Eureka Acceleration Tool:
Grade 6 Module 2, Topic B

To become mathematically proficient, students **must** access on-grade-level content. This document aims to help teachers who use the Eureka curriculum to ensure readiness for students before and during on-grade-level work, creating opportunities for timely support directly connected to the new learning.

About this Topic

Focus Standards:

6.NS.B.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Topic Overview per the Eureka Curriculum

Prior to division of decimals, students revisit all decimal operations in Topic B. Students have had extensive experience with decimal operations to the hundredths and thousandths (5.NBT.B.7), which prepares them to easily compute with more decimal places. Students begin by relating the first lesson in this topic to mixed numbers from the last lesson in Topic A. They find that sums and differences of large mixed numbers can be more efficiently determined by first converting to a decimal and then applying the standard algorithms (6.NS.B.3). Within decimal multiplication, students begin to practice the distributive property. Students use arrays and partial products to understand and apply the distributive property as they solve multiplication problems involving decimals. Place value enables students to determine the placement of the decimal point in products and recognize that the size of a product is relative to each factor. Students discover and use connections between fraction multiplication and decimal multiplication.

Eureka Acceleration Tool: Grade 6
Module 2, Topic B

Overview

Eureka Acceleration Tools include:

1. a diagnostic assessment to help teachers determine the misunderstandings or gaps in mathematical knowledge related to a specific Topic in the Eureka curriculum
2. guidance for teachers to analyze student work on the diagnostic assessment
3. suggested materials for targeted remedial instruction

Note: The use of this guidance is not intended to delay students' engagement with on-grade-level learning. On-grade-level learning should be the focus of instructional time and be treated as an opportunity for students to "finish" learning previous skills and deepen conceptual understanding.

Diagnostic Assessment

The diagnostic assessment is designed to be administered to targeted students prior to beginning instruction on the given Topic. When appropriate, it is broken into parts (Part A, Part B, and so on); each part addresses a different prerequisite standard and contains three problems. If a student correctly answers at least 2 out of the 3 problems, it can be assumed that he/she is ready to engage with the new content of the Topic with little to no support needed prior to engaging with the Topic. The diagnostic assessment is designed in this way so that teachers can determine the "entry point" to remedial instruction and/or opportunities for unfinished learning within the context of the new learning. The entry points and opportunities for unfinished learning will vary between students.

Guidance for Acceleration

The Acceleration Guidance is designed for teacher use. It is also broken into parts (Part A, Part B, and so on) and correlates to the parts on the diagnostic assessment. Each part contains the following:

1. **The focus standard**: The focus standards are strategically chosen to address prerequisite skills and are purposefully arranged in the order that students typically master the skills and knowledge.
2. **Why this is important for current grade level work**: This section describes how the work of the prerequisite standard relates to the standard(s) addressed in the Topic of instruction.
3. **Using the diagnostic assessment to identify gaps**: This section identifies common errors students make on the diagnostic assessment items.
4. **Acceleration Resources for Targeted Instruction**: The resources pinpoint specific Eureka lessons and parts of lessons for teachers to use to address gaps in mathematical knowledge. Using Eureka materials to address acceleration ensures alignment to the standards, consistency in approach to learning, and similarities in strategies for solving problems.

Part A: 5.NBT.B.7 Addition

1. Find the sum. Explain and/or show your work.
   0.34 + 0.05

2. Find the sum. Explain or show your work.
   2.1 + 1.4 =

3. Find the sum. Explain or show your work
   3.08 + 8.94 =

Part B. 5.NBT.B.7 Subtraction

4. Find the difference. Explain or show your work.
   8.01 – 0.04 =

5. 5. Find the difference. Explain or show your work.
   0.76 – 4.8 =

6. Find the difference. Explain or show your work.
   4 – 0.38 =

Part C. 5.NBT.7 Multiplication

7. Find the product. Explain or show your work.
   4 x 0.06 =

8. Find the product. Explain or show your work.
   0.42 x 2 =

9. Find the product. Explain or show your work.
   0.5 x 1.32 =

Solutions:

1. 0.39
2. 3.5
3. 12.02
4. 8.03
5. 2.8
6. 3.962
7. 2.4
8. 0.84
9. 0.66

Part A Focus: 5.NBT.B.7 – Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; justify the reasoning used with a written explanation.

<table>
<tr>
<td colspan="3">Why this is important for current grade level work:
In order for students to become fluent with the standard algorithm of adding decimals in grade 6, place value concepts must be understood. Students should recognize that just as with whole number addition, like units must be added together and bundled or carried to the next place when there are ten or more of that unit. Place value charts, disks, and/or base ten pieces may be provided for student use when completing the diagnostic assessment. Mental math with a written justification should be encouraged for higher students.</td>
<td rowspan="2">Acceleration Resources for Targeted Instruction:
adapted from
5th Grade, Module 1, Topic D, Lesson 9

Teacher Companion
Student Activity Sheet</td>
</tr>
<tr>
<td colspan="3">Using the Diagnostic Assessment to identify gaps:</td>
</tr>
<tr>
<td>Problem 1:
Students should connect the problem to addition of whole numbers by adding like units, tenths + tenths = tenths, and hundredths + hundredths = hundredths</td>
<td>Problem 2:
Students should determine that since 13 tenths is a fraction or decimal greater than one, it must be converted to one whole and three tenths. After converting, like units should be added.</td>
<td>Problem 3:
Take note as to whether students are able to bundle like units and carry to the next place. Students may also use the partial sum method to add.</td>
</tr>
</table>

Part B Focus: 5.NBT.B.7 – Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; justify the reasoning used with a written explanation.

Why this is important for current grade level work:
In order for students to become fluent with the standard algorithm of subtracting multi-digit decimals in grade 6, the role of place value concepts in subtraction must be understood. Students should recognize that just as with whole number subtraction, like units must be taken from like units. Students should have a conceptual understanding of re-grouping units and recognize that the minuend does not change when it has been regrouped. Place value charts, disks, and/or base ten pieces may be provided for student use when completing the diagnostic assessment. Mental math with a written justification should be encouraged for higher students.

Using the Diagnostic Assessment to identify gaps:

Problem 4:
When students write the standard number sentence, make sure they have placed a 0 in the tenths place for each number. It is not necessary for students to use 0 as a placeholder in the subtrahend. Students may compute this problem mentally and explain that because the only thing being subtracted was 4-hundredths, the ones place would not change.

Problem 5:
Students may use a mental math method, such as counting-up by first changing 4.8 to 48 -tenths and counting up from 48 –tenths to 76-tenths, calculating 28 -tenths, then converting 28 -tenths to 2.8. If students use the standard algorithm, make sure they have converted 78-tenths to 7.8 and lined-up their decimals correctly.

Problem 6:
Students may use a mental strategy to solve this problem. Since 38-hundredths and 62-hundredths make a whole, then the difference is 3 wholes and 62-hundredths, 3.62

Acceleration Resources for Targeted Instruction:
adapted from
5th Grade, Module 1, Topic D, Lesson 10

Teacher Companion
Student Activity Sheet

Part C Focus: 5.NBT.B.7 – Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; justify the reasoning used with a written explanation.

Why this is important for current grade level work:
Relating decimal multiplication to whole-number multiplication will support the connection between the standard algorithm of whole-number multiplication to the standard algorithm of decimal multiplication. A focus on the distributive property and the area model can help students use place value understanding to decompose units and multiply using place value concepts. Estimation strategies are also important in determining decimal placement and the reasonableness of an answer. Place value charts, disks, and/or base ten pieces may be provided for student use when completing the diagnostic assessment. Mental math with a written justification should be encouraged for higher students.

Using the Diagnostic Assessment to identify gaps:

Problem 7:
Students should relate this problem to whole-number multiplication, knowing that four copies of 6-ones is 24 ones, 4 copies of 6-tenths is 24-tenths which is 2.4. Students may write their answer as a mixed number.

Problem 8:
Students should relate this problem to whole-number multiplication and reason if 2 groups of 42 is 84, then 2 groups of 42-hundredths is 84-hundredths or .84.

Problem 9:
Student may view the number as 132 hundredths and then decompose it and use the area model and/or distributive property to multiply mentally and add the partial products. ½ a group of 100 is 50, ½ a group of 30 is 15 and ½ a group of 2 is 1. 30-hundredths + 15-hundredths + 1 hundredth is 66-hundredths or .66.

Acceleration Resources for Targeted Instruction:
adapted from
5th Grade, Module 1, Topic E, Lesson(s) 11 - 12

Teacher Companion
Student Activity Sheet

Acceleration Guidance:
Grade 6 Eureka Module 2, Topic B

Appendix

Eureka Acceleration Tools

Prerequisite Support Lesson for Grade 6, Module 2, Topic B
Part A: Adding Decimals Using Place Value Strategies

Adapted from Eureka Lesson: Grade 5, Module 1, Topic D, Lesson 9

Use Prior to: Grade 6, Module 2, Topic B, Lesson 9

Standard: 5.NBT.B.7 – **Add**, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; justify the reasoning used with a written explanation.

Purpose: In order for students to become fluent with the standard algorithm of adding decimals in grade 6, place value concepts must be understood. Students should recognize that just as with whole number addition, like units must be added together and bundled or carried to the next place when there are ten or more of that unit. Place value charts, disks, and/or base ten pieces may be provided for student use when completing the diagnostic assessment and this Mini Lesson. Mental math with a written justification should be encouraged for higher students.

Note: Review Example Problems #1-2 together, emphasizing place value concepts.

- Understanding the meaning of tenths, hundredths, and thousandths is essential.
- Remind students, that just like whole numbers, you add like units when adding decimals.
- Using standard form (0.8), unit form (8 tenths), and expanded form (0.2 + 0.6) interchangeably can help students conceptualize place value and place value units.

Example Problems: When adding decimals, add like units.

1. 2 tenths + 6 tenths = 8 tenths or 0.8 (2 tenths plus tenths equals 8 tenths, just like 2 apples plus 6 apples equals 8 apples)
2. 2 ones 3 thousandths + 6 ones 1 thousandths = 8 ones and 4 thousandths or 8.004

Note: Allow students to try the following Example Problems #3 (a-i) on their own or with a partner, discussing afterwards to check for understanding.

- Students can then discuss answers with a partner or as a class.
- Students should explain how they used place value to add like units.

3. Solve, and then write the sum in standard form.
   a. 1 tenth + 2 tenths = 3 tenths (students add like units) = 0.3 (rewrite in standard form)
   b. 14 tenths + 9 tenths = 23 tenths = 2 one(s) 3 tenth(s) = 2.3

      (Because 14 tenths and 9 tenths make 23 tenths, help students understand that they can compose 2 wholes (or ones) and 3 tenths from 23 tenths; Using a place value chart or base ten blocks to bundle the tenths may help struggling students.)
   c. 1 hundredth + 2 hundredths = 3 hundredths (students add like units) = 0.03 (rewrite in standard form)
   d. 27 hundredths + 5 hundredths = 32 hundredths = 3 tenths 2 hundredths = 0.32

(Because 27 hundredths and 5 hundredths make 32 hundredths, help students think of 32 hundredths as 3 tenths and 2 hundredths since 10 hundredths equals 1 tenth, so 30 hundredths equals 3 tenths. Use a place value chart or base ten blocks if students struggle with this idea)

e. 1 thousandth + 2 thousandths = 3 thousandths = 0.003

f. 35 thousandths + 8 thousandths = 43 thousandths = 4 hundredths 3 thousandths = 0.043

g. 6 tenths + 3 thousandths = 603 thousandths = 0.603 (have students think of how many thousandths are in 1 tenths, if 100 thousandths are in 1 tenth, then there must be 600 thousandths in 6 tenths)

h. 7 ones 2 tenths + 4 tenths = 76 tenths = 7.6

i. 2 thousandths + 9 ones 5 thousandths = 9007 thousandths = 9.007

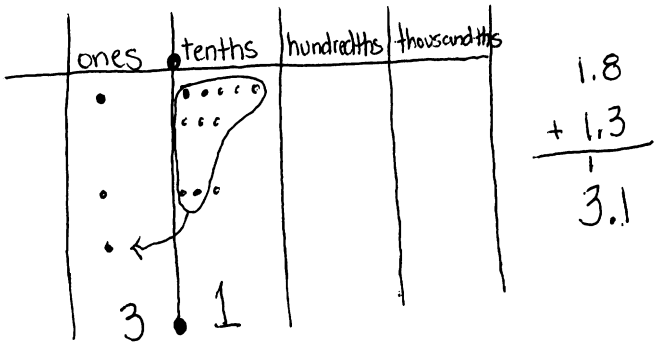
Note: Review Example Problem #4 together, emphasizing place value concepts.

- Students should understand that a digit in one place represents 10 times as much as it represents in the place to its right.
  - 10 thousandths = 1 hundredth
  - 10 hundredths = 1 tenth
  - 10 tenths = 1 whole (one)
- This will help students as they "bundle" groups of ten in the place value chart.

Example Problem

4. Using Place Value Strategies to Solve 1.8 + 13 tenths

For students who need to visualize the bundling process, use the place value chart.



1.8 + 13 tenths = 1.8 + 1.3
Use the place value chart to add like units - ones with ones, tenths with tenths. This time, you have to bundle in one of the place value units. Notice how the vertical written method (standard algorithm) mirrors the place value chart. Show students how bundling 10 tenths will make 1 whole, which needs to be added to the ones place. This supports the concept of bundling as students use the vertical method when adding.

1.8 + 13 tenths = 1 one and 21 tenths
1 whole + 8 tenths + 13 tenths = 1 whole and 21 tenths. Since 10 tenths make one, 21 tenths can be bundled to make 2 ones and 1 tenth. 1 one + 2 ones + tenth = 3 ones and 1 tenth or 3.1. Students can see the numbers as 18 tenths and 13 tenths or 1 whole and 8 tenths and 1 whole and 3 tenths.

Note: Students should complete the Problem Set independently, in a small group with the teacher, or with partners, depending on their level of need. Students can use whichever strategy or method works best for them but should work towards using the standard algorithm.

Problem Set: Solve using the standard algorithm or by using place value strategies.

a. 0.3 + 0.82 = 1.12 $\begin{array}{r} 0.30 \\ +\ 0.82 \\ \hline 1.12 \end{array}$	b. 1.03 + 0.08 = 1.11 $\begin{array}{r} 1.03 \\ +\ 0.08 \\ \hline 1.11 \end{array}$
c. 7.3 + 2.8 = 10.1 $\begin{array}{r} 7.3 \\ +\ 2.8 \\ \hline 10.1 \end{array}$	d. 57.03 + 2.08 = 59.11 $\begin{array}{r} 57.03 \\ +\ 2.08 \\ \hline 59.11 \end{array}$
e. 62.573 + 4.328 = 66.901 $\begin{array}{r} 62.573 \\ +\ 4.328 \\ \hline 66.901 \end{array}$	f. 85.703 + 12.197 = 97.900 $\begin{array}{r} 85.703 \\ +\ 12.197 \\ \hline 97.900 \end{array}$

Name: _____

Eureka Acceleration Tools

Prerequisite Support Lesson for Grade 6, Module 2, Topic B

Part A: Adding Decimals Using Place Value Strategies

Example Problems: When adding decimals, add like units.

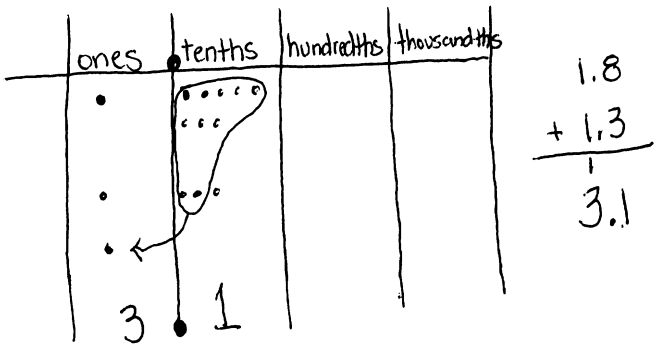
1. 2 tenths + 6 tenths = 8 tenths or 0.8
2. 2 ones 3 thousandths + 6 ones 1 thousandths = 8 ones and 4 thousandths or 8.004

3. Solve, and then write the sum in standard form.
   a. 1 tenth + 2 tenths = _____ tenths = _____
   b. 14 tenths + 9 tenths = _____ tenths = _____ one(s) _____ tenth(s) = _____
   c. 1 hundredth + 2 hundredths = _____ hundredths = _____
   d. 27 hundredths + 5 hundredths = _____ hundredths = _____ tenths _____ hundredths = _____
   e. 1 thousandth + 2 thousandths = _____ thousandths = _____
   f. 35 thousandths + 8 thousandths = ____ thousandths = ____ hundredths ____ thousandths = _____
   g. 6 tenths + 3 thousandths = _____ thousandths = _____
   h. 7 ones 2 tenths + 4 tenths = _____ tenths = _____
   i. 2 thousandths + 9 ones 5 thousandths = _____ thousandths = _____

Example Problem

4. Using Place Value Strategies to Solve 1.8 + 13 tenths

1.8 + 13 tenths = 1.8 + 1.3
Use the place value chart to add like units - ones with ones, tenths with tenths. This time, you have to bundle in one of the place value units. Notice how the vertical written method (standard algorithm) mirrors the place value chart.



1.8 + 13 tenths = 1 one and 21 tenths
1 whole + 8 tenths + 13 tenths = 1 whole and 21 tenths. Since 10 tenths make one, 21 tenths can be bundled to make 2 ones and 1 tenth. 1 one + 2 ones + tenth = 3 ones and 1 tenth or 3.1.

Problem Set: Solve using the standard algorithm or by using place value strategies.

a. 0.3 + 0.82 = _____	b. 1.03 + 0.08 = _____
c. 7.3 + 2.8 = _____	d. 57.03 + 2.08 = _____
e. 62.573 + 4.328 = _____	f. 85.703 + 12.197 = _____

Eureka Acceleration Tools

Prerequisite Support Lesson for Grade 6, Module 2, Topic B

Part B: Subtracting Decimals Using Place Value Strategies

Adapted from Eureka Lesson: Grade 5, Module 1, Topic D, Lesson 10

Use Prior to: Grade 6, Module 2, Topic B, Lesson 9

Standard: 5.NBT.B.7 – Add, **subtract**, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; justify the reasoning used with a written explanation.

Purpose: In order for students to become fluent with the standard algorithm of subtracting multi-digit decimals in grade 6, the role of place value concepts in subtraction must be understood. Students should recognize that just as with whole number subtraction, like units must be taken from like units. Students should have a conceptual understanding of re-grouping units and recognize that the minuend does not change when it has been regrouped. Place value charts, disks, and/or base ten pieces may be provided for student use when completing the diagnostic assessment and this Mini Lesson. Mental math with a written justification should be encouraged for higher students.

Note: Review Example Problems together, emphasizing place value concepts.

- Understanding the meaning of tenths, hundredths, and thousandths is essential.
- Remind students, that just like whole numbers, you subtract like units when subtracting decimals.
- Using standard form (0.5) and unit form (5 tenths) interchangeably can help students conceptualize place value units.

Example Problem 1: When subtracting decimals, subtract like units.

5 tenths – 3 tenths = 2 tenths or 0.2 (5 tenths minus 3 tenths equals 2 tenths, just like 5 apples minus 3 apples equals 2 apples)

7 ones 5 thousandths – 2 ones 3 thousandths = 5 ones and 2 thousandths or 5.002

Note: Allow students to try the following problems on their own, discussing afterwards to check for understanding.

- Students can then discuss answers with a partner or as a class.
- Students should explain how they used place value to add like units.

Subtract, writing the difference in stand form. Use place value strategies to solve.

a. 5 tenths – 2 tenths = 3 tenths (subtract like units) = 0.3 (rewrite in standard form)

b. 5 ones 9 thousandths – 2 ones = 3 ones 9 thousandths = 3.009 (continue subtracting like units and rewriting in word form, regrouping is not yet addressed)

c. 7 hundreds 8 hundredths – 4 hundredths = 7 hundreds 4 hundredths = 700.04

d. 37 thousandths – 16 thousandths = 21 thousandths = 0.021

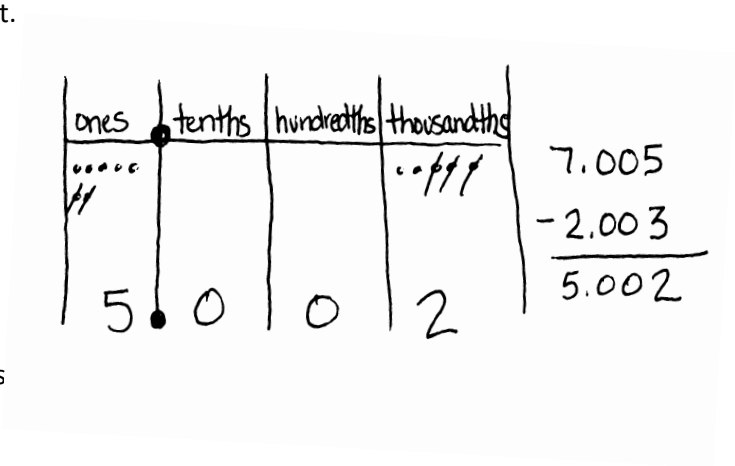
Note: Review Example Problem 2 together, emphasizing place value concepts.

- Students should understand that a digit in one place represents 10 times as much as it represents in the place to its right.
  - 10 thousandths = 1 hundredth
  - 10 hundredths = 1 tenth
  - 10 tenths = 1 whole (one)
- This will help students as they regroup when necessary.

Example Problem 2: Subtract using a place value chart.

7 ones 5 thousandths – 2 ones 3 thousandths

The place value chart helps students visualize the process, as well as relate the subtraction with the vertical method. 7 ones and 5 thousandths are drawn on the chart (or use place value disks). 2 ones and 3 thousandths are then removed from the chart, resulting in 5 ones and 2 thousandths leftover.



- Use the place value chart to subtract like units
- Record your thinking vertically.
- The units may change, but the basic fact

  5 – 2 = 3 is the same.
- The vertical method mirrors the place value chart.

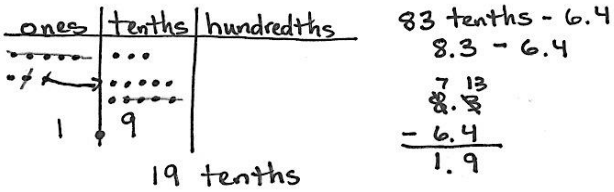
Note: Allow students to try the following problems on their own, discussing afterwards to check for understanding.

Use a place value chart to subtract.

a. 83 tenths – 6.4

Students should rewrite as 8.3 – 6.4 and then draw 8 ones and 3 tenths on the chart.

Before they can subtract 4 tenths from 3 tenths, they will have to regroup by subtracting one from the ones place and adding ten tenths to the tenths place.

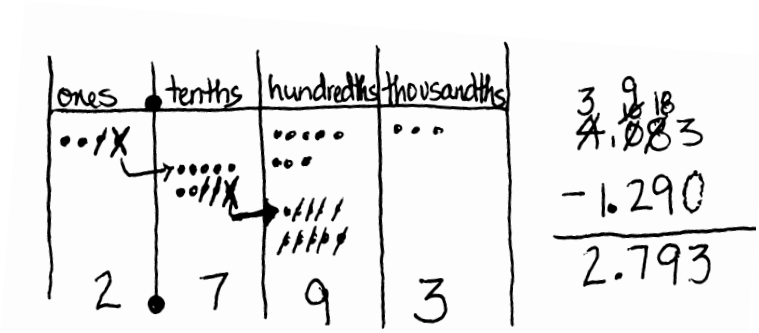


Students can now subtract 13 tenths and 4 tenths, and then 7 ones minus 6 ones, resulting in 19 tenths or 1.9.

b. 4.083 – 1.29

Encourage students to write out the problem and solve vertically, as they use the place value chart for regrouping.

Some students may need assistance when regrouping, especially when there is not a value in the tenths place to begin with.



Note: Students should complete the Problem Set independently, in a small group with the teacher, or with partners, depending on their level of need. Students can use whichever strategy or method works best for them but should work towards using the standard algorithm.

Problem Set

1. Solve using place value strategies.

a. 10 tens – 1 ten 1 tenth $\begin{array}{r} 0\ \cancel{10}\ \cancel{10}\ 10 \\ \cancel{100}.0 \\ -\ 10.1 \\ \hline 89.9 \end{array}$	b. 3 – 22 tenths $\begin{array}{r} 2\ 10 \\ \cancel{3}.0 \\ -\ 2.2 \\ \hline 0.8 \end{array}$	c. 37 tenths – 1 one 2 tenths $\begin{array}{r} 3.7 \\ -\ 1.2 \\ \hline 2.5 \end{array}$
d. 8 ones 9 hundredths – 3.4 $\begin{array}{r} 7\ 10 \\ \cancel{8}.09 \\ -\ 3.4 \\ \hline 4.69 \end{array}$	e. 5.622 – 3 hundredths $\begin{array}{r} 5\ 12 \\ 5.\cancel{6}\cancel{2}2 \\ -\ 0.03 \\ \hline 5.592 \end{array}$	f. 2 ones 4 tenths – 0.59 $\begin{array}{r} 1\ 13\ 10 \\ \cancel{2}.\cancel{4}0 \\ -\ 0.59 \\ \hline 1.81 \end{array}$

2. Solve using the standard algorithm.

a. 1.4 – 0.7 = 0.7 $\begin{array}{r} 0\ 14 \\ \cancel{1}.\cancel{4} \\ -0.7 \\ \hline 0.7 \end{array}$	b. 91.49 – 0.7 = 90.79 $\begin{array}{r} 0\ 14 \\ 9\cancel{1}.\cancel{4}9 \\ -\ 0.7 \\ \hline 90.79 \end{array}$	c. 191.49 – 10 .72 = 180.77 $\begin{array}{r} 0\ 14 \\ 19\cancel{1}.\cancel{4}9 \\ -\ 10.72 \\ \hline 180.77 \end{array}$
d. 7.148 – 0 .07 = 7.078 $\begin{array}{r} 0\ 14 \\ 7.\cancel{1}\cancel{4}8 \\ -\ 0.07 \\ \hline 7.078 \end{array}$	e. 60.91 – 2.856 = 58.054 $\begin{array}{r} 5\ 10\ 8\ 10\ 10 \\ \cancel{6}\cancel{0}.\cancel{9}\cancel{1}\cancel{0} \\ -\ 2.856 \\ \hline 58.054 \end{array}$	f. 361.31 – 2.841 = 358.469 $\begin{array}{r} 5\ 10\ 12\ 10\ 10 \\ 3\cancel{6}\cancel{1}.\cancel{3}\cancel{1}\cancel{0} \\ -\ 2.841 \\ \hline 358.469 \end{array}$

Name: _____

Eureka Acceleration Tools

Prerequisite Support Lesson for Grade 6, Module 2, Topic B

Part B: Subtracting Decimals Using Place Value Strategies

Example Problem 1: When subtracting decimals, subtract like units.

5 tenths – 3 tenths = 2 tenths or 0.2

7 ones 5 thousandths – 2 ones 3 thousandths = 5 ones and 2 thousandths or 5.002

Subtract, writing the difference in stand form. Use place value strategies to solve.

a. 5 tenths – 2 tenths = _____ tenths = _____

b. 5 ones 9 thousandths – 2 ones = _____ ones _____ thousandths = _____

c. 7 hundreds 8 hundredths – 4 hundredths = _____ hundreds _____ hundredths = _____

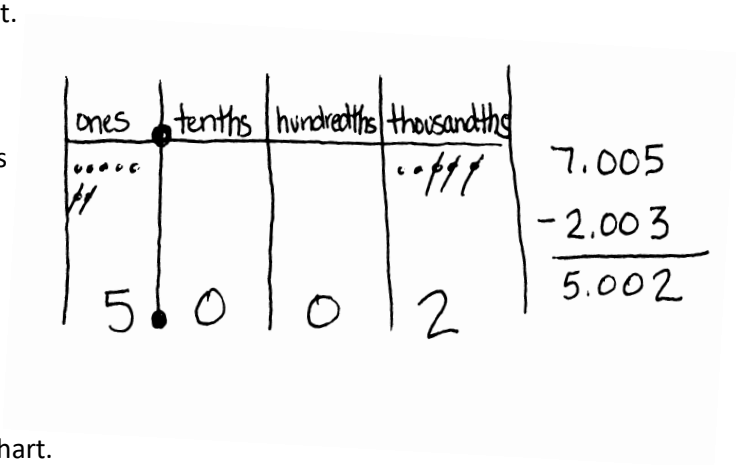
d. 37 thousandths – 16 thousandths = _____ thousandths = _____

Example Problem 2: Subtract using a place value chart.

7 ones 5 thousandths – 2 ones 3 thousandths

- Use the place value chart to subtract like units
- Record your thinking vertically.
- The units may change, but the basic fact

  5 – 2 = 3 is the same.
- The vertical method mirrors the place value chart.



Use a place value chart to subtract.

a. 83 tenths – 6

b. 4.083 – 1.29

Problem Set

1. Solve using place value strategies.

a. 10 tens – 1 ten 1 tenth	b. 3 – 22 tenths	c. 37 tenths – 1 one 2 tenths
d. 8 ones 9 hundredths – 3.4	e. 5.622 – 3 hundredths	f. 2 ones 4 tenths – 0.59

2. Solve using the standard algorithm.

a. 1.4 – 0.7 =	b. 91.49 – 0.7 =	c. 191.49 – 10.72 =
d. 7.148 – 0.07 =	e. 60.91 – 2.856 =	f. 361.31 – 2.841 =

Eureka Acceleration Tools

Prerequisite Support Lesson for Grade 6, Module 2, Topic B

Part C: Multiplying Decimals Using Place Value Strategies & Estimation

Adapted from Eureka Lesson: Grade 5, Module 1, Topic D, Lesson 11 & 12

Use Prior to: Grade 6, Module 2, Topic B, Lesson 10

Standard: 5.NBT.B.7 – Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; justify the reasoning used with a written explanation.

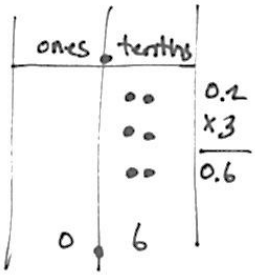
Purpose: Relating decimal multiplication to whole-number multiplication will support the connection between the standard algorithm of whole-number multiplication to the standard algorithm of decimal multiplication. A focus on the distributive property and the area model can help students use place value understanding to decompose units and multiply using place value concepts. Estimation strategies are also important in determining decimal placement and the reasonableness of an answer. Place value charts, disks, and/or base ten pieces may be provided for student use when completing the diagnostic assessment. Mental math with a written justification should be encouraged for higher students.

Note: Review the first Example Problem with the students. Walk them through creating the place value chart and solving the math on the next two problems.

- Encourage students to think about repeated addition as they find the products.
- When students find the answer for 2 and 3, ask how they are different.
  - Students will have to bundle the tenths to make 1 one and 2 tenths left over.
  - 4 copies of 3 tenths is 12 tenths. 12 tenths is the same as 1 one and 2 tenths.

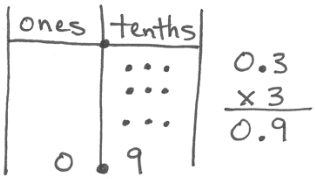
Example Problems

Solve using a place value chart.

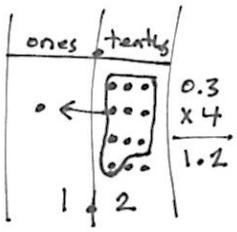


1. $3 \times 0.2 = 0.6$
   - Draw 2 tenths on the place value chart.
   - Make 3 copies of 2 tenths. How many tenths do you have in all?
   - Write the algorithm showing 5 tenths
     - 0.2 + 0.2+ 0.2 = 0.6
     - 3 x 0.2 = 0.6

2. $3 \times 0.3 =$ <u>0.9</u>



3. $4 \times 0.3 =$ <u>1.2</u>

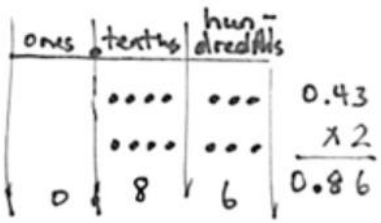


Note: Review Example Problem #4 with the students. Walk them through creating the area model and solving the math on the next two problems.

- Have students relate their place value chart to the area model.
  - In the place value chart, there are two groups of 4 tenths and 2 groups of 3 hundredths. I need to combine the tenths with tenths and hundredths with hundredths.
  - This can be represented on the area model. 2 groups of 4 tenths is 8 tenths. 2 groups of 3 hundredths is 6 hundredths. I can now add the partial products, 8 tenths plus 6 hundredths (or 0.8 + 0.06) equals 86 hundredths (or 0.86)
-

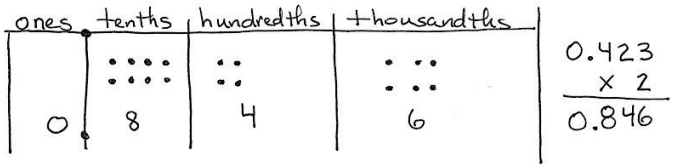
Solve using a place value chart and an area model.

4. $2 \times 0.43 =$ _____
   - Place Value Chart
     - Draw 4 tenths and 3 hundredths
     - Make 2 copies
     - Write the algorithm
   - Area Model
     - Put the expanded decimal form across the top
     - Put 2 on the side.
     - Multiply 2 by 4 tenths
     - Multiply 2 by 3 hundredths
     - Find the sum of the partial products.



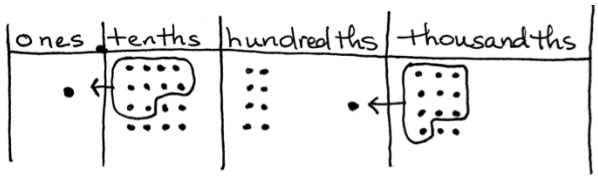
	4 tenths	+	3 hundredths	
2	8 tenths		6 hundredths	
	0.8	+	0.06	= 0.86

5. $2 \times 0.423 =$ 0.846



	4 tenths	+	2 hundredths	+	3 thousandths	
2	8 tenths		4 hundredths		6 thousandths	
	0.8	+	0.04	+	0.006	= 0.846

6. $4 \times 0.423 =$ 1.692



	4 tenths	+	2 hundredths	+	3 thousandths	
4	16 tenths		8 hundredths		12 thousandths	
	1.6	+	0.08	+	0.012	= 1.692

Discuss the bundling/regrouping that occurs with the thousandths and the tenths. Have students explain when regrouping was necessary and what they actually did in the process.

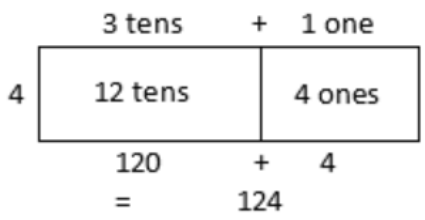
- 4 times 3 thousandths is 12 thousandths, so we had to bundle 10 thousandths to make 1 hundredth
- 4 times 4 tenths is 16 tenths, so we had to regroup 10 tenths to make 1 whole.

Note: Tell students to look at Example Problems 7-9. Ask the following questions:

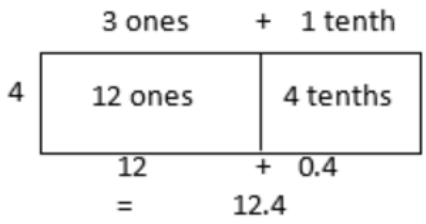
- How are all these three problems alike? (they are alike because they all have 3, 1, and 4 apart of the problem)
- How are the products of all three problems alike? (Every product has the digits 1, 2, and 4, and they are always in the same order)
- If the products have the same digits and those digits are in the same order, do the products have the same value? Why or why not? (The decimal is not in the same place in every product. The values are different because the units that we multiplied are different. The digits that we multiplied are the same, but you have to think about the units to make sure the answer is right)
- We can multiply the numerals first and then think about the units to help place the decimal.

Solve using an area model and estimation.

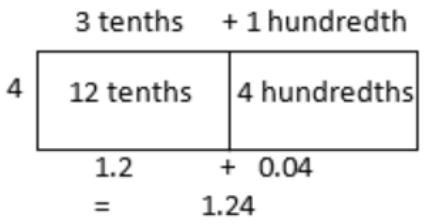
7. $31 \times 4 = 124$



8. $3.1 \times 4 = 12.4$



9. $0.31 \times 4 = 1.24$



Think about multiplying the numerals first, and then think about the units to help place the decimal.

Note: For Example Problems 10 – 12, walk students through using estimation to correctly place the decimal.

10. $5.1 \times 6 =$ <u>30.6</u>

- What is the smallest unit in 5.1? (tenths)
- Multiply 5.1 by 10 to convert it to tenths. How many tenths is the same as 5.1 (51 tenths)
- Suppose our multiplication sentences was 51 x 6. Multiply and record your multiplication vertically. What is the product? (306)
- We know that our product will contain these digits, but is 306 a reasonable product for our actual problem of 5.1 x 6? (We have to think about the units. 306 ones is not reasonable, but 306 tenths is. 5.1 is close to 5, and 5 x 6 = 30, so the answer should be around 30. 306 tenths is the same as 30 ones and 6 tenths)
- Using this reasoning, where does it make sense to place the decimal in 306? What is the product of 5.1 x 6? (Between the zero and the six. The product is 30.6

11. $11.4 \times 4 =$ <u>45.6</u>

- Use the same process as walking students through this problem.
- Students should multiply without the decimal, resulting in 456 tenths.
- Students should see 11.4 as close to 11 and estimate the answer by multiplying 11 x 4 = 44.
- This estimation should help students place the decimal between 5 and 6, resulting in 45.6.

12. $7.8 \times 3 =$ <u>23.4</u>

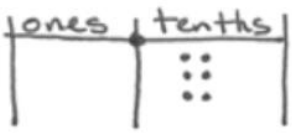
- Use the same process as walking students through this problem.
- Students should multiply without the decimal, resulting in 234 tenths.
- Students should see 7.8 as close to 8 and estimate the answer by multiplying 8 x 3 = 24.
- This estimation should help students place the decimal between 3 and 4, resulting in 23.4.

Note: Note: Students should complete the Problem Set independently, in a small group with the teacher, or with partners, depending on their level of need.

Problem Set

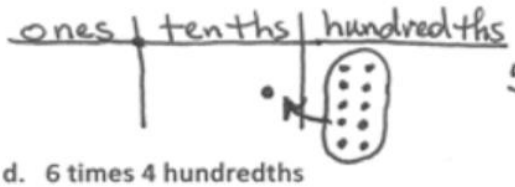
1. Solve by drawing disks on a place value chart. Write an equation, and express the product in standard form.

a. 3 copies of 2 tenths



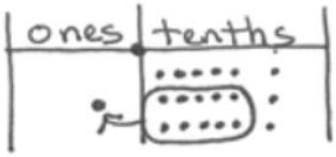
$3 \times 0.2 =$
0.6

b. 5 groups of 2 hundredths



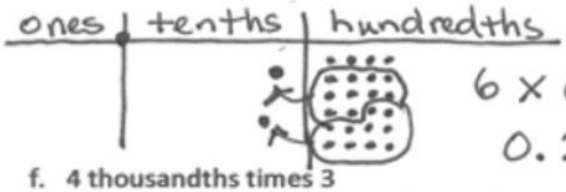
$5 \times 0.02 =$
0.10

c. 3 times 6 tenths



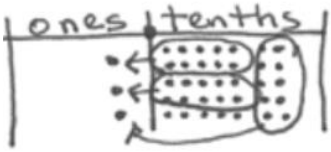
$3 \times 0.6 =$
1.8

d. 6 times 4 hundredths



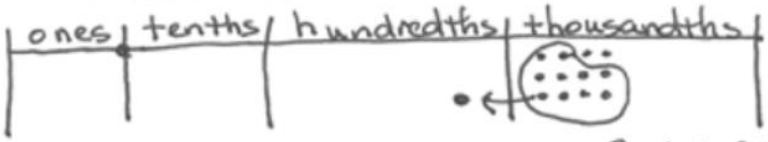
$6 \times 0.04 =$
0.24

e. 5 times as much as 7 tenths



$5 \times 0.7 =$
3.5

f. 4 thousandths times 3



$3 \times 0.004 =$
0.012

2. Draw an area model similar to the one pictured below for Parts (b), (c), and (d). Find the sum of the partial products to evaluate each expression.

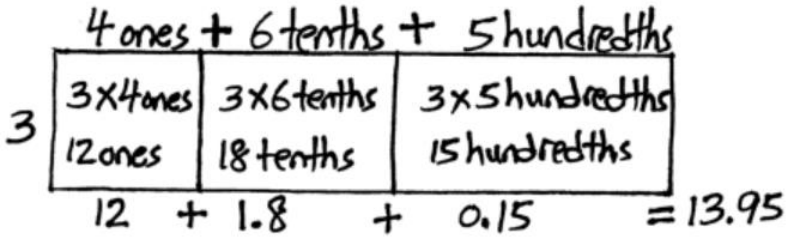
a. 7×3.12

	3 ones	+	1 tenth	+	2 hundredths
7	7×3 ones		7×1 tenth		7×2 hundredths
	24	+	1.2	+	0.14 = 21.84

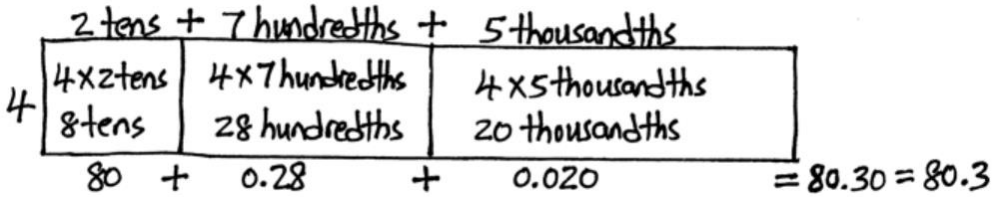
b. $6 \times 4.25 =$ 25.5

	4 ones		2 tenths		5 hundredths
6	6 x 4 ones 24 ones		6 x 2 tenths 12 tenths		6 x 5 thousandths 30 thousandths
	24	+	1.2	+	0.30 = 25.5

c. 3 copies of 4.65 = 13.95



d. 4 times as much as 20.075 = 25.5



3. Choose the reasonable product for each expression. Explain your reasoning in the spaces below using words, pictures, or numbers.

a. 2.5×4	0.1	1	10	100
Twenty-five tenths x 4 is 100 tenths. 100 tenths is 10.				
b. 3.14×7	2198	219.8	21.98	2.198
I know the product has to be 3x7 plus some more. The answer has to be 21 and something.				
c. 8×6.022	4.8176	48.176	481.76	4817.6
8 x 6 = 48; 8 x 0.022 is rounded to 8 x 0.02. 8 x two hundredths is 16 hundredths. 48 + .16 is close to 48.176.				
d. 9×5.48	493.2	49.32	4.932	0.4932
9 x 5 = 45. I rounded .48 to .5. 9 x .5 is 4.5. 45 + 4.5 is 49.5. 49.5 is close to 49.32				

Name: _____

Eureka Acceleration Tools

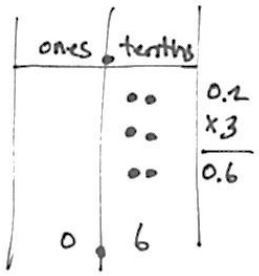
Prerequisite Support Lesson for Grade 6, Module 2, Topic B

Part C: Multiplying Decimals Using Place Value Strategies & Estimation

Example Problems

Solve using a place value chart.

1. $3 \times 0.2 = 0.6$
   - Draw 2 tenths on the place value chart.
   - Make 3 copies of 2 tenths. How many tenths do you have in all?
   - Write the algorithm showing 5 tenths
     - 0.2 + 0.2+ 0.2 = 0.6
     - 3 x 0.2 = 0.6

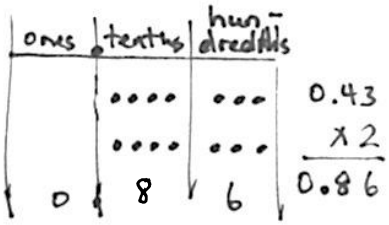


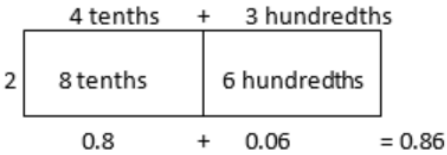
2. $3 \times 0.3 =$ _____

3. $4 \times 0.3 =$ _____

Solve using a place value chart and an area model.

4. $2 \times 0.43 =$ _____
   - Place Value Chart
     - Draw 4 tenths and 3 hundredths
     - Make 2 copies
     - Write the algorithm
   - Area Model
     - Put the expanded decimal form across the top
     - Put 2 on the side.
     - Multiply 2 by 4 tenths
     - Multiply 2 by 3 hundredths
     - Find the sum of the partial products.



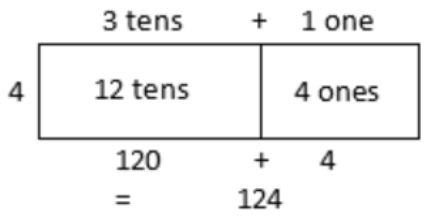


5. $2 \times 0.423 =$ _____

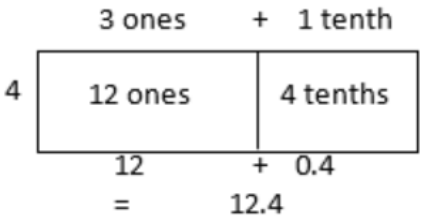
6. $4 \times 0.423 =$ _____

Solve using an area model and estimation.

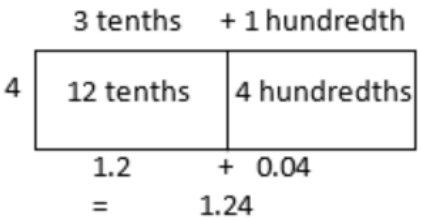
7. $31 \times 4 = 124$



8. $3.1 \times 4 = 12.4$



9. $0.31 \times 4 = 1.24$



Think about multiplying the numerals first, and then think about the units to help place the decimal.

10. $5.1 \times 6 =$ _____

11. $11.4 \times 4 =$ _____

12. $7.8 \times 3 =$ _____

Problem Set

1. Solve by drawing disks on a place value chart. Write an equation, and express the product in standard form.

   a. 3 copies of 2 tenths

   b. 5 groups of 2 hundredths

   c. 3 times 6 tenths

   d. 6 times 4 hundredths

   e. 5 times as much as 7 tenths

   f. 4 thousandths times 3

2. Draw an area model similar to the one pictured below for Parts (b), (c), and (d). Find the sum of the partial products to evaluate each expression.

a. 7×3.12

	3 ones	+	1 tenth	+	2 hundredths
7	7×3 ones		7×1 tenth		7×2 hundredths
	_____	+	_____	+	0.14 = _____

b. 6×4.25

c. 3 copies of 4.65

d. 4 times as much as 20.075

3. Choose the reasonable product for each expression. Explain your reasoning in the spaces below using words, pictures, or numbers.

a. 2.5×4	0.1	1	10	100
b. 3.14×7	2198	219.8	21.98	2.198
c. 8×6.022	4.8176	48.176	481.76	4817.6
d. 9×5.48	493.2	49.32	4.932	0.4932