

Name: _____

Date: _____

Student Exploration: Adding Decimals

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

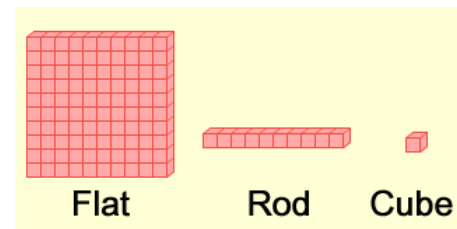
Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

The Gardner family is having a garage sale. Ricky Gardner starts with an empty cash box.

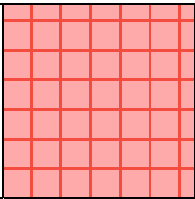
- Mrs. Widget, 8 months pregnant, buys a crib. She gives Ricky 3 ten-dollar bills and 17 one-dollar bills. How much money does Ricky have in his cash box now? _____
- Mr. Horton from out of town buys a large painting of Simon Bolivar. He gives Ricky 2 hundred-dollar bills, 3 ten-dollar bills, and 6 one-dollar bills.
 - How much did Mr. Horton pay for the painting? _____
 - How much money does Ricky have in his cash box now? _____

Gizmo Warm-up

The *Adding Decimals* Gizmo™ uses **base-10 blocks** to model two numbers, called **addends**, which can be added together. Numbers can be modeled with *cubes* (single blocks), *rods* (rows of 10 cubes), and *flats* (squares of 100 cubes). Each of these can be dragged onto the yellow mat to model a number.



- Check that **Set block values** is set to **100, 10, 1**. With the blocks in the top area, model the number 140. Turn on **Show values on mat** to check your answer.
How many flats, rods, and cubes did you use? Flats: _____ Rods: _____ Cubes: _____
- Model 104 with the blocks in the bottom area.
How many flats, rods, and cubes did you use? Flats: _____ Rods: _____ Cubes: _____
- Select **Model sum** and add up the blocks. What is the **sum** of 140 and 104? _____

Activity A: Adding whole numbers	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> • Click Clear. • Be sure Set block values is set to 100, 10, 1. • Select Model addends and Show addends. • Turn off Show values on mat and Show sum. 	
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If you have 13 one-dollar bills in your wallet, it might be convenient to trade in 10 of these bills for a ten-dollar bill. Adding numbers in the **base-10 system** often requires “trading in.”

1. Model 87 with the top blocks, and model 114 with the bottom blocks. Fill in the number of flats, rods, and cubes you used for each number:

87: Flats: _____ Rods: _____ Cubes: _____

114: Flats: _____ Rods: _____ Cubes: _____

2. Select **Model sum**. Click the **Sort** button to arrange the blocks if necessary. How many total flats, rods, and cubes are there?

Sum: Flats: _____ Rods: _____ Cubes: _____

3. If you have 10 cubes, you can “trade them in” for a rod (10 cubes). To do this, drag the cursor to select exactly 10 cubes, and drag them into the **Tens** area.

How many flats, rods, and cubes are there now?

Sum: Flats: _____ Rods: _____ Cubes: _____

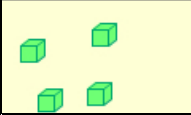
4. If you have 10 rods, you can trade them in for a flat (100 cubes). To do this, drag the cursor to select exactly 10 rods, and drag them into the **Hundreds** area.

How many flats, rods, and cubes are there now?

Sum: Flats: _____ Rods: _____ Cubes: _____

5. What is the sum of 87 and 114? _____ Turn on **Show sum** to check.

6. Look at the numbers under **Show sum**. Notice the little “1”s above the 8 and 7. Based on what you did with the blocks, what do these numbers mean?

Activity B: Adding decimals	<u>Get the Gizmo ready:</u>	■ Hundredths
	<ul style="list-style-type: none"> • Click Clear, and select Model addends. • Turn off Show sum. • Under Set block values, select 1, 0.1, 0.01. 	

If you have 10 one-dollar bills, you can trade them for a ten-dollar bill. The same thing works for cents—you could trade 10 pennies (10 one-cent coins) for a dime (1 ten-cent coin).

1. A **decimal** number is any number written in the base-10 system. Most people think of decimals as any number with a **decimal point** that separates the ones from the tenths. Look at the labels at the top and bottom of the Gizmo.

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

2. Model 1.44 with the top blocks, and model 3.68 with the bottom blocks. Fill in the number of flats, rods, and cubes you used for each number:

1.44: Flats: _____ Rods: _____ Cubes: _____

3.68: Flats: _____ Rods: _____ Cubes: _____

3. Select **Model sum**. Click the **Sort** button to arrange the blocks if necessary. How many total flats, rods, and cubes are there?

Sum: Flats: _____ Rods: _____ Cubes: _____

4. If there are enough cubes, trade in 10 cubes for a rod. If possible, trade in 10 rods for a flat.

How many flats, rods, and cubes are there now?

Sum: Flats: _____ Rods: _____ Cubes: _____

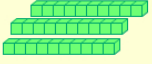
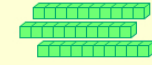
5. What is the sum of 1.44 and 3.68? _____ Turn on **Show sum** to check.

6. Click **Clear**, and turn off **Show sum**. Solve each problem at right. Then use the Gizmo to model each problem and check your answers. (Note: For the last problem, set the block values to **0.1, 0.01, 0.001**.)

$$\begin{array}{r} 0.34 \\ + 0.57 \\ \hline \end{array}$$

$$\begin{array}{r} 2.72 \\ + 3.43 \\ \hline \end{array}$$

$$\begin{array}{r} 0.495 \\ + 0.005 \\ \hline \end{array}$$

Activity C: Ragged decimals	<u>Get the Gizmo ready:</u>	
	<ul style="list-style-type: none"> • Click Clear, and select Model addends. • Turn off Show sum. • Under Set block values, select 1, 0.1, 0.01. 	

Marco has 7 dimes in his pocket, or 0.7 dollars. Julia has 24 pennies (0.24 dollars). They are wondering who has more money, and how much money they have together.

1. Select **Model addends**. Model Marco's seven dimes with 7 rods in the top area, and model Julia's 24 pennies with 24 cubes in the bottom area.

 - A. Who do you think has more money, Marco or Julia? _____
 - B. Convert all of Marco's rods into cubes by dragging them into the **Hundredths** area.
How many cubes does Marco have? _____
 - C. Select all of Julia's cubes, and drag them into the **Tenths** area.
How many rods does Julia have? _____

2. Click **Clear**. Model 0.7 and 0.24 again, but this time use two rods and four cubes to model 0.24. Click **Model sum** and turn on **Show addends**.

 - A. How many rods are there in the sum of 0.7 and 0.24? _____
 - B. How many individual cubes are in the sum of 0.7 and 0.24? _____
 - C. What is the sum of 0.7 and 0.24? _____ Turn on **Show sum** to check.
 - D. Look at the way the sum is written below the **Show addends** checkbox. What do you notice about the two decimal points? _____

3. Click **Clear**, and turn off **Show sum**. In the space at right, use column addition to find the sum of 0.4 and 0.009. Then use the Gizmo to check your answer. (Note: Set the block values to **0.1, 0.01, 0.001**.)

$$\begin{array}{r} + \\ \hline \end{array}$$

 - A. What is the sum of 0.4 and 0.009? _____
 - B. When you add two decimals with different numbers of digits, it can be a challenge to line them up correctly. What is a good rule for lining up decimals?

