

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Student Exploration: Modeling Decimals (Base-10 Blocks)

**Vocabulary:** base-10 blocks, base-10 system, decimal, decimal point, whole number

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. Sally has 2 hundred-dollar bills, 6 ten-dollar bills, and 7 ones.

How much money does Sally have? \_\_\_\_\_

2. Buck has 91 one-dollar bills in his wallet. The wallet is so fat it barely fits into his pocket.

What is a better way to carry 91 dollars? \_\_\_\_\_

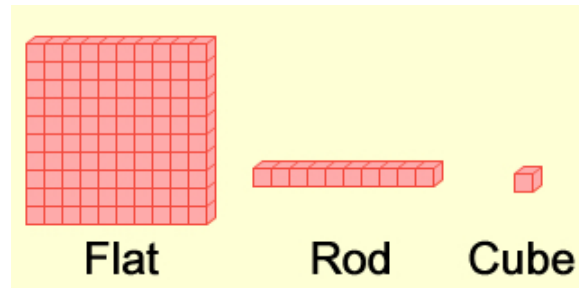
3. Morgan has 214 pennies in her purse. She makes a jingling sound as she walks.

What is a better way to carry 214 cents? \_\_\_\_\_

### Gizmo Warm-up

Most people in the world use a **base-10 system**. Each place in this system represents 10 times as much as the next place to the right. For example, 345 means 3 hundreds + 4 tens + 5 ones.

The *Modeling Decimals (Base-10 Blocks)* Gizmo™ uses **base-10 blocks** to represent numbers. There are three types of blocks: *flats*, *rods*, and *cubes*.



1. Drag one flat, one rod, and one cube onto the yellow mat.

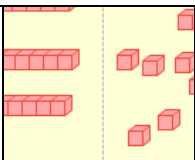
A. How many cubes are in a rod? \_\_\_\_\_

B. How many rods are in a flat? \_\_\_\_\_

C. How many cubes are in a flat? \_\_\_\_\_

2. Click **Clear**. Drag a flat into the **Tens** area. What happens? \_\_\_\_\_

3. Now drag a rod into the **Ones** area. What happens? \_\_\_\_\_

<b>Activity A:</b> <b>Modeling whole numbers</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Click <b>Clear</b>.</li> <li>• Under <b>Set block values</b>, check that <b>100, 10, 1</b> is selected.</li> </ul>	
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Numbers with no fractional or decimal part are called **whole numbers**. With the base-10 blocks shown in the Gizmo, you can model whole numbers up to 1000.

1. Drag 2 flats into the **Hundreds** area, 3 rods into the **Tens** area, and 5 cubes into the **Ones** area of the yellow mat. What number have you modeled? \_\_\_\_\_

Check your answer by turning on **Show value**.

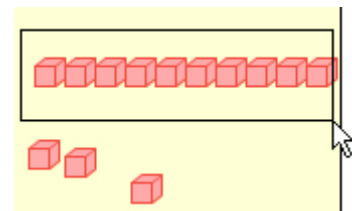
2. Drag one of the flats into the **Tens** area, and drag one of the rods into the **Ones** area.

A. How many total flats, rods, and cubes do you have now?

Flats: \_\_\_\_\_ Rods: \_\_\_\_\_ Cubes: \_\_\_\_\_

B. Has the number being modeled changed? \_\_\_\_\_

3. Click and drag your cursor to select 10 cubes, as shown at right. Drag these cubes into the **Tens** area.



What happens? \_\_\_\_\_

\_\_\_\_\_

4. Use the same method to drag 10 rods into the **Hundreds** area. What happens? \_\_\_\_\_

\_\_\_\_\_

5. Click **Clear**. Model 134 in as many different ways as you can. Describe what you did below:

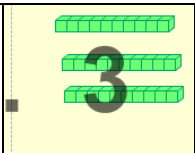
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

6. Wilson has 210 dollars, all in one-dollar bills. He needs a briefcase just to carry his money around. How could Wilson carry his money with the fewest number of bills?

\_\_\_\_\_

<b>Activity B:</b> <b>Modeling decimals</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Click <b>Clear</b>.</li> <li>• Under <b>Set block values</b>, select <b>1, 0.1, 0.01</b>.</li> </ul>	
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**Decimals** are numbers written in the base-10 number system. Often, though, the term “decimal” is used to mean a number with a **decimal point** separating the units place and the tenths place.

1. With block values of **1, 0.1, 0.01** selected, look at the labels next to the flat, rod, and cube at the top of the Gizmo.

- A. What is the value of one cube? \_\_\_\_\_
- B. What is the value of one rod? \_\_\_\_\_
- C. What is the value of one flat? \_\_\_\_\_

2. The flats, rods, and cubes can be converted from one form to another.

- A. Drag a flat into the **tenths** area. How many tenths are in one whole? \_\_\_\_\_
- B. Drag a rod into the **hundredths** area. How many hundredths are in one tenth? \_\_\_\_\_
- C. Click **Clear**. How many hundredths do you think are in one whole? \_\_\_\_\_

Use the Gizmo to check your answer.

3. Turn on **Show values on mat**. Drag flats, rods, and cubes onto the mat until you have created the number 3.18. How many flats, rods, and cubes did you use?

Flats: \_\_\_\_\_      Rods: \_\_\_\_\_      Cubes: \_\_\_\_\_

4. Model 3.18 in at least two other ways. Describe how you did it in the space below.

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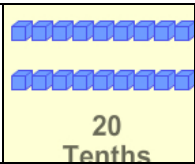
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5. Shontay has 4 dollar bills. She wants to play a video game that only takes dimes. How many dimes can she get for her dollars? How many pennies? Explain.

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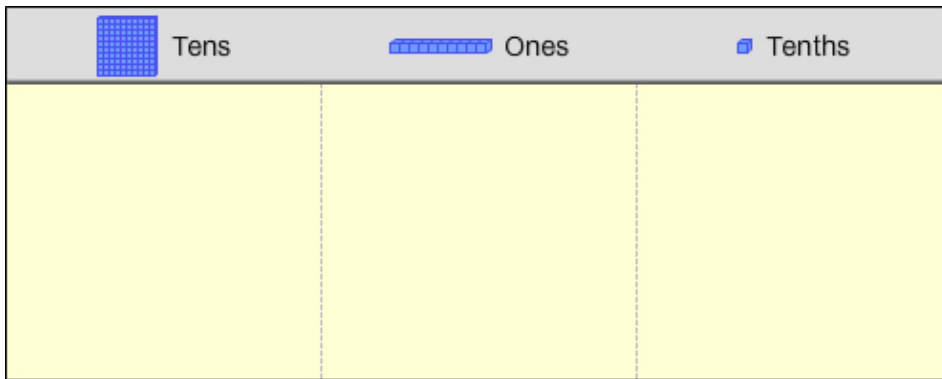
<b>Activity C:</b> <b>Other models</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>Click <b>Clear</b>. Turn off <b>Show values on mat</b> and <b>Show value</b>.</li> <li>Under <b>Set block values</b>, select <b>10, 1, 0.1</b>.</li> </ul>	
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Base-10 blocks can be used to represent any set of places in the base-10 system.

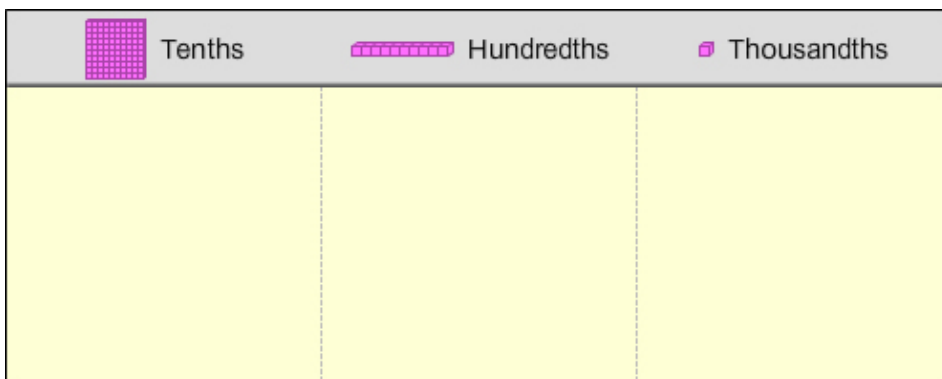
1. With block values set to **10, 1, 0.1**, look at the labels next to the flat, rod and cube at the top.

- In this set, what is the value of one cube? \_\_\_\_\_
- What is the value of one rod? \_\_\_\_\_
- What is the value of one flat? \_\_\_\_\_

2. In the space, draw flats, rods, and cubes to model 25.3. Use the Gizmo to check your work.



3. Click **Clear**, and set the block values to **0.1, 0.01, 0.001**. Sketch a model of the number 0.147, and then use the Gizmo to check your work.



4. Turn **Show values on mat** and **Show value** off. Play the following game with a partner:

- Model a number by dragging flats, rods, and cubes onto the mat.
- Have your partner guess what the number is, and then turn on **Show value** to check.
- Switch roles and play again! Play as many rounds as you like.