# Number and Operations in Base Ten

In fifth grade, students continue building on **base ten** concepts. In earlier grades, they examined the relationships among digits in whole numbers. They now extend their learning to understand base ten relationships among decimals, with focused attention on reasoning about the magnitudes of numbers.

Students 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 $\frac{1}{10}$ of what it represents in the place to its left. They develop fluency in applying concepts to decimal notation and adding and subtracting decimals. Additionally, students learn why division procedures work based on the meanings of numerals and the properties of operations.

Additionally, students are able to explain patterns related to the number of zeros in products when multiplying a number by powers of 10 and what happened to the placement of the decimal point when a decimal number is multiplied or divided by a power of ten. They read, write, and compare decimals to thousandths; use base ten numerals, number names, and expanded form; and use place value understanding to round decimals to any place.

**The Grade 5 Common Core State Standards for Number and Operations in Base Ten specify that students should–**

- Understand the place value system.
- Perform operations with multi-digit whole numbers and with decimals to hundredths.

The following hands-on activities will help students learn base ten concepts in a meaningful way. Concrete models and number lines are especially useful in helping students understand decimals and equivalence of decimals. Models can help students discover patterns and structure in numbers. When adding, subtracting, multiplying, and dividing fractions and decimals, students should examine numerical patterns and relate them to rules, models, and graphic representations.

# Number and Operations in Base Ten

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LESSON 1

## Number and Operations in Base Ten

# Decimals

Decimal place value is an extension of whole-number place value, which students have studied previously. A common model used to help students understand place value is Base Ten Blocks, which work with both decimals and whole numbers. In this activity, students use the blocks to model tenths, hundredths, and thousandths.

### Objective

Understand place value in decimal numbers.

### Common Core State Standards

- **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.
- **5.NBT.3a** Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000).

**Try It!** *Perform the Try It! activity on the next page.*

## Talk About It

Discuss the Try It! activity.

- **Ask:** *What fraction of the whole does a flat represent?* Elicit that a flat is $\frac{100}{1,000}$, or $\frac{1}{10}$ of the whole.
- **Ask:** *What fraction of the whole does a rod represent?* Elicit that a rod is $\frac{10}{1,000}$, or $\frac{1}{100}$ of the whole.
- **Ask:** *What fraction of the whole does a unit represent?* Elicit that a unit is $\frac{1}{1,000}$ of the whole.
- Tell students that the expression 0.1 + 0.02 + 0.005 is an expanded form of the decimal number 0.125. Present and discuss the equivalent form $1 \times \frac{1}{10} + 2 \times \frac{1}{100} + 5 \times \frac{1}{1,000}$.

## Solve It

Reread the problem with students. Elicit from students that the 125 cyclists in each group represent a fraction of the 1,000 cyclists in the race and that this fraction, $\frac{125}{1,000}$, also can be expressed using the decimal number 0.125. Both numbers mean "one hundred twenty-five thousandths." Students break 0.125 into place-value parts to model this number using 125 total units.

## More Ideas

For other ways to teach decimals—

- Have students use Base Ten Blocks to model other decimal numbers, such as 0.6, 0.42, 0.07, 0.305, 0.009, and 0.231.
- Have students use Base Ten Blocks to show that 1 tenth (flat) = 10 hundredths (rods) = 100 thousandths (units). Then have them write the corresponding decimal numbers, 0.1 = 0.10 = 0.100, and the corresponding fractions, $\frac{1}{10} = \frac{10}{100} = \frac{100}{1,000}$.

## Formative Assessment

Have students try the following problem.

*Which of the following is an expanded form of 0.408?*

**A.** 0.4 + 0.8 **B.** 0.4 + 0.08 **C.** 0.4 + 0.008 **D.** 0.04 + 0.008

## Try It! 20 minutes | Groups of 3

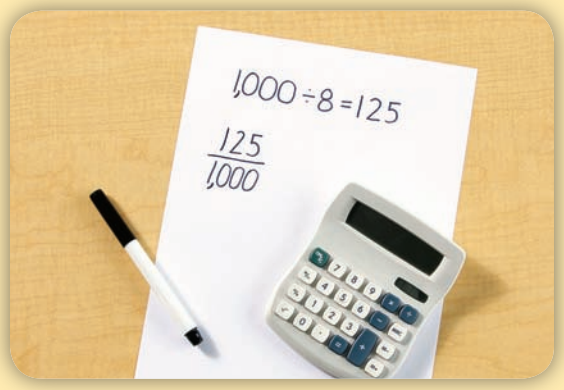
Here is a problem about decimals.

*A bicycle race has 1,000 cyclists divided into 8 equal groups. Each group will start the race at a different time. The first group starts at 8:00 AM, the second group starts at 8:15 AM, the third group starts at 8:30 AM, and so on. Write and model a decimal number for the fraction of the 1,000 cyclists that is represented by each group.*

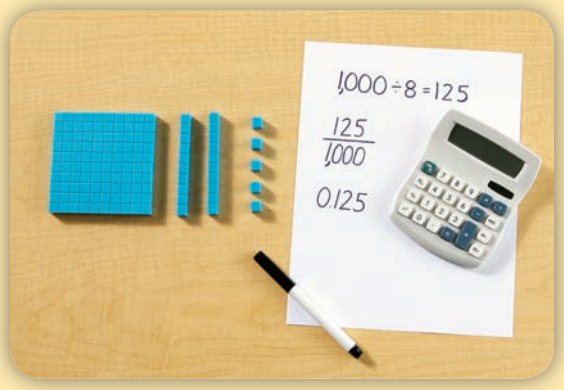
Introduce the problem. Then have students do the activity to solve the problem. Distribute Base Ten Blocks, worksheets, paper, and pencils. Display the large cube and say it represents the whole (1,000 cyclists). Have students determine the values of the other blocks.

### Materials

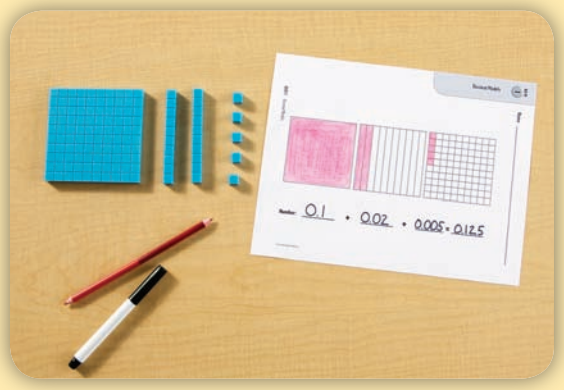
- Base Ten Blocks (1 flat, 10 rods, and 20 units per group, and 1 large cube for teacher demonstration)
- Decimal Models (BLM 1; 1 per group)
- paper (1 sheet per group)
- colored pencils (1 per group)




**1. Say:** *Calculate the number of cyclists in each group.* Students divide 1,000 by 8 and get 125. **Ask:** *If there are 125 cyclists in each group and 1,000 cyclists altogether, what fraction does each group represent? Write the fraction.* Students write $\frac{125}{1,000}$.




**2. Say:** *Model this fraction as a decimal. The decimal has three parts: tenths, hundredths, and thousandths.* Students use 1 flat, 2 rods, and 5 units. **Ask:** *How could we redefine the Base Ten Blocks so we can represent this decimal?*




**3. Say:** *Now, color and complete the worksheet to match the blocks you used to represent 0.125.* Students complete the worksheet.

### ⚠ Look Out!

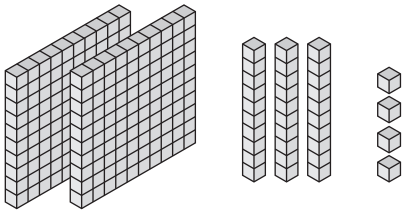
Students might think that the 1 flat, 2 rods, and 5 units represent the whole number 125, rather than the decimal number 0.125. This is good mathematical thinking, because these blocks can represent both 125 and 0.125! Explain this to students in terms of place value.

**Answer Key**

**Use Base Ten Blocks to model each number as a fraction of 1,000. Write the decimal. Tell the number in each place-value position.**

(Check students' work.)

**1.**



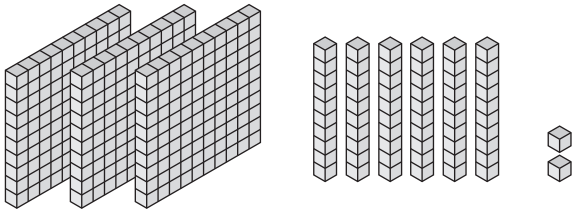
0.234

2 tenths

3 hundredths

4 thousandths

**2.**



0.362

3 tenths

6 hundredths

2 thousandths

**Using Base Ten Blocks, model the number as a fraction of 1,000. Sketch the model. Write the decimal. Tell the number in each place-value position.**

**3.** 412 out of 1,000 (Check students' models.)

0.412

4 tenths 1 hundredths 2 thousandths

**Write each fraction as a decimal.**

**4.** $\frac{556}{1,000}$ 0.556

**5.** $\frac{135}{1,000}$ 0.135

**6.** $\frac{89}{1,000}$ 0.089

**7.** $\frac{210}{500}$ 0.420

**8.** $\frac{80}{500}$ 0.160

**9.** $\frac{442}{500}$ 0.884

## Answer Key

**Challenge!** Explain why you want the denominators of these fractions to be 1,000 when you are writing a fraction as a decimal. In Problems 7–9, what must you do to get the fraction so that the denominator is 1,000?

Challenge: (Sample) When the denominator is 1,000, the decimal equivalent is the numerator written as thousandths. For Problems 7–9, the denominator is 500. Multiply both the numerator and denominator by 2 so that the denominator is 1,000. Then, the decimal equivalent is the numerator written in thousandths.

LESSON 2

## Objective

Compare decimals to the thousandths place.

## Common Core State Standards

- **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.
- **5.NBT.3b** Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

### Number and Operations in Base Ten

# Comparing Decimals

Proficiency in comparing decimal values is an important building block for future mathematical learning and problem solving. Yet, decimal order can be challenging to students, because unlike the case with whole numbers, place values increase as they approach the decimal point. This lesson will help students learn to evaluate the sizes of decimals by working from the decimal point to the thousandths place.

**Try It!** *Perform the Try It! activity on the next page.*

## Talk About It

Discuss the Try It! activity.

- **Ask:** *Can you name the place values in decimals? Which place do we look at first?*
- **Ask:** *How many thousandths are in one hundredth? How many hundredths are in one tenth?*
- Discuss that a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left. Have students make a place value chart if necessary.

## Solve It

Reread the problem with students. Have students look over their labeled number lines and discuss the order of the weights in terms of place value. Have them compare pairs of weights using the symbols < and >.

## More Ideas

For other ways to teach about comparing decimals—

- Have students use Base Ten Blocks to model decimals. Show them the 1,000 cube and tell them it represents 1. Then elicit that a flat is $\frac{1}{10}$, a rod is $\frac{1}{100}$, and a unit is $\frac{1}{1{,}000}$. Have students record the decimals they model on Decimal Models (BLM 1).
- Have students create place value charts for decimals. Explain that there is no "oneths" place because decimals represent parts of wholes.

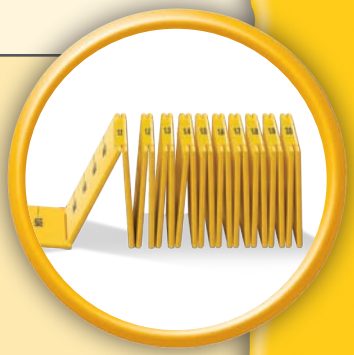
## Formative Assessment

Have students try the following problem.

*Which of the following decimals is greatest?*

**A.** 0.509 **B.** 0.059 **C.** 0.905 **D.** 0.950

## Try It! 15 minutes | Groups of 4



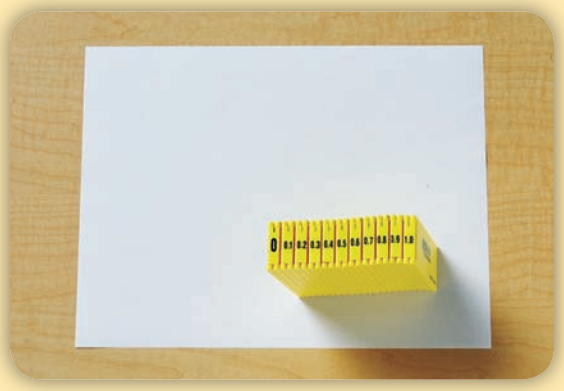
Here is a problem about comparing decimal numbers.

*Lena is weighing rocks for a science experiment. The weights are 0.098 kg, 0.028 kg, 0.150 kg, and 0.095 kg. Help her arrange the rocks from least weight to greatest.*

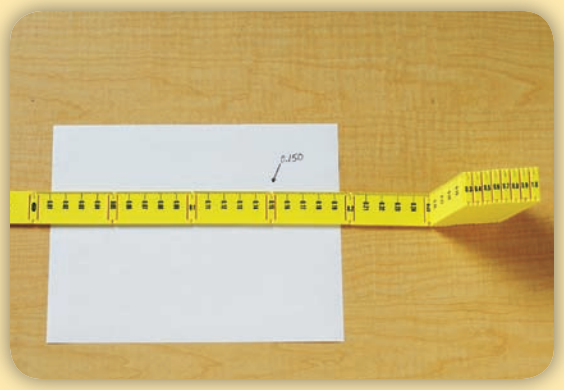
Introduce the problem. Then have students do the activity to solve the problem. Distribute Folding Number Lines, paper, and pencils to students.

### Materials

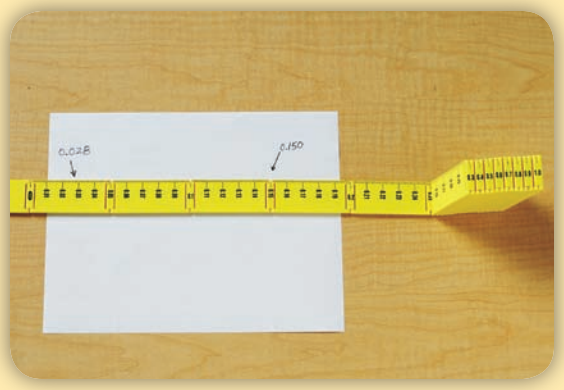
- Folding Number Line (1 per group)
- paper (1 sheet per group)
- pencils



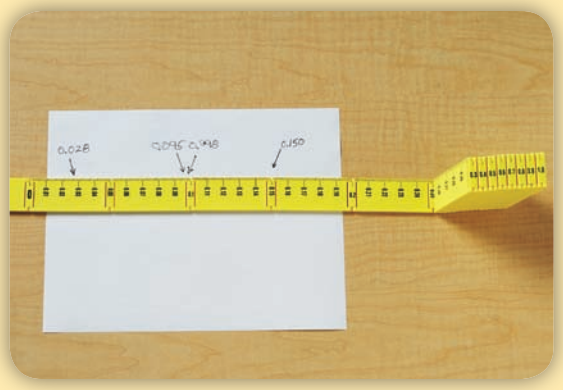
**1.** Write 0.098, 0.028, 0.150, and 0.095 on the board. **Ask:** *Are these numbers greater than or less than 1? Which number line should you use to locate these numbers?* Elicit from students that they should use the 0–1 line.



**2.** Have students look at the tenths place of each number and decide where to open the number line. Ask them to expose a range that includes all the numbers and lay it on a piece of paper. **Ask:** *By comparing tenths, can you tell which number is greatest?* Elicit that 0.150 is the greatest. Have students locate 0.150, draw an arrow pointing to it, and label the arrow.



**3. Say:** *Look at the other numbers. Compare the hundredths place.* **Ask:** *Which one is different? Is that number greater than or less than the other two?* Elicit that the hundredths place of 0.028 is different and that 0.028 is less than 0.095 and 0.098. Have students locate 0.028, draw an arrow pointing to it, and label the arrow.

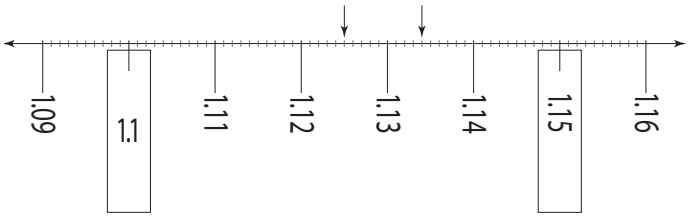


**4. Say:** *Compare 0.095 and 0.098.* **Ask:** *Which place do you need to compare?* Elicit from students that they need to compare the thousandths place. Have students locate and label 0.095. **Ask:** *Should 0.098 be to the left or right of 0.095?* Have students locate and label 0.098. Elicit that it is to the right.

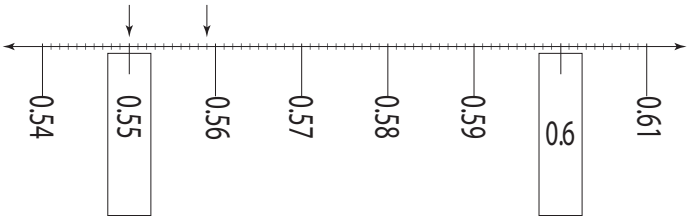
**Answer Key**

**Use a Folding Number Line to model and compare the decimals. Insert a <, >, or = symbol in the circle.** (Check students' work.)

**1.** 1.134 ( > ) 1.125




**2.** 0.550 ( < ) 0.559




**Using a Folding Number Line, model and compare the decimals. Sketch the model on a number line. Insert a <, >, or = symbol in the circle.**

(Check students' models.)

**3.** 0.895 ( < ) 0.990

**4.** 1.111 ( > ) 1.099

**Use a <, >, or = symbol to compare the decimals.**

**5.** 3.001 ( > ) 2.995

**6.** 0.009 ( < ) 0.010

**7.** 0.999 ( < ) 1.001

**8.** 2.540 ( < ) 2.550

**9.** 0.030 ( > ) 0.029

**10.** 0.001 ( < ) 0.100

## Answer Key

**Challenge!** How many times bigger is 0.050 than 0.005? Explain how you know.

Challenge: 10; a digit in one place represents 10 times as much as it represents in the place to its right.

LESSON 3

## Objective

Use place value to round decimals.

## Common Core State Standards

- **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.
- **5.NBT.4** Use place value understanding to round decimals to any place.

### Number and Operations in Base Ten

# Rounding Decimals

Students need a solid understanding of place value to round decimals correctly. Using concrete models that represent tenths, hundredths, and thousandths helps them build this understanding. This lesson will reinforce students' knowledge of place value and help them focus on rounding to the desired place.

**Try It!** *Perform the Try It! activity on the next page.*

## Talk About It

Discuss the Try It! activity.

- Write *0.259* on the board and review the place value of each digit. **Ask:** *Which digit do we look at when rounding to the hundredths place?* Underline the 9. **Ask:** *Which of our Base Ten Blocks represent the thousandths place?*
- **Ask:** *Which digit do we look at when rounding to the tenths place?* Underline the 5. **Ask:** *Which of our Base Ten Blocks represent the hundredths place?*
- Suggest students draw an arrow to the digit they are rounding to.

## Solve It

Reread the problem with students. Make sure they understand that the problem is asking for two separate answers. Remind them to look only at the digit to the immediate right of the place they are rounding to. Have students write sentences explaining the answers.

## More Ideas

For other ways to teach about rounding decimals—

- Have pairs make up their own decimals to round and challenge each other. Make sure they are rounding to a variety of place values.
- Have students use the Folding Number Line to round decimals.

## Formative Assessment

Have students try the following problem.

*What is 24.462 rounded to the nearest tenth?*

**A.** 24.4 **B.** 24.46 **C.** 24.5 **D.** 25

## Try It! 15 minutes | Groups of 4

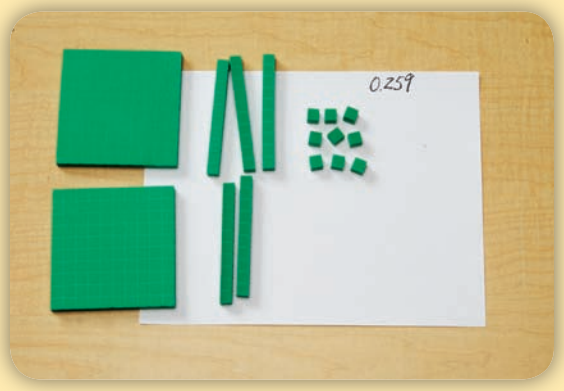
Here is a problem about rounding decimals.

*Alvin's model airplane has wheels that are 0.259 inch wide. He wants to compare the wheels to some wheels he sees in a catalog. He needs to round the width to the nearest hundredth of an inch and to the nearest tenth of an inch. Can you help?*

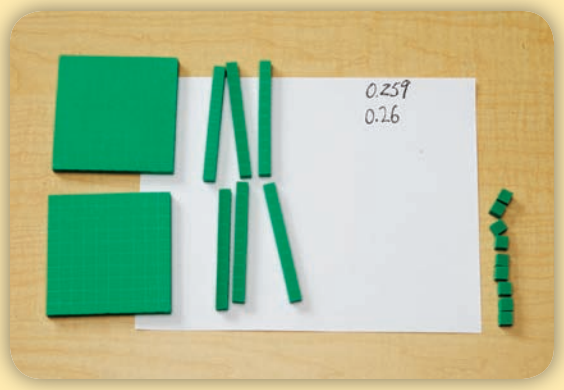
Introduce the problem. Then have students do the activity to solve the problem. Distribute Base Ten Blocks, paper, and pencils to students.

### Materials

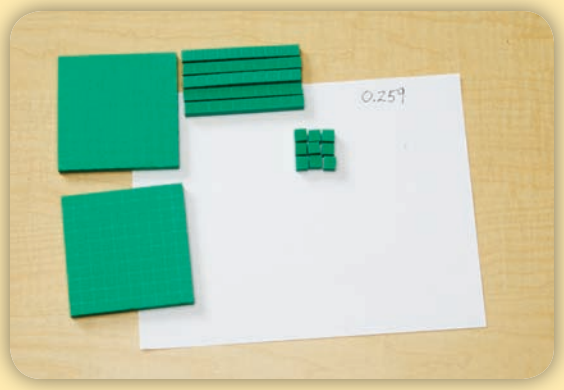
- Base Ten Blocks
- paper (1 sheet per group)
- pencils (1 per group)



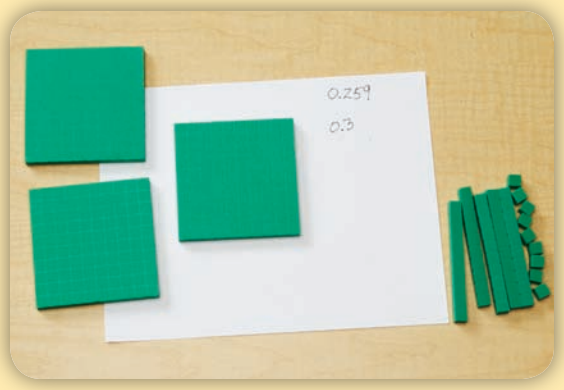

**1.** Have students write the decimal 0.259 and model it with Base Ten Blocks. Remind students that the large cube represents one whole. If necessary, guide students to use 2 flats, 5 rods, and 9 units. **Ask:** *What digit is in the tenths place? Hundredths place? Thousandths place?*




**2. Say:** *Let's round to the nearest hundredth.* **Ask:** *What should we do with the thousandths?* Have students line up the 9 units alongside one of the rods. **Ask:** *Are the units few enough to just remove them, or is it better to replace them with a rod?* Elicit that since 9 is closer to 10 than to 0, it makes more sense to replace the 9 units with a rod. Have students write the result, 0.26.




**3.** Have students write and build 0.259 again. **Say:** *Let's round to the nearest tenth.* Have students match up the 5 rods with 5 rows of one of the flats. Elicit that the 5 rods are exactly half of a flat so it's not clear whether the rods should be rounded up to another whole flat.




**4.** Tell students that by general agreement we round up when the place to the immediate right is 5. You can point out that the 9 thousandths tip the balance but that they would round up even if there were no thousandths. Have them replace the rods and units with a flat and write the result, 0.3.

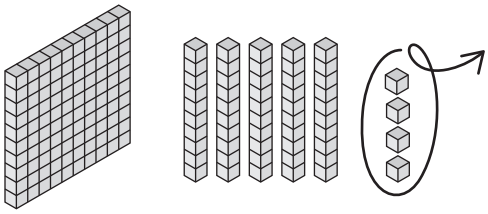
Answer Key

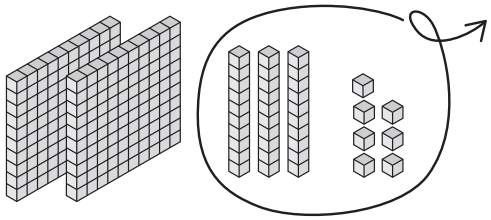
**Use Base Ten Blocks to build the model. Round the decimal to the specified place.**

(Check students' work.)

**1.** Round 0.154 to the nearest hundredth: 0.15

**2.** Round 0.237 to the nearest tenth: 0.2





**Using Base Ten Blocks, model the number and round to the specified place. Sketch the model.**

(Check students' models.)

**3.** Round 0.357 to the nearest tenth: 0.4

**4.** Round 0.089 to the nearest hundredth: 0.09

**Round to the nearest tenth.**

**5.** 0.099 0.1

**6.** 0.825 0.8

**7.** 0.111 0.1

**Round to the nearest hundredth.**

**8.** 0.673 0.67

**9.** 0.176 0.18

**10.** 0.099 0.10

## Answer Key

**Challenge!** Clyde and Leah want to combine their money. They have no paper, pencils, or calculators, so they solve the problem mentally by rounding. Clyde has $2.68 and Leah has $3.49. Clyde rounds both amounts to the nearest dollar and then adds them. Leah rounds the amounts to the nearest ten cents and adds them. Which rounding attempt most accurately describes their combined total?

Challenge: (Sample) Clyde's attempt rounded to $6.00, and Leah's rounded to $6.20. Leah's rounding attempt more accurately describes the actual combined total of $6.17.

LESSON 4

## Number and Operations in Base Ten

# Add and Subtract Decimals I

Students should be introduced to a variety of strategies for solving decimal problems, including models, pictures, estimation, and paper-and-pencil computing. The focus of adding and subtracting decimals should be on students' understanding of number sense and operations, rather than a specific computational process. Students use their knowledge of the base ten number system to regroup decimals into whole numbers when adding.

### Objective

Add and subtract decimals.

### Common Core State Standards

- **5.NBT.7** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

**Try It!** *Perform the Try It! activity on the next page.*

## Talk About It

Discuss the Try It! activity.

- Explain that the first place to the right of the decimal is "tenths." Write *1.2* on the board. **Ask:** *How do we read this number? How much is the* 2 *worth? How much is the* 1 *worth?*
- **Ask:** *In what situations would it be important to understand decimals? When might you need to add or subtract decimals?*
- **Ask:** *How are adding and subtracting decimals similar to adding and subtracting whole numbers? How are they different?*

## Solve It

With students, reread the problem. Have students draw models of Makayla's two pieces of yarn and mark off each tenth. Then have students write a sentence to explain how they added the numbers together to get the total.

## More Ideas

For other ways to teach about adding and subtracting decimals—

- Have students practice adding tenths using Two-Color Counters. Direct students to model two addends with the counters yellow-side up. As students count the tenths, they should flip the counters over to the red side and set them aside as a group every time they reach 10.
- Have students use a Place-Value Chart (BLM 10) and Centimeter Cubes to add decimals. Relabel the charts to show ones, tenths, and hundredths. Provide story problem scenarios, and have students model each addend on the chart. Tell students to model the sum in the bottom row of the chart, reminding them to regroup the tenths into whole ones, if necessary.

## Formative Assessment

Have students try the following problem.

*Riana and Jake take turns feeding the class hamster. One week Jake gives the pet 0.7 cups of food, and the next week Riana gives him 0.8 cups of food. How much food in total did the hamster get during the two weeks?*

**A.** 1.3 cups **B.** 1.5 cups **C.** 1.7 cups **D.** 1.9 cups

## Try It! 25 minutes | Pairs

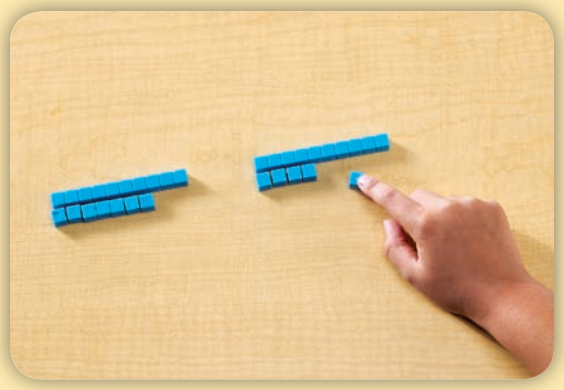
Here is a problem about adding and subtracting decimals.

*The art teacher, Mr. Davis, asked students to cut two different lengths of yarn to use in an art project. Makayla cut one piece of yarn that was 0.7 meters long and another that was 0.5 meters long. How much yarn did Makayla cut altogether?*

Introduce the problem. Then have students do the activity to solve the problem. Distribute Base Ten Blocks to students.

### Materials

- Base Ten Blocks (3 rods and 15 units per pair)



**1. Say:** *We want to add 0.7 and 0.5. Let's say that for this activity, a rod equals 1 and a unit equals 0.1.* Have students model 0.7 and 0.5 with the blocks.

**2.** Have students count the units. Then have students regroup the blocks to end up with 1 rod and 2 units. **Ask:** *What number do the blocks add up to?*

**3. Ask:** *What if we wanted to find the difference between 0.7 and 0.5?* Guide students to model 0.7 – 0.5 with the units. Remind them that they are using 1 rod to represent 1 whole.

### ⚠ Look Out!

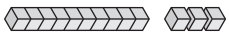
Watch out for students who express a sum greater than 1 in tenths or hundredths. Use Fraction Tower® Equivalency Cubes to reinforce the idea that a sum with 10 or more tenths must be regrouped into a whole number. For example, 0.5 + 0.9 = 1.4, not 0.14.

**Answer Key**

**Use Base Ten Blocks to model each decimal. Let a rod equal 1 and a unit block equal 0.1. Fill in the blanks with decimals. Find the sum or difference.**

(Check students' work.)

**1.**  0.4 + 0.9 = 13 unit block

 1.3

**2.**  0.9 – 0.4 = 5 unit block

 0.5

**Using Base Ten Blocks, model each pair of decimals using a rod to equal 1. Then sketch the models. Find the sum or difference.**

(Check students' models.)

**3.** 0.3 + 1.2

**4.** 1.3 – 0.6

1.5

0.7

**Find each sum or difference.**

**5.** 0.8 + 0.3

1.1

**6.** 0.8 – 0.4

0.4

**7.** 1.7 – 0.2

1.5

**8.** 0.3 + 0.8 + 0.5

1.6

**9.** 0.8 – 0.7

0.1

**10.** 1.6 – 0.9

0.7

## Answer Key

**Challenge!** Show a different model for Problem 5 that uses the same numbers and has the same sum. What property does your model demonstrate? Can you apply this property to Problem 10? Explain your answer.

Challenge: (Sample) 0.3 + 0.8 = 1.1; Commutative Property of Addition; No; There is no Commutative Property of Subtraction because subtraction is not commutative.

LESSON 5

## Objective

Add and subtract decimals involving tenths and hundredths.

## Common Core State Standards

- **5.NBT.7** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

### Number and Operations in Base Ten

# Add and Subtract Decimals II

Students will deepen their understanding of the base ten system as they regroup hundredths, tenths, and ones when they add and subtract decimals. Developing number sense helps students grasp the concept of addition and subtraction and leads to an understanding that these two operations are inversely related. This prepares students for multiplying and dividing decimals.

**Try It!** *Perform the Try It! activity on the next page.*

## Talk About It

Discuss the Try It! activity.

- **Ask:** *Why do you count the hundredths first?*
- **Ask:** *When adding, why do you need to regroup hundredths? Tenths?*
- **Ask:** *When subtracting hundredths, how do you regroup tenths? How do you regroup ones to subtract tenths?*
- **Ask:** *How can you use inverse operations to check your solutions?*

## Solve It

Reread the problem with students. Before students begin to solve the problems, make sure they understand why they are adding or subtracting. Encourage them to check that they have regrouped correctly.

## More Ideas

For other ways to teach about adding and subtracting decimals—

- Have students use Fraction Tower® Equivalency Cubes or Snap Cubes® to add and subtract decimals to tenths. When using the Snap Cubes, tell students that each cube represents one tenth and each set of 10 cubes snapped together represents 1 whole. Provide various scenarios using decimals up to 0.9 and have students add and subtract decimals with regrouping. Have students snap together 10 Fraction Tower Equivalency Cubes or Snap Cubes when regrouping 10 tenths as 1 whole to reinforce the relationship between tenths and ones.
- Have students use Deluxe Rainbow Fraction® Circles and the decimal ring to add and subtract numbers to tenths and hundredths.

## Formative Assessment

Have students try the following problem.

*Ms. Jenks bought 1.75 pounds of ham and 0.8 pound of turkey from the deli. How many more pounds of ham than turkey did she buy?*

**A.** 2.55 pounds **B.** 1.83 pounds **C.** 0.95 pound **D.** 1.67 pounds

## Try It! 25 minutes | Pairs

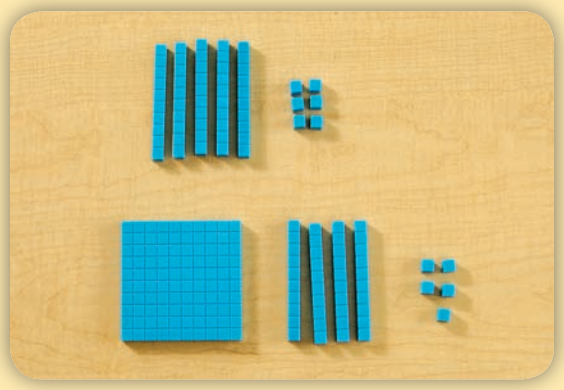
Here is a problem about adding and subtracting decimals.

*Joaquin hiked 0.56 mile in the morning and 1.45 miles in the afternoon. Joaquin wants to record in his journal how many miles he hiked altogether and how much farther he hiked in the afternoon. What distances should he put in his journal?*

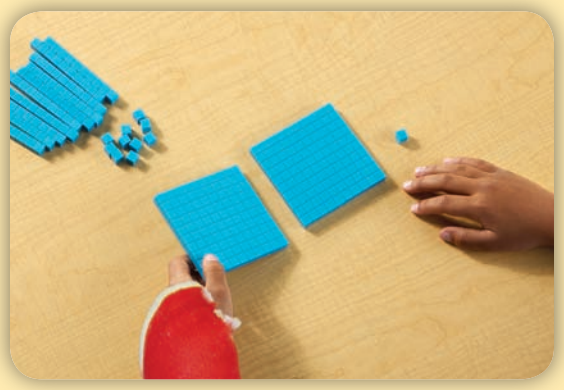
Introduce the problem. Then have students do the activity to solve the problem. Distribute Base Ten Blocks to students. Explain to students that a flat equals $\frac{100}{100}$, or 1. Have students determine the value of a rod and of a unit.

### Materials

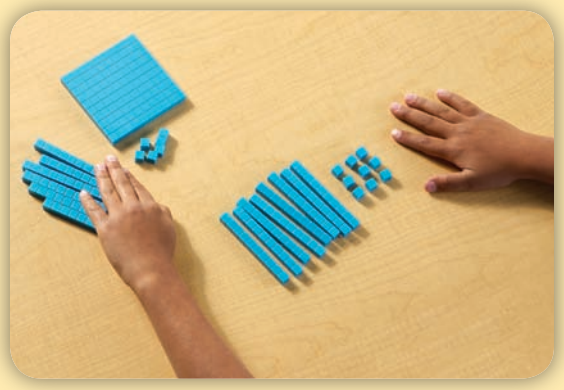
- Base Ten Blocks (2 flats, 15 rods, and 25 units per pair)



**1. Say:** *You want to add 0.56 and 1.45 to find the total distance Joaquin hiked.* Have students model 0.56 and 1.45 with the blocks.



**2. Say:** *Count the hundredths and regroup. Then count the tenths and regroup.* After students have counted and regrouped, they should show 2 flats and 1 unit. **Ask:** *How many miles did Joaquin hike?*



**3. Ask:** *Now you want to know how much farther Joaquin hiked in the afternoon than in the morning. What operation do you use?* Write *1.45 – 0.56* on the board, and have students model the subtraction. Help them regroup when subtracting hundredths and tenths.

### ⚠ Look Out!

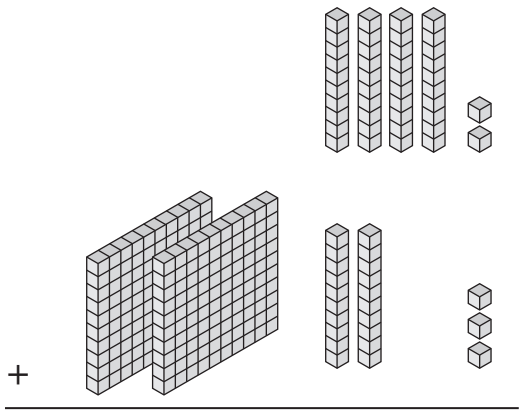
Some students might express the solution to the addition problem as 2.1 rather than 2.01. Remind students that 1 unit represents $\frac{1}{100}$ and is expressed 0.01 as a decimal. Model the differences between 2.0 and 2.1 using Base Ten Blocks. Show that 2.0 is the same as 1 whole and 10 tenths and that 2.1 is equivalent to 1 whole and 11 tenths. This will reinforce the importance of placing a zero in the tenths place when regrouping 10 tenths as 1 whole.

**Answer Key**

**Use Base Ten Blocks to model each sum or difference. Let the flat equal 1 whole. Write and complete the number sentence for each model.**

(Check students' work.)

**1.**



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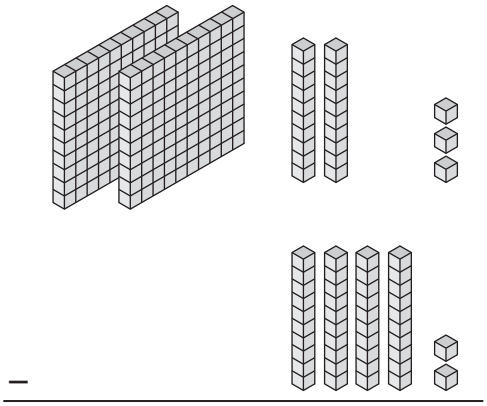
2.65

**2.**



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1.81

**Using Base Ten Blocks, model each sum or differnce. Sketch the model. Write the sum or difference.**

(Check students' models.)

**3.** 1.78 + 2.53

4.31

**4.** 3.16 – 0.86

2.3

**Find each sum or difference.**

**5.** 0.16 + 2.27

2.43

**6.** 4.12 – 1.24

2.88

**7.** 1.94 + 2.08

4.02

**8.** 2.56 – 0.76

1.8

## *Answer Key*

**Challenge!** Describe any exchanges you made with the Base Ten Blocks to find the difference for Problem 8. Draw a picture to help.

Challenge: (Sample) I had to trade one flat for 10 rods so that I could subtract the 7 rods. That left me with 8 rods and one flat.

LESSON 6

## Objective

Multiply and divide decimals to hundredths.

## Common Core State Standards

- **5.NBT.7** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Number and Operations in Base Ten

# Multiply and Divide Decimals

As students multiply and divide decimals, they use and develop concepts such as multiplication as repeated addition and division as sharing. These are concepts that students learned when they worked with whole numbers and fractions. After completing this activity, students should know when to add, subtract, multiply, or divide to solve a real-world decimal problem.

**Try It!** *Perform the Try It! activity on the next page.*

## Talk About It

Discuss the Try It! activity.

- **Ask:** *How does repeated addition help you model the problem?*
- **Ask:** *In Step 2, why do you regroup the units first and then the rods?*
- **Ask:** *In Step 4, why do you regroup in the opposite order that you regrouped in Step 2, from flats to rods instead of from units to rods?*

## Solve It

Reread the problem with students. Have them count the total number of rods and units after they regroup. Remind them to regroup 10 units as one rod, 10 rods as one flat, and one flat as 10 rods as necessary.

## More Ideas

For other ways to teach multiplying and dividing decimals—

- Have students use Base Ten Blocks and Hundredths Grids (BLM 11) to multiply a decimal by a whole number, such as 0.4 × 2. Have them model 0.4 using 4 rows of a grid, remove the rods, and shade the rows in one color. Then have them repeat the model below the first model. Have students count the tenths.
- Have students use Base Ten Blocks to divide a decimal by a whole number, such as 1.5 ÷ 3. Have them model 1.5 and then regroup the one flat as 10 rods. Now have them use repeated subtraction to group 3 rods at a time until no rods remain.

## Formative Assessment

Have students try the following problem.

*Katrina can swim 5 meters in 4.35 seconds. How long does it take her to swim 1 meter?*

**A.** 0.81 second **B.** 0.87 second **C.** 0.91 second **D.** 0.95 second

## Try It! 30 minutes | Groups of 4

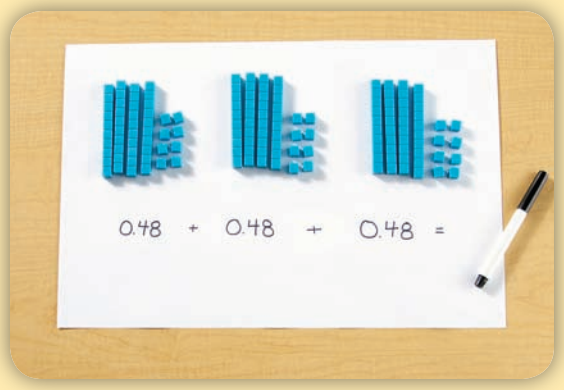
Here is a problem about multiplying and dividing decimals.

*Diego bought 3 DVDs from an online store. If one DVD weighs 0.48 pound, what is the shipping weight of 3 DVDs? Diego also bought 3 copies of a book online. The total shipping weight for the books is 2.37 pounds. What is the shipping weight of one book?*

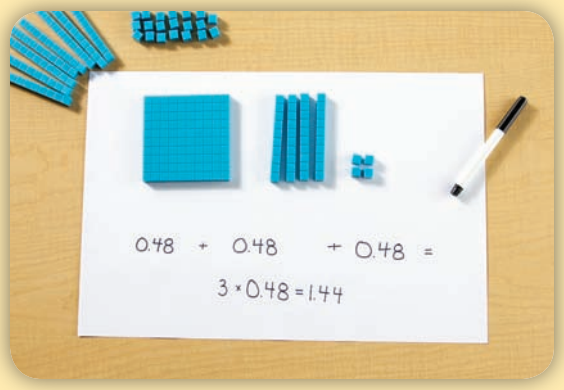
Introduce the problem. Then have students do the activity to solve the problem. Distribute Base Ten Blocks, paper, and pencils. Tell students that a flat represents 1.0. Have students determine what a rod and a unit represent.

### Materials

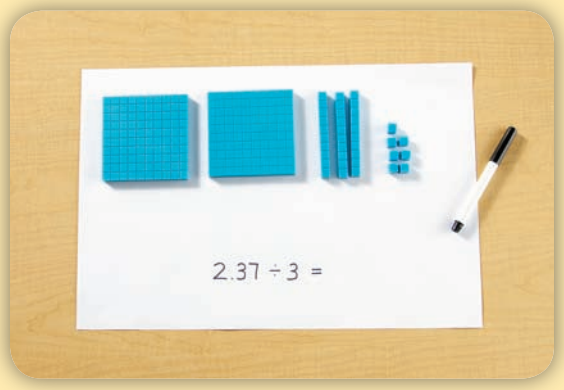
- Base Ten Blocks (2 flats, 21 rods, and 30 units per group)
- paper (11" x 17"; 2 sheets per group)
- pencils (1 per group)



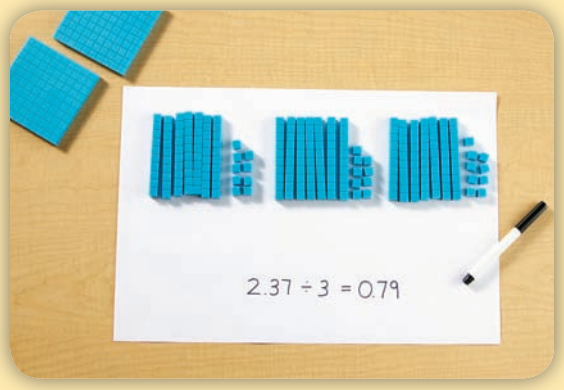

**1. Say:** *Multiplication is repeated addition, so you can model the problem as 0.48 + 0.48 + 0.48.* Have students model the problem as 3 sets of 4 rods and 8 units and write *0.48 + 0.48 + 0.48* = on the first sheet of paper.




**2. Say:** *Combine the rods and units.* Have students group the rods and group the units. **Say:** *Regroup the units as rods and the rods as flats.* **Ask:** *What is the total shipping weight of the DVDs?* Have students write *3 × 0.48 = 1.44* below the first equation.




**3. Say:** *The total shipping weight of three books is 2.37 pounds.* **Ask:** *What is the shipping weight of one book? What do you need to do to solve the problem?* Have students use the Base Ten Blocks to model 2.37 and write *2.37 ÷ 3* = on the second sheet of paper.



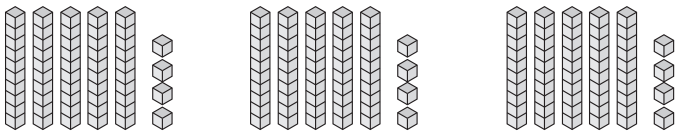

**4. Say:** *To form 3 equal groups, you must first regroup the flats as rods and then share them equally among the groups.* Have students form the 3 equal groups. **Say:** *Now regroup the rods as units and share them equally among the groups.* **Ask:** *What is the weight of one book?* Finally, have students complete the equation, *2.37 ÷ 3 = 0.79.*

Answer Key

**Let the flat represent a whole (1). Use Base Ten Blocks to model multiplication of decimals. Write a number sentence to show the product. Sketch the product.**

(Check students' work.)

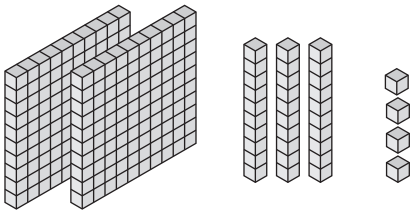
**1.**



0.54 × 3 = 1.62

**Let the flat represent a whole (1). Use Base Ten Blocks to model division by 3. Write a number sentence to show the quotient. Sketch the quotient.**

**2.**



2.34 ÷ 3 = 0.78

**Find each product or quotient.**

**3.** 2.56 ÷ 2

1.28

**4.** 1.32 × 4

5.28

**5.** 0.48 × 3

1.44

**6.** 6.39 ÷ 3

2.13

**7.** 5.08 ÷ 4

1.27

**8.** 4.22 × 2

8.44

## Answer Key

**Challenge!** Describe what you did differently in Problems 1 and 2.

Challenge: (Sample) In Problem 1, I used repeated addition to show multiplication. In Problem 2, I used equal sharing to show division.