- I am 45. I have 25 ones. How many tens do I have?
- I am 431. I have 23 tens. How many hundreds do I have?
- I have 14 tens, 2 hundreds, and 11 ones. What number am I?
- If you put 2 more tens with me, I would be 115. What number am I?
- I have 17 ones. I am between 30 and 40. What number am I?
- I have 17 ones. I am between 30 and 40. How many tens do I have?