Number and Operations in Base Ten
Base 10 Number Concepts
Grades 4-5

Rationale

- Allowing students to explore the relationship between digits in multi-digit numbers gives students a chance to discover the digits' values for themselves. Experimenting with multiplying and dividing the numbers by ten allows students to concretely visualize the different values and discover the relationship on their own.

Goal

- To understand the place value concepts involved when comparing digits in different place values

Standards

- *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. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*
- 5.NBT.1 Recognize that in a multi-digit 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.

Objectives

- Students will discover the values of digits in multi-digit numbers through a matching activity.
- Students will multiply and divide multi-digit numbers by 10 to determine the relationship between digit values.

Materials

- Activity sheet (This should be pre-prepared: copy on cardstock, cut along lines, and place into a baggie or envelope. Prepare enough for each pair of students to have one set.)
- *Place Value Charts*, 1 per student
- Pencils

Procedures

- Tell students that today they will be discovering patterns in multi-digit numbers.
- Group students into pairs and distribute 1 set of prepared cards (from activity sheet). Instruct students to find matching pairs.

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- Once students have finished matching the pairs, begin a class discussion about what they found. Ask students in particular about the patterns they noticed.
- Tell students to pay particular attention to two sets of cards: 5,481 and its match, and 4,815 and its match. Point out that both numbers have the same digits, and ask the students to share what they know about the differences in values. Then, ask students what they notice about the value of the 4 in each number. What conclusions can they draw about the values since the numbers are in adjacent place values?
- Distribute *Place Value Charts* (1 per student).
- For 4th Grade Students:
  - Draw students' attention to one pair of number cards (For example, 5,481 and its expanded notation match.). Looking at the number written in expanded notation, tell students to multiply each part by 10 and write the new number on the place value chart. (For example, 5,000 x 10 = 50,000; 400 x 10 = 4,000, etc.) Students should write the new number on the place value chart and then put the number "back together" to make 54,810.
  - What do students notice about the value of the 5 in each number? Or the 4? In pairs, tell students to experiment with other numbers in expanded notation from the activity cards, write the number multiplied by 10 on the place value chart, and look for patterns with the digits. (Students should recognize that a digit in one place represents ten times what it would represent in the place to its right.)
- For 5th Grade Students:
  - Draw students' attention to one pair of number cards (For example, 5,481 and its expanded notation match). Looking at the number written in expanded notation, tell students to multiply each part by 10 and write the new number on the place value chart. (For example, 5,000 x 10 = 50,000; 400 x 10 = 4,000, etc.) Students should write the new number on the place value chart and then put the number "back together" to make 54,810.
  - What do students notice about the value of the 5 in each number? Or the 4? In pairs, tell students to experiment with other numbers in expanded notation from the activity cards, write the number multiplied by 10 on the place value chart, and look for patterns with the digits. (Students should recognize that a digit in one place represents ten times what it would represent in the place to its right.)
  - After students have established a pattern and recognize that a digit in one place represents 10 times what it would represent in the place to its right, experiment in the same way with dividing the numbers in expanded notation by 10 and ask students to determine the relationship between the digits in these numbers. (For example, 5,481 and 548.1: Students should recognize that 8 is 1/10 the value of the digit to its left: 80.)
- Once students are finished experimenting with the numbers, review their findings with a class discussion. Next, ask pairs of students to develop a rule for explaining the relationship between digits in a multi-digit number. Once students are

finished, ask the students to share the rule with the class and develop a class rule for explaining the relationship.

Teacher Tips

- 4th Grade Students: After multiplying the numbers by 10, have students practice dividing the numbers by 10 and check the relationship between the digits for students who can handle the extra challenge.
- Students who need an extra challenge can multiply the numbers by higher powers of ten and experiment with the relationship between the digits. Students can determine if a digit's value is 100 times a digit two places to its right, etc.

Extension Activities

- Students can practice writing numbers in expanded form to review place values.
- Give students sets of numbers (such as 2,345 and 23,450) and ask them to write factual statements comparing the values of the digits.
- Pair students and have one student give his or her partner a number written in expanded form and ask the partner to say the numerals that correspond.

5,481	5,000 + 400 + 80 + 1
4,815	4,000 + 800 + 10 + 5
8,154	8,000 + 100 + 50 + 4
1,548	1,000 + 500 + 40 + 8
1,845	1,000 + 800 + 40 + 5
8,451	8,000 + 400 + 50 + 1
4,518	4,000 + 500 + 10 + 8
5,184	5,000 + 100 + 80 + 4

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Place Value Chart (For 4th Grade)

Ten Thousands	Thousands	Hundreds	Tens	Ones

Place Value Chart (for 5th grade)

Ten Thousands	Thousands	Hundreds	Tens	Ones	.	Tenths	Hundredths