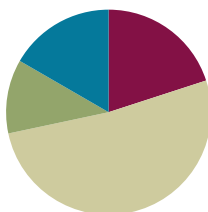## Lesson 24

Objective: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

Suggested Lesson Structure

- ■ Fluency Practice   (12 minutes)
- ■ Application Problem   (7 minutes)
- ■ Concept Development   (31 minutes)
- ■ Student Debrief   (10 minutes)
- **Total Time**   **(60 minutes)**

Fluency Practice (12 minutes)

- ▪ Rename Tenths and Hundredths **5.NBT.2**   (4 minutes)
- ▪ Divide Decimals **5.NBT.7**   (3 minutes)
- ▪ Divide by Two-Digit Numbers **5.NBT.6**   (5 minutes)

Rename Tenths and Hundredths (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity prepares students for estimating decimal quotients in Lesson 25.

Repeat the process from Lesson 23 using the following possible sequence: 9 tenths, 10 tenths, 20 tenths, 90 tenths, 95 tenths, 100 tenths, 200 tenths, 600 tenths, 650 tenths, 657 tenths, 832 tenths, 9 hundredths, 10 hundredths, 20 hundredths, 90 hundredths, 95 hundredths, 100 hundredths, 200 hundredths, 900 hundredths, 950 hundredths, 1,000 hundredths, 2,000 hundredths; 5,000 hundredths, 5,800 hundredths, 5,830 hundredths, 5,834 hundredths, and 2,834 hundredths.

Divide Decimals (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity prepares students for the Concept Development in today's lesson.

Repeat the process from Lesson 22 using the following possible sequence:
15 ones ÷ 5, 15 tenths ÷ 5, 15 hundredths ÷ 5, 12 tens ÷ 3, 12 tenths ÷ 3, 24 hundreds ÷ 6, and 24 hundredths ÷ 6.

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Lesson 24: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.
Date: 10/27/14

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Divide by Two-Digit Numbers (5 minutes)

Materials: (S) Personal white board

Note: This exercise reviews Lesson 23 content.

Repeat the process from Lesson 21 using the following possible sequence: $5{,}349 \div 21$, $6{,}816 \div 32$, and $4{,}378 \div 51$.

Application Problem (7 minutes)

A long-time runner compiled her training distances in the following chart. Fill in the missing values.

Runner's Log

Total Number of Miles Run	Number of Days	Miles Run Each Day
420		12
14.5	5	
38.0	10	
	17	16.5

Note: This Application Problem serves as a quick review of multi-digit multiplication and division with double-digit divisors. Students must determine which operation is needed, and the review of whole number division can serve as an anticipatory set for today's continuation into decimal divisors.

Concept Development (31 minutes)

Materials: (S) Millions to thousandths place value chart (Lesson 1 Template), personal white board

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Lesson 24: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

Date: 10/27/14

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Problems 1–3

54 ÷ 10

5.4 ÷ 10

0.54 ÷ 10

54 ÷ 10 = 5.4

MP.2

T: (Write 54 ÷ 10 horizontally on the board.) Let's solve this problem using place value disks. Draw 5 tens disks and 4 ones disks on your personal white board.

Student and teacher draw 5 tens disks and 4 ones disks as shown to the right.

5.4 ÷ 10 = 0.54

T: Say this in unit form.

S: 5 tens 4 ones.

T: What is 1 ten divided by 10?

S: 1 one.

T: If 1 ten divided by 10 is 1 one, what is 5 tens divided by 10?

S: 5 ones.

0.54 ÷ 10 = 0.054

T: I'll show that division with my place value disks. You do the same. (Draw an arrow showing ÷ 10 and 5 ones disks.)

T: What is 1 one divided by 10?

S: 1 tenth.

T: If 1 one divided by 10 is 1 tenth, what is 4 ones divided by 10?

S: 4 tenths.

T: Show that division with place value disks.

T: (Point to the original problem.) Read the equation with the solution.

S: 54 ÷ 10 = 5.4.

T: (Write 5.4 ÷ 10 on the board.) Compare this problem to 54 divided by 10. Turn and talk.

S: The whole is less than the first one, but we are still dividing by 10. → 5.4 is 1 tenth as large as 54. → The quotient from our first problem is now the whole. → The first whole is 10 times as large, so its quotient should also be 10 times larger than the quotient of 5.4 ÷ 10.
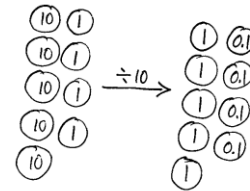
T: Imagine what this number would look like on a place value chart. When we divide, what will happen to the digits and why?

S: They will move to the right one place value because they are being divided into smaller units.
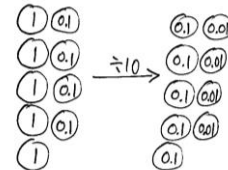
T: What pattern do you notice in the placement of the decimal? Turn and talk.
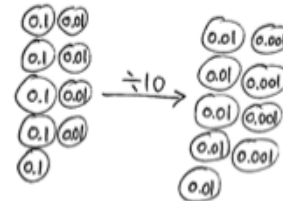
S: (Share.)

tens	ones	tenths	hundredths	thousandths
5	4			
	5	4		
		5	4	
		0	5	4

Follow a similar sequence for this problem and the others in this Problem Set. Use Module 1 knowledge of the place value chart to support division with the disks. Please refer to the graphics for examples of student work.

Problems 4–8

$54 \div 90$

$5.4 \div 90$

$0.54 \div 90$

$54 \div 900$

$5.4 \div 900$

> T: (Write $54 \div 90$ horizontally on the board.) How is this problem different than the others we've solved? Turn and talk.
>
> S: I know 54 divided by 9 equals 6. → We're still dividing with tens, but there are 9 tens rather than 1 ten.
>
> T: Our divisor this time is 90. Can you decompose 90 with 10 as a factor?
>
> S: Yes, $10 \times 9 = 90$.
>
> T: I'll rewrite the problem to reflect our thinking. (Write $54 \div 90 = 54 \div 10 \div 9$.) Turn and tell your neighbor the quotient of 54 divided by 10. If necessary, you may use your place value disks, chart, or visualize what happens when dividing by 10.
>
> T: What is 54 divided by 10?
>
> S: 5.4.
>
> T: Are we finished?
>
> S: No, we still need to divide by 9.
>
> T: Say the division equation we now have to solve.
>
> S: Five and four tenths divided by 9.
>
> T: Read this equation naming 5.4 as tenths.
>
> S: 54 tenths divided by 9.
>
> T: Solve it on your personal white boards.
>
> T: Say the original division equation with the quotient.
>
> S: 54 divided by 90 equals 6 tenths.
>
> T: When we factored our divisor as 10×9, we first divided by 10. Then, we divided by 9. Would our quotient be affected if we divided by 9 and then by 10? Why or why not? Turn and talk.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Many students may benefit if teachers think aloud as they solve a problem. This strategy is often referred to as s*elf talk,* wherein a teacher doesn't ask any questions as the problem is solved. Instead, the teacher talks through each step, verbalizing why each decision is made, as if talking out loud to his or herself.

This strategy is beneficial for students who do not have enough background knowledge or vocabulary to answer questions.

$$54 \div 90$$
$$= 54 \div 10 \div 9$$
$$= 5.4 \div 9$$
$$= 0.6$$

$$5.4 \div 90$$
$$= 5.4 \div 10 \div 9$$
$$= 0.54 \div 9$$
$$= 0.06$$

$$0.54 \div 90$$
$$= 0.54 \div 10 \div 9$$
$$= 0.054 \div 9$$
$$= 0.006$$

$$54 \div 900$$
$$= 54 \div 100 \div 9$$
$$= 0.54 \div 9$$
$$= 0.06$$

$$5.4 \div 900$$
$$= 5.4 \div 100 \div 9$$
$$= 0.054 \div 9$$
$$= 0.006$$

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Lesson 24: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.
Date: 10/27/14

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S: No. It wouldn't matter because we are still dividing by 90 either way. → 9 × 10 and 10 × 9 are both equal to 90. 54 ÷ (10 × 9) = 54 ÷ (9 × 10). Our divisor wasn't changed, so the quotient wouldn't change. → (54 ÷ 10) ÷ 9 = (54 ÷ 9) ÷ 10.

Repeat this sequence with the other problems in the set. Please refer to the graphics for student work.

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 should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

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.

- Describe the pattern that you noticed in our lesson and Problem Set when a smaller number is divided by a greater number.

- In Problem 1(l), by which factor of 90 did you divide first? Find someone who divided the same way you did. Now, find someone who did it differently. Compare your approach and quotients.

- Discuss Problems 1(g) and 1(h). Ask, "The divisors and wholes are different in these problems, yet the quotients are the same. How is this possible?"

- Challenge students to generate another pair of problems similar to Problems 1(g) and 1(h).

Lesson 24: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

Date: 10/27/14

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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.

Lesson 24:   Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

Date: 10/27/14

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Name _____   Date _____

1. Divide. Show the division in the right-hand column in two steps. The first two have been done for you.

    a. 1.2 ÷ 6 = 0.2

    b. 1.2 ÷ 60 = (1.2 ÷ 6) ÷ 10 = 0.2 ÷ 10 = 0.02

    c. 2.4 ÷ 4 = _____

    d. 2.4 ÷ 40 = _____

    e. 14.7 ÷ 7 = _____

    f. 14.7 ÷ 70 = _____

    g. 0.34 ÷ 2 = _____

    h. 3.4 ÷ 20 = _____

    i. 0.45 ÷ 9 = _____

    j. 0.45 ÷ 90 = _____

    k. 3.45 ÷ 3 = _____

    l. 34.5 ÷ 300 _____

2. Use place value reasoning and the first quotient to compute the second quotient. Explain your thinking.

   a. 46.5 ÷ 5 = 9.3

       46.5 ÷ 50 = _____

   b. 0.51 ÷ 3 = 0.17

       0.51 ÷ 30 = _____

   c. 29.4 ÷ 70 = 0.42

       29.4 ÷ 7 = _____

   d. 13.6 ÷ 40 = 0.34

       13.6 ÷ 4 = _____

3. Twenty polar bears live at the zoo. In four weeks, they eat 9,732.8 pounds of food altogether. Assuming each bear is fed the same amount of food, how much food is used to feed one bear for a week? Round your answer to the nearest pound.

4. The total weight of 30 bags of flour and 4 bags of sugar is 42.6 kg. If each bag of sugar weighs 0.75 kg, what is the weight of each bag of flour?

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Lesson 24:   Divide decimal dividends by multiples of 10, reasoning about the
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              method.
Date: 10/27/14

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Name _____   Date _____

1. Divide.

    a. $27.3 \div 3$ b. $2.73 \div 30$ c. $273 \div 300$

2. If $7.29 \div 9 = 0.81$, then the quotient of $7.29 \div 90$ is _____. Use place value reasoning to explain the placement of the decimal point.

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Lesson 24:   Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.

Date: 10/27/14

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Name _____   Date _____

1. Divide. Show every other division sentence in two steps. The first two have been done for you.

   a. $1.8 \div 6 = 0.3$

   b. $1.8 \div 60 = (1.8 \div 6) \div 10 = 0.3 \div 10 = 0.03$

   c. $2.4 \div 8 =$ _____

   d. $2.4 \div 80 =$ _____

   e. $14.6 \div 2 =$ _____

   f. $14.6 \div 20 =$ _____

   g. $0.8 \div 4 =$ _____

   h. $80 \div 400 =$ _____

   i. $0.56 \div 7 =$ _____

   j. $0.56 \div 70 =$ _____

   k. $9.45 \div 9 =$ _____

   l. $9.45 \div 900 =$ _____

Lesson 24: Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.
Date: 10/27/14

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2. Use place value reasoning and the first quotient to compute the second quotient. Use place value to explain how you placed the decimal point.

   a. $65.6 \div 80 = 0.82$

   $65.6 \div 8 =$ _____

   b. $2.5 \div 50 = 0.05$

   $2.5 \div 5 =$ _____

   c. $19.2 \div 40 = 0.48$

   $19.2 \div 4 =$ _____

   d. $39.6 \div 6 = 6.6$

   $39.6 \div 60 =$ _____

3. Chris rode his bike along the same route every day for 60 days. He logged that he had gone exactly 127.8 miles.
   a. How many miles did he bike each day? Show your work to explain how you know.

   b. How many miles did he bike over the course of two weeks?

4. 2.1 liters of coffee were equally distributed to 30 cups. How many milliliters of coffee were in each cup?

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Lesson 24:   Divide decimal dividends by multiples of 10, reasoning about the placement of the decimal point and making connections to a written method.
Date: 10/27/14

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2.G.13