



Core Knowledge® MATHEMATICS

# Place Value Patterns and Decimal Operations

Teacher Guide



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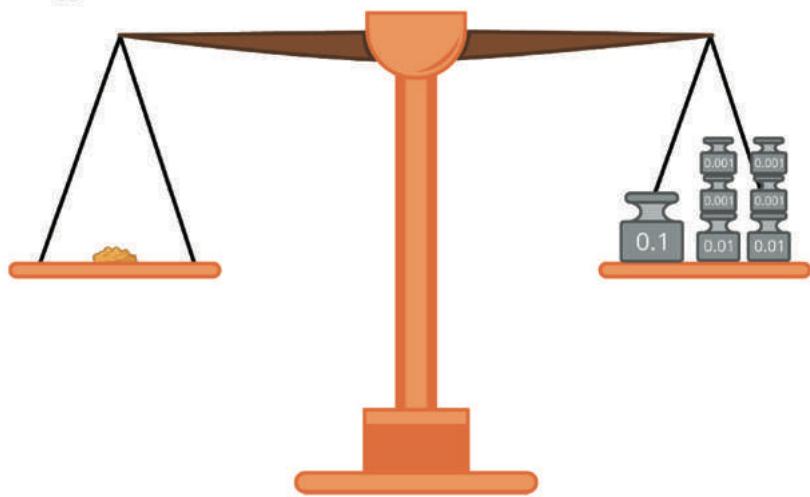
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# Place Value Patterns and Decimal Operations

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**Place Value Patterns and Decimal Operations**  
**Teacher Guide**  
Core Knowledge Mathematics™



# **Unit 5: Place Value Patterns and Decimal Operations**

## **At a Glance**

Unit 5 is estimated to be completed in 26-28 days including 2 days for assessment.

This unit is divided into four sections including 24 lessons and 2 optional lessons.

- Section A—Numbers to Thousandths (Lessons 1-10)
- Section B—Add and Subtract Decimals (Lessons 11-16)
- Section C—Multiply Decimals (Lessons 17-21)
- Section D—Divide Decimals (Lessons 22-26)

On pages 10-11 of this Teacher Guide is a chart that identifies the section each lesson belongs in and the materials needed for each lesson.

This unit uses nine new variations of student centers.

- Mystery Number
- Greatest of Them All
- Get Your Numbers in Order
- Tic Tac Round
- Jump the Line
- How Close?
- Target Numbers
- Compare
- Would You Rather?



# Unit 5: Place Value Patterns and Decimal Operations

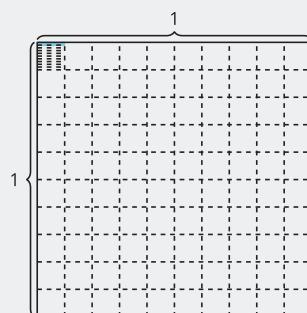
## Unit Learning Goals

- Students build from place value understanding in grade 4 to 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 use this place value understanding to round, compare, order, add, subtract, multiply, and divide decimals.

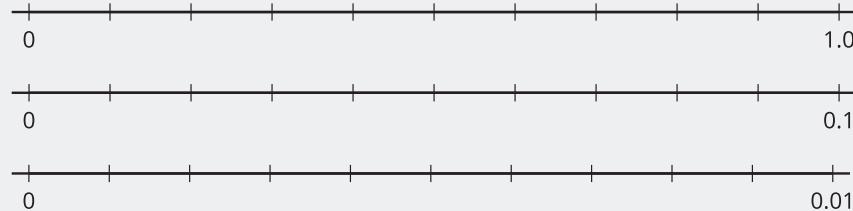
In this unit, students expand their knowledge of decimals to read, write, compare, and round decimals to the thousandths. They also extend their understanding of place value and numbers in base ten by performing operations on decimals to the hundredth.

In grade 4, students wrote fractions with denominators of 10 and 100 as decimals. They recognized that the notations 0.1 and  $\frac{1}{10}$  express the same amount and are both called “one tenth.” They used hundredths grids and number lines to represent and compare tenths and hundredths.

Here, students likewise rely on diagrams and their understanding of fractions to make sense of decimals to the thousandths. They see that “one thousandth” refers to the size of one part if a hundredth is partitioned into 10 equal parts, and that its decimal form is 0.001. Diagrams help students visualize the magnitude of each decimal place and compare decimals.



*Locate 0.001 on each number line.*



Students then apply their understanding of decimals and of whole-number operations to add, subtract, multiply, and divide decimal numbers to the hundredths, using strategies based on place value and the properties of operations.

They see that the reasoning strategies and algorithms they used to operate on whole numbers are also applicable to decimals. For example, addition and subtraction can be done by attending to the place value of the digits in the numbers, and multiplication and division can still be understood in terms of equal-size groups.

In grade 6, students will build on the work here to reach the expectation to fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

# Section A: Numbers to Thousandths

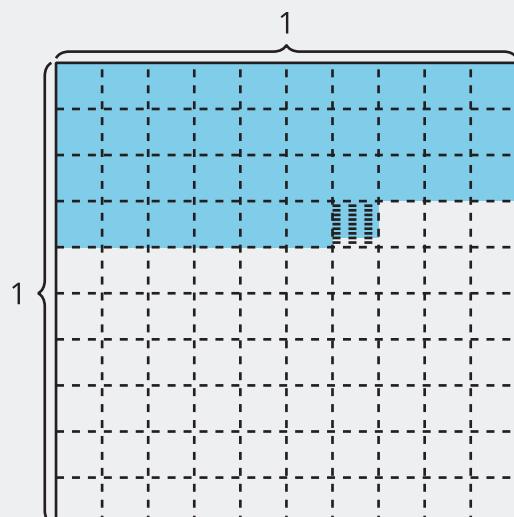
## Standards Alignments

Building On	5.NBT.A.4
Addressing	5.NBT.A, 5.NBT.A.1, 5.NBT.A.3, 5.NBT.A.3.a, 5.NBT.A.3.b, 5.NBT.A.4, 5.OA.A
Building Towards	5.NBT.A.4

## Section Learning Goals

- Compare, round and order decimals through the thousandths place based on the value of the digits in each place.
- Read, write, and represent decimals to the thousandths place, including in expanded form.

In this section, students reason about decimals to the thousandths place. They begin by representing decimals on gridded area diagrams, where the large square has a value of 1, and each small square within represents  $\frac{1}{100}$ . Students learn that if they partition each small square into tenths, each of those parts represents a thousandth of the large square.



The diagram highlights the relationships between place values. For instance, each thousandth is  $\frac{1}{10}$  of a hundredth and each hundredth is 10 thousandths.

It also helps to illustrate the structure of the number in its expanded form. In this case, the shaded region includes 3 tenths, 6 hundredths, and 8 thousandths, which can be written as  $(3 \times 0.1) + (6 \times 0.01) + (8 \times 0.001)$ .

This awareness helps to prepare students for multiplication of a decimal by a whole number later in the unit.

Students then move on to using number lines to represent decimals and to compare, order, and round them. This number line shows that  $92.415 < 92.451$  because 92.415 is further to the left. It also shows that 92.451 rounded to the nearest hundredth is 92.45 and rounded to the nearest tenth it is 92.5.



 PLC: Lesson 7, Activity 1, Gold Doubloons**Suggested Centers**

- Mystery Number (1–4), Stage 5: Six-digit Numbers (Supporting)
- Greatest of Them All (1–5), Stage 3: Multi-digit Numbers (Supporting)
- Get Your Numbers in Order (1–5), Stage 4: Denominators 2, 3, 4, 5, 6, 8, 10, 12, or 100 (Supporting)
- Tic Tac Round (3–5), Stage 3: Decimals (Addressing)
- Greatest of Them All (1–5), Stage 4: Decimals (Addressing)
- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)
- Mystery Number (1–4), Stage 6: Decimals (Addressing)
- Get Your Numbers in Order (1–5), Stage 5: Decimals (Addressing)

## Section B: Add and Subtract Decimals

### Standards Alignments

Addressing 5.NBT.B.7  
Building Towards 5.NBT.B.7

### Section Learning Goals

- Add and subtract decimals to the hundredths using strategies based on place value.

In this section, students add and subtract decimals to the hundredths. They begin by adding and subtracting in ways that make sense to them, which prompts them to relate the operations to those on whole numbers. It also allows the teacher to take note of the strategies and algorithms they choose, including the standard algorithm and those that use expanded form.

Adding and subtracting decimals using the standard algorithm brings up a new question in terms of how the digits should be aligned. To highlight this consideration, students analyze a common error as shown here.

Elena

$$\begin{array}{r}
 621.45 \\
 + 72.3 \\
 \hline
 628.68
 \end{array}$$

my answer makes sense  
because it is more than 621.

Andre

$$\begin{array}{r}
 621.45 \\
 + 72.30 \\
 \hline
 693.75
 \end{array}$$

My answer makes sense  
because  $620 + 70 = 690$  and then  
I still have to add a little bit more  
than 3 to 690.

Before using the standard algorithm, students use place-value reasoning to decide whether sums and differences are reasonable and to ensure that the digits in the numbers are aligned correctly. As they take care to align tenths with tenths and hundredths with hundredths, students practice attending to precision (MP6).

↔ PLC: Lesson 11, Activity 2, Target Numbers: Add Tenths or Hundredths

### Suggested Centers

- Tic Tac Round (3–5), Stage 3: Decimals (Addressing)
- Greatest of Them All (1–5), Stage 4: Decimals (Addressing)
- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)

- How Close? (1–5), Stage 7: Multiply Fractions and Whole Numbers to 5 (Supporting)
- How Close? (1–5), Stage 8: Add Decimals to 1 (Addressing)
- Jump the Line (2–5), Stage 3: Add and Subtract Tenths, Hundredths, and Thousandths (Addressing)

## Section C: Multiply Decimals

### Standards Alignments

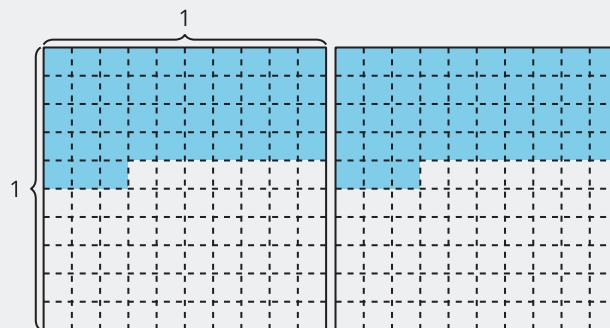
Addressing 5.NBT.A.1, 5.NBT.B.7, 5.NF.B.4, 5.OA.A, 5.OA.A.1, 5.OA.A.2  
 Building Towards 5.NBT.B.7, 5.NF.B.7

### Section Learning Goals

- Multiply decimals with products resulting in the hundredths using place value reasoning and properties of operations.

In this section, students learn to multiply decimals. They continue to think in terms of place value, make connections with whole-number operations, and use diagrams to support their reasoning.

Students begin by multiplying a whole number and a decimal. To find  $2 \times 0.43$ , for instance, they shade 43 hundredths in each of two large squares, and see that the 86 shaded pieces or 86 hundredths, which is 0.86.

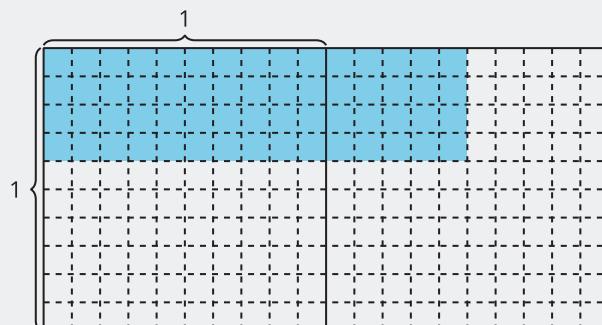


Diagrams also help students relate products of decimals and products of whole numbers. This diagram shows 2 groups of 43 shaded pieces where each piece is 0.01. The combined shaded region therefore represents  $(2 \times 43) \times 0.01$ .

Likewise,  $15 \times 0.26$  can be viewed as 15 groups of 26 hundredths or  $15 \times 26$  hundredths. Because  $15 \times 26$  is 390, the value of  $15 \times 0.26$  is 390 hundredths or 3.90.

Next, students reason about the product of two decimals. Diagrams are helpful here as well.

For example,  $1.5 \times 0.4$  can be represented by the area of a rectangle with side lengths of 1.5 and 0.4.



Students can see that the result is 60 hundredths or 0.60 because there are  $15 \times 4$  or 60 shaded pieces and each represents a hundredth.

They also recognize that they can decompose the shaded region and find  $1 \times 0.4$  (the shaded area in the first large square) and  $0.5 \times 0.4$  (the shaded area in the second large square) and add these partial products:  $(1 \times 0.4) + (0.5 \times 0.4)$ .

**Suggested Centers**

- Target Numbers (1–5), Stage 8: Add Tents or Hundredths (Addressing)
- Target Numbers (1–5), Stage 9: Subtract Tents or Hundredths (Addressing)
- Compare (1–5), Stage 4: Divide within 100 (Supporting)
- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)

## Section D: Divide Decimals

### Standards Alignments

Addressing 5.NBT.A.3, 5.NBT.B.7, 5.OA.A.2  
 Building Towards 5.NBT.A.1

### Section Learning Goals

- Divide decimals with quotients resulting in the hundredths using place value reasoning and properties of operations.

In this section, students use the relationship between multiplication and division and the idea of equal groups to make sense of division of decimals, just as they had done with whole numbers and fractions.

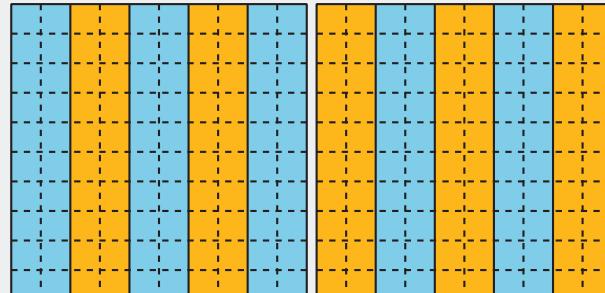
Students learned previously that the expression  $8 \div 2$  can mean finding how many are in one group if 8 is put into 2 equal groups, or it can mean finding how many groups of 2 are in 8.

Here, students interpret  $8 \div 0.1$  to mean finding how many groups of 1 tenths are in 8. There are 10 tenths in 1, so there must be 80 tenths in 8, so  $8 \div 0.1 = 80$ . This understanding provides a foundation for students to divide a whole number by any amount of tenths or hundredths.

For instance, to find the value of  $2 \div 0.2$ , we can see how many groups of 2 tenths are in 2.

There are 5 groups of 2 tenths in 1, so there must be  $2 \times 5$  or 10 groups of 2 tenths in 2, as shown in the diagram.

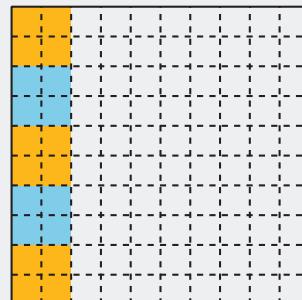
$$2 \div 0.2 = 10$$



When dividing a decimal by a whole number, the other interpretation of division may be more intuitive.

For example,  $0.2 \div 5$  can mean putting 0.2 into 5 equal groups and finding the size of each group. The diagram shows 4 hundredths in each group, so  $0.2 \div 5 = 0.04$ .

Later in the unit, students use equivalent expressions to find quotients. For example, they reason that  $6 \div 0.4$  is equivalent to  $60 \div 4$  because both the dividend and divisor are multiplied by 10. If the value of  $60 \div 4$  is 15, then the value of  $6 \div 0.4$  is also 15.



 PLC: Lesson 22, Activity 1, Patterns in Dividing by Decimal Units

### Suggested Centers

- Compare (1–5), Stage 4: Divide within 100 (Supporting)
- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)
- Would You Rather? (2–5), Stage 2: Compare to Smaller Units (Supporting)

### Throughout the Unit

The Number Talk routine is used throughout the unit to support students' developing fluency with fraction and decimal operations, and division by powers of 10.

Here is a sampling of Number Talk warm-ups in the unit.

lesson 12	lesson 15	lesson 16	lesson 19	lesson 22	lesson 25
$1.00 + 0.99 + 0.02$	$1.50 - 0.51$	$2.57 - 2.55$	$40 \times 2 \times 0.1$	$1 \div \frac{1}{10}$	$20 \div 2$
$1.99 + 0.02$	$1.50 - 0.52$	$2.57 - 2.49$	$20 \times 0.1 \times 4$	$2 \div \frac{1}{10}$	$2 \div 0.2$
$1.99 + 0.03$	$1.50 - 0.60$	$2.57 - 0.99$	$0.1 \times 80$	$1 \div 0.01$	$50 \div 2$
$1.99 + 0.13$	$1.50 - 0.62$	$2.57 - 0.59$	$0.01 \times 20 \times 40$	$2 \div 0.01$	$5 \div 0.2$

## Materials Needed

LESSON	GATHER	COPY
A.1	<ul style="list-style-type: none"> <li>● Chart paper</li> <li>● Colored pencils, crayons, or markers</li> </ul>	<ul style="list-style-type: none"> <li>● Small Grids (groups of 1)</li> </ul>
A.2	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
A.3	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
A.4	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
A.5	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● Small Grids (groups of 1)</li> </ul>
A.6	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
A.7	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
A.8	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
A.9	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
A.10	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
B.11	<ul style="list-style-type: none"> <li>● Chart paper</li> <li>● Colored pencils, crayons, or markers</li> <li>● Number cubes</li> </ul>	<ul style="list-style-type: none"> <li>● Target Numbers Stage 8 Recording Sheet (groups of 1)</li> </ul>
B.12	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
B.13	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>
B.14	<ul style="list-style-type: none"> <li>● Chart paper</li> <li>● Colored pencils, crayons, or markers</li> <li>● Number cubes</li> </ul>	<ul style="list-style-type: none"> <li>● Small Grids (groups of 1)</li> <li>● Target Numbers Stage 9 Recording Sheet (groups of 1)</li> </ul>
B.15	<ul style="list-style-type: none"> <li>● none</li> </ul>	<ul style="list-style-type: none"> <li>● none</li> </ul>

B.16	● none	● none
C.17	● none	● Small Grids (groups of 1)
C.18	● none	● none
C.19	● none	● Decimal Multiplication Expression Card Sort (groups of 2)
C.20	● none	● Small Grids (groups of 1)
C.21	● none	● none
D.22	● none	● Small Grids (groups of 1)
D.23	● none	● Small Grids (groups of 1)
D.24	● none	● Small Grids (groups of 1)
D.25	● none	● Small Grids (groups of 1)
D.26	● none	● none

## Center: Mystery Number (1-4)

### Stage 5: Six-digit Numbers

#### Lessons

- Grade5.5.A1 (supporting)
- Grade5.5.A2 (supporting)
- Grade5.5.A3 (supporting)

#### Stage Narrative

Students choose a mystery number (up to six digits) from the gameboard. Students give clues using the given vocabulary.

#### Standards Alignments

Addressing 4.NBT.A

#### Materials to Copy

Mystery Number Stage 5 Gameboard (groups of 2)

## Stage 6: Decimals

#### Lessons

- Grade5.5.A5 (addressing)
- Grade5.5.A6 (addressing)
- Grade5.5.A7 (addressing)
- Grade5.5.A8 (addressing)

#### Stage Narrative

Students choose a mystery number (up to nine digits) from the gameboard. Students give clues using the given vocabulary.

#### Standards Alignments

Addressing 4.NBT.A

#### Materials to Copy

Mystery Number Stage 6 Gameboard (groups of 2)

## Stages used in Grade 4

### Stage 3

#### Supporting

- Grade4.2.A

### Stage 4

#### Addressing

- Grade4.2.B
- Grade4.2.C

#### Supporting

- Grade4.4.B

### Stage 5

#### Addressing

- Grade4.4.C

## Center: Greatest of Them All (1–5)

### Stage 3: Multi-digit Numbers

#### Lessons

- Grade 5.5.A1 (supporting)

#### Stage Narrative

Students make six-digit numbers.

#### Variation:

Students try to make the number with the least value.

#### Standards Alignments

Addressing 4.NBT.A.2

#### Materials to Gather

Number cards 0–10

#### Materials to Copy

Greatest of Them All Stage 3 Recording Sheet  
(groups of 1)

## Stage 4: Decimals

#### Lessons

- Grade 5.5.A4 (addressing)
- Grade 5.5.A9 (addressing)
- Grade 5.5.A10 (addressing)
- Grade 5.5.B11 (addressing)
- Grade 5.5.B12 (addressing)

#### Stage Narrative

Students make decimal numbers less than 1.

#### Variation:

Students can write digits in the ones and tens place, as well.

#### Standards Alignments

Addressing 5.NBT.A

**Materials to Gather**

Number cards 0-10

**Materials to Copy**

Greatest of Them All Stage 4 Recording Sheet  
(groups of 1)

## Stages used in Grade 4

### Stage 2

#### Supporting

- Grade4.4.B

### Stage 3

#### Addressing

- Grade4.4.B
- Grade4.4.C

## Center: Get Your Numbers in Order (1–5)

### Stage 4: Denominators 2, 3, 4, 5, 6, 8, 10, 12, or 100

#### Lessons

- Grade 5.5.A2 (supporting)
- Grade 5.5.A3 (supporting)

#### Stage Narrative

Students choose cards with fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100. Students write their number in any space on the board, as long as the numbers from left to right go from least to greatest. If students cannot place their number, they get a point. The player with the fewest points when the board is filled is the winner.

#### Standards Alignments

Addressing 4.NF.A.2

#### Materials to Gather

Dry erase markers, Sheet protectors

#### Materials to Copy

Fraction Cards Grade 3 (groups of 2), Fraction Cards Grade 4 (groups of 2), Get Your Numbers in Order Stage 3 and 4 Gameboard (groups of 2)

## Stage 5: Decimals

#### Lessons

- Grade 5.5.A5 (addressing)
- Grade 5.5.A6 (addressing)
- Grade 5.5.A7 (addressing)
- Grade 5.5.A8 (addressing)
- Grade 5.5.A9 (addressing)

#### Stage Narrative

Students remove the cards that show 10 before they start. Then they choose three number cards and make a decimal number less than 1. Students write their number in any space on the board, as long as the numbers from left to right go from least to greatest. If students cannot place their number, they get a point. The player with the fewest points when the board is filled is the winner.

#### Standards Alignments

Addressing 5.NBT.A.3.b

**Materials to Gather**

Dry erase markers, Number cards 0–10, Sheet protectors

**Materials to Copy**

Get Your Numbers in Order Stage 5 Gameboard (groups of 2)

## Stages used in Grade 4

### Stage 3

#### Addressing

- Grade4.2.A

### Stage 4

#### Addressing

- Grade4.2.B

#### Supporting

- Grade4.4.A

## Center: Tic Tac Round (3–5)

### Stage 3: Decimals

#### Lessons

- Grade 5.5.A4 (addressing)
- Grade 5.5.A10 (addressing)
- Grade 5.5.B11 (addressing)
- Grade 5.5.B12 (addressing)

#### Stage Narrative

Students remove the cards that show 10 before they start. Then they choose five number cards and make a number less than 100. They spin the spinner to get a place value to round to. Students write their number in any space on the board, each partner using a different color. The first player to get three in a row wins.

#### Standards Alignments

Addressing 5.NBT.A.4

#### Materials to Gather

Colored pencils, crayons, or markers, Number cards 0–10, Paper clips

#### Materials to Copy

Tic Tac Round Stage 3 Gameboard (groups of 2),  
Tic Tac Round Stage 3 Spinner (groups of 2)

## Stages used in Grade 4

### Stage 1

#### Supporting

- Grade 4.4.B
- Grade 4.4.C

### Stage 2

#### Addressing

- Grade 4.4.D

## Center: Jump the Line (2–5)

### Stage 2: Add and Subtract Tenths and Hundredths

#### Lessons

- Grade 5.5.A4 (supporting)
- Grade 5.5.A10 (supporting)
- Grade 5.5.B11 (supporting)
- Grade 5.5.B12 (supporting)
- Grade 5.5.B13 (supporting)
- Grade 5.5.B14 (supporting)

#### Stage Narrative

Both players start at 0 on a number line marked by  $\frac{1}{100}$ . Spinners show adding or subtracting tenths or hundredths.

#### Standards Alignments

Addressing 4.NF.C

#### Materials to Gather

Dry erase markers, Paper clips, Sheet protectors

#### Materials to Copy

Jump the Line Stage 2 Gameboard (groups of 2),  
Jump the Line Stage 2 Spinner (groups of 2)

#### Additional Information

Each group of 2 needs a sheet protector, a dry erase marker, and a paper clip.

### Stage 3: Add and Subtract Tenths, Hundredths, and Thousandths

#### Lessons

- Grade 5.5.B15 (addressing)
- Grade 5.5.B16 (addressing)

#### Stage Narrative

Both players start at 0 on a number line marked by  $\frac{5}{1,000}$ . Spinners show adding or subtracting tenths, hundredths, or thousandths.

**Standards Alignments**

Addressing 5.NBT.B.7

**Materials to Gather**

Dry erase markers, Paper clips, Sheet protectors

**Materials to Copy**Jump the Line Stage 3 Gameboard (groups of 2),  
Jump the Line Stage 3 Spinner (groups of 2)**Additional Information**

Each group of 2 needs a sheet protector, a dry erase marker, and a paper clip.

**Stages used in Grade 4****Stage 2****Addressing**

- Grade4.3.C

## Center: How Close? (1–5)

### Stage 7: Multiply Fractions and Whole Numbers to 5

#### Lessons

- Grade 5.5.B13 (supporting)
- Grade 5.5.B14 (supporting)

#### Stage Narrative

Before playing, students remove the cards that show 10 and set them aside.

Each student picks 6 cards and chooses 3 of them to create a multiplication expression with a fraction and a whole number. Each student multiplies their numbers and the student whose product is closest to 5 wins a point for the round. Students pick new cards so that they have 6 cards in their hand and then start the next round.

#### Variation:

Students can choose a different number as the goal.

#### Standards Alignments

Addressing 5.NBT.B.7

#### Materials to Gather

Number cards 0–10

#### Materials to Copy

How Close? Stage 7 Recording Sheet (groups of 1)

### Stage 8: Add Decimals to 1

#### Lessons

- Grade 5.5.B15 (addressing)
- Grade 5.5.B16 (addressing)

#### Stage Narrative

Before playing, students remove the cards that show 10 and set them aside.

Each student picks 6 cards and chooses 3–4 of them to create an addition expression. Each student adds the numbers and the student whose sum is closest to 1 wins a point for the round. Students pick new cards so that they have 6 cards in their hand and then start the next round.

#### Variation:

Students can choose a different number as the goal and decide on a different place for the decimal point.

## Standards Alignments

Addressing 5.NBT.B.7

### Materials to Gather

Number cards 0–10

### Materials to Copy

How Close? Stage 8 Recording Sheet (groups of 1)

## Stages used in Grade 4

### Stage 5

#### Supporting

- Grade4.5.A

### Stage 6

#### Addressing

- Grade4.5.A
- Grade4.5.B

#### Supporting

- Grade4.2.C

## Center: Target Numbers (1–5)

### Stage 8: Add Tenths or Hundredths

#### Lessons

- Grade5.5.C17 (addressing)
- Grade5.5.C18 (addressing)
- Grade5.5.C19 (addressing)
- Grade5.5.C20 (addressing)

#### Stage Narrative

Students add hundredths and tenths to get as close to 1 as possible. Students start their first equation with 0 and take turns rolling a number cube and choosing whether to add that number of hundredths or tenths and write an equation. The sum becomes the first number in the next equation. The player who gets closest to 1 in 6 rounds, without going over 1, is the winner.

#### Standards Alignments

Addressing 5.NBT.B.7

#### Materials to Gather

Number cubes

#### Materials to Copy

Target Numbers Stage 8 Recording Sheet (groups of 1)

#### Additional Information

Each group of 2 needs one number cube.

### Stage 9: Subtract Tenths or Hundredths

#### Lessons

- Grade5.5.C17 (addressing)
- Grade5.5.C18 (addressing)
- Grade5.5.C19 (addressing)
- Grade5.5.C20 (addressing)

#### Stage Narrative

Students subtract hundredths and tenths to get as close to 1 as possible. Students start their first equation with 2 and take turns rolling a number cube and choosing whether to subtract that number of hundredths or tenths and write an equation. The difference becomes the first number in the next equation. The player who gets closest to 1 in 6 rounds, without going below 1, is the winner.

## Standards Alignments

Addressing 5.NBT.B.7

## Materials to Gather

Number cubes

## Additional Information

Each group of 2 needs one number cube.

## Materials to Copy

Target Numbers Stage 9 Recording Sheet (groups of 1)

## Center: Compare (1–5)

### Stage 4: Divide within 100

#### Lessons

- Grade5.5.C21 (supporting)
- Grade5.5.D22 (supporting)
- Grade5.5.D23 (supporting)

#### Stage Narrative

Students use cards with division expressions within 100.

This stage of the Compare center is used in grades 3, 4, and 5. When used in grade 3 or 4, remove the cards with two-digit divisors.

#### Standards Alignments

Addressing 3.OA.C.7

#### Materials to Copy

Compare Stage 3-8 Directions (groups of 2), Compare Stage 4 Division Cards (groups of 2)

## Stage 6: Add and Subtract Fractions

#### Lessons

- Grade5.5.C21 (supporting)
- Grade5.5.D22 (supporting)
- Grade5.5.D23 (supporting)
- Grade5.5.D24 (supporting)
- Grade5.5.D25 (supporting)
- Grade5.5.D26 (supporting)

#### Stage Narrative

Students use cards with expressions with addition and subtraction of fractions with the same denominator.

#### Standards Alignments

Addressing 4.NF.B.3

## Materials to Copy

Compare Stage 3-8 Directions (groups of 2), Compare Stage 6 Cards (groups of 2)

# Stages used in Grade 4

## Stage 3

### Supporting

- Grade4.2.C
- Grade4.3.C
- Grade4.5.A
- Grade4.5.B
- Grade4.6.B

## Stage 4

### Supporting

- Grade4.6.C

## Stage 5

### Addressing

- Grade4.2.C

### Supporting

- Grade4.3.A
- Grade4.7.A
- Grade4.7.B
- Grade4.7.C
- Grade4.8.A
- Grade4.8.B

## Stage 6

### Addressing

- Grade4.3.B
- Grade4.3.C

## Stage 7

### Addressing

- Grade4.6.D

### Supporting

- Grade4.7.A
- Grade4.8.A
- Grade4.8.B

## Center: Would You Rather? (2–5)

### Stage 2: Compare to Smaller Units

#### Lessons

- Grade 5.5.D24 (supporting)
- Grade 5.5.D25 (supporting)
- Grade 5.5.D26 (supporting)

#### Stage Narrative

The first partner spins to get a measurement and a unit. They write a question that compares the amount they spun to a quantity reported in a smaller unit of measurement.

#### Standards Alignments

Addressing 4.MD.A.1

#### Materials to Copy

Would You Rather Stage 2 Recording Sheet (groups of 2), Would You Rather Stage 2 Spinner (groups of 2)

## Stages used in Grade 4

### Stage 2

#### Addressing

- Grade 4.5.B

## Section A: Numbers to Thousandths

### Lesson 1: What is One Thousandth?

#### Standards Alignments

Addressing 5.NBT.A, 5.NBT.A.1

#### Teacher-facing Learning Goals

- Understand the relationship between one tenth, one hundredth and one thousandth.

#### Student-facing Learning Goals

- Let's make sense of thousandths.

#### Lesson Purpose

The purpose of this lesson is for students to recognize the unit of thousandths in relationship to tenths and hundredths.

In grade 4, students studied decimal fractions with denominators 10 and 100. They represented tenths and hundredths with hundredths grids, number lines, and decimal notation.

In this lesson students make sense of representations of tenths, hundredths, and thousandths with hundredths grid diagrams, fractions, and decimals. They also see relationships between these values, namely that a tenth of a tenth is a hundredth and a tenth of a hundredth is a thousandth. Students may use informal language to describe the relationship between decimals (for example, to get from 0.01 to .001 you add a zero in front of the one.) This language supports students in sharing their developing understanding. Teachers should ask questions to help students develop more precise language to describe base-ten representations (for example, what does the extra 0 you wrote in .001 represent?). They will have many opportunities to develop this understanding in upcoming lessons.

#### Access for:

##### Students with Disabilities

- Representation (Activity 1)

##### English Learners

- MLR7 (Activity 2)

#### Instructional Routines

Estimation Exploration (Warm-up)

**Materials to Gather**

- Chart paper: Activity 1
- Colored pencils, crayons, or markers: Activity 1

**Lesson Timeline**

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

**Materials to Copy**

- Small Grids (groups of 1): Activity 1

**Teacher Reflection Question**

Why is it important to integrate students' lived experiences into the classroom community? How might this integration empower students?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Journal Prompt: One Thousandth

**Standards Alignments**

Addressing 5.NBT.A

**Student-facing Task Statement**

What did you learn about 1 thousandth? What do you still wonder about 1 thousandth?

**Student Responses**

Sample responses: One thousandth can be represented on a grid. It can be written as 0.001. It's really small. It is one tenth of one hundredth. I wonder if there is something smaller than 1 thousandth.

----- Begin Lesson -----

## Warm-up

⌚ 10 min

### Estimation Exploration: One Tiny Piece

#### Standards Alignments

Addressing 5.NBT.A

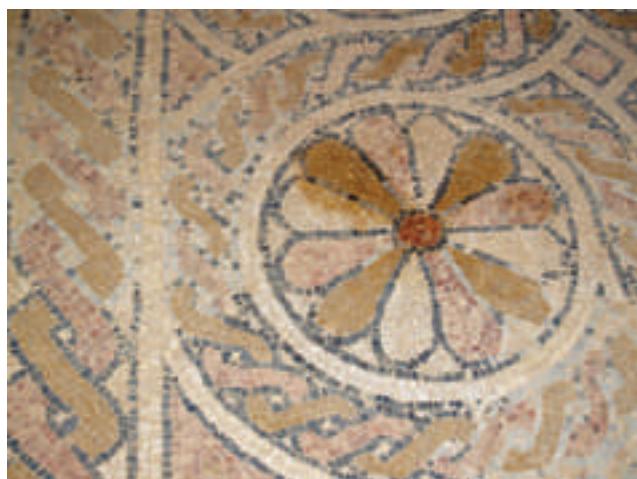
The purpose of this Estimation Exploration is to invite students to think about small fractions of a quantity in context. The mosaic pictured here is made up of many small square tiles. They are arranged in a complex pattern and are not identical in size but students can relate the denominator of a fraction giving the size of each tile, relative to the whole mosaic, to the total number of tiles making the mosaic. This helps them think of a fraction with a large denominator which prepares them to think about the fraction  $\frac{1}{1,000}$  in this lesson.

#### Instructional Routines

##### Estimation Exploration

#### Student-facing Task Statement

What fraction of the whole picture is a single square tile?



Record an estimate that is:

too low	about right	too high

#### Launch

- Groups of 2
- Display the image.
- “What is an estimate that’s too high?” “Too low?” “About right?”
- 1 minute: quiet think time

#### Activity

- “Discuss your thinking with your partner.”
- 2–3 minutes: partner discussion
- Share and record responses.

#### Synthesis

- “How did you make your estimate?” (I tried to estimate out how many tiles made the whole picture and then used that as my denominator.)
- “We will be investigating very small numbers and how to represent them in the next several lessons.”

## Student Responses

Sample responses:

- too low:  $\frac{1}{10,000}$  or less
- about right:  $\frac{1}{3,000}$  to  $\frac{1}{500}$
- too high:  $\frac{1}{100}$  or more

## Activity 1

⌚ 20 min

What Do You Know About Thousandths?

### Standards Alignments

Addressing 5.NBT.A

The purpose of this activity is for students to share what they know about one tenth and one hundredth, and consider what they might know about one thousandth. Students make a poster showing what they know about these numbers and then discuss different representations they made. If students show tenths, hundredths or thousandths on a number line or with base ten diagrams, highlight these representations in the synthesis, as they are familiar from grade 4.

This activity is meant to be an invitational opportunity for students to bring their lived experience into the math classroom. Consider taking a walk through the community where your students live and noticing places that decimals are seen and used. Take pictures or notes that capture the details of your observations. Be prepared to share these artifacts with students during the synthesis.

### ⌚ Access for Students with Disabilities

*Representation: Develop Language and Symbols.* Synthesis: Maintain a visible display to record new vocabulary. Invite students to suggest details (words or pictures) that will help them remember the meaning of thousandths and the thousandths' connection to tenths and hundredths.

*Supports accessibility for: Conceptual Processing, Memory*

### Materials to Gather

Chart paper, Colored pencils, crayons, or markers

### Materials to Copy

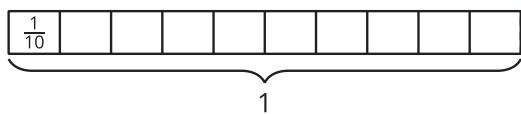
Small Grids (groups of 1)

## Student-facing Task Statement

1. What do you know about 1 tenth?
2. What do you know about 1 hundredth?
3. What do you know about 1 thousandth?

## Student Responses

Sample responses:



1. There are ten  $\frac{1}{10}$ s in 1. It's less than 1. I can also write it as 0.1.
2.  $\frac{1}{100}$  is small. It's smaller than  $\frac{1}{10}$ . There are one hundred  $\frac{1}{100}$ s in 1. There are ten  $\frac{1}{100}$ s in  $\frac{1}{10}$ . I can also write it as 0.01. I can put it on the number line.



3.  $\frac{1}{1,000}$  is really small. It's smaller than  $\frac{1}{100}$ . There are one thousand  $\frac{1}{1,000}$ s in 1. It would take a long time to count to 1 by  $\frac{1}{1,000}$ s. I wonder how to make a drawing of  $\frac{1}{1,000}$  because there are so many of them in 1. I wonder if there's a coin that's worth a thousandth of a dollar.

## Launch

- Groups of 2
- Give students access to hundredths grids on the Instructional master.
- Give students access to chart paper and colored pencils, crayons, or markers.
- “Work with your partner to make a poster showing what you know about the numbers 1 tenth, 1 hundredth, and 1 thousandth.”

## Activity

- 6-8 minutes: partner work time
- Monitor for students who:
  - represent the numbers with fractions
  - represent the numbers with decimals
  - represent the numbers with diagrams

## Synthesis

- Invite students to share their posters.
- “What are some ways to represent 1 tenth?” (I can write it as a fraction or a decimal. I can divide a rectangle into 10 equal pieces. I can put it on the number line.)
- “What was challenging about representing 1 hundredth with a drawing or diagram?” (Answers vary. It was hard to divide something into 100 equal pieces because that's a lot.)
- “What was challenging about representing 1 thousandth with a drawing or diagram?” (Dividing a rectangle into 1,000 pieces would take forever.)
- “In the next activity we will make and compare drawings of these numbers.”

## Activity 2

⌚ 15 min

Represent Numbers on a Hundredths Grid

### Standards Alignments

Addressing 5.NBT.A.1

The purpose of this activity is for students to represent tenths, hundredths, and thousandths with diagrams and decimals. The diagrams highlight the relationships between these quantities:

- there are 10 tenths in a whole
- there are 10 hundredths in a tenth
- there are 10 thousandths in a hundredth

This relationship can be seen when numbers are written as decimals or fractions. When students see this common relationship between the decimal place values they look for and make use of structure (MP7).

### 🌐 Access for English Learners

*MLR7 Compare and Connect.* Synthesis: After all strategies have been presented, lead a discussion comparing, contrasting, and connecting the different approaches. Ask, “What kinds of additional details or language helped you understand the displays?”, “Were there any additional details or language that you have questions about?”, and “Did anyone solve the problem the same way, but would explain it differently?”

*Advances: Representing, Conversing*

### Student-facing Task Statement

1. The grid represents 1. What does the shaded region represent?

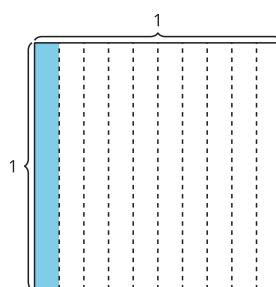
Be prepared to  
explain your  
reasoning.

### Launch

- Groups of 2
- “Today we are going to investigate some really small numbers.”

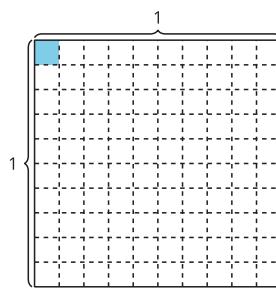
### Activity

- 2 minutes: independent work time
- 8 minutes: partner work time



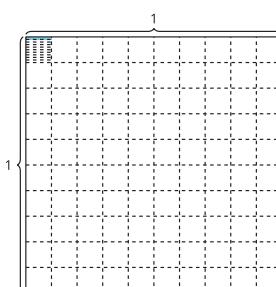
2. The grid represents 1. What does the shaded region represent?

Be prepared to explain your reasoning.



3. How many of the small rectangular pieces (one of them is shaded) are there in the unit square?

Explain or show your thinking.



Fraction	Decimal
$\frac{1}{10}$	0.1
$\frac{1}{100}$	0.01
$\frac{1}{1,000}$	?

How do you think we write the number one thousandth as a decimal? Explain your reasoning.

## Synthesis

- Display the last image.
- "How many of the tiny shaded rectangles are there in the whole unit square? How do you know?" (1,000 because there are 10 in the small square and 100 of those squares in the whole.)
- "How much of the whole square is shaded?" (There is one tiny rectangle shaded and there are 1,000 of those in the whole so  $\frac{1}{1,000}$  is shaded. There is  $\frac{1}{10}$  of  $\frac{1}{100}$  shaded. That's  $\frac{1}{10} \times \frac{1}{100}$ . There is  $\frac{1}{100} \div 10$  because the hundredth is divided into 10 equal pieces.)
- "The number  $\frac{1}{1,000}$  can also be written in decimal form as 0.001. Like the fraction, we call it 'thousandth.'"
- "How do you think you would write  $\frac{4}{1,000}$  as a decimal?" (0.004)

## Student Responses

1.  $\frac{1}{10}$  or 0.1 because there are 10 columns so the shaded part is one tenth.
2.  $\frac{1}{100}$  or 0.01 because there are 100 small squares in the whole so each one is  $\frac{1}{100}$ .
3. 1,000 because there are 10 of the tiny rectangles in each square and 100 squares in the whole so that's  $100 \times 10 = 1,000$  tiny rectangles in the whole.
4. Sample response: Maybe as 0.001 if the pattern for  $\frac{1}{10}$  and  $\frac{1}{100}$  of writing another 0 continues.

## Advancing Student Thinking

If students do not explain how many small rectangular pieces are in the whole unit square, ask: "How many small rectangular pieces would be in one row of the unit square?"

## Lesson Synthesis

⌚ 10 min

"Today we represented 1 tenth, 1 hundredth, and 1 thousandth in different ways. What are some different ways that you can represent 1 hundredth?" (as a fraction  $\frac{1}{100}$ , as a decimal 0.01, or with a drawing)

"What are some different ways that you can represent 1 thousandth?" ( $\frac{1}{1000}$ , 0.001, or with a drawing, but it's so small and there are so many of them in the whole that the drawing is not that helpful)

## Suggested Centers

- Mystery Number (1–4), Stage 5: Six-digit Numbers (Supporting)
- Greatest of Them All (1–5), Stage 3: Multi-digit Numbers (Supporting)

----- Complete Cool-Down -----

## Response to Student Thinking

Students have ideas to share with a partner.

### Next Day Support

- After the warm-up in the next lesson, pair students up to discuss their responses.

# Lesson 2: Thousandths on Grids and in Words

## Standards Alignments

Addressing 5.NBT.A, 5.NBT.A.3

### Teacher-facing Learning Goals

- Represent fractions and decimals to thousandths on hundredths grids.
- Write fractions and decimals to thousandths to represent shaded amounts on hundredths grids.

### Student-facing Learning Goals

- Let's represent numbers as decimals, fractions, words, and on hundredths grids.

## Lesson Purpose

The purpose of this lesson is for students to read and write decimals to the thousandths place and represent the decimals with diagrams.

The purpose of this lesson is for students to represent decimals to the thousandths in different ways. First, students use hundredths grids to represent fractions and decimals and also write decimals representing a shaded region. Then students analyze language to describe a decimal represented on a hundredths grid, focusing on the value of each digit in a decimal and how it is represented in the corresponding diagram. These different ways of viewing a decimal lead naturally to the expanded form and word form of decimals which students will study in greater detail in future lessons.

## Access for:

### Students with Disabilities

- Engagement (Activity 1)

### English Learners

- MLR2 (Activity 1)

## Instructional Routines

Estimation Exploration (Warm-up)

## Lesson Timeline

Warm-up	10 min
Activity 1	20 min

## Teacher Reflection Question

Think about a recent time from class when your students were confused. What did you do to support them in reasoning about their confusion together as a community of learners?

Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

## Cool-down (to be completed at the end of the lesson)

⌚ 5 min

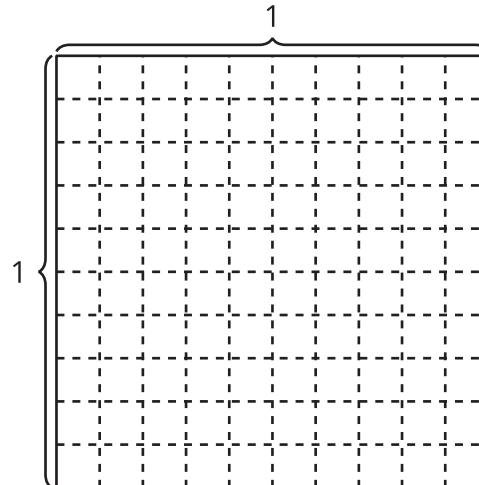
Shading Thousandths

### Standards Alignments

Addressing 5.NBT.A

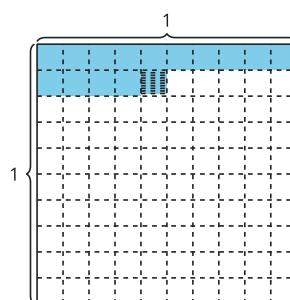
### Student-facing Task Statement

1. Shade the grid to represent 0.149.
2. What is another way you could represent 0.149?



### Student Responses

1. Sample response:



## 2. Sample responses:

- one tenth, four hundredths, and nine thousandths
- one hundred forty-nine thousandths
- $\frac{149}{1000}$

## ----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Estimation Exploration: What Part of the Square is Shaded?

**Standards Alignments**

Addressing 5.NBT.A

The purpose of this Estimation Exploration is for students to recognize the structure of the hundredths grid. Students have used this grid in this course and earlier courses. Without the hundredths grid, it is difficult to estimate the shaded region. This grid helps students to see tenths, hundredths, and with some extra work, even thousandths.

When students reflect about how the hundredths grid could help refine their estimate, they observe the value and power of its structure (MP7).

**Instructional Routines**

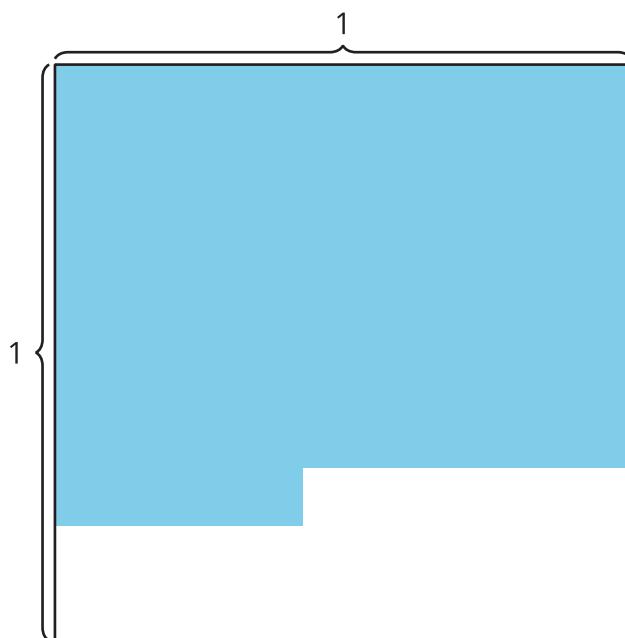
Estimation Exploration

**Student-facing Task Statement**

How much of the square is shaded?

**Launch**

- Groups of 2
- Display the image.
- “What is an estimate that’s too high?” “Too low?” “About right?”
- 1 minute: quiet think time



Record an estimate that is:

too low	about right	too high

## Student Responses

Sample responses:

- Too low: 0.50 to 0.60 or fraction equivalent
- About right: 0.65 to 0.80 or fraction equivalent
- Too high: 0.85 to 1.00 or fraction equivalent

## Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.

## Synthesis

- “Why is estimating the shaded region more difficult without the gridlines of a hundredths grid?” (The gridlines show me the tenths and hundredths. Without that, I can only guess or estimate.)

## Activity 1

⌚ 20 min

Represent Thousandths on a Grid

### Standards Alignments

Addressing 5.NBT.A

The purpose of this activity is for students to shade diagrams to represent fractions and decimals

to the thousandths place. The first problem reviews grade 4 work in which students filled in the same diagrams to show decimal fractions and decimals to hundredths. After this review, the problems all involve thousandths. First students interpret how much of a square is shaded and then they shade a part of a square to represent a three-digit decimal. Because the thousandths are so small students may struggle to count the shaded thousandths and may disagree about how many thousandths are shaded in the diagrams.

Monitor for students who interpret and draw diagrams of decimals by thinking about each individual digit in a number. For example, in order to show 0.327 in a diagram, students can think of this as:

- 3 tenths
- 2 hundredths
- 7 thousandths

When shading the thousandths and naming them, students must be precise and pay close attention to what they decide to shade (MP6).

### Access for English Learners

*MLR2 Collect and Display.* Circulate, listen for, and collect the language students use as they shade and interpret diagrams. On a visible display, record words and phrases such as: “fraction,” “part of,” “decimal,” “tenths,” “row,” “hundredths,” “thousandths,” “represents,” “shows.” Invite students to borrow language from the display as needed, and update it throughout the lesson.

*Advances: Conversing, Reading*

### Access for Students with Disabilities

*Engagement: Develop Effort and Persistence.* Differentiate the degree of difficulty or complexity. Some students may benefit from starting with representing smaller values on the grid. For example, represent one thousandth or two thousandths on the grid.

*Supports accessibility for: Conceptual Processing, Attention*

### Student-facing Task Statement

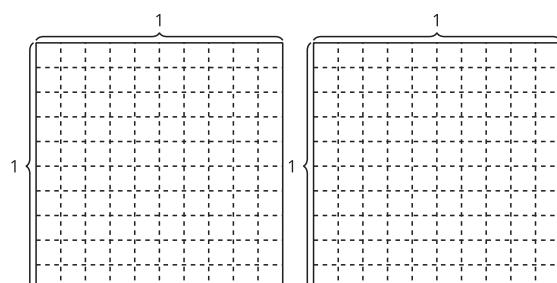
1. Shade each grid to represent the given number.

a.  $\frac{2}{10}$

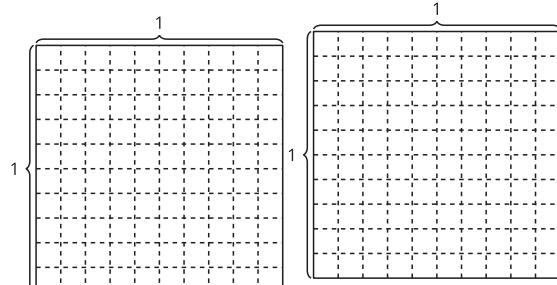
b. 0.2

### Launch

- Groups of 2
- “Today we are going to represent decimal numbers with diagrams.”
- “What does the decimal 0.001 mean?”  
(1 thousandth)

c.  $\frac{15}{100}$ 

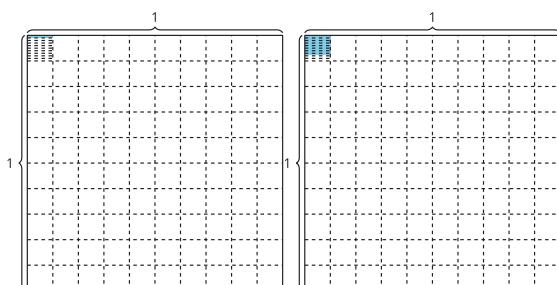
d. 0.34



2. For each diagram, write a decimal number to represent how much is shaded. Explain or show your reasoning.

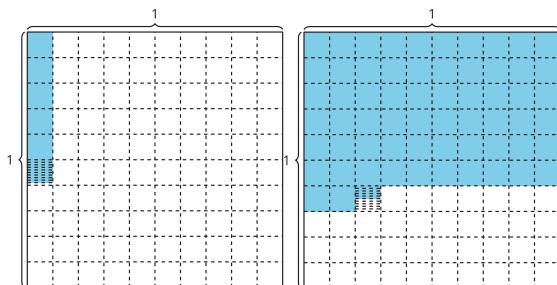
a.

b.



c.

d.



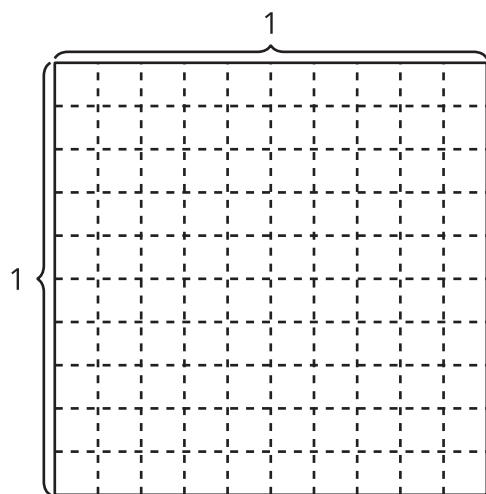
3. Shade 0.328 in the diagram. Explain or show your reasoning.

## Activity

- 8–10 minutes: independent work time
- Monitor for students who relate the diagrams to the decimal numbers by thinking about the tenths, hundredths, and thousandths shaded in the diagrams.

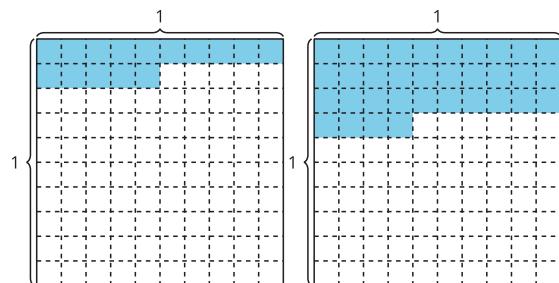
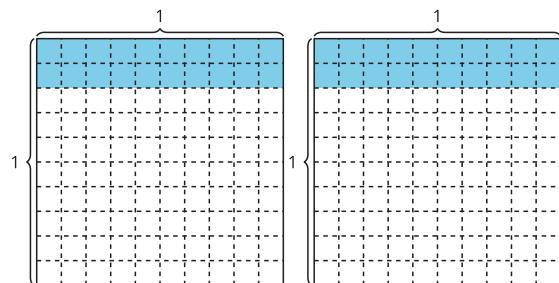
## Synthesis

- Display the diagram that shows 0.625.
- “What number does this diagram represent?” (six hundred twenty-five thousandths)
- As students respond to each of the following questions, highlight on the diagram the tenths, hundredths, and thousandths.
- “Where do you see 0.6 in the diagram?” (There are 6 rows shaded and each row is 0.1 or a tenth.)
- “Where do you see 0.62 in the diagram?” (There are 62 small squares shaded and each one is 0.01 or a hundredth so that's 0.62 or 62 hundredths.)
- “Where do you see 0.625 in the diagram?” (If we divide each small square into ten tiny rectangles there will be 625 of them and they are each 0.001.)



### Student Responses

1.

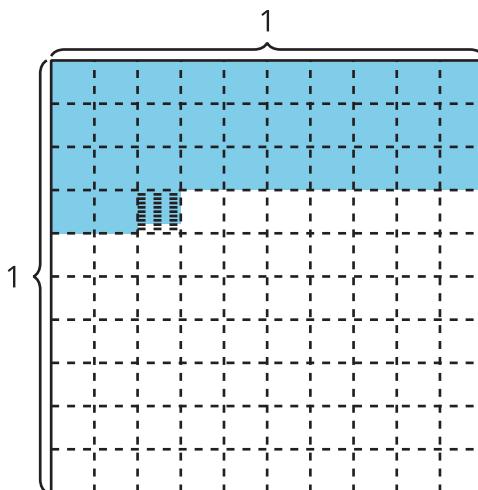


2.

- a. 0.001 because there is 1 thousandth shaded and 1 thousandth is 0.001
- b. 0.007 because there are 7 thousandths shaded and 7 thousandth is 0.007
- c. 0.058 because there are 5 hundredths and 8 thousandths shaded

d. 0.625 because there are 6 tenths, 2 hundredths, and 5 thousandths shaded

3.



### Advancing Student Thinking

If students do not write the correct number to represent the shaded hundredths grids, ask:

- “How does the diagram represent the number you wrote?”
- “How does the diagram represent each of the digits in the number you wrote?”

## Activity 2

⌚ 15 min

Say What?

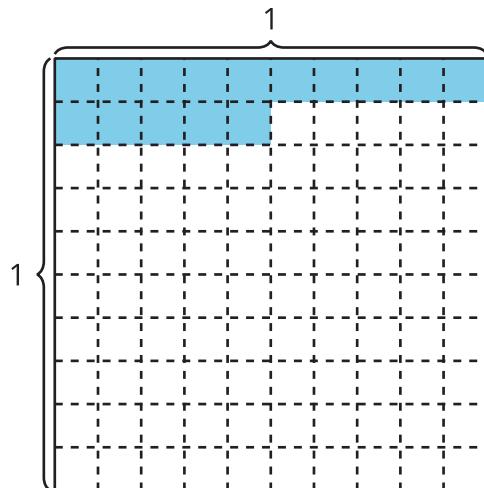
### Standards Alignments

Addressing 5.NBT.A.3

In this activity, students consider different ways to name a decimal shown on a hundredths grid. The meaning of a decimal such as 0.150 is 1 tenth, 5 hundredths, and 0 thousandths. In words, however, it is usually read as one hundred fifty thousandths. Students see, using a diagram, that 1 tenth and 5 hundredths is equivalent to 150 thousandths. When students interpret the different

descriptions of the shaded region they construct viable arguments and critically analyze claims (MP3).

### Student-facing Task Statement



Several students look at the diagram and describe the shaded region in different ways. Who do you agree with? Why?

- A. Jada says it's "15 hundredths."
- B. Priya says it's "150 thousandths."
- C. Tyler says it's "15 thousandths."
- D. Diego says it's "1 tenth and 5 hundredths."
- E. Mai says it's "1 tenth and half of a tenth."

### Student Responses

A, B, D, E

- A. Jada is correct. Sample response: The shaded row is a tenth or 10 hundredths and the 5 small shaded pieces are 5 hundredths more making 15 hundredths total.
- B. Priya is correct. Sample response: If each small square is divided into 10 tiny rectangles, those rectangles are thousandths. There are 100 thousandths in 0.1 and then 50 more in 0.05.

### Launch

- Groups of 2

### Activity

- 2 minutes: quiet think time
- 6 minutes: partner work time
- Monitor for students who use fractions or decimals to represent the language each student uses.

### Synthesis

- Invite students to share their answer and reasoning for each student's statement.
- As students share, represent their language with fractions and decimals and show their reasoning on the hundredths grid.

- C. Tyler is not correct. Sample response: It's 15 hundredths, not 15 thousandths.
- D. Diego is correct. Sample response: The 1 in 0.15 represents 1 tenth and the 5 represents 5 hundredths.
- E. Mai is correct. Sample response: The 0.1 is a tenth and 5 hundredths is half of another tenth.

### Advancing Student Thinking

If students need support when identifying the correct ways to represent 0.15 with words, refer to each of the correct student descriptions and ask, “How does the description represent the hundredths grid?” Then, refer to the incorrect description and ask, “Why doesn’t this description make sense?”

## Lesson Synthesis

⌚ 10 min

“Today we represented decimal numbers in different ways.” Display a shaded grid, such as a student response to represent the decimal 0.34 in the first activity.

“What are some different ways we can say this number?” (34 hundredths, 340 thousandths, 3 tenths and 4 hundredths)

Show or ask students to show how the diagram shows each way of saying the number.

### Suggested Centers

- Mystery Number (1–4), Stage 5: Six-digit Numbers (Supporting)
- Get Your Numbers in Order (1–5), Stage 4: Denominators 2, 3, 4, 5, 6, 8, 10, 12, or 100 (Supporting)

### Complete Cool-Down

## Response to Student Thinking

Students do not explain or show another way to represent the decimal.

### Next Day Support

- Launch warm-up or activity by creating a poster of the different representations students used in the cool-down of this lesson.

# Lesson 3: Thousandths in Expanded Form

## Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.A.3.a, 5.OA.A

### Teacher-facing Learning Goals

- Relate different representations of the same number.
- Write decimals in expanded form.

### Student-facing Learning Goals

- Let's represent thousandths.

## Lesson Purpose

The purpose of this lesson is for students to represent decimals to the thousandths place in expanded form.

The previous lesson introduced students to different ways of thinking about a decimal number, including by place value. The goal of this lesson is for students to make connections between familiar representations of decimals, such as grids or numerical form, and expanded form. Students have seen expanded form of whole numbers in a previous course and apply the same idea here to write expressions showing how many of each decimal place value is in a number. This sets students up for work in a future unit considering the relationship between place values.

## Instructional Routines

Which One Doesn't Belong? (Warm-up)

### Lesson Timeline

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

### Teacher Reflection Question

What unfinished learning or misunderstandings do your students have about the relationship between place values? How did you leverage those misconceptions in a positive way to further the understanding of the class?

**Cool-down** (to be completed at the end of the lesson) 5 min

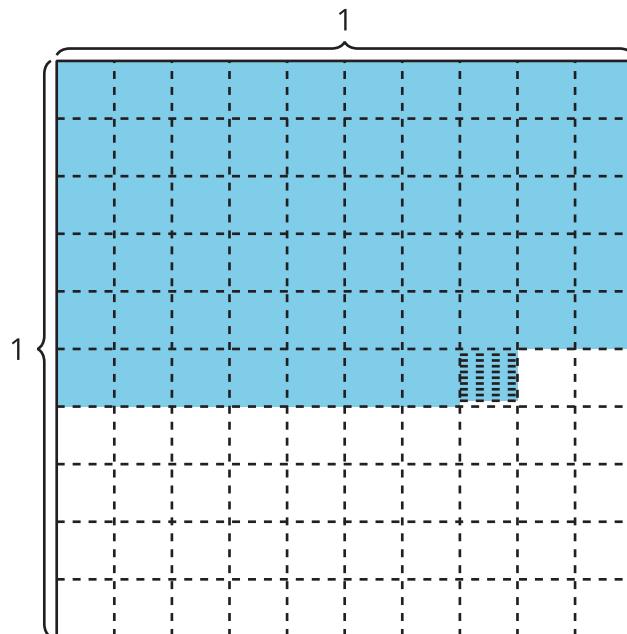
## Different Ways to Write a Decimal Number

**Standards Alignments**

Addressing 5.NBT.A.3.a

**Student-facing Task Statement**

The shaded region of the diagram shows a number.



1. Write the number as a decimal.
2. Write the number as a fraction.
3. Write the number in expanded form.
4. Write the number in word form.

**Student Responses**

1. 0.579
2.  $\frac{579}{1000}$
3.  $(5 \times 0.1) + (7 \times 0.01) + (9 \times 0.001)$
4. five hundred seventy-nine thousandths

## ----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Which One Doesn't Belong: Different Ways to Express a Decimal Number

**Standards Alignments**

Addressing 5.OA.A

This warm-up prompts students to compare four expressions. The particular expressions chosen give students a chance to focus on several important features, including:

- the operations
- the values of the expressions
- the types of numbers in the expressions (whole numbers versus decimals)

Students work in this lesson to express decimals in many different forms, and this warm-up gives students some familiarity thinking about some of those different forms.

**Instructional Routines**

Which One Doesn't Belong?

**Student-facing Task Statement**

Which one doesn't belong?

- $26 \div 100$
- 0.26
- $26 \times 0.001$
- $(2 \times 0.1) + (6 \times 0.01)$

**Student Responses**

Sample responses:

- A is the only one that has no decimals in the expression.
- B is the only one that has no operation.
- C is the only one that doesn't have the value 0.26.

**Launch**

- Groups of 2
- Display the image.
- “Pick one that doesn't belong. Be ready to share why it doesn't belong.”
- 1 minute: quiet think time

**Activity**

- “Discuss your thinking with your partner.”
- 2–3 minutes: partner discussion
- Share and record responses.

**Synthesis**

- Display the expression:  $2 \times 0.1 + 6 \times 0.01$
- “How is this expression different from the

- D is the only one that's not a single term, there's a sum. It's also the only one that does not have the digits 2 and 6 together.
- others?" (It is written as a sum. The different place values are written separately.)
- "Today we are going to represent decimal numbers in this way."

## Activity 1

⌚ 20 min

### Expanded Form

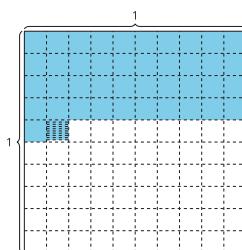
#### Standards Alignments

Addressing 5.NBT.A.3.a, 5.OA.A

In a previous course, students multiplied a decimal fraction by a whole number. In previous lessons, students wrote decimal fractions in decimal form. The purpose of this activity is for students to use expanded form of a decimal number to the thousandth. Students relate expanded form to both diagrams and decimal numbers. The expanded form of a decimal number highlights the value of each digit. For the number 0.835, for example, the 8 represents 8 tenths. This is shown in expanded form by writing the 0.8 as  $8 \times 0.1$ . Students practice relating decimals, diagrams, and expanded form and then are formally introduced to the term expanded form, as it applies to decimals, in the activity synthesis (MP2). The notation of expanded form is a generalization of what students saw in a previous grade with whole numbers.

#### Student-facing Task Statement

1. a. Explain or show why the shaded region represents  $(4 \times 0.1) + (1 \times 0.01) + (9 \times 0.001)$ .



1. b. What decimal number represents the shaded region?

#### Launch

- Groups of 2

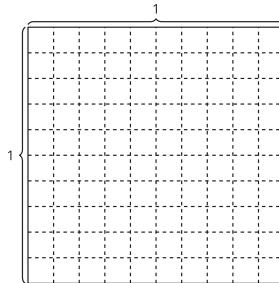
#### Activity

- 15 minutes: partner work time

#### Synthesis

- Display the diagram from the student workbook that shows 0.835.
- Consider circling each part of the diagram as students respond to the questions.
- "What part of the diagram shows  $8 \times 0.1$ ? How do you know?" (The 8 shaded

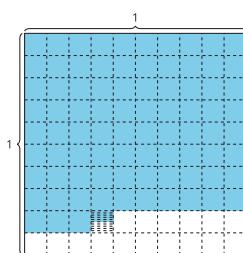
2. a. Shade the grid to represent  $(8 \times 0.1) + (3 \times 0.01) + (5 \times 0.001)$ .  
 b. Write the number  $(8 \times 0.1) + (3 \times 0.01) + (5 \times 0.001)$  in decimal form.



3. Mai says that the decimal 0.105 represents  $(1 \times 0.1) + (5 \times 0.01)$ . Do you agree with Mai? Explain or show your reasoning.

### Student Responses

1. a. The 4 horizontal shaded rows are each 0.1 and there are 4 of them. Then, the 1 small shaded square is 0.01, and then there are 9 tiny shaded rectangles and each of them is 0.001.  
 b. 0.419



2. a.  
 b. 0.835  
 3. No, the 1 in 0.105 does represent 1 tenth, but the 5 represents 5 thousandths, not 5 hundredths.

horizontal strips because they are each tenths or 0.1.)

- “What part of the diagram shows  $3 \times 0.01$ ? How do you know?” (The 3 single shaded squares because they are hundredths or 0.01.)
- “What part of the diagram shows  $5 \times 0.001$ ? How do you know?” (The 5 tiny shaded pieces because they are each thousandths or 0.001.)
- “What does the 5 in 0.105 represent?” (5 thousandths)
- “I can write 0.105 as  $1 \times 0.1 + 5 \times 0.001$  to show that it is 1 tenth and 5 thousandths. This is called the expanded form of a decimal.”

## Activity 2

⌚ 15 min

### Decimal Numbers in Numerous Ways

#### Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.A.3.a

The purpose of this activity is for students to practice different ways of expressing decimal numbers to the thousandth. In addition to standard decimal digit form, these ways include:

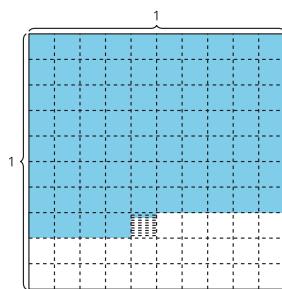
- diagrams
- expanded form
- fractions
- words

The goal of the activity synthesis is to show how the different ways to represent a decimal are interrelated. This gives students an opportunity to make sense of each form and how it relates to the others (MP2).

#### Student-facing Task Statement

Represent each number in as many ways as you can.

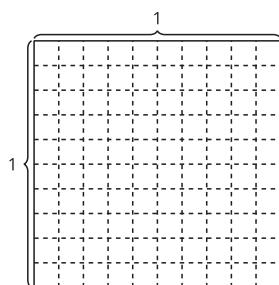
1.



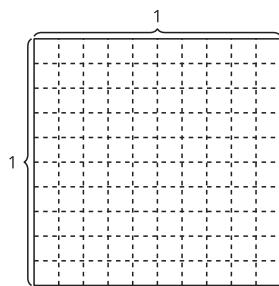
2.  $\frac{477}{1,000}$

#### Launch

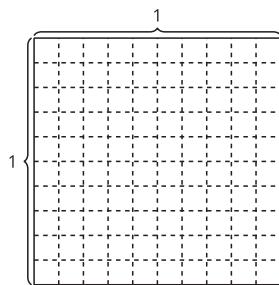
- Groups of 2
- Display the first image that represents the number 0.742 in the student workbook.
- “What are some different ways we can represent the number shown in the diagram?”
  - 0.742
  - seven hundred forty-two thousandths
  - $0.7 + 0.04 + 0.002$
  - $(7 \times 0.1) + (4 \times 0.01) + (2 \times 0.001)$
  - $\frac{742}{1,000}$
- 1 minute: quiet think time
- Share and record responses.



3. one hundred thirty-six thousandths



4.  $(3 \times 0.1) + (6 \times 0.01) + (8 \times 0.001)$



## Student Responses

1. Sample responses:
  - 0.742
  - seven hundred forty-two thousandths
  - $(7 \times 0.1) + (4 \times 0.01) + (2 \times 0.001)$
  - $\frac{742}{1,000}$
2. Sample responses:
  - four hundred seventy-seven thousandths
  - $(4 \times 0.1) + (7 \times 0.01) + (7 \times 0.001)$

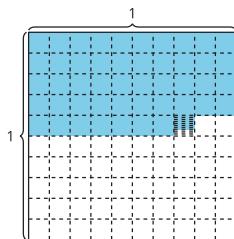
## Activity

- “Now find as many ways as you can to represent each number.”
- 2 minutes: independent work time
- 6 minutes: partner work time

## Synthesis

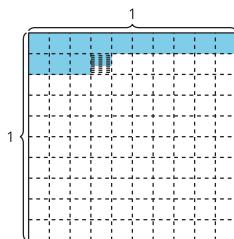
- Invite students to share their representations of  $(3 \times 0.1) + (6 \times 0.01) + (8 \times 0.001)$ .
- Display: 0.368
- “How does each digit in the decimal relate to the expanded form?” (The 3 is 3 groups of 1 tenth or 0.3, the 6 is six groups of 1 hundredths or 0.06, and the 8 is 8 groups of 1 thousandth or 0.008.)
- Display:  $\frac{368}{1000}$
- “How does the expanded form relate to the fraction?” (The 300 is the 3 tenths, the 60 is the 6 hundredths, and the 8 is the 8 thousandths.)
- Display student work that shows 0.368 represented on the hundredths grid.
- “How does the expanded form relate to the diagram?” (The 3 tenths are the top 3 rows. The 6 hundredths are the 6 squares in the next row. The 8 thousandths are the small rectangles.)

- 0.477



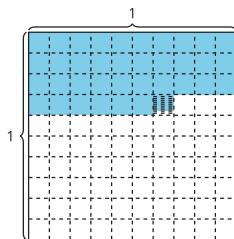
3. Sample responses:

- $(1 \times 0.1) + (3 \times 0.01) + (6 \times 0.001)$
- 0.136
- $\frac{136}{1000}$



4. Sample responses:

- three hundred sixty-eight thousandths
- 0.368
- $\frac{368}{1000}$



### Advancing Student Thinking

If students are not able to find multiple ways to represent a given number, refer to the list from the launch of the activity.

## Lesson Synthesis

⌚ 10 min

"Today we represented decimal numbers in many ways."

Display: 0.315

"What are some different ways you can represent this number? What is your favorite way?" (Three hundred fifteen thousandths,  $\frac{315}{1,000}$ ,  $(3 \times 0.1) + (1 \times 0.01) + (5 \times 0.001)$ , or I could draw a diagram. My favorite way is the decimal because it's the shortest.)

Display responses for all to see.

### Suggested Centers

- Mystery Number (1–4), Stage 5: Six-digit Numbers (Supporting)
- Get Your Numbers in Order (1–5), Stage 4: Denominators 2, 3, 4, 5, 6, 8, 10, 12, or 100 (Supporting)

### Complete Cool-Down

### Response to Student Thinking

Students do not represent the number correctly.

### Next Day Support

- Launch Warm-up or Activity 1 by highlighting important ideas from previous lessons.

# Lesson 4: Explore Place Value Relationships (Optional)

## Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.A.3, 5.NBT.A.3.a

### Teacher-facing Learning Goals

- Explore place value relationships between tenths, hundredths, and thousandths.

### Student-facing Learning Goals

- Let's explore place value relationships.

## Lesson Purpose

The purpose of this lesson is for students to explore the relationships between different ways of representing a decimal using the context of weights and a balance.

In previous lessons, students represented 1 tenth, 1 hundredth, and 1 thousandth as fractions, decimals, with words and in expanded form. The purpose of this optional lesson is to use the context of weight to further understand and relate these different ways to represent a decimal number (MP2). The weights make the expanded form of a decimal tangible and also help to explain the word form which, in the weight context, represents using all weights of the smallest size (one thousandth for a decimal to the thousandths).

The third activity in the lesson focuses on the multiplicative relationships between the different place values, again shown by the weights. In particular, 1 tenth is equivalent to 10 hundredths and 1 hundredth is equivalent to 10 thousandths. These relationships will be explored further in the next unit, but students use these relationships throughout this unit as they work with decimals and perform arithmetic with decimals.

## Access for:

### Students with Disabilities

- Representation (Activity 3)

### English Learners

- MLR1 (Activity 1)

## Instructional Routines

Notice and Wonder (Warm-up)

## Lesson Timeline

Warm-up

10 min

## Teacher Reflection Question

What connections did students make between the different strategies shared? What questions

Activity 1	15 min	did you ask to help make the connections more visible?
Activity 2	10 min	
Activity 3	10 min	
Lesson Synthesis	10 min	
Cool-down	5 min	

## Cool-down (to be completed at the end of the lesson) ⌚ 5 min

### Worth its Weight in Gold

#### Standards Alignments

Addressing 5.NBT.A.3

#### Student-facing Task Statement

A gold nugget balances with 2 one hundredth ounce weights and 6 one thousandth ounce weights.

1. What is the weight of the nugget? Write your answer as a decimal.
2. What is a different set of weights that will balance the nugget?

#### Student Responses

1. 0.026 ounces
2. One hundredth ounce and 16 thousandth ounce weights, because a hundredth is the same as 10 thousandths.

----- Begin Lesson -----

## Warm-up

⌚ 10 min

### Notice and Wonder: Maintain Your Balance

## Standards Alignments

Addressing 5.NBT.A.3

The purpose of this warm-up is for students to recognize that a balance shows when two weights are equal. This will be useful when students look at weights representing the different decimal place values, providing students with a concrete way to think about the meaning of the digits in a decimal number and the multiplicative relationships between the place values (MP7). The weights will also be used to connect the word form of a decimal number to thousandths and the decimal form.

## Instructional Routines

Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?



### Student Responses

Students may notice:

- There is a scale with weights.
- There is only one weight on the left.
- There are a lot of weights on the right.
- The balance says that the weights on the left and right are equal.
- Ten 0.001s is equal to 0.01.

Students may wonder:

- What are the objects on the balance?
- Do the numbers represent weights?

### Launch

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- “Each of the smaller weights weigh 0.001 of an ounce. The larger weight weighs one hundredth of an ounce. If there were 20 weights that each weighed 0.001 of an ounce on one side, what would need to be on the other side to stay balanced?” (2 hundredths, 1 hundredth and 10 thousandths, 20 thousandths)

- How does a balance work?
- What will happen if I take off a weight on one side?

## Activity 1

⌚ 15 min

Balance the Weight

### Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.A.3

The purpose of this activity is for students to examine relationships between the different decimal place values. In earlier lessons, students represented decimal numbers using words, fractions, diagrams, and symbols. The diagrams help to reveal that a thousandth is 1 tenth of a hundredth and a hundredth is 1 tenth of a tenth. In this activity, students systematically examine these relationships. For example, there are many different ways to represent 2 tenths. It is also 20 hundredths or 200 thousandths or 1 tenth and 10 hundredths. Through the idea of weights, students investigate these different equivalences. The weights give students a visual and physical way to reason about the different place values and their relationships (MP2, MP7).

The activity synthesis focuses on two key ways to balance a weight or represent a decimal number:

- use the least number of weights to represent a three-digit decimal weight, which is the expanded form students studied in the previous lesson (for example 3 tenths, 8 hundredths, and 5 thousandths).
- use only the smallest weights, thousandths, to represent a three-digit weight, which is the way the decimal number is usually said in words or written as an equivalent fraction (385 thousandths).

### 🌐 Access for English Learners

*MLR1 Stronger and Clearer Each Time.* Synthesis: Before the whole-class discussion, give students time to meet with 2–3 partners to share and get feedback on their response to “What sets of weights will balance the nuggets?”. Invite listeners to ask questions, to press for details, and to suggest mathematical language. Give students 2–3 minutes to revise their written explanation based on the feedback they receive.

*Advances: Writing, Speaking, Listening*

## Required Preparation

- If needed, give students access to the hundredths grid.

## Student-facing Task Statement



For each problem, you have a balance and weights of 0.1 ounce, 0.01 ounce, and 0.001 ounce.

1. A gold nugget weighs 0.2 ounces.
  - a. What is one set of weights you could use to balance the nugget? Explain or show your reasoning.
  - b. What is another set of weights you could use to balance the nugget? Explain or show your reasoning.
  - c. How many 0.01 ounce weights would you need to balance the nugget? What about 0.001 ounce weights?
2. Another nugget weighs 0.385 ounce.
  - a. What is one set of weights you could use to balance the nugget? Explain or show your reasoning.
  - b. What is the smallest number of weights you can use to balance the nugget? Explain or show your reasoning.
  - c. What is the largest number of weights you can use to balance the nugget? Explain or show your reasoning.
3. Write a decimal number for the weight of the gold nuggets that balanced with:
  - a. 266 of the 0.001 ounce weights
  - b. 150 of the 0.01 ounce weights
  - c. 27 of the 0.1 ounce weights

## Launch

- Display the image of balance.
- “Balances are used to weigh things. On one side you put the object you want to weigh and on the other side you put weights. When the two sides balance, they have the same weight.”

## Activity

- 8–10 minutes: independent work time
- Monitor for students who explicitly use the values of the different decimal places in their reasoning by:
  - thinking about the digits in the decimals separately
  - understanding how to express tenths in terms of hundredths or thousandths, and hundredths in terms of thousandths

## Synthesis

- Invite students to share their responses for the weights they use to balance the 0.385 ounce gold nugget.
- “How do you know that 3 of the 0.1 ounce weights, 8 of the 0.01 ounce weights, and 5 of the 0.001 ounce weights will work?” (The 3 tenth ounce weights give the 3 from the decimal, the 8 hundredth ounce weights give the 8, and the 5 thousandth ounce weights give the 5.)
- “We can represent this with expanded form.”
- Display equation:
 
$$0.385 = 3 \times 0.1 + 8 \times 0.01 + 5 \times 0.001$$
- “How do you know that 385 of the 0.001

## Student Responses

1.
  - a. Two 0.1 ounce weights because that makes 0.2 ounces.
  - b. One 0.1 ounce weight and ten 0.01 ounce weights. Since 10 hundredths is a tenth, I can replace a 0.1 ounce weight with ten 0.01 ounce weights.
  - c. Since there are 10 hundredths in each tenth, I could replace the two 0.1 ounce weights with twenty 0.01 ounce weights. I could replace the 0.1 ounce weights with all 0.001 ounce weights. There are 10 thousandths in a hundredth and 100 thousandths in a tenth so I can replace the two 0.1 ounce weights with 200 of the 0.001 ounce weights.
2.
  - a. Three 0.1 ounce weights, eight 0.01 ounce weights, and five 0.001 ounce weights
  - b. The smallest number of weights is three 0.1 ounce weights, eight 0.01 ounce weights, and five 0.001 ounce weights. I can replace a 0.1 ounce weight but only by using more weights. I can also replace a 0.01 ounce weight but only using more weights. I can't replace a 0.001 ounce weight.
  - c. I could use all thousandth ounce weights and there would be 385 of them since 0.385 is 385 thousandths.
3.
  - a. 0.266 ounces
  - b. 1.5 ounces
  - c. 2.7 ounces

ounce weights will also work?" (Because that is the same as 3 tenth ounce weights, 8 hundredth ounce weights, and 5 thousandth ounce weights.)

- Refer to the decimal, 0.385
- "How can you say or name this decimal number?" (Three hundred eighty five thousandths or 3 tenths, 8 hundredths, and 5 thousandths)

## Activity 2

⌚ 10 min

### Weights and Place Values

#### Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.A.3.a

The purpose of this activity is to provide further practice relating the different forms of decimals. This includes expanded form, word form, and decimal form. Using the balance and weight of gold nuggets as a context, students go back and forth between different ways of representing these weights (MP2). The synthesis highlights the meaning of the digits in a decimal and how that relates to the expanded form of the decimal.

#### Student-facing Task Statement



- Weights are used to balance some gold nuggets. Write the weight of each gold nugget in expanded form.
  - three 0.1 ounce weights, five 0.01 ounce weights, and eight 0.001 ounce weights
  - six 0.1 ounce weights and two 0.001 ounce weights
  - two 0.01 ounce weights and six 0.1 ounce weights
- Here are the weights of some gold nuggets in word form. Write the weights in expanded

#### Launch

- Display the image.
- "What decimal can I write for the weight of the gold nugget?" (0.124)
- Write equation:  

$$0.124 = (1 \times 0.1) + (2 \times 0.01) + (4 \times 0.001)$$
- "How does the balance show the expanded form of 0.124?" (There is 1 tenth of an ounce weight, 2 hundredth of an ounce weights, and 4 thousandth of an ounce weights.)

#### Activity

- 8–10 minutes: independent work time
- Monitor for students who see, in the first problem, that the digits in the decimal for the gold weights are the same as the number of weights for that decimal place value.

#### Synthesis

- Invite students to share the expanded form

form.

- a. two hundred eighty three thousandths of an ounce
- b. four hundred nine thousandths of an ounce
3. A gold nugget weighs 0.527 ounces.
  - a. What is the value of each of the digits in the decimal 0.527?
  - b. How does the expanded form of 0.527 show the value of each digit in the decimal?

### Student Responses

1. a.  $(3 \times 0.1) + (5 \times 0.01) + (8 \times 0.001)$   
b.  $(6 \times 0.1) + (2 \times 0.001)$   
c.  $(2 \times 0.01) + (6 \times 0.1)$
2. a.  $(2 \times 0.1) + (8 \times 0.01) + (3 \times 0.001)$   
b.  $(4 \times 0.1) + (9 \times 0.001)$
3. a. The value of the 5 is 5 tenths. The value of the 2 is 2 hundredths and the value of the 7 is 7 thousandths.  
b. The expanded form highlights the value of each digit. The expanded form of 0.527 is  $(5 \times 0.1) + (2 \times 0.01) + (7 \times 0.001)$ . The products in the expanded form give the value of each digit.

of the decimal 0.527.

- Display the expression:  $(5 \times 0.1) + (2 \times 0.01) + (7 \times 0.001)$
- “What is the value of the 5 in 0.527?” (5 tenths)
- “How does the expanded form show this?” (It shows the 5 is  $5 \times 0.1$  or 5 tenths.)
- “What is the value of the 7 in 0.527?” (7 thousandths)
- “How does the expanded form show this?” (It shows the 7 is  $7 \times 0.001$  or 7 thousandths.)
- “How is going from word form to expanded form different than going from decimal form to expanded form?” (The decimal form shows the place values. With the word form, everything is given in terms of thousandths, so I need to figure out what the individual place values of the number are.)

## Activity 3

⌚ 10 min

### Comparing Place Values with Weights

#### Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.A.3

The purpose of this activity is for students to use the weights from the previous activity to support place value understanding, specifically to see the multiplicative relationships between different decimal place values (MP7). These relationships will be taken up in greater detail in the next unit but the weights provide a convenient way to see these relationships which complements the diagrams students used in earlier lessons.

Students first compare weights of two gold nuggets, one weighed using 0.1 ounce weights and the other using 0.01 ounce weights. The two nuggets have the same weight because ten 0.01 ounce weights are equivalent to one 0.1 ounce weight, as students saw in the warm-up. Students move from here to making multiplicative comparisons between place values. They can use the weights to help visualize or calculate or they might use a diagram like those in the previous lesson.

### ⓘ Access for Students with Disabilities

*Representation: Internalize Comprehension.* Synthesis: Provide students with a partially completed graphic organizer, such as a two column table, to record the relationship between tenths and hundredths, hundredths and thousandths, and tenths and thousandths.

*Supports accessibility for: Conceptual Processing, Memory*

### Student-facing Task Statement

- How many 0.01 ounce weights will balance one 0.1 ounce weight? Explain or show your reasoning.
- How many 0.001 ounce weights will balance a 0.1 ounce weight? Explain or show your reasoning.
- The table shows the weights of 3 of the gold nuggets Diego and his friends found panning for gold.

Fill in the blanks. Explain or show your reasoning.

gold	weight (grams)
nugget A	0.6
nugget B	0.06
nugget C	0.006

### Launch

- Groups of 2

### Activity

- 2 minutes: independent work time
- 8 minutes: partner work time
- Monitor for students who use different strategies to compare the values of the 6s in the gold nugget weights:
  - using the value of each place in the decimal
  - thinking about fractions or representing the decimals as fractions
  - using a diagram such as a hundredths grid

- Nugget A weighs \_\_\_\_ times as much as Nugget B.
- Nugget A weighs \_\_\_\_ times as much as Nugget C.
- Nugget C weighs \_\_\_\_ times as much as Nugget B.
- Nugget C weighs \_\_\_\_ times as much as Nugget A.

### Student Responses

- 10 because there are 10 hundredths in a tenth
- 100 because there are 10 thousandths in a hundredth and 10 hundredths in a tenth
- a. 10 because there are 10 hundredths in a tenth and so there are 60 hundredths in 6 tenths  
b. 100 because there are 100 thousandths in each tenth so here are 600 thousandths in 6 tenths  
c.  $\frac{1}{10}$  because each thousandth is  $\frac{1}{10}$  of a hundredth  
d.  $\frac{1}{100}$  because each thousandth is  $\frac{1}{100}$  of a tenth

### Synthesis

- “How are the weights of the nuggets the same? How are they different?” (They all have a 6 in them. They each balance with 6 of one of the unit weights. The value of the 6 is different for each nugget.)
- “How do hundredths, the weights for B, compare to tenths, the weights for A?” (There are 10 hundredths in each tenth or a tenth of a tenth is a hundredth.)
- “Nugget B weighs how many times as much as Nugget A? How do you know?” ( $\frac{1}{10}$  because Nugget A is 6 tenths and a tenth of that is 6 hundredths since a tenth of a tenth is a hundredth.)
- “How do thousandths, the weights for C, compare to tenths, the weights for A?” (There are 100 thousandths in a tenth and one hundredth of a tenth is a thousandth.)
- “Nugget A weighs how many times as much as Nugget C?” (100, there are 100 thousandths in a tenth.)

## Lesson Synthesis

⌚ 10 min

“Today we investigated different ways to write decimal numbers by thinking about a balance and the different ways we can balance a given object. Here are the weights that balance two gold nuggets.”

Display the table:

gold	weight
nugget 1	two 0.1 ounce weights
nugget 2	twenty 0.01 ounce weights

"How many ounces do the two gold nuggets weigh?" (2 tenths and 20 hundredths)

"How do you know those two weights are equivalent?" (1 tenth is 10 hundredths so 2 tenths is 20 hundredths)

"How many thousandth ounce weights would you need to balance each of these nuggets?" (I would need 200 thousandth weights because 10 of them is a hundredth and so 20 hundredths is 200 thousandths.)

Display the decimals: 0.2, 0.20, 0.200

"What do you notice? What do you wonder?" (I notice that they all have the same value, 2 tenths, 20 hundredths, 200 thousandths. I wonder why there are so many different ways to express a decimal number.)

---

## Suggested Centers

- Tic Tac Round (3–5), Stage 3: Decimals (Addressing)
- Greatest of Them All (1–5), Stage 4: Decimals (Addressing)
- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)

---

## Complete Cool-Down

---

### Response to Student Thinking

Students do not accurately explain a different set of weights that would balance the gold nugget.

### Next Day Support

- Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.

# Lesson 5: Compare Decimals

## Standards Alignments

Addressing 5.NBT.A.3, 5.NBT.A.3.b

### Teacher-facing Learning Goals

- Compare decimals to the thousandths place.

### Student-facing Learning Goals

- Let's compare decimals.

## Lesson Purpose

The purpose of this lesson is for students to use place value understanding to compare decimals to the thousandths place.

In previous lessons, students read and write decimals to the thousandths place. In this lesson, students use place value understanding to compare decimals to the thousandths place. Students may use diagrams, words, or expressions to justify their thinking. Make hundredths grids available for students to use. Students will build on their earlier work with thousandths when they look for a number between 5 and 5.01. In order to find a decimal between these two numbers students will realize that they need a value smaller than a hundredth, motivating them to use the thousandths place and to think of 5 as 5.000 and 5.01 as 5.010.

## Access for:

### Students with Disabilities

- Representation (Activity 2)

### English Learners

- MLR8 (Activity 1)

## Instructional Routines

True or False (Warm-up)

### Materials to Copy

- Small Grids (groups of 1): Activity 1
- Small Grids (groups of 1): Activity 2

## Lesson Timeline

Warm-up

10 min

## Teacher Reflection Question

In what ways did your students apply place

Activity 1	10 min	value reasoning from previous lessons during the lesson today?
Activity 2	20 min	
Lesson Synthesis	10 min	
Cool-down	5 min	

## Cool-down (to be completed at the end of the lesson) ⌚ 5 min

Compare Decimals

### Standards Alignments

Addressing 5.NBT.A.3.b

### Student-facing Task Statement

Lin threw the frisbee 5.09 meters. Andre threw the frisbee 5.1 meters. Who threw the frisbee farther? Explain or show your reasoning.

### Student Responses

Andre threw the frisbee farther. They each threw it 5 meters but then 1 tenth is 10 hundredths and that's more than 9 hundredths.

----- Begin Lesson -----

## Warm-up

⌚ 10 min

True or False: Decimals

### Standards Alignments

Addressing 5.NBT.A.3

The purpose of this warm-up is for students to compare different ways of representing a decimal number. It will be important in this and future lessons to write a given decimal in a different form. For example, it is convenient to write 7.3 as 7.300 in order to compare it to 7.299.

## Instructional Routines

True or False

### Student-facing Task Statement

Decide if each statement is true or false. Be prepared to explain your reasoning.

- $7.06 = 7.006$
- $7.06 = 7.060$
- $7.06 = 7.600$

### Student Responses

Sample responses:

- False: They both have 7 but 6 hundredths is not the same as 6 thousandths.
- True: They both have 7 and 6 hundredths. One number also shows 0 thousandths but that does not change the value.
- False: One is 7 and 6 tenths while the other is 7 and 6 hundredths.

### Launch

- Display one statement.
- “Give me a signal when you know whether the statement is true and can explain how you know.”
- 1 minute: quiet think time

### Activity

- Share and record answers and strategy.
- Repeat with each statement.

### Synthesis

- “How did you decide if the second equation is true?” (I looked at the value of the digits in each place. They are all the same except for an extra 0. But 0 thousandths does not change the value of the number.)

## Activity 1

⌚ 10 min

Farther and Faster

### Standards Alignments

Addressing 5.NBT.A.3.b

The purpose of this activity is for students to compare decimals using the context of distance. Students should have access to hundredths grids, if they choose to use them. Monitor for students who compare the decimals using

- place value reasoning to compare the 1 tenth for Diego's throw with the 1 hundredth for Jada's throw

- hundredths grids for the decimal part of the throws
- number lines, recalling work from a previous course

When students decide to compare the decimals using number lines or hundredths grids, they are using appropriate tools strategically (MP5).

### Access for English Learners

*MLR8 Discussion Supports.* Encourage students to begin partner discussions by reading their written responses aloud. If time allows, invite students to revise or add to their responses based on the conversation that follows.

*Advances: Conversing, Speaking*

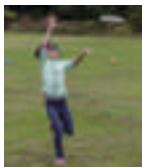
### Materials to Copy

Small Grids (groups of 1)

### Student-facing Task Statement

1. Diego and Jada were competing to see who could throw the frisbee further. Diego threw the frisbee 5.10 meters. Jada threw the frisbee 5.01 meters.

Who threw the frisbee further?  
Be prepared to explain your thinking.



2. Tyler and Han were competing to see who could swim the length of the pool faster. Tyler swam the length of the pool in 35.15 seconds. Han swam the length of the pool in 35.30 seconds. Who swam the length of the pool faster? Be prepared to explain your thinking.

### Student Responses

1. Diego because he threw it five meters plus 0.1 of a meter and Jada only threw it 5 feet plus 0.01 of a meter. Sample diagram:

### Launch

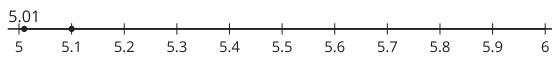
- Groups of 2
- Display the image in student workbook.
- “Have you ever thrown a frisbee?”
- Poll the class.
- “A frisbee is a disc. In the Olympics, there is an event called the discus throw. Participants try to throw a metal disc as far as they can.”

### Activity

- 2 minutes: independent work time
- 5 minutes: partner work time
- Monitor for students who use reasoning named in the activity narrative.

### Synthesis

- Ask previously selected students to share their solutions.
- “Both problems are about comparing decimals. How are the problems different?”



2. Tyler because 35.15 is less than 35.30. It has only 1 tenth and some hundredths while 35.30 has 3 tenths.

(The units are different in the two problems. One is meters and the other is seconds. In one problem, the winner has the greater number and in the other problem, the winner has the lesser number.)

## Activity 2

⌚ 20 min

### Farthest Frisbee Flight

#### Standards Alignments

Addressing 5.NBT.A.3

The purpose of this activity is for students to use place value understanding to find decimals that are greater than or less than given numbers. Students work with the frisbee context from the previous activity. They choose decimals for possible distances which are in between the given distances of frisbee throws. Then they list several possible distances in increasing order. Students may use many strategies which all rely on place value:

- using hundredths grids or other diagrams
- using expanded form and comparing the value in each place

Make hundredths grids available for students.

When students use strategies that are based on place value they are looking for and making use of place value structure (MP7).

#### ⌚ Access for Students with Disabilities

*Representation: Internalize Comprehension.* Activate or supply background knowledge. Provide a blank place value chart for students to use as a reference.

*Supports accessibility for: Memory, Conceptual Processing*

#### Materials to Copy

Small Grids (groups of 1)

## Student-facing Task Statement

Recall that Diego threw the frisbee 5.1 meters and Jada threw the frisbee 5.01 meters. For each question, find 2 possible answers.

1. Han threw the frisbee farther than Diego. How far might Han have thrown the frisbee?
2. Tyler threw the frisbee farther than Diego but less than 6 meters. How far might Tyler have thrown the frisbee?
3. Mai threw the frisbee a shorter distance than Jada. How far might Mai have thrown the frisbee?
4. Priya threw the frisbee a shorter distance than Jada, but more than 5 meters. How far might Priya have thrown the frisbee?

## Student Responses

Sample responses:

1. 5.5 meters, 6 meters, 7 meters
2. 5.11 meters, 5.2 meters, 5.3 meters
3. 4 meters, 5 meters, 4.99 meters
4. 5.001 meters, 5.002 meters, 5.003 meters

## Launch

- Groups of 2
- Display: 0.01, 0.001
- “Which is greater? How do you know?” (0.01 because it’s a hundredth and that’s more than a thousandth or 0.001.)

## Activity

- 6–8 minutes: partner work time
- “Get together with a different pair of students and list all of your distances for Tyler and for Priya in increasing order.” (Answers vary.)
- 4–5 minutes: group work time

## Synthesis

- Invite students to share their distances for Mai and Priya.
- “How did you find some possible distances for Mai?” (I could pick any number that was 5 or less so there were lots of choices, 5, 4, 4.7, 4.8)
- “How was finding a distance for Priya different than finding a distance for Mai?” (I had to pick a number that was bigger than 5 but Priya had just 1 hundredth. I could not find a number using just hundredths. I had to use thousandths because they’re smaller than hundredths.)
- “What strategies did you use to put the numbers in your group in order?” (We had some duplicate numbers so we needed to find those. We looked at the whole number and then the tenths, hundredths, and thousandths to find which number was the greatest.)

## Lesson Synthesis

⌚ 10 min

"Today we used place value understanding to compare decimals."

Display:

$$0.51 = 0.510$$

$$0.52 = 0.520$$

"How is this helpful for determining numbers that come between these two numbers?" (We can name all the thousandths. There aren't any hundredths between 0.51 and 0.52.)

"What is a number that is between 0.51 and 0.52? How do you know?" (0.513 because it has 3 more thousandths than 0.51 but it is still smaller than 0.52 which has an extra hundredth.)

---

### **Suggested Centers**

- Mystery Number (1–4), Stage 6: Decimals (Addressing)
- Get Your Numbers in Order (1–5), Stage 5: Decimals (Addressing)

# Lesson 6: Compare Decimals on the Number Line

## Standards Alignments

Addressing 5.NBT.A, 5.NBT.A.3.b

## Teacher-facing Learning Goals

- Compare two decimals based on the value of the digits in each place, using  $>$ ,  $=$ , and  $<$  symbols to record the results of comparisons.
- Represent decimals on a number line.

## Student-facing Learning Goals

- Let's locate and label decimals on number lines.

## Lesson Purpose

The purpose of this lesson is for students to represent decimals to the thousandths place on the number line and compare them.

In the previous lesson students compared decimals using a strategy that made sense to them with a focus on developing place value understanding to include thousandths. In this lesson, students use the number line to locate decimals to the thousandth. They continue to use their place value understanding as they label tick marks representing tenths, hundredths, and thousandths (MP7). They also see that the number line can be used to compare decimals just like it was used to compare whole numbers in earlier grades. Students also consider which number line is best for locating different decimals.

## Access for:

### Students with Disabilities

- Engagement (Activity 1)

### English Learners

- MLR8 (Activity 1)

## Instructional Routines

Notice and Wonder (Warm-up)

## Lesson Timeline

Warm-up	10 min
Activity 1	15 min

## Teacher Reflection Question

Reflecting on the students' work today, who participated in math class today? What assumptions are you making about those who

Activity 2	10 min
Activity 3	10 min
Lesson Synthesis	10 min
Cool-down	5 min

did not participate? How can you leverage each of your students' ideas to support them in being seen and heard in tomorrow's math class?

## Cool-down (to be completed at the end of the lesson) ⌚ 5 min

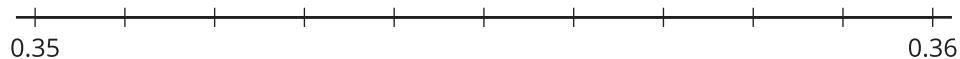
Locate, Label, and Compare Numbers

### Standards Alignments

Addressing 5.NBT.A.3.b

### Student-facing Task Statement

1. Locate and label 0.355 and 0.359 on the number line.



2. Which is greater, 0.355 or 0.359? Explain or show your reasoning.

### Student Responses



2. Sample response: 0.359 is greater because it's farther to the right.

----- Begin Lesson -----

## Warm-up

⌚ 10 min

Notice and Wonder: Nested Lines

### Standards Alignments

Addressing 5.NBT.A.3.b

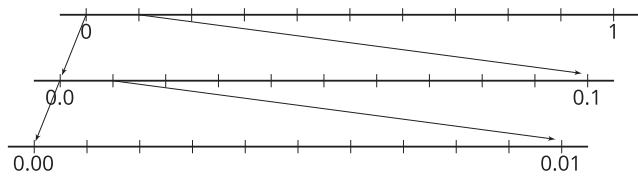
The purpose of this Notice and Wonder is for students to look at different number lines that all start at 0 but show different decimals. The number lines are nested, that is each successive one is contained in the previous one. The key points for students to notice are that the number lines all have decimals on them and that the size of those decimals is getting smaller. In the lesson, they will plot decimals on number lines like these.

## Instructional Routines

Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?



### Student Responses

Students may notice

- There are three number lines.
- Each number line looks like it comes out of the one above it.
- Each number line has smaller numbers on it.

Students may wonder

- Are we going to use these number lines?
- Can I keep going, putting in more number lines?
- What numbers go on the tick marks?

### Launch

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- “What are the tick marks on the top number line?” (one tenth, two tenths, three tenths, and so on)
- “Today we are going to use number lines like these to locate different decimals.”

## Activity 1

⌚ 15 min

Locate 1 Thousandth

## Standards Alignments

Addressing 5.NBT.A

The purpose of this activity is for students to plot the same number on different number lines and recognize that the location of the number on the number line can only be accurately determined when it lies on a tick mark. As they work on locating the number, students reinforce their understanding of place value as the tick marks on the number lines are tenths, hundredths, and thousandths (MP7). Students may struggle to locate 0.001 on the first two number lines. The important take-away is that when a decimal does not lie on a tick mark estimation is needed to locate the number and it can be difficult or impossible to locate it precisely (MP6).

### 🌐 Access for English Learners

*MLR8 Discussion Supports.* Prior to solving the problems, invite students to make sense of the situations. Monitor and clarify any questions about the context.

*Advances: Reading, Representing*

### ♿ Access for Students with Disabilities

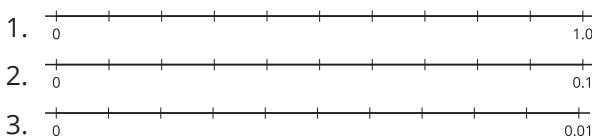
*Engagement: Provide Access by Recruiting Interest.* Provide choice. Invite students to decide which number line to label first.

*Supports accessibility for: Attention, Organization*

## Student-facing Task Statement

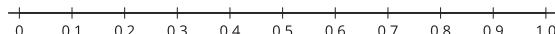
On each number line:

- Label all of the tick marks.
- Locate and label the number 0.001.



## Student Responses

1.



0.001 is so close to 0 that I was not able to put it in accurately.

## Launch

- Groups of 2

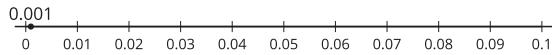
## Activity

- 5 minutes: independent work time
- 5 minutes: partner discussion
- Monitor for students who reason about place value to:
  - label each tick mark
  - locate 0.001 on each number line

## Synthesis

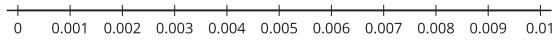
- Ask previously identified students to share.
- “How did you decide what to label the tick

2.



I put 0.001 much closer to 0 than to 0.01 since there are ten 0.001s in 0.01.

3.



0.001 is already labeled on the first tick mark after 0.

marks on the first number line?" (There are ten tick marks and there are ten tenths in one whole so I counted by tenths.)

- “Where is ten tenths on the first number line?” (The number 1 is ten tenths.)
- “How did you decide what to label the tick marks on the second and third number lines?” (There are 10 hundredths in 1 tenth. There are ten thousandths in 1 hundredth.)
- “How was locating 0.001 different for each of the number lines?” (It was so close to 0 on the first number line that I could not plot it. I could estimate its location on the second number line and then it was the first tick mark on the last number line.)

## Activity 2

⌚ 10 min

### Label and Compare Decimals

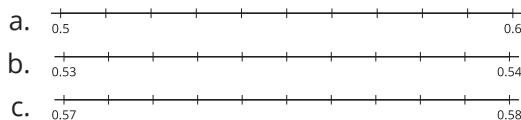
#### Standards Alignments

Addressing 5.NBT.A.3.b

The purpose of this activity is for students to label number lines where the end tick marks are tenths or hundredths written as decimals. They will use their understanding of place value when they label the tick marks (MP7). Students also choose one of the number lines to compare two numbers, preparing them for the comparison work in the next activity and in future lessons.

#### Student-facing Task Statement

- Label the tick marks on each number line.



#### Launch

- Groups of 2

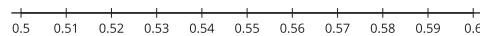
#### Activity

- 4–5 minutes: independent work

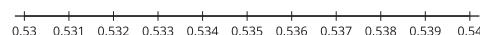
2. Which of the number lines would you use to compare 0.534 and 0.537? Explain or show your reasoning.

### Student Responses

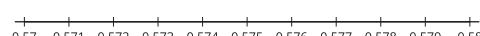
1. a.



b.



c.



2. Sample response: I would use the number line going from 0.53 to 0.54 because 0.534 and 0.537 are both tick marks on that number line.

- 2–3 minutes minutes: partner discussion
- Monitor for students who accurately label the number lines with hundredths and thousandths.

### Synthesis

- Ask previously identified students to share their solutions and reasoning.
- “Which number line would you choose to compare 0.534 and 0.537?” (I liked the middle one because those numbers were labeled tick marks and I could see which one was further to the right.)
- “Which number is greater, 0.534 or 0.537? Why?” (0.537 because it is further to the right on the number line.)
- Display inequality:  $0.534 < 0.537$
- “We can also say that 0.534 is less than 0.537 with symbols.”

## Activity 3

⌚ 10 min

### Locate and Compare With Symbols

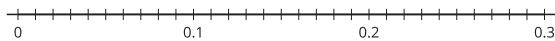
#### Standards Alignments

Addressing 5.NBT.A.3.b

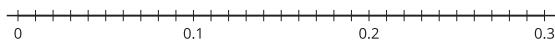
The purpose of this activity is for students to compare decimal numbers using the number line for support. All of the numbers lie on tick marks and students will use their understanding of place value to accurately place the decimals. They will also use their understanding that one number is greater than another when it lies farther to the right on the number line.

## Student-facing Task Statement

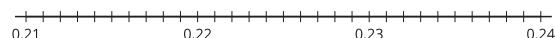
1. Use the symbol  $<$  or  $>$  to compare the decimals 0.2 and 0.02. Use the number line to explain or show your thinking.



2. Use the symbol  $<$  or  $>$  to compare the decimals 0.3 and 0.14. Use the number line to explain or show your thinking.



3. Use the symbol  $<$  or  $>$  to compare the decimals 0.23 and 0.216. Use the number line to explain or show your thinking.



## Student Responses

1.  $0.2 > 0.02$ : 0.02 is located two tick marks after 0, between 0 and 0.1
2.  $0.3 > 0.14$ : 0.14 is located four tick marks after 0.1, between 0.1 and 0.2
3.  $0.23 > 0.216$ : 0.216 is located six tick marks after 0.21, between 0.21 and 0.22

## Launch

- Groups of 2

## Activity

- 5 minutes: independent work
- 2 minutes: partner discussion

## Synthesis

- “How do number lines help compare decimals?” (We can put the decimals exactly on tick marks and then see which number is farther to the right.)

## Lesson Synthesis

⌚ 10 min

“Today we used place value reasoning to locate and compare decimals to the thousandths place using number lines.”

Display the last number line from the last activity.

“What number is located at the first tick mark after 0.23?” (0.231)

“What number is located at the last tick mark before 0.22?” (0.219)

Label the numbers as students respond.

“Which number is greater? How do you know?” (0.231 because it is farther to the right on the number line)

## Suggested Centers

- Mystery Number (1–4), Stage 6: Decimals (Addressing)
- Get Your Numbers in Order (1–5), Stage 5: Decimals (Addressing)

## ----- Complete Cool-Down -----

## Response to Student Thinking

The work in this lesson builds from the decimal concepts developed in a prior unit.

### Prior Unit Support

Grade 4, Unit 4, Section A: Decimals with Tenths and Hundredths

# Lesson 7: Round Doubloons

## Standards Alignments

Addressing	5.NBT.A.3, 5.NBT.A.4
Building Towards	5.NBT.A.4

## Teacher-facing Learning Goals

- Examine accuracy of quantities and relate to rounding.

## Student-facing Learning Goals

- Let's explore rounding with decimals.

## Lesson Purpose

The purpose of this lesson is for students to examine situations where decimal quantities are rounded.

The purpose of this lesson is for students to consider the concept of rounding through the context of weight. There are different reasons why it can be difficult to measure quantities accurately. The quantity can be so large, like the population of Los Angeles, that counting exactly is not realistic. Or the quantity can be a decimal, like the weight of a coin, and then the issue is that introducing new place values can alter the value of the decimal. In practice, the scale used to weigh the coin measures to a specific place value and that means that the actual weight is rounded to this place value. In future lessons, students will round decimal numbers to different place values and look in greater depth at what happens in situations where reported quantities are rounded.

Throughout this lesson, students attend to precision in measurement (MP6). In some cases, such as the scale, they are given how accurately the scale measures weight. In other cases, they are given quantities and determine whether or not they are exact or approximate.

## Access for:

### Students with Disabilities

- Engagement (Activity 2)

### English Learners

- MLR8 (Activity 1)

## Instructional Routines

Notice and Wonder (Warm-up)

## Lesson Timeline

Warm-up

10 min

## Teacher Reflection Question

What strategy did you anticipate today? Which

Activity 1	20 min	did you not anticipate?
Activity 2	15 min	
Lesson Synthesis	10 min	
Cool-down	5 min	

## Cool-down (to be completed at the end of the lesson)

⌚ 5 min

A Golden Dollar

### Standards Alignments

Addressing 5.NBT.A.4

### Student-facing Task Statement

A one-dollar gold coin weighs 1.672 grams.

1. A scale reads to the nearest tenth of a gram. What will the scale give for the weight of this coin?
2. A different scale reads to the nearest hundredth of a gram. What will the scale give for the weight of this coin?

### Student Responses

1. 1.7 grams
2. 1.67 grams

----- Begin Lesson -----

## Warm-up

⌚ 10 min

Notice and Wonder: A Digital Scale

### Standards Alignments

Building Towards 5.NBT.A.4

The purpose of this Notice and Wonder is for students to share what they know about scales and to initiate a discussion about rounding. The weights on the scale total 12.32 ounces, but the scale reads 12.3 ounces. There are different possible explanations for this discrepancy. For example, the scale might be inaccurate. Or the scale might only give readings in tenths of an ounce. In the discussion, students consider the idea that the value shown on the scale is not always exact. It may just show the closest value that it is capable of reading, which is the nearest tenth of an ounce in this case (MP6).

## Instructional Routines

Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?



### Student Responses

Students may notice:

- There are some weights on the scale.
- The weights on the scale total 12.32 ounces.
- The scale reads 12.3 ounces.

Students may wonder:

- Why does the scale not read the 2 hundredths of an ounce?
- Is the scale accurate?
- If I put more 0.01 ounce weights on, what will the scale read?

### Launch

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- “What do you notice about the weights on the scale and the reading of the scale?” (They aren’t the same. The weights are 12.32 ounces and the scale says 12.3 ounces.)
- “Why do you think the scale and the weights don’t agree?” (The scale could be wrong.)
- “What if the scale only shows tenths of an ounce, and it can’t show hundredths of an ounce?” (The value is still not accurate but it’s the best the scale can do.)
- “In today’s lesson we will look at scales that show different numbers of decimals and see how that influences what they show.”

## Activity 1

⌚ 20 min

Gold Doubloons

👤 ↔👤 PLC Activity

### Standards Alignments

Addressing 5.NBT.A.3, 5.NBT.A.4

The purpose of this activity is for students to round to the nearest tenth and hundredth. Students have rounded in earlier grades but this is the first time they round to tenths or hundredths. This is a direct extension of rounding to the nearest ten, hundred, thousand, and other whole number values. Locating the numbers on the number line will recall this earlier work.

The launch introduces the context of a doubloon, a major currency in Portugal and Spain in the seventeenth, eighteenth, and nineteenth centuries. Students round the weight of a doubloon to the nearest tenth and hundredth of a gram. In both cases, older doubloons are still heavier after rounding. Rounded to the nearest gram, however, they are the same. This is important from a practical perspective because it is easier to measure a weight to the nearest gram than it is to the nearest tenth of a gram or hundredth of a gram. It is also important because the numbers 6.9 and even 6.87 are not as complex as 6.867, and having fewer digits helps visualize the value more quickly.

### 🌐 Access for English Learners

*MLR8 Discussion Supports.* During small-group discussion, invite students to take turns sharing their responses. Ask students to restate what they heard using precise mathematical language and their own words. Display the sentence frame: “I heard you say . . . .” Original speakers can agree or clarify for their partner.

*Advances: Listening, Speaking*

### Student-facing Task Statement



- Until 1728, doubloons weighed 6.867 grams.
- After 1728, they weighed 6.766 grams.

1.

### Launch

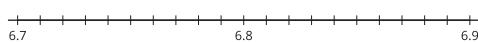
- Groups of 2
- Display the image.
- “This is a doubloon. What do you notice? What do you wonder?” (I notice 1798. I wonder if that’s the year it was made. I wonder if people actually used these as money. I notice there are words in a foreign language. I wonder what they say. I

You have a scale that measures weight to the nearest tenth of a gram.

Was the doubloon on the scale made before or after 1728?

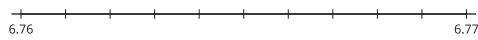


2. If you had a scale that measured to the nearest gram, explain why you would not be able to tell what year the doubloon was made based on the weight listed on the scale.
3. a. Which doubloons weigh more, the ones made before 1728 or the ones made after 1728? Explain or show your reasoning.  
b. Show the weights of the doubloons on the number line.

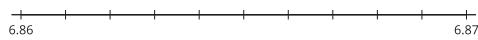


4. Use the number lines to find which hundredth of a gram the doubloon weights are each closest to.

a.



b.



## Student Responses

1. The doubloons made after 1728 are closer to 6.8 grams. The ones made before are closer to 6.9 grams. I think it is probably one of the later doubloons.
2. The older and newer doubloons would both weigh 7 grams.
3. a. The doubloons from before 1728 are heavier because there are 8 tenths

wonder what language it is.)

- “Doubloons were a major currency in Portugal and Spain in the seventeenth, eighteenth, and nineteenth centuries. Today, we are going to study the weights of doubloons.”

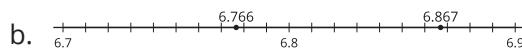
## Activity

- “Take a couple of minutes to work on the first problem.”
- 2 minutes: partner work time
- “What does it mean to measure a weight to the nearest tenth of a gram?” (It means you find the closest tenth of a gram to the weight.)
- “How did you decide which kind of doubloon was on the scale?” (The older ones are heavier and the tenth they are closest to is 6.9 not 6.8.)
- “The weight of the doubloon is rounded to the nearest tenth of a gram.”
- “Now complete the rest of the problems.”
- 6–8 minutes: partner work time

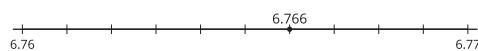
## Synthesis

- Invite students to share their answers for rounding the weights of the doubloons.
- “How did you round the weight of the older doubloon to the nearest tenth? What about the nearest hundredth?” (It was closer to 6.9 than to 6.8, so I rounded to 6.9 to the nearest tenth. It was closer to 6.87 than to 6.86 so I rounded to 6.87 to the nearest hundredth.)
- “How did the number lines help you round the numbers?” (I could see on the number line which tenth or which hundredth the number was closest to and then knew to round it there.)

instead of 7 tenths. The number line shows that the older doubloons are further to the right and so they are heavier.

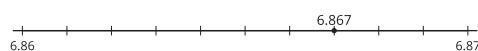


4. a.



The doubloon weight is closer to 6.77 grams so it rounds to 6.77 grams to the nearest hundredth of a gram.

b.



The doubloon weight is closer to 6.87 grams so it rounds to 6.87 grams to the nearest hundredth of a gram.

## Activity 2

⌚ 15 min

Exact or Approximate?

### Standards Alignments

Addressing 5.NBT.A.3

The purpose of this activity is for students to examine numbers in different situations and decide if they are exact or approximate. In most cases, there is no definitive answer but it is likely that the numbers are approximate or rounded. Two important reasons for using rounded measurements are

- it is easier to measure a length, for example, to the nearest kilometer or meter than to the nearest centimeter or millimeter
- round numbers can communicate the size of a quantity more clearly than exact numbers

For example, we might say that the classroom is 15 meters long. That number is probably not

exact but it gives a good idea of the length. It is possible that 14.63 meters is more accurate but it is also cumbersome. The goal of the activity synthesis is to discuss some of the ways you can tell if a measurement is exact or rounded and what that tells you about the measurement.

## ⓘ Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Synthesis: Invite students to generate a list of additional examples of rounded measurements that connect to their personal backgrounds and interests.

*Supports accessibility for: Conceptual Processing, Visual-Spatial Processing*

## Student-facing Task Statement

Decide if each quantity is exact or an estimate. Be prepared to explain your reasoning.

1. There are 14 pencils on the desk.
2. The population of Los Angeles is 12,400,000.
3. It's 2.4 miles from the school to the park.
4. The runner finished the race in 19.78 seconds.

## Student Responses

Sample responses:

1. Exact. I can count the pencils to find out how many there are.
2. Estimate. There are so many people that counting every one is not possible. This is an estimate.
3. Estimate. Adding or taking away a few steps would not change this. It's pretty precise but it's still probably an estimate.
4.
  - Exact. That's a really precise value so I think it's exact.
  - Estimate. We don't know exactly when the runner started or finished and maybe the timer only reads hundredths of a second like the scale only read hundredths of a gram.

## Launch

- Groups of 2

## Activity

- 2 minutes: independent work time
- 6–8 minutes: partner work time
- Monitor for students who
  - recognize that the population of Los Angeles is approximate
  - think that the time is exact
  - think that the time is an estimate

## Synthesis

- Invite students to share their reasoning for the population of Los Angeles.
- “Why is the population of Los Angeles different than the pencils?” (There are so many people in Los Angeles that you can't count them all. The pencils I can count one by one and be sure of my answer.)
- Invite students to share their reasoning for the time of 19.87 seconds.
- “Why do you think the measurement could be exact?” (It's really precise. If it said 20 seconds then that sounds like an estimate but 19.87 seconds looks too precise to be

an estimate.)

- “Why do you think the measurement could be approximate?” (It’s like the doubloons. There could be some thousandths of a second and then 19.87 seconds is just an estimate.)

## Lesson Synthesis

⌚ 10 min

“Today we looked at different quantities and saw that they are not always exact. We related this to the idea of rounding decimals.”

Display:	45 minutes
	44.8 minutes
	44.764 minutes

“Which of these quantities would you use to describe how long one of your classes is? Why?” (I would say 45 minutes because that’s what I would be able to tell from the clock and I understand what that means. I would not use the decimals because that does not tell me anything important about how long the class lasted.)

## Suggested Centers

- Mystery Number (1–4), Stage 6: Decimals (Addressing)
- Get Your Numbers in Order (1–5), Stage 5: Decimals (Addressing)

## Complete Cool-Down

## Response to Student Thinking

Students do not accurately round or plot the numbers.

## Next Day Support

- After the warm-up in the next lesson, pair students up to discuss their responses.

# Lesson 8: Round Decimals

## Standards Alignments

Building On 5.NBT.A.4  
Addressing 5.NBT.A.3.b, 5.NBT.A.4

## Teacher-facing Learning Goals

- Round decimals to the nearest whole, tenth, and hundredth.

## Student-facing Learning Goals

- Let's round decimals to the nearest whole, tenth, and hundredth.

## Lesson Purpose

The purpose of this lesson is for students to round to the nearest whole, tenth, and hundredth.

In this lesson students build on prior understandings of rounding whole numbers to round decimals to different place values. In the first activity students label tick marks on number lines and reason about the possible value of a point on the number line. They consider which two decimals the point lies between, which of those decimals is closer, and how much closer. In the second activity, students round numbers to different places, first using the number lines provided and then using place value reasoning, supported by number lines if students choose to use them. A third activity provides extra rounding practice.

## Access for:

### Students with Disabilities

- Action and Expression (Activity 2)

### English Learners

- MLR8 (Activity 1)

## Instructional Routines

Estimation Exploration (Warm-up)

## Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	15 min
Activity 3	15 min

## Teacher Reflection Question

What did you see or hear in your students' responses today that showed evidence of their understandings of place value?

Lesson Synthesis 10 min

Cool-down 5 min

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Round to the Nearest Tenth and Thousandth

**Standards Alignments**

Addressing 5.NBT.A.3.b

**Student-facing Task Statement**

1. Round 17.637 to the nearest tenth. Use the number lines if they are helpful.
2. Round 17.637 to the nearest hundredth. Use the number lines if they are helpful.

**Student Responses**

1. 17.6
2. 17.64

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Estimation Exploration: Number Line

**Standards Alignments**

Addressing 5.NBT.A.3.b

The purpose of this Estimation Exploration is for students to use their experience with the number line, decimals, and fractions to estimate the value of a number located on the number line. Students may answer with a fraction but are likely to write a decimal since they have been working with decimals for the last several lessons. In the synthesis, students reflect on how having tick marks for each tenth would help improve their estimate.

## Instructional Routines

Estimation Exploration

### Student-facing Task Statement

What number might be represented on the number line?



Record an estimate that is:

too low	about right	too high

### Student Responses

Sample responses

- too low: 0.1 to 0.2
- about right: 0.2 to 0.4
- too high: 0.4 to 1

### Launch

- Groups of 2
- Display the image.
- “What is an estimate that’s too high?” “Too low?” “About right?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.

### Synthesis

- “Would having tick marks for each tenth on the number line help improve your estimate? Why or why not?” (Yes, because I could see if it is one of the tenths and if not, where it is relative to those numbers.)

## Activity 1

⌚ 15 min

Name that Number

### Standards Alignments

Addressing 5.NBT.A.3.b

The purpose of this activity is for students to use place value understanding to accurately label number lines and then estimate the value of a labeled point. When they label the tick marks students will use their knowledge that a tenth is a tenth of one and a hundredth is a tenth of a tenth. When they estimate the value of the labeled point, students will also use their understanding that there are ten thousandths in each hundredth. This gives students an opportunity to make sense of each quantity and place it accurately on the number line (MP2).

The activity begins with a group discussion about how Jada labeled a number on the number line. This prepares students for the work of the activity by:

- highlighting how a decimal with a digit in the thousandths place is located between two decimals to the hundredths on the number line
- highlighting that the digits in a number of thousandths give information about which hundredths the decimal is between

As students discuss and justify their decisions, they share a mathematical claim and the thinking behind it (MP3).

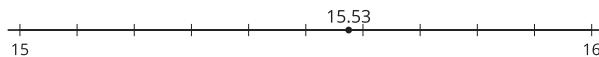
### Access for English Learners

*MLR8 Discussion Supports.* Display sentence frames to support small-group discussion: “I noticed \_\_\_\_\_ so I . . . .”, and “I agree/disagree because . . . .”

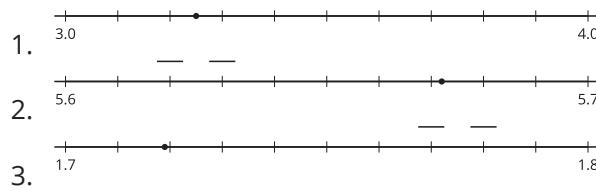
*Advances: Conversing, Representing*

### Student-facing Task Statement

Jada locates 15.53 on the number line. Do you think Jada accurately located the number?



A number is located between two tick marks on each number line. Label those tick marks and then estimate the number.



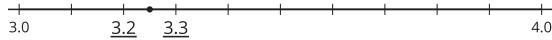
### Launch

- Groups of 2
- Display the first image from workbook.
- “Jada locates 15.53 on the number line. Do you think Jada accurately located the number? Explain your reasoning.” (She placed 15.53 between 15.5 and 15.6 which is correct. She placed 15.53 closer to 15.6 than to 15.5 and this is not correct.)
- 1 minute: independent think time
- 1 minute: partner discussion time
- Make sure students identify that 15.53 should be closer to 15.5 than to 15.6.

## Student Responses

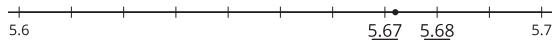
Sample responses:

1.



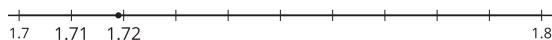
The point is 3.25 because that's halfway between 3.2 and 3.3.

2.



I think the point is 5.672 because it is more than 5.67, but a lot closer to 5.67 than to 5.68.

3.



I think the point is 1.719 because it is really close to 1.72, but less than 1.72.

## Activity

- 5 minutes: independent work time
- 2 minutes: partner discussion
- Monitor for students who:
  - accurately label the tick marks using their understanding of place value and the values of the end tick marks
  - use their understanding of place value to estimate each number

## Synthesis

- Ask previously selected students to share.
- Display first image.
- "How did you know how to label the tick marks?" (Since the ends of the number line are whole numbers, the tick marks are tenths. It's the second and third tick marks so that meant they are 3.2 and 3.3.)
- "How did you estimate the value of the number?" (It is halfway between 3.2 and 3.3 so that's 3.25.)
- Display the last number line.
- "How did you estimate this number?" (The tick marks are 1.71 and 1.72 and it is really close to 1.72. So I put 1.719 which is just 1 thousandth from 1.72.)

## Activity 2

⌚ 15 min

Which Number is Closest?

### Standards Alignments

Building On 5.NBT.A.4

The purpose of this activity is for students to round a decimal number to the nearest whole number, tenth, and hundredth. Number lines are provided for the first set of problems but not for the second set. Monitor for students who

- use the given number lines or draw number lines for the second set of problems
- use place value reasoning

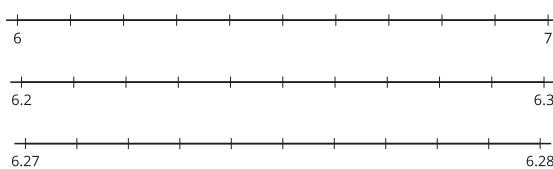
## ⓘ Access for Students with Disabilities

*Action and Expression: Internalize Executive Functions.* Invite students to verbalize their strategy for determining proximity before they begin. Students can speak quietly to themselves, or share with a partner.

*Supports accessibility for: Organization, Conceptual Processing, Language*

### Student-facing Task Statement

- Round 6.273 to the nearest whole number, tenth, and hundredth. Use the number lines if they are helpful. Explain or show your reasoning.



- Round 4.158 to the nearest whole number, tenth, and hundredth.

### Student Responses

- 6, 6.3, 6.27. Sample response: I located 6.273 on the number lines. On the first number line it was closer to 6 than to 7. On the second number line it was closer to 6.3 than to 6.2. On the third number line it was closer to 6.27 than to 6.28.
- 4, 4.2, 4.16. It is closer to 4 than to 5 because there are less than 2 tenths. It is closer to 4.2 than to 4.1 because there are 5 hundredths and some thousandths. It is closer to 4.16 than to 4.15 because there are 8 thousandths.

### Launch

- Groups of 2

### Activity

- 5 minutes: independent work
- 2 minutes: partner discussion
- Monitor for who students:
  - who are using the number lines to determine proximity
  - who are using the digits in the number (place value reasoning)

### Synthesis

- Ask previously selected students to share. Have the student who used the number line share first.
- “How did the number line help you round numbers?”
- “How did thinking about the place and value of the digit help you round numbers?”

## Activity 3 (optional)

⌚ 15 min

Round the Numbers

### Standards Alignments

Addressing 5.NBT.A.4

The purpose of this activity is for students to practice rounding numbers to the nearest whole, tenth, or hundredth. Students may choose to use a number line or any other strategy that makes sense to them.

### Student-facing Task Statement

Round each number to the nearest whole number, tenth, and hundredth.

	nearest whole number	nearest tenth	nearest hundredth
34.482			
99.909			
5.555			
19.509			

### Student Responses

	nearest whole number	nearest tenth	nearest hundredth
34.482	34	34.5	34.48
99.909	100	99.9	99.91
5.555	6	5.6	5.56
19.509	20	19.5	19.51

### Launch

- Groups of 2

### Activity

- 5 minutes: independent work
- 2 minutes: partner discussion
- Monitor for students who:
  - use a number line to round
  - reason using the digits and place value to round

### Synthesis

- Ask previously selected students to share.

## Lesson Synthesis

⌚ 10 min

"Today we rounded decimals to the nearest whole, tenth, and hundredth."

Display:

"Tyler said that 0.345 rounds to 0.3. Jada said 0.345 rounds to 0.35."

"Who do you agree with? Why?" (If we're rounding to the tenths place then I agree with Tyler. If we're rounding to the hundredths place, I agree with Jada.)

"Write three other numbers that round to 0.3 to the nearest tenth and three other numbers that round to 0.35 to the nearest hundredth." (0.342, 0.32, 0.299 round to 0.3, and 0.351, 0.349, 0.352 round to 0.35.)

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### Suggested Centers

- Mystery Number (1–4), Stage 6: Decimals (Addressing)
- Get Your Numbers in Order (1–5), Stage 5: Decimals (Addressing)

---

### Complete Cool-Down

---

### Response to Student Thinking

Students do not write the correct number when rounding.

#### Next Day Support

- During the warm-up of the next lesson, use number lines to represent the decimals in the inequalities.

# Lesson 9: Order Decimals

## Standards Alignments

Addressing 5.NBT.A.3.b

### Teacher-facing Learning Goals

- Order decimals within the thousandths place.

### Student-facing Learning Goals

- Let's put decimals in order.

## Lesson Purpose

The purpose of this lesson is for students to order decimals.

The purpose of this lesson is for students to apply their understanding of decimal place value to list a set of decimal numbers in increasing size. Some students may wish to use a number line to help locate the numbers. Students who choose to use the number lines have the interesting task of figuring out which numbers to put at the ends of their number line, which will require thinking carefully about place value and the size of the numbers they are locating (MP6).

## Access for:

### Students with Disabilities

- Engagement (Activity 1)

### English Learners

- MLR1 (Activity 2)

## Instructional Routines

True or False (Warm-up)

## Lesson Timeline

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

## Teacher Reflection Question

Identify who has been sharing their ideas in class lately. Make a note of students whose ideas have not been shared and look for an opportunity for them to share their thinking in tomorrow's lesson.

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Order the Decimals

**Standards Alignments**

Addressing 5.NBT.A.3.b

**Student-facing Task Statement**

Write these numbers in order from least to greatest: 565.4, 556.040, 565.004

**Student Responses**

556.040, 565.004, 565.4

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

True or False: Decimal Inequalities

**Standards Alignments**

Addressing 5.NBT.A.3.b

The purpose of this True or False is for students to demonstrate strategies and understandings they have for comparing decimals. These understandings will be valuable when students order decimals later in this lesson. As students discuss and justify their decisions, they share a mathematical claim and the thinking behind it (MP3).

**Instructional Routines**

True or False

**Student-facing Task Statement**

Decide whether each statement is true or false. Be

**Launch**

- Display one statement.

prepared to explain your reasoning.

- $0.909 > 0.91$
- $4.1 < 4.100$
- $0.99 < 0.999$

### Student Responses

- False. 0.910 is larger because it has a one in the tenths place.
- False. 4.1 is equal to 4.100.
- True. 0.99 is equal to 0.990 which is less than 0.999.

- “Give me a signal when you know whether the statement is true and can explain how you know.”
- 1 minute: quiet think time

### Activity

- Share and record answers and strategy.
- Repeat with each statement.

### Synthesis

- “Is the statement  $0.909 > 0.91$  true or false? How do you know?” (It is false because 0.909 has 9 tenths and 9 thousandths and 0.91 is 9 tenths and 1 hundredth. 1 hundredth is greater than 9 thousandths.)
- Display: 0.909 and 0.910
- “How does writing the numbers like this help to compare them?” (I can see that 0.910 has 10 thousandths compared to 9 for 0.909.)

## Activity 1

⌚ 20 min

### Caught in the Middle

#### Standards Alignments

Addressing 5.NBT.A.3.b

The purpose of this activity is for students apply what they have learned about comparing decimals to find numbers that lie between two other decimal numbers. Students may draw number line diagrams, if it helps them, or they may use their understanding of place value.

In each case, there are many different decimal numbers between the two and this will be brought out in the activity synthesis. The last question in this activity is exploratory. Students may say that there is no number between 1.731 and 1.732 or they may say that it looks like there is and they cannot name it yet. The important observation is that the number line suggests that there are numbers in between but we cannot name any of those numbers yet. This question gives students an opportunity to make sense of a problem and some students may propose an answer, using

fractions for example (MP1).

## ⓘ Access for Students with Disabilities

*Engagement: Develop Effort and Persistence.* Differentiate the degree of difficulty or complexity. Begin with more accessible values. For example, allow students to complete one side of the statement at a time.

*Supports accessibility for: Conceptual Processing, Attention*

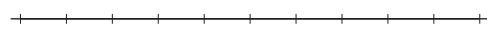
### Student-facing Task Statement

- Fill in the blank to make each statement true. Be prepared to explain your reasoning. Use the number lines if they are helpful.

a.  $786.2 < \underline{\hspace{2cm}} < 786.3$



b.  $9.99 < \underline{\hspace{2cm}} < 10$



c.  $0.46 > \underline{\hspace{2cm}} > 0.45$



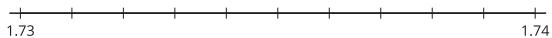
d.  $0.5 < \underline{\hspace{2cm}} < 0.51$



e.  $0.99 < \underline{\hspace{2cm}} < 0.999$



- Kiran says that there is no number between 1.731 and 1.732. Do you agree with Kiran? Use the number line if it is helpful.



### Student Responses

- Sample responses:

- $786.2 < 786.21 < 786.3$
- $9.99 < 9.991 < 10$
- $0.46 > 0.455 > 0.45$
- $0.5 < 0.509 < 0.51$

### Launch

- Groups of 2

### Activity

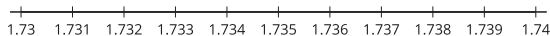
- 10 minutes: independent work
- 5 minutes: partner discussion
- Monitor for students who:
  - use a number line
  - count up by hundredths or thousandths between the intervals to find a number in the middle
  - use place value understanding to introduce new places in the decimals when needed

### Synthesis

- Display the inequality:  $0.99 < \underline{\hspace{2cm}} < 0.999$
- “What are some possible numbers that will make this true?” (0.995, 0.991, 0.997)
- “What do you notice about all the possible numbers?” (They all have 9 tenths and 9 hundredths and also some thousandths.)
- “Why does this make sense?” (They need 9 tenths and 9 hundredths to be as big as 0.99 and some thousandths to be bigger. There can be at most 8 thousandths so the number will be less than 0.999.)

e.  $0.99 < 0.994 < 0.999$

2. Sample response: It looks like there are lots of points on the number line between 1.731 and 1.732. But there are no decimal numbers to the thousandth between them. Maybe there are more place values beyond thousandths?



- Display number line from the student solution or use a student generated image.
- “Do you think there are numbers between 1.731 and 1.732?” (It looks like there are lots of them but we don’t know what any of those numbers are.)

## Activity 2

⌚ 15 min

Least to Greatest

### Standards Alignments

Addressing 5.NBT.A.3.b

The purpose of this activity is for students to apply what they have learned about place value and decimals to order several decimals from least to greatest. Students may draw number line diagrams, if it helps them, but will need to think strategically about the endpoints that they choose if they want all 3 numbers to fit. They can also order the numbers by looking carefully at place value to compare pairs of decimals (MP7).

### 🌐 Access for English Learners

*MLR1 Stronger and Clearer Each Time.* Synthesis: Before the whole-class discussion, give students time to meet with 2–3 partners to share and get feedback on their response to ordering the sets of numbers from least to greatest. Invite listeners to ask questions, to press for details and to suggest mathematical language. Give students 2–3 minutes to revise their written explanation based on the feedback they receive.

*Advances: Writing, Speaking, Listening*

### Student-facing Task Statement

1. Write each set of numbers in order from least to greatest.

### Launch

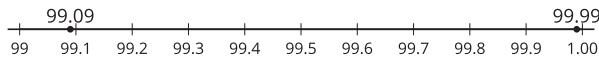
- Groups of 2

- a. 67.020, 67.200, 67.002
- b. 1.101, 1.02, 1.1
- c. 0.333, 0.323, 0.3
- d. 99.99, 99.09, 99.091

## Student Responses

1. a. 67.002, 67.020, 67.200  
b. 1.02, 1.1, 1.101  
c. 0.3, 0.323, 0.333  
d. 99.09, 99.091, 99.99

Sample response: The number 99.091 is just to the right of 99.09, but is so close that it looks like it's the same.



## Activity

- 8 minutes: independent work time
- 2 minutes: partner discussion
- Monitor for students who:
  - use their understanding of place value to compare the numbers
  - use a number line to visualize how the numbers compare

## Synthesis

- Display the numbers: 1.101, 1.02, 1.1
- “How did you decide which of these numbers is the smallest?” (They all have 1 and some more. The second one only has hundredths while the other two have tenths, so 1.02 is the smallest.)
- “How did you decide which one of these numbers is the greatest?” (1.101 has a tenth and a thousandth while 1.1 only has a tenth, so 1.101 is the greatest.)
- Use a student generated number line or display the number line from student solutions and consider asking:
- “How do you know that 99.091 is between 99.09 and 99.99 on the number line?” (It has a thousandth more than 99.09 and has no tenths so is smaller than 99.1 and definitely smaller than 99.99.)
- “Why is it hard to locate 99.091 precisely on the number line?” (It is really close to 99.09, just one thousandth to the right.)

## Lesson Synthesis

⌚ 10 min

“Today we ordered decimals.”

“Describe the steps you would use to put a set of numbers in order from least to greatest.” (Start with the digits in the largest place value and compare them. When they are the same, compare the digits in

the next largest place. If all the digits are the same, then the numbers are the same. Wherever they differ first, the number with the larger digit in that place is larger.)

---

### Suggested Centers

- Greatest of Them All (1–5), Stage 4: Decimals (Addressing)
- Get Your Numbers in Order (1–5), Stage 5: Decimals (Addressing)

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### Complete Cool-Down

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### Response to Student Thinking

Students do not write the numbers in order from least to greatest.

### Next Day Support

- Launch Activity 1 with a discussion about this cool-down.

# Lesson 10: Solve Problems with Decimals

## Standards Alignments

Addressing 5.NBT.A.3, 5.NBT.A.4

### Teacher-facing Learning Goals

- Round decimals to different place values and order them.

### Student-facing Learning Goals

- Let's round and order decimals to solve problems.

## Lesson Purpose

The purpose of this lesson is for students to round and order decimals to the nearest one, tenth, and hundredth.

In this lesson, students round numbers to different place values in context. In addition to rounding numbers, students determine the possible value of a number, given the numbers it rounds to. When students interpret the speeds and times as they might be rounded to different places and how this would influence their order they reason abstractly and quantitatively (MP2).

While not required, number lines can be helpful throughout this lesson to visualize which whole number, tenth, or hundredth is closest to a given quantity. Locating all the numbers on the same number line accurately will be challenging, but students can locate them individually to help round or they can estimate the locations in order to compare decimals.

This lesson has a Student Section Summary.

### Access for:

#### Students with Disabilities

- Engagement (Activity 1)

#### English Learners

- MLR5 (Activity 1)

## Instructional Routines

Notice and Wonder (Warm-up)

### Lesson Timeline

Warm-up	10 min
Activity 1	20 min

### Teacher Reflection Question

Think about times when students were able to make connections to and build on the ideas of their peers during discussions today. What

Activity 2	15 min	norms or routines allowed students to engage with other students' ideas?
Lesson Synthesis	10 min	
Cool-down	5 min	

---

## Cool-down (to be completed at the end of the lesson) ⌚ 5 min

Luge Rider

### Standards Alignments

Addressing 5.NBT.A.4

### Student-facing Task Statement

A luge rider finished a race in 49.256 seconds. Determine the time rounded to the nearest tenth and hundredth of a second.

### Student Responses

- Nearest tenth: 49.3 seconds
- Nearest hundredth: 49.26 seconds

----- Begin Lesson -----

## Warm-up ⌚ 10 min

Notice and Wonder: The Luge

### Standards Alignments

Addressing 5.NBT.A.3

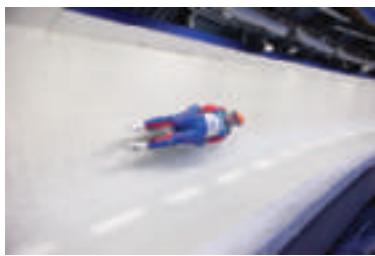
The purpose of this Notice and Wonder is for students to consider the sport of luge and give them some numerical data that they will work with later in the lesson. The times and top speeds have been created and do not represent actual times from an event. The table is not labeled in order to encourage students to think about the meaning of the numbers.

## Instructional Routines

### Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?



A	B
48.532	82.13
48.561	82.75
48.626	82.81
48.634	83.07
48.708	82.80

### Student Responses

Students may notice:

- There is a person on a sled.
- The numbers in column A are increasing.
- The numbers in column B are not increasing.
- The numbers in column B are all bigger than the numbers in column A.
- The numbers in column A all have thousandths and the numbers in column B only have hundredths.

Students may wonder:

- What is that person doing?
- What do the numbers mean?
- How do the numbers relate to the person on the sled?
- Why aren't the numbers in column B increasing like those in column A?

### Launch

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- “The person in the picture is performing a sporting event called the luge. Athletes go down a steep ice track on a sled.”
- “The numbers on the left are the times, in seconds, it took different athletes to complete the course. The numbers on the right are the maximum speed, in mph.” Consider labeling the columns of the table.
- Invite students to share what they notice about the numbers, including that in the first column, they get larger from top to bottom and they all have 3 decimal places. In the second column, there are only two decimal places and the numbers are not in increasing or decreasing order.

## Activity 1

⌚ 20 min

How Accurate Is It?

### Standards Alignments

Addressing 5.NBT.A.3, 5.NBT.A.4

The purpose of this activity is for students to investigate a situation in which knowing a value to the thousandth place is important. Many high speed athletic events such as sprinting, cycling, downhill skiing, and the luge (studied here), are measured to the thousandth of a second in order to distinguish athletes whose finish times are very close to one another. Students examine the finishing times for the luge athletes, introduced in the warm-up, and what would happen if the times were only measured to the nearest hundredth of a second, tenth of a second, or second.

Students may use number lines to help answer the questions, but as in the previous lesson, will need to think carefully about how to label the number line.

### 🌐 Access for English Learners

*MLR5 Co-Craft Questions.* Keep books or devices closed. Display only the table, without revealing the questions. Give students 2–3 minutes to write a list of mathematical questions that could be asked about this situation, before comparing their questions with a partner. Invite each group to contribute one written question to a whole-class display. Ask the class to make comparisons among the shared questions and their own. Reveal the intended questions for this task and invite additional connections.

*Advances: Reading, Writing*

### ♿ Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Optimize meaning and value. Invite students to share activities that they have competed in, participated in, or watched in which athletes' speed determined their victory.

*Supports accessibility for: Memory, Attention*

### Student-facing Task Statement

athlete	time (seconds)	speed (mph)
Athlete 1	48.532	82.13
Athlete 2	48.561	82.75

### Launch

- Groups of 2
- Display a stopwatch that records time to the hundredth of a second.

athlete	time (seconds)	speed (mph)
Athlete 3	48.626	82.81
Athlete 4	48.634	83.07
Athlete 5	48.708	82.80

1. How would the results of the race change if the times were recorded to the nearest second?
2. How would the results of the race change if the times were recorded to the nearest tenth of a second?
3. How would the results of the race change if the times were recorded to the nearest hundredth of a second?
4. An athlete recorded a time of 48.85 seconds to the nearest hundredth of a second. What are the possible times of this athlete recorded to the thousandth of a second?
5. An athlete recorded a time of 48.615 seconds to the nearest thousandth of a second. What are the possible times that this athlete recorded to the nearest hundredth of a second?

## Student Responses

1. All of the athletes would tie with a time of 49 seconds.
2. The three athletes in the middle would all tie with a time of 48.6 seconds. Athlete 1 would still win with 48.5 seconds and Athlete 5 would still be in 5th place with 48.7 seconds.
3. The third and fourth athletes would have the same time of 48.63 seconds. Athlete 1 would have a time of 48.53 seconds, Athlete 2 would have a time of 48.56 seconds, and Athlete 5 would have a time of 48.71 seconds.
4. 48.845, 48.846, 48.847, 48.848, 48.849, 48.850, 48.851, 48.852, 48.853, 48.854 are the values of the numbers at the tick marks that round to 48.85.

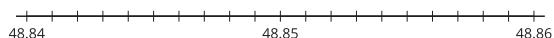
- “What can you do in one second?” (stand up, wave my hand, say my name)
- “What can you do in one tenth of a second?” (blink, type one letter)

## Activity

- 5 minutes: independent work time
- 5 minutes: partner work time
- Monitor for students who:
  - use place value understanding to round the numbers
  - plot the numbers on a number line to round them

## Synthesis

- Ask previously identified students to share their responses.
- “How does rounding the times to the nearest second impact each of the athletes?” (It makes all of the times greater and impossible to distinguish. It impacts the fastest athletes the most as their times are shifted up the most.)
- “How does rounding the times to the nearest tenth of a second impact each of the athletes?” (It makes the times of the 1st, 3rd, and 4th athletes faster and the times of the 2nd and 5th athletes slower. It makes the second athlete tie for second place instead of winning second place.)
- Display the image from the solution or a student generated image.
- “How can you use the number line to find the times to the thousandth of a second that round to 48.85 seconds?” (I can label the tick marks and then take the ones that are closest to 48.85 and the one halfway between 48.84 and 48.85.)



5. Either 48.61 or 48.62. 48.615 is exactly halfway between, so it depends whether the athlete's real speed was below 48.615 or at or above 48.615.

## Activity 2

⌚ 15 min

### Compare Speeds

#### Standards Alignments

Addressing 5.NBT.A.4

The purpose of this activity is for students to order decimals and examine the effect of rounding on numbers continuing to use the luge context. In this activity, students investigate the top speeds of the athletes. In this case, the numbers are not listed in decreasing order because the top speeds do not correspond to the fastest times. Students order the top speeds before and after they have been rounded. Then they find a speed between two given speeds when the thousandths place is added. Since the speeds of the riders are not given to the thousandth, students will need to create values for the riders. There is one set of values students could pick, namely 82.804 and 82.805, where there is no value in between to the thousandth. If students choose these values, ask “Are there different possible top speeds for these athletes?”

#### Student-facing Task Statement

The table shows the top speeds, in miles per hour, of 5 luge athletes:

athlete	speed (miles per hour)
Athlete 1	82.13
Athlete 2	82.75

#### Launch

- Groups of 2
- “We will now look at the top speeds that the different athletes recorded.”
- Highlight how fast these speeds are: most speed limits on freeways are between 65 and 75 mph and the athletes are only inches from the ice.

#### Activity

- 5 minutes: independent work time

athlete	speed (miles per hour)
Athlete 3	82.81
Athlete 4	83.07
Athlete 5	82.80

1. List the top speeds of the athletes in decreasing order.
2. Do any of the athletes have the same top speed rounded to the nearest tenth of a mile per hour? What about rounded to the nearest mile per hour?
3. There was a sixth athlete who was faster than the rider at 82.80 mph, but slower than the rider at 82.81 mph. What could the speeds of the 3 athletes be if all measured to the nearest thousandth of a mile per hour?

### Student Responses

1. 83.07, 82.81, 82.80, 82.75, 82.13
2. Yes, rounded to the nearest tenth of a mile per hour, 82.81, 82.80, and 82.75 are all 82.8. Rounded to the nearest mile per hour, Athletes 2, 3, 4, and 5 are all 83 mph.
3. Sample response: The athlete who is 82.80 to the nearest hundredth could be 82.796 to the nearest thousandth. The athlete who is 82.81 to the nearest hundredth could be 82.812 to the nearest thousandth. The athlete who is between could be 82.797, 82.798, all the way up to 82.811.

- 5 minutes: partner work time

### Synthesis

- “Are there different speeds the athlete at 82.80 mph could have, measured to the nearest thousandth of a mile per hour?” (yes)
- “What is the greatest? The least?” (82.804, 82.795) “What about for the athlete at 82.81? What are their fastest and slowest speeds to the thousandth of a mile per hour?” (82.814, 82.805)
- Invite students to give a possible set of top speeds, to the thousandth of a mile per hour, for athletes 3, 5, and 6.

## Lesson Synthesis

⌚ 10 min

"Today we studied numbers that represented times and top speeds of luge riders and how they are affected when rounded to different places."

"What are some reasons to round numbers?" (It gives a general idea of the size of a number. It's easier to understand how big a number is when it is a round number.)

"What are some reasons to keep numbers unrounded?" (If we need to know the exact size of the number then it can be important not to round it. If we want to compare two numbers, then we may need more digits to decide which is larger.)

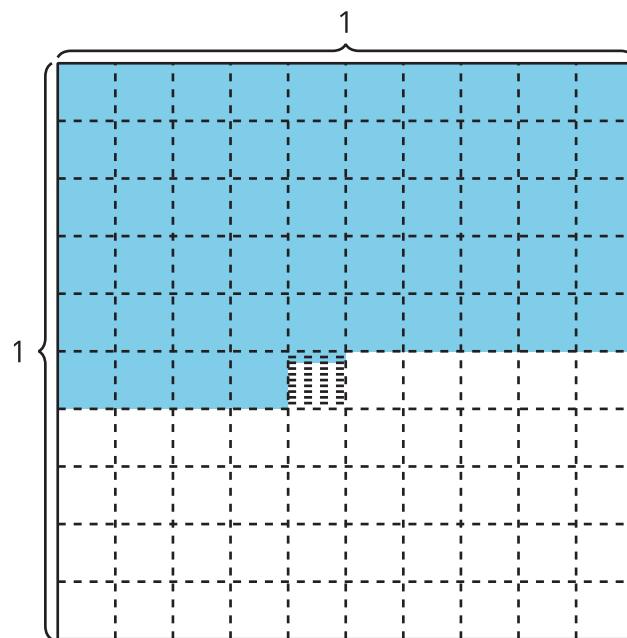
"How is rounding decimals the same as rounding whole numbers?" (I need to think about place value and then find the closest hundredth or tenth or one just like I would look for the nearest ten, hundred, or thousand for whole numbers.)

## Suggested Centers

- Tic Tac Round (3–5), Stage 3: Decimals (Addressing)
- Greatest of Them All (1–5), Stage 4: Decimals (Addressing)
- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)

## Student Section Summary

In this section, we represented decimals to the thousandths place.

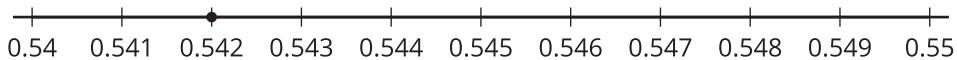


The shaded region of the diagram represents 0.542. The 5 shaded rows are each a tenth or 0.1, the 4 shaded small squares are each a hundredth or 0.01, and the 2 shaded tiny rectangles are each a

thousandth or 0.001. The decimal 0.542 can be represented in other ways

- $\frac{542}{1,000}$
- five hundred forty-two thousandths
- $(5 \times 0.1) + (4 \times 0.01) + (2 \times 0.001)$

We can also locate 0.542 on a number line.



The number line shows that 0.542 is closer to 0.54 than to 0.55 so 0.542 rounded to the nearest hundredth is 0.54.

----- Complete Cool-Down -----

### Response to Student Thinking

Students do not round correctly.

### Next Day Support

- Before the warm-up, pass back the cool down and work in small groups to make corrections.

## Section B: Add and Subtract Decimals

### Lesson 11: Make Sense of Decimal Addition

#### Standards Alignments

Addressing 5.NBT.B.7  
Building Towards 5.NBT.B.7

#### Teacher-facing Learning Goals

- Add decimals to the hundredths in a way that makes sense to them.

#### Student-facing Learning Goals

- Let's add decimals.

#### Lesson Purpose

The purpose of this lesson is for students to add decimals in a way that makes sense to them.

The purpose of this lesson is for students to extend their understanding of adding multi-digit whole numbers to evaluate sums with decimals. Students find sums in a way that makes sense to them. The activities in the lesson are designed to encourage students to think about composing new units. This allows them to build on their work with equivalent decimal values in the previous section as well as their whole number work in previous grades.

#### Access for:

##### Students with Disabilities

- Engagement (Activity 2)

#### Instructional Routines

How Many Do You See? (Warm-up), MLR7 Compare and Connect (Activity 1)

#### Materials to Gather

- Chart paper: Activity 1
- Colored pencils, crayons, or markers: Activity 1
- Number cubes: Activity 2

#### Materials to Copy

- Target Numbers Stage 8 Recording Sheet (groups of 1): Activity 2

## Required Preparation

- Create a large chart titled “Decimal Addition” to display during the lesson synthesis.

## Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

## Teacher Reflection Question

How did the student work that you selected impact the direction of the discussion? What student work might you pick next time if you taught the lesson again?

## Cool-down (to be completed at the end of the lesson)

⌚ 5 min

The Value of the Sum

### Standards Alignments

Addressing 5.NBT.B.7

### Student-facing Task Statement

What is the value of  $1.20 + 0.13$ ? Explain or show your reasoning.

### Student Responses

1.33. Sample responses:  $1.20 + 0.10 = 1.30$ ,  $1.30 + 0.03 = 1.33$

----- Begin Lesson -----

## Warm-up

⌚ 10 min

How Many Do You See: Grids

### Standards Alignments

Building Towards 5.NBT.B.7

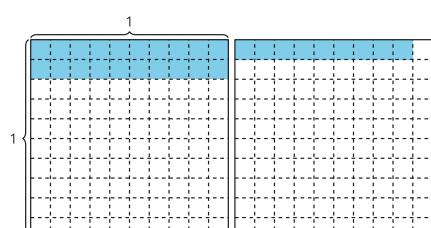
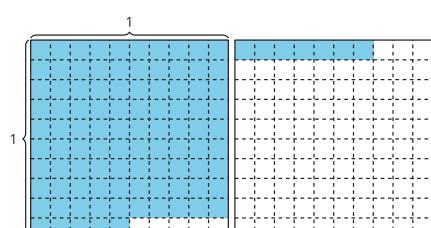
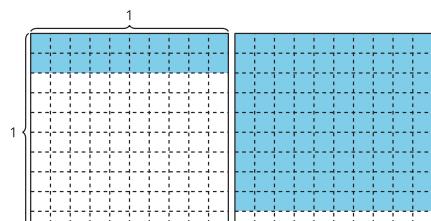
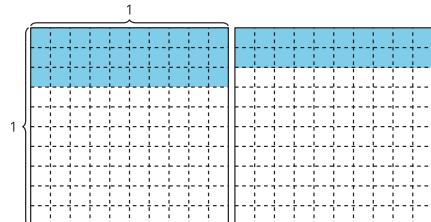
The purpose of this How Many Do You See is for students to group common decimal values and compose new units when they describe the images they see. This helps prepare students to add decimals given in numerical form in the lesson. Students may use words, fractions, or decimals to describe how many they see.

## Instructional Routines

How Many Do You See?

### Student-facing Task Statement

How many do you see? How do you see them?



### Launch

- Groups of 2
- “How many do you see? How do you see them?”
- Display the image.
- 1 minute: quiet think time

### Activity

- Display the image.
- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.
- Repeat for each image.

### Synthesis

- Display the third image.
- “How many do you see? How do you see them?” (I see 95 hundredths and 7 hundredths more. I can move 5 hundredths from the second square to the first and then I have 1 full square and 2 more hundredths.)

## Student Responses

- 0.5: 0.3 and 0.2
- 1.1: 0.9 and 0.2
- 1.02: 0.95 and 0.07
- 0.29: 0.2 and 0.09

## Activity 1

⌚ 15 min

### The Sum

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to add decimals in a way that makes sense to them. Students may use a variety of strategies including

- drawing a diagram using hundredths grids (MP5)
- adding by place value
- adding on to the larger number

Students should be encouraged to use whatever strategies make sense to them.

This activity uses *MLR7 Compare and Connect*. Advances: Representing, Conversing.

#### Instructional Routines

MLR7 Compare and Connect

#### Materials to Gather

Chart paper, Colored pencils, crayons, or markers

#### Required Preparation

- Each group of 2 needs a piece of chart paper and colored pencils, markers, or crayons.

## Student-facing Task Statement

1. Find the value of the expression. Show your thinking. Organize it so it can be followed by others.

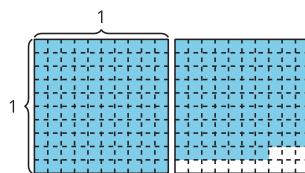
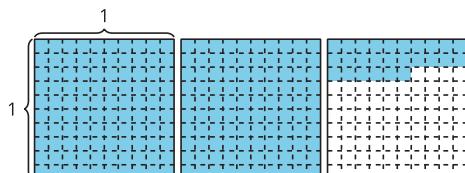
$$2.26 + 1.87$$

2. What questions do you have about adding decimals?

## Student Responses

1. Sample responses:

- There are 3 wholes and then I can move 13 small squares from 2.26 to complete a fourth whole and there are 13 left so that's 4.13 altogether



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- $2 + 1 = 3$
- $0.2 + 0.8 = 1$
- $0.06 + 0.07 = 0.13$
- $3 + 1 + 0.13 = 4.13$
- $1.87 + 0.13 = 2$
- $2 + 2.13 = 4.13$

2. Sample responses:

- What are some other strategies I can use to add decimals?
- How do I add decimals to the thousandths place?
- Can I use the same strategies to add decimals that I use to add whole

## Launch

- Groups of 2
- Give each group of students a piece of chart paper, colored pencils, crayons or markers, and access to hundredths grids.

## Activity

- 5 minutes independent work time

### MLR7 Compare and Connect

- "Create a visual display that shows your thinking about the first problem. You may want to include details such as notes, diagrams or drawings to help others understand your thinking."
- 2–5 minutes: partner work time
- 5–7 minutes: gallery walk

## Synthesis

- Refer to the visual displays that students created or use the student solutions.
- "What is the same and what is different between the strategies?" (Some of them use diagrams to show the numbers and add them and some of them use equations. They both have to think about making a new whole out of the decimals.)
- Display equation:  $0.8 + 0.2 = 1$
- "How does the diagram show this equation?" (I can move two shaded rows from 2.26 to complete the partly shaded square in 1.87.)
- Display equation:  $0.06 + 0.07 = 0.13$
- "How does the diagram show this equation?" (I can put together all of the single shaded squares that don't fill a full row from the two diagrams and I get 1 tenth and 3 hundredths.)

numbers?

- What if the sum of the digits is more than 10?

## Advancing Student Thinking

If students do not have a strategy for getting started, refer to the grids and ask, “How can we represent the sum on the grids?”

## Activity 2

⌚ 20 min

Target Numbers: Add Tents or Hundredths

👤 ↔👤 PLC Activity

### Standards Alignments

Addressing 5.NBT.B.7

In the previous activity, students added decimals in a way that made sense to them. The purpose of this activity is for students to play a game that requires them to consider place value while adding decimals (MP7). This is Stage 8 of the center Target Numbers. Students played previous stages of this game with whole numbers in earlier grades.

Students roll a number cube and decide whether they want the number to represent tenths or hundredths. They roll the number cube six times and try to make a cumulative sum that is as close to 1 as possible, without being greater than 1. Students make strategic choices about which value to assign the number as they roll and adapt their strategy throughout the game.

For example, here is a sample record of a game.

number rolled	0.1	0.01	equation to represent the total
3	0.3		$0 + 0.3 = 0.3$
1	0.1		$0.3 + 0.1 = 0.4$
4	0.4		$0.4 + 0.4 = 0.8$
4		0.04	$0.8 + 0.04 = 0.84$
5		0.05	$0.84 + 0.05 = 0.89$

number rolled	0.1	0.01	equation to represent the total
3		0.03	$0.89 + 0.03 = 0.92$

## ⑩ Access for Students with Disabilities

*Engagement: Develop Effort and Persistence.* Invite students to generate a list of shared expectations for group work. Record responses on a display and keep visible during the activity.

*Supports accessibility for: Attention, Social-Emotional Functioning*

### Materials to Gather

Number cubes

### Materials to Copy

Target Numbers Stage 8 Recording Sheet  
(groups of 1)

### Required Preparation

- Each group of 2 needs 1 number cube.

### Student-facing Task Statement

Directions:

- Play one round of Target Numbers.
  - Partner A
    - Start at 0. Roll the number cube. Choose whether to add that number of tenths or hundredths to your starting number.
    - Write an equation to represent the sum.
  - Take turns until you've played 6 rounds.
  - Each round, the sum from the previous equations becomes the starting number in the new equation.

### Launch

- Groups of 2
- Give each group one number cube and a copy of the Instructional master.
- "We're going to play a game called Target Numbers. Let's read through the directions and play one round together."
- Read through the directions with the class and play a round with the class:
  - Display each roll of the number cube.
  - Think through your choices aloud.
  - Record your move and score for all to see.
- "Now, play the game with your partner."

- The partner to get a sum closest to 1 without going over wins.

2. Describe a move that you could have made differently to change the outcome of the game.

## Student Responses

1. See teacher narrative for a sample response.
2. See synthesis for sample responses.

## Activity

- 8–10 minutes: partner work time
- Monitor for students who:
  - go over 1 and describe how they could have changed the placement of a number from the tenths place to the hundredths place to impact the game
  - don't come close to 1 and describe how they could have changed the placement of a number from the hundredths place to tenths place to impact the game

## Synthesis

- “What could you have done differently to change the outcome of the game?”
  - I picked too many tenths and went over.
  - I did not get close to 1 because I was worried about going over. I picked too many hundredths.
- Give students a chance to write their reflection.
- “Look back at the questions you wrote in the last activity about adding decimals. Discuss with your partner whether you are able to answer any of your questions.”

## Advancing Student Thinking

If students are not being strategic about their placement of the number rolled, ask, “How did you decide whether to make the number you rolled worth tenths or hundredths?”

## Lesson Synthesis

⌚ 10 min

“Today we added decimals.”

Display a piece of chart paper titled “Decimal Addition” as you reflect on the work from today.

“How is adding decimals the same as adding whole numbers?” (You have to pay attention to place value. Sometimes you have to compose a new unit.)

“How is it different?” (You have to add tenths and hundredths. There is a decimal point.)  
Record responses on poster.

“What do you still wonder about adding decimals?” (Can you add thousandths? What if there is a zero in one of the places? Can we use the algorithm like we do for whole numbers?)

Record responses on poster. Save poster to refer back to in future lessons.

---

### Suggested Centers

- Tic Tac Round (3–5), Stage 3: Decimals (Addressing)
- Greatest of Them All (1–5), Stage 4: Decimals (Addressing)
- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)

---

### Complete Cool-Down

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### Response to Student Thinking

Students do not find the correct value of the sum.

### Next Day Support

- Before the warm-up of the next lesson, pair students up to discuss their responses from the cool-down of this lesson.

# Lesson 12: Estimate and Add

## Standards Alignments

Addressing 5.NBT.B.7

### Teacher-facing Learning Goals

- Add decimals to the hundredths place using strategies based on place value.

### Student-facing Learning Goals

- Let's add decimals and think about whether our answers are reasonable.

## Lesson Purpose

The purpose of this lesson is for students to estimate and find the value of addition expressions with decimals.

In a previous lesson, students found decimal sums in a way that made sense to them. In this lesson, students see that the standard algorithm for whole number addition, familiar from a previous course, also works for decimals. Students then estimate sums and find their values. Students are not required to use the standard algorithm, but see how it is an efficient way to add.

Display the Decimal Addition chart from a previous lesson to be used during the lesson synthesis.

## Access for:

### ⓘ Students with Disabilities

- Representation (Activity 2)

## Instructional Routines

MLR1 Stronger and Clearer Each Time (Activity 1), Number Talk (Warm-up)

### Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

### Teacher Reflection Question

What did you say, do, or ask during the lesson synthesis that helped students be clear on the learning of the day? How did understanding the cool-down of the lesson before you started teaching today help you synthesize that learning?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Sums of Decimals

**Standards Alignments**

Addressing 5.NBT.B.7

**Student-facing Task Statement**Find the value of  $3.45 + 21.6$ . Explain or show your reasoning.**Student Responses**

25.05. Sample responses:

- $21 + 3 = 24, 0.40 + 0.60 = 1.00, 24 + 1 = 25, 25 + 0.05 = 25.05$

$$\begin{array}{r}
 & & 1 \\
 & 3. & 4 & 5 \\
 + & 2 & 1. & 6 & 0 \\
 \hline
 & 2 & 5. & 0 & 5
 \end{array}$$

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Number Talk: 99 Hundredths

**Standards Alignments**

Addressing 5.NBT.B.7

The purpose of this number talk is for students to develop strategies for adding decimals with a focus on composing a new whole number. Students will work on sums where a new whole number is composed throughout the lesson.

## Instructional Routines

### Number Talk

#### Student-facing Task Statement

Find the value of each expression mentally.

- $1.00 + 0.99 + 0.02$
- $1.99 + 0.02$
- $1.99 + 0.03$
- $1.99 + 0.13$

#### Student Responses

- 2.01: I added one of the hundredths from 0.02 to 0.99 to make another whole and then I had 2 and one hundredth.
- 2.01: It is the same problem as the first one, but  $1.00 + 0.99$  is written as 1.99.
- 2.02: It is 1 hundredth more than the last one.
- 2.12: It is 1 tenth more than the last one and  $2.02 + .1 = 2.12$ .

#### Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”

#### Activity

- 1 minute: quiet think time
- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

#### Synthesis

- “How did you use the value of one of the expressions to help you find the value of a different expression?” (I knew that  $1.99 + 0.13$  is 0.1 more than  $1.99 + 0.03$ .)

## Activity 1

⌚ 15 min

Use the Standard Algorithm to Add Decimals

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to understand that the standard algorithm for addition can be used with decimals. Students first find the value of a sum of decimals using a strategy that makes sense to them and then see calculations organized using the standard algorithm. They recognize the importance of organizing the calculations and carefully recording any newly composed units.

When students share their explanation of Han's calculations with a partner and revise their work after receiving feedback they critique the reasoning of others and improve their arguments (MP3).

This activity uses *MLR1 Stronger and Clearer Each Time*. Advances: Conversing

## Instructional Routines

MLR1 Stronger and Clearer Each Time

### Student-facing Task Statement

- Find the value of  $5.61 + 2.53$ . Explain or show your reasoning.
- Han used the standard algorithm to add decimals. This is Han's work. Describe what Han did in each step.

$$\begin{array}{r}
 \text{Step 1} \quad \text{Step 2} \quad \text{Step 3} \\
 \begin{array}{r} 5.61 \\ + 2.53 \\ \hline . \quad 4 \end{array} \quad \begin{array}{r} 5.61 \\ + 2.53 \\ \hline .14 \end{array} \quad \begin{array}{r} 5.61 \\ + 2.53 \\ \hline 8.14 \end{array}
 \end{array}$$

- Use the standard algorithm to find the value of  $6.62 + 3.74$ .

### Student Responses

- 8.14. Sample response:  $5 + 2 = 7$ ,  $0.6 + 0.5 = 1.1$ ,  $0.03 + 0.01 = 0.04$ , and  $7 + 1.1 + 0.04 = 8.14$
- Sample responses: In the first step, he adds 3 hundredths and 1 hundredth and writes a 4 in the hundredths place of the sum. In the second step, he adds 6 tenths and 5 tenths and writes 1 whole over the 5 because 11 tenths is equal to 1 whole and 1 tenth. Then, he writes the 1 in the tenths place of the sum. Finally, he adds 5, 2, and 1 and writes the result in the ones place of the sum.
- 

### Launch

- Groups of 2
- "Work on the first two problems on your own."

### Activity

- 5–6 minutes: independent work time

### MLR1 Stronger and Clearer Each Time

- "Share your description of Han's work with your partner. Take turns being the speaker and the listener. If you are the speaker, share your ideas and writing so far. If you are the listener, ask questions and give feedback to help your partner improve their work."
- 3–5 minutes: structured partner discussion.
- Repeat with 2–3 different partners.
- "Revise your initial draft based on the feedback you got from your partners."
- 2–3 minutes: independent work time

### Synthesis

- "Solve the last problem on your own."
- 2–3 minutes: independent work time
- "What was helpful about using the standard algorithm?" (It was helpful to line up the numbers and keep track of

$$\begin{array}{r}
 & 1 \\
 & 6. 6 \ 2 \\
 + & 3. \ 7 \ 4 \\
 \hline
 & 1 \ 0. \ 3 \ 6
 \end{array}$$

everything. It was also helpful to add everything in order, step by step.)

- “How was the standard algorithm with decimals the same as for whole numbers?” (I add numbers with the same place value and then when I get a new unit, like the 1 here, I write it over the correct place value.)

## Advancing Student Thinking

If students do not get the correct solution, ask, “What 2 whole numbers will the answer be between?”

## Activity 2

⌚ 20 min

Estimate and Find the Value

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to estimate and then find sums. Students may use the standard algorithm which they just learned to find the sums or they may add by place value. The numbers here are deliberately chosen so that one number has tenths but no hundredths and the other number has hundredths. A new and important feature to adding decimals with the standard algorithm is making sure to add digits with the same place value. In practice, this means that the numbers are not always “right aligned” as they are when adding whole numbers. Students will examine an error in alignment in the next lesson.

### ⌚ Access for Students with Disabilities

*Representation: Internalize Comprehension.* Synthesis: Invite students to identify which details were important to solve the problem. Display the sentence frame, “The next time I estimate the sums of multi-digit decimals, I will pay attention to . . .”

*Supports accessibility for: Conceptual Processing, Memory*

## Student-facing Task Statement

- Which whole number is the sum  $2.82 + 5.2$  closest to? Explain or show your reasoning.
- What is the value of  $2.82 + 5.2$ ? Explain or show your reasoning. Use the standard algorithm if it is helpful.
- Which whole number is the sum  $6.8 + 4.97$  closest to? Explain or show your reasoning.
- What is the value of  $6.8 + 4.97$ ? Explain or show your reasoning. Use the standard algorithm if it is helpful.

## Student Responses

8. Sample response:  $2.82$  is a little less than  $3$  and  $5.2$  is a little more than  $5$  and  $3 + 5 = 8$ .

- Sample responses:

- $5 + 2 = 7$ ,  $0.8 + 0.2 = 1$ ,  $7 + 1 = 8$ , and  $8 + 0.02 = 8.02$

$$\begin{array}{r}
 & 1 \\
 & 2. 8 \ 2 \\
 + & 5. 2 \\
 \hline
 & 8. 0 \ 2
 \end{array}$$

o

12. Sample response: The answer will be closest to  $12$  because  $6.8$  is almost  $7$  and  $4.97$  is really close to  $5$  and  $7 + 5 = 12$ .

- Sample responses:

- $6 + 4 = 10$ ,  $0.8 + 0.9 = 1.7$ ,  $10 + 1.7 = 11.7$ , and  $11.7 + 0.07 = 11.77$
- $6 + 4 = 10$ ,  $10 + 0.97 = 10.97$ ,  $10.97 + 0.03 = 11$ ,  $11 + 0.8 = 11.8$ , and  $11.8 - 0.03 = 11.77$

$$\begin{array}{r}
 & 1 \\
 & 6. 8 \\
 + & 4. 9 \ 7 \\
 \hline
 & 1. 1. 7 \ 7
 \end{array}$$

o

## Launch

- Groups of 2

## Activity

- 8 minutes: independent work time
- 2 minutes: partner work time
- Monitor for students who use different approaches to add the numbers including using the standard algorithm or place value reasoning.

## Synthesis

- Invite students who used different strategies to add to share their work for the first problem.
- "What is the same about their strategies? What is different?" (In both of them, they had to make sure to add the same place values. They also both composed a new unit. One added on in parts, by place value, and the other used the standard algorithm.)
- "How did the estimate help you with your calculation?" (I saw that  $4.97$  was really close to  $5$  and that gave me the idea of adding  $5$  which I could do mentally and then taking away  $0.03$ .)

## Advancing Student Thinking

If students don't have a strategy for determining which whole number the sum is closest to, ask, "Will the sum be greater or less than 8?"

## Lesson Synthesis

⌚ 10 min

"Today we added decimals and we used the standard algorithm."

Refer to the poster from the previous lesson.

"Did we answer any of the questions that we wondered about?"

Add to or change poster as necessary.

"How is using the standard algorithm for adding decimals the same as and different from the standard algorithm for adding whole numbers?" (The calculations are organized vertically with newly composed units recorded above the numbers. I make sure to add digits with the same place value. I need to keep track of where the decimal is in each number.)

## Suggested Centers

- Tic Tac Round (3–5), Stage 3: Decimals (Addressing)
- Greatest of Them All (1–5), Stage 4: Decimals (Addressing)
- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)

## Complete Cool-Down

## Response to Student Thinking

The work in this lesson builds from the standard algorithm for addition developed in a prior unit.

### Prior Unit Support

Grade 4, Unit 4, Section D: Add and Subtract

# Lesson 13: Analyze Addition Mistakes

## Standards Alignments

Addressing 5.NBT.B.7

### Teacher-facing Learning Goals

- Add decimals to the hundredths place using strategies based on place value.

### Student-facing Learning Goals

- Let's use place value strategies to add decimals.

## Lesson Purpose

The purpose of this lesson is for students to add decimals and consider common errors in lining up place values when adding with the standard algorithm.

In previous lessons, students used strategies based on place value and properties of operations to add decimal numbers including the standard algorithm. The purpose of this lesson is to highlight the importance of adding the same place values when making vertical calculations with decimals. This issue does not arise when adding whole numbers as the numbers are always aligned to the right, starting with ones, then tens, and so on. For decimal numbers it is more complicated because the last digits in two decimals, such as 5.18 and 16.7, may not have the same place value. Rather than aligning these numbers to the right as shown here

$$\begin{array}{r} 5. 1 \ 8 \\ + \ 1 \ 6. \ 7 \\ \hline \end{array}$$

they need to be aligned by place value. After examining this alignment error, students practice adding decimals taking care to add using the correct place values.

## Access for:

### Students with Disabilities

- Engagement (Activity 2)

## Instructional Routines

Estimation Exploration (Warm-up), MLR3 Clarify, Critique, Correct (Activity 1)

## Lesson Timeline

Warm-up

10 min

## Teacher Reflection Question

Reflect on a time your thinking changed about something in class recently. How will you alter

Activity 1	20 min	your teaching practice to incorporate your new understanding?
Activity 2	15 min	
Lesson Synthesis	10 min	
Cool-down	5 min	

## Cool-down (to be completed at the end of the lesson)

⌚ 5 min

What is the Error?

### Standards Alignments

Addressing 5.NBT.B.7

### Student-facing Task Statement

The calculation below has an error.

$$\begin{array}{r}
 1 \ 1 \\
 3 \ 8. \ 7 \\
 + \ 9. \ 4 \ 6 \\
 \hline
 1 \ 3. \ 3 \ 3
 \end{array}$$

1. Explain the error.
2. Find the correct value of  $38.7 + 9.46$ .

### Student Responses

1. The decimal places are not lined up so the 30 in 38.7 is treated like it's only 3.
- 2.

$$\begin{array}{r}
 1 \ 1 \\
 3 \ 8. \ 7 \ 0 \\
 + \ 9. \ 4 \ 6 \\
 \hline
 4 \ 8. \ 1 \ 6
 \end{array}$$

----- Begin Lesson -----

## Warm-up

⌚ 10 min

### Estimation Exploration: Many Places

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this Estimation Exploration is for students to estimate a sum of two decimals. The numbers are complex to encourage students to make an estimate which means identifying that the leading digits, rather than the decimal places, are the most important for making a good estimate.

In this lesson, students start to work with sums of larger numbers. Making a mental estimate before calculating is a valuable skill to help confirm the reasonableness of a solution.

#### Instructional Routines

Estimation Exploration

#### Student-facing Task Statement

$$1,987.89 + 658.54$$

Record an estimate that is:

too low	about right	too high

#### Student Responses

Sample responses

- Too low: 2,000 to 2,600
- About right: 2,640 to 2,650
- Too high: 2,658 to 2,659

#### Launch

- Groups of 2
- Display the expression.
- “What is an estimate that’s too high?” “Too low?” “About right?”
- 1 minute: quiet think time

#### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.

#### Synthesis

- “Which digits in the numbers were most important for making your estimate?” (The 1 and first 9 from the first number and the 6 and 5 from the second number.)

## Activity 1

⌚ 20 min

### Compare Calculations

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to analyze a common error when using the standard algorithm to add decimals. The standard addition algorithm requires students to add digits with the same place value. In the given example the two numbers are “right aligned” as when adding whole numbers but this leads to the error of adding tenths from one number to hundredths of the other number as if they had the same place value. When students analyze the incorrect calculation, explain why it is incorrect, and correct it they critique the reasoning of others (MP3).

This activity uses *MLR3 Clarify, Critique, and Correct*. Advances: Reading, Writing, Representing.

#### Instructional Routines

MLR3 Clarify, Critique, Correct

#### Student-facing Task Statement

- Find the value of  $621.45 + 72.3$ . Explain or show your reasoning.
- Elena and Andre found the value of  $621.45 + 72.3$ . Who do you agree with? Explain or show your reasoning.

#### Launch

- Groups of 2
- “Solve the first problem on your own.”
- 2–3 minutes: independent work time
- “Now, work on the second problem on your own for a few minutes, and then talk to your partner about it.”

#### Activity

- 1–2 minutes: independent work time
- 6–8 minutes: partner work time
- Monitor for students who:
  - use estimation to reason (For example, they notice that adding almost 70 to 620 must be a lot greater than 628, as shown in

Elena

$$\begin{array}{r}
 621.45 \\
 + 72.3 \\
 \hline
 628.68
 \end{array}$$

My answer makes sense because it is more than 621.

Andre

$$\begin{array}{r}
 621.45 \\
 + 72.30 \\
 \hline
 693.75
 \end{array}$$

My answer makes sense because  $620 + 70 = 690$  and then I still have to add a little bit more than 3 to 690.

## Student Responses

Sample responses:

1.

$$\begin{array}{r}
 6 2 1. 4 5 \\
 + 7 2. 3 0 \\
 \hline
 6 9 3. 7 5
 \end{array}$$

2. I agree with Andre because his answer is closest to my estimate and he lined up the digits by place value and then added the numbers in the same place value position. Elena didn't line up her digits correctly so her solution is too small.

Elena's calculation.)

- notice the misalignment of the decimal places being added in Elena's calculation

## Synthesis

### MLR3 Clarify, Critique, Correct

- Display Elena's partially correct answer and explanation.
- Read the explanation aloud.
- "What do you think Elena means? Is anything unclear?" (She says the answer will be more than 621, but she doesn't say how much more. The answer will be a lot more than 628.68.)
- "With your partner, work together to write a revised solution and explanation."
- (Optional) Display and review the following criteria:
  - Explanation of mistakes
  - Specific words and phrases
    - Decimal point
    - Place value
  - Labeled diagram
  - Correct solution
- 3–5 minutes: partner work time
- Select 1–2 groups to share their revised explanation with the class.
- "What is the same and different about the revised solutions and explanations?"
- Invite previously selected students to share.
- Display Andre's solution.
- "How does Andre know that he needs to add a little more than 3 to 690?" (He hasn't added the ones, tenths, or hundredths places yet and  $1.45 + 2.30$  is a little more than 3.)

- “Why do you think Andre uses 72.30 instead of 72.3?” (It helps him keep the place values and decimals in line so he doesn’t mix up the places when he is adding. 72.30 is equivalent to 72.3.)

## Advancing Student Thinking

If students do not have a strategy to solve the first problem, ask “What strategy would you use to find the value of  $621 + 72$ ?”

## Activity 2

⌚ 15 min

### Same Digits, Different Sums

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find the value of various decimal sums with no scaffold. Most of the numbers do not have the same number of decimal digits so students need to add carefully if they make vertical calculations, making sure to align place values correctly (MP6).

#### ⌚ Access for Students with Disabilities

*Engagement: Internalize Self-Regulation.* Synthesis: Provide students an opportunity to self-assess and reflect on their own progress. For example, provide students with an exemplar of one or more problems and have students highlight the similarities and differences in how they found the value of each expression.

*Supports accessibility for: Conceptual Processing, Attention*

#### Student-facing Task Statement

Find the value of each expression. Explain or show your reasoning.

#### Launch

- Groups of 2

1.  $2.63 + 7.74$
2.  $26.3 + 774$
3.  $46.3 + 31.42$
4.  $463 + 3.14$

### Student Responses

1.  $2.63 + 7.74 = 10.37$ . Sample response:

$$\begin{array}{r}
 1 \\
 2. \ 6 \ 3 \\
 + \ 7. \ 7 \ 4 \\
 \hline
 1 \ 0. \ 3 \ 7
 \end{array}$$

2.  $26.3 + 774 = 800.3$ . Sample response: I added 26 to 774 to get 800 and then there is 0.3 more.
3.  $46.3 + 31.42 = 77.72$ . Sample response: I added 46 and 31 to get 77 and then  $0.3 + 0.42 = 0.72$ .
4.  $463 + 3.14 = 466.14$ . Sample response:

$$\begin{array}{r}
 4 \ 6 \ 3. \ 0 \ 0 \\
 + \ \ \ \ \ \ 3. \ 1 \ 4 \\
 \hline
 4 \ 6 \ 6. \ 1 \ 4
 \end{array}$$

### Activity

- 5 minutes: independent work time
- 2 minutes: partner discussion
- Monitor for students who
  - use the standard algorithm
  - use place value understanding but do not organize their calculations vertically

### Synthesis

- Invite previously selected students to share.
- Display:  $463 + 3.14$
- “How do you add these using the standard algorithm?” (I made sure that the 3 in 463 lines up with the 3 in 3.14 so I am adding numbers with the same place value. I added 0’s in the tenths and hundredths places of 463 to help add the numbers.)
- “Did anyone use a different strategy to add these numbers?” (I knew that 463 and 3 is 466 and then I also have 14 hundredths so it’s 466.14.)

### Advancing Student Thinking

If students do not find the correct value of a sum, ask, “Which 2 whole numbers will the value of the sum be between?”

## Lesson Synthesis

⌚ 10 min

“Today we analyzed errors in strategies for adding decimals.”

“Describe what is the most important thing to remember when we add decimal numbers.” (Pay attention to the place values of the digits that I add together.)

“What are some mistakes someone can make when finding the sum?” (Adding different place value positions. Making an error in writing the expression vertically by not lining up the decimal. Forgetting

to write down newly composed units.)

### Suggested Centers

- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)
- How Close? (1–5), Stage 7: Multiply Fractions and Whole Numbers to 5 (Supporting)

### Complete Cool-Down

### Response to Student Thinking

Students do not find the correct value of  $38.7 + 9.46$ .

#### Next Day Support

- Prior to the next lesson, brainstorm a list of possible strategies to use to solve the cool-down problem from today's lesson.

# Lesson 14: Make Sense of Decimal Subtraction

## Standards Alignments

Addressing 5.NBT.B.7

### Teacher-facing Learning Goals

- Subtract decimals to the hundredths in a way that makes sense to them.

### Student-facing Learning Goals

- Let's subtract decimals.

## Lesson Purpose

The purpose of this lesson is for students to subtract decimals to the hundredths place in a way that makes sense to them.

In previous lessons, students used place value strategies, including the standard algorithm, to add multi-digit decimal numbers. They compared the strategies and algorithms they used to add whole numbers to the strategies and algorithms they used to add decimals. In the next few lessons, students build an understanding of how to use place value strategies, the properties of operations, and the relationship between addition and subtraction to subtract multi-digit decimals. The lessons that address subtraction of decimals follow a similar structure to the lessons that addressed addition of decimals. Common routines and activities were chosen to help students make connections between what they learned about adding decimals and the strategies they are now using to subtract decimals.

## Access for:

### Students with Disabilities

- Representation (Activity 1)

## Instructional Routines

MLR7 Compare and Connect (Activity 1), True or False (Warm-up)

### Materials to Gather

- Chart paper: Activity 1
- Colored pencils, crayons, or markers: Activity 1
- Number cubes: Activity 2

### Materials to Copy

- Small Grids (groups of 1): Activity 1
- Target Numbers Stage 9 Recording Sheet (groups of 1): Activity 2

**Lesson Timeline**

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

Think about a time you recently made a mistake during math class. How did you leverage your mistake to show students that mistakes are just learning in progress?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Subtract

**Standards Alignments**

Addressing 5.NBT.B.7

**Student-facing Task Statement**

Find the value of  $3.57 - 1.4$ . Explain or show your reasoning.

**Student Responses**

2.17. Sample response:  $3 - 1 = 2$ ,  $0.57 - 0.40 = 0.17$ ,  $2.00 + 0.17 = 2.17$

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

True or False: Decimal Differences

**Standards Alignments**

Addressing 5.NBT.B.7

The purpose of this True or False is for students to apply their understanding of place value to subtraction equations with decimals. The names of the decimals will likely suggest a strategy using

whole number subtraction. For example  $0.61 - 0.02 = 0.59$  can be read as “61 hundredths minus 2 hundredths equals 59 hundredths,” which students will recognize is true. Alternatively they can think about place value. For example, 0.5 is 5 tenths or 50 hundredths and 50 hundredths minus 1 hundredth is 49 hundredths.

## Instructional Routines

True or False

### Student-facing Task Statement

Decide if each statement is true or false. Be prepared to explain your reasoning.

- $0.5 - 0.01 = 0.4$
- $0.61 - 0.02 = 0.59$
- $1 - 0.07 = 0.93$

### Student Responses

Sample responses

- False: 0.5 is 50 hundredths so the difference is 0.49 not 0.4.
- True: If I take 2 hundredths from 61 hundredths that's 59 hundredths.
- True: 1 is 100 hundredths and if I subtract 7 hundredths that leaves 93 hundredths.

### Launch

- Display one statement.
- “Give me a signal when you know whether the statement is true and can explain how you know.”
- 1 minute: quiet think time

### Activity

- Share and record answers and strategy.
- Repeat with each statement.

### Synthesis

- Display first equation.
- “How did you use what you know about place value to decide if the equation is true?” (I know 5 tenths is 50 hundredths and if I subtract 1 hundredth that's 49 hundredths so it's false.)

## Activity 1

⌚ 20 min

The Difference

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to subtract decimals in a way that makes sense to them. Students should be encouraged to use whatever strategies make sense to them, including using place value understanding and the relationship between addition and subtraction. Strategies students may use include

- using hundredths grids (MP5)
- using place value and writing equations

This activity uses *MLR7 Compare and Connect*. Advances: Representing, Conversing.

## ⓘ Access for Students with Disabilities

*Representation: Develop Language and Symbols.* Synthesis: Invite students to explain their thinking orally, using a visual from the gallery walk that was similar to their approach to find the value of the subtraction expression.

*Supports accessibility for: Conceptual Processing, Language, Attention*

## Instructional Routines

MLR7 Compare and Connect

### Materials to Gather

Chart paper, Colored pencils, crayons, or markers

### Student-facing Task Statement

1. Find the value of  $2.26 - 1.32$ . Explain or show your reasoning.
2. What questions do you have about subtracting decimals?

### Student Responses

1. Sample responses:
  - $2.26 - 1 = 1.26$ ,  $1.26 - 0.26 = 1$ ,  $1 - 0.06 = 0.94$
  - $2.26 + 0.06 = 2.32$ ,  $2.32 - 1.32 = 1$ ,  $1.00 - 0.06 = 0.94$
  - $1.32 + 0.08 = 1.40$ ,  $1.40 + 0.60 = 2.00$ ,  $2.00 + 0.26 = 2.26$ , and

### Materials to Copy

Small Grids (groups of 1)

### Launch

- Groups of 2
- Give each group of students a piece of chart paper, colored pencils, crayons or markers, and access to grids.
- 5 minutes: independent work time

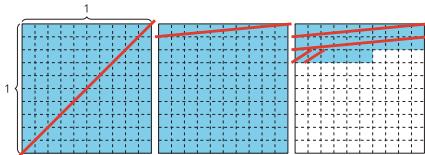
### Activity

#### MLR7 Compare and Connect

- “Create a visual display that shows your thinking. You may want to include details such as notes, diagrams, and drawings to help others understand your thinking.”
- 2–5 minutes: partner work time

$$0.08 + 0.60 + 0.26 = 0.94$$

- There are 9 tenths and 4 hundredths left or 0.94.



2. Can I subtract decimals like I subtract whole numbers? How is subtraction different from addition of decimals? What do I do if one of the numbers is a decimal and the other number is a whole number?

- 5–7 minutes: gallery walk
- Monitor for students who:
  - use strategies like the ones listed in student solutions

### Synthesis

- Refer to visual displays that students created.
- “What is the same and what is different about the strategies used to find the value of the difference?” (They all pay close attention to place value and the meaning of each digit in the numbers. Some of the displays use subtraction while some of them use addition. They add and subtract different pieces sometimes in different order. Some of the displays have diagrams and some don’t.)
- Display image from students solution.
- “How does the diagram show the difference  $2.26 - 1.32$ ?” (It shows 2.26 and then it takes away 1.32. What’s left is the difference.)
- “How is the diagram different from using equations?” (The 1 and 32 hundredths can be crossed out anywhere that’s convenient and then you just count what’s left. You don’t have to think as strategically about what to take away or in what order.)

### Advancing Student Thinking

If students do not have a strategy to get started, ask, “Is the difference greater than or less than 1? How do you know?”

## Activity 2

⌚ 15 min

Target Numbers: Subtract Tenths or Hundredths

## Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to practice subtracting decimals to the hundredth. Students play a new stage of the center Target Numbers. Students played a previous stage that involved adding tenths or hundredths. The game begins when students roll a number cube and decide whether they want the number to represent tenths or hundredths. Then, they subtract the number from 2. They roll the number cube six times and try to make a final difference that is as close to 1 as possible, without being less than 1. Students make strategic choices about which value to assign the number they rolled and adapt their strategy throughout the game. For example, here is a sample record of a game.

number rolled	0.1	0.01	equation to represent the difference
4	0.4		$2 - 0.4 = 1.6$
1	0.1		$1.6 - 0.1 = 1.5$
3	0.3		$1.5 - 0.3 = 1.2$
5		0.05	$1.2 - 0.05 = 1.15$
2		0.02	$1.15 - 0.02 = 1.13$
5		0.05	$1.13 - 0.05 = 1.08$

Some students may notice that the strategy of this game is identical to the addition game they played in an earlier lesson, the only difference being that here they start at 2 and subtract whereas with the addition game they started at 0 and add (MP8).

### Materials to Gather

Number cubes

### Materials to Copy

Target Numbers Stage 9 Recording Sheet  
(groups of 1)

### Student-facing Task Statement

Directions:

- Play one round of Target Numbers.

### Launch

- Groups of 2
- Give each group 1 number cube.

- Partner A:
  - Start at 2. Roll the number cube. Choose whether to subtract that number of tenths or hundredths from your starting number.
  - Write an equation to represent the difference.
- Take turns until you've played 6 rounds.
- Each round, the difference from the previous equations becomes the starting number in the new equation.
- The partner to get a difference closest to 1 without going under wins.

2. Describe a move that you could have made differently to change the outcome of the game.

## Student Responses

1. See teacher narrative for a sample game.
2. See synthesis for sample responses.

- “We’re going to play a new stage of the game called Target Numbers. Let’s read through the directions and play one round together.”
- Read through the directions with the class and play a round with the class:
  - Display each roll of the number cube.
  - Think through your choices aloud.
  - Record your move and score for all to see.
- “Now, play the game with your partner.”

## Activity

- 8–10 minutes: partner work time
- Monitor for students who:
  - go under 1 before their sixth roll and describe how they could have changed the placement of a number from the tenths place to the hundredths place to possibly impact the outcome of the game
  - have a final difference that is not close to 1 and describe how they could have strategically changed the placement of a number from the hundredths place to tenths place to possibly impact the outcome of the game

## Synthesis

- Ask previously selected students to share their reflections on the game.
- Recall the addition game students played three lessons earlier, choosing tenths or hundredths with a target number of 1.
- “How is the subtraction game the same as the addition game?” (I have 6 rolls of the dice and I get to choose tenths or hundredths each time. The strategy is the

same because in both cases I want the 6 decimals to add up to close to 1 without going over.)

- “How is the subtraction game different than the addition game?” (Instead of adding the decimals starting with 0, I am subtracting them starting with 2. Sometimes I have to break up a 1 or a tenth. In the addition game I sometimes made a 1 or a tenth.)
- “Which game did you prefer?” (I liked the addition game because it was easier to add the decimals than to subtract.)

### Advancing Student Thinking

If students are not being strategic about their placement of the digits, ask, “Why did you choose that value for the number you rolled?”

## Lesson Synthesis

⌚ 10 min

Create a large chart titled “Decimal Subtraction”.

“How is subtracting decimals the same as subtracting whole numbers?” (You have to pay attention to the place values and make sure you are subtracting digits with the same place value. Sometimes you have to decompose a unit.)

“How is it different?” (There are more places to pay attention to and I have to remember how many tenths are in a whole, how many hundredths are in a tenth.)

“How is subtracting decimals the same as adding decimals? How is it different?” (I have to think about place value in the same way. The only difference is that I’m subtracting now instead of adding. So I have to decompose sometimes while with addition I compose sometimes.)

Record responses on poster.

### Suggested Centers

- Jump the Line (2–5), Stage 2: Add and Subtract Tenths and Hundredths (Supporting)
- How Close? (1–5), Stage 7: Multiply Fractions and Whole Numbers to 5 (Supporting)

----- Complete Cool-Down -----

### Response to Student Thinking

Students do not find the correct difference.

### Next Day Support

- During the launch of activity 1 of the next lesson, discuss correct solutions of the cool-down from this lesson.

# Lesson 15: Estimate and Subtract

## Standards Alignments

Addressing 5.NBT.B.7

### Teacher-facing Learning Goals

- Subtract decimals to the hundredths using strategies based on place value and the relationship between addition and subtraction.

### Student-facing Learning Goals

- Let's use place value to subtract decimals.

## Lesson Purpose

The purpose of this lesson is for students to estimate and find the value of subtraction expressions with decimals.

In a previous lesson, students found decimal differences in a way that made sense to them. In this lesson, students see that the standard algorithm for subtraction, which they have used in grade 4, also works for decimals. Students then estimate differences and find their values. Students are not required to use the standard algorithm, but see how it is an efficient way to subtract.

The lesson also includes an optional activity where students analyze an error in subtracting decimals with the standard algorithm. This activity can be used if students are still struggling with combining digits with the same place values in two numbers when they add and subtract.

Display the Decimal Subtraction chart from a previous lesson to be used during lesson synthesis.

## Access for:

### ⑩ Students with Disabilities

- Action and Expression (Activity 2)

## Instructional Routines

MLR1 Stronger and Clearer Each Time (Activity 1), MLR3 Clarify, Critique, Correct (Activity 3), Number Talk (Warm-up)

**Lesson Timeline**

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Activity 3	10 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

What aspects of the math community are going well? What aspects would you like to work on? What actions can you take to improve those areas?

**Cool-down** (to be completed at the end of the lesson)  5 min

Subtract Decimals

**Student-facing Task Statement**

Find the value of  $321.87 - 20.4$ . Explain or show your reasoning.

**Student Responses**

301.47. Sample responses:

- $321 - 20 = 301, 0.8 - 0.4 = 0.4, 0.07 - 0 = 0.07, 301 + 0.4 + 0.07 = 301.47$

$$\begin{array}{r}
 3 \ 2 \ 1. \ 8 \ 7 \\
 - \ 2 \ 0. \ 4 \ 0 \\
 \hline
 3 \ 0 \ 1. \ 4 \ 7
 \end{array}$$

----- Begin Lesson -----

**Warm-up**

 10 min

Number Talk: One and Five Tenths

## Standards Alignments

Addressing 5.NBT.B.7

The purpose of this number talk is for students to develop mental strategies for subtracting decimals where decomposition of one or more units is needed when subtracting by place value. These strategies will be useful as students subtract more complex decimals and need to pay close attention to place value.

## Instructional Routines

Number Talk

### Student-facing Task Statement

Find the value of each expression mentally.

- $1.50 - 0.51$
- $1.50 - 0.52$
- $1.50 - 0.60$
- $1.50 - 0.62$

### Student Responses

- 0.99:  $1.50 - 0.50 = 1, 1 - 0.01 = 0.99$
- 0.98: I subtracted one more hundredth from the first problem.
- 0.90:  $1.50 - 0.50 = 1, 1 - 0.10 = 0.90$
- 0.88: I subtracted 2 more hundredths from the third problem.

### Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

### Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

### Synthesis

- “How did you use the value of the third expression to find the value of the last expression?” (I know 0.62 is two hundredths more than 0.60 so I subtracted 2 hundredths from 0.90 and that left 0.88.)

## Activity 1

Revisit the Algorithm

⌚ 15 min

## Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to understand that the standard algorithm for subtraction can be used with decimals. Students first find the value of a difference of decimals using a strategy that makes sense to them and then see calculations organized using the standard algorithm. When students calculate using a strategy of their choice, they may or may not show decomposition of a whole into 10 tenths. The standard algorithm explicitly shows this decomposition.

When students share their explanation of Han's calculations with a partner and revise their work after receiving feedback they critique the reasoning of others and improve their arguments (MP3).

This activity uses *MLR1 Stronger and Clearer Each Time*. Advances: Conversing.

## Instructional Routines

MLR1 Stronger and Clearer Each Time

### Student-facing Task Statement

- Find the value of  $8.53 - 2.7$ . Show your reasoning.
- Han used the standard algorithm to subtract decimals. This is Han's work. Describe what Han did in each step.

$$\begin{array}{r}
 \text{Step 1} \qquad \text{Step 2} \qquad \text{Step 3} \\
 \begin{array}{r} 8.53 \\ - 2.7 \\ \hline .3 \end{array} \qquad \begin{array}{r} 8.53 \\ - 2.7 \\ \hline .83 \end{array} \qquad \begin{array}{r} 8.53 \\ - 2.7 \\ \hline 5.83 \end{array}
 \end{array}$$

- Use the standard algorithm to find the value of  $6.62 - 3.71$ .

### Student Responses

- 5.83. Sample response:  $8.53 - 2 = 6.53$  and  $6.53 - 0.7 = 5.83$
- In step 1, Han had no hundredths to subtract and there are 3 hundredths in 8.53

### Launch

- Groups of 2
- "Work on the first two problems on your own."

### Activity

- 5–6 minutes: independent work time

### MLR1 Stronger and Clearer Each Time

- "Share your description of Han's work with your partner. Take turns being the speaker and the listener. If you are the speaker, share your ideas and writing so far. If you are the listener, ask questions and give feedback to help your partner improve their work."
- 3–5 minutes: structured partner discussion
- Repeat with 2–3 different partners.
- "Revise your initial draft based on the

so that leaves 3 hundredths which he wrote in the hundredths place. Then, he changed 8 and 5 tenths to 7 and 15 tenths so he could subtract 7 tenths from 15 tenths. 15 tenths minus 7 tenths is equal to 8 tenths so he wrote 8 in the tenths place. Finally, he subtracted 2 from 7 and wrote 5 in the ones place.

3.

$$\begin{array}{r}
 5 \ 16 \\
 \cancel{6} \ \cancel{0} \ 2 \\
 - \ 3. \ 7 \ 1 \\
 \hline
 2. \ 9 \ 1
 \end{array}$$

feedback you got from your partners."

- 2–3 minutes: independent work time

### Synthesis

- "Solve the last problem on your own."
- 2-3 minutes: independent work time
- "How is the standard algorithm for subtraction the same as the standard algorithm for addition?" (I work from right to left. I line up all of the place values and make sure the digits I am subtracting have the same place value.)
- "How is the standard algorithm for subtraction different than the standard algorithm for addition?" (Sometimes I need to decompose a unit. I need to decompose a whole into 10 tenths. With addition, I sometimes need to compose a new unit.)

## Activity 2

⌚ 20 min

Estimate and Subtract

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to estimate and then find differences. Students just learned the standard algorithm for subtraction can be used with decimals in the previous activity and may use it here. All students should be encouraged to find the differences in a way that makes sense to them. Any subtraction strategy they use will require close attention to place value and this is the focus of the synthesis.

## ⑩ Access for Students with Disabilities

*Action and Expression: Develop Expression and Communication.* Provide alternative options for expression. Students can share their thinking using a place value chart, diagram, or a picture to show how they decomposed in order to subtract.

*Supports accessibility for: Conceptual Processing, Visual-Spatial Processing*

## Student-facing Task Statement

1. Which whole number is the difference  $15.27 - 4.3$  closest to? Explain or show your reasoning.
2. What is the value of  $15.27 - 4.3$ ? Explain or show your reasoning.
3. Which whole number is the difference  $16.14 - 9.8$  closest to? Explain or show your reasoning.
4. What is the value of  $16.14 - 9.8$ ? Explain or show your reasoning.

## Student Responses

1. 11. Sample response:  $15 - 4 = 11$  and the decimal parts of the two numbers are both close to 0.3 so the difference is very small.
2. 10.97. Sample responses:

- $15.27 - 4 = 11.27$ ,  
 $11.27 - 0.27 = 11$ ,  
 $11 - 0.03 = 10.97$
- 

$$\begin{array}{r}
 & 4 & 1 & 2 \\
 & 1 & 5 & \cancel{2} & 7 \\
 - & & 4 & 3 \\
 \hline
 & 1 & 0 & 9 & 7
 \end{array}$$

3. 6. Sample response:  $16 - 10 = 6$  and  $16.14$  is very close to 16 and  $9.8$  is very close to 10.

4. 6.34. Sample responses:

- $16.14 - 10 = 6.14$ ,  $6.14 + 0.2 = 6.34$

## Launch

- Groups of 2

## Activity

- 8 minutes: independent work time
- 2 minutes: partner work time
- Monitor for students who:
  - use place value understanding to subtract by place
  - use the standard algorithm
  - use a compensation strategy to subtract 9.8

## Synthesis

- Invite students to share their strategies for finding the difference  $15.27 - 4.3$ .
- “How are the strategies the same? How are they different?” (They both broke up 4.3 into pieces and then subtracted each piece. Some students used the standard algorithm and some subtracted by place value. The standard algorithm works in one way. There are different ways to subtract 4.3 working by place value.)
- Invite students to share their estimate for  $16.14 - 9.8$ .
- “How did you know that the value would be close to 6?” (16.14 is just a little more than 16 and 9.8 is almost 10 so I used whole number subtraction to estimate,

○

$$\begin{array}{r}
 \begin{array}{r}
 5 \ 11 \\
 1 \ \cancel{6}.\ \cancel{1} \ 4 \\
 - \\
 9. \ 8 \\
 \hline
 6. \ 3 \ 4
 \end{array}
 \end{array}$$

$$16 - 10 = 6.)$$

- “Did the estimate help you with the calculation?” (Yes, I used the standard algorithm and got an answer that was just a little more than 6 and that agreed with my estimate. Yes, the estimate made me think of subtracting 10 which I could do in my head and then adding back 0.2 which I could also do in my head.)

## Activity 3 (optional)

⌚ 10 min

Compare Calculations to Evaluate a Difference

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to analyze a common error when using the standard algorithm to subtract decimals. This activity is recommended if students need additional practice with the standard algorithm when the two numbers do not have the same number of decimal places. The standard addition algorithm requires students to subtract digits with the same place value. In the given example the two numbers are “right aligned” as when subtracting whole numbers and this leads to the error of subtracting hundredths from tenths, tenths from ones, and so on as if these digits had the same place value.

When students identify and correct Elena's error they construct viable arguments and critique the reasoning of others (MP3).

This activity uses *MLR3 Clarify, Critique, and Correct*. Advances: Reading, Writing, Representing.

### Instructional Routines

MLR3 Clarify, Critique, Correct

### Student-facing Task Statement

- Find the value of  $622.35 - 71.4$ . Explain or

### Launch

- Groups of 2

show your reasoning.

2. Elena and Andre found the value of  $622.35 - 71.4$ . Who do you agree with? Explain or show your reasoning.

Elena

$$\begin{array}{r} 622.35 \\ - 71.4 \\ \hline 615.21 \end{array}$$

My answer makes sense because 615.21 is less than 622.35.

Andre

$$\begin{array}{r} 622.35 \\ - 71.40 \\ \hline 550.95 \end{array}$$

My answer makes sense because  $620 - 70 = 550$ . So my answer should be right around 550.

## Student Responses

1. 550.95: Sample response:

$$\begin{array}{r} 5 \ 12 \ 1 \ 13 \\ \cancel{8} \ \cancel{2} \ \cancel{2} \ \cancel{.} \ 5 \\ - \ 7 \ 1. \ 4 \ 0 \\ \hline 5 \ 5 \ 0. \ 9 \ 5 \end{array}$$

2. Sample response: I agree with Andre because his answer is closest to my estimate and he lined up the digits by place value and then subtracted the digits in the same place value position. Elena didn't line up her digits correctly so her solution is too small.

## Activity

- 1–2 minutes: quiet think time
- 6–8 minutes: partner work time

### MLR3 Clarify, Critique, Correct

- Display Elena's solution and explanation.
- Read the explanation aloud.
- "What do you think Elena means? Is anything unclear?" (She says the answer will be less than 622.3, but she doesn't say how much less. The answer will be a lot less than 615.21.)
- "With your partner, work together to write a revised solution and explanation."
- (Optional) Display and review the following criteria:
  - Explanation of mistakes
  - Specific words and phrases
    - Decimal point
    - Place value
  - Labeled diagram
  - Correct solution
- 3–5 minutes: partner work time
- Select 1–2 groups to share their revised explanation with the class.
- "What is the same and different about the revised solutions and explanations?"

## Synthesis

- Display Andre's solution and explanation.
- "Why do you think Andre wrote 71.40 instead of 72.4?" (It helps him keep the place values and decimals in line so he doesn't mix up the places when he is subtracting. 71.40 is equivalent to 71.4.)
- Display Elena's solution.
- "How can you see without finding the difference that Elena's answer is not

correct?" (Taking 71 away from 622 is a lot less than 615.  $620 - 70 = 550$  so the answer should be around 550.)

### Advancing Student Thinking

If a student does not have a strategy to solve problem 1, ask them to explain how they would find the value of  $622 - 51$ .

## Lesson Synthesis

⌚ 10 min

"Today we subtracted decimals and we used the standard algorithm."

"How is the standard algorithm for subtracting the same and different when you subtract whole numbers or decimals?" (When I can't subtract in one place, I need to move to a larger place and break up a larger unit. I have to keep track of the decimal points and make sure that I am subtracting the same place values.)

"Are there other subtraction strategies that you use for whole numbers that also work with decimals?" (Yes. I can use addition. I can add on to the smaller number. I can also subtract by place value or use compensation.)

### Suggested Centers

- How Close? (1–5), Stage 8: Add Decimals to 1 (Addressing)
- Jump the Line (2–5), Stage 3: Add and Subtract Tenths, Hundredths, and Thousandths (Addressing)

### Complete Cool-Down

### Response to Student Thinking

Students do not find the correct solution.

### Next Day Support

- Throughout the lesson, ask, "What did you learn yesterday that was helpful in this

activity?"

The work in this lesson builds from the standard algorithm for subtraction developed in a prior unit.

**Prior Unit Support**

Grade 4, Unit 4, Section D: Add and Subtract

# Lesson 16: Addition and Subtraction

## Standards Alignments

Addressing 5.NBT.B.7

### Teacher-facing Learning Goals

- Add and subtract decimals to the hundredths using strategies based on place value.

### Student-facing Learning Goals

- Let's use place value strategies to add and subtract decimals.

## Lesson Purpose

The purpose of this lesson is for students to add and subtract decimals.

In previous lessons students have found sums and differences of decimals using a variety of strategies. They have used place value reasoning, with words or equations, and have seen that the standard addition and subtraction algorithms also work just like they did for whole numbers as long as the same place values in the two numbers are added or subtracted. In this lesson, students add and subtract decimals with no method suggested. Students can use their favorite method or they can think strategically about the given numbers and adapt their strategy. The sums and differences encourage a variety of approaches such as adding on or adding or subtracting by place value.

The lesson also includes an optional activity where students find differences of more complex numbers and think strategically about which method to use. Whether they choose to use the standard algorithm or a different method using place value understanding, these problems help build fluency working with decimals.

This lesson has a Student Section Summary.

### Access for:

#### Students with Disabilities

- Action and Expression (Activity 1)

## Instructional Routines

Number Talk (Warm-up)

**Lesson Timeline**

Warm-up	10 min
Activity 1	15 min
Activity 2	10 min
Activity 3	20 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

What connections did students make between the different strategies shared? What questions did you ask to help make the connections more visible?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Add and Subtract Decimals

**Standards Alignments**

Addressing 5.NBT.B.7

**Student-facing Task Statement**

- Find the value of each expression. Show or explain your reasoning.
  - $75.2 - 4.37$
  - $236.87 + 5.15$

**Student Responses**

- 70.83. Sample response:

$$\begin{array}{r}
 & 11 \\
 & 4 \cancel{1} 10 \\
 7 & 5. \cancel{2} \\
 - & 4. 3 \ 7 \\
 \hline
 & 7 \ 0. \ 8 \ 3
 \end{array}$$

- 242.02. Sample response:  $236.87 + 0.13 = 237$ ,  $237 + 5.02 = 242.02$

----- Begin Lesson -----

## Warm-up

⌚ 10 min

### Number Talk: Subtracting Decimals

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this number talk is to find the value of subtraction expressions with decimal numbers which encourage adding on as a strategy. While the first two expressions can be found readily by taking away, finding the difference or adding on to the smaller number is an effective strategy. The second pair of expressions also encourage adding on or compensation strategies. Students will have an opportunity to use these strategies in the lesson as they continue to add and subtract decimals.

#### Instructional Routines

Number Talk

#### Student-facing Task Statement

Find the value of each expression mentally.

- $2.57 - 2.55$
- $2.57 - 2.49$
- $2.57 - 0.99$
- $2.57 - 0.59$

#### Student Responses

- 0.02: They're the same except 2.57 has 2 more hundredths.
- 0.08: I took away 7 hundredths to get 2.50 and then 1 more.
- 1.58: I added 0.01 to get 1 and then 1.57 more to get 2.57.
- 1.98: I added 4 tenths to the previous answer. I added 2 and then took away 2 hundredths.

#### Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

#### Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

#### Synthesis

- “What strategy did you use to find the value of  $2.57 - 0.99$ ?”
  - I subtracted 1.57 to get 1 and then one more hundredth to get 0.99.
  - I added 0.01 to 0.99 to get 1 and then added 1.57 more to get 2.57.

## Activity 1

⌚ 15 min

What's the Difference?

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find the value of various decimal differences. Most of the numbers do not have the same number of decimal digits so students need to subtract carefully if they make vertical calculations, making sure to align place values correctly (MP6). Students may use the standard algorithm or they may choose a different technique. Some of the differences are designed to bring out other techniques such as adding on or compensation.

### ⌚ Access for Students with Disabilities

*Action and Expression: Internalize Executive Functions.* Invite students to verbalize their strategy for subtracting decimals before they begin. Students can speak quietly to themselves, or share with a partner.

*Supports accessibility for: Organization, Conceptual Processing, Language*

### Student-facing Task Statement

Find the value of each expression. Explain or show your reasoning.

1.  $7.35 - 2.6$
2.  $100.8 - 6.03$
3.  $26.5 - 13.62$
4.  $465 - 463.14$

### Student Responses

1. 4.75. Sample response:

$$\begin{array}{r}
 6 \ 13 \\
 7. \ 8 \ 5 \\
 - 2. \ 6 \\
 \hline
 4. \ 7 \ 5
 \end{array}$$

### Launch

- Groups of 2

### Activity

- 5 minutes: independent work time
- 2 minutes: partner discussion
- Monitor for students who
  - use the standard algorithm correctly for each calculation
  - use other techniques such as adding on or subtracting in different ways by place value

### Synthesis

- Display expression:  $100.8 - 6.03$

2. 94.77

- Sample response 1:  $100 - 6 = 94$ ,  $0.80 - 0.03 = 0.77$
- Sample response 2:

$$\begin{array}{r}
 9 \\
 \cancel{10} \cancel{10} \cancel{7} \cancel{10} \\
 \cancel{1} \cancel{0} 0. \cancel{8} 0 \\
 - \quad \quad \quad 6. 0 3 \\
 \hline
 9 4. 7 7
 \end{array}$$

3. 12.88. Sample response:

$$\begin{array}{r}
 14 \\
 \cancel{5} \cancel{4} 10 \\
 2 \cancel{6} \cancel{5} 0 \\
 - \quad \quad \quad 1 3. 6 2 \\
 \hline
 1 2. 8 8
 \end{array}$$

4. 1.86

- Sample response 1: I added 1 to get 464.14 and then 8 tenths and 6 hundredths to get 465 so that's 1.86.
- Sample response 2:

$$\begin{array}{r}
 9 \\
 \cancel{4} \cancel{10} 10 \\
 4 6 \cancel{5} \cancel{0} 0 \\
 - \quad \quad \quad 4 6 3. 1 4 \\
 \hline
 1. 8 6
 \end{array}$$

- “How did you find the value of the difference?”
  - I used the standard algorithm.
  - I first took the 6 from 100 and then the 0.03 from 0.8.
- Display expression:  $465 - 463.14$
- “How did you find the value of this difference?”
  - I used the standard algorithm.
  - I added on to 463.14 since they are so close.
- “How are the different strategies you used to subtract the same? How are they different?” (They all make sure to use the right place value for each digit. The standard algorithm starts from the smallest place value and then breaks up larger place values when needed. The other strategies subtract an amount that you can do mentally or use addition.)

## Advancing Student Thinking

If students do not find the correct value of a difference, ask, “Which 2 whole numbers will the value of the difference be between?”

## Activity 2

### Sums and Differences

⌚ 10 min

The purpose of this activity is to find sums and differences of decimals using any method. The variety of problems encourages different strategies including

- adding or subtracting by place value
- using the standard algorithm
- adding on in order to calculate a difference

The goal of the synthesis is to discuss how students decided which strategies to use to find the values of the different expressions. As students discuss and justify their decisions, they share a mathematical claim and the thinking behind it (MP3).

### Student-facing Task Statement

Find the value of each expression. Explain or show your reasoning.

1.  $36.51 - 4.3$
2.  $100 + 31.05$
3.  $100 - 31.05$
4.  $266.43 + 75.9$

### Student Responses

1. 32.21
  - a. Sample response 1: I subtracted by place, taking 4 from 6 and then 3 tenths from 5 tenths.
  - b. Sample response 2:
 
$$\begin{array}{r}
 3 \ 6 \ . \ 5 \ 1 \\
 - \ 4 \ . \ 3 \\
 \hline
 3 \ 2 \ . \ 2 \ 1
 \end{array}$$
2. 131.05. Sample response: I again just added by place which meant adding a hundred to 31.05.
3. 68.95
  - a. Sample response 1: I added on to 31.05 to get 100. First I added 0.95 since 95 hundredths and 5 hundredths make 1. So that gives me

### Launch

- Groups of 2

### Synthesis

- Invite students to share how they found the value of the expression  $36.51 - 4.3$ .
- “Why is subtracting by place value a good strategy for this expression?” (I can take 4 from 6 and 3 tenths from 5 tenths and that gives me 32.21.)
- “Does the standard algorithm also work?” (Yes, you just need to make sure to subtract ones from ones and tenths from tenths.)
- Display image of calculation of  $36.51 - 4.3$  with the standard algorithm from student solution.
- Invite students to share how they found the value of the expression  $100 - 31.05$ .
- “Did anyone use the standard algorithm?” (I tried but there was a lot of borrowing so I decided to use a different strategy.)
- Display image of calculation of  $100 - 31.05$  with the standard algorithm from student solution.
- “The standard algorithm always works to

32. Then I added 8 more to get 40 and 60 more to get 100. Altogether that's  $0.95 + 8 + 60$  or 68.95.

b. Sample response 2:

$$\begin{array}{r}
 & 9 & 10 \\
 & 9 & 10 \\
 & 10 \\
 & 10 & 0 & 0 \\
 - & 1 & 0 & 0. & 0 & 0 \\
 \hline
 & 3 & 1. & 0 & 5 \\
 & 6 & 8. & 9 & 5
 \end{array}$$

4. 342.33. Sample response: I used the standard algorithm.

$$\begin{array}{r}
 & 1 & 1 & 1 \\
 & 2 & 6 & 6. & 4 & 3 \\
 + & & 7 & 5. & 9 \\
 \hline
 & 3 & 4 & 2. & 3 & 3
 \end{array}$$

find sums and differences but sometimes the numbers make other methods more efficient."

## Activity 3 (optional)

⌚ 20 min

Subtraction with Larger Numbers

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find the value of subtraction expressions using a strategy of their choice. The standard algorithm which students learned in a previous activity will always work to successfully calculate a difference but some of the problems are deliberately chosen to encourage other techniques such as adding on or compensation. If students choose to use the standard algorithm to calculate the differences, they will need to pay close attention to place value as several of the differences have one decimal with only tenths while the other has hundredths (MP6).

## Student-facing Task Statement

Find the value of each expression.

1.  $43.14 - 18.6$
2.  $73.3 - 52.99$
3.  $128.44 - 62.57$
4.  $261.25 - 260.7$

## Student Responses

1. 24.54. Sample response:

$$\begin{array}{r}
 & 12 \\
 & 3 \cancel{2} \cancel{1} 1 \\
 & \cancel{4} \cancel{3} \cancel{.} \cancel{1} 4 \\
 - & 1 8. 6 0 \\
 \hline
 & 2 4. 5 4
 \end{array}$$

2. 20.31. Sample response: I added 0.01 to 52.99 to make 53 and then I needed 20.3 more to get 73.3.

3. 65.87. Sample response:

$$\begin{array}{r}
 & 13 \\
 & 7 \cancel{8} \cancel{1} 4 \\
 & 1 2 \cancel{8} \cancel{.} \cancel{4} \cancel{4} \\
 - & 6 2. 5 7 \\
 \hline
 & 6 5. 8 7
 \end{array}$$

4. 0.55. Sample response: I took away 260 and that left 1.25, and then I took away 7 tenths which left 5 tenths and 5 hundredths.

## Launch

- Groups of 2

## Activity

- 10 minutes: independent work time
- 5 minutes: partner discussion

## Synthesis

- Display expression  $43.14 - 18.6$
- "What estimate would you make for the value of this expression?" (about 20, about 25)
- Invite students to share their strategies and solutions.
- "Why did you use the standard algorithm?" (The numbers are complicated so I can't see what the difference is.)
- "Did your solution make sense, based on your estimate?" (Yes, it is between 24 and 25.)
- Display expression:  $261.25 - 260.7$
- Invite students to share their strategies and solutions.
- "Can you find this difference mentally? How?" (Yes, I can add 0.3 to 260.7 and that gives me 261 and then I need 0.25 more. That's 5 tenths and 5 hundredths so 0.55.)

## Lesson Synthesis

⌚ 10 min

"We found sums and differences of decimals using many techniques."

Display expression:  $36.51 - 4.3$

"What are some different methods that you can use to find this difference?" (I can subtract 4 ones from 6 ones and 4 tenths from 5 tenths. I can add on to 4.3, first I added 32, and then 2 tenths and then 1 hundredth. I can use the algorithm.)

"What is your favorite strategy?" (My favorite strategies are the ones I can do mentally, like counting up or using friendly numbers.)

## Suggested Centers

- How Close? (1–5), Stage 8: Add Decimals to 1 (Addressing)
- Jump the Line (2–5), Stage 3: Add and Subtract Tenths, Hundredths, and Thousandths (Addressing)

## Student Section Summary

In this section, we learned that we can use the same strategies and algorithms we used to add and subtract whole numbers to add and subtract decimals.

We learned that it is helpful to estimate a sum before we solve. For example, the sum below is going to be close to  $620 + 70$  or 690.

$$\begin{array}{r}
 6 \ 2 \ 1. \ 4 \ 5 \\
 + \ 7 \ 2. \ 3 \ 0 \\
 \hline
 6 \ 9 \ 3. \ 7 \ 5
 \end{array}$$

We also learned that it is important to make sure the places are aligned when we add and subtract.

$$\begin{array}{r}
 5 \ 12 \ 1 \ 13 \\
 \cancel{6} \ \cancel{2} \ \cancel{2.} \ \cancel{3} \ 5 \\
 - \ 7 \ 1. \ 4 \ 0 \\
 \hline
 5 \ 5 \ 0. \ 9 \ 5
 \end{array}$$

We can also estimate that the value of the difference will be about  $620 - 70$  or 550.

## ----- Complete Cool-Down -----

### Response to Student Thinking

Students do not find the correct value of the expressions.

### Next Day Support

- Create a poster with a diagram that represents the cool-down from this lesson.

## Section C: Multiply Decimals

### Lesson 17: Multiply Decimals and Whole Numbers

#### Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A.2  
Building Towards 5.NBT.B.7

#### Teacher-facing Learning Goals

- Multiply a whole number by tenths and hundredths in a way that makes sense to them.

#### Student-facing Learning Goals

- Let's multiply whole numbers by tenths and hundredths.

#### Lesson Purpose

The purpose of this lesson is for students to multiply a whole number by any amount of tenths or hundredths.

In previous lessons students made sense of decimals to the thousandth and added and subtracted decimals to the hundredth. The goal of this lesson is for students to multiply decimals to the hundredth in a way that makes sense to them. They apply their work with decimal place value and multiplication of whole numbers. Students may draw pictures (hundredths grids or tape diagrams) or reason using place value or properties of operations (distributive and associative). As with addition and subtraction of decimals, students see that for multiplication, they can use what they know about whole number multiplication as long as they pay close attention to place value.

#### Access for:

##### Students with Disabilities

- Action and Expression (Activity 1)

#### Instructional Routines

MLR3 Clarify, Critique, Correct (Activity 2), True or False (Warm-up)

## Materials to Copy

- Small Grids (groups of 1): Activity 1
- Small Grids (groups of 1): Activity 2

## Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

## Teacher Reflection Question

If you were to teach this lesson again what would you do the same? What would you change?

**Cool-down** (to be completed at the end of the lesson)  5 min

Multiply a Decimal by a Whole Number

## Standards Alignments

Addressing 5.NBT.B.7

## Student-facing Task Statement

Find the value of each expression. Explain or show your reasoning.

1.  $2 \times 0.4$
2.  $4 \times 0.03$

## Student Responses

1. 0.8. Sample response: 0.4 is 4 tenths and double that is 8 tenths or 0.8.
2. 0.12. Sample response: 0.03 is 3 hundredths and 4 groups of 3 hundredths is 12 hundredths or 0.12.

----- Begin Lesson -----

## Warm-up

⌚ 10 min

True or False: Place Value Products

### Standards Alignments

Building Towards 5.NBT.B.7

The purpose of this True or False is to consider relationships between place values. This recalls work that students did earlier in the unit and seeing these relationships expressed using multiplication naturally prepares students for the work of the next several lessons where they will learn to find products of decimals. Students will revisit multiplicative relationships of place values in a later unit.

### Instructional Routines

True or False

#### Student-facing Task Statement

Decide if each statement is true or false. Be prepared to explain your reasoning.

- $100 \times 0.01 = 1$
- $10 \times 0.1 = 0.01$
- $10 \times 0.01 = 0.1$

#### Student Responses

Sample responses:

- True: There are 100 hundredths in a whole.
- False: There are 10 hundredths in a tenth not ten tenths in a hundredth.
- True: There are ten hundredths in a tenth.

#### Launch

- Display one statement.
- “Give me a signal when you know whether the statement is true and can explain how you know.”
- 1 minute: quiet think time

#### Activity

- Share and record answers and strategy.
- Repeat with each statement.

#### Synthesis

- Display:  $100 \times 0.1$ ,  $10 \times 0.1$ ,  $10 \times 0.01$
- “What is the same and different about these expressions?” (They all have multiples of 10 in them. They all have decimals. The values are all different.)

## Activity 1

⌚ 15 min

### Multiply Decimals By Whole Numbers

#### Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A.2

The purpose of this activity is for students to find decimal products in a way that makes sense to them. Many approaches are possible including:

- thinking about the meaning of place value and multiplying by place value
- using the hundredths grids
- using fractions or a number line

For the last problem, students may use their understanding of arithmetic, the distributive property, and their work on the first two problems (MP7) or they may make a new calculation. The goal of the synthesis is to share and connect different strategies for finding the values of the products.

#### ⌚ Access for Students with Disabilities

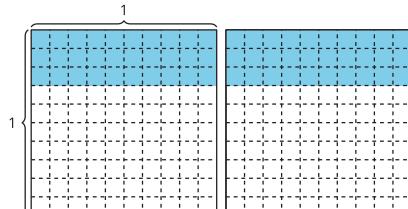
*Action and Expression: Internalize Executive Functions.* Invite students to plan a strategy, including the tools they will use, for finding the value of each expression. If time allows, invite students to share their plan with a partner before they begin.

*Supports accessibility for: Conceptual Processing, Organization, Attention*

#### Materials to Copy

Small Grids (groups of 1)

#### Student-facing Task Statement



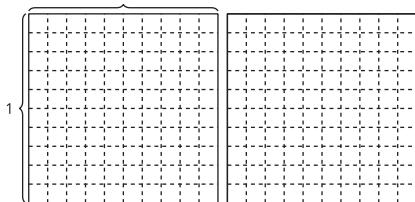
Find the value of each expression in a way that

#### Launch

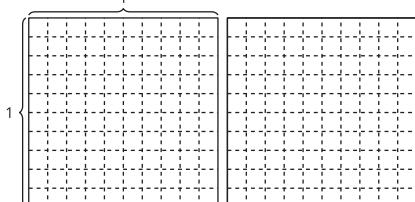
- Groups of 2
- Make copies of hundredths grid available to students.
- Display the image from student workbook.
- “How many do you see?” (2 big squares, 60 small shaded squares, 6 shaded rows)
- 1 minute: partner discussion

makes sense to you. Explain or show your reasoning. Use the grids, if needed.

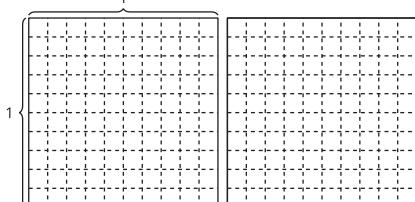
1.  $2 \times 0.7$



2.  $2 \times 0.08$

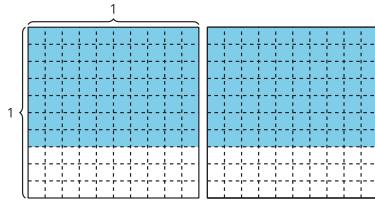


3.  $2 \times 0.78$

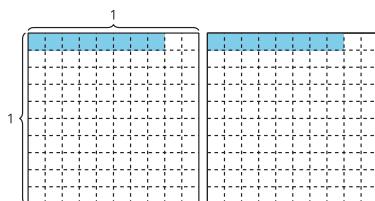


## Student Responses

1. 1.4. Sample responses: 0.7 is 7 tenths so twice that is 14 tenths or 1.4.



2. 0.16. Sample responses: 0.08 is 8 hundredths so twice that is 16 hundredths or 0.16.



- Display expression:  $2 \times 0.3$
- “How does the diagram represent the expression?” (There are 2 groups of 0.3 shaded.)

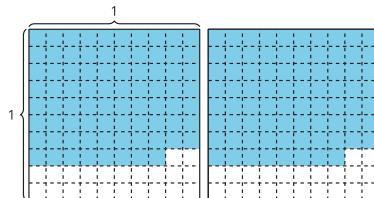
## Activity

- 5–7 minutes: partner work time
- Monitor for students who:
  - use diagrams to find the products
  - use multiplication of whole numbers and place value understanding to find the products

## Synthesis

- Invite students to share how they found the value of  $2 \times 0.7$ .
- Display student work or image from solution.
- “How does the diagram show  $2 \times 0.7$ ?” (There are two groups of 0.7 shaded.)
- “How can you use the diagram to find the value of  $2 \times 0.7$ ?” (I can see that I have  $2 \times 7$  or 14 tenths and that's 1 whole and 4 more tenths.)
- “How is finding the value of  $2 \times 0.08$  the same as finding the value of  $2 \times 0.7$ ? How is it different?” (I could shade part of each of the large squares and then see the total. This time I shaded individual squares rather than rows of squares. In both cases, I can use multiplication to find the product.)

3. 1.56. Sample response: I used the diagrams and see that I have 14 tenths or 1.4 and 16 hundredths or 0.16. That's 1 and 56 hundredths or 1.56.



## Activity 2

⌚ 20 min

Using Whole Number Products

### Standards Alignments

Addressing 5.NBT.B.7

In the previous activity students found products of a whole number and some tenths or hundredths using hundredths grids or a strategy that made sense to them. The goal of this activity is to find these products with a greater focus on place value and the associative property of multiplication (MP7). For example,  $5 \times 0.07$  means 5 groups of 7 hundredths. That means that its value is 35 hundredths or 0.35. This way of thinking about products allows students to use what they know about finding whole number products in order to find products of a whole number and a decimal number (MP8).

This activity uses *MLR3 Clarify, Critique, and Correct*. Advances: Reading, Writing, Representing.

### Instructional Routines

MLR3 Clarify, Critique, Correct

### Materials to Copy

Small Grids (groups of 1)

## Student-facing Task Statement

- Find the value of each expression. Explain or show your reasoning.
  - $3 \times 0.5$
  - $5 \times 0.3$
  - $7 \times 0.02$
- Kiran wrote this explanation to describe the strategy he used to multiply a whole number by some tenths:
 

"I just turn the numbers into whole numbers, multiply them, and call them tenths." (Pause for teacher directions.)
- Can you use Kiran's reasoning to find the value of  $6 \times 0.07$ ? Explain your reasoning.

## Student Responses

- 1.5, it's 3 halves or 1.5.
  - 1.5, it's 3 tenths 5 times which is 15 tenths and that's 1.5.
  - 0.14, it's 2 hundredths 7 times and that's 14 hundredths or 0.14.
- Sample response: Kiran sees  $6 \times 0.7$  as 6 groups of 7 tenths so that's 42 tenths altogether or 4.2.
- Sample response: Yes, it's the same except that it's hundredths now. So  $6 \times 0.07$  is 6 groups of 7 hundredths and that's  $6 \times 7$  or 42 hundredths. That's 0.42.

## Launch

- Groups of 2
- Make hundredths grids available for students.

## Activity

- "Take a few minutes to find the value of the expressions in the first problem."
- 1–2 minutes: quiet think time
- 5 minutes: partner work time

## MLR3 Clarify, Critique, Correct

- Read Kiran's explanation aloud.
- "What do you think Kiran means? What is unclear?"
- 1 minute: quiet think time
- 2 minutes: partner discussion
- "With your partner, work together to write a revised explanation."
- Display and review the following criteria:
  - Write an explanation for each step.
  - Use specific words and phrases such as equal or groups of.
  - Use complete sentences.
  - Write expressions or equations as examples.
- 3–5 minutes: partner work time
- Select 1–2 groups to share their revised explanation with the class. Record responses as students share.
- "What is the same and different about the explanations?" (Kiran did not use any numbers or equations. He did not explain why his strategy works.)

## Synthesis

- "Work with your partner to adapt Kiran's reasoning to find the value of  $6 \times 0.07$ ."

- 2-3 partner work time
- Invite students to share their responses and reasoning for the value of  $6 \times 0.07$ .
- “How is this the same as finding the value of  $6 \times 7$ ? How is it different?” (I found  $6 \times 7$  but needed to remember that it’s hundredths so the product is 42 hundredths.)

### Advancing Student Thinking

If a student does not find the correct value of the expressions, show them  $3 \times 5$ ,  $5 \times 3$ ,  $7 \times 2$  and ask, “How are these expressions the same as and different from the expressions in the problem?”

## Lesson Synthesis

⌚ 10 min

“Today we found products of a whole number and some tenths and a whole number and some hundredths.”

“What questions do you have about multiplying whole numbers and decimals?” (Can I always use whole number multiplication to find these products? What do I do if the numbers are larger or more complicated? Is there an algorithm like we used for multiplying whole numbers?)

Give students time to record their answers in a math journal before they share their thinking.

Record responses for all to see. Keep display visible throughout the section and refer back to it in future lessons to see if any questions have been answered. Add to and adapt the display, as necessary.

### Suggested Centers

- Target Numbers (1–5), Stage 8: Add Tenths or Hundredths (Addressing)
- Target Numbers (1–5), Stage 9: Subtract Tenths or Hundredths (Addressing)

### Complete Cool-Down

## Response to Student Thinking

If students do not find the correct value of the expressions.

### Next Day Support

- Launch Activity 1 with a discussion about this cool-down.

# Lesson 18: Use Whole Number Facts

## Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A.1

### Teacher-facing Learning Goals

- Multiply a whole number and a decimal using properties of operations and place value understanding.

### Student-facing Learning Goals

- Let's multiply whole numbers and decimals.

## Lesson Purpose

The purpose of this lesson is for students to multiply a whole number and a decimal using their understanding of properties of operations and place value.

The purpose of this lesson is for students to use whole number products to find products of a whole number and some tenths or hundredths. This builds on work from the previous lesson where students analyzed this strategy but did not represent the reasoning using equations. In this lesson, they write expressions and use the associative property of multiplication to justify why the strategy works (MP2, MP3). Students are not expected to name the associative property of multiplication each time they use it. In the second activity, the number of hundredths exceeds 10 but the same reasoning with whole number products applies. Because this product involves a decimal with both tenths and hundredths, it also makes sense to use the distributive property and work with tenths and hundredths separately and students analyze this strategy. Using distributive property to find products with decimals will be a main focus of the next lesson.

## Access for:

### ⓘ Students with Disabilities

- Action and Expression (Activity 1)

## Instructional Routines

True or False (Warm-up)

### Lesson Timeline

Warm-up

10 min

### Teacher Reflection Question

What unfinished learning or misunderstandings do your students have about using the

Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

associative property to multiply whole numbers? How did you leverage those misconceptions in a positive way to further the understanding of the class?

## Cool-down (to be completed at the end of the lesson) 5 min

Fill in the Blank

### Standards Alignments

Addressing 5.NBT.B.7

### Student-facing Task Statement

Fill in the blank to make each equation true.

1.  $5 \times 0.3 = 5 \times 3 \times \underline{\hspace{1cm}}$
2.  $5 \times 0.03 = 5 \times \underline{\hspace{1cm}} \times 0.01$
3.  $5 \times 0.03 = \underline{\hspace{1cm}}$

### Student Responses

1.  $5 \times 0.3 = 5 \times 3 \times 0.1$
2.  $5 \times 0.03 = 5 \times 3 \times 0.01$
3.  $5 \times 0.03 = 0.15$

----- Begin Lesson -----

## Warm-up

 10 min

True or False: Group Dynamics

## Standards Alignments

Addressing 5.OA.A.1

The purpose of this True or False is for students to demonstrate strategies and understandings they have for using the associative property of multiplication. The numbers in this warm-up are whole numbers. In this lesson, students will use whole number products to find the value of the product of a whole number and a decimal and this requires using the associative property of multiplication.

## Instructional Routines

True or False

### Student-facing Task Statement

Decide if each statement is true or false. Be prepared to explain your reasoning.

- $30 \times 2 \times 10 = 6 \times 10$
- $30 \times 2 \times 10 = 20 \times 3 \times 10$
- $60 \times 10 = 30 \times 20$

### Student Responses

- False:  $30 \times 2$  doesn't equal 6.
- True:  $30 \times 2 = 20 \times 3$
- True: They both equal 600.

### Launch

- Display one equation.
- "Give me a signal when you know whether the equation is true and can explain how you know."
- 1 minute: quiet think time

### Activity

- Share and record answers and strategy.
- Repeat with each equation.

### Synthesis

- Display first equation.
- "How can you show this is false without finding the value of both sides?" (I know  $30 \times 2$  is not 6 and then multiplying both sides by 10 will not make them equal.)
- Display second equation.
- "How can you show this is true without finding the value of both sides?" (I know  $30 \times 2$  and  $20 \times 3$  are equal and then they are both multiplied by 10.)

## Activity 1

⌚ 15 min

Agree or Disagree

### Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A.1

The purpose of this activity is for students to use place value reasoning and properties of operations to relate products of a whole number and a decimal to products of a whole number and either 0.1 or 0.01 (MP7). Students may decide that an equation is false without finding the value of both sides. For example, in the first problem, they may determine that 28 is unreasonable because 0.7 is less than one whole so the answer will be less than 4. When students find the value that makes equations true, they think about place value and the associative property of multiplication.

### ♿ Access for Students with Disabilities

*Action and Expression: Internalize Executive Functions.* Check for understanding by inviting students to rephrase directions in their own words.

*Supports accessibility for: Memory, Organization*

### Student-facing Task Statement

- Decide whether each equation is true or false and explain or show why.
  - $4 \times 0.7 = 28$
  - $5 \times 0.8 = 0.40$
  - $6 \times 0.03 = (6 \times 3) \times 0.01$
  - $8 \times 0.07 = (8 \times 7) \times 0.1$
- Fill in the blank to make each equation true.
  - $3 \times 0.7 = 3 \times 7 \times \underline{\hspace{1cm}}$
  - $3 \times 0.07 = 3 \times 7 \times \underline{\hspace{1cm}}$
  - $5 \times \underline{\hspace{1cm}} = (5 \times 4) \times 0.1$

### Launch

- Groups of 2

### Activity

- 4 minutes: independent work time
- 4 minutes: partner discussion
- Monitor for students who:
  - compare the size of the product to the size of the factors to determine reasonableness. For example, explain that  $4 \times 0.7$  is not equal to 28 because the product should be less than 4.
  - use the associative property to represent the product of a whole

## Student Responses

1. a. False.  $4 \times 0.7 = 2.8$ , It's 28 tenths not 28.
- b. False.  $5 \times 0.8 = 4.0$ , It's 40 tenths not 40 hundredths.
- c. True.  $6 \times 0.03 = 6 \times 3 \times 0.01$  because 0.03 is 3 hundredths or  $3 \times 0.01$ .
- d. False.  $8 \times 0.07 = (8 \times 7) \times 0.01$  because 0.07 is 7 hundredths or  $7 \times 0.01$ .

2. a. 0.1
- b. 0.01
- c. 0.4

number and a decimal as a product of two whole numbers and a decimal such as  $3 \times 0.7 = (3 \times 7) \times 0.1$ .

## Synthesis

- Display the equation  $8 \times 0.07 = (8 \times 7) \times 0.1$  from the first problem.
- “Is the equation true or false?” (false)
- Display expression:  $(8 \times 7) \times 0.1$
- “How could we revise this expression to make the equation true?” (Change it to read  $56 \times 0.01$ ,  $8 \times 7 \times 0.01$ , or 0.56.)
- Display equation:  
 $8 \times \underline{\hspace{1cm}} = (8 \times 7) \times 0.1$
- “What can I write in the blank to make the equation true?” (0.7 since that's 8 groups of 7 tenths or  $8 \times 7 \times 0.1$ .)

## Activity 2

⌚ 20 min

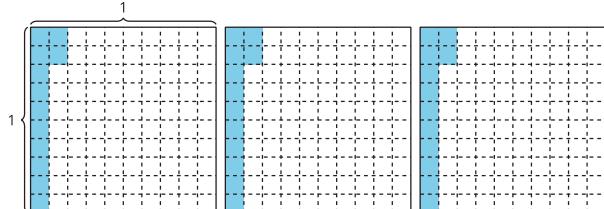
Interpret Diagrams and Expressions

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to use a diagram to support understanding two different ways to calculate the product of a whole number and a decimal number. The first strategy is one that students saw in the previous lesson, namely using whole number arithmetic to find the number of hundredths in the product and then multiplying that number by 0.01. The second strategy is useful specifically when the decimal has both tenths and hundredths. Using the distributive property, students can find the product of the whole number and the tenths and then the product of the whole number and the hundredths and combine these (MP7). In the next several activities, students will use both of these strategies as they build their understanding of how to find the product of a whole number and a decimal.

## Student-facing Task Statement



1. Explain or show how the diagram represents each expression.
  - $3 \times 0.12$
  - $(3 \times 12) \times 0.01$
  - $(3 \times 0.1) + (3 \times 0.02)$
2. Find the value of  $(3 \times 12) \times 0.01$ . Explain or show your reasoning.
3. Find the value of  $(3 \times 0.1) + (3 \times 0.02)$ . Explain or show your reasoning.

## Student Responses

1. Sample responses:
  - There are 3 squares and in each square there is 0.12 shaded so that's  $3 \times 0.12$  total.
  - $3 \times 12$  is the number of shaded pieces and each one is 0.01 of the whole so that's  $(3 \times 12) \times 0.01$ .
  - $3 \times 0.1$  is the 3 tenths or full columns of little squares and  $3 \times 0.02$  is the 3 groups of 2 pieces.
2. 0.36 because  $3 \times 12$  is 36 and then when I multiply by 0.01 it becomes 36 hundredths or 0.36.
3. 0.36 because  $3 \times 0.1$  is 3 tenths or 0.3 and  $3 \times 0.02$  is 6 hundredths or 0.06. Then 3 tenths and 6 hundredths is 0.36.

## Launch

- Groups of 2

## Activity

- 2 minutes: quiet think time
- 10 minutes: partner work time

## Synthesis

- Invite students to share their calculations of the value of  $3 \times 0.12$  using the different expressions.
- "How did the expression  $(3 \times 12) \times 0.01$  help to find the value of  $3 \times 0.12$ ?" (I was able to just multiply whole numbers and then notice that the product is that many hundredths.)
- "How did the expression  $(3 \times 0.1) + (3 \times 0.02)$  help to find the value of  $3 \times 0.12$ ?" (I multiplied the tenths and then the hundredths and added them together.)
- "Which strategy do you prefer?" (I like the first strategy because I can just use what I know about whole number products and it will always work.)

## Advancing Student Thinking

If students don't explain how the diagram represents an expression, ask, "How does the diagram show multiplication of decimals?" Then, connect the student's response to the expressions.

## Lesson Synthesis

⌚ 10 min

"Today we used our understanding of place value to multiply decimals."

Display:

$$25 \times 0.3$$

$$25 \times 0.03$$

"Describe the process you would use to find the value of these expressions." (Find  $25 \times 3 = 75$  and then multiply that by 0.1 or 0.01. The first one is 75 tenths or 7.5 and the second one is 75 hundredths or 0.75.)

"How can we multiply any whole number by an amount of tenths or hundredths?" (Find the whole number multiplied by the number of tenths or hundredths and multiply that result by 0.1 or 0.01.)

## Suggested Centers

- Target Numbers (1–5), Stage 8: Add Tenths or Hundredths (Addressing)
- Target Numbers (1–5), Stage 9: Subtract Tenths or Hundredths (Addressing)

## Complete Cool-Down

## Response to Student Thinking

Students do not write the correct numbers to make true equations.

## Next Day Support

- Launch activity 1 of the next lesson by discussing a correct response to the cool-down from this lesson.

# Lesson 19: Use Properties to Multiply Decimals

## Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A

### Teacher-facing Learning Goals

- Use properties of operations to interpret and evaluate multiplication expressions with decimals and whole numbers.

### Student-facing Learning Goals

- Let's interpret and evaluate multiplication expressions with decimals and whole numbers.

## Lesson Purpose

The purpose of this lesson is for students to interpret and evaluate multiplication expressions with decimals and whole numbers.

In previous lessons, students used diagrams and expressions to articulate strategies for multiplying a whole number and a decimal. The purpose of this lesson is solidify this understanding as they match many different expressions for a single product and choose one to find the value. They think strategically about which expression to use. In previous lessons, the strategies included using whole number products and the associative property or using the distributive property. This lesson introduces one more strategy, compensation which is also an example of the distributive property. In the second activity, students choose from these different strategies to find the value of more complex products of a whole number and a decimal.

## Access for:

### Students with Disabilities

- Engagement (Activity 2)

## Instructional Routines

MLR2 Collect and Display (Activity 1), Number Talk (Warm-up)

### Materials to Copy

- Decimal Multiplication Expression Card Sort (groups of 2): Activity 1

**Lesson Timeline**

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Activity 3	10 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

What did you say, do, or ask during the lesson synthesis that helped students be clear on the learning of the day? How did understanding the cool-down of the lesson before you started teaching today help you synthesize that learning?

**Cool-down** (to be completed at the end of the lesson)
 5 min

Interpret Expressions

**Standards Alignments**

Addressing 5.NBT.B.7

**Student-facing Task Statement**

1. Select **all** the expressions that are equivalent to  $15 \times 0.19$ .
  - A.  $15 \times 19 \times 0.01$
  - B.  $(15 \times 0.1) + (15 \times 0.09)$
  - C.  $15 \times 19 \times 0.1$
  - D.  $(15 \times 0.2) - (15 \times 0.01)$
2. Choose one expression to find the value of  $15 \times 0.19$ .

**Student Responses**

1. A, B, and D
2. Sample response:  $15 \times 0.2$  is 30 tenths or 3 and  $15 \times 0.01$  is 15 hundredths or 0.15. Then  $3 - 0.15 = 2.85$ .

----- Begin Lesson -----

## Warm-up

⌚ 10 min

### Number Talk: Many Hundredths

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this Number Talk is for students to demonstrate strategies and understandings they have for place value relationships and the properties of operations as they find the value of different products (MP7). The products all have the same value, 6, and also all have a decimal factor of 0.1 or 0.01. The whole number factors are organized differently and this encourages students to think flexibly about how to find products of a whole number and a decimal.

#### Instructional Routines

Number Talk

#### Student-facing Task Statement

Find the value of each expression mentally.

- $40 \times 2 \times 0.1$
- $20 \times 0.1 \times 4$
- $0.1 \times 80$
- $0.01 \times 20 \times 40$

#### Student Responses

- 8:  $40 \times 2 = 80$  and  $80 \times 0.1 = 8.0$
- 8:  $20 \times 4$  is the same as  $40 \times 2$  so the value of the expression is the same as the first one.
- 8: 80 tenths is equal to 8 ones.
- 8: It is the same as  $800 \times 0.01$ .

#### Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

#### Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

#### Synthesis

- “How is the last expression different from the others?” (It has a hundredth in the product instead of a tenth.)
- “How did you find the value of this expression?” (I knew  $40 \times 20 = 800$  and then 800 hundredths is 8.)

## Activity 1

⌚ 20 min

### Card Sort: Decimal Multiplication Card Sort

#### Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A

The purpose of this activity is for students to use properties of operations to develop strategies for multiplying decimals (MP7). They first sort expressions into groups which can be used to find the value of a given decimal product. Then they choose one of the expressions to find the value. Many of the expressions use whole number products and the associative property which students have seen in previous lessons. Some of the expressions use subtraction and a compensation strategy. This strategy is new for decimals but will be familiar to students for whole number products.

This activity uses MLR2 Collect and Display. Advances: Conversing, Reading, Writing.

#### Instructional Routines

MLR2 Collect and Display

#### Materials to Copy

Decimal Multiplication Expression Card Sort  
(groups of 2)

#### Student-facing Task Statement

1. Your teacher will give you a set of cards that show multiplication expressions.
  - a. Sort the cards into 2 categories of your choosing. Then, sort the cards into 2 categories in a different way. Be prepared to explain the meaning of your new categories. (Pause for teacher directions.)
  - b. There are three expressions labeled A, B, and C. The value of each of the other expressions is equal to one of

#### Launch

- Groups of 2
- Distribute one set of pre-cut cards to each group of students.

#### Activity

- “In this activity, you will sort some expressions into categories of your choosing. When you sort the expressions, work with your partner to come up with categories.”
- 3 minutes: partner work time

these. Match the expressions. Be prepared to explain your reasoning.

- Choose one expression from each group to find the value of the expressions on cards A, B, and C.
- Write at least one more expression that is equal to each of the expressions on cards A, B, and C.

## Student Responses

- Sample responses:
  - I sorted into expressions that only have multiplication or division and expressions that have multiplication and addition or subtraction. I sorted into products that have 0.1 or 0.01 and ones that do not.
  - Card A:  $(4 \times 3) + (4 \times 0.5)$ ,  
 $4 \times 35 \times 0.1$ ,  
 $(4 \times 4) - (4 \times 0.5)$ ,  $2 \times 2 \times 3.5$   
 ■ Card B:  $35 \times 4 \times 0.01$ ,  
 $(35 \times 4) \div 100$ ,  
 $(4 \times 0.3) + (4 \times 0.05)$   
 ■ Card C:  $(4 \times 3) + (4 \times 0.9)$ ,  
 $(4 \times 4) - (4 \times 0.1)$ ,  
 $4 \times 39 \times 0.1$ .
- Sample responses:
  - Card A: I chose  $(4 \times 3) + (4 \times 0.5)$  because I know that  $4 \times 3 = 12$  and  $4 \times 0.5 = 2$  and  $12 + 2 = 14$
  - Card B: I chose  $35 \times 4 \times 0.01$  because I know that  $35 \times 4 = 140$  and one hundred forty times one hundredth is one hundred forty hundredths which is equal to 1 and 4 tenths or 1.4.
  - Card C: I chose  $(4 \times 4) - (4 \times 0.1)$  because  $4 \times 4 = 16$  and then I just had to subtract 0.4 which is 15.6.
- Sample responses:

- “Each expression matches one of the expressions marked A, B, or C. Work with your partner to match the cards. Justify your choices.”
- 8 minutes: partner work time

## MLR2 Collect and Display

- Circulate, listen for and collect the language students use to explain how they know expressions are equal. Listen for words such as groups of, the same as, and break apart. For example, students may say:
  - 4 groups of 39 tenths is the same as 4 groups of 3 and 9 tenths.
  - 4 times 3 tenths plus 4 times 5 hundredths is the same as 4 times 35 hundredths.
  - 2 groups of 2 groups of three and 5 tenths is the same as 4 groups of 3 and 5 tenths.
- Record students' words and phrases on a visual display and update it throughout the lesson.

## Synthesis

- Invite students to share the matches they made and explain how they know those cards go together.
- Refer to the language on the display as students describe their justification for a match, giving them opportunities to describe the relationship more precisely.
- “Are there any other words or phrases that are important to include on our display?”
- As students share responses, update the display, by adding (or replacing) language, diagrams, or annotations.
- Remind students to borrow language from the display as needed.
- Invite selected students to share their strategies for calculating  $4 \times 3.9$ .

- Card A:  $(4 \times 35) \div 10$
- Card B:  $(4 \times 0.4) - (4 \times 0.05)$
- Card C:  $(4 \times 39) \div 10$

- “Why is  $(4 \times 4) - (4 \times 0.1)$  a useful expression for finding the value of  $4 \times 3.9$ ?” (I can find those products in my head.)
- “Why is  $(4 \times 39) \times 0.1$  a useful expression for finding the value of  $4 \times 3.9$ ?” (I know how to find products of whole numbers like  $4 \times 39$  and then multiplying by 0.1 just changes place values.)

## Activity 2

⌚ 15 min

Choose a Strategy

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find products of a whole number and a decimal where the decimal has more than one place value, either a whole number and some tenths or some tenths and some hundredths. Monitor for these strategies which students saw in the previous activity

- multiplying whole numbers and then multiplying the result by 0.1 or 0.01
- using the distributive property and multiplying by place value
- using the distributive property and compensation

### ⌚ Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Synthesis: Revisit math community norms to prepare students for the whole-class discussion.

*Supports accessibility for: Language, Social-Emotional Functioning*

### Student-facing Task Statement

Find the value of each expression. Explain or show your reasoning.

### Launch

- Groups of 2

1.  $6 \times 0.12$
2.  $4 \times 1.4$
3.  $5 \times 3.9$
4.  $25 \times 0.41$

## Student Responses

1. 0.72. Sample response:  $6 \times 12 = 72$ ,  $72 \times 0.01 = 0.72$
2. 5.6. Sample response:  $4 \times 1 = 4$ ,  $4 \times 0.4 = 1.6$  and  $4 + 1.6 = 5.6$  or  $4 \times 14 = 56$  and  $56 \times 0.1 = 5.6$
3. 19.5. Sample response:  $5 \times 4 = 20$ ,  $5 \times 0.1 = 0.5$ , and  $20 - 0.5 = 19.5$
4. 10.25. Sample response:  $25 \times 0.4 = 10$  and  $25 \times 0.01 = 0.25$  so  $25 \times 0.41 = 10.25$

## Activity

- 1–2 minutes: quiet think time
- 6–8 minutes: partner work time
- Monitor for students who find the products using
  - whole number products and place value understanding
  - the distributive property

## Synthesis

- Invite selected students to share their reasoning for the value of  $4 \times 1.4$ .
- Display expression:  $(4 \times 14) \times 0.1$
- “Why is this expression helpful to find the value of  $4 \times 1.4$ ?” (I know  $4 \times 14$  is 56. I can do that with whole number multiplication. Then it’s that many tenths so 5.6.)
- Display expression:  $(4 \times 1) + (4 \times 0.4)$
- “Why is this expression helpful to find the value of  $4 \times 1.4$ ?” (It breaks it up by place value. I first find 4 ones and then 4 times 4 tenths. That’s 4 and 16 tenths or 5 and 6 tenths so it’s 5.6.)
- “How did you choose a strategy for each problem?” (I like to multiply whole numbers so I always thought of products of whole numbers and then took that many tenths or hundredths. I noticed 3.9 is really close to 4 and I know  $5 \times 4$  so I started there and figured out what I needed to subtract.)

## Advancing Student Thinking

If students need support with the placement of the decimal in the product, ask them to use the language on the display from activity 1 to describe each of the expressions.

## Activity 3 (optional)

⌚ 10 min

### More Multiplication Problems (Optional)

#### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this optional activity is to find more complex products of a whole number and a decimal using any strategy. For the more complex numbers, the strategies that students have seen all apply but the most reliable one is to find a product of whole numbers and then identify the number of tenths or hundredths that is. The distributive property is still an effective tool but a product of 2 two-digit numbers gives 4 single digit products. The problems are scaffolded so that students can use their answers for the first two problems to find the answer to the third.

#### Student-facing Task Statement

Find the value of each expression.

1.  $35 \times 0.08$
2.  $35 \times 0.7$
3.  $35 \times 0.78$
4.  $42 \times 0.66$

#### Student Responses

1. 2.8: I know  $35 \times 8$  is 280 and it's 280 hundredths or 2.8.
2. 24.5: I know  $35 \times 0.7$  is 245 and it's 245 tenths or 24.5.
3. 27.3: I added the two previous products.
4. 27.72: I found  $42 \times 66$  and then multiplied that by 0.01.

#### Activity

- 5 minutes: independent work time
- Monitor for students who use the first two calculations for the third and who use place value understanding for the last calculation.

#### Synthesis

- Invite students to share their calculations.
- “How did you use the values of  $35 \times 0.08$  and  $35 \times 0.7$  to find the value of  $35 \times 0.78$ ?” (I added them.)
- Display equation:  

$$35 \times 0.78 = (35 \times 0.7) + (35 \times 0.08)$$
- “How do you know this equation is true?” (It’s the distributive property.)
- “How did you calculate  $42 \times 0.66$ ?” (I found  $42 \times 66$  and then knew I had that many hundredths.)

## Lesson Synthesis

⌚ 10 min

"Today we used different strategies to multiply whole numbers by decimals."

"What are some different strategies we used to multiply whole numbers by decimals?" (We multiplied whole numbers by 0.1 or 0.01. We broke the decimal apart, multiplied the whole number by the different parts, and then added or subtracted the products.)

"How is multiplying decimals the same as multiplying whole numbers? How is it different?" (We use the same strategies that we used for multiplying whole numbers. We multiply different places than when we multiply whole numbers. I can use the same whole number products but then need to remember to multiply that result by 0.1 or 0.01.)

"What do you still wonder about multiplying decimals?" (Are there more strategies we can use? Does the multiplication algorithm work with decimals? Can we multiply thousandths?)

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### Suggested Centers

- Target Numbers (1–5), Stage 8: Add Tents or Hundredths (Addressing)
- Target Numbers (1–5), Stage 9: Subtract Tents or Hundredths (Addressing)

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### Complete Cool-Down

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### Response to Student Thinking

Students choose expressions that are not equivalent to  $15 \times 0.19$ .

### Next Day Support

- Launch the warm-up or Activity 1 by highlighting important notation from previous lessons.

# Lesson 20: Products in the Hundredths Place

## Standards Alignments

Addressing	5.NBT.B.7, 5.NF.B.4
Building Towards	5.NF.B.7

## Teacher-facing Learning Goals

- Use diagrams and place value reasoning to interpret and evaluate products of two decimal numbers.

## Student-facing Learning Goals

- Let's multiply tenths by tenths.

## Lesson Purpose

The purpose of this lesson is for students to find products of tenths and tenths.

The purpose of this lesson is for students to find products of two decimal numbers where each decimal represents a number of tenths, using the place value reasoning and diagrams that were also useful for finding the product of a whole number and a decimal. Students explain why  $0.1 \times 0.1 = 0.01$  in the warm-up and this opens up one strategy for finding products like  $1.5 \times 0.7$ . In particular, this can be rewritten as

$$(15 \times 0.1) \times (7 \times 0.1) = (15 \times 7) \times (0.1 \times 0.1).$$

So the value of  $1.5 \times 0.7$  is 105 hundredths or 1.05. A second approach uses area diagrams which students are familiar with from earlier lessons in this unit and from when they used them to find products of fractions. Decimals are an example of fractions and these diagrams are useful in this situation as well.

## Access for:

### Students with Disabilities

- Representation (Activity 1)

### English Learners

- MLR8 (Activity 1)

## Instructional Routines

What Do You Know About \_\_\_\_? (Warm-up)

## Materials to Copy

- Small Grids (groups of 1): Activity 1

- Small Grids (groups of 1): Activity 2

### Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

### Teacher Reflection Question

What do you love most about math? How are you sharing that joy with your students and encouraging them to think about what they love about math?

### Cool-down (to be completed at the end of the lesson)

⌚ 5 min

Tenths

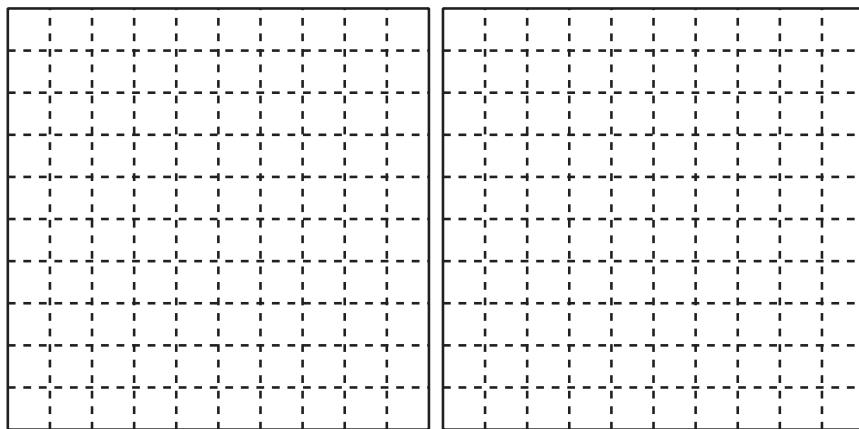
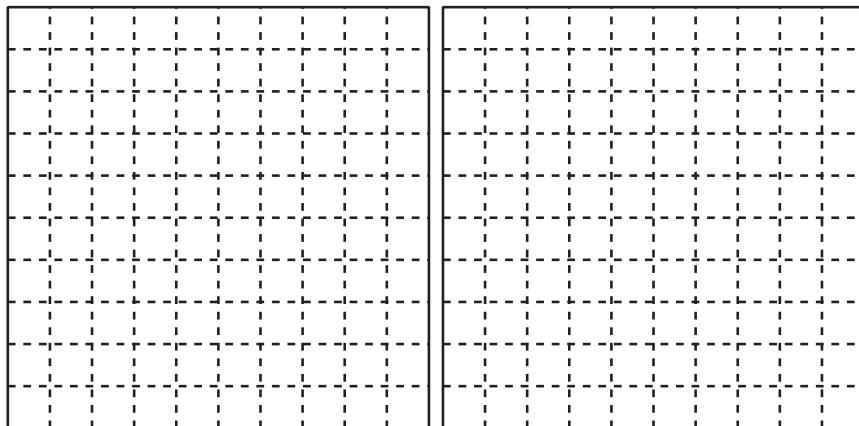
### Standards Alignments

Addressing 5.NBT.B.7

### Student-facing Task Statement

Find the value of each expression. Use the diagrams if they are helpful.

1.  $0.3 \times 0.6$
2.  $1.3 \times 0.6$



### Student Responses

1. 0.18 or equivalent
2. 0.78 or equivalent

----- Begin Lesson -----

### Warm-up

⌚ 10 min

What do you know about  $1 \times 0.1$  and  $0.1 \times 0.1$ ?

## Standards Alignments

Addressing 5.NF.B.4  
 Building Towards 5.NF.B.7

The purpose of this What Do You Know About \_\_\_? is for students to think about  $0.1 \times 0.1$  before working with this kind of expression more formally in the lesson. Students know that 0.1 is the same as  $\frac{1}{10}$  and they know how to find products of fractions. The goal of the synthesis is to highlight this before students find products of decimals in the lesson.

## Instructional Routines

What Do You Know About \_\_\_?

### Student-facing Task Statement

What do you know about these expressions?

- $1 \times 0.1$
- $0.1 \times 0.1$

### Student Responses

Sample responses:

- $1 \times 0.1 = 0.1$
- 0.1 is  $\frac{1}{10}$  so  $0.1 \times 0.1$  is  $\frac{1}{10} \times \frac{1}{10}$  which is  $\frac{1}{100}$
- $0.1 \times 0.1$  is going to be smaller than 0.1.

### Launch

- Display the expressions.
- “What do you know about  $1 \times 0.1$  and  $0.1 \times 0.1$ ?”
- 1 minute: quiet think time

### Activity

- Record responses.
- “How could we represent these expressions? (I could use a hundredths grid or area diagram.)

### Synthesis

- “Can you find the value of  $0.1 \times 0.1$ ? (Yes, 0.1 is  $\frac{1}{10}$  so that’s  $\frac{1}{10} \times \frac{1}{10}$  and I know that’s  $\frac{1}{100}$ .)

## Activity 1

Products of Tenths

⌚ 15 min

👤 ↔👤 PLC Activity

## Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find products of a number of tenths and a number of tenths written as decimals. Students can think of find these products in many ways including

- using a diagram
- using whole number arithmetic and place value reasoning or properties of operations (MP7)

The goal of the synthesis is to relate these different ways of finding the product.

### 🌐 Access for English Learners

*MLR8 Discussion Supports.* Synthesis: During group work, invite students to take turns sharing their responses. Ask students to restate what they heard using precise mathematical language and their own words. Display the sentence frame: “I heard you say . . .” Original speakers can agree or clarify for their partner.

*Advances: Listening, Speaking*

### ♿ Access for Students with Disabilities

*Representation: Internalize Comprehension.* Provide students with a graphic organizer, such as a two-column table, to record the multiplication expression using fractions and the corresponding multiplication expression using decimal numbers to show the connection between fractions and decimal numbers and why  $0.1 \times 0.1 = 0.01$ .

*Supports accessibility for: Conceptual Processing, Memory*

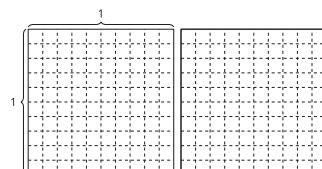
## Materials to Copy

Small Grids (groups of 1)

### Student-facing Task Statement

1. Find the value of each expression. Explain or show your reasoning. Use the grids if they are helpful.

a.  $2 \times 0.3$



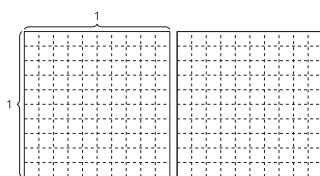
### Launch

- Groups of 2

### Activity

- 1–2 minutes: quiet think time
- 6–8 minutes: partner work time
- Monitor for students who:
  - use grids

b.  $0.2 \times 0.3$

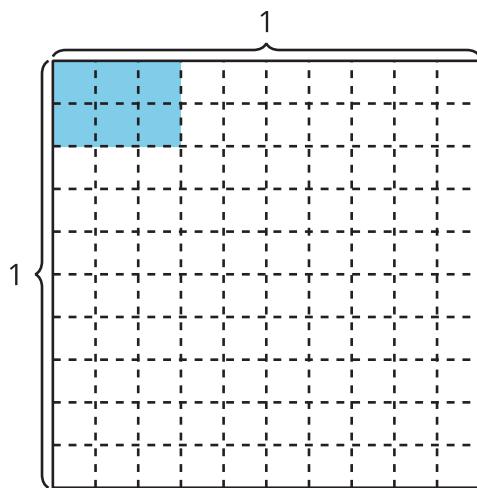


2. Kiran says  $0.2 \times 0.4 = 0.8$ . Do you agree with Kiran? Explain or show your reasoning.

### Student Responses

1. a. 0.6. Sample responses:  
That's 2 groups of 3 tenths or 6 tenths.  
 $2 \times 3 \times 0.1 = 0.6$

b. Sample responses:  
0.06. I made a rectangle that has length 0.3 and width 0.2 and it is 6 pieces that are each a hundredth so that's 0.06.



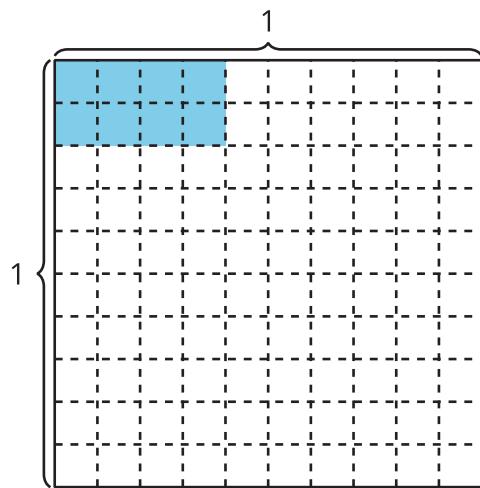
0.06 because the answer will be one tenth of  $2 \times 0.3$ .

c. I disagree. Sample responses:  
 $2 \times 0.4 = 0.8$  so  $0.2 \times 0.4 = 0.8$  can't be the same value. It has to be smaller than 0.8.  
I filled out the grid and the product is 8 hundredths, not 8 tenths.

- use whole number facts and place value reasoning

### Synthesis

- Invite students to share their reasoning for  $0.2 \times 0.4$ .
- Display a student generated diagram of  $0.2 \times 0.4$  or the diagram from the student solution.
- "How does the diagram show  $0.2 \times 0.4$ ?" (There are 2 tenths of 4 tenths of the rectangle shaded.)
- "How did you know that the shaded region has area 0.08 square units?" (There are  $2 \times 4$  shaded pieces and each one is  $\frac{1}{100}$  of the full square.)
- Display equation  
 $0.2 \times 0.4 = 2 \times 4 \times (0.1 \times 0.1)$ .
- "How does the diagram show this equation?" (The shaded part is 2 tenths of 4 tenths of the rectangle so that's  $0.2 \times 0.4$ . It's  $2 \times 4 \times (0.1 \times 0.1)$  because there are  $2 \times 4$  pieces and each one has area  $0.1 \times 0.1$  or one hundredth of a square unit.)



## Activity 2

⌚ 20 min

Multiply Tenths

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to multiply decimals by decimals, building on the strategies they saw in the previous activity. Monitor for these strategies:

- using a diagram
- using whole number products and place value understanding
- using expressions to show their thinking

### Materials to Copy

Small Grids (groups of 1)

### Student-facing Task Statement

1. Find the value of each expression. Explain or show your reasoning.

### Launch

- Groups of 2
- Make copies of hundredths grid

Instructional

- a.  $1.8 \times 0.4$
- b.  $2.5 \times 0.6$
- c.  $3.8 \times 0.7$

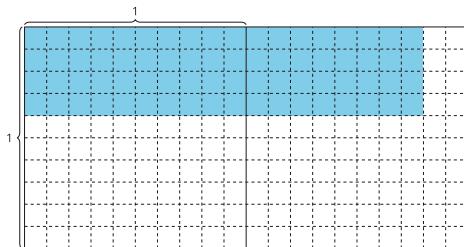
2. How are these products the same? How are they different?

- o  $74 \times 6$
- o  $7.4 \times 6$
- o  $7.4 \times 0.6$

## Student Responses

### 1. Sample responses:

a. The diagram shows that the area is  $18 \times 4$  or 72 hundredths square units so that's 0.72.



b. I know that  $2 \times 0.6$  is 12 tenths or 1.2. I know that  $0.5 \times 0.6$  is half of 0.6 which is 0.3. Then  $1.2 + 0.3 = 1.5$ .

c. I found  $38 \times 7 = 266$ . If I used the grid I would have 266 pieces and each one is a hundredth so that's 266 hundredths or 2.66.

2. All 3 products have numbers with the same digits. In the first one, they are whole numbers so the product is a whole number. In the second one, it's a decimal and a whole number and the product is the same as the whole number product except that it's tenths. The third one is a product of two decimals. The product is again the same as the whole number product but it's that many hundredths.

master available.

## Activity

- 5 minutes: independent work time
- 2 minutes: partner discussion
- Monitor for students who:
  - use the grids
  - multiply two whole numbers and then multiply their product by 0.01

## Synthesis

- Invite students to share their responses and reasoning for the product  $1.8 \times 0.4$ .
- Display student generated diagram or diagram in student solution.
- "How does the diagram show  $1.8 \times 0.4$ ?" (There is a full group of 0.4 and then there is 8 tenths of another group of 0.4.)
- "How does the diagram show  $18 \times 4 \times 0.01$ ?" (There is an 18 by 4 array of pieces and each piece is a hundredth of the whole.)
- Display:  $1.8 \times 0.4 = (18 \times 4) \times 0.01$
- Invite students to share their responses about the products  $74 \times 6$ ,  $7.4 \times 6$  and  $7.4 \times 0.6$ .
- "How can you use the whole number product to find decimal products?" (I just think about how many tenths or hundredths I have.)

## Lesson Synthesis

⌚ 10 min

"Today we found products of decimals using diagrams and thinking about place value."

Display:

$$4.5 \times 8.1 = 45 \times 0.1 \times 81 \times 0.1$$

"How do we know this is true?" ( $4.5 = 45 \times 0.1$  and  $8.1 = 81 \times 0.1$  so  $4.5 \times 8.1 = 45 \times 0.1 \times 81 \times 0.1$ )

Display:

$$4.5 \times 8.1 = 45 \times 81 \times 0.01$$

"How do we know this is true?" (If we change the order of factors in the expression  $45 \times 0.1 \times 81 \times 0.1$ , we get  $45 \times 81 \times 0.1 \times 0.1$  and that is equal to  $45 \times 81 \times 0.01$ .)

"How is this helpful for finding the value of  $4.5 \times 8.1$ ?" (I can just find the whole number product and then say I have that many hundredths.)

### Suggested Centers

- Target Numbers (1–5), Stage 8: Add Tents or Hundredths (Addressing)
- Target Numbers (1–5), Stage 9: Subtract Tents or Hundredths (Addressing)

### Complete Cool-Down

### Response to Student Thinking

Students do not find the correct values of the products.

The work in this lesson builds from the multiplication concepts developed in a prior unit.

### Next Day Support

- Create a poster with a diagram that represents the cool-down from previous lessons.

### Prior Unit Support

Grade 4, Unit 6, Section B: Multi-digit Multiplication

# Lesson 21: Multiply More Decimals

## Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.B.7

### Teacher-facing Learning Goals

- Calculate products of decimals using whole number products and place value understanding.

### Student-facing Learning Goals

- Let's multiply decimals.

## Lesson Purpose

The purpose of this lesson is for students to use place value understanding and multi-digit whole number products to find multi-digit decimal products.

In this lesson, students use place value understanding and properties of operations to find products of decimals. The numbers are more complex in this lesson so diagrams representing the products are less helpful. Students find the values of both types of expressions they have worked with in the last several lessons, products of two decimals to the tenth and products of a whole number and a decimal to the hundredth. Students find the products using a strategy of their choice. When they explain their reasoning, students will apply their understanding of place value to relate decimal products to whole number products based on the repeated reasoning they have acquired (MP3, MP7, MP8).

This lesson has a Student Section Summary.

## Access for:

### Students with Disabilities

- Engagement (Activity 2)

### English Learners

- MLR2 (Activity 1)

## Instructional Routines

Estimation Exploration (Warm-up)

## Lesson Timeline

Warm-up	10 min
Activity 1	20 min

## Teacher Reflection Question

Reflect on a time your thinking changed about something in class recently. How will you alter your teaching practice to incorporate your new understanding?

Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

**Cool-down** (to be completed at the end of the lesson)  5 min

Explain Why Expressions are Equal

### Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.B.7

### Student-facing Task Statement

1. Explain why  $2.5 \times 6.4$  and  $(25 \times 64) \times 0.01$  are equal.
2. Find the value of  $2.5 \times 6.4$ .

### Student Responses

1.  $2.5 = 25 \times 0.1$  and  $6.4 = 64 \times 0.1$  so  $2.5 \times 6.4 = (25 \times 64) \times 0.01$
2.  $25 \times 64 = 1,600$  so  $2.5 \times 6.4 = 16.00$

----- Begin Lesson -----

## Warm-up 10 min

Estimation Exploration: Central Park

### Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.B.7

The purpose of this estimation exploration is for students to apply what they know about area and multiplication of decimals to a situation where the side length of the rectangle are decimals. Students will approximate the length and width to obtain a product of decimals which they can find mentally.

This prepares them for work in the lesson where they will find more complex products of decimals since making an estimate is a good way to check work.

## Instructional Routines

Estimation Exploration

### Student-facing Task Statement

Central Park is a large park in Manhattan. It is about 3.85 kilometers long and 0.79 km wide. What is the area of Central Park?

Record an estimate that is:



too low	about right	too high

### Student Responses

Sample responses:

- Too low: 2 to 2.5 square kilometers
- About right: near 3 square kilometers
- Too high: 3.5 square kilometers or more

### Launch

- Groups of 2
- Display the image.
- “What is an estimate that’s too high?” “Too low?” “About right?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.

### Synthesis

- Invite students to share their estimates.
- “How do you know the area is greater than 2 square kilometers?” (I know that  $3 \times 0.7$  is 21 tenths or 2.1 and it’s more than that.)
- “How do you know the area is less than 3.2 square kilometers?” (I know 3.85 is less than 4 and 0.79 is less than 0.8. Then  $4 \times 0.8$  is 32 tenths or 3.2.)

## Activity 1

⌚ 20 min

### Multiply More Decimals

#### Standards Alignments

Addressing 5.NBT.A.1, 5.NBT.B.7

In previous lessons, students have found products of a whole number and a decimal and products of two decimals. They used diagrams, place value reasoning, and expressions to explain their reasoning. The purpose of this activity is for students to find both kinds of products with larger numbers. For each product, students show that an expression using whole number products is equal to the given decimal product. Then they calculate the decimal product. Students may use a strategy, other than the given equivalent expressions, to make the calculations. For example, they might decompose the numbers by place value and use the distributive property (partial products). All of these methods focus on the place value of each digit in the products (MP7).

#### 🌐 Access for English Learners

*MLR2 Collect and Display.* Collect the language students use to explain why the expressions are equivalent. Display words and phrases such as: equal, multiply, decimal, equivalent, same value, divide, tenths, hundredths. During the synthesis, invite students to suggest ways to update the display. Invite students to borrow language from the display as needed.

*Advances: Conversing, Reading*

#### Student-facing Task Statement

1. Explain or show why each pair of expressions is equivalent.
  - a.  $7.2 \times 5.3$  and  $(72 \times 53) \times 0.01$
  - b.  $6.5 \times 2.8$  and  $(65 \times 28) \div 100$
  - c.  $31 \times 0.44$  and  $(31 \times 44) \times \frac{1}{100}$
2. Find the value of the products in the previous problem.

#### Launch

- Groups of 2

#### Activity

- 1–2 minutes: quiet think time
- 8–10 minutes: partner work time

#### Synthesis

- Invite students to explain why  $7.2 \times 5.3$  is equivalent to  $72 \times 53 \times 0.01$ .
- Display equations:  $7.2 = 72 \times 0.1$  and

## Student Responses

1. a.  $7.2 = 0.1 \times 72$  and  $5.3 = 0.1 \times 53$  so  $7.2 \times 5.3 = (0.1 \times 0.1) \times (72 \times 53)$  and  $0.1 \times 0.1 = 0.01$   
b.  $6.5 \times 2.8$  is  $0.01 \times (65 \times 28)$  and that's the same as dividing by  $65 \times 28$  by 100.  
c. Since  $0.44 = \frac{1}{100} \times 44$ ,  
 $31 \times 0.44 = (31 \times 44) \times \frac{1}{100}$
2. a. 38.16  
b. 18.20  
c. 13.64

$$5.3 = 53 \times 0.1$$

- “How do you know the equations are true?” (Multiplying 72 or 53 by 0.1 changes the tens to ones and the ones to tenths.)
- Display equation:  

$$7.2 \times 5.3 = (72 \times 53) \times 0.01$$
- “How do you know the equation is true?” (I use the equations for 7.2 and 5.3 and multiply 0.1 and 0.1 to get a hundredth or 0.01.)
- “How can you use the equation to find the value of  $7.2 \times 5.3$ ?” (I can multiply 72 and 53 and then multiply that by 0.01.)

## Activity 2

⌚ 15 min

Choose Your Strategy

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find products of decimals and whole numbers with no scaffold. As in the previous activity, the products are either a whole number and a decimal to the hundredths or two decimals to the tenths. Students may use any strategy including partial products or using products of whole numbers and place value understanding. The final problem, the product of a three-digit decimal number and a two-digit decimal number, is new but all of the strategies students have used to multiply two-digit decimals apply here as well.

### ⌚ Access for Students with Disabilities

*Engagement: Develop Effort and Persistence.* Some students may benefit from feedback that emphasizes effort, and time on task. For example, Invite students that used a different method for each problem to explain their choice(s).

*Supports accessibility for: Conceptual Processing, Language*

## Student-facing Task Statement

Find the value of each product.

1.  $7.3 \times 4.2$
2.  $38 \times 0.55$
3.  $285 \times 0.17$

## Student Responses

1. Sample response: I found  $73 \times 42 = 3,066$  and then multiplied by 0.01 to get 30.66.
2. Sample response: I found  $38 \times 55 = 2,090$  and multiplied by 0.01 to get 20.90.
3. Sample response: I found  $285 \times 17 = 4,845$  and multiplied by 0.01 to get 48.45.

## Launch

- Groups of 2

## Activity

- 5-8 minutes: independent work time
- 2-5 minutes: partner discussion

## Synthesis

- Invite students to share their responses for the first two products.
- “How did you use your understanding of place value to find the products?” (I used whole number products and then remembered that I have that many hundredths so I had to multiply that product by 0.01.)
- “How is the last product the same as the other products you have found? How is it different?” (It is also a whole number and a decimal and the decimal has tenths and hundredths. The whole number is bigger. I can use the same methods but the product is more complicated since one factor has three digits.)

## Lesson Synthesis

⌚ 10 min

“Today we found products of whole numbers and decimals.”

“How is finding products of whole numbers and decimals the same as finding products of whole numbers? How is it different?” (I have to find the products of the digits in both cases. I can use the same strategies for finding those products. When there are decimals, I need to remember that those whole number products of digits might be tenths or hundredths.)

## Suggested Centers

- Compare (1–5), Stage 4: Divide within 100 (Supporting)

- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)

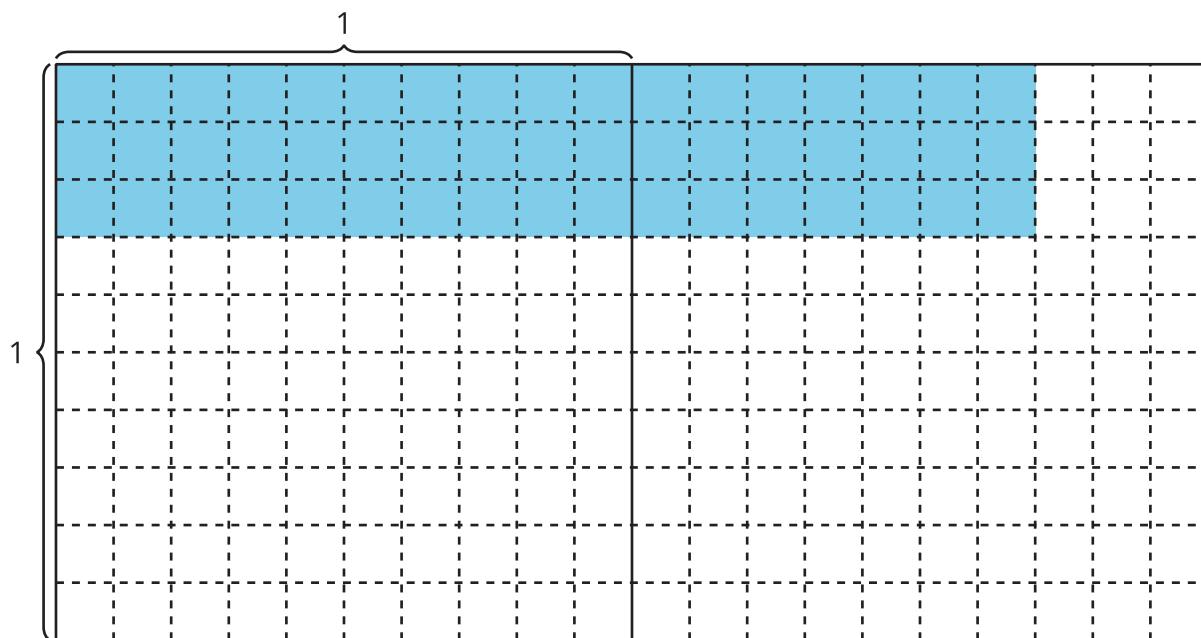
## Student Section Summary

In this section, we learned to use place value relationships to multiply a whole number and a decimal. For example,

$$6 \times 0.14 = 0.84$$

because 6 groups of 14 hundredths is  $6 \times 14$  or 84 hundredths.

We also found products like  $1.7 \times 0.3$ . We can use a diagram to see that this is  $17 \times 3$  hundredths or 0.51.



### Complete Cool-Down

#### Response to Student Thinking

Students do not explain why the expressions are equal.

#### Next Day Support

- Create a poster with important terms and expressions from this cool-down.

## Section D: Divide Decimals

### Lesson 22: Divide Whole Numbers by 0.1 and 0.01

#### Standards Alignments

Addressing 5.NBT.B.7  
Building Towards 5.NBT.A.1

#### Teacher-facing Learning Goals

- Divide whole numbers by one tenth and one hundredth.

#### Student-facing Learning Goals

- Let's divide whole numbers by one tenth and one hundredth.

#### Lesson Purpose

The purpose of this lesson is for students to notice and explain patterns when dividing a whole number by one tenth and one hundredth.

In prior lessons, students represented decimals to the thousandths with diagrams, words, numbers, and expressions. They also added, subtracted and multiplied decimals using place value understanding, properties of operations, and relationships between operations. In this lesson, students begin to work with decimals and division. They divide whole numbers by one tenth and one hundredth and notice and explain patterns they observe. Students apply their understanding of division as “how many groups” to hundredths grids where the entire grid represents one whole. This allows them to visualize how many tenths or hundredths are in one or several wholes while also preparing students to find quotients of more complex decimals in future lessons.

#### Access for:

##### Students with Disabilities

- Representation (Activity 1)

#### Instructional Routines

MLR1 Stronger and Clearer Each Time (Activity 2), Number Talk (Warm-up)

## Materials to Copy

- Small Grids (groups of 1): Activity 1
- Small Grids (groups of 1): Activity 2

## Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

## Teacher Reflection Question

Reflect on how comfortable your students are asking questions of you and of each other. What can you do to encourage students to ask more questions?

## Cool-down (to be completed at the end of the lesson)

 5 min

Many Tenths and Hundredths

## Standards Alignments

Addressing 5.NBT.B.7

## Student-facing Task Statement

Find the value of each expression. Explain or show your reasoning.

1.  $7 \div 0.1$
2.  $7 \div 0.01$

## Student Responses

1. 70. Sample response:  $1 \div 0.1 = 10$  and  $7 \times 10 = 70$
2. 700. Sample response: There are 100 hundredths in 1, so there are 700 hundredths in 7.

----- Begin Lesson -----

## Warm-up

⌚ 10 min

### Number Talk: Remember Division of Unit Fractions

The purpose of this number talk is for students to divide a whole number by a tenth and a hundredth, presented both as fractions and as decimals. This prepares students to work with and understand quotients of whole numbers by decimals in this and future lessons.

## Instructional Routines

### Number Talk

#### Student-facing Task Statement

Find the value of each expression mentally.

- $1 \div \frac{1}{10}$
- $2 \div \frac{1}{10}$
- $1 \div 0.01$
- $2 \div 0.01$

#### Student Responses

Sample responses:

- 10: There are 10 tenths in 1 whole.
- 20: There are twice as many tenths in 2 wholes.
- 100: There are 100 hundredths in 1 whole.
- 200: There are twice as many hundredths in 2 wholes.

#### Launch

- Display one problem.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

#### Activity

- Record answers and strategy.
- Keep problems and work displayed.
- Repeat with each problem.

#### Synthesis

- “What is the same about these expressions? What is different?” (They all show a whole number divided by a number less than 1. Some have decimals and some have fractions, but the decimals and fraction are all 1 of some unit. They all have a value that is a whole number.)

## Activity 1

⌚ 15 min

### Patterns in Dividing by Decimal Units

👤 ↔👤 PLC Activity

## Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to divide a whole number by 0.1 or 0.01. Students may think about the quotients in different ways. Monitor for students who

- use the hundredths grids to visualize the tenths and hundredths in 3 or 4 wholes
- use their understanding of fractions or decimals to identify the number of tenths and hundredths in 1 whole and then multiply by the number of wholes
- build on and solidify their reasoning from the warm-up

The work in this activity focusing on the tenths and hundredths in 3 or 4 wholes prepares students to generalize in the next activity where they explain how to find the number of tenths or hundredths in any whole number.

### ⓘ Access for Students with Disabilities

*Representation: Internalize Comprehension.* Begin by asking, "Does this problem/situation remind anyone of something we have seen/read/done before?"

*Supports accessibility for: Memory, Attention*

### Materials to Copy

Small Grids (groups of 1)

### Student-facing Task Statement

- Find the value of each expression. Explain or show your reasoning. Use a diagram if it is helpful.
  - $3 \div 0.1$
  - $3 \div 0.01$
  - $4 \div 0.1$
  - $4 \div 0.01$
- What patterns do you notice?

### Student Responses

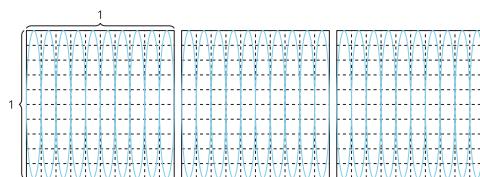
- a. Sample response 1: There are 10 tenths in 1 so there are 30 tenths in 3.

### Launch

- Groups of 2
- Give students access to Instructional masters with grids.

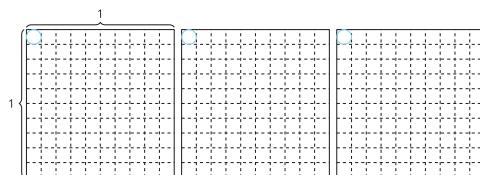
### Activity

- 1–2 minutes: quiet think time
- 5–7 minutes: partner work time
- Monitor for students who:
  - use fractions
  - use diagrams
  - use multiplication



Sample response 2:  $10 \times 0.1 = 1$ ,  
 $20 \times 0.1 = 2$ ,  $30 \times 0.1 = 3$

b. Sample response 1: There are 100 hundredths in 1 so there are 300 hundredths in 3. I just circled one of the hundredths on each grid but know there are 100 of them.



Sample response 2:  $100 \times 0.01 = 1$ ,  
 $200 \times 0.01 = 2$ ,  $300 \times 0.01 = 3$

c. There are 10 tenths in 1 so there are 40 tenths in 4,  $40 \times 0.1 = 4$ .  
 d. There are 100 hundredths in 1 so there are 400 hundredths in 4,  
 $400 \times 0.01 = 4$ .

2. When I divide by a tenth, I get ten times as much. When I divide by a hundredth I get 100 times as much. Dividing by 0.01 is 10 times as much as dividing by 0.1.

## Synthesis

- Ask previously selected students to share their strategies for finding the value of the division expressions.
- “How do the different representations show that there are 10 tenths in 1 whole and 100 hundredths in 1 whole?” (With the diagram I can see each tenth and each hundredth in the whole. With fractions or decimals, I just know how many tenths or hundredths there are in 1 and can use that to figure out how many there are in 3 or 4.)
- Display equations:  
 $3 \div 0.01 = 300$   
 $4 \div 0.01 = 400$
- “What patterns do you notice?” (I notice that I multiply by 100 to find how many 0.01s there are in 3 or 4.)

## Advancing Student Thinking

If students do not find the value of  $3 \div 0.1$ , ask, “How can you use a diagram to show  $1 \div 0.1$ ? How can your diagram help you find the value of  $3 \div 0.1$ ?”

## Activity 2

### Divide Whole Numbers by Decimals

⌚ 20 min

## Standards Alignments

Addressing 5.NBT.B.7  
Building Towards 5.NBT.A.1

The purpose of this activity is for students to describe the patterns they notice when they divide a whole number by one tenth and one hundredth (MP7). Students have the option of using a diagram recalling work from the previous activity. The reasoning students develop here prepares them to:

- evaluate more complex quotients with decimals in future lessons.
- observe patterns when multiplying or dividing by powers of 10 which will be a focus in the next unit.

This activity uses *MLR1 Stronger and Clearer Each Time*. Advances: Reading, Writing.

## Instructional Routines

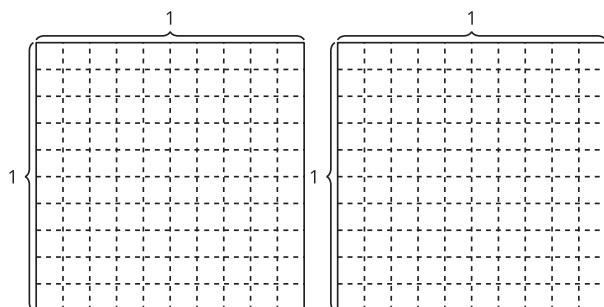
MLR1 Stronger and Clearer Each Time

### Materials to Copy

Small Grids (groups of 1)

### Student-facing Task Statement

- Describe how you can find the value of any whole number divided by 0.1. Use a diagram if it is helpful.
- Describe how you can find the value of any whole number divided by 0.01. Use a diagram if it is helpful.



### Launch

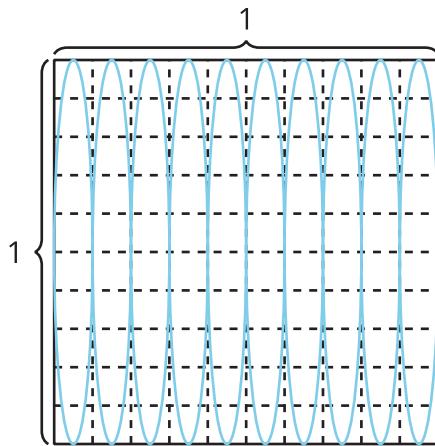
- Groups of 2
- Give students access to Instructional masters with grids.
- "You are going to use the patterns you noticed to explain how to divide any whole number by a tenth and a hundredth."

### Activity

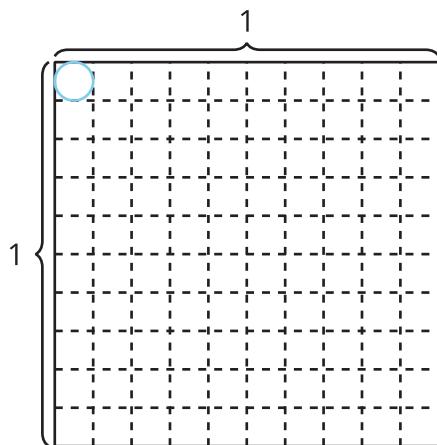
- 6–8 minutes: independent work time
- Monitor for students who notice:
  - that when they divide a whole number by one tenth, the quotient is ten times larger than the whole number
  - that when they divide a whole

## Student Responses

1. Sample response: I can multiply the whole number by 10 if I am dividing by one tenth. I can use the diagram to show why there are ten 0.1s in each whole.



2. Sample response: I can multiply the whole number by 100 if I am dividing by one hundredth. I can use the diagram to show why there are one hundred 0.01s in each whole though I only circled one of them.



number by one hundredth, the quotient is one hundred times larger than the whole number

## Synthesis

### MLR1 Stronger and Clearer Each Time

- “Share with your partner your explanation of how you would find the value of
  - any whole number divided by one tenth
  - any whole number divided by one hundredth”
- “Take turns being the speaker and the listener. If you are the speaker, share your ideas and writing so far. If you are the listener, ask questions and give feedback to help your partner improve their work.”
- 2 minutes: structured partner discussion
- Repeat with 2 different partners.
- If needed, display question starters and prompts for feedback.
  - “Can you give an example to help show . . . ?”
  - “Can the examples we studied in the first activity fit in your explanation?”
- “Revise your initial draft based on the feedback you got from your partners.”
- 2–3 minutes: independent work time

## Advancing Student Thinking

If students do not describe how they could find the value of any whole number divided by 0.1 or 0.01, ask them to draw a diagram to show  $1 \div 0.1$  and ask, “How can you use this diagram to figure out the value of any whole number divided by one tenth?”

## Lesson Synthesis

⌚ 10 min

“Today, we divided whole numbers by one tenth and one hundredth.”

Display expressions:

$$5 \div 0.1$$

$$5 \div 0.01$$

“Describe to your partner how to find the value of each of these expressions.” (To divide by 0.1 I just multiply by 10 so that's 50 and to divide by 0.01 I multiply by 100.)

“Now discuss with your partner why your strategy works.” (There are 10 tenths in 1 so that's  $5 \times 10$  or 50 in 5. There are 100 hundredths in 1 so that's  $5 \times 100$  or 500 in 5.)

---

### Suggested Centers

- Compare (1–5), Stage 4: Divide within 100 (Supporting)
- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)

---

### Complete Cool-Down

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### Response to Student Thinking

Students do not evaluate the expressions correctly.

#### Next Day Support

- Throughout the lesson, ask, “How does this connect to the work you did in yesterday's lesson?”

# Lesson 23: Divide Whole Numbers by Decimals

## Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A.2

### Teacher-facing Learning Goals

- Divide whole numbers by decimals to the hundredths using strategies based on place value.

### Student-facing Learning Goals

- Let's divide whole numbers by decimals.

## Lesson Purpose

The purpose of this lesson is for students to divide a whole number by a decimal less than 1 by reasoning about the number of groups of one tenth or one hundredth in one whole.

In the previous lesson, students divided whole numbers by one tenth and one hundredth and made generalizations about how to divide any whole number by those units. The purpose of this lesson is for students to extend that work to divide whole numbers by any number of tenths or hundredths (with total value less than 1). Consistent divisors are used in repetition to highlight relationships between the dividends and the quotients (MP8). Students evaluate expressions with larger divisors such as  $12 \div 0.2$  in order to encourage them to use the relationship between multiplication and division. Rather than drawing 12 unit squares and dividing all of them into groups of 2 tenths, students may draw a single whole divided into 2 tenths and then use multiplication.

## Access for:

### Students with Disabilities

- Action and Expression (Activity 2)

## Instructional Routines

MLR1 Stronger and Clearer Each Time (Activity 2), True or False (Warm-up)

### Materials to Copy

- Small Grids (groups of 1): Activity 1
- Small Grids (groups of 1): Activity 2

**Lesson Timeline**

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

What aspects of today's lesson allowed each of your students to see themselves as productive mathematical reasoners?

**Cool-down** (to be completed at the end of the lesson)

 5 min

Divide Whole Numbers by Decimals

**Standards Alignments**

Addressing 5.NBT.B.7

**Student-facing Task Statement**

Find the value of each expression. Explain or show your reasoning.

1.  $12 \div 0.5$
2.  $13 \div 0.02$

**Student Responses**

1. 24. Sample response: There are 2 groups of 0.5 in 1 whole and  $12 \times 2 = 24$ .
2. 650. Sample responses:
  - There are 50 groups of 0.02 in 1. Since there are 13 wholes, that means there will be 13 times as many 0.02s which is the same as 13 groups of 50.
  - $50 \times 0.02 = 1, 500 \times 0.02 = 10, 100 \times 0.02 = 2$  and  $50 \times 0.02 = 1$  so  $(500 + 100 + 50) \times 0.02 = 10 + 2 + 1 = 13$

----- Begin Lesson -----

## Warm-up

⌚ 10 min

True or False: Tenths and Hundredths

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this warm-up is for students to analyze statements about quotients of whole numbers by 0.1 or 0.01. Students compare the value of quotients by 0.1 and 0.01. They can analyze the statements either by calculating the value of the expressions or reasoning about the relationship between 0.1 and 0.01, namely that there are ten hundredths in a tenth.

### Instructional Routines

True or False

#### Student-facing Task Statement

Decide if each statement is true or false. Be prepared to explain your reasoning.

- $6 \div 0.01 = 60$
- $6 \div 0.1 < 6 \div 0.01$
- $6 \div 0.01 = 60 \div 0.1$

#### Student Responses

- False: There are six hundred 0.01s in 6.
- True: There are fewer tenths than hundredths in 6.
- True: There are 600 tenths in 60 and 600 hundredths in 6.

#### Launch

- Display one statement.
- “Give me a signal when you know whether the statement is true and can explain how you know.”
- 1 minute: quiet think time

#### Activity

- Share and record answers and strategy.
- Repeat with each statement.

#### Synthesis

- Display second statement.
- “How can you prove this statement is true without finding the value of the expressions on both sides of the equal sign?” (I can think about the size of the quotients. They both show 6 being divided into groups, but the size of the groups is bigger in  $6 \div 0.1$  so there will be fewer groups.)

## Activity 1

⌚ 15 min

Same Divisor, Different Dividend

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find quotients of a whole number by tenths or hundredths. This activity focuses on divisors of 0.2 and 0.02 to build on students' previous work dividing by 0.1 and 0.01. The strategies, diagrams and place value reasoning used in the previous lessons still apply. Students may also think about the problems using multiplication. For example  $1 \div 0.2 = 5$  because  $5 \times 0.2 = 1$ .

### Materials to Copy

Small Grids (groups of 1)

### Student-facing Task Statement

- Find the value of each expression. Explain or show your reasoning.
  - $1 \div 0.2$
  - $2 \div 0.2$
  - $3 \div 0.2$
  - $4 \div 0.2$
- Find the value of each expression. Explain or show your reasoning.
  - $1 \div 0.02$
  - $2 \div 0.02$
  - $3 \div 0.02$
  - $4 \div 0.02$
- What patterns do you notice?

### Student Responses

- Sample responses:

### Launch

- Groups of 2
- Give students access to Instructional masters with grids.

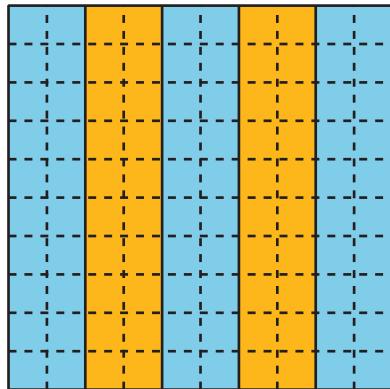
### Activity

- 1–2 minutes: quiet think time
- 8–10 minutes: partner work time
- Monitor for students who represent their reasoning with:
  - diagrams
  - expressions or words using multiplication

### Synthesis

- Ask selected students to share the representations listed above.
- "How are the representations the same?"

a. 5. Since  $5 \times 0.2 = 1$ .



b. 10. I added one more group of 5 to the quotient from the first problem because there is 1 more whole being divided into groups of 0.2.

c. 15. Since  $5 \times 0.2 = 1$  and there are 3 so that is 5, 10, 15 groups of 0.2.

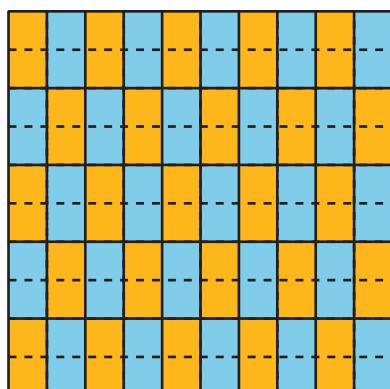
d. 20. Since  $5 \times 0.2 = 1$  and there are 4 so that's  $4 \times 5$  or 20.

2. Sample responses:

a. 50. There are five 0.2s in 1 and ten 0.02s in each 0.2 so that's  $5 \times 10$  or fifty 0.02s in 1.

How are they different?" (They both figured out how many tenths or hundredths are in one whole. Then they multiplied that by the number of wholes. One of them used a picture and one of them reasoned about the size of tenths and hundredths to find how many 0.2's and 0.02's are in one whole.)

- Display a student's completed work showing the values of the quotients.
- "What patterns do you see across the sets of equations?" (The quotients with a divisor of 0.01 are 10 times larger than those with a divisor of 0.1. The quotients with a divisor of 0.1 are a tenth of the value of those with a divisor of 0.01.)
- Record the patterns as students describe them.



b. 100. There are twice as many groups of 0.02 as the first problem.

c. 150. Since  $1 \div 0.02 = 50$  and I have 3 wholes that's 50, 100, 150. There are

150 groups of 0.02 in 3.

d. 200. There are 50 more than  $3 \div 0.02$  so that's 200.

3. Sample responses: The quotients with divisors of 0.02 are ten times as great as those with divisors of 0.2. When the dividend increases by 1, the number of 0.2s increases by 5 and the number of 0.02s increases by 50.

## Advancing Student Thinking

If a student is not able to use the value of the first expression in each set to find the value of the later expressions, ask them to describe what they notice and wonder about each set of expressions. Use numbers and symbols when possible to record the relationships they describe.

## Activity 2

⌚ 20 min

### Evaluate Expressions

#### Standards Alignments

Addressing 5.NBT.B.7, 5.OA.A.2

The purpose of this activity is for students to find the value of quotients where the divisor is less than 1 and where the dividend is large enough that drawing a complete diagram is cumbersome. Instead, students are encouraged to use a diagram to find how many divisor sized groups are in 1 whole and then multiply the dividend by that number to find the value of the quotient. When students use the value of  $1 \div 0.2$  and multiplication to find the value of  $12 \div 0.2$  they are using regularity in reasoning (MP8).

This activity uses *MLR1 Stronger and Clearer Each Time*. Advances: Conversing.

#### ⌚ Access for Students with Disabilities

*Action and Expression: Internalize Executive Functions.* Invite students to plan a strategy, including the tools they will use, for finding the value of the expression. If time allows, invite students to share their plan with a partner before they begin.

*Supports accessibility for: Conceptual Processing, Memory*

## Instructional Routines

MLR1 Stronger and Clearer Each Time

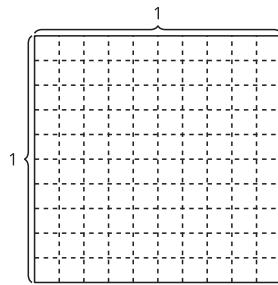
### Materials to Copy

Small Grids (groups of 1)

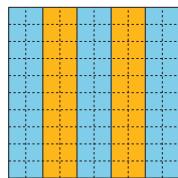
### Student-facing Task Statement

- Find the value of the expression. Use a diagram if it is helpful.

$$12 \div 0.2$$



- This is the diagram and explanation Tyler used to justify why  $12 \div 0.2 = 60$ .



$12 \div 0.2 = 60$   
There are 5 groups of 0.2 in 1  
and there are 12 so that is  
12 groups of 5

Explain how the expression  $12 \times (1 \div 0.2)$  relates to Tyler's reasoning.

- Find the value of each expression.

- $14 \div 0.5$
- $5 \div 0.25$

### Student Responses

60. Sample response: In one unit square, there are 5 groups of 0.2. For 12 unit squares, there 12 times as many 0.2s or 60.
- Sample response: Tyler divided 1 into

### Launch

- Groups of 2
- Give students access to Instructional masters with hundredths grids.

### Activity

- 3–5 minutes: independent work time
- Monitor for students who use the following strategies for problem 1:
  - reason about how many divisor-sized groups are in 1 whole, possibly with a diagram, and then multiply by the dividend
  - use multiplication equations to find the value of the division expressions

### Synthesis

- Ask previously identified students to share their solutions and strategies for evaluating the expression in the first problem.
- "How was multiplication useful to find the value of the expression in the first problem?" (I didn't have to draw 12 wholes because I knew there were five 0.2s in each one so that would be  $12 \times 5$  total.)

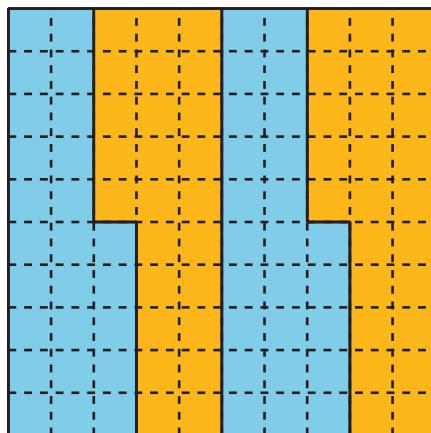
### MLR1 Stronger and Clearer Each Time

- "Share your response to problem 2 with your partner. Take turns being the speaker and the listener. If you are the speaker, share your ideas and writing so far. If you are the listener, ask questions and give feedback to help your partner improve

groups of 0.2 and then he multiplied the quotient by 12.  $1 \div 0.2 = 5$  and  $12 \times 5 = 60$ .

3. Sample responses:

- There are two 0.5s in 1 whole so there are 14 times as many or 28 in 14 wholes.
- There are four 0.25s in 1 whole so there are  $5 \times 4$  or 20 in 5 wholes.



their work."

- 3-5 minutes: structured partner discussion
- Repeat with 2 different partners.
- "Revise your initial draft based on the feedback you got from your partners."
- 2-3 minutes: independent work time

### Advancing Student Thinking

If a student is not sure how to explain Tyler's reasoning in problem 2, ask them to read the expression to you and record the words they use. Then ask them how those words relate to the words Tyler used.

## Lesson Synthesis

⌚ 10 min

"Today we divided whole numbers by decimals."

Display two expressions:

$$2 \div 0.2$$

$$2 \div 0.5$$

"In both these cases, 2 is being divided by a decimal number. Describe to your partner how you would find the value of each expression." (I would use the 2 grids and divide them into groups of 0.2 or 0.5

and then see how many of them there are.)

Display:

$$18 \div 0.2$$

$$18 \div 0.5$$

"How does your strategy for the first two expressions change with this set of problems? Why?" (For these, the hundredths grids still help to visualize the 0.2s and 0.5s in one whole, but I don't want to draw 18 of them so I would just multiply the 0.2s in 1 whole or the 0.5s in one whole by 18.)

## Suggested Centers

- Compare (1–5), Stage 4: Divide within 100 (Supporting)
- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)

## Complete Cool-Down

### Response to Student Thinking

Students do not evaluate the expressions correctly.

### Next Day Support

- Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.

# Lesson 24: Divide Decimals by Whole Numbers

## Standards Alignments

Addressing 5.NBT.B.7

### Teacher-facing Learning Goals

- Divide decimals to hundredths by whole numbers

### Student-facing Learning Goals

- Let's divide decimals by whole numbers.

## Lesson Purpose

The purpose of this lesson is for students to divide a decimal less than 1 by a whole number.

In previous lessons students divided a whole number by a decimal less than 1, using place value understanding and the relationship between multiplication and division. The purpose of this lesson is to apply these ideas to find quotients of a decimal less than 1 by a whole number. Students work with diagrams and also think about place value, relating these quotients of a decimal by a whole number to whole number quotients.

## Access for:

### Students with Disabilities

- Representation (Activity 1)

### English Learners

- MLR8 (Activity 2)

## Instructional Routines

Estimation Exploration (Warm-up)

### Materials to Copy

- Small Grids (groups of 1): Activity 1

## Lesson Timeline

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min

## Teacher Reflection Question

What opportunities are you giving students to reflect on their understanding of the mathematical content?

Lesson Synthesis 10 min

Cool-down 5 min

**Cool-down** (to be completed at the end of the lesson)  5 min

Divide Decimals by Whole Numbers

**Standards Alignments**

Addressing 5.NBT.B.7

**Student-facing Task Statement**

Find the value of each expression. Explain or show your reasoning.

1.  $0.9 \div 3$
2.  $0.09 \div 3$
3.  $0.8 \div 5$

**Student Responses**

1. 0.3. There are 9 tenths so that's 3 groups of 3 tenths.
2. 0.03. There are 9 hundredths so that's 3 groups of 3 hundredths.
3. 0.16. There are 80 hundredths so that's 5 groups of 16 hundredths.

----- Begin Lesson -----

**Warm-up** 10 min

Estimation Exploration: Divide by Whole Numbers

The purpose of this estimation exploration is for students to consider quotients of a decimal to the hundredth by a whole number. Students can draw or visualize a diagram or they may reason about place value in order to make a meaningful estimate.

## Instructional Routines

Estimation Exploration

### Student-facing Task Statement

What is the value of  $0.42 \div 5$ ?

Record an estimate that is:

too low	about right	too high

### Student Responses

Sample responses

- too low: range 0.07 to 0.08
- about right: range 0.08 to 0.09
- too high: range 0.09 to 0.1

### Launch

- Groups of 2
- Display the expression.
- “What is an estimate that’s too high?” “Too low?” “About right?”

### Activity

- 1 minute: quiet think time
- 1 minute: partner discussion
- Record responses.

### Synthesis

- “How do you know  $0.42 \div 5$  is more than 8 hundredths?” (I know 5 groups of 8 hundredths is 40 hundredths and that’s 0.4 which is 2 hundredths less than 0.42.)
- “Why is 8 hundredths a good estimate for the value of  $0.42 \div 5$ ?” (Because 40 hundredths is really close to 42 hundredths.)

## Activity 1

⌚ 20 min

Whole Number Groups

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find quotients of a decimal by a whole number. Students may choose to use diagrams to show their reasoning. Since the diagram is a hundredths grid, this will naturally encourage students to think of decimals like 0.8 and 0.5 as 0.80 and 0.50,

that is, think about them in terms of hundredths. This is an important step since finding a quotient like  $0.5 \div 2$  will require thinking about hundredths. Students may also apply their understanding of dividing fractions by whole numbers (MP7). Monitor for students who

- use the grid to identify the amount being divided and think geometrically about finding equal shares
- think about the number of pieces that they need to partition into equal groups and use whole number division to find those shares

## ⑩ Access for Students with Disabilities

*Representation: Develop Language and Symbols.* Activate or supply background knowledge. To help students recall the term dividend and divisor, ask, “What is the dividend and how is it being divided?” or “What is the divisor and how will it impact the quotient?”

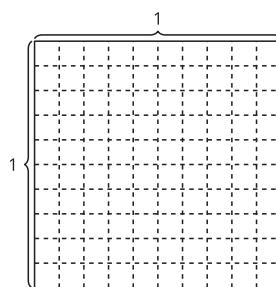
*Supports accessibility for: Memory, Language*

## Materials to Copy

Small Grids (groups of 1)

### Student-facing Task Statement

- Find the value of the expression  $0.8 \div 4$ . Explain or show your reasoning.



- Find the value of the expression  $0.6 \div 3$ . Explain or show your reasoning.

### Launch

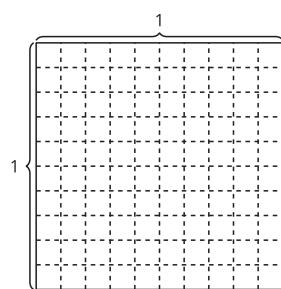
- Groups of 2
- Give students access to Instructional master of grids.

### Activity

- 2 minutes: quiet think time
- 10 minutes: partner work time
- Monitor for students who:
  - use equivalence to think about tenths as hundredths
  - decompose the dividend into a sum of dividends that are divisible by the divisor

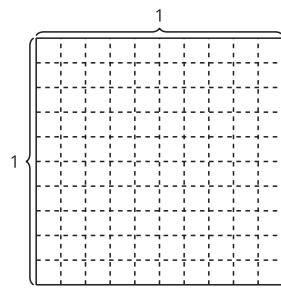
### Synthesis

- Ask previously identified students to share their thinking for the last two problems.
- Display expression:  $0.5 \div 2$

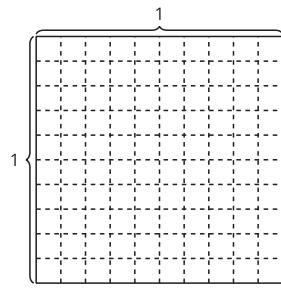


3. Find the value of  $0.5 \div 2$ . Explain or show your reasoning.

- "How does thinking about hundredths help find the value of this expression?" (Since 0.5 is 50 hundredths I can find half of that and that's 25 hundredths or 0.25.)
- Display expression:  $0.75 \div 5$
- "How does thinking about equal shares help find the value of this expression?" (If I have 75 things I can make 5 groups of 10 with 25 left so that's 5 more groups of 5. So 75 is 5 groups of 15 and 75 hundredths is 5 groups of 15 hundredths.)

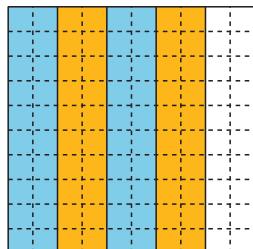


4. Find the value of  $0.75 \div 5$ . Explain or show your reasoning.

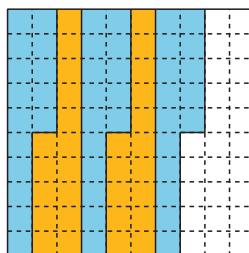


## Student Responses

1. 0.2. Sample response:



2. 0.2. Sample response: 6 tenths is 3 groups of 2 tenths.
3. 0.25. Sample response: Half of 5 tenths is 2 tenths and half of a tenth. Since half of a tenth is 5 hundredths, that's 2 tenths and 5 hundredths or 0.25.
4. 0.15. Sample response:



## Activity 2

⌚ 15 min

Evaluate Expressions

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this activity is for students to find quotients of a decimal by a whole number. In the previous activity students saw that whole number quotients can be used to find the quotient of a decimal by a whole number. In this activity, they begin with a whole number quotient which they can use to find decimal quotients and then they find the value of decimal quotients without a scaffold.

### ⌚ Access for English Learners

*MLR8 Discussion Supports.* Encourage students to begin partner discussions by reading their written responses aloud. If time allows, invite students to revise or add to their responses based on the conversation that follows.

*Advances: Conversing, Speaking*

## Student-facing Task Statement

1. Find the value of each expression.

- a.  $60 \div 5$
- b.  $6 \div 5$
- c.  $0.6 \div 5$

2. Find the value of each expression.

- a.  $0.7 \div 2$
- b.  $0.45 \div 5$

## Student Responses

1. a. 12. Sample response: I know ten 5s is 50 and 2 more makes 60.
- b. 1.2. Sample response: 6 is the same as 60 tenths so this is 12 tenths or 1.2.
- c. 0.12. Sample response: 0.6 is 60 hundredths so this is 12 hundredths or 0.12.
2. a. 0.35. Sample response: 0.7 is 70 hundredths and half of that is 35 hundredths or 0.35.
- b. 0.09. Sample response: 45 is 5 groups of 9. These are hundredths so that's 9 hundredths or 0.09.

## Launch

- Groups of 2

## Activity

- 5 minutes: quiet work time
- 3 minutes: partner discussion
- Monitor for students who use whole number facts to find the decimal quotients.

## Synthesis

- Invite students to share responses for the second question.
- “How did thinking of 0.7 and 0.45 as hundredths help to find the value of these expressions?” (I can think about whole number division. I have 70 hundredths and splitting that in half would give me 35 hundredths. Or I have 45 hundredths and that’s 5 equal groups of 9 hundredths.)
- “Could you use a diagram to find these quotients?” (I can shade 7 tenths in a hundredths grid and then cut that in half. I think seeing 5 groups of 9 hundredths in 45 hundredths might be challenging.)

## Lesson Synthesis

⌚ 10 min

“Today, we divided decimals by whole numbers.”

Display:

$$0.9 \div 2$$

“Describe to your partner how you would find the value of this expression.” (I would view 0.9 as 90 hundredths and that’s two equal groups of 45 hundredths so  $0.9 \div 2 = 0.45$ . I would use a diagram. I would shade 9 tenths and then divide that in half.)

Record strategies for all to see.

## Suggested Centers

- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)
- Would You Rather? (2–5), Stage 2: Compare to Smaller Units (Supporting)

## Complete Cool-Down

## Response to Student Thinking

Students do not find the correct value of  $0.8 \div 5$ .

### Next Day Support

- Launch the warm-up or Activity 1 by highlighting important notation from previous lessons.

# Lesson 25: Divide Decimals by Decimals

## Standards Alignments

Addressing 5.NBT.B.7

### Teacher-facing Learning Goals

- Divide decimals greater than 1 by decimals less than 1.

### Student-facing Learning Goals

- Let's divide decimals by decimals.

## Lesson Purpose

The purpose of this lesson is for students to divide decimals greater than 1 by decimals less than 1.

In previous lessons, students divided whole numbers by decimals and decimals by whole numbers, with the decimals always less than 1. The purpose of this lesson is for students to apply their understanding of the number of tenths and hundredths in 1 whole to divide a decimal greater than 1 by a decimal. Students use the same strategies that they have in previous lessons to find these quotients

- diagrams
- whole number facts combined with reasoning about place value
- using the relationship between multiplication and division

This lesson has a Student Section Summary.

## Access for:

### Students with Disabilities

- Representation (Activity 2)

### English Learners

- MLR7 (Activity 1)

## Instructional Routines

Number Talk (Warm-up)

## Materials to Copy

- Small Grids (groups of 1): Activity 2

**Lesson Timeline**

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

As you finish up this unit, reflect on the norms and activities that have supported each student in learning math. List ways you have seen each student grow as a young mathematician throughout this work. List ways you have seen yourself grow as a teacher. What will you continue to do and what will you improve upon in the next unit?

**Cool-down** (to be completed at the end of the lesson)
 5 min

Divide by Decimals

**Standards Alignments**

Addressing 5.NBT.B.7

**Student-facing Task Statement**

Find the value of each expression. Explain or show your reasoning.

1.  $1.6 \div 0.01$
2.  $2.87 \div 0.01$

**Student Responses**

- 160. Sample responses:
  - $1.6 \div 0.01 = 160 \div 1$
  - There are one hundred 0.01s in 1, sixty 0.01s in 0.6, and one hundred sixty 0.01s in 1.6.
- 287. Sample responses:
  - $2.87 \div 0.01 = 287 \div 1$
  - There are two hundred 0.01s in 2, eighty 0.01s in 0.8, seven 0.01s in 0.07, and two hundred eighty-seven 0.01s in 2.87.

----- Begin Lesson -----

## Warm-up

⌚ 10 min

Number Talk: Same/Different

### Standards Alignments

Addressing 5.NBT.B.7

The purpose of this Number Talk is to elicit strategies and understandings students have to divide whole numbers by decimals. These understandings help students develop fluency and will be helpful later in this lesson when students divide decimals greater than 1 by decimals less than 1.

### Instructional Routines

Number Talk

#### Student-facing Task Statement

Find the value of each expression mentally.

- $20 \div 2$
- $2 \div 0.2$
- $50 \div 2$
- $5 \div 0.2$

#### Student Responses

- 10:  $10 \times 2 = 20$
- 10:  $1 \div 0.2 = 5, 2 \times 5 = 10$
- 25: I just know it.
- 25: I'm dividing 50 tenths into groups of 2 tenths so that's the same as  $50 \div 2$ .

#### Launch

- Display one problem.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

#### Activity

- Record answers and strategy.
- Keep problems and work displayed.
- Repeat with each problem.

#### Synthesis

- “Why do  $50 \div 2$  and  $5 \div 0.2$  have the same value?” (Because 5 is 50 tenths and I am dividing that into groups of 2 tenths so that's  $50 \div 2$ .)

## Activity 1

⌚ 15 min

Dividing by a Tenth and a Hundredth

The purpose of this activity is for students to divide decimal numbers by 0.1 and 0.01. They are given diagrams to help see that there are 10 tenths in each whole and 100 hundredths in each whole. The diagrams are not labeled with the whole so that the same diagram which shows  $1.6 \div 0.1 = 16$  can be interpreted as whole number division showing  $160 \div 10 = 16$ . This dual way of interpreting one diagram is highlighted in the synthesis. When students interpret the diagram as representing two different equations they attend to precision in the meaning each part of the diagram (MP6).

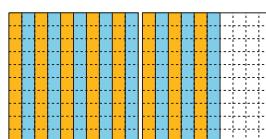
## Access for English Learners

*MLR7 Compare and Connect.* Synthesis: After all strategies have been presented, lead a discussion comparing, contrasting, and connecting the different approaches. Ask, “What kinds of additional details or language helped you understand the displays?”, “Were there any additional details or language that you have questions about?”, and “Did anyone solve the problem the same way, but would explain it differently?”

*Advances: Representing, Conversing*

### Student-facing Task Statement

1. To find the value of  $1.6 \div 0.1$ , Jada drew this diagram.
  - a. Describe how the diagram shows 1.6.
  - b. Describe how the diagram shows 16 groups of 1 tenth.
  - c. Describe how the diagram shows the value of  $1.6 \div 0.1$ .
  - d. Describe how the diagram also represents the expression  $160 \div 10$ .
2. Explain how this diagram represents  $1.3 \div 0.01$ .



### Launch

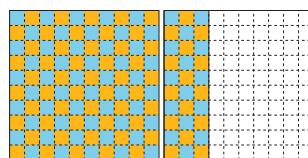
- Groups of 2

### Activity

- 5 minutes: independent work time
- 5 minutes: partner work time
- Monitor for students who:
  - Describe how Jada's diagram shows the value of  $1.6 \div 0.1$  as 16.
  - Describe how Jada's diagram also represents the expression  $160 \div 10$ .

### Synthesis

- Ask selected students to share their reasoning for each problem.
- Display:  $1.6 \div 0.1 = 160 \div 10$
- “How does the first diagram show that this equation is true?” (If each large square is a whole then the number of shaded strips is  $1.6 \div 0.1$  and if each large square is 100



a. What is the value of  $1.3 \div 0.01$ ? Explain or show your reasoning.

### Student Responses

1. a. There is 1 whole square and 6 tenths of another square.  
b. There are 16 vertical strips and each one is 0.1 of a full square.  
c. It's 16 because the diagram shows that there are sixteen 0.1s in 1.6.  
d. There are 160 small pieces altogether and they are divided into 16 groups of 10.
2. There is 1 whole and 3 tenths of another whole so that's 1.3. All the small squares are hundredths.  
a. There are 130 small pieces making up the total and each one is one hundredth or 0.01. That means  $1.3 \div 0.01 = 130$ .

then the number of those strips is  $160 \div 10$ . The same diagram represents both expressions so they are equal.)

- Display:  $1.3 \div 0.01 = 130 \div 1$
- "How does the second diagram show that this equation is true?" (If each large square is a whole then the number of small pieces represents  $1.3 \div 0.01$  and if each large square is 100 then the number of small pieces represents  $130 \div 1$ .)

## Activity 2

⌚ 20 min

### Divide Decimals by Decimals

#### Standards Alignments

Addressing 5.NBT.B.7

In this activity, students practice finding quotients of decimals divided by 0.1 and 0.01. Students

find the value of different expressions without the scaffold of a diagram. Monitor for these approaches:

- diagrams
- whole number quotient facts
- multiples of the divisor

## ⓘ Access for Students with Disabilities

*Representation: Internalize Comprehension.* Synthesis: Invite students to identify which details were necessary to solve the problem. Display the sentence frame: “The next time I evaluate a division expression containing decimals, I will pay attention to . . . .”

*Supports accessibility for: Conceptual Processing, Attention, Organization*

## Materials to Copy

Small Grids (groups of 1)

## Student-facing Task Statement

Find the value of each expression. Explain or show your reasoning.

- $5 \div 0.1$
- $5 \div 0.01$
- $0.5 \div 0.1$
- $0.5 \div 0.01$
- $0.02 \div 0.01$
- $1.53 \div 0.01$

## Student Responses

50. There are 10 tenths in 1 so there are 50 tenths in 5.
500. There are 100 hundredths in 1 so there are 500 hundredths in 5.
5. There are 5 tenths in 0.5.
50. There are 10 hundredths in one 0.1 so there are 50 hundredths in 0.5.
2. There are 2 hundredths in 0.02.
153. There are 100 hundredths in 1, 50

## Launch

- Groups of 2
- Give students access to Instructional master of grids.

## Activity

- 8 minutes: independent work time
- 2 minutes: partner discussion

## Synthesis

- Display:
 
$$0.5 \div 0.1 = 5$$

$$0.50 \div 0.01 = 50$$
- “How can we use the meaning of decimal place values to explain these equations?” (5 tenths is the same as 50 hundredths so that’s 5 groups of 0.1 or 50 groups of 0.01.)
- “How can we use the meaning of decimal place values to help find the value of  $1.53 \div 0.01$ ?” (The three is in the

hundredths in 0.5, and 3 hundredths in 0.03, so there are 153 hundredths in 1.53.

hundredths place so there are 3 one hundredths in three hundredths. The 5 is in the tenths place and there are 10 hundredths in each tenth so that's 50 more hundredths. There are 100 hundredths in one whole. That's 153 hundredths altogether in 1.53.)

## Lesson Synthesis

⌚ 10 min

"Today we divided a decimal by a decimal and then found lots of quotients involving decimals."

Display:

$$1.25 \div 0.01 = 125$$

"How do we know this equation is true?" (If we multiply the dividend and the divisor by 100, we get  $1.25 \div 0.01 = 125 \div 1$ , which is 125. We can also see that there are 100 hundredths in 1, and 25 hundredths in 0.25, so there are 125 hundredths in 1.25.)

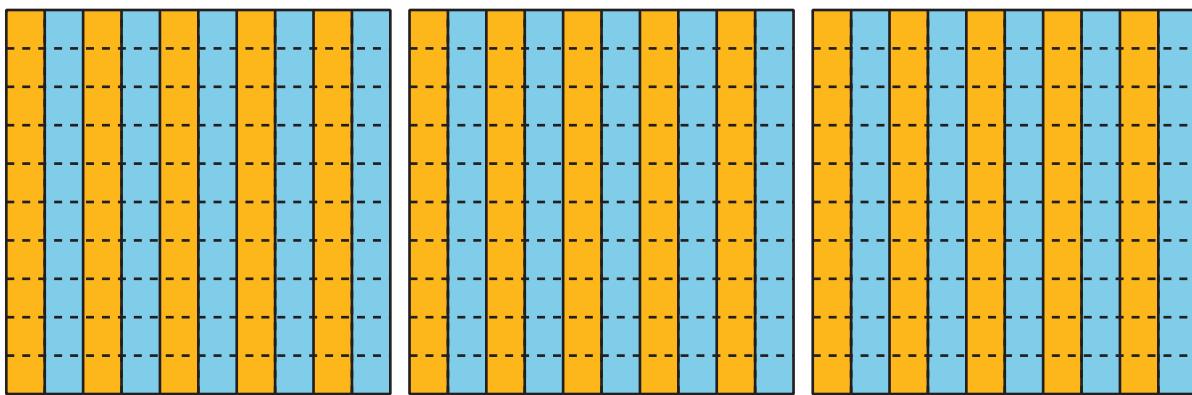
"How is dividing with decimals the same as dividing with whole numbers? How is it different?" (I can use multiplication in both cases. I can draw a diagram in both cases. I use place value in both cases. With decimals I need to think carefully about the meaning of each digit. I think the diagrams are more helpful to get started with decimals to visualize the numbers I am working with.)

### Suggested Centers

- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)
- Would You Rather? (2–5), Stage 2: Compare to Smaller Units (Supporting)

### ✍ Student Section Summary

In this section we learned to divide with decimals. We studied different ways to find a quotient like  $3 \div 0.1$ . We can draw a diagram which shows that there are 10 groups of 0.1 in each whole so there are  $3 \times 10$  or 30 groups of 0.1 in 3 wholes:  $3 \div 0.1 = 30$ .



We can also think about place value. We know 3 is 30 tenths and 0.1 is 1 tenth, so  $3 \div 0.1$  is equivalent to  $30 \div 1$  which has the value 30. We also can use multiplication to find the value of  $3 \div 0.1$ . We know that  $10 \times 0.1 = 1$  and  $30 \times 0.1 = 3$  so this also shows that  $3 \div 0.1 = 30$ .

----- Complete Cool-Down -----

### Response to Student Thinking

Students do not find the correct value of  $1.6 \div 0.01$  or  $2.87 \div 0.01$ .

### Next Day Support

- Create a poster with the steps to solving the cool-down problem from the previous lesson.

# Lesson 26: Book Drive (Optional)

## Standards Alignments

Addressing 5.NBT.A.3, 5.NBT.B.7

### Teacher-facing Learning Goals

- Add and subtract decimals to the hundredths using strategies based on place value.
- Multiply decimals with products resulting in the hundredths using place value reasoning and properties of operations.

### Student-facing Learning Goals

- Let's plan a book sale fundraiser.

## Lesson Purpose

The purpose of this lesson is for students to apply their understanding of working with decimal numbers in an applied context.

This lesson is optional because it does not address any new mathematical content standards. This lesson does provide students with an opportunity to apply precursor skills of mathematical modeling. The purpose of this lesson is for students to build on their previous understanding and experiences with decimal numbers. In this lesson, students plan a school book fair. They consider different categories of books to order and the sale price of the books. They estimate the number of people likely to attend the fair and approximate the amount of money the school can make from sales.

School book fairs are common events in many schools and are often used as fundraisers. Depending on how familiar students are with this context, more or less of an introduction is necessary.

When students think about the variables in a problem, make choices and assumptions, and make estimates, they model with mathematics (MP4).

## Access for:

### Students with Disabilities

- Engagement (Activity 2)

### English Learners

- MLR6 (Activity 1)

## Instructional Routines

Notice and Wonder (Warm-up)

**Lesson Timeline**

Warm-up	10 min
Activity 1	20 min
Activity 2	20 min
Lesson Synthesis	10 min

**Teacher Reflection Question**

Reflect on how comfortable your students are asking questions of you and of each other. What can you do to encourage students to ask questions?

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Notice and Wonder: Books for Sale

**Standards Alignments**

Addressing 5.NBT.A.3

The purpose of this warm-up is to introduce the idea of a book sale, which will be useful when students work with this context in a later activity. While students may notice and wonder many things about these images, the range of and prices and types of books are the important discussion points.

**Instructional Routines**

Notice and Wonder

**Student-facing Task Statement**

What do you notice? What do you wonder?

**Launch**

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

**Activity**

- “Discuss your thinking with your partner.”



- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- “What are some things we have to think about if we plan a book fair for our school?” (The different types of books we sell and have to order, the cost of the books for us, the amount to charge for each book, the number of people who come to the fair, and the number of books that we sell.)

## Student Responses

Students may notice:

- There are a lot of books on a shelf and on tables.
- There are different types of books.
- Some of the books have a bunch of copies.

Students may wonder:

- I wonder if this is a book sale.
- I wonder if all the books cost the same amount.
- I wonder how many books there are.

## Activity 1

⌚ 20 min

### Book Prices

#### Standards Alignments

Addressing 5.NBT.B.7

In this activity students compare two book sale scenarios in which there is a different base price of a book for the fundraiser. Students notice that when you increase the price by a lot, you make more profit per book, but you may also sell fewer books. On the other hand, if you increase the price by less money, you have to sell more books to make the same profit.

## Access for English Learners

*MLR6 Three Reads.* Keep books or devices closed. Display only the problem stem, without revealing the questions. “We are going to read this question 3 times.” After the 1st Read: “Tell your partner what this situation is about.” After the 2nd Read: “List the quantities. What can be counted or measured?” Reveal the question(s). After the 3rd Read: “What strategies can we use to solve this problem?”

*Advances: Reading, Representing*

## Student-facing Task Statement

Two schools buy science books for \$8 from a publisher to sell at their book sale. School A sells the books for \$12. School B sells the books for \$12.90.

1. Who do you think sells more science books? Why?
2. How much profit does each school make if they each sell 35 books?
3. School B sells 10 science books. How many science books does School A have to sell to raise about the same amount of money?

## Student Responses

Sample responses:

1. School A sells more books because the book costs less money and more people are willing to spend the smaller amount than the bigger amount.
2. School A raises \$4 per book  $(12.00 - 8.00 = 4)$  so they raise \$140.00 for 35 books.  
School B raises \$4.90 per book  $(12.90 - 8.00 = 4.9)$  so they raise \$171.50 for 35 books.
3. School B raises \$49.00 from 10 books.  $(10 \times 4.90 = 49.00)$  School A would have to sell 12 or 13 books to raise about the same

## Launch

- Groups of 2
- “When a school plans a book sale fundraiser, the school orders books from the publisher, or bookseller, for a certain price. Then the school sells it for a different price at the book fair.”
- “Let’s imagine the school buys a book for \$10. Should they sell the book for more or less than \$10 at the book fair? Why?” (More if they want to make money from the sale.)
- “This is called the mark-up price. For every book they sell, the bookseller will get \$10 and the school keeps the amount they added. The amount they add is called the profit.”

## Activity

- 1 minute quiet think time
- 5 minutes: group work time
- Monitor for students who consider the profit per book in their justifications.

## Synthesis

- “What is a reasonable mark-up price?”
- “What do you need to consider when deciding a mark-up price?”

amount of money since the profit for each book for School A is \$4 per book and  $12 \times 4 = 48$  and  $13 \times 4 = 51$ .

## Activity 2

⌚ 20 min

Plan a Book Fair

### Standards Alignments

Addressing 5.NBT.B.7

In this activity students plan a school book fair. They choose the types of books to order and the cost for each type of book. They also estimate how many people might come to the book fair and how much money the school might raise through the book sale.

Students will have to make many assumptions in this activity: how many people are coming, how many books each person will buy, and how much to add to the price of the book, to name a few. When students are explicit about assumptions, they model with mathematics (MP4).

### ♿ Access for Students with Disabilities

*Engagement: Develop Effort and Persistence.* Invite students to generate a list of shared expectations for group work. Record responses on a display and keep visible during the activity.

*Supports accessibility for: Language, Social-Emotional Functioning, Organization*

### Student-facing Task Statement

Price list from the publisher:

type of book	price
boxed sets & collections	\$24.95
comic books	\$2.60
science books	\$8.00
chapter books	\$9.99
history books	\$14.49

Plan a book fair:

### Launch

- Groups of 2
- "In this activity, you'll plan a book fair. The table shows the price list of each type of book from the publisher."
- "Sometimes when we plan something like a book fair, we make assumptions. Assumptions are things we think will be true based on our experiences, but they might not always be. For example, we can

type of book	price
audiobooks	\$20.00
activity books	\$4.50
reference books	\$12.00
Spanish language books	\$6.00
biographies	\$6.05

1. Choose 3–5 types of books you want to order.
2. Decide on the mark-up price for each type of book you chose.
3. Estimate the amount of money your school will raise as a profit with your book sale.

Record an estimate that is:

too low	about right	too high

4. Show or explain your reasoning for the estimate. Include the assumptions you made.

## Student Responses

Answers vary. Sample response:

1. Book choices:
  - comic books \$2.60
  - history books \$14.49
  - biographies \$6.05
2. Sale prices:
  - comic books \$4.60
  - history books \$19.99
  - biographies \$8.95
3. too low: \$600  
about right: \$2,450  
too high: \$10,000

make assumptions about who might come to the book fair.”

- “Who might come to the book fair and buy books?” (students, parents, grandparents, friends)
- As you plan the book fair, think about other assumptions you make, how they affect the book fair, and how to communicate them in your work.

## Activity

- 1–2 minutes: quiet think time
- 10–12 minutes: partner work time
- Monitor for students who:
  - Select the types of books based on the kinds of attendees. For example, they select history books because that is something parents want and chapter books which are preferred by students.
  - Make assumptions about the number of attendees and the number of each type of book sold.

## Synthesis

- Invite students to share their book sale plans.
- Invite students to share their assumptions.
- “Why did you make these assumptions?” (There are 600 students, so I thought that maybe only half would come since that is usually what happens. Since the school wants to make a profit, but also make the books affordable, the mark-up price is only one more dollar than the list price.)

## 4. Sample responses:

- Too low: For each book, the school makes at least \$2.00. There are 300 students who bring people. If each group buys 1 book, the school makes at a minimum \$600.
- About right: Maybe every family buys one history book. This is a profit of \$1,350 ( $300 \times 4.50$ ) In addition, half of the families buy comic books, and the other half buys biographies. This means a profit of almost \$750. ( $150 \times 2 + 150 \times 2.90$ ). Let's say there are another 100 attendees and they all buy one book. Half buy history books, one fourth buy comic books, and one fourth buy biographies. This is another \$350 in profit. ( $50 \times 4.50 + 25 \times 2 + 25 \times 2.90 = 347.50$ ) So the total is about \$2,450.

**Lesson Synthesis**

⌚ 10 min

"Today, you planned a book fair and made assumptions to make decisions about the book fair."

"How did the assumptions you made affect your plan or the money raised at the book fair?" (I picked the kinds of books to sell based on the people I thought would come. I assumed everyone who came would buy at least one book. I assumed that half of the students from the school would come. This helped me decide how to price the books so we can raise the most money without making the books too expensive.)

**Suggested Centers**

- Compare (1–5), Stage 6: Add and Subtract Fractions (Supporting)
- Would You Rather? (2–5), Stage 2: Compare to Smaller Units (Supporting)



# Family Support Materials

# Family Support Materials

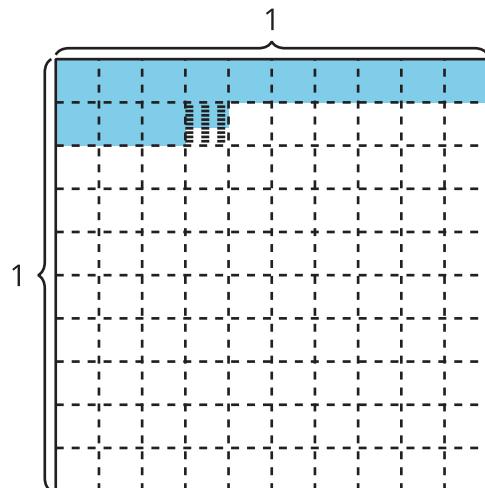
## Place Value Patterns and Decimal Operations

In this unit, students use place value understanding to round, compare, order, add, subtract, multiply, and divide decimals.

### Section A: Numbers to Thousandths

In this section, students are introduced to the thousandths place. They represent decimals on gridded area diagrams where the large square has a value of 1, and each small square within represents  $\frac{1}{100}$ .

Students learn that if they partition each small square into ten equal parts, each of those parts represents 1 thousandth of the large square.



Students write decimals in expanded form using sums of multiplication expressions. For example, 0.124 in expanded form can be written as  $(1 \times \frac{1}{10}) + (2 \times \frac{1}{100}) + (4 \times \frac{1}{1,000})$ .

Students use this developing understanding of place value to the thousandths to locate decimals on a number line. They then use the number line to round, compare, and order decimals.

### Section B: Add and Subtract Decimals

In this section, students add and subtract decimals to the hundredths. Initially, students add and subtract in ways that make sense to them. This allows students to relate addition and subtraction of decimals to operations with whole numbers. Students also use place value reasoning to estimate the value of sums and differences.

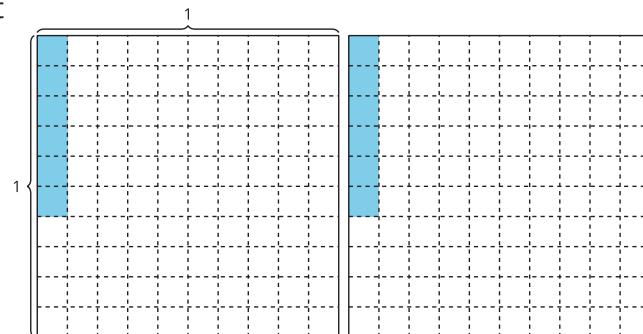
## Section C: Multiply Decimals

In this section, students multiply decimals with products up to hundredths. Students initially multiply decimals in ways that make sense to them. Area diagrams were used to make sense of fraction multiplication in earlier units, and they are used here as a familiar representation to make sense of decimal multiplication. They use the diagrams to relate multiplying with whole numbers to multiplying with decimals.

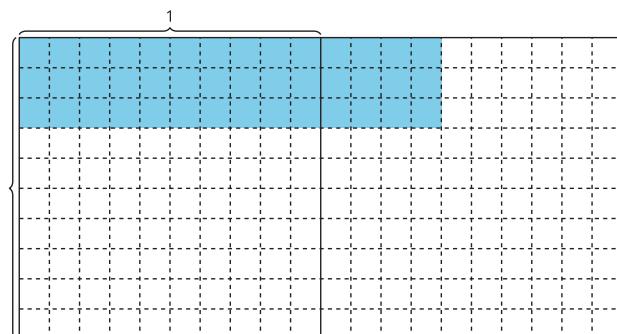
For example, the diagram shown can represent 2 groups of 6 hundredths, or 12 hundredths, which can be written as the equation  $2 \times 0.06 = 0.12$ .

Students may also see this as 2 times 6 groups of 1 hundredth or

$$2 \times 6 \times 0.01 = 12 \times 0.01 = 0.12.$$



To multiply tenths by tenths, students revisit area concepts from previous units. Using area diagrams, they find the area of the shaded region by multiplying side lengths. They use decimal notation to mark the side lengths. The diagram shows how the students would represent  $0.3 \times 1.4$  to arrive at an answer of 0.42.

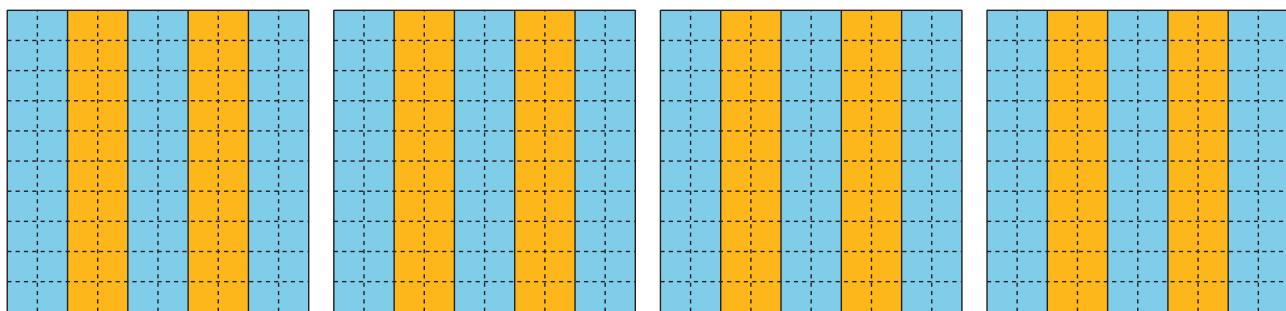


## Section D: Divide Decimals

Just as with whole numbers and fractions, students use the relationship between multiplication and division to make sense of division with decimals. In this section, students consider how many tenths or hundredths are in whole numbers (that is, 10 tenths are in 1 whole, 100 hundredths are in 1 whole). This understanding provides a foundation for students to divide a whole number by any amount of tenths or hundredths. Students learn how to use diagrams to help them solve division problems.

The example shows how students can divide 4 into groups of 2 tenths. There are 20 groups of 2 tenths in 4 wholes.

$$4 \div 0.2 = 20$$



## Try it at home!

Near the end of the unit, ask your student to solve the following problems:

- $1.8 \times 0.2$
- $12.1 \div 1.1$

Questions that may be helpful as they work:

- Can you draw a diagram to help you solve the problem? How does your diagram show the solution?
- Can you explain the steps of your algorithm?



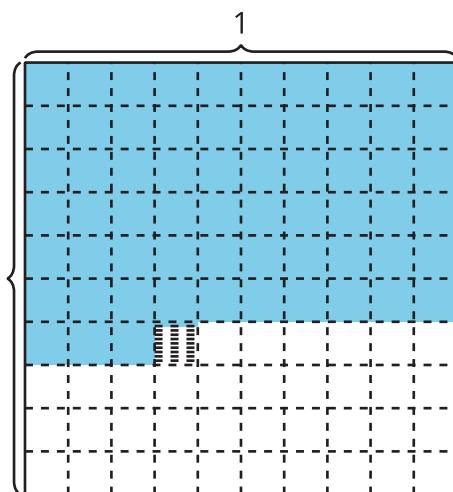
# Unit Assessments

Check Your Readiness A, B, C and D  
End-of-Unit Assessment

# Place Value Patterns and Decimal Operations: Section A Checkpoint

1. Select all representations of 0.631.

A.



B. Six hundred thirty-one hundredths

C.  $(3 \times 0.1) + (6 \times 0.01) + (1 \times 0.001)$

D.  $\frac{631}{1,000}$

E. Six hundred thirty-one thousandths

2. Order the following decimals from least to greatest.

0.439      0.394      0.441      0.531      0.342

---

3. What is 13.728 rounded to the nearest tenth? What about to the nearest hundredth? Explain or show your reasoning. Use the number line if it is helpful.

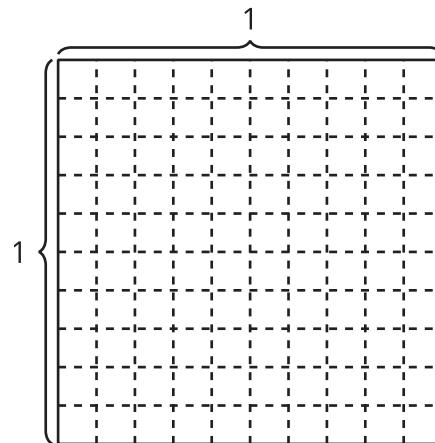


## Place Value Patterns and Decimal Operations: Section B Checkpoint

1. Priya ran 1.9 miles on Saturday, and 2.34 miles on Sunday. How many miles did she run altogether? Explain or show your reasoning.
2. Find the value of each expression. Explain or show your reasoning.
  - a.  $12.1 + 5.77$
  - b.  $1 - 0.15$
  - c.  $38.12 - 27.3$

# Place Value Patterns and Decimal Operations: Section C Checkpoint

1. Find the value of the expression  $0.3 \times 0.5$ . Explain or show your reasoning. Use the grid if it is helpful.

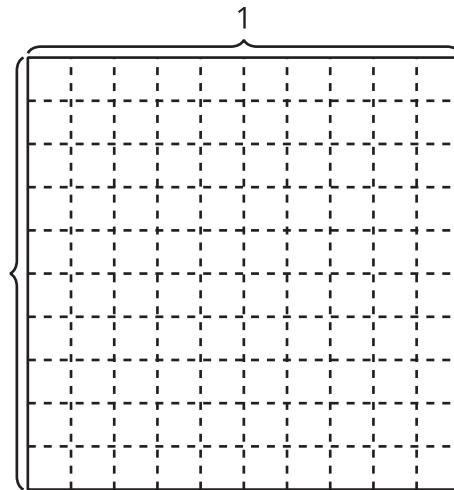


2. To find the value of  $0.28 \times 37$  Andre calculates  $28 \times 37$  and then multiplies by 0.01. Explain or show why Andre's strategy works and use it to find the value of  $0.28 \times 37$ .

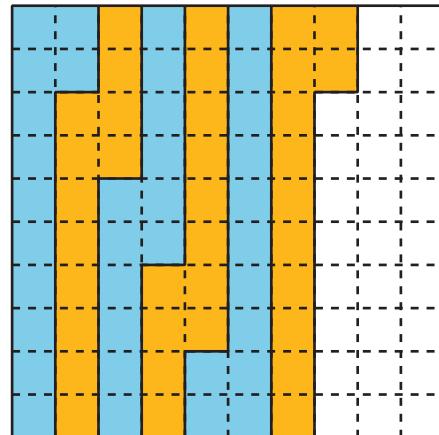
3. Find the value of the expression  $2.1 \times 7.3$ . Explain or show your reasoning.

## Place Value Patterns and Decimal Operations: Section D Checkpoint

1. Find the value of  $1 \div 0.05$ . Use the diagram if it is helpful.



2. a. Explain how the shaded region of the diagram shows  $0.72 \div 6$ .



b. Find the value of  $0.72 \div 6$ .

3. Which expression has the same value as  $84 \div 0.1$ ?

A.  $840 \div 0.01$

B.  $840 \div 10$

C.  $8400 \div 1$

D.  $8.4 \div 0.01$

# Place Value Patterns and Decimal Operations: End-of-Unit Assessment

1. Select **all** correct statements.

- A.  $1.000 = 1$
- B.  $0.99 > 1$
- C.  $1.53 < 1.62$
- D.  $813.8 > 388.1$
- E.  $0.001 = 0.01$
- F.  $0.208 > 0.45$

2. Select **all** correct ways to represent the number 12.085.

- A.  $(1 \times 10) + (2 \times 1) + \left(8 \times \frac{1}{10}\right) + \left(5 \times \frac{1}{100}\right)$
- B.  $(1 \times 10) + (2 \times 1) + \left(8 \times \frac{1}{100}\right) + \left(5 \times \frac{1}{1,000}\right)$
- C. twelve and eighty-five thousandths
- D. twelve and eighty-five hundredths
- E. twelve and eighty-five tenths

3. What is 1.357 rounded to the nearest hundredth? What about to the nearest tenth? To the nearest whole number? Explain or show your reasoning.

4. Find the value of each expression. Explain or show your reasoning.

a.  $613.5 + 7.68$

b.  $64.38 - 17.9$

5. In which number does the 6 represent  $\frac{1}{1,000}$  the value of the 6 in 16.003?

- A. 3
- B. 10.006
- C. 16.004
- D. 16,003

6. Find the value of each expression.

a.  $13.74 + 105.6$

b.  $218.92 - 17.4$

c.  $3 \times 0.6$

d.  $5 \times 0.03$

e.  $0.4 \times 0.5$

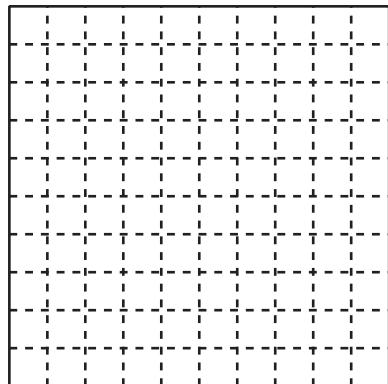
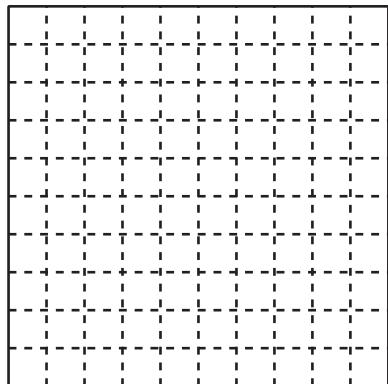
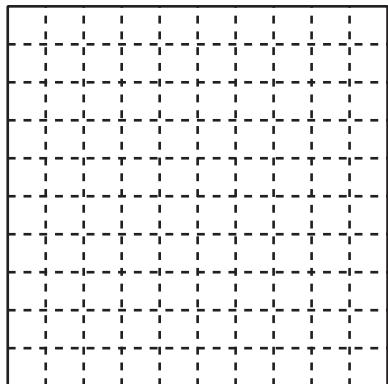
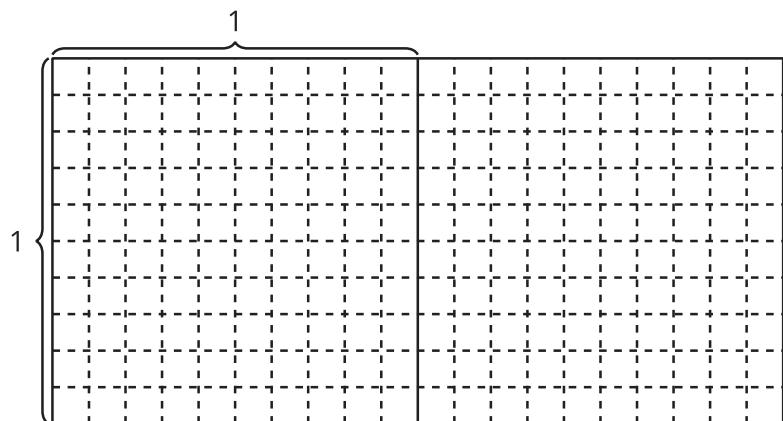
f.  $3.5 \times 0.7$

7. Find the value of each product or quotient. Explain or show your reasoning. Use the grids if they are helpful.

a.  $1.6 \times 0.7$

b.  $3 \div 0.1$

c.  $0.6 \div 4$



8. Find the value of each expression. Explain or show your reasoning.

a.  $999.98 \times 37$

b.  $200.1 - 163.68$

c.  $683 \div 0.02$



# Assessment Answer Keys

Check Your Readiness A, B, C and D  
End-of-Unit Assessment

# Assessment Answer Keys

## Assessment: Section A Checkpoint

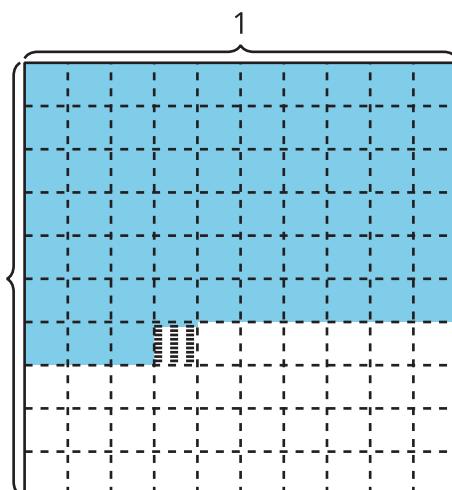
### Problem 1

#### Goals Assessed

- Read, write, and represent decimals to the thousandths place, including in expanded form.

Select **all** representations of 0.631.

A.



B. Six hundred thirty-one hundredths

C.  $(3 \times 0.1) + (6 \times 0.01) + (1 \times 0.001)$

D.  $\frac{631}{1,000}$

E. Six hundred thirty-one thousandths

### Solution

["A", "D", "E"]

## Problem 2

**Goals Assessed**

- Compare, round and order decimals through the thousandths place based on the value of the digits in each place.

Order the following decimals from least to greatest.

0.439      0.394      0.441      0.531      0.342

## Solution

0.342, 0.394, 0.439, 0.441, 0.531

## Problem 3

**Goals Assessed**

- Compare, round and order decimals through the thousandths place based on the value of the digits in each place.

What is 13.728 rounded to the nearest tenth? What about to the nearest hundredth? Explain or show your reasoning. Use the number line if it is helpful.



## Solution

13.7 to the nearest tenth because it is between 13.7 and 13.8 and is closer to 13.7 than to 13.8.

13.73 to the nearest hundredth because it is between 13.72 and 13.73 and is closer to 13.73 than to 13.72.

## Assessment: Section B Checkpoint

### Problem 1

#### Goals Assessed

- Add and subtract decimals to the hundredths using strategies based on place value.

Priya ran 1.9 miles on Saturday, and 2.34 miles on Sunday. How many miles did she run altogether? Explain or show your reasoning.

### Solution

4.24 miles

Sample response:  $1.9 + 2 = 3.9$ ,  $3.9 + 0.3 = 4.2$ ,  $4.2 + 0.04 = 4.24$

### Problem 2

#### Goals Assessed

- Add and subtract decimals to the hundredths using strategies based on place value.

Find the value of each expression. Explain or show your reasoning.

- $12.1 + 5.77$
- $1 - 0.15$
- $38.12 - 27.3$

### Solution

- 17.87. Sample response:  $12.1 + 5 = 17.1$ ,  $17.1 + 0.77 = 17.87$
- 0.85. Sample response:  $0.15 + 0.05 = 0.2$ ,  $0.2 + 0.8 = 1$ ,  $0.05 + 0.8 = 0.85$
- 10.82. Sample response:

$$\begin{array}{r}
 \textcolor{blue}{7} \textcolor{blue}{1} \textcolor{blue}{1} \\
 \textcolor{red}{3} \textcolor{red}{8} \textcolor{red}{.} \textcolor{red}{1} \textcolor{red}{2} \\
 - \textcolor{black}{2} \textcolor{black}{7} \textcolor{black}{.} \textcolor{black}{3} \textcolor{black}{0} \\
 \hline
 1 \textcolor{black}{0} \textcolor{black}{.} \textcolor{black}{8} \textcolor{black}{2}
 \end{array}$$

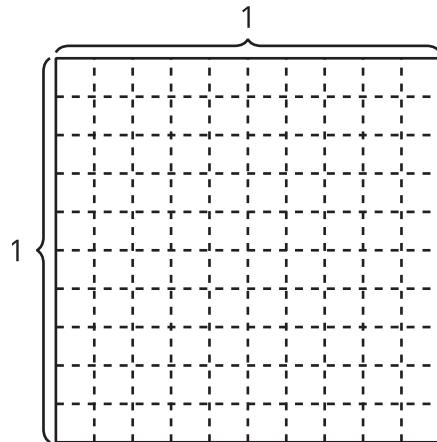
## Assessment: Section C Checkpoint

### Problem 1

#### Goals Assessed

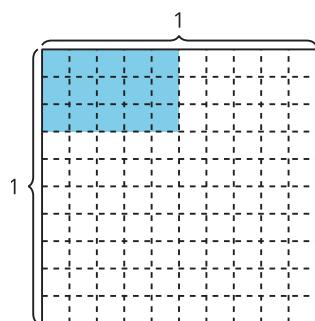
- Multiply decimals with products resulting in the hundredths using place value reasoning and properties of operations.

Find the value of the expression  $0.3 \times 0.5$ . Explain or show your reasoning. Use the grid if it is helpful.



### Solution

0.15. Sample response: There are 15 shaded parts and each one is 0.01.



## Problem 2

### Goals Assessed

- Multiply decimals with products resulting in the hundredths using place value reasoning and properties of operations.

To find the value of  $0.28 \times 37$  Andre calculates  $28 \times 37$  and then multiplies by 0.01. Explain or show why Andre's strategy works and use it to find the value of  $0.28 \times 37$ .

## Solution

10.36. Sample reasoning: Since 0.28 is 28 hundredths, I can multiply 28 and 37 and then multiply that by 0.01. Since  $28 \times 37 = 1,036$ ,  $0.28 \times 37$  is 10.36.

## Problem 3

### Goals Assessed

- Multiply decimals with products resulting in the hundredths using place value reasoning and properties of operations.

Find the value of the expression  $2.1 \times 7.3$ . Explain or show your reasoning.

## Solution

15.33. Sample reasoning: I first found  $21 \times 73$  which is 1,533. Then I multiply that by 0.1 twice since  $2.1 = 21 \times 0.1$  and  $7.3 = 73 \times 0.1$ . That gives 15.33.

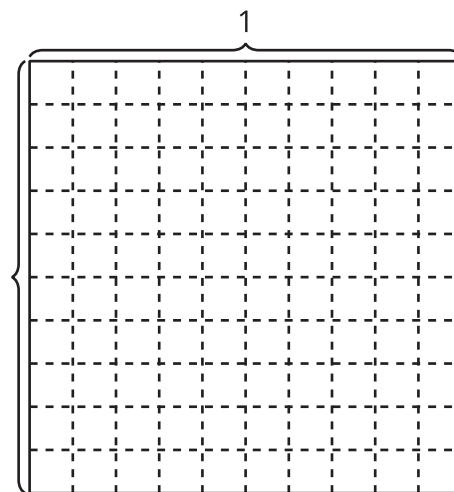
## Assessment: Section D Checkpoint

### Problem 1

#### Goals Assessed

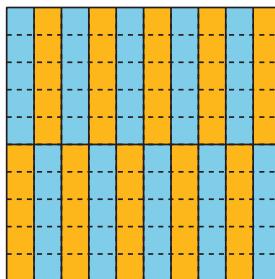
- Divide decimals with quotients resulting in the hundredths using place value reasoning and properties of operations.

Find the value of  $1 \div 0.05$ . Use the diagram if it is helpful.



### Solution

20. Sample response: I filled in the unit square with groups of 0.5 and there are 20 of them.

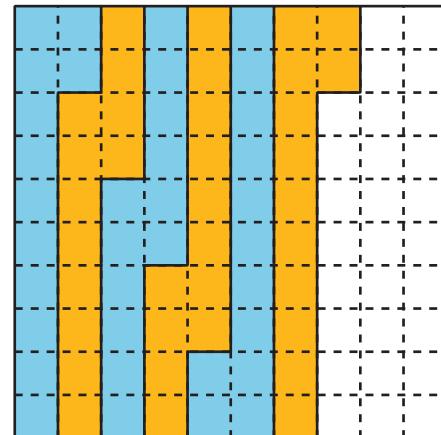


## Problem 2

**Goals Assessed**

- Divide decimals with quotients resulting in the hundredths using place value reasoning and properties of operations.

- Explain how the shaded region of the diagram shows  $0.72 \div 6$ .
- Find the value of  $0.72 \div 6$ .



## Solution

- There is a total of 72 hundredths of the square shaded in the diagram and it is divided into 6 equal groups.
- 0.12 since there are 12 hundredths in each of the groups.

## Problem 3

**Goals Assessed**

- Divide decimals with quotients resulting in the hundredths using place value reasoning and properties of operations.

Which expression has the same value as  $84 \div 0.1$ ?

A.  $840 \div 0.01$

- B.  $840 \div 10$
- C.  $8400 \div 1$
- D.  $8.4 \div 0.01$

**Solution**

D

# Assessment: End-of-Unit Assessment

## Problem 1

### Standards Alignments

Addressing 5.NBT.A.3.b

### Narrative

Students compare decimal numbers. Students may select B if they see the 9s and think this means the quantity 0.99 must be greater than 1. Students may select E if they do not understand place value or think zeros to the right of a decimal can be ignored. Students may select F if they do not pay attention to the decimal and reason that 208 is greater than 45. It is important for students to see inequalities with the smaller number first (as in C) or second (as in D). Students who fail to select both of these may be looking for a particular structure rather than comparing the numbers and reading the inequality.

Select **all** correct statements.

- A.  $1.000 = 1$
- B.  $0.99 > 1$
- C.  $1.53 < 1.62$
- D.  $813.8 > 388.1$
- E.  $0.001 = 0.01$
- F.  $0.208 > 0.45$

## Solution

["A", "C", "D"]

## Problem 2

### Standards Alignments

Addressing 5.NBT.A.3.a

**Narrative**

Students identify different ways to write a decimal number, including expanded form and word form. Students who select both A and D may have misread the number as 12.85 or they require further work understanding the meaning of the different place values. Students who select E also need further work understanding place value.

Select **all** correct ways to represent the number 12.085.

- A.  $(1 \times 10) + (2 \times 1) + \left(8 \times \frac{1}{10}\right) + \left(5 \times \frac{1}{100}\right)$
- B.  $(1 \times 10) + (2 \times 1) + \left(8 \times \frac{1}{100}\right) + \left(5 \times \frac{1}{1,000}\right)$
- C. twelve and eighty-five thousandths
- D. twelve and eighty-five hundredths
- E. twelve and eighty-five tenths

**Solution**

["B", "C"]

**Problem 3****Standards Alignments**

Addressing 5.NBT.A.4

**Narrative**

Students round a decimal number to the nearest hundredth, tenth, and one. They may draw number lines to help reason but number lines are not provided so the expectation is that students will use their understanding of place value to solve the problem.

What is 1.357 rounded to the nearest hundredth? What about to the nearest tenth? To the nearest whole number? Explain or show your reasoning.

**Solution**

1.36 to the nearest hundredth since 1.357 is between 1.35 and 1.36 and is closer to 1.36 than to 1.35.

1.4 to the nearest tenth since 1.357 is between 1.3 and 1.4 and is closer to 1.4 than to 1.3.

1 to the nearest whole number since 1.357 is between 1 and 2 and is closer to 1 than to 2.

**Problem 4****Standards Alignments**

Addressing 5.NBT.B.7

**Narrative**

Students add and subtract decimal numbers to the hundredth. The numbers are too complex for drawings to be a helpful strategy and the expectation is that students will use the standard algorithm or perhaps expanded form and their understanding of place value. If students use the standard algorithm, they will need to be careful to add or subtract the correct place values since in each case, one decimal is given in tenths and the other is given in hundredths.

Find the value of each expression. Explain or show your reasoning.

a.  $613.5 + 7.68$

b.  $64.38 - 17.9$

**Solution**

a.

$$\begin{array}{r}
 & 1 & 1 \\
 & 6 & 1 & 3. & 5 & 0 \\
 + & & & 7. & 6 & 8 \\
 \hline
 & 6 & 2 & 1. & 1 & 8
 \end{array}$$

I grouped ten tenths to make a one and ten ones to make a ten.

b.

$$\begin{array}{r}
 & 13 \\
 & 5 & \cancel{3} & 13 \\
 & \cancel{6} & \cancel{4} & \cancel{3} & 8 \\
 - & 1 & 7. & 9 & 0 \\
 \hline
 & 4 & 6. & 4 & 8
 \end{array}$$

I needed to decompose a one to make ten tenths and a ten to make ten ones and then I could subtract.

### Problem 5

#### Standards Alignments

Addressing 5.NBT.A.1

#### Narrative

Students use their understanding of place value to identify the value of digits in different numbers. Students who select A have likely noticed that there is a 3 in the thousandths place of 16.003 and have not read the question carefully. Students who select C have likely added  $\frac{1}{1,000}$  to 16.003.

Students who select D have not read the question carefully or have possibly multiplied 16.003 by 1,000.

In which number does the 6 represent  $\frac{1}{1,000}$  the value of the 6 in 16.003?

- A. 3
- B. 10.006
- C. 16.004
- D. 16,003

### Solution

B

### Problem 6

#### Standards Alignments

Addressing 5.NBT.B.7

#### Narrative

Students find sums, differences, and products of decimals. No explanation is requested as students have many opportunities to explain their reasoning in other items. The goal of this item is to assess fluency. If students struggle with some of the operations, then a closer look is in order at

their responses to the items on the corresponding operation which ask for reasoning. It could be that students understand how to perform the operations but have not been careful or it could be that they need more work with one or more of the operations.

Find the value of each expression.

- a.  $13.74 + 105.6$
- b.  $218.92 - 17.4$
- c.  $3 \times 0.6$
- d.  $5 \times 0.03$
- e.  $0.4 \times 0.5$
- f.  $3.5 \times 0.7$

**Solution**

- a. 119.34
- b. 201.52
- c. 1.8
- d. 0.15
- e. 0.2
- f. 2.45

**Problem 7**

### **Standards Alignments**

Addressing 5.NBT.B.7

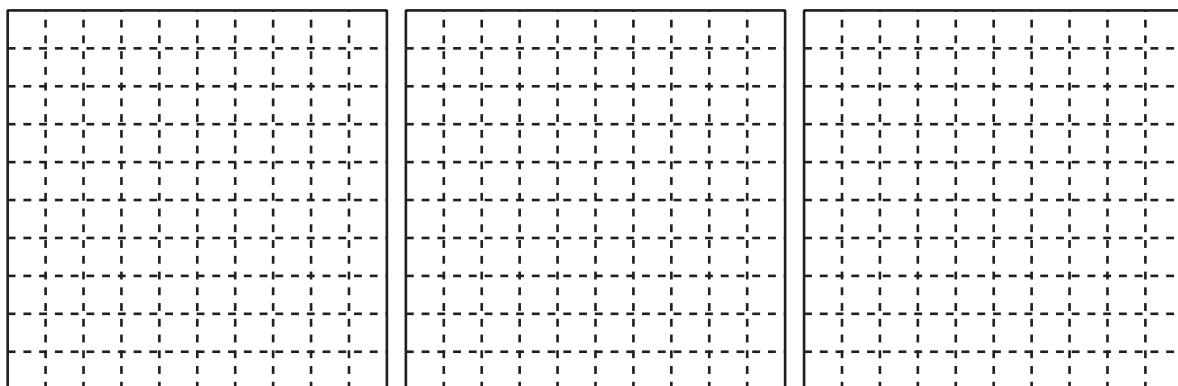
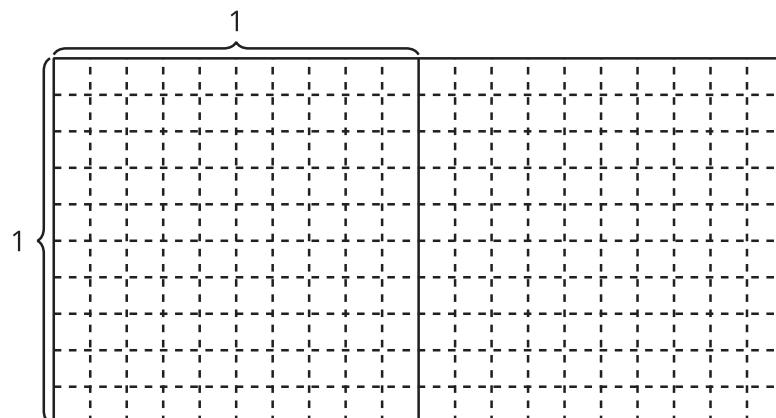
### **Narrative**

Students find products and quotients involving decimal numbers. They may draw pictures, using the provided hundredths grids for example, or they may use place value reasoning and whole number arithmetic.

Find the value of each product or quotient. Explain or show your reasoning. Use the grids if they are helpful.

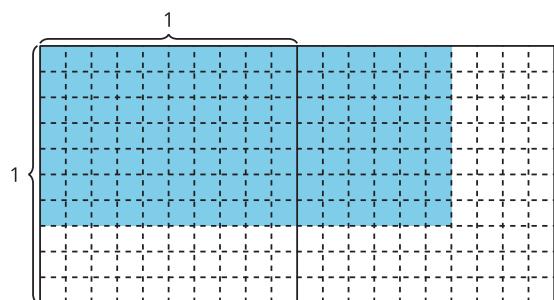
- a.  $1.6 \times 0.7$
- b.  $3 \div 0.1$

c.  $0.6 \div 4$



**Solution**

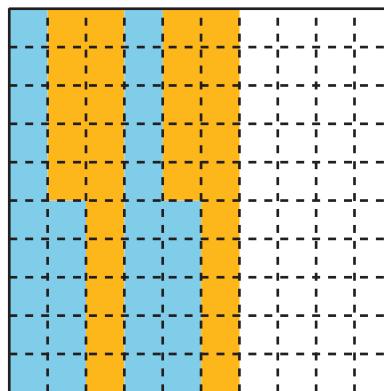
a.



Each shaded part is  $\frac{1}{100}$  or 0.01. The number of shaded parts is  $16 \times 7$ . That makes 112 so that's 1.12.

b. 30. There are ten 0.1s in each whole so there are 30 in 3.

c. 0.15, I made 4 equal groups from 6 tenths. There is 1 tenth in each group and half of another tenth or 5 hundredths.



### Problem 8

#### Standards Alignments

Addressing 5.NBT.B.7

#### Narrative

Students apply all 4 operations to complex decimal numbers. In each case, understanding of place value and operations will be important in order to calculate efficiently. For the first problem, a good strategy is compensation. The subtraction problem can be done subtracting by place value but because of all the zeros there will be a lot of decomposing units. Adding on is an efficient strategy for this problem. The division problem can be turned into a multiplication problem by recognizing that there are 50 groups of 0.02 in 1. Alternatively, students might reason that the quotient has the same value as  $68,300 \div 2$ .

By the end of the year, students should be able to think productively about these problems, understand the reasoning involved in solving them, and devise a strategy to solve them.

Find the value of each expression. Explain or show your reasoning.

- $999.98 \times 37$
- $200.1 - 163.68$
- $683 \div 0.02$

#### Solution

a.  $36,999.26$ ,  $999.98 = 1,000 - 0.02$  so  $999.98 \times 37 = (1,000 \times 37) - (0.02 \times 37)$ . That's  $37,000 - 0.74$  which is  $36,999.26$ .

- b. 36.42. I added 36.32 to 163.68 to get 200 and then 0.1 more.
- c. 34,150. I know that there are 5 groups of 0.02 in 0.1 and 50 groups of 0.02 in 1. So in 683 there are  $683 \times 50$ . I found the product and it's 34,150.



# Lesson Cool Downs

# Lesson 1: What is One Thousandth?

## Cool Down: Journal Prompt: One Thousandth

What did you learn about 1 thousandth? What do you still wonder about 1 thousandth?

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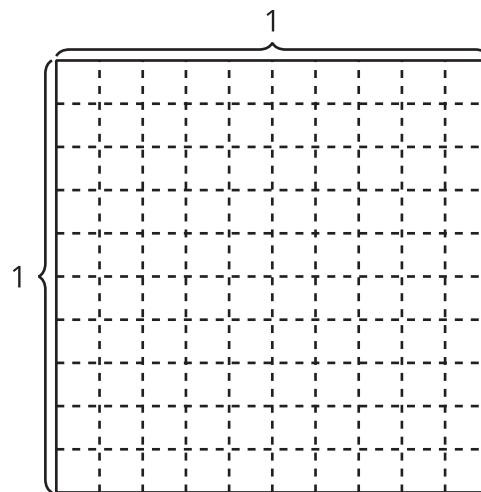
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## Lesson 2: Thousandths on Grids and in Words

### Cool Down: Shading Thousandths

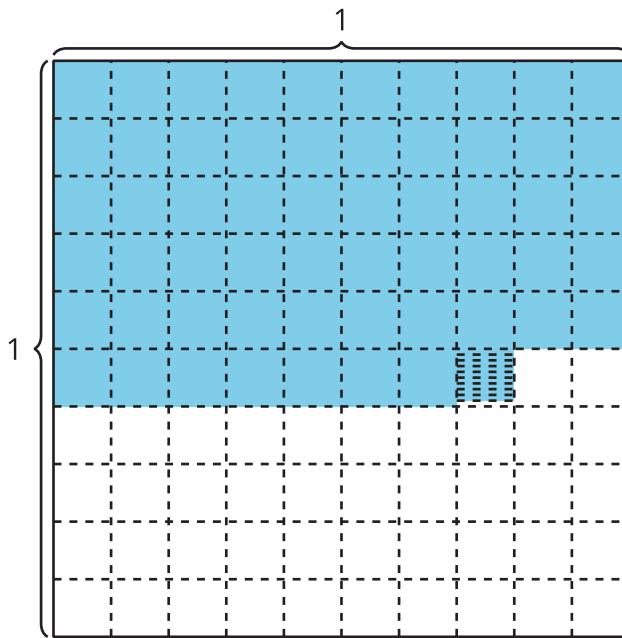
1. Shade the grid to represent 0.149.
2. What is another way you could represent 0.149?



# Lesson 3: Thousandths in Expanded Form

## Cool Down: Different Ways to Write a Decimal Number

The shaded region of the diagram shows a number.



1. Write the number as a decimal.
2. Write the number as a fraction.
3. Write the number in expanded form.
4. Write the number in word form.

# Lesson 4: Explore Place Value Relationships

## Cool Down: Worth its Weight in Gold

A gold nugget balances with 2 one hundredth ounce weights and 6 one thousandth ounce weights.

1. What is the weight of the nugget? Write your answer as a decimal.

2. What is a different set of weights that will balance the nugget?

# Lesson 5: Compare Decimals

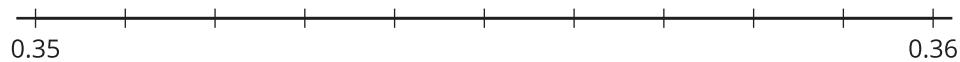
## Cool Down: Compare Decimals

Lin threw the frisbee 5.09 meters. Andre threw the frisbee 5.1 meters. Who threw the frisbee farther? Explain or show your reasoning.

# Lesson 6: Compare Decimals on the Number Line

## Cool Down: Locate, Label, and Compare Numbers

1. Locate and label 0.355 and 0.359 on the number line.



2. Which is greater, 0.355 or 0.359? Explain or show your reasoning.

# Lesson 7: Round Doubloons

## Cool Down: A Golden Dollar

A one-dollar gold coin weighs 1.672 grams.

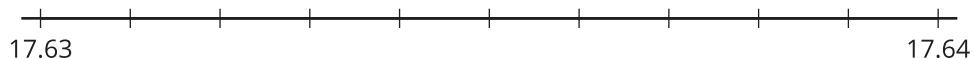
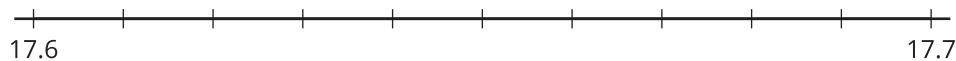
1. A scale reads to the nearest tenth of a gram. What will the scale give for the weight of this coin?
2. A different scale reads to the nearest hundredth of a gram. What will the scale give for the weight of this coin?

# Lesson 8: Round Decimals

## Cool Down: Round to the Nearest Tenth and Thousandth

1. Round 17.637 to the nearest tenth. Use the number lines if they are helpful.

2. Round 17.637 to the nearest hundredth. Use the number lines if they are helpful.



# **Lesson 9: Order Decimals**

## **Cool Down: Order the Decimals**

Write these numbers in order from least to greatest: 565.4, 556.040, 565.004

# Lesson 10: Solve Problems with Decimals

## Cool Down: Luge Rider

A luge rider finished a race in 49.256 seconds. Determine the time rounded to the nearest tenth and hundredth of a second.

# Lesson 11: Make Sense of Decimal Addition

## Cool Down: The Value of the Sum

What is the value of  $1.20 + 0.13$ ? Explain or show your reasoning.

# Lesson 12: Estimate and Add

## Cool Down: Sums of Decimals

Find the value of  $3.45 + 21.6$ . Explain or show your reasoning.

# Lesson 13: Analyze Addition Mistakes

## Cool Down: What is the Error?

The calculation below has an error.

$$\begin{array}{r} 1 \ 1 \\ 3 \ 8. \ 7 \\ + \ 9. \ 4 \ 6 \\ \hline 1 \ 3. \ 3 \ 3 \end{array}$$

1. Explain the error.
2. Find the correct value of  $38.7 + 9.46$ .

# Lesson 14: Make Sense of Decimal Subtraction

## Cool Down: Subtract

Find the value of  $3.57 - 1.4$ . Explain or show your reasoning.

# Lesson 15: Estimate and Subtract

## Cool Down: Subtract Decimals

Find the value of  $321.87 - 20.4$ . Explain or show your reasoning.

# Lesson 16: Addition and Subtraction

## Cool Down: Add and Subtract Decimals

1. Find the value of each expression. Show or explain your reasoning.

a.  $75.2 - 4.37$

b.  $236.87 + 5.15$

# Lesson 17: Multiply Decimals and Whole Numbers

## Cool Down: Multiply a Decimal by a Whole Number

Find the value of each expression. Explain or show your reasoning.

1.  $2 \times 0.4$

2.  $4 \times 0.03$

# Lesson 18: Use Whole Number Facts

## Cool Down: Fill in the Blank

Fill in the blank to make each equation true.

$$1. \quad 5 \times 0.3 = 5 \times 3 \times \underline{\hspace{1cm}}$$

$$2. \quad 5 \times 0.03 = 5 \times \underline{\hspace{1cm}} \times 0.01$$

$$3. \quad 5 \times 0.03 = \underline{\hspace{1cm}}$$

# Lesson 19: Use Properties to Multiply Decimals

## Cool Down: Interpret Expressions

1. Select **all** the expressions that are equivalent to  $15 \times 0.19$ .

- A.  $15 \times 19 \times 0.01$
- B.  $(15 \times 0.1) + (15 \times 0.09)$
- C.  $15 \times 19 \times 0.1$
- D.  $(15 \times 0.2) - (15 \times 0.01)$

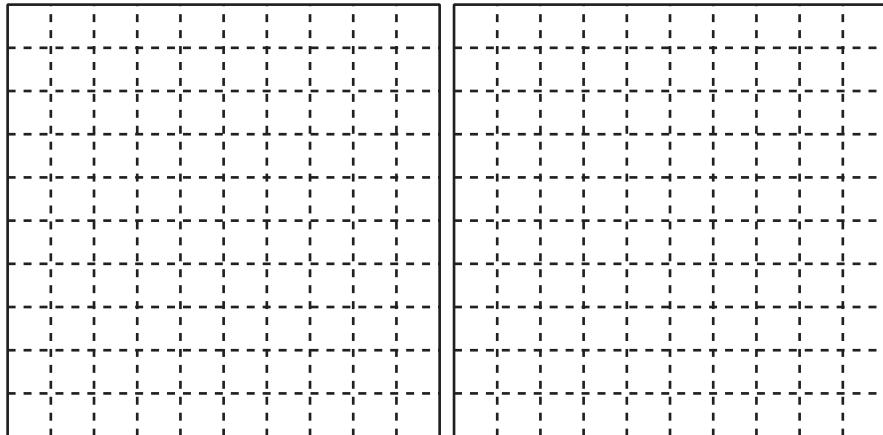
2. Choose one expression to find the value of  $15 \times 0.19$ .

# Lesson 20: Products in the Hundredths Place

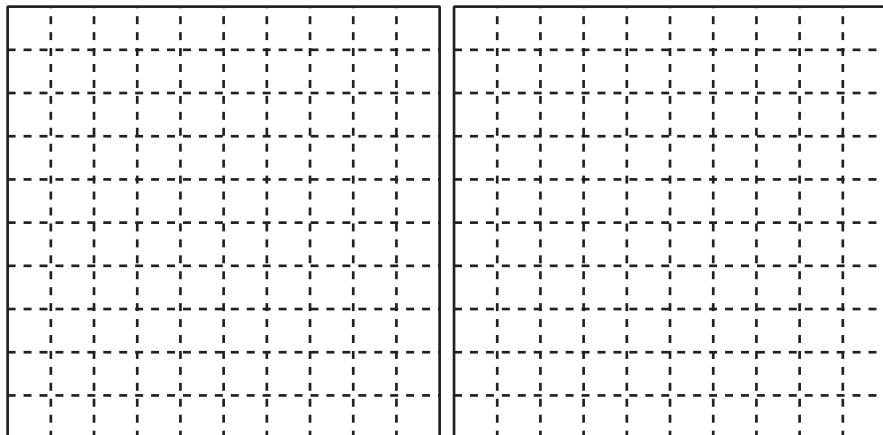
## Cool Down: Tenths

Find the value of each expression. Use the diagrams if they are helpful.

1.  $0.3 \times 0.6$



2.  $1.3 \times 0.6$



# Lesson 21: Multiply More Decimals

## Cool Down: Explain Why Expressions are Equal

1. Explain why  $2.5 \times 6.4$  and  $(25 \times 64) \times 0.01$  are equal.

2. Find the value of  $2.5 \times 6.4$ .

# Lesson 22: Divide Whole Numbers by 0.1 and 0.01

## Cool Down: Many Tenths and Hundredths

Find the value of each expression. Explain or show your reasoning.

1.  $7 \div 0.1$

2.  $7 \div 0.01$

# Lesson 23: Divide Whole Numbers by Decimals

## Cool Down: Divide Whole Numbers by Decimals

Find the value of each expression. Explain or show your reasoning.

1.  $12 \div 0.5$

2.  $13 \div 0.02$

# Lesson 24: Divide Decimals by Whole Numbers

## Cool Down: Divide Decimals by Whole Numbers

Find the value of each expression. Explain or show your reasoning.

1.  $0.9 \div 3$

2.  $0.09 \div 3$

3.  $0.8 \div 5$

# Lesson 25: Divide Decimals by Decimals

## Cool Down: Divide by Decimals

Find the value of each expression. Explain or show your reasoning.

1.  $1.6 \div 0.01$

2.  $2.87 \div 0.01$



# Instructional Masters

# Instructional Masters for Place Value Patterns and Decimal Operations

address	title	students written per copy	requires cutting?	card stock recommended?	color paper recommended?
Activity Grade5.5.11.2	Target Numbers Stage 8 Recording Sheet	1	yes	no	no
Center	Target Numbers Stage 8 Recording Sheet	1	yes	no	no
Activity Grade5.5.19.1	Decimal Multiplication Expression Card Sort	2	no	yes	no
Activity Grade5.5.1.1	Small Grids	1	yes	yes	no
Activity Grade5.5.5.1	Small Grids	1	yes	yes	no
Activity Grade5.5.5.2	Small Grids	1	yes	yes	no
Activity Grade5.5.14.1	Small Grids	1	yes	yes	no
Activity Grade5.5.17.1	Small Grids	1	yes	yes	no
Activity Grade5.5.17.2	Small Grids	1	yes	yes	no
Activity Grade5.5.20.1	Small Grids	1	yes	yes	no
Activity Grade5.5.20.2	Small Grids	1	yes	yes	no
Activity Grade5.5.22.1	Small Grids	1	yes	yes	no

Activity Grade5.5.22.2	Small Grids	1	yes	yes	no	no
Activity Grade5.5.23.1	Small Grids	1	yes	yes	no	no
Activity Grade5.5.23.2	Small Grids	1	yes	yes	no	no
Activity Grade5.5.24.1	Small Grids	1	yes	yes	no	no
Activity Grade5.5.25.2	Small Grids	1	yes	yes	no	no
Activity Grade5.5.14.2	Target Numbers Stage 9 Recording Sheet	1	yes	no	no	no
Center	Target Numbers Stage 9 Recording Sheet	1	yes	no	no	no
Center	Mystery Number Stage 5 Gameboard	2	no	no	no	no
Center	Greatest of Them All Stage 3 Recording Sheet	1	yes	no	no	no
Center	Get Your Numbers in Order Stage 3 and 4 Gameboard	2	yes	no	no	no
Center	Fraction Cards Grade 4	2	no	no	yes	no
Center	Fraction Cards Grade 3	2	no	no	yes	no
Center	Tic Tac Round Stage 3 Gameboard	2	yes	no	no	no
Center	Tic Tac Round Stage 3 Spinner	2	no	no	no	no
Center	Greatest of Them All Stage 4 Recording Sheet	1	yes	no	no	no
Center	Jump the Line Stage 2 Spinner	2	no	no	no	no
Center	Jump the Line Stage 2 Gameboard	2	yes	no	no	no

Center	Mystery Number Stage 6 Gameboard	2	no	no	no	no	no
Center	Get Your Numbers in Order Stage 5 Gameboard	2	yes	no	no	no	no
Center	How Close? Stage 7 Recording Sheet	1	yes	no	no	no	no
Center	How Close? Stage 8 Recording Sheet	1	yes	no	no	no	no
Center	Jump the Line Stage 3 Spinner	2	no	no	no	no	no
Center	Jump the Line Stage 3 Gameboard	2	yes	no	no	no	no
Center	Compare Stage 4 Division Cards	2	no	yes	no	no	no
Center	Compare Stage 3-8 Directions	2	yes	no	no	no	no
Center	Compare Stage 3-8 Directions	2	yes	no	no	no	no
Center	Compare Stage 6 Cards	2	no	yes	no	no	no
Center	Would You Rather Stage 2 Spinner	2	no	no	no	no	no
Center	Would You Rather Stage 2 Recording Sheet	2	no	no	no	no	no

## Target Numbers Stage 8 Recording Sheet

### Directions:

- On your turn:
  - Start at 0. Roll the number cube. Choose whether to add that number of tenths or hundredths to your starting number.
  - Write an equation to represent the sum.
- Take turns until you've played 6 rounds.
- Each round, the sum from the previous equations becomes the starting number in the new equation.
- The partner to get a sum closest to 1 without going over wins.

## Target Numbers Stage 8 Recording Sheet

### Directions:

- On your turn:
  - Start at 0. Roll the number cube. Choose whether to add that number of tenths or hundredths to your starting number.
  - Write an equation to represent the sum.
- Take turns until you've played 6 rounds.
- Each round, the sum from the previous equations becomes the starting number in the new equation.
- The partner to get a sum closest to 1 without going over wins.

# Decimal Multiplication Expression Card Sort

Decimal Multiplication Card Sort

$$(4 \times 4) - (4 \times 0.5)$$

Decimal Multiplication Card Sort

$$(4 \times 3) + (4 \times 0.5)$$

Decimal Multiplication Card Sort

$$4 \times 35 \times 0.1$$

Decimal Multiplication Card Sort

$$2 \times 2 \times 3.5$$

Decimal Multiplication Card Sort

$$35 \times 4 \times 0.01$$

Decimal Multiplication Card Sort

$$(35 \times 4) \div 100$$

Decimal Multiplication Card Sort

$$(4 \times 0.3) + (4 \times 0.05)$$

Decimal Multiplication Card Sort

$$(4 \times 3) + (4 \times 0.9)$$

Decimal Multiplication Card Sort

$$(4 \times 4) - (4 \times 0.1)$$

Decimal Multiplication Card Sort

$$4 \times 39 \times 0.1$$

Decimal Multiplication Card Sort

**A.**  $4 \times 3.5$

**B.**  $4 \times 0.35$

Decimal Multiplication Card Sort

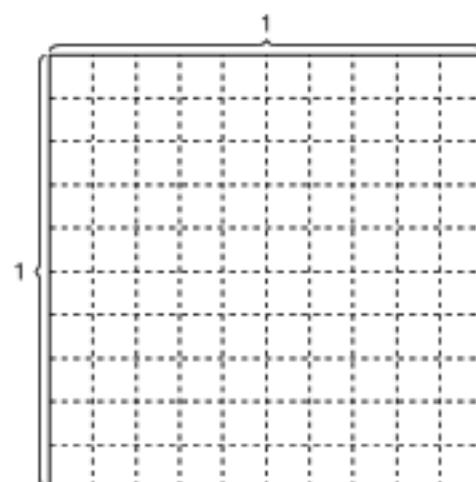
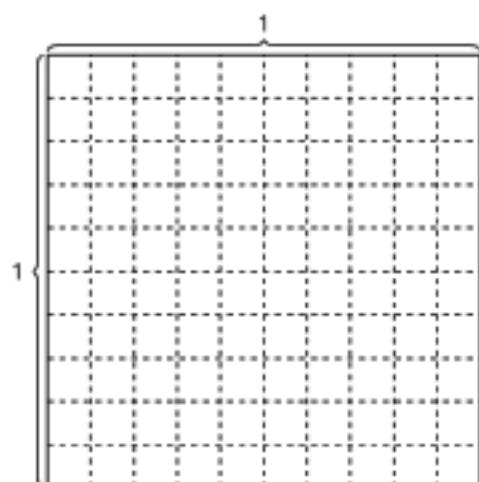
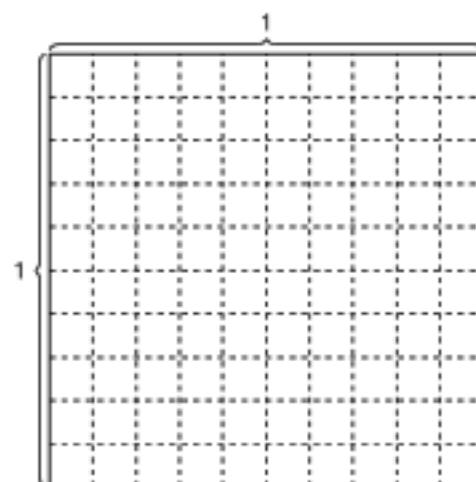
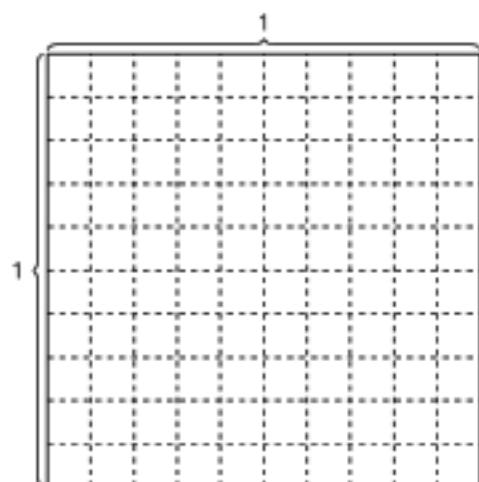
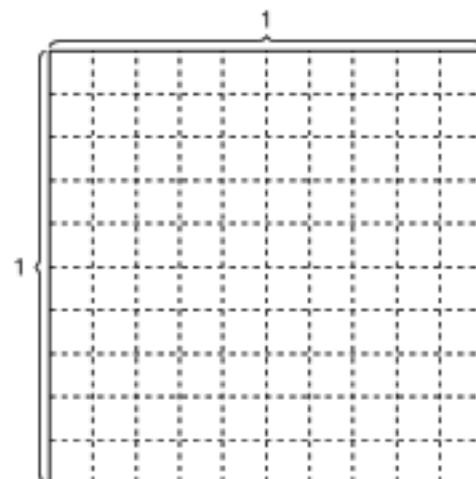
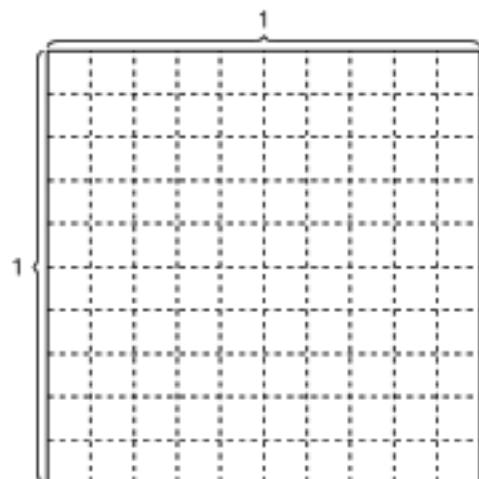
**C.**  $4 \times 3.9$

Decimal Multiplication Card Sort

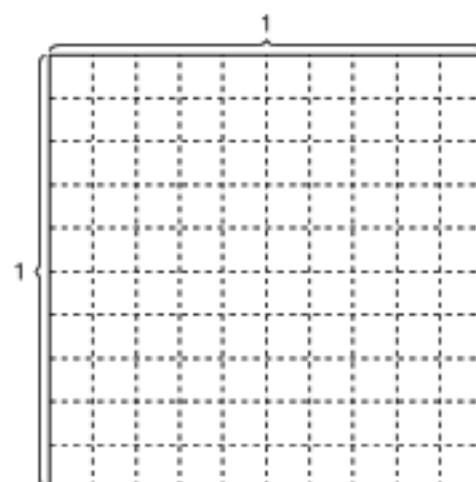
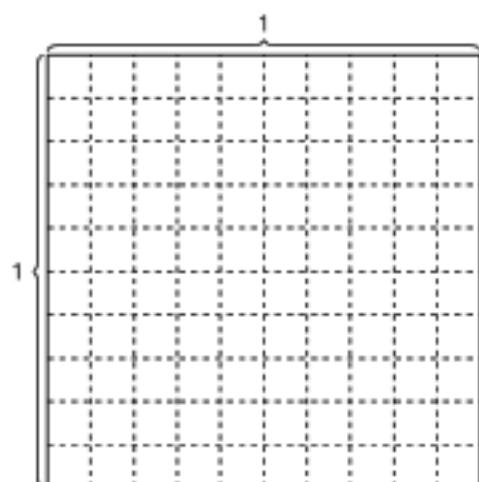
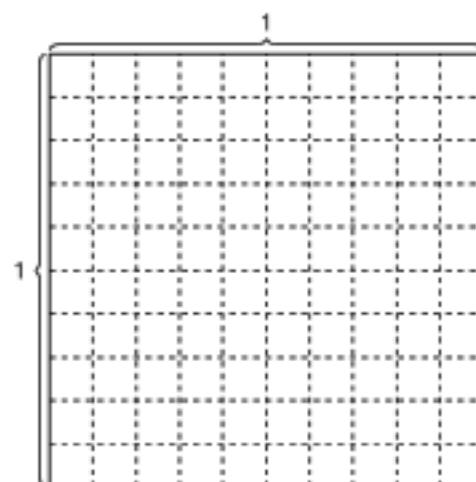
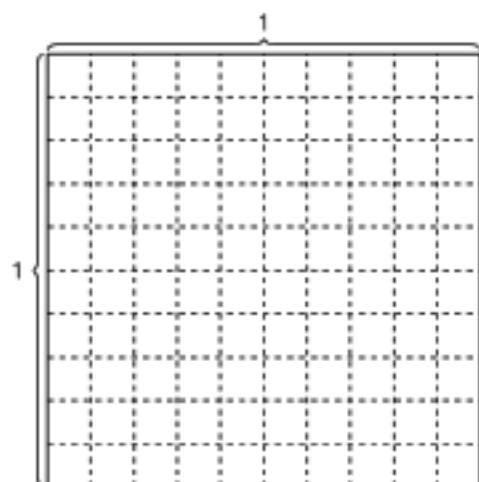
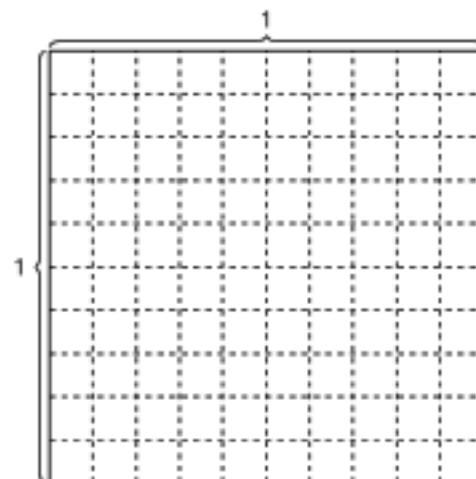
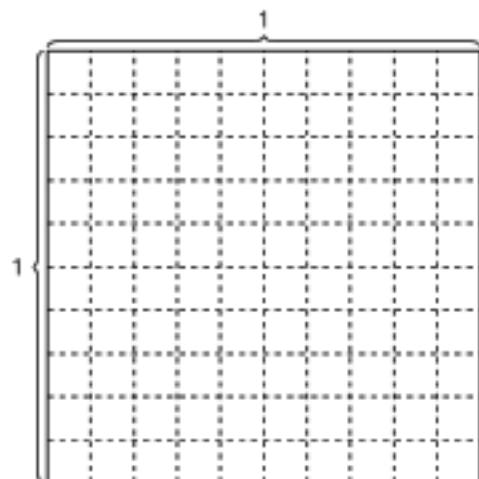
Decimal Multiplication Card Sort

Decimal Multiplication Card Sort

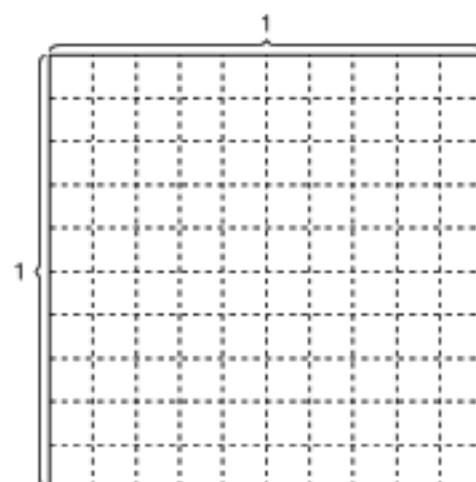
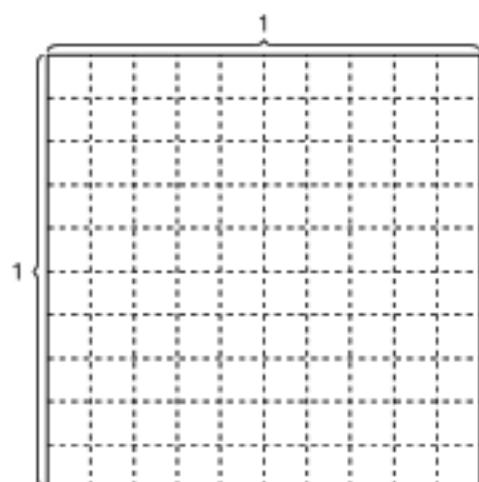
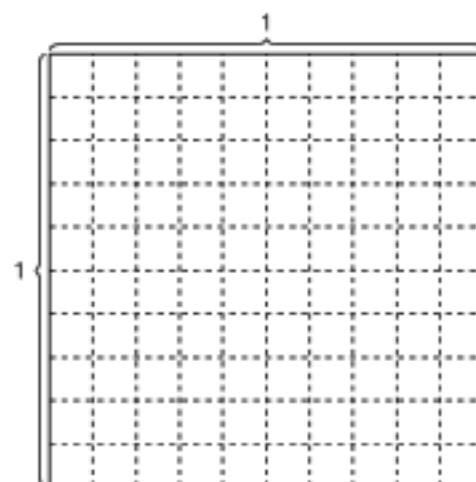
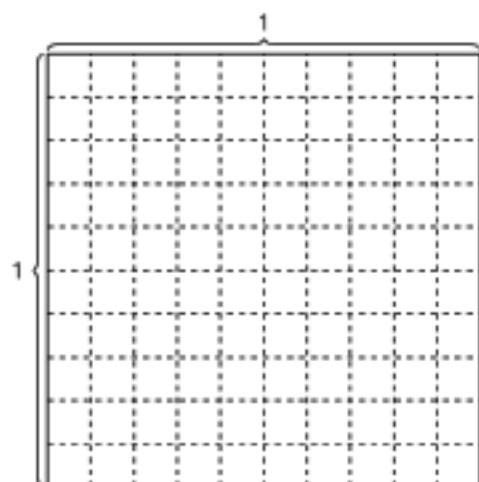
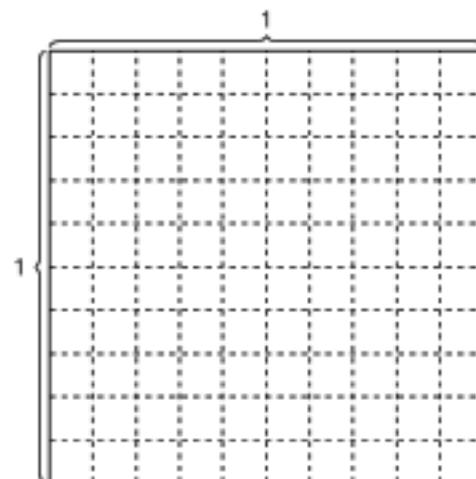
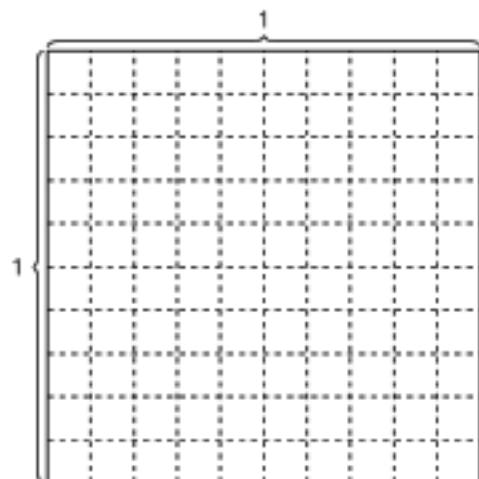
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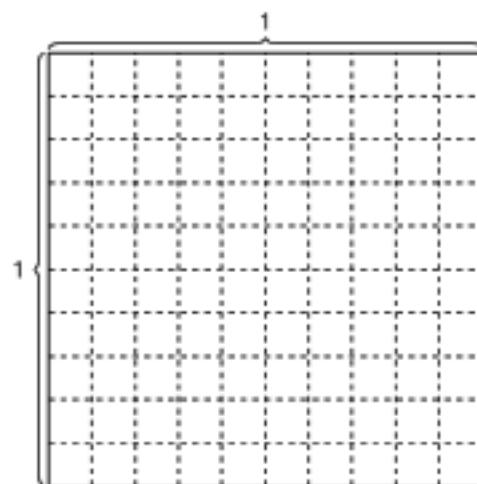
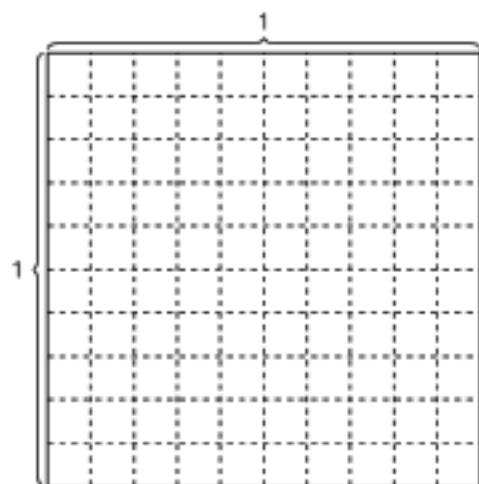
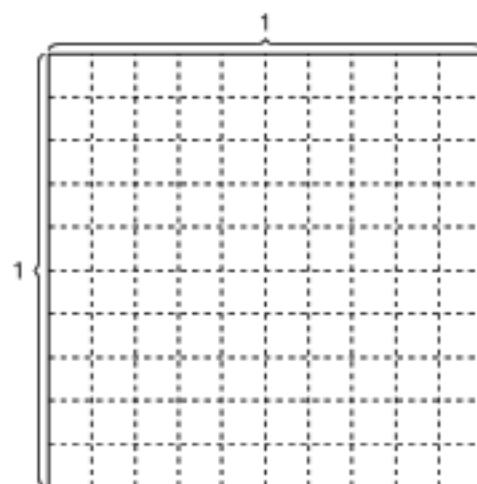
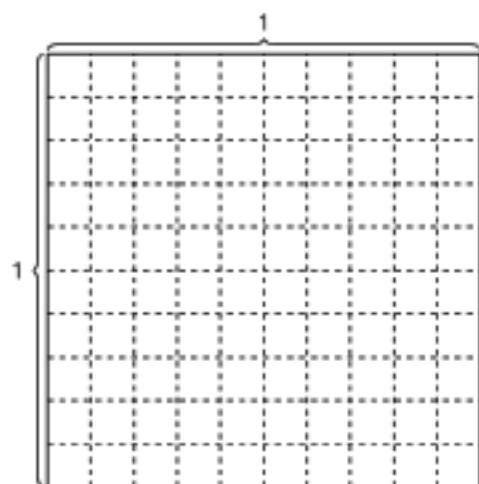
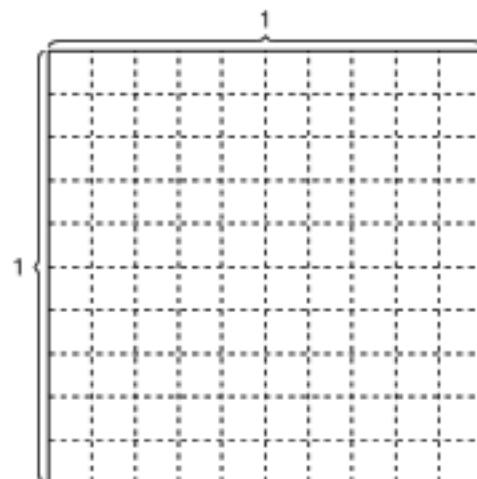
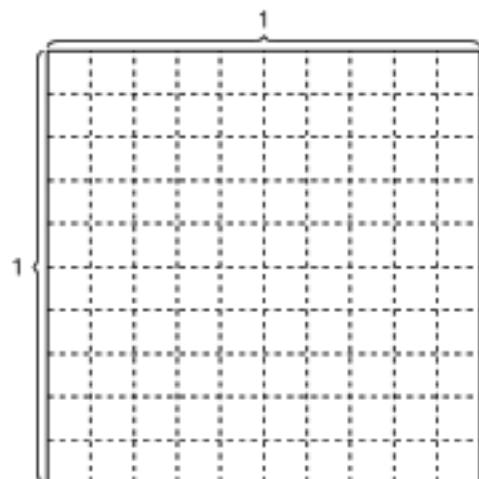
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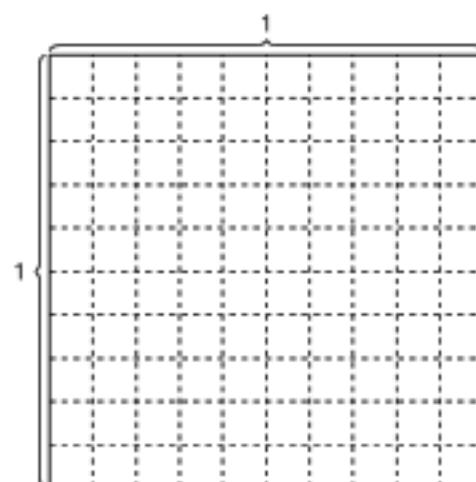
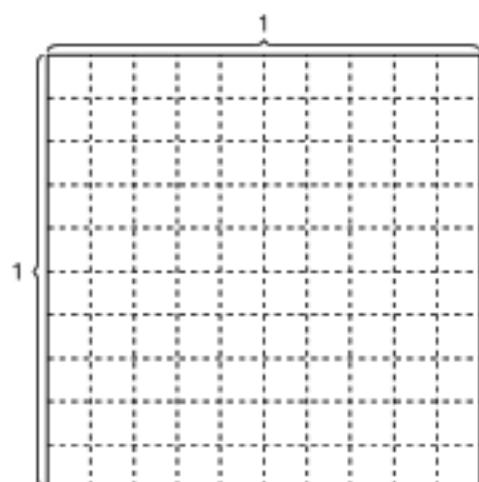
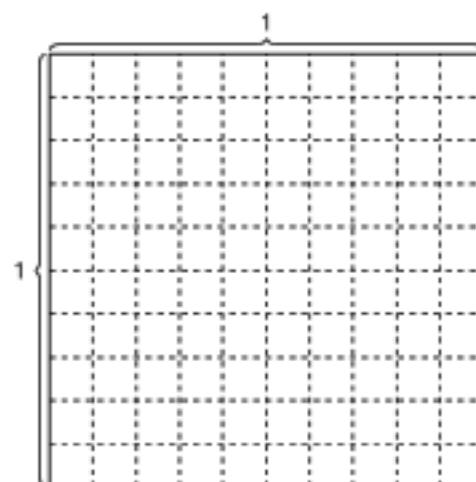
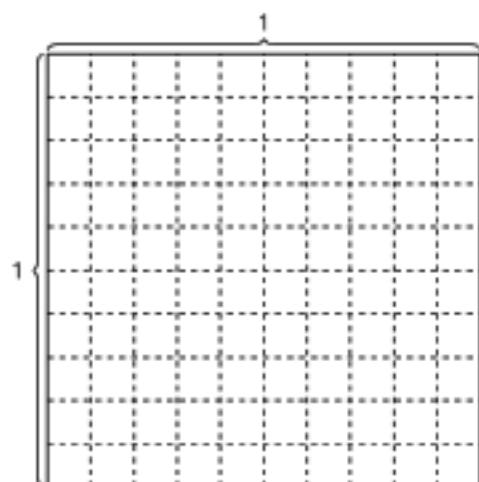
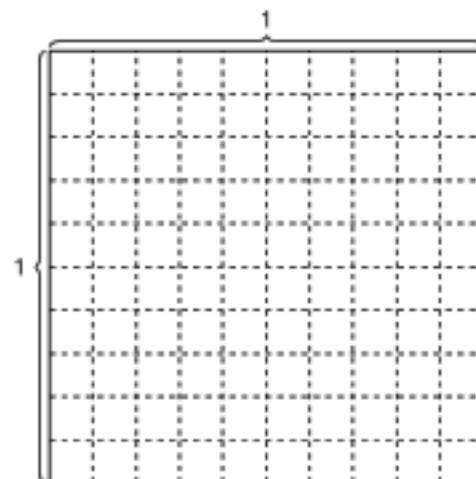
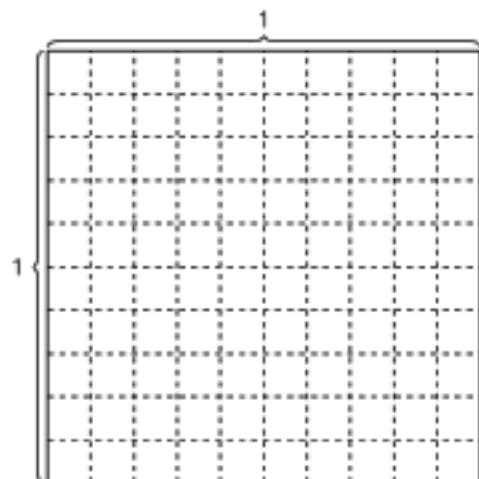
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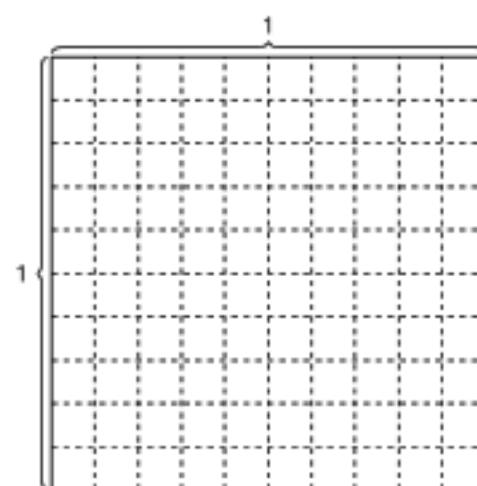
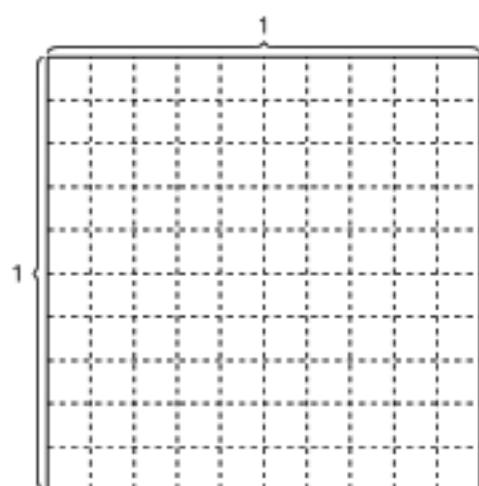
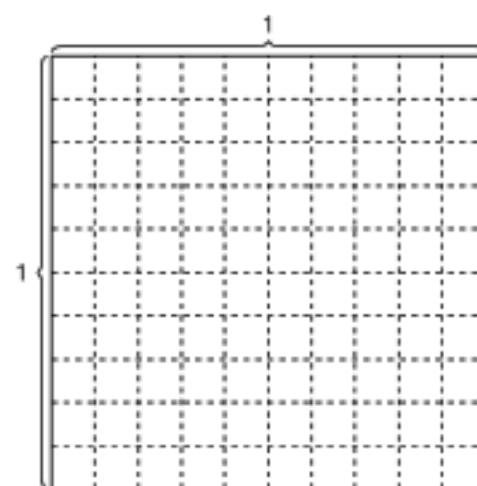
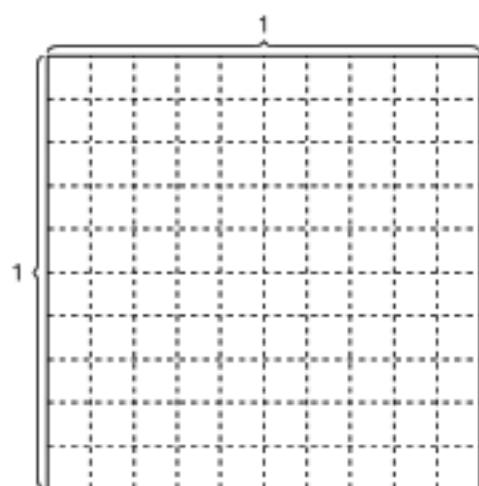
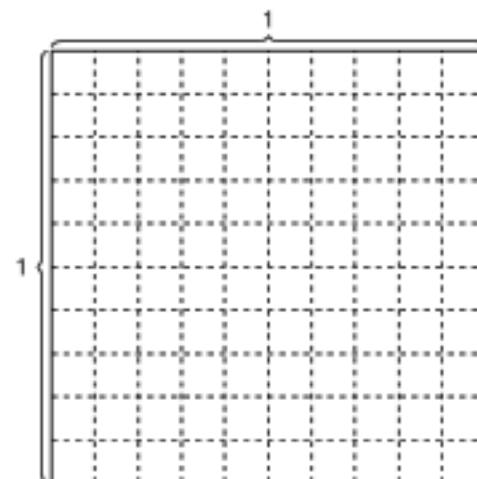
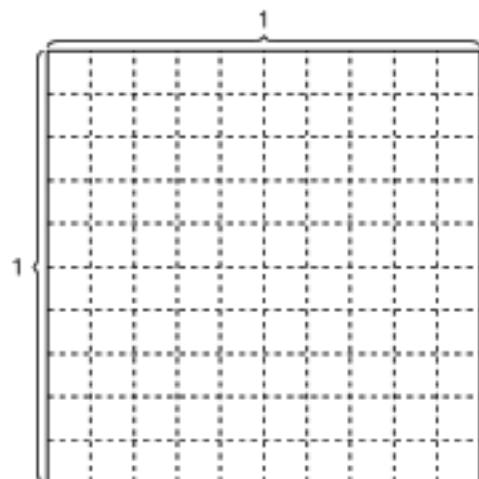
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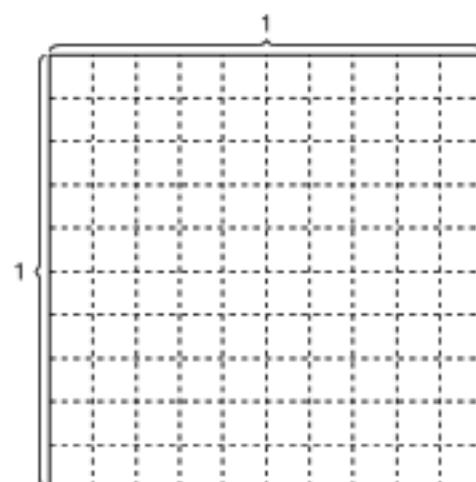
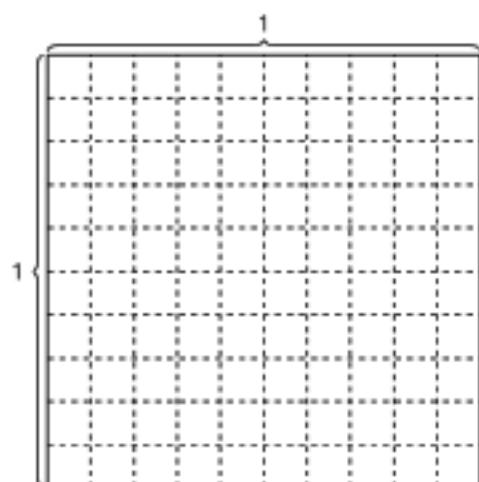
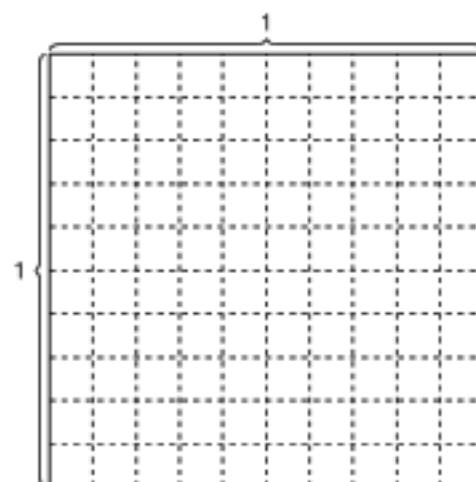
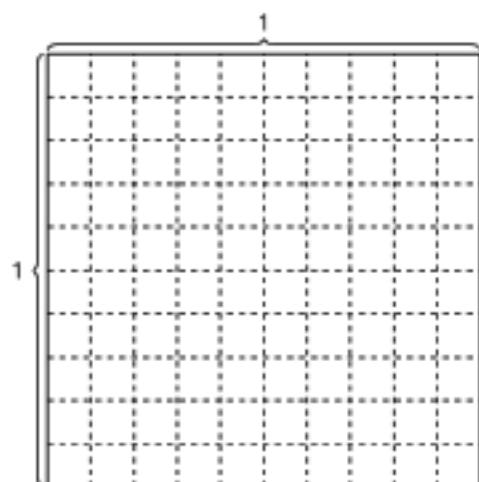
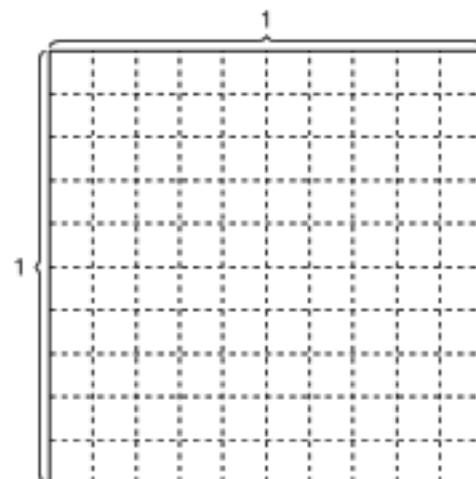
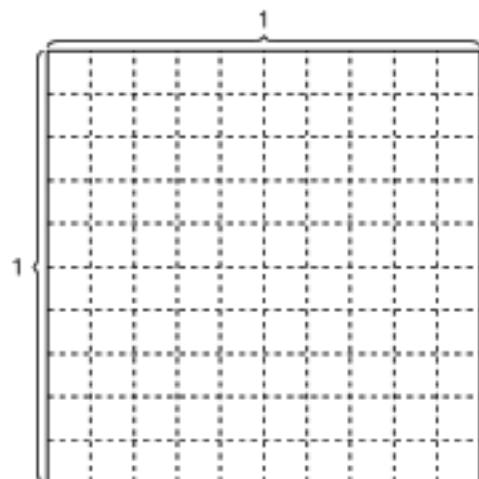
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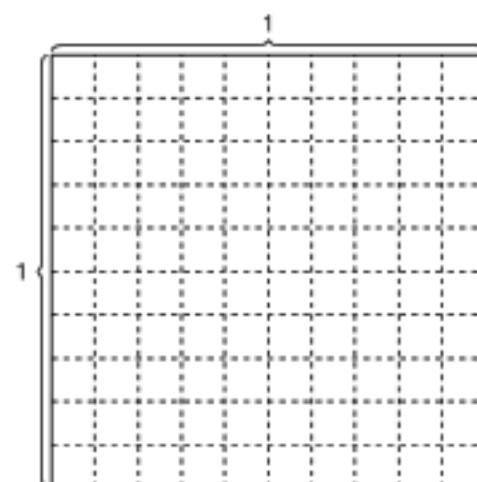
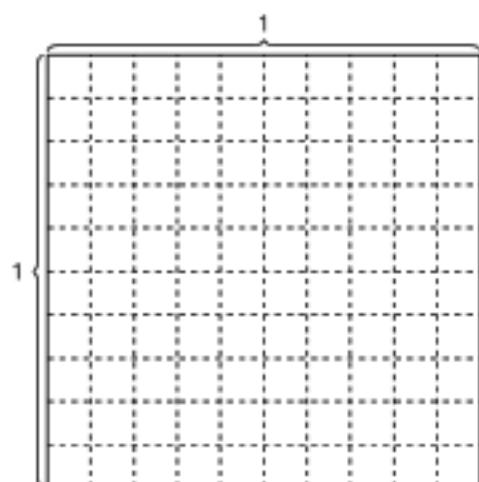
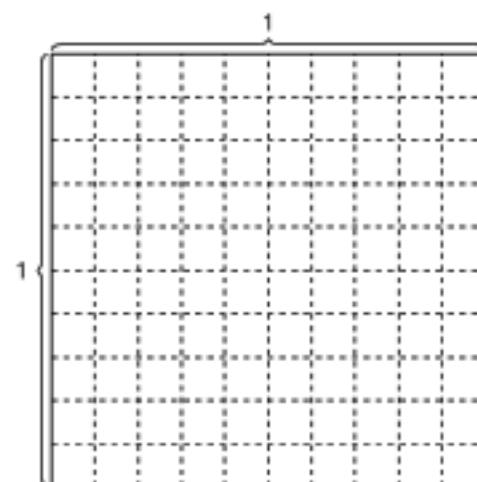
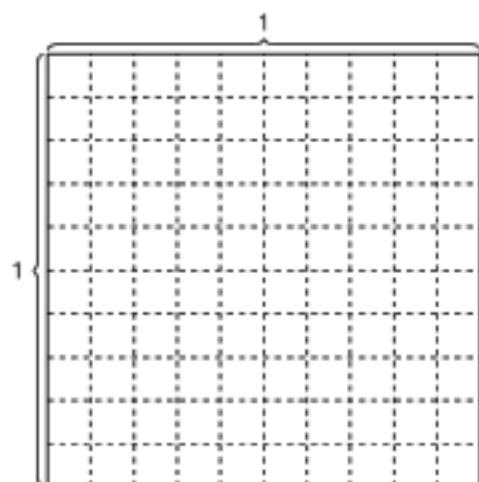
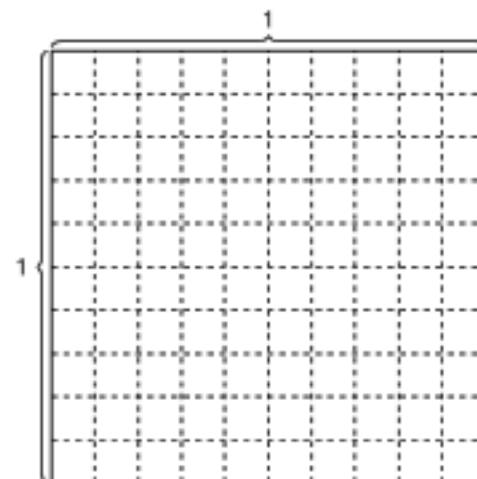
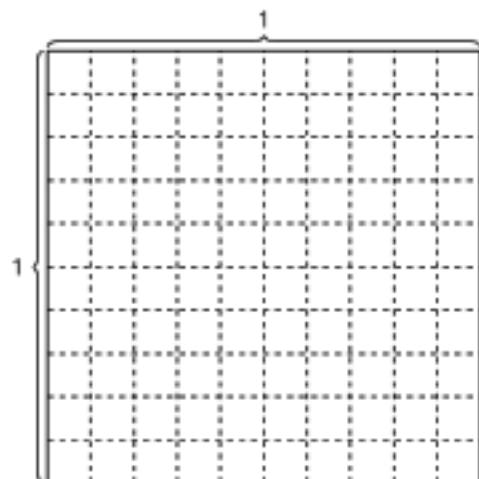
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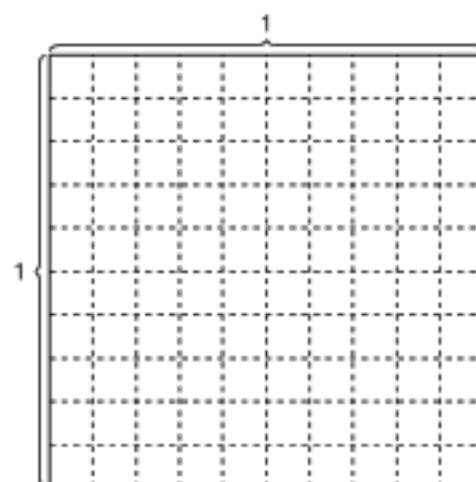
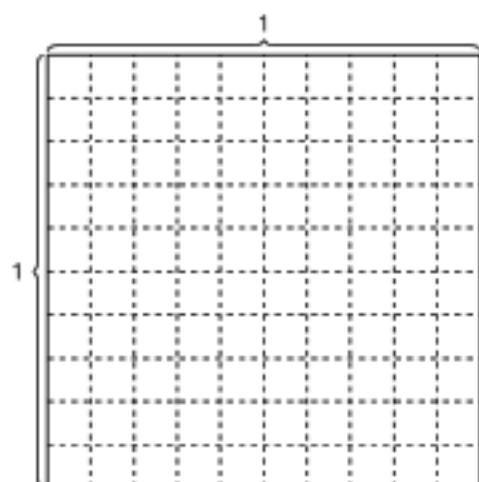
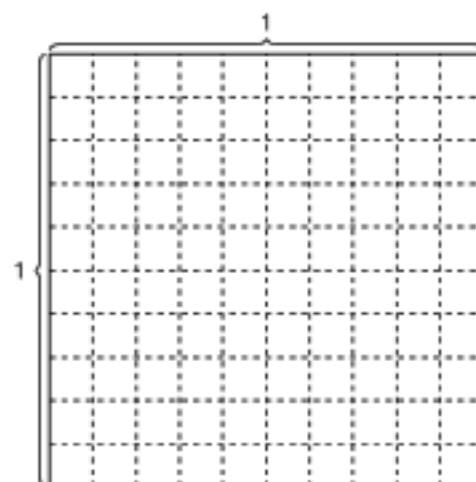
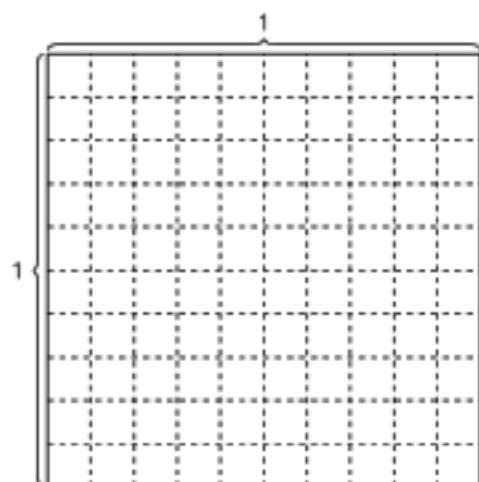
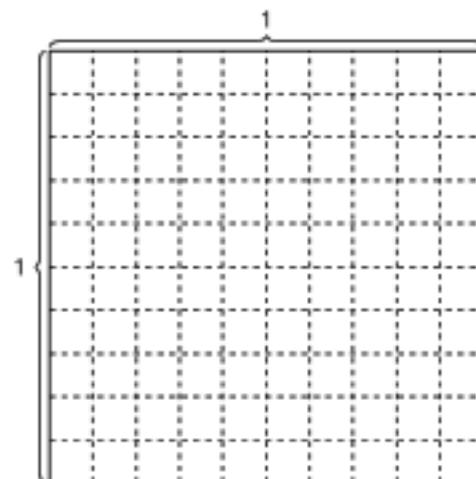
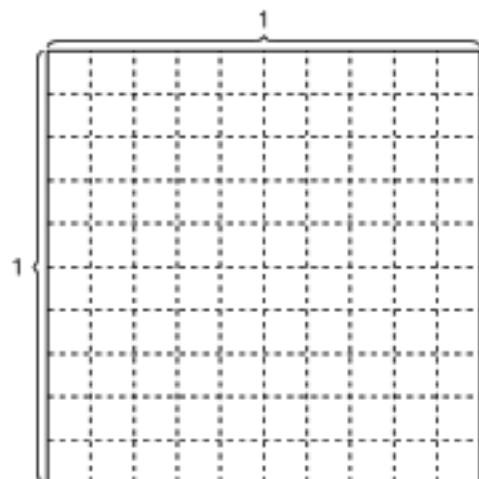
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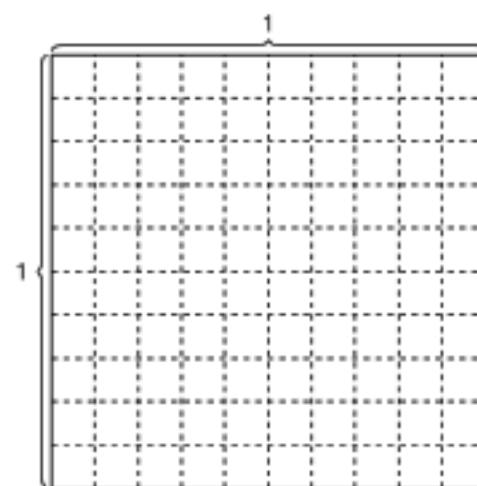
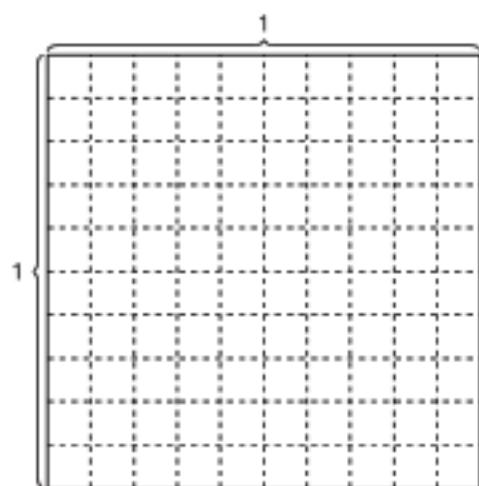
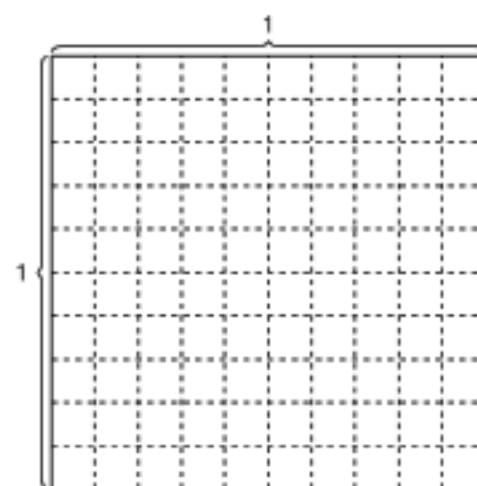
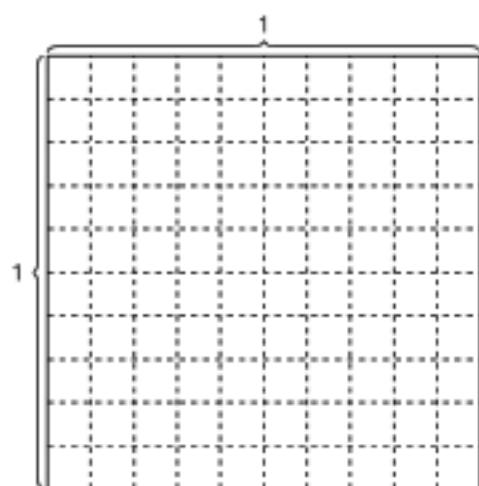
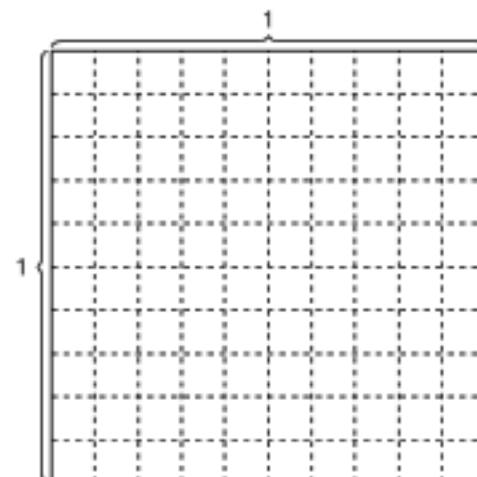
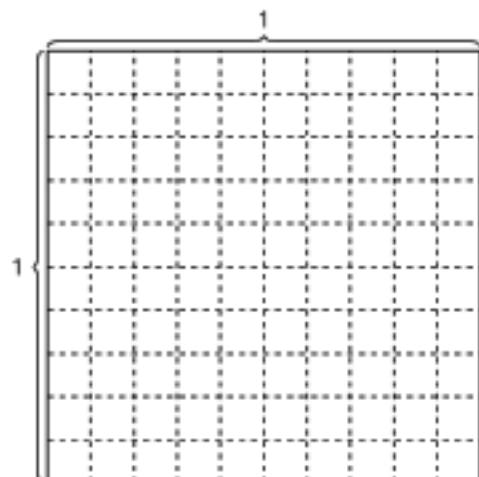
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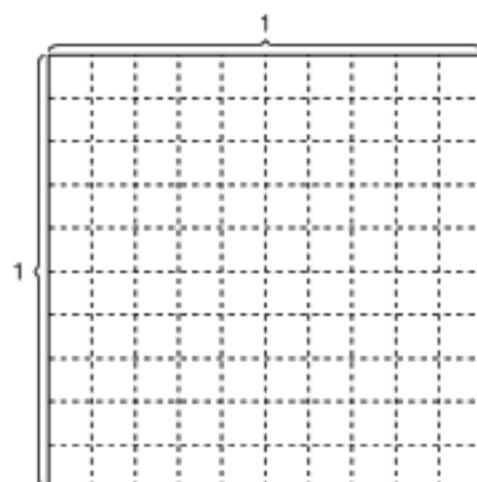
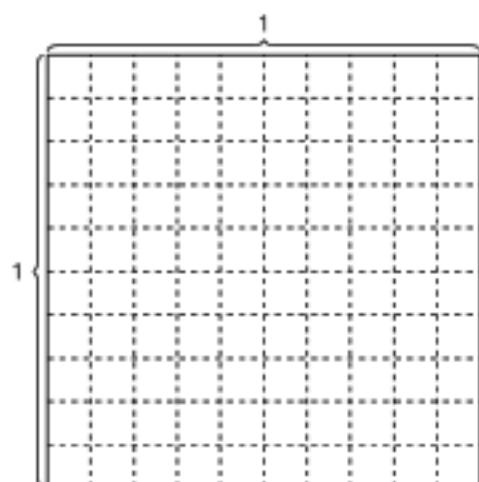
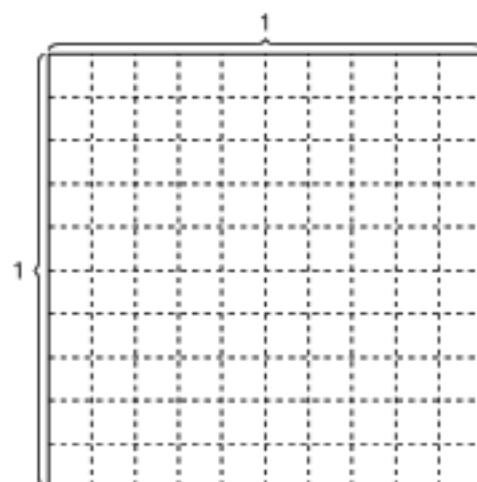
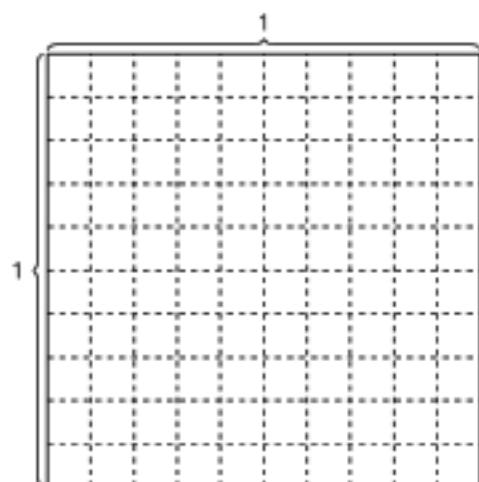
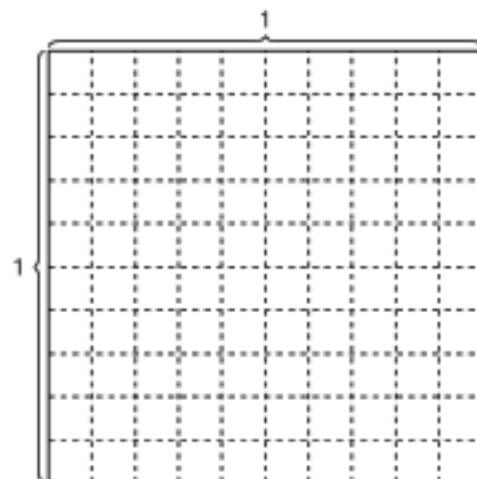
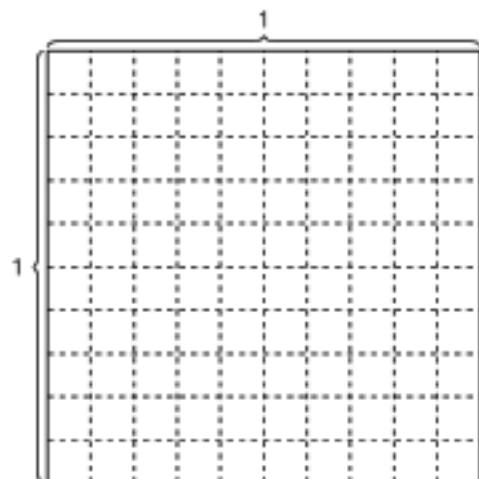
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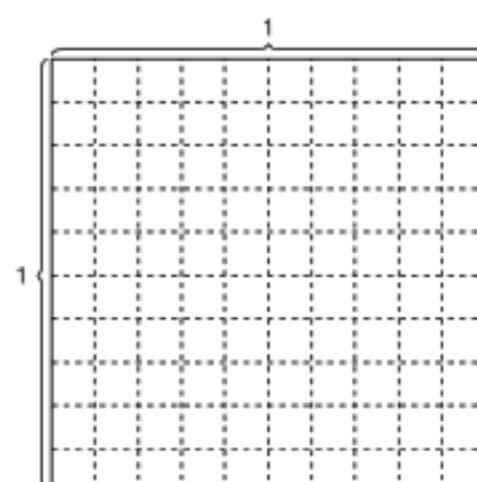
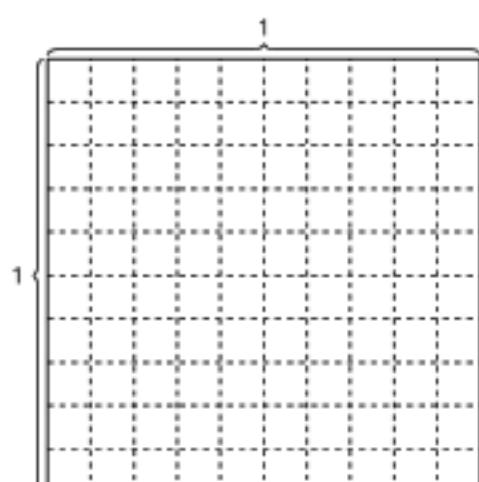
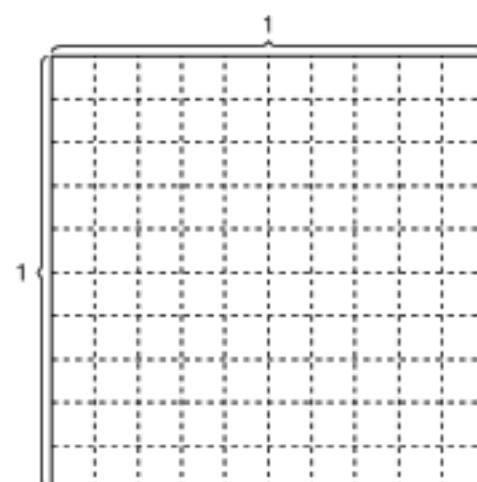
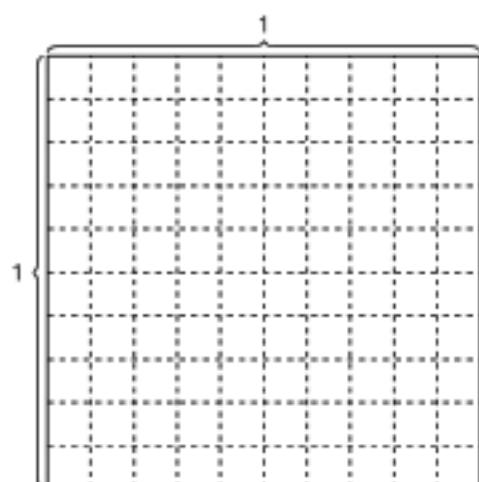
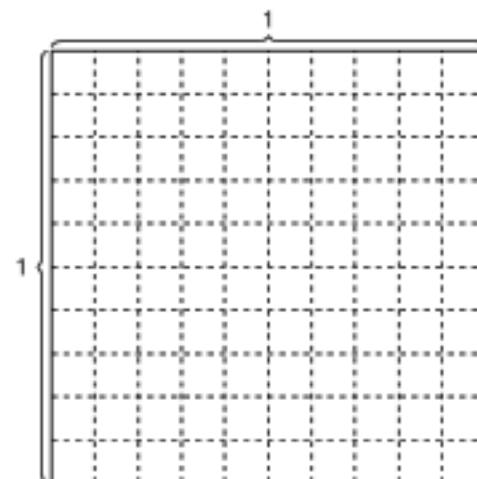
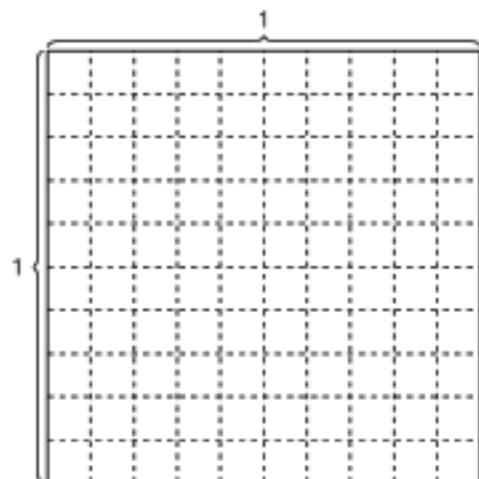
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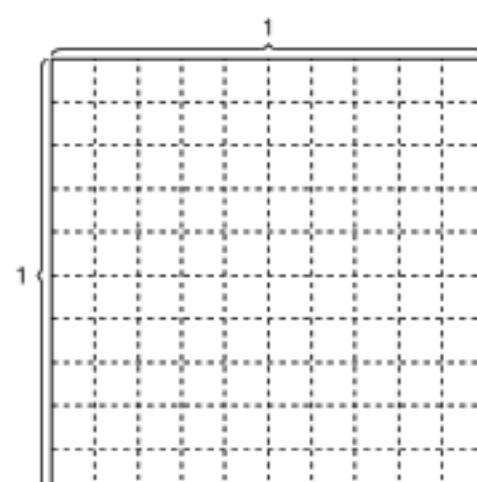
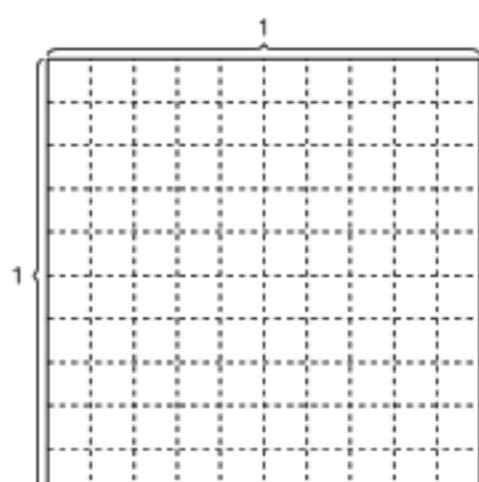
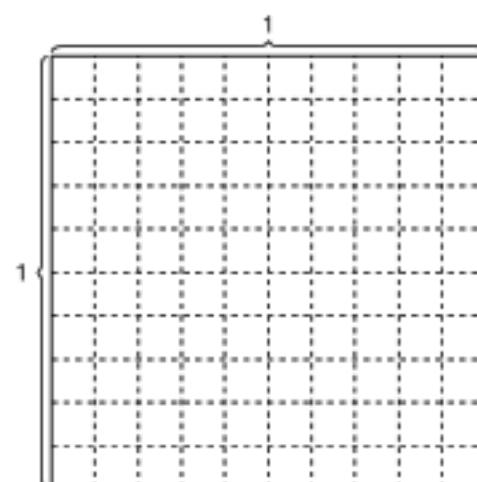
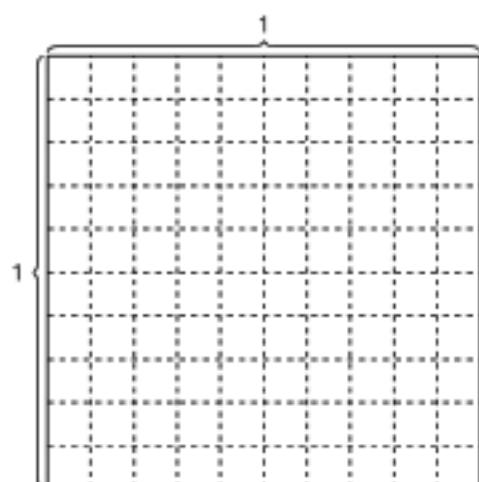
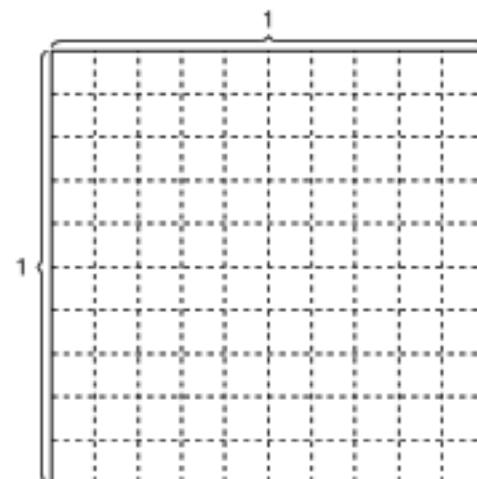
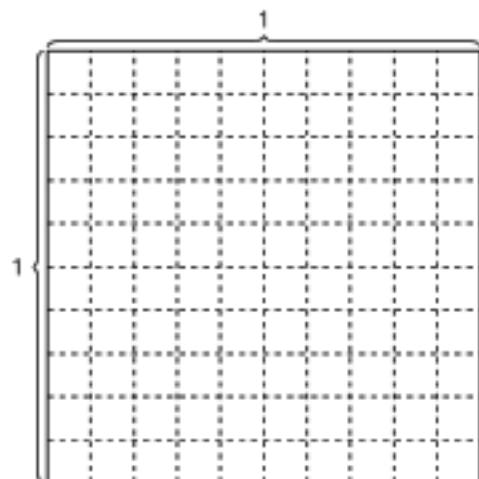
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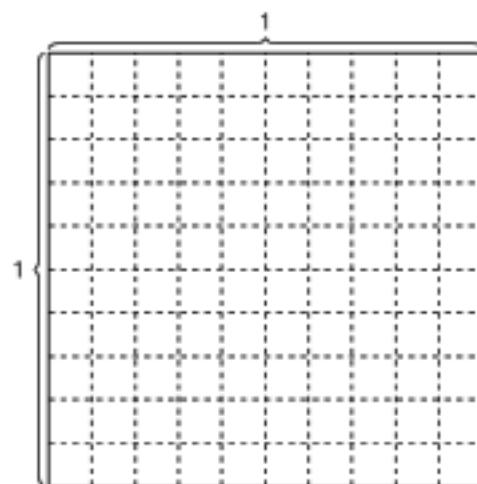
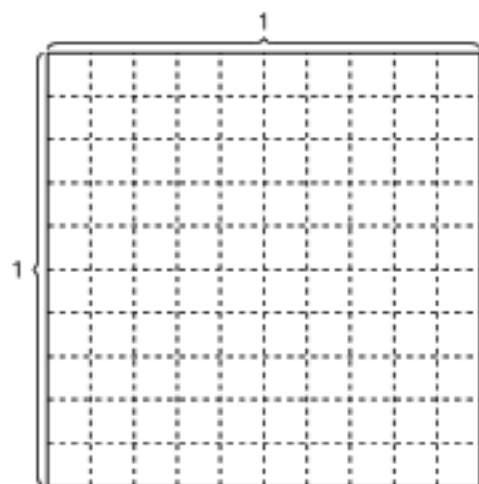
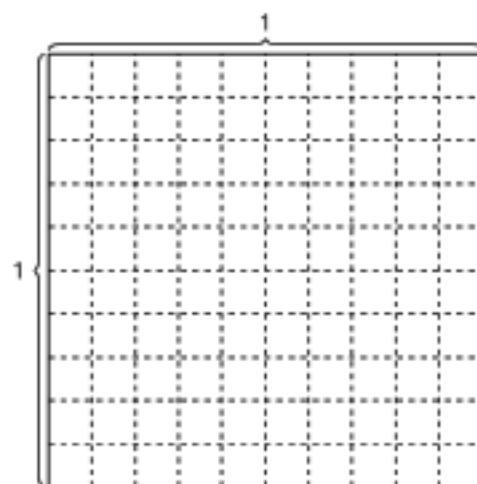
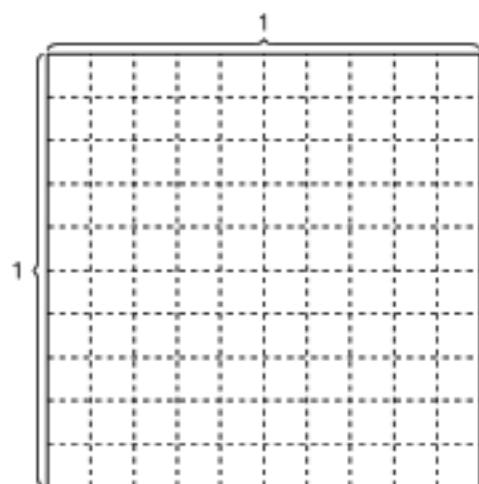
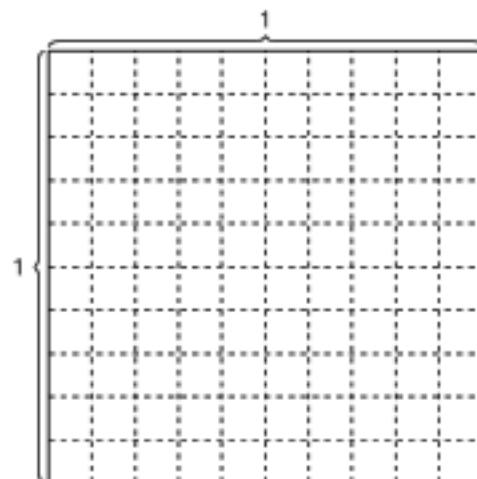
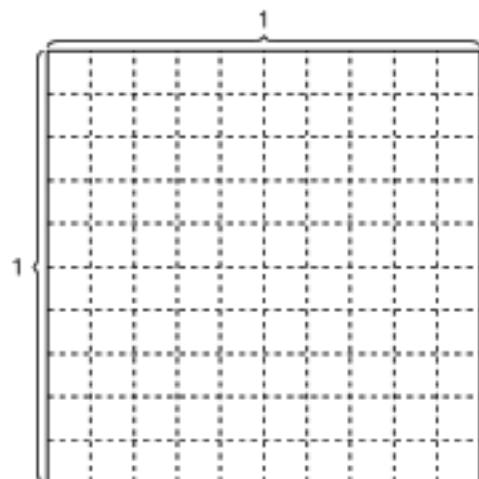
## Small Grids



## Small Grids



## Small Grids



## Target Numbers Stage 9 Recording Sheet

### Directions:

- On your turn:
  - Start at 2. Roll the number cube. Choose whether to subtract that number of tenths or hundredths from your starting number.
  - Write an equation to represent the difference.
- Take turns until you've played 6 rounds.
- Each round, the difference from the previous equations becomes the starting number in the new equation.
- The partner to get a difference closest to 1 without going under wins.

## Target Numbers Stage 9 Recording Sheet

### Directions:

- On your turn:
  - Start at 2. Roll the number cube. Choose whether to subtract that number of tenths or hundredths from your starting number.
  - Write an equation to represent the difference.
- Take turns until you've played 6 rounds.
- Each round, the difference from the previous equations becomes the starting number in the new equation.
- The partner to get a difference closest to 1 without going under wins.

## Mystery Number Stage 5 Gameboard

### Directions:

- Partner A:
  - Pick a number on the game board. Don't tell your partner!
  - Give your partner a clue about your mystery number. You can use the vocabulary below to help you give clues, or make up your own.
- Partner B:
  - Guess your partner's mystery number.
- If Partner B guesses the mystery number, switch roles.
- If Partner B does not guess the mystery number, Partner A gives another clue. Go back and forth guessing the number and giving clues until Partner B guesses the mystery number.

### Vocabulary:

ones, tens, hundreds, thousands, ten-thousands, hundred-thousands, greater than, less than, between, 10 times as much, multiple, factor

505,505	23,849	329,192	878,830
7,404	63,053	149,834	2,139
38,513	262,987	6,535	784,936
409,281	919,675	603,146	56,350
31,452	8,493	591,230	334,621
2,958	457,592	137,004	98,670
89,067	72,540	3,587	154,239
753,402	662,193	376	982,415
123,456	1,938	158,678	21,109
873,751	43,820	999,999	6,537

## Greatest of Them All Stage 3 Recording Sheet

### Directions:

- Partner A chooses a number card and writes the number in one of the blanks for Round 1.
- Partner B does the same.
- Repeat until each partner has a six-digit number.
- Write a comparison using  $<$ ,  $>$ , or  $=$ .
- The partner with the greater number wins the round.

### Round 1:

My Number	My Partner's Number
	
Compare using $<$ , $>$ , or $=$ .	

### Round 2:

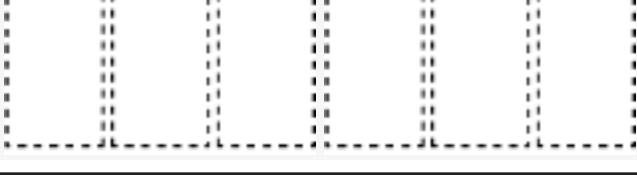
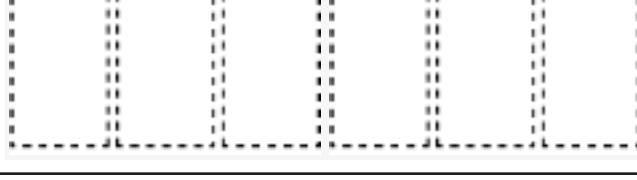
My Number	My Partner's Number
	
Compare using $<$ , $>$ , or $=$ .	

## Greatest of Them All Stage 3 Recording Sheet

### Round 3:

My Number	My Partner's Number
	
Compare using <, >, or =.	

### Round 4:

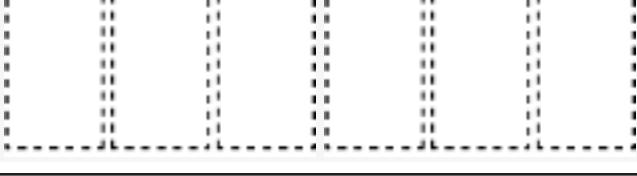
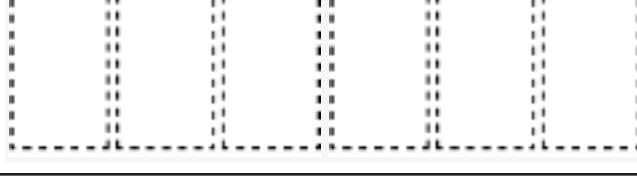
My Number	My Partner's Number
	
Compare using <, >, or =.	

## Greatest of Them All Stage 3 Recording Sheet

### Round 5:

My Number	My Partner's Number
	
Compare using <, >, or =.	

### Round 6:

My Number	My Partner's Number
	
Compare using <, >, or =.	

## Get Your Numbers in Order Stage 3 and 4 Gameboard

Directions:

- On your turn:
  - Pick a fraction card.
  - Write your number on any spot on the board. The numbers need to go from least to greatest. If your number is equivalent to a number already on the board, you can write it in the same box.
  - You may not move a number once it is on the board. If your number cannot be placed on the game board you must keep the card, say "pass," and you get a point.
- Take turns with your partner until all the numbers on the board are filled. The partner with the fewest points at the end of the game wins.

**Least**

**Greatest**

**Points**

Partner A

Partner B

## Fraction Cards Grade 4

Fraction Cards Grade 4

$$\frac{1}{8}$$

Fraction Cards Grade 4

$$\frac{2}{8}$$

Fraction Cards Grade 4

$$\frac{3}{8}$$

Fraction Cards Grade 4

$$\frac{4}{8}$$

Fraction Cards Grade 4

$$\frac{5}{8}$$

Fraction Cards Grade 4

$$\frac{6}{8}$$

Fraction Cards Grade 4

$$\frac{7}{8}$$

Fraction Cards Grade 4

$$\frac{8}{8}$$

## Fraction Cards Grade 4

Fraction Cards Grade 4

$$\frac{1}{5}$$

Fraction Cards Grade 4

$$\frac{2}{5}$$

Fraction Cards Grade 4

$$\frac{3}{5}$$

Fraction Cards Grade 4

$$\frac{4}{5}$$

Fraction Cards Grade 4

$$\frac{5}{5}$$

Fraction Cards Grade 4

$$\frac{6}{5}$$

Fraction Cards Grade 4

$$\frac{1}{10}$$

Fraction Cards Grade 4

$$\frac{2}{10}$$

## Fraction Cards Grade 4

Fraction Cards Grade 4

$$\frac{3}{10}$$

Fraction Cards Grade 4

$$\frac{4}{10}$$

Fraction Cards Grade 4

$$\frac{5}{10}$$

Fraction Cards Grade 4

$$\frac{6}{10}$$

Fraction Cards Grade 4

$$\frac{7}{10}$$

Fraction Cards Grade 4

$$\frac{8}{10}$$

Fraction Cards Grade 4

$$\frac{9}{10}$$

Fraction Cards Grade 4

$$\frac{10}{10}$$

## Fraction Cards Grade 4

Fraction Cards Grade 4

$$\frac{11}{10}$$

Fraction Cards Grade 4

$$\frac{19}{10}$$

Fraction Cards Grade 4

$$\frac{1}{12}$$

Fraction Cards Grade 4

$$\frac{3}{12}$$

Fraction Cards Grade 4

$$\frac{4}{12}$$

Fraction Cards Grade 4

$$\frac{7}{12}$$

Fraction Cards Grade 4

$$\frac{9}{12}$$

Fraction Cards Grade 4

$$\frac{10}{12}$$

## Fraction Cards Grade 4

Fraction Cards Grade 4

$$\frac{13}{12}$$

Fraction Cards Grade 4

$$\frac{15}{12}$$

Fraction Cards Grade 4

$$\frac{1}{100}$$

Fraction Cards Grade 4

$$\frac{5}{100}$$

Fraction Cards Grade 4

$$\frac{10}{100}$$

Fraction Cards Grade 4

$$\frac{20}{100}$$

Fraction Cards Grade 4

$$\frac{49}{100}$$

Fraction Cards Grade 4

$$\frac{50}{100}$$

## Fraction Cards Grade 4

Fraction Cards Grade 4

$$\frac{51}{100}$$

Fraction Cards Grade 4

$$\frac{75}{100}$$

Fraction Cards Grade 4

$$\frac{99}{100}$$

Fraction Cards Grade 4

$$\frac{200}{100}$$

## Fraction Cards Grade 3

Fraction Cards Grade 3

$$\frac{1}{4}$$

Fraction Cards Grade 3

$$\frac{2}{4}$$

Fraction Cards Grade 3

$$\frac{3}{4}$$

Fraction Cards Grade 3

$$\frac{4}{4}$$

Fraction Cards Grade 3

$$\frac{5}{4}$$

Fraction Cards Grade 3

$$\frac{1}{6}$$

Fraction Cards Grade 3

$$\frac{2}{6}$$

Fraction Cards Grade 3

$$\frac{3}{6}$$

## Fraction Cards Grade 3

Fraction Cards Grade 3

$$\frac{4}{6}$$

Fraction Cards Grade 3

$$\frac{5}{6}$$

Fraction Cards Grade 3

$$\frac{6}{6}$$

Fraction Cards Grade 3

$$\frac{7}{6}$$

Fraction Cards Grade 3

$$\frac{1}{2}$$

Fraction Cards Grade 3

$$\frac{2}{2}$$

Fraction Cards Grade 3

$$\frac{1}{3}$$

Fraction Cards Grade 3

$$\frac{2}{3}$$

## Fraction Cards Grade 3

Fraction Cards Grade 3

$$\frac{3}{3}$$

Fraction Cards Grade 3

$$\frac{6}{3}$$

Fraction Cards Grade 3

$$\frac{4}{2}$$

Fraction Cards Grade 3

$$\frac{16}{6}$$

Fraction Cards Grade 3

$$\frac{6}{2}$$

Fraction Cards Grade 3

$$\frac{8}{2}$$

Fraction Cards Grade 3

$$\frac{5}{3}$$

Fraction Cards Grade 3

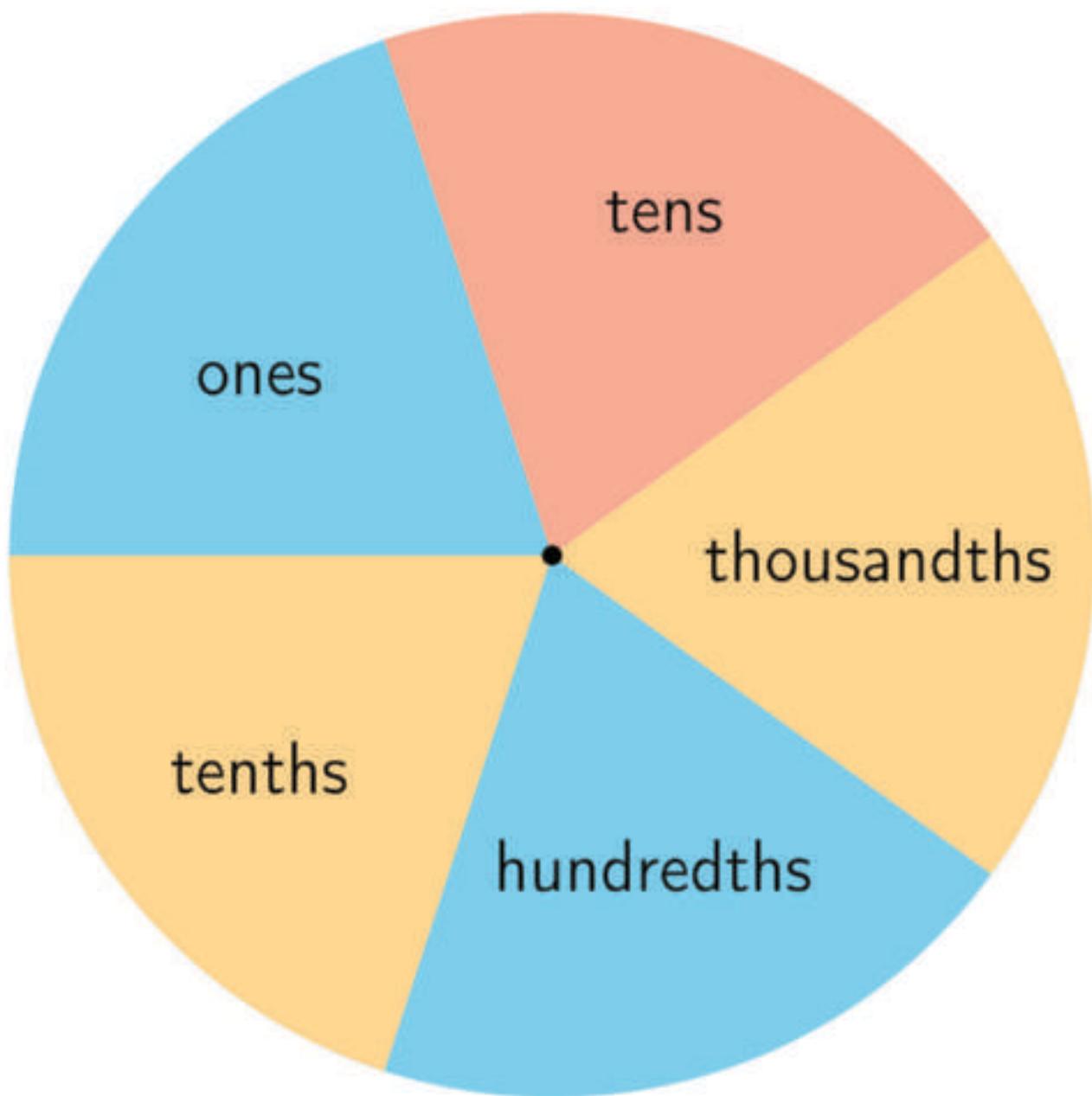
$$\frac{13}{4}$$

## Tic Tac Round Stage 3 Gameboard

### Directions:

- Each partner:
  - Pick 5 cards and create a number less than 100. (for example, 51.093)
  - Spin the spinner and round to that place.
  - Record the rounded number in any empty box.
- Take turns. The first player to fill 3 boxes in a row wins.


Tic Tac Round Stage 3 Spinner



## Greatest of Them All Stage 4 Recording Sheet

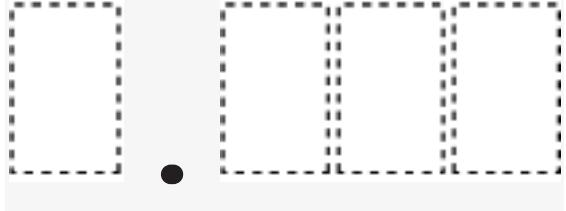
### Directions:

- Player A chooses a number card and writes the number in one of the blanks for round 1.
- Player B does the same.
- Repeat until each player has a number to the thousandths place.
- Write a comparison using  $<$ ,  $>$ , or  $=$ .
- The player with the greater number wins the round.

### Round 1:

My Number	My Partner's Number
	
Compare using $<$ , $>$ , or $=$ .	

### Round 2:

My Number	My Partner's Number
	
Compare using $<$ , $>$ , or $=$ .	

## Greatest of Them All Stage 4 Recording Sheet

### Round 3:

My Number	My Partner's Number
  	 
Compare using <, >, or =.	

### Round 4:

My Number	My Partner's Number
  	 
Compare using <, >, or =.	

## Greatest of Them All Stage 4 Recording Sheet

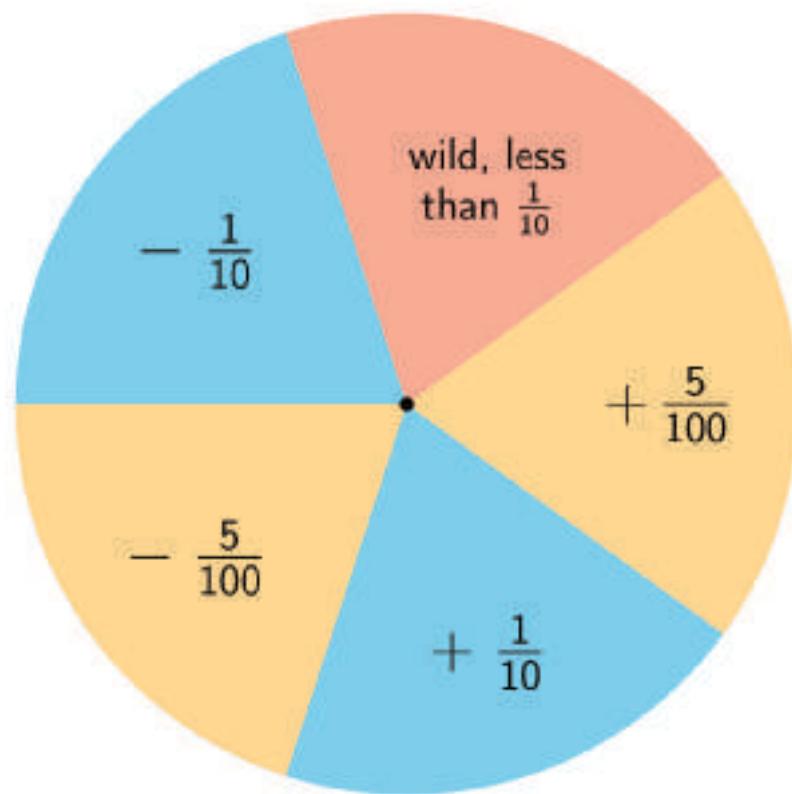
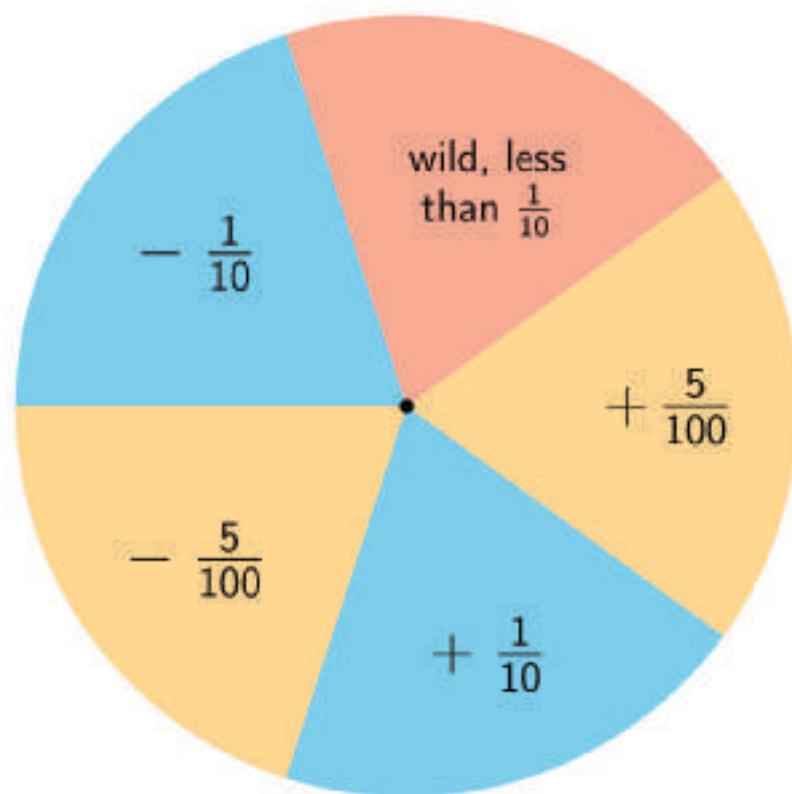
### Round 5:

My Number	My Partner's Number
 	 
Compare using <, >, or =.	

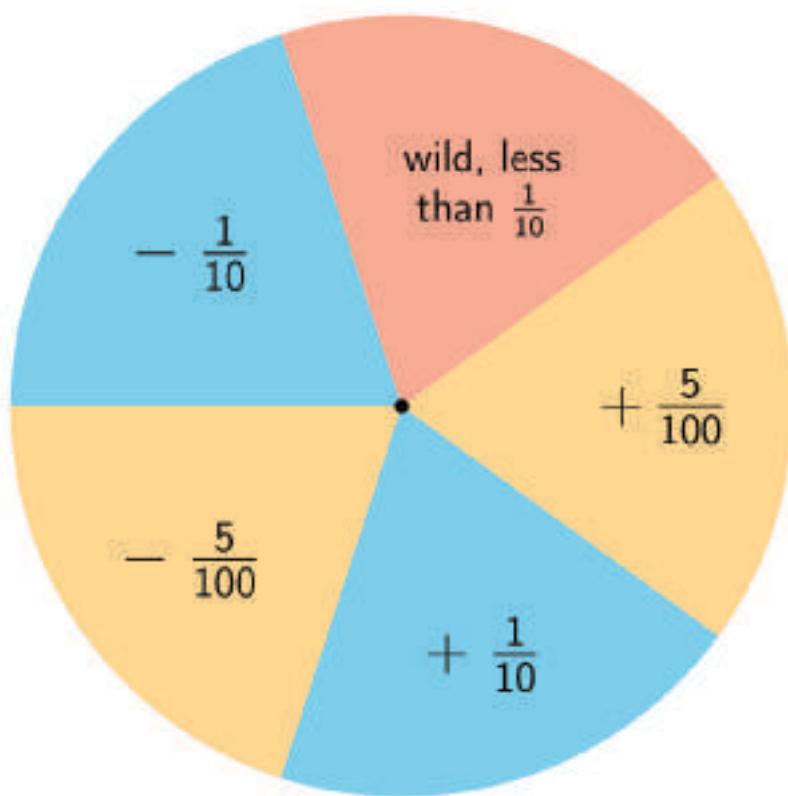
### Round 6:

My Number	My Partner's Number
 	 
Compare using <, >, or =.	

Jump the Line Stage 2 Spinner



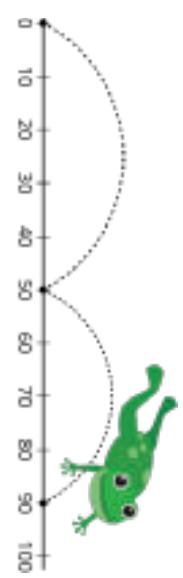
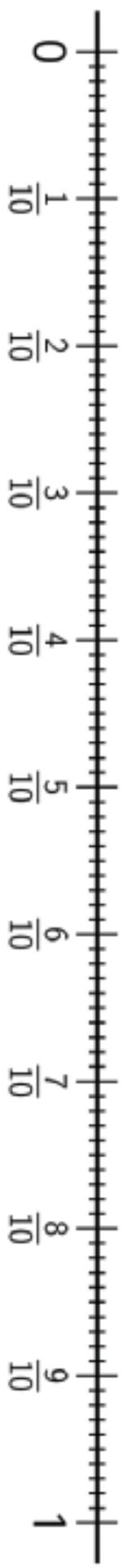
Jump the Line Stage 2 Spinner



## Jump the Line Stage 2 Gameboard

Directions:

- Together with your partner, decide on 3 target numbers, mark them on your number line.
- On your turn:
  - Spin all 3 spinners. Decide which moves you want to use on your turn.
  - Mark where you ended up on the number line.
- Take turns spinning and moving on the number line. The first partner to land on 2 of the target numbers wins.



## Mystery Number Stage 6 Gameboard

### Directions:

- Partner A:
  - Pick a number on the game board. Don't tell your partner!
  - Give your partner a clue about your mystery number. You can use the vocabulary below to help you give clues, or make up your own.
- Partner B:
  - Guess your partner's mystery number.
- If Partner B guesses the mystery number, switch roles.
- If Partner B does not guess the mystery number, Partner A gives another clue. Go back and forth guessing the number and giving clues until Partner B guesses the mystery number.

### Vocabulary:

thousandths, hundredths, tenths, ones, tens, hundreds, thousands, ten-thousands, hundred-thousands, greater than, less than, between, 10 times as much,  $\frac{1}{10}$  as much

5,055.05	2,384.901	329.192	8,788.30
7,404.361	263,059.1	14,874.58	2,139.825
38,513.92	262,987.5	6,535.803	784,936.6
49,281.74	919,675.3	60,146.09	76,350.68
31,452.34	1,345.03	591,230.3	35,621.72
892.508	47,592.98	137.04	98,670.88
9,067.213	72,540.11	3,517.27	154,239.6
754.402	66,293.41	3,762.893	82,415.86
123,456.4	1,938.823	58,678.99	1,109.222
83,751.72	40,820.6	9,999.98	6,537.28

## Get Your Numbers in Order Stage 5 Gameboard

### Directions:

- On your turn:
  - Pick 3 number cards and make a decimal number less than 1.
  - Write your number on any spot on the board. The numbers need to go from least to greatest.
  - You may not move a number once it is on the board. If your number cannot be placed on the game board you must say "pass" and you get a point.
- Take turns with your partner until all the numbers on the board are filled. The partner with the fewest points at the end of the game wins.

**Least**

**Greatest**

**Points**

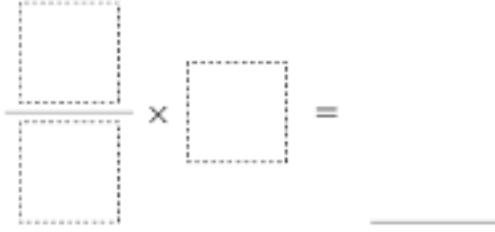
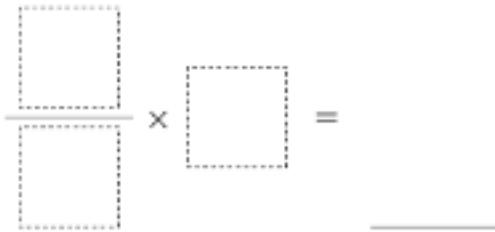
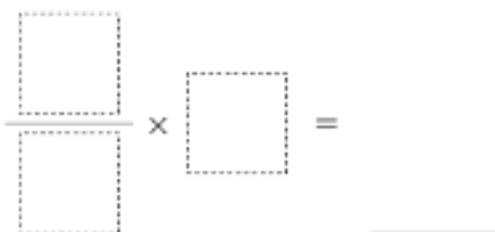
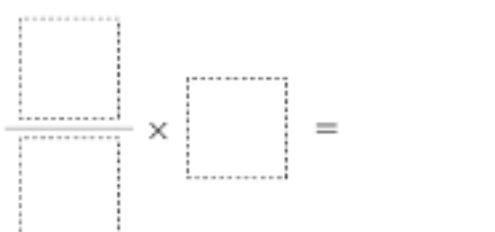
Partner A

Partner B

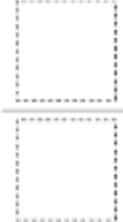
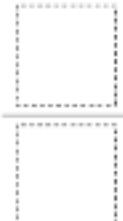
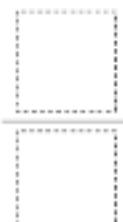
## How Close? Stage 7 Recording Sheet

Directions:

- Each partner:
  - Take 6 cards.
  - Choose 3 cards to make a multiplication expression.
  - Write an equation to show the product of the numbers you made.
  - Your score for each round is the difference between your product and 5.
- Take new cards so that you have 6 cards to start the next round.
- At the end of the game, add your score for each round. The player with the lowest score wins.

round	multiplication expression	points for the round
1		
2		
3		
4		

## How Close? Stage 7 Recording Sheet

5	 $\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \end{array}$ $=$ <hr/>	
6	 $\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \end{array}$ $=$ <hr/>	
7	 $\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \end{array}$ $=$ <hr/>	
8	 $\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \end{array}$ $=$ <hr/>	

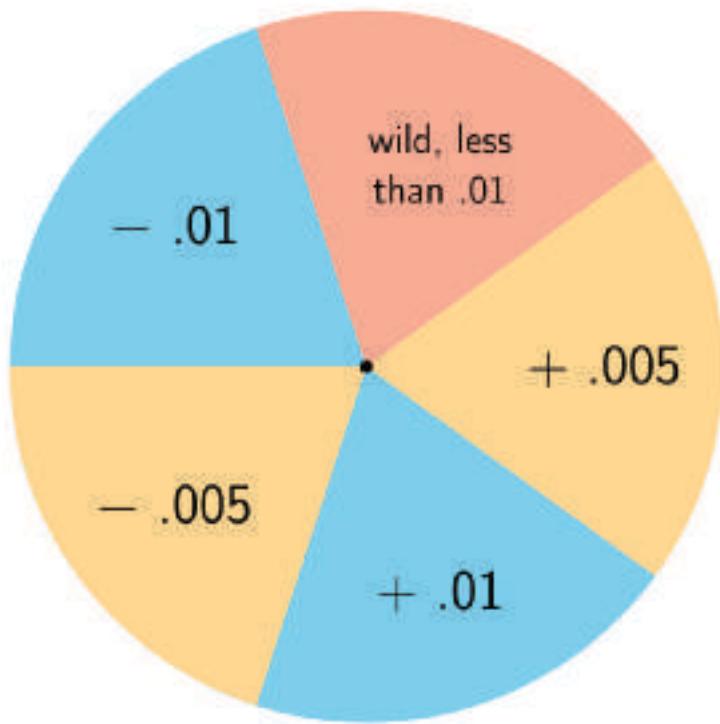
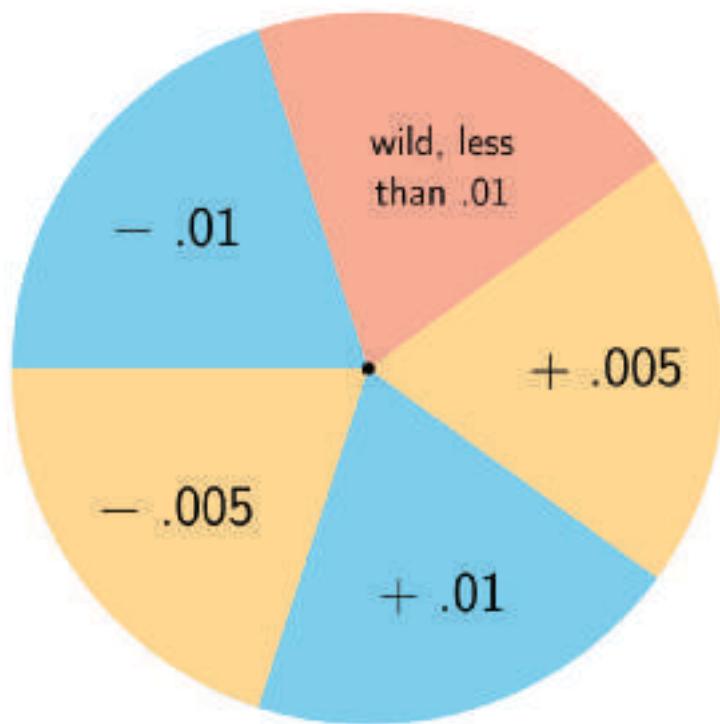
## How Close? Stage 8 Recording Sheet

Directions:

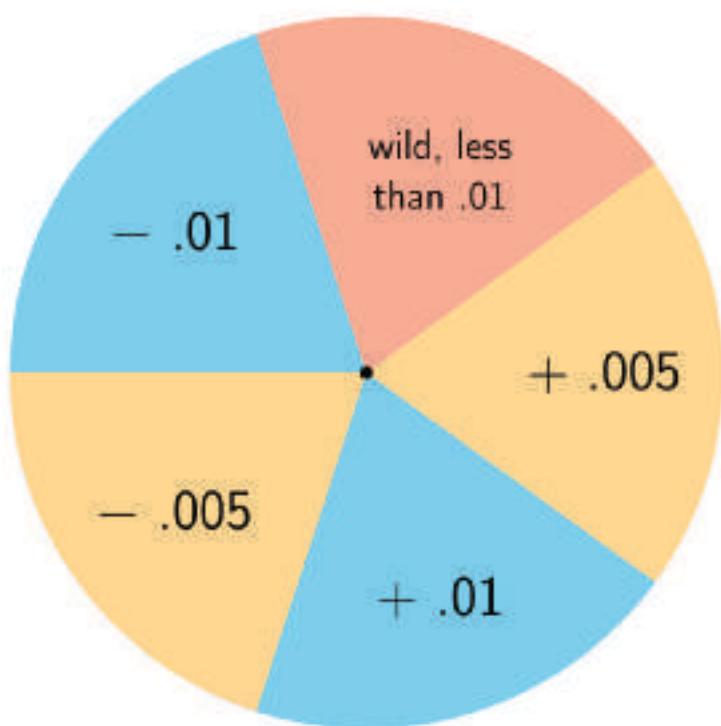
- Each partner:
  - Take 6 cards.
  - Choose 3-4 cards to make an addition expression.
  - Write an equation to show the sum of the numbers you made.
  - Your score for each round is the difference between your sum and 1.
- Take new cards so that you have 6 cards to start the next round.
- At the end of the game, add your score for each round. The player with the lowest score wins.

round	addition equation	points for the round
1	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	
2	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	
3	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	
4	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	
5	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	
6	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	
7	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	
8	$\cdot \underline{\quad} \underline{\quad} + \cdot \underline{\quad} \underline{\quad} = \underline{\quad}$	

Jump the Line Stage 3 Spinner



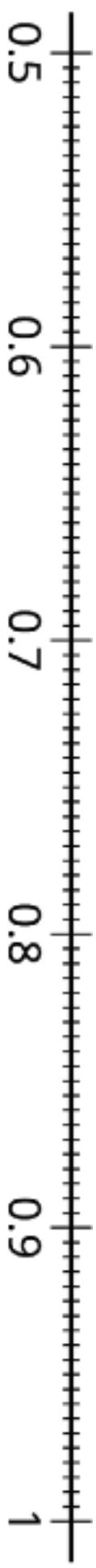
Jump the Line Stage 3 Spinner



## Jump the Line Stage 3 Gameboard

### Directions:

- Together with your partner, decide on 3 target numbers, mark them on your number line.
- On your turn:
  - Spin all 3 spinners. Decide which moves you want to use on your turn.
  - Mark where you ended up on the number line.
- Take turns spinning and moving on the number line. The first partner to land on 2 of the target numbers wins.



## Compare Stage 4 Division Cards

Compare Stage 4

$$78 \div 6$$

Compare Stage 4

$$84 \div 7$$

Compare Stage 4

Compare Stage 4

$$68 \div 4$$

$$65 \div 5$$

Compare Stage 4

Compare Stage 4

$$90 \div 6$$

$$45 \div 15$$

Compare Stage 4

Compare Stage 4

$$57 \div 19$$

$$72 \div 18$$

## Compare Stage 4 Division Cards

Compare Stage 4

$$52 \div 13$$

Compare Stage 4

$$84 \div 12$$

Compare Stage 4

Compare Stage 4

$$42 \div 7$$

$$56 \div 8$$

Compare Stage 4

Compare Stage 4

$$72 \div 9$$

$$64 \div 8$$

Compare Stage 4

Compare Stage 4

$$81 \div 9$$

$$72 \div 3$$

## Compare Stage 4 Division Cards

Compare Stage 4

$$92 \div 4$$

Compare Stage 4

$$69 \div 3$$

Compare Stage 4

$$84 \div 4$$

Compare Stage 4

$$63 \div 3$$

## Compare Stage 3-8 Directions

Directions:

- Split the deck between the players.
- Each player turns over a card.
- Compare the values. The player with the greater value keeps both cards.
- If the values are the same, each player turns over one more card. The player with the greater value keeps all four cards.
- Play until you run out of cards. The player with the most cards at the end of the game wins.

Record any sets of cards that are challenging to compare:

## Compare Stage 3-8 Directions

Directions:

- Split the deck between the players.
- Each player turns over a card.
- Compare the values. The player with the greater value keeps both cards.
- If the values are the same, each player turns over one more card. The player with the greater value keeps all four cards.
- Play until you run out of cards. The player with the most cards at the end of the game wins.

Record any sets of cards that are challenging to compare:

## Compare Stage 6 Cards

Compare Stage 6

$$\frac{4}{6} + \frac{1}{6}$$

Compare Stage 6

$$\frac{2}{4} - \frac{1}{4}$$

Compare Stage 6

$$\frac{2}{5} + \frac{4}{10}$$

Compare Stage 6

$$\frac{3}{6} - \frac{1}{3}$$

Compare Stage 6

$$\frac{4}{6} + \frac{4}{12}$$

Compare Stage 6

$$\frac{5}{8} - \frac{1}{2}$$

Compare Stage 6

$$\frac{7}{10} + \frac{35}{100}$$

Compare Stage 6

$$\frac{8}{10} - \frac{64}{100}$$

## Compare Stage 6 Cards

Compare Stage 6

$$\frac{8}{10} + \frac{26}{100}$$

Compare Stage 6

$$\frac{7}{10} - \frac{59}{100}$$

Compare Stage 6

$$\frac{5}{10} + \frac{43}{100}$$

Compare Stage 6

$$\frac{9}{10} - \frac{72}{100}$$

Compare Stage 6

$$2\frac{2}{5} + 3\frac{3}{5}$$

Compare Stage 6

$$1\frac{4}{6} + 4\frac{1}{6}$$

Compare Stage 6

$$3\frac{1}{4} - \frac{2}{4}$$

Compare Stage 6

$$4\frac{3}{5} - 2\frac{4}{5}$$

## Compare Stage 6 Cards

Compare Stage 6

$$5\frac{2}{12} - \frac{7}{12}$$

Compare Stage 6

$$2 + \frac{3}{6} + \frac{4}{6}$$

Compare Stage 6

$$3\frac{1}{4} - 1\frac{3}{4}$$

Compare Stage 6

$$5\frac{2}{7} + \frac{4}{7} + \frac{3}{7}$$

Compare Stage 6

$$1 - \frac{3}{12} - \frac{5}{12}$$

Compare Stage 6

$$1 - \frac{5}{8}$$

Compare Stage 6

$$\frac{9}{10} + \frac{4}{10} + \frac{5}{10}$$

Compare Stage 6

$$8 + \frac{6}{9}$$

## Compare Stage 6 Cards

Compare Stage 6

$$\frac{3}{4} + \frac{6}{4} + 1$$

Compare Stage 6

$$1 - \frac{2}{9} - \frac{6}{9}$$

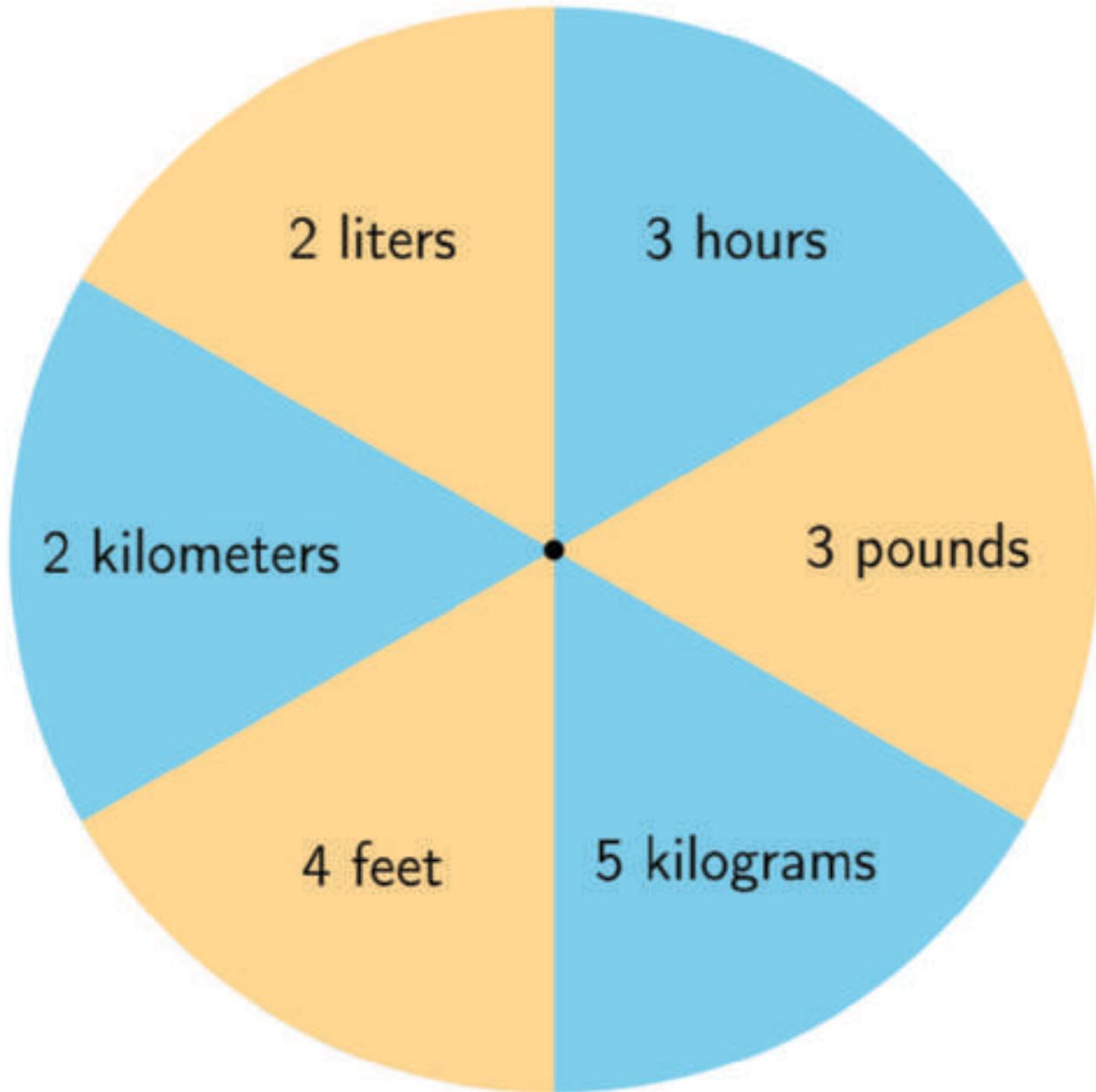
Compare Stage 6

$$1\frac{3}{8} - \frac{6}{8}$$

Compare Stage 6

$$6\frac{5}{8} - 2\frac{7}{8}$$

Would You Rather Stage 2 Spinner



## Would You Rather Stage 2 Recording Sheet

### Directions:

- Partner A:

- Spin to get a measurement.
- Ask your partner a question comparing that measurement to an amount in a smaller unit of measurement.

hours - minutes - seconds	liters - milliliters
kilometers - meters- centimeters	pounds - ounces
feet - inches	kilograms - grams

- Partner B:

- Answer your partner's question.
- Explain your choice.

- Switch roles and repeat.

Would you rather \_\_\_\_\_

verb \_\_\_\_\_ measurement you spun

Or \_\_\_\_\_ verb \_\_\_\_\_ number \_\_\_\_\_ measurement unit you chose \_\_\_\_\_ ?

## Credits

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