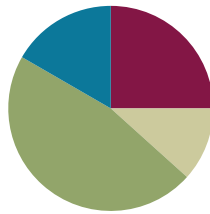## Lesson 13

Objective: Divide decimals by single-digit whole numbers involving easily identifiable multiples using place value understanding and relate to a written method.

Suggested Lesson Structure

- Fluency Practice   (15 minutes)
- Application Problems   (7 minutes)
- Concept Development   (28 minutes)
- Student Debrief   (10 minutes)

  Total Time   **(60 minutes)**

Fluency Practice (15 minutes)

- Subtract Decimals   **5.NBT.7**   (9 minutes)
- Find the Product   **5.NBT.7**   (3 minutes)
- Compare Decimal Fractions **3.NF.3d**   (3 minutes)

Sprint: Subtract Decimals (9 minutes)

Materials: (S) Subtract Decimals Sprint

Note: This Sprint will help students build automaticity in subtracting decimals without renaming.

Find the Product (3 minutes)

Materials: (S) Personal white boards

Note: Reviewing this skill that was introduced in Lessons 11 and 12 will help students work towards mastery of multiplying single-digit numbers times decimals.

- T: (Write 4 x 3 = ___.) Say the multiplication sentence in unit form.
- S: 4 x 3 ones = 12 ones.
- T: (Write 4 x 0.2 = ___.) Say the multiplication sentence in unit form.
- S: 4 x 2 tenths = 8 tenths.
- T: (Write 4 x 3.2 = ___.) Say the multiplication sentence in unit form.
- S: 4 x 3 ones 2 tenths = 12.8.
- T: Write the multiplication sentence.

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S: (Students write 4 x 3.1 = 12.8.)

Repeat the process for 4 x 3.21, 9 x 2, 9 x 0.1, 9 x 0.03, 9 x 2.13, 4.012 x 4, and 5 x 3.2375.

Compare Decimal Fractions (3 minutes)

Materials: (S) Personal white boards

Note: This review fluency will help solidify student understanding of place value in the decimal system.

T: (Write 13.78 ___ 13.86.) On your personal white boards, compare the numbers using the greater than, less than, or equal sign.

S: (Students write 13.78 < 13.76.)

Repeat the process and procedure for 0.78 ___ 78/100, 439.3 ___ 4.39, 5.08 ___ fifty-eight tenths, Thirty-five and 9 thousandths ___ 4 tens.

Application Problems (7 minutes)

Louis buys 4 chocolates. Each chocolate costs $2.35. Louis multiplies 4 x 235 and gets 940. Place the decimal to show the cost of the chocolates and explain your reasoning using words, numbers, and pictures.

Note: This application problem requires students to estimate $4 \times \$2.35$ in order to place the decimal point in the product. This skill was taught in the previous lesson.

He paid $9.40 for the chocolates. The decimal has to go between the 9 and 4 because when Louis multiplies 4 and 235 it means 940 hundredths which is 9 wholes and 40 hundredths.

2	+ 0.3	+ 0.05
4	8	1.2	0.20

8 + 1.2 + 0.20
= $9.40

The only place that makes sense is between the 9 and 4 because He will pay between (4 x $2) and (4 x $3).

Concept Development (28 minutes)

Materials: (S) Number disks, personal white boards

Problems 1–3

0.9 ÷ 3 = 0.3

0.24 ÷ 4 = 0.06

0.032 ÷ 8 = 0.004

T: Show 9 tenths with your disks.

S: (Students show.)

T: Divide 9 tenths into 3 equal groups.

S: (Students make 3 groups of 3 tenths.)

T: How many tenths are in each group?

S: There are 3 tenths in each group.

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T: (Write 0.9 ÷ 3 = 0.3 on board.)   Read the number sentence using unit form.

S: 9 tenths divided by 3 equals 3 tenths.

T: How does unit form help us divide?

S: When we identify the units, then it's just like dividing 9 apples into 3 groups. → If you know what unit you are sharing, then it's just like whole number division. You can just think about the basic fact.

T: (Write 3 groups of _____ = 0.9 on board.) What is the missing number in our equation?

S: 3 tenths (0.3).

Repeat this sequence with 0.24 (24 hundredths) and 0.032 (32 thousandths).

Problems 4–6

$1.5 ÷ 5 = 0.3$

$1.05 ÷ 5 = 0.21$

$3.015 ÷ 5 = 0.603$

T: (Write on board.) 1.5 ÷ 5 = _____. Read the equation using unit form.

S: Fifteen tenths divided by 5.

T: What is useful about reading the decimal as 15 tenths?

S: When you say the units, it's like a basic fact.

T: What is 15 tenths divided by 5?

S: 3 tenths.

T: (Write on board.) 1.5 ÷ 5 = 0.3

T: (Write on board.) 1.05 ÷ 5 = _____. Read the equation using unit form.

S: 105 hundredths divided by 5.

T: Is there another way to decompose (name or group) this quantity?

S: 1 one and 5 hundredths. → 10 tenths and 5 hundredths.

T: Which way of naming 1.05 is most useful when dividing by 5? Why? Turn and talk. Then solve.

S: 10 tenths and 5 hundredths because they are both multiples of 5. This makes it easy to use basic facts and divide mentally. The answer is 2 tenths and 1 hundredth. → 105 hundredths is easier for me because I know 100 is 20 fives so 105 is 1 more, 21. 21 hundredths. → I just used the algorithm from Grade 4 and got 21 and knew it was hundredths.

> **NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**
>
> Students can also be challenged to use a compensation strategy to make another connection to whole number division. The dividend is multiplied by a power of ten, which converts it to its smallest units. Once the dividend is shared among the groups, it must be converted back to the original units by dividing it by the same power of ten. For example :
>
> $1.5 ÷ 5 → (1.5 \textbf{ x 10}) ÷ 5 →$
>
> $15 ÷ 5 = 3 → 3 ÷ \textbf{10} = 0.3$

Repeat this sequence with 3.015 ÷ 5. Have students decompose the decimal several ways and then reason about which is the most useful for division. It is also important to draw parallels among the next three problems. You might ask, "How does the answer to the second set of problems help you find the answer to the third?"

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Problems 7–9

Compare the relationships between:

$4.8 \div 6 = 0.8$ and $48 \div 6 = 8$

$4.08 \div 8 = 0.51$ and $408 \div 8 = 51$

$63.021 \div 7 = 9.003$ and $63{,}021 \div 7 = 9{,}003$

> T: (Write on board $4.8 \div 6 = 0.8$ $48 \div 6 = 8$.) What relationships do you notice between these two equations? How are they alike?
>
> S: 8 is 10 times greater than 0.8. → 48 is 10 times greater than 4.8 → The digits in the dividends are the same, the divisor is the same and the digits in the quotient are the same.
>
> T: How can $48 \div 6$ help you with $4.8 \div 6$? Turn and talk.
>
> S: If you think of the basic fact first, then you can get a quick answer. Then you just have to remember what units were really in the problem. This one was really 48 tenths → The division is the same; the units are the only difference.

Repeat the process for following equations:

$4.08 \div 8 = 0.51$ and $408 \div 8 = 51$; $63.021 \div 7 = 9.003$ and $63{,}021 \div 7 = 9{,}003$

> T: When completing your problem set, remember to use what you know about whole numbers to help you divide the decimals.

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.

Student Debrief (10 minutes)

Lesson Objective: Divide decimals by single-digit whole numbers involving easily identifiable multiples using place value understanding and relate to a written method.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Unfamiliar vocabulary can slow down the learning process, or even confuse students. Reviewing key vocabulary, such as dividend, divisor, or quotient may benefit all students. Displaying the words in a familiar mathematical sentence may serve as a useful reference for students. For example, display:

Dividend ÷ **Divisor = Quotient.**

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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.

- In 2(a), how does your understanding of whole number division help you solve the equation with a decimal?

- Is there another decomposition of the dividend in 2(c) that could have been useful in dividing by 2? What about in 2(d)? Why or why not?

- When decomposing decimals in different ways, how can you tell which is the most useful? (We are looking for easily identifiable multiples of the divisor.)

- In 4(a), what mistake is being made that would produce 5.6 ÷ 7 = 8?

- Correct all the dividends in Problem 4 so that the quotients are correct. Is there a pattern to the changes that you must make?

- 4.221 ÷ 7 = _____. Explain how you would decompose 4.221 so that you only need knowledge of basic facts to find the quotient.

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.

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A

Correct _____

Subtract.

1	5 - 1 =	.	23	7.985 - 0.002 =	.
2	5.9 - 1 =	.	24	7.985 - 0.004 =	.
3	5.93 - 1 =	.	25	2.7 - 0.1 =	.
4	5.932 - 1 =	.	26	2.785 - 0.1 =	.
5	5.932 - 2 =	.	27	2.785 - 0.5 =	.
6	5.932 - 4 =	.	28	4.913 - 0.4 =	.
7	0.5 - 0.1 =	.	29	3.58 - 0.01 =	.
8	0.53 - 0.1 =	.	30	3.586 - 0.01 =	.
9	0.539 - 0.1 =	.	31	3.586 - 0.05 =	.
10	8.539 - 0.1 =	.	32	7.982 - 0.04 =	.
11	8.539 - 0.2 =	.	33	6.126 - 0.001 =	.
12	8.539 - 0.4 =	.	34	6.126 - 0.004 =	.
13	0.05 - 0.01 =	.	35	9.348 - 0.006 =	.
14	0.057 - 0.01 =	.	36	8.347 - 0.3 =	.
15	1.057 - 0.01 =	.	37	9.157 - 0.05 =	.
16	1.857 - 0.01 =	.	38	6.879 - 0.009 =	.
17	1.857 - 0.02 =	.	39	6.548 - 2 =	.
18	1.857 - 0.04 =	.	40	6.548 - 0.2 =	.
19	0.005 - 0.001 =	.	41	6.548 - 0.02 =	.
20	7.005 - 0.001 =	.	42	6.548 - 0.002 =	.
21	7.905 - 0.001 =	.	43	6.196 - 0.06 =	.
22	7.985 - 0.001 =	.	44	9.517 - 0.004 =	.

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B

Improvement _____   # Correct _____

Subtract.

1	6 - 1 =	.	23	7.986 - 0.002 =	.
2	6.9 - 1 =	.	24	7.986 - 0.004 =	.
3	6.93 - 1 =	.	25	3.7 - 0.1 =	.
4	6.932 - 1 =	.	26	3.785 - 0.1 =	.
5	6.932 - 2 =	.	27	3.785 - 0.5 =	.
6	6.932 - 4 =	.	28	5.924 - 0.4 =	.
7	0.6 - 0.1 =	.	29	4.58 - 0.01 =	.
8	0.63 - 0.1 =	.	30	4.586 - 0.01 =	.
9	0.639 - 0.1 =	.	31	4.586 - 0.05 =	.
10	8.639 - 0.1 =	.	32	6.183 - 0.04 =	.
11	8.639 - 0.2 =	.	33	7.127 - 0.001 =	.
12	8.639 - 0.4 =	.	34	7.127 - 0.004 =	.
13	0.06 - 0.01 =	.	35	1.459 - 0.006 =	.
14	0.067 - 0.01 =	.	36	8.457 - 0.4 =	.
15	1.067 - 0.01 =	.	37	1.267 - 0.06 =	.
16	1.867 - 0.01 =	.	38	7.981 - 0.001 =	.
17	1.867 - 0.02 =	.	39	7.548 - 2 =	.
18	1.867 - 0.04 =	.	40	7.548 - 0.2 =	.
19	0.006 - 0.001 =	.	41	7.548 - 0.02 =	.
20	7.006 - 0.001 =	.	42	7.548 - 0.002 =	.
21	7.906 - 0.001 =	.	43	7.197 - 0.06 =	.
22	7.986 - 0.001 =	.	44	1.627 - 0.004 =	.

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1.F.9

Name _____   Date _____

1. Complete the sentences with the correct number of units and complete the equation.

   a. 4 groups of _____ tenths is 1.6.   1.6 ÷ 4 = _____

   b. 8 groups of _____ hundredths is 0.32.   0.32 ÷ 8 = _____

   c. 7 groups of _____ thousandths is 0.084.   .084 ÷ 7 = _____

   d. 5 groups of _____ tenths is 2.0   2.0 ÷ 5 = _____

2. Complete the number sentence. Express the quotient in units and then in standard form.

   a. 4.2 ÷ 7 = _____ tenths ÷ 7 = _____ tenths = _____

   b. 2.64 ÷ 2 = _____ ones ÷ 2 + _____ hundredths ÷ 2

      = _____ ones + _____ hundredths

      = _____

   c. 12.64 ÷ 2 = _____ ones ÷ 2 + _____ hundredths ÷ 2

      = _____ ones + _____ hundredths

      = _____

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d.   4.26 ÷ 6 = _____ tenths ÷ 6 + _____ hundredths ÷ 6

    =   _____

    =   _____

e.   4.236 ÷ 6 = _____

    =   _____

    =   _____

3.   Find the quotients. Then use words, numbers, or pictures to describe any relationships you notice between each pair of problems and quotients.

   a.   32 ÷ 8 = _____   3.2 ÷ 8 = _____

   b.   81 ÷ 9 = _____   0.081 ÷ 9 = _____

4.   Are the quotients below reasonable? Explain your answer.

   a.   5.6 ÷ 7 = 8

   b.   56 ÷ 7 = 0.8

   c.   .56 ÷ 7 = 0.08

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5. 12.48 milliliters of medicine were separated into doses of 4 ml each. How many doses were made?

6. The price of most milk in 2013 is around $3.28 a gallon. This is eight times as much as you would have probably paid for a gallon of milk in the 1950's. What was the cost for a gallon of milk during the 1950's? Use a tape diagram and show your calculations.

Name _____ Date _____

1. Complete the sentences with the correct number of units and complete the equation.

   a. 2 groups of _____ tenths is 1.8   1.8 ÷ 2 = _____

   b. 4 groups of _____ hundredths is 0.32   0.32 ÷ 4 = _____

   c. 7 groups of _____ thousandths is 0.021   0.021 ÷ 7 = _____

2. Complete the number sentence. Express the quotient in units and then in standard form.

   a. 4.5 ÷ 5 = _____ tenths ÷ 5 = _____ tenths = _____

   b. 6.12 ÷ 6 = _____ ones ÷ 6 + _____ hundredths ÷ 6

      = _____ ones + _____ hundredths

      = _____

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Name _____   Date _____

1. Complete the sentences with the correct number of units and complete the equation.

   a. 3 groups of _____ tenths is 1.5 $1.5 \div 3 =$ _____

   b. 6 groups of _____ hundredths is 0.24 $0.24 \div 6 =$ _____

   c. 5 groups of _____ thousandths is 0.045 $0.045 \div 5 =$ _____

2. Complete the number sentence. Express the quotient in units and then in standard form.

   a. $9.36 \div 3 =$ _____ ones $\div 3 \ +$ _____ hundredths $\div 3$

       $=$ _____ ones $+$ _____ hundredths

       $=$ _____

   b. $36.012 \div 3 =$ _____ ones $\div 3 +$ _____ thousandths $\div 3$

       $=$ _____ ones $+$ _____ thousandths

       $=$ _____

   c. $3.55 \div 5 =$ _____ tenths $\div 5 +$ _____ hundredths $\div 5$

       $=$ _____

       $=$ _____

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    d. $3.545 \div 5 =$ _____

                  $=$ _____

                  $=$ _____

3.   Find the quotients. Then use words, numbers, or pictures to describe any relationships you notice between each pair of problems and quotients.

    a. $21 \div 7 =$ _____ $2.1 \div 7 =$ _____

    b. $48 \div 8 =$ _____ $0.048 \div 8 =$ _____

4.   Are the quotients below reasonable? Explain your answer.

    a. $0.54 \div 6 = 9$

    b. $5.4 \div 6 = 0.9$

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   c.   54 ÷ 6 = 0.09

5.   A toy airplane costs $4.84. It costs 4 times as much as a toy car. What is the cost of the toy car?

6.   Julian bought 3.9 liters of cranberry juice and Jay bought 8.74 liters of apple juice. They mixed the two juices together then poured them equally into 2 bottles. How many liters of juice are in each bottle?

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