The Value of Place Value

Grades 2 - 6

Overview

Students will build their flexibility in using numbers by exploring the connections between the number symbols and their representations with base-ten materials.

Math Concepts

Grades 2 - 4
- whole number place value (through thousands)
- money

Grades 4 - 6
- decimal place value (through thousandths)
- metric units (meters, decimeters, centimeters)

Materials
- TI-15
- pencil
- *Counting on Frank* by Rod Clement
- base-ten materials
- student activity (pages 32 and 33)

Introduction

1. Read *Counting On Frank* by Rod Clement. Discuss some other kinds of questions that a person could ask about how many objects fit in or on other objects.

2. Give each group of students a large pile of units (over 300) from the base-ten materials, and tell them that this is how many jelly beans fit into a jar that you filled. Ask them to count the "jelly beans," and observe the techniques they use (counting one at a time, making groups of 10, etc.).

3. Tell students you have run out of unit pieces and then ask:
   How many rods (groups of 10) would I need to use to make a pile of jelly beans the same size as yours?

4. Have students explore the answer to this problem with their units or apply their knowledge of place value. Then show them how to explore the answer using the calculator.

5. Have students compare their solutions with the base-ten materials to the calculator display. (They can make 31 tens rods from the 314 units, with 4 units left over.)

▤ To use the Place Value feature for this activity:

1. Press ◈ (Mode).
2. Press ➡ (Enter) to select **MAN** (Manual).
3. Press ◄ (Enter) to set the **Place Value** mode to **11–.** This lets you find out how many ones, tens, hundreds, etc., are in a number. (The mode **– 1 – .** is used to find what digit is in the ones, tens, hundreds, etc., place.)

▤ To explore answers to this problem on the calculator:

1. Press ◈.
2. Enter the number of units (for example, 314).
3. Press ▣. ⑩. to see the display. (Using 314, the display is **31▯**, meaning there are 31 tens in 314.)

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The Value of Place Value (Continued)

Collecting and Organizing Data

Have students use their base-ten materials and the calculator to continue the exploration with other numbers, identifying how many hundreds and thousands (and 0.1s and 0.01s for older students). Encourage exploration with questions such as:

- *How many hundreds are in 120? 2478? 3056?*

- *How many tens are in 120? 2478? 3056?*

- *How many units (ones) are in 120? 2478? 3056?*

- *What numbers can you find that have 12 units? 12 tens? 12 hundreds?*

- *What numbers can you find that have 60 units? 60 tens? 60 hundreds?*

Analyzing Data and Drawing Conclusions

Have students use the table on *The Value of Place Value* Student Activity page to record their findings and identify the patterns they see. To help them focus on the patterns, ask questions such as:

- *How does the number of tens in 1314 compare to the number 1314? How about 567? 2457? 4089, etc.?*

  If you cover the digit in the units place, you see how many tens are in a number.

- *How does the number of hundreds in 1314 compare to the number 1314? How about 567? in 2457? in 4089, etc.?*

  If you cover the digits to the right of the hundreds place, you see how many hundreds are in a number.

- *How does the display on the calculator compare to what you can do with the base-ten materials?*

  If the calculator shows 31_, for 316, I should be able to make 31 tens rods out of the 316 units I have.

⌨ Students can use the **11 − .** Place Value mode to test their conjectures. For example, if they think 1602 has 160 hundreds, they enter **1602**, press ▣., ⌷00., and see **16▯▯**. They can then use the base-ten materials to see why there are only 16 hundreds in 1602. (If students use the **− 1 − .** mode to find what digit is in the hundreds place, they will see **▯6▯▯** displayed to show that 6 is the digit in the hundreds place.

Continuing the Investigation

Connect the place-value patterns to money. For example, ask students:

- *If each one of your "jelly beans" costs a penny, how many pennies would you spend for 1,314 jelly beans?*

  1,314 pennies.

- *How many dimes (tens) would you spend?*

  131 dimes and 4 more pennies.

- *How many dollars (hundreds)?*

  13 dollars, plus 14 more pennies, or 1 dime and 4 pennies.

Older students can record the money (and enter it into the calculator) in decimal form, 13.14. Then they can use the calculator to connect dimes to one tenth (0.1) of a dollar ($13.14 has 131 dimes or tenths) and pennies to one hundredth (0.01) of a dollar ($13.14 has 1314 pennies or hundredths).

For older students, connect the place-value patterns to conversions between metric units. For example, a measurement of 324 centimeters can also be recorded as 32.4 decimeters (or rounded to 32 dm) because 1 dm = 10 cm, or it can be recorded as 3.25 meters (or rounded to 3 m), because 1 m = 100 cm.

The Value of Place Value, Part A

Collecting and Organizing Data

1. Use your base-ten materials and your calculator to explore how many tens, hundreds, and thousands are in a number. Record your observations in the table. What patterns do you see?

Number	Number of Thousands	Number of Hundreds	Number of Tens

Analyzing Data and Drawing Conclusions: Patterns

2. Write 5 numbers that have 15 tens.

   _____

3. Write 5 numbers that have 32 hundreds.

   _____

4. Write 5 numbers that have 120 tens.

   _____

The Value of Place Value, Part B

Name _____

Date _____

Collecting and Organizing Data

1. Use your base-ten materials and your calculator to explore how many tenths, hundredths, and thousandths are in a number. Record your observations in the table. What patterns do you see?

Number	Number of Tenths	Number of Hundredths	Number of Thousandths

Analyzing Data and Drawing Conclusions: Patterns

2. Write 5 numbers that have 15 tenths.

   _____

3. Write 5 numbers that have 32 hundredths.

   _____

4. Write 5 numbers that have 120 tenths.

   _____