National Center on
INTENSIVE INTERVENTION
at American Institutes for Research

Teaching Place-Value Concepts:
Considerations for Instruction

Purpose and Overview of Guide

The purpose of this guide is to provide strategies and materials for developing and implementing lessons for students who need intensive instruction in place value. Special education teachers, mathematics interventionists, and others working with students struggling with place-value concepts may find this guide helpful.

Within college- and career-ready standards, place value is typically taught in grades K–5. This guide can be used when place-value concepts are introduced or with students in higher grade levels who continue to struggle with the concepts. Sample activities, worksheets and supplemental materials also accompany the guide and are available for download at http://www.intensiveintervention.org/.

The guide is divided into four sections:

1. Sequence of skills as defined by the college- and career-ready standards
2. A list of important vocabulary and symbols
3. A brief explanation of the difficulties students may have with place value
4. Suggested strategies for teaching place-value concepts

Sequence of Skills – College- and Career-Ready Standards

(Numbers in parentheses represents the grade level of the standard.)

EXTEND THE COUNTING SEQUENCE.

- Count to 120, starting at any number. (1)
- Read and write numerals. (1)
- Count within 1,000. (2)
- Skip-count by 5s, 10s, and 100s. (2)

UNDERSTAND PLACE VALUE.

- Compose and decompose numbers from 11 to 19 into tens and ones. (K)
- Understand a two-digit number as represented by amounts of tens and ones. (1)
- Understand 10 can be thought of as a bundle of 10 ones—called a “ten.” (1)

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- Understand a three-digit number as represented by amounts of hundreds, tens, and ones. (2)
- Read and write numbers to 1,000. (2)
- Compare two three-digit numbers. (2)
- Round whole numbers to the nearest 10 or 100. (3)
- Recognize that in a multidigit whole number, a digit in one place represents 10 times what it represents in the place to its right. (4)
- Read and write multidigit whole numbers. (4)
- Compare two multidigit numbers. (4)
- Round multidigit whole numbers to any place. (4)
- Recognize that in a multidigit 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. (5)
- Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. (5)
- Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. (5)
- Use whole-number exponents to denote powers of 10. (5)
- Read, write, and compare decimals to thousandths. (5)
- Compare two decimals to thousandths. (5)
- Round decimals to any place. (5)

Vocabulary and Symbols

The following terms are important for students to understand when working with place value.

Digit: A symbol used to show a number 0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Value: Quantity of a digit 2 = 2 ones 39 = 3 tens and 9 ones	Place: The position of a digit relative to the decimal Ones, tens, hundreds, etc.
Place Value: The quantity represented by the position of a digit relative to the decimal 42,103. 2 is in the thousands place, so its place value is 2000.	Standard notation: Writing a number with one digit in each place value 42,103	Expanded notation: Writing a number and showing the place value of each digit 40,000 + 2,000 + 100 + 3

Word form: Writing a number using words Forty-two thousand, one-hundred three.	Decimal: A number written on the basis of powers of ten 53.109	Decimal point: A dot noting the change from positive powers of ten (left of point) to negative powers of ten (right of point) 53.109
Zero: A digit representing the absence of quantity. Zero is necessary in holding place value. 402,005	Estimate: An approximate value	Round: Substitute an approximate value (usually to the nearest 10, 100, 1,000, etc.)
Regroup: Exchange equal amounts of tens and ones, hundreds and tens, thousands and hundreds, etc. 10 ones = 1 ten	Trade/exchange/borrow/carry/rename: Alternative terms for regrouping	
1,000 = 10 hundreds		

Common Areas of Difficulty

Prerequisite skills not mastered:

- Knowledge or understanding of numbers

Specific Place-Value skills:

- *Zero (0)*
  For example, 602 is not the same as 62
- *Reading numbers*
  For example, two thousand, seventy-nine. NOT two thousand and seventy and nine.
- *Understanding place value*
  For example, in the number 312, the 1 represents 1 ten, not 1 one.

Developing Conceptual Understanding

Base-10 blocks can be used to help students understand the concepts behind place value. Base-10 blocks also can be used to explain decimals. Other place-value manipulatives are Unifix cubes, snap cubes, plastic clips, and bean sticks/beans.

Activities and Strategies Related to Specific Standards

Count to 120, starting at any number. (1)

Count within 1,000. (2)

- Practice with counting objects, on number lines, or on hundreds charts.
- Count the number of school days.

Hundreds Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	10
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Skip-count by 5s, 10s, and 100s. (2)

- Practice with counting sets of objects, on number lines, or on hundreds charts.
- Sing counting songs. (Many examples are provided on YouTube.)

Read and write numerals. (1)

Read and write numbers to 1,000. (2)

Read and write multidigit whole numbers. (4)

- Practice handwriting for writing numerals.
  - Check for appropriate pencil grip.
  - Use poems to remember how to write numerals.
  - Explicitly teach students how to write numbers, and practice correct procedure.
- Write an orally presented number.
  - Present numbers of increasing difficulty.
- Break 23 into tens and ones.
  - 23 = 2 tens, 3 ones
- Represent 2 tens and 3 ones as a number.
  - 2 tens, 3 ones = 23
  - How many tens in 23?
  - How many ones in 23?

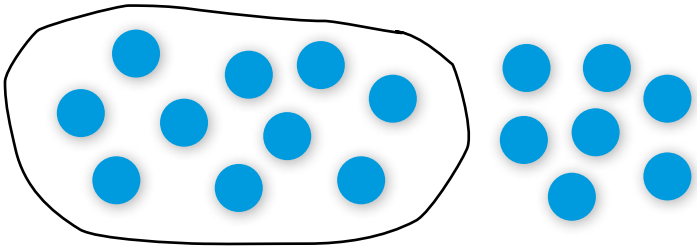
- Explain what each digit represents.
  - 972 = 9 hundreds, 7 tens, and 2 ones.

Compose and decompose numbers from 11 to 19 into tens and ones. (K)

Understand a two-digit number as represented by amounts of tens and ones. (1)

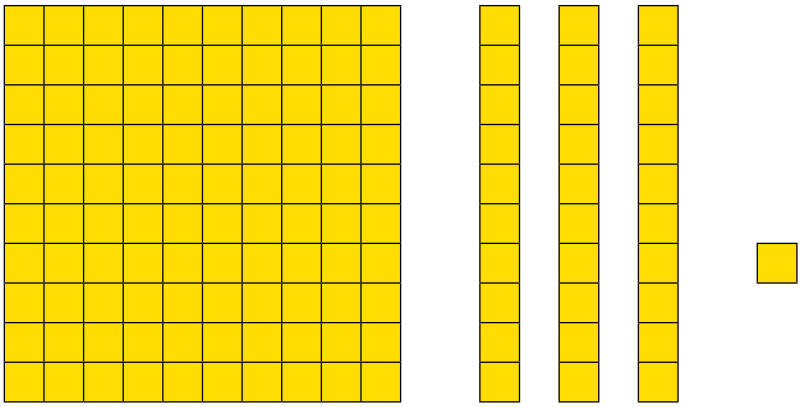
Understand 10 can be thought of as a bundle of 10 ones—called a "ten." (1)

- Show 17 in base-10 units. How many sets of ten? How many remaining ones?
- Line up 10 base-10 units and show equivalency to one rod.
- Line up one base-10 rod and show equivalency to 10 units.
- Represent 45 with base-10 blocks. How many sets of ten? How many remaining ones?
- Use hands to show 45. Flash four bundles of 10 ("10, 20, 30, 40"). Hold up one finger for each one ("41, 42, 43, 44, 45").
- Draw circles around sets of 10 presented on paper.



Understand a three-digit number as represented by amounts of hundreds, tens, and ones. (2)

- Line up 10 base-10 rods and show equivalency to 1 flat.
- Line up one base-10 flat and show equivalency to 10 rods. Show equivalency to 100 ones.
- Represent 124 with base-10 blocks. How many sets of hundred? How many sets of ten? How many remaining ones?
- Draw a three-digit number with squares, lines, and little squares.



Compare two three-digit numbers. (2)

Compare two multidigit numbers. (4)

Read, write, and compare decimals to thousandths. (5)

- Teach < and > signs with a Greater Gator.

- Teach = sign with an understanding of making two sides of an equation the same.
- Use base-10 blocks to show two numbers. Compare.
  - Which amount is greater?
  - Which amount is smaller?
  - Are the amounts the same?
- Show two numbers in standard form.
- Show two numbers in expanded form.
- Show two numbers in word form.
  - Which amount is greater?
  - Which amount is less?
  - Which amount is bigger?
  - Which amount is smaller?
  - Are the amounts the same?

Recognize that in a multidigit whole number, a digit in one place represents 10 times what it represents in the place to its right. (4)

Recognize that in a multidigit 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. (5)

Explain patterns in the number of zeros of the product when multiplying a number by powers of 10. (5)

Explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. (5)

Use whole-number exponents to denote powers of 10. (5)

- Discuss 1 cube = 10 flats = 100 rods = 1,000 units.
- For decimals, discuss 1 flat = 10 rods (tenths) = 100 units (hundredths)
- Explain decimal point.
  - Discuss implicitness of decimal point for all whole numbers.
- 425 has a decimal point after the 5, but we don't write it that way. We write the decimal point only if there are numbers to the right of the decimal point.
- Read the decimal point as "and." 425.38 reads as "four-hundred twenty-five and thirty-eight hundredths."
- Show the following pattern:
  - 1 x 10 = 10
  - 10 x 10 = 100
  - 100 x 10 = 1,000
  - 1,000 x 10 = 10,000
  - 10,000 x 10 = 100,000
  - 0.1 x 10 = 1
  - 0.01 x 10 = 0.1
  - 0.001 x 10 = 0.01
- Explain exponents.
  - $10^0 = 1$
  - $10^1 = 10$
  - $10^2 = 100$
  - $10^3 = 1{,}000$
  - $10^4 = 10{,}000$
  - $10^{-1} = 0.1$
  - $10^{-2} = 0.01$
  - $10^{-3} = 0.001$

Round whole numbers to the nearest 10 or 100. (3)

Round multidigit whole numbers to any place. (4)

Round decimals to any place. (5)

- Teach students to underline the place value of desired rounding. If the digit to the right of underlined digit is 0–4, round down. If 5–9, round up.
- Round to the nearest ten thousand. 5<u>4</u>6,388. 5<u>5</u>0,000.

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