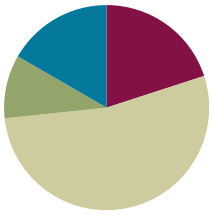
Lesson 8

Objective: Round a given decimal to any place using place value understanding and the vertical number line.

Related Topics: More Lesson Plans for the Common Core Math

Suggested Lesson Structure



Fluency Practice	(12 minutes)
Application Problems	(6 minutes)
Concept Development	(32 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**

Fluency Practice (12 minutes)

- Rename the Units **5.NBT.3** (6 minutes)
- Round to Different Place Values **5.NBT.4** (6 minutes)

Rename the Units (6 minutes)

Note: Decomposing common units as decimals will strengthen student understanding of place value.

T: (Write 13 tenths = ____.) Say the decimal.
S: One and 3 tenths.

Repeat the process for 14 tenths, 24 tenths, 124 tenths, and 524 tenths.

T: Name the number of tenths. (Write 2. 5 tenths.)
S: 25 tenths.

Repeat the process for 17.5, 27.5, 24.5, 24.3, and 42.3. Repeat the entire process but with hundredths.

T: (Write 37 hundredths = ____.) Say the decimal.
S: 0.37
T: (Write 37 hundredths = 0.37. Below it, write 137 hundredths = ____.) Say the decimal.
S: 1.37

Repeat the process for 537 hundredths and 296 hundredths.

T: (Write 0.548 = ____ thousandths.) Say the number sentence.
S: 0.548 = 548 thousandths.

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

Learners with language differences may have more success in responding to today's sprint by writing rather than verbalizing responses. Often English language learners have receptive language abilities that exceed productive abilities, therefore allowing a choice of written response can increase their accuracy and allow for more confident participation.

T: (Write 0.548 = 548 thousandths. Below it, write 1.548 = ____ thousandths.) Say the number sentence.

S: 1.548 = 1548 thousandths.

Repeat the process for 2.548 and 7.352.

Round to Different Place Values (6 minutes)

Materials: (S) Personal white boards

Note: Reviewing this skill introduced in Lesson 7 will help students work towards mastery of rounding decimal numbers to different place values.

Although the approximation sign (≈) is used in Grade 4, a quick review of its meaning may be in order.

T: (Project 8.735.) Say the number.

S: 8 and 735 thousandths.

T: Draw a vertical number line on your boards with 2 endpoints and a midpoint.

T: Between what two ones is 8.735?

S: 8 ones and 9 ones.

T: What's the midpoint for 8 and 9?

S: 8.5

T: Fill in your endpoints and midpoint.

T: 8.5 is the same as how many tenths?

S: 85 tenths.

T: How many tenths are in 8.735?

S: 87 tenths.

T: (Write 8.735 ≈ _____.) Show 8.735 on your number line and write the number sentence.

S: (Students write 8.735 between 8.5 and 9 on the number line and write 8.735 ≈ 9.)

Repeat the process for the tenths place and hundredths place. Follow the same process and procedure for 7.458.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Turn and talk is a strategy intended to broaden active student participation by offering opportunity for all to speak during a lesson. Spend time in the beginning of the school year helping students understand what *turn and talk* looks like and sounds like by demonstrating with a student for the whole class. Modeling knee-to-knee, eye-to-eye body posture and active listening expectations (Can I restate my partner's ideas in my own words?) make for successful implementation of this powerful strategy.

Application Problem (6 minutes)

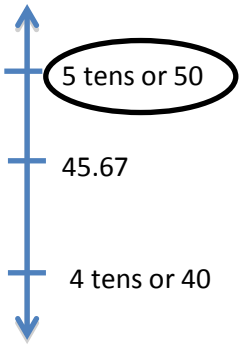
Organic, whole-wheat flour sells in bags weighing 2.915 kilograms. How much flour is this rounded to the nearest tenth? How much flour is this rounded to the nearest one? What is the difference of the two answers? Use a place value chart and number line to explain your thinking.

Concept Development (32 minutes)

Materials: (S) Personal place value boards

Problem 1

Round 49.67 to the nearest ten.



T: Turn and talk to your partner about the different ways 49.67 could be decomposed using place value disks. Show the decomposition that you think will be most helpful in rounding to the nearest ten.

T: Which one of these decompositions did you decide was the most helpful?

S: The decomposition with more tens is most helpful, because it helps me identify the two rounding choices: 4 tens or 5 tens.

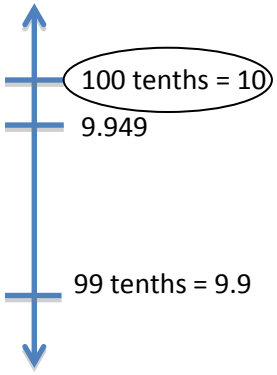
4 tens	9 ones	6 tenths	7 hundredths
	49 ones	6 tenths	7 hundredths
		496 tenths	7 hundredths

T: Draw and label a number line and circle the rounded value. Explain your reasoning.

Repeat this sequence with rounding 49.67 to the nearest ones, and then tenths.

Problem 2

Decompose 9.949 and round to the nearest tenth and hundredth. Show your work on a number line.



9 ones	9 tenths	4 hundredths	9 thousandths
	99 tenths	4 hundredths	9 thousandths
		994 hundredths	9 thousandths

T: What decomposition of 9.949 best helps to round this number to the nearest tenth?

S: The one using the most tenths to name the decimal fraction. I knew I would round to either 99 tenths or 100 tenths. I looked at the hundredths. Nine hundredths is past the midpoint, so I rounded to the next tenth, 100 tenths. One hundred tenths is the same as 10.

T: Which digit made no difference when you rounded to the nearest tenth? Explain your thinking.

S: The thousandths, because the hundredths decided which direction to round. As long as I had 5 hundredths, I was past the halfway point so I rounded to the next number.

Repeat the process rounding to the nearest hundredth.

Problem 3

A decimal number has 1 digit to the right of the decimal point. If we round this number to the nearest whole number, the result is 27. What are the maximum and minimum possible values of these two numbers? Use a number line to show your reasoning. Include the midpoint on the number line.

T: (Draw a vertical number line with 3 points.)

T: What do we know about the unknown number?

S: It has a number in the tenths place, but nothing else past the decimal point. We know that is has been rounded to 27.

T: (Write 27 at the bottom point on the number line and circle it.) Why did I place 27 as the lesser rounded value?

S: We are looking for the largest number that will round down to 27. That number will be greater than 27, but less than the midpoint between 27 and 28.

T: What is the midpoint between 27 and 28?

S: 27.5

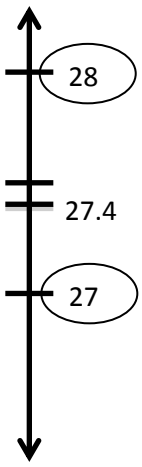
T: (Place 27.5 on the number line.)

T: If we look at numbers that have exactly 1 digit to the right of the decimal point, what is the greatest one that will round down to 27?

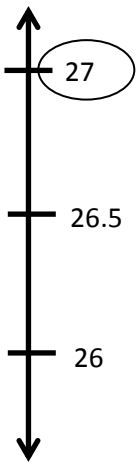
S: 27.4. If we go to 27.5, that would round up to 28.

Repeat the same process to find the minimum value.

To find maximum



To find minimum



Encourage further discussion with the following:

What if our number had exactly 2 digits to the right of the decimal point? Could I find a number larger than 27.4 that would still round down to 27? (Various answers could be expected: 27.41, 27.49, etc.). What is the largest possible value it could have? (27.49.)

A similar discussion can take place in finding the minimum when students discover that 26.5 rounds up to 27. Lead students to discover that something different happens here. Can we find a number less than 26.5 with exactly 2 digits to the right of the decimal point that would still round up? (No, nothing smaller than 26.50.)

Problem Set (10 minutes)

Students should do their personal best to complete the problem set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

On this Problem Set, we suggest all students begin with Problems 1 and 3 and possibly leave Problem 2 to the end if they still have time.

Before circulating while students work, review the debrief questions relevant to the problem set so that you can better guide students to a deeper understanding of a skill with the lesson's objective.

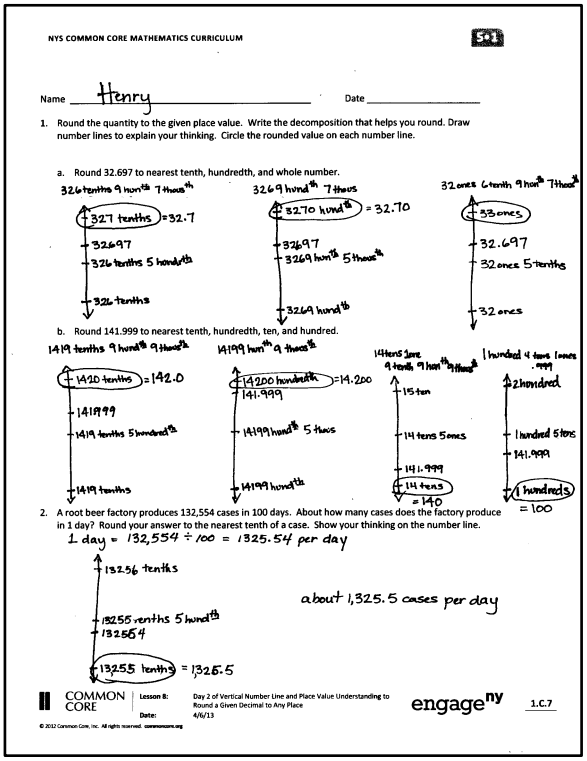
Student Debrief (10 minutes)

Lesson Objective: Round a given decimal to any place using place value understanding and the vertical number line.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson. You may choose to use any combination of the questions below to lead the discussion.

- Compare our approach to rounding today and yesterday. How are they alike? How are they different? (Students will likely offer many accurate responses. However, lead the discussion toward the notion of our only choosing specific decompositions to round in today's lesson as opposed to naming every


NYS COMMON CORE MATHEMATICS CURRICULUM 5•1

Name Henry Date

1. Round the quantity to the given place value. Write the decomposition that helps you round. Draw number lines to explain your thinking. Circle the rounded value on each number line.

a. Round 32.697 to nearest tenth, hundredth, and whole number.

326 tenths 9 hundredths 7 thousandths
327 tenths = 32.7
326.97
326 tenths 5 hundredths
326 tenths

3269 hundredths 7 thousandths
3270 hundredths = 32.70
3269.7
3269 hundredths 5 thousandths
3269 hundredths

32 ones 6 tenths 9 hundredths 7 thousandths
33 ones
32.697
32 ones 5 tenths
32 ones

b. Round 141.999 to nearest tenth, hundredth, ten, and hundred.

1419 tenths 9 hundredths 9 thousandths
1420 tenths = 142.0
141.999
1419 tenths 5 hundredths
1419 tenths

14199 hundredths 9 thousandths
14200 hundredths = 14.200
141.999
14199 hundredths 5 thousandths
14199 hundredths

14 tens 1 one 9 tenths 9 hundredths 9 thousandths
15 tens
14 tens 5 ones
141.999
140
14 tens
= 140

1 hundred 4 tens 1 one .999
2 hundreds
1 hundred 5 tens
141.999
1 hundreds
= 100

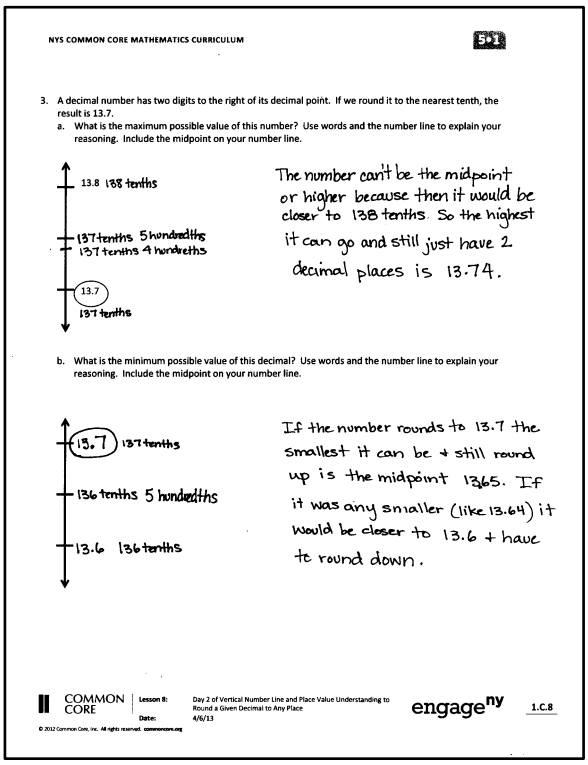
2. A root beer factory produces 132,554 cases in 100 days. About how many cases does the factory produce in 1 day? Round your answer to the nearest tenth of a case. Show your thinking on the number line.

1 day = 132,554 ÷ 100 = 1325.54 per day
132.56 tenths
about 1,325.5 cases per day
132.55 tenths 5 hundredths
132554
1325.55 tenths = 1325.5

COMMON CORE Lesson 8: Day 2 of Vertical Number Line and Place Value Understanding to Round a Given Decimal to Any Place Date: 4/6/13 engage^ny 1.C.7

decomposition in yesterday's lesson. Also explore which units (place values) are worthy of attention and which are not when rounding to a specific place value. Are there patterns to these choices?)

- Once a number rounds up at one place value, does it follow then that every place value will round up? Why or why not? (Encourage students to reference their problem sets as evidence of their reasoning. Problem 1(b) provides an example of differing unit choices resulting in differences in rounding up and down.)
- How does the place value chart help organize your thinking when rounding?
- Finding the maximum and minimum values poses a significant increase in cognitive load and an opportunity to build excitement! Make time to deeply discuss ways of reasoning about these tasks, as they are sure to be many and varied. Consider a discussion of Problem 3 that mirrors the one in the lesson: What if our number had exactly three digits to the right of the decimal? Can we find a value larger than 13.74 that would round down to 13.7? (13.749) What about 4 places or 5 places to the right of the decimal? (13.7499, 13.74999) Encourage students to generalize that we can get infinitely close to 13.5 with a decimal that has an infinite number of 9's yet that decimal will still round down to 13.7. We can find points on the number line as close as we like, and yet they will not be equal to 13.75. Follow that with the discovery that this is not true for our minimum value. There is nothing smaller than 13.750 that will round up to 13.8. Math journals offer a venue for students to continue to explore maximum and minimum tasks beyond today's lesson.



NYS COMMON CORE MATHEMATICS CURRICULUM 5•1

3. A decimal number has two digits to the right of its decimal point. If we round it to the nearest tenth, the result is 13.7.
   a. What is the maximum possible value of this number? Use words and the number line to explain your reasoning. Include the midpoint on your number line.

13.8 138 tenths
137 tenths 5 hundredths
137 tenths 4 hundredths
13.7
137 tenths

The number can't be the midpoint or higher because then it would be closer to 138 tenths. So the highest it can go and still just have 2 decimal places is 13.74.

   b. What is the minimum possible value of this decimal? Use words and the number line to explain your reasoning. Include the midpoint on your number line.

13.7 137 tenths
136 tenths 5 hundredths
13.6 136 tenths

If the number rounds to 13.7 the smallest it can be + still round up is the midpoint 13.65. If it was any smaller (like 13.64) it would be closer to 13.6 + have to round down.

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Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

Name _____ Date _____

1. Write the decomposition that helps you, and then round to the given place value. Draw number lines to explain your thinking. Circle the rounded value on each number line.

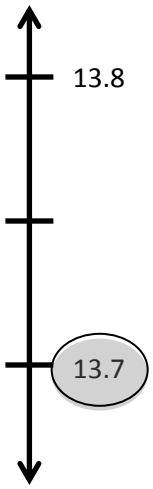
   a. Round 32.697 to nearest tenth, hundredth, and whole number.

   b. Round 141.999 to nearest tenth, hundredth, ten, and hundred.

2. A root beer factory produces 132,554 cases in 100 days. About how many cases does the factory produce in 1 day? Round your answer to the nearest tenth of a case. Show your thinking on the number line.

3. A decimal number has two digits to the right of its decimal point. If we round it to the nearest tenth, the result is 13.7.

   a. What is the maximum possible value of this number? Use words and the number line to explain your reasoning. Include the midpoint on your number line.



   b. What is the minimum possible value of this decimal? Use words and the number line to explain your reasoning. Include the midpoint on your number line.

Name _____ Date _____

1. Round the quantity to the given place value. Draw number lines to explain your thinking. Circle the rounded value on the number line.

   a. 13.989 to nearest tenth

   b. 382.993 to nearest hundredth

Name _____ Date _____

1. Round the quantity to the given place value. Draw number lines to explain your thinking. Circle the rounded value on the number line.

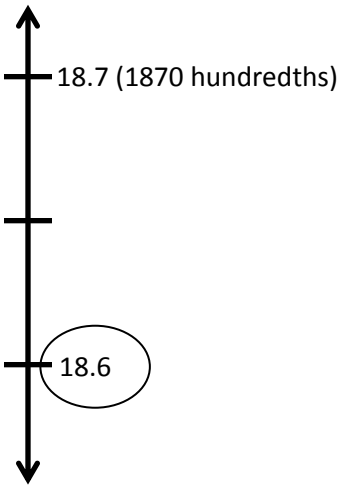
   a. 43.586 to nearest tenth, hundredth, and whole number

   b. 243.875 to nearest tenth, hundredth, ten, and hundred

2. A trip from New York City to Seattle is 2,852.1 miles. A family wants to make the drive in 10 days, driving the same number of miles each day. About how many miles will they drive each day? Round you answer to the nearest tenth of a mile.

3. A decimal number has two digits to the right of its decimal point. If we round it to the nearest tenth, the result is 18.6.

   a. What is the maximum possible value of this decimal? Use words and the number line to explain your reasoning.



   b. What is the minimum possible value of this decimal? Use words, numbers and pictures to explain your reasoning.