

Grade 2 Place Value

2.N.7	
Illustrate, concretely and pictorially, the meaning of place value for numerals to 100.	<ol style="list-style-type: none">1. Explain and show with counters the meaning of each digit for a 2-digit numeral with both digits the same (e.g., for the numeral 22, the first digit represents two tens [twenty counters] and the second digit represents two ones [two counters]).2. Count the number of objects in a set using groups of 10s and 1s, and record the result as a 2-digit numeral under the headings of 10s and 1s.3. Describe a 2-digit numeral in at least two ways (e.g., 24 as two 10s and four 1s, twenty and four, two groups of ten and four left over, and twenty-four ones).4. Illustrate using 10 frames and diagrams that a numeral consists of a certain number of groups of 10 and a certain number of 1s.5. Illustrate using proportional base-10 materials that a numeral consists of a certain number of tens and a certain number of ones.6. Explain why the value of a digit depends on its placement within a numeral.

Clarification of the outcome:

- ◆ Students' first formal exposure to place value - tens and ones
- ◆ Grade 3 continues to the hundreds place; Grade 4 to the thousands place.

Required close-to-at-hand prior knowledge:

- ❖ Counting to 100 by ones.
- ❖ Skip counting by tens to one hundred.
- ❖ Understanding that many objects can be seen as one unit/group/collection of objects.
- ❖ Understanding addition and being able to add 1-digit numbers.
- ❖ Understand a dime is worth ten pennies.
- ❖ Familiar with the number words to 100.
- ❖ Can decode numerals to 100.

SET SCENE stage

Present a fantasy world called Numodomo (for example) to students. The inhabitants of this world have not figured out how to write numbers for counts. They have visited our world and have seen the symbols on a 0 – 99 chart but they do not understand what the symbols (the numbers) mean. Your students' job is to help the Numodomo people understand but first your students need to clearly understand the numbers yourselves.

The problem task to present to students:

Have students draw pictures of what the inhabitants of Numodomo might look like and what their world might look like.

Comments:

Most students of this age enjoy fantasy stories. You could instead imagine a fairy tale world as the SET SCENE world. Whatever type of world is used can be integrated into language arts/visual arts.

DEVELOP stage

Activity 1: Revisits SET SCENE, prior knowledge and addresses achievement indicator 6.

- ◆ Ask students to show their pictures and, as each picture is presented, tack it on a wall somewhere. Mention that we are going to take a close look at the numbers, 0 to 99, that the inhabitants of Numodomo saw on their visit to earth.
- ◆ Have students examine a 0-99 hundred chart (**a list from 0 to 99**, not from 1 to 100). Ask students to find all the different symbols that are used to make the numerals from 0 to 99 (for the reader: interpret 'symbol' as 'digit'). List what they find on the board (they should find: 0, 1, 2, 3, . . . 8, 9). After students conclude that only the symbols 0 to 9 are used to write all the numbers, discuss the reason for that probably has something to do with remembering numbers better. If there were many different symbols used to write a number, it would be difficult to remember them all. Relate the ten symbols (0 to 9) that are used to write numbers to the letters of the alphabet (26 different letters are used to write a lot of words).
- ◆ Ask students whether such numbers as 24 and 42 (symbols reversed) might mean the same thing or not. Relate the order of symbols to the order of letters (for example, the word 'no' has a different meaning than the word 'on').
- ◆ Still referring to the 0-99 chart, have students notice how the second symbol (the ones digit) begins at 0, then goes to 1, to 2, etc. to 9, and then starts over again at 0 for each first symbol (the tens digit). The first symbol (the tens digit) "clicks one up" after the second symbol (the ones digit) goes past 9. Call this the "roll over" pattern. [This is like a car odometer; it rolls over after '9' is reached.]

Activity 2: Addresses achievement indicators 1 and 2.

- ◆ Ask a student to select one number from the 0-99 chart that is made up of two symbols and that is not too big (e. g. 23). Ask students if any one knows what it means. Expect them to say "twenty-three" (they are decoding). Ask if any one knows what the '2' tells you and what the '3' tells you. At this point, expect silence or "interesting" responses. Tell them it is time to learn what the numbers mean so that they can help the inhabitants of Numodomo.
- ◆ Organize students into pairs. Give each pair 23 objects (because 23 was the number selected) such as buttons. Write '23' on the board as a reminder of the number being investigated. Ask each pair to group the 23 objects into equal piles of whatever size they want (for example, groups of 8). Tell them to place any extra objects (not in the piles) loosely away from the piles. Each time the pairs finish the grouping task, ask them to look closely at '23' (on the board) and at the piles and the extras they made. Ask them whether they notice something the same. Do this for about three rounds. [If no pair makes piles of ten, suggest it.] When one pair finally makes piles of ten, have all pairs make piles of ten. Have the students take a good look at the piles of ten and the extras they made and at '23' on the board. Ask them whether they notice something the same. Somewhere the light bulb will go on. That is to say, at least one pair will notice that the '2' tells you how many piles of ten and the '3' tells you how many extras. Discuss their discovery and introduce the language of tens and ones, and digits (the '2' and '3' are examples of digits - symbols that are used to make up numbers).

Activity 3: Addresses achievement indicators 1, 2, and 4.

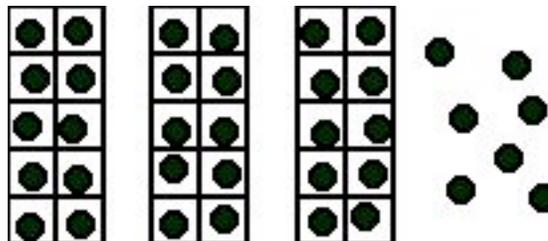
Write a two-digit number less than 50 (e.g. 37) on the board. Ask students to say it (decoding).

Have students represent the number, using ten-frames. One way to use a ten frame is to place a small object (e.g. bingo chip) in an empty spot

of a ten-frame until the count has been reached, with any leftover objects placed outside of a ten-

frame. [See the diagram for this way of

representing 37.]

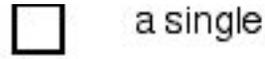


Another way to use ten frames is to place the extras in a ten frame instead of outside as shown here. Doing it this way, there will be completely filled ten frames and one partly filled ten frame.

- ★ Discuss how the count of completely filled ten-frames matches the tens digit of the number and how the count of leftover objects (or unfilled ten frame) matches the ones digit of the number. Repeat this about three times, using different two-digit numbers.
- ★ Reverse the direction of the task. Present ten frames that show a two-digit number. Ask students to write the number the ten frame shows and to decode it. Repeat about 4 times.

Activity 4: Addresses achievement indicators 1, 2, and 5.

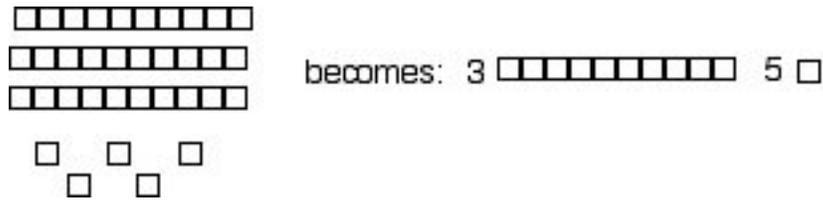
Provide proportional place value materials (longs and singles - see example). Have students examine the materials to ensure that they realize that one long is made up of ten singles.



- ◆ Ask students to build whatever number they want, using longs and singles. Ask them to write the number they built and to decode it. Repeat at least four times.

Important:

To help students with the above task, for each representation (for example, three longs and five singles), write the representation in the way shown below. This way the tens digit and the ones digit are seen as COUNTS of something. This associates the symbolic representation with the concrete representation of a number more effectively and clearly.



- ◆ Reverse the direction of the task. Write two-digit numerals (or have students take turns writing their choices) on the board and ask students to decode and to build each number, using longs and singles. Repeat at least four times

Activity 5: Addresses achievement indicators 1, 2, 5, and 6.

- ◆ Because students sometimes confuse numbers involving reversed digits (for example: 27 and 72), write pairs of such numbers on the board and ask students to say and to build the numbers in each reversed pair, using longs and singles. Discuss the distinction in meaning each time. Include numbers from 11 through 19 (e. g. 15 and 51). Ensure that students understand why the value of a digit depends on its placement within a number. (e.g. in '35', the value of the '3' is 30, while in '53' the value of the '3' is only 3).
- ◆ Because numerals such as 20, 30, etc. can also be troublesome, write such numbers on the board and ask students to say and to build the numbers, using longs and singles. Discuss the matter of a number having zero ones. [Notice zero ones, not no ones. There is an important distinction. Remember that EACH DIGIT REPRESENTS a COUNT.]
- ◆ Write the numbers 03, 05, 09 on the board. Ask students what they mean. [You want them to realize that the '0' indicates zero tens and that it is okay to put a zero in front but we normally do not do that because it "wastes" ink.]

Activity 6: Addresses achievement indicators 1 and 6.

- ◆ Provide pennies and dimes. Ensure that students understand that one dime trades for ten pennies. Build a two-digit number, using pennies and dimes. Ask students to write the number and to decode it. Repeat this about four times.
- ◆ Reverse the direction of the previous activity. Ask a student to write a two-digit number on the board. Ask students to decode and to build it, using pennies and dimes. Repeat this about four times.

Activity 7: Addresses achievement indicators 1 and 3.

Provide students with counters of some type.

- ◆ Ask students to use the counters to build 24 by making piles of tens and ones.
- ◆ Ask students to rearrange the counters to show 24 is 1 pile of ten and 14 ones and to show 24 is 24 ones.

Repeat the above about five times, using other 2-digit numbers, and asking students to build in other ways (for example, 56 is 2 piles of ten and 36 ones).

Activity 8: Addresses achievement indicators 1 and 3.

- ◆ Engage students in a number guessing game. Pretend that you are an inhabitant from Numodomo trying to understand the numbers. Provide clues while the students figure out the secret number. Have them say and write the number. Repeat at least five times. [Here are sample clues: *the number is twenty and four; the number is two groups of ten and four extra, the number is twenty-four ones., the number is 1 ten and 14 ones*]
- ◆ Engage students in a more difficult number guessing game (for example: There is a number that has 3 tens and more than 5 ones. What could the number be?). You think of a secret number and provide clues while the students figure out the secret number. Have them say and write the number. Repeat at least five times.

Activity 9: Addresses achievement indicators 1, 2, 3, 4, 5, and 6, and practice.

Provide place value materials, ten frames, and counters. Students use them as needed.

- ◆ Write a two-digit number such as 35 on the board. Ask students to say and write the number that has one more ten than the number you wrote on the board (expect 45). Repeat about four times. Write a two-digit number such as 35 on the board. Ask students to say and write the number that has one less ten than the number you wrote on the board (expect 25). Repeat about four times.
- ◆ Write a two-digit number such as 35 on the board. Ask students to say and write the number that has one more one than the number you wrote on the board (expect 36). Repeat about four times. Write a two-digit number such as 35 on the board. Ask students to say and write the number that has one less one than the number you wrote on the board (expect 34). Repeat about four times.

Important

Sometimes, during the above tasks, ask a student to explain his/her thinking about saying and writing the number.

Activity 10: Addresses achievement indicators 1, 2, 3, 4, 5, and 6, and practice.

Ask students to prepare for helping the inhabitants of Numodomo understand what the numbers 0 to 99 mean.

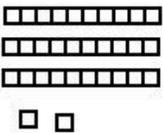
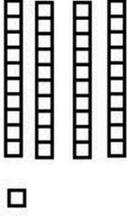
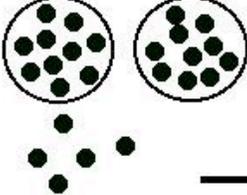
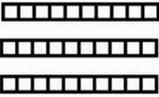
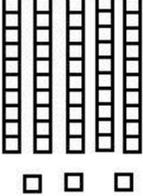
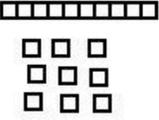
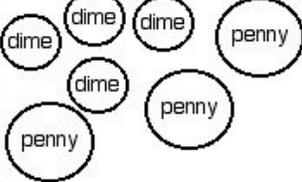
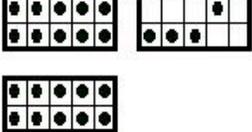
- ◆ Organize students into groups. Each group writes a two-digit number less than forty on a sheet of paper. On the sheet, they represent the number in three ways by drawing appropriate diagrams. The three ways are: ten-frames, PV materials, and dimes and pennies.
- ◆ Each group presents its drawings and explains what they show about the number.

Activity 11: Assessment of teaching.

Provide a worksheet where the task is to write the number for each pictorial representation (see example).

Note:

This assessment of teaching should be treated with caution. Students can simply count single squares/dots to write the number for each situation. They do not need to use place value (tens and ones) thinking. One way to better ensure place value is being assessed (and not counting) is to place a time limit on the worksheet (for example, 3 minutes). Students who count single squares/dots will have difficulty completing the worksheet in three minutes.

 <p>_____</p>	 <p>_____</p>
 <p>_____</p>	 <p>_____</p>
 <p>_____</p>	 <p>_____</p>
 <p>_____</p>	 <p>_____</p>

If all is well with the assessment of teaching, engage students in PRACTICE (the conclusion to the lesson plan).

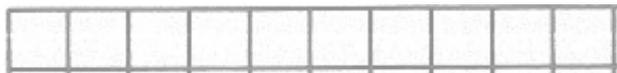
Two examples of partially well-designed worksheets follow.

Each worksheet contains a sampling of question types. More questions of each type are needed for a well-designed worksheet.

The MAINTAIN stage follows the sample worksheets.

Question 1.

Tens block



Ones block



37 is _____ ten blocks and _____ ones blocks

92 is _____ ten blocks and _____ ones blocks

60 is _____ ten blocks and _____ ones blocks

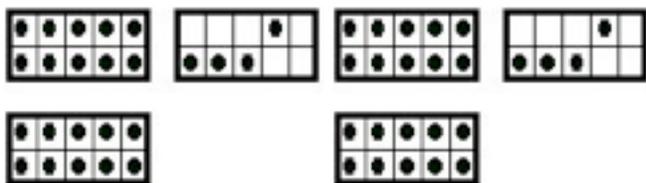
73 is _____ ten blocks and _____ ones blocks

Question 2.

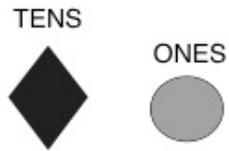
Joe says 32 and 23 mean the same thing. Explain why he is wrong.

Question 3.

Write the number shown by the ten frames. _____



Question 4.



For each number, draw a picture, using diamonds and circles, to show tens and ones.

21	32
40	16

Question 5.

27 is 2 tens and 7 ones.

27 is 1 ten and 17 ones.

27 is 0 tens and 27 ones.

35 is ____ tens and ____ ones.

MAINTAIN stage

Mini-task example

During the morning routine, every so often:

- Present a 2-digit number and have students tell what it means in terms of tens and ones.
- Present a 2-digit number and have students say and write the number that has one more ten, one less ten.
- Present a 2-digit number and have students say and write the number that has one more one, one less one.
- Present a 2-digit number and have students say and write the number in terms of adding tens and ones (e.g.: 34 is $30 + 4$).
- Present a picture of a 2-digit number (using PV blocks and/or ten frames). Have students say and write the number represented by the picture.

Rich-task example

Provide word problems that involve adding and/or subtracting 2-digit numbers. Students will need to use their place value understandings to do the arithmetic.

Sample problem:

Mark and Mary helped mom and dad with the dishes last evening after the family reunion. Mark dried 14 plates and 17 cups. Mary dried 12 bowls and 28 glasses. How many dishes did they dry in all?