College- and Career-Readiness Standards for Mathematics

Exemplar Lesson Plan

“Operations with Decimals”

5.NBT.7

MISSISSIPPI DEPARTMENT OF EDUCATION
Ensuring a bright future for every child
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## Mississippi College- and Career-Readiness Standards
### Mathematics
## Exemplar Lesson Plan

**GRADE: 5**

<table>
<thead>
<tr>
<th>Title: Operations with Decimals</th>
<th>Real World Purpose:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Duration: 3 Days</td>
<td>What would you do if you wanted to know how much change you would have after purchasing something from a store? If you bought more than one of the same item, how could you determine how much you spent (including tax) on each item? Operations with decimals to the hundredths place allows us to answer these and other questions.</td>
</tr>
</tbody>
</table>

### I Can:

- **5.NBT.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; relate the strategy to a written method and explain the reasoning used. (SMP 1, 2, 6, and 7)

### Prerequisite Skills:

- Have a conceptual knowledge of division and division models. (4.NBT.6)
- Find whole-number quotients and remainders of up to four-digit dividends and one-digit divisors. (4.NBT.6)
- Know how to use visual models to divide whole numbers. (4.NBT.6)
- Know how to add, subtract, multiply and divide whole numbers using strategies based on place value and the properties of operations. (4.OA.3)
- Recognize that addition and subtraction are inverse operations. (2.NBT.5)
- Recognize that multiplication and division are inverse operations. (3.OA.5 and 4.NBT.6)
- Understand that place value is extremely important when performing operations. (4.NBT.6)
Materials/Resources:
- Colored Printer Paper
- Glue
- Scissors
- Markers
- Pencils
- Projector
- Sentence Strips
- Base Ten Blocks
- Place Value Disks
- Construction Paper

Key Vocabulary:
- Quotient
- Dividend
- Divisor
- Multiple
- Factor
- Product
- Addend
- Sum
- Minuend
- Subtrahend
- Difference
- Properties of Operations

- Place Value
- Inverse Operations
- Tenths
- Hundredths
- Thousandths

3-hole punch
Attachments (Total: 10)

Lesson Introduction
Student Exploration Activity:

Day 1:
Foldable Directions: (see Attachment #2, Place Value Strip, for visual reference)

- The teacher will distribute a sentence strip and a bag of Attachment #1, Number Cards, to each student. (The Number Cards can be laminated and used multiple times. The students will not keep these.)
- The student will fold their sentence strip into fourths and draw a line along the fold to designate four separate sections. The student will label the sections from left to right: Millions, Thousands, Ones, Decimals.
- The student will divide/partition each fourth into thirds by drawing vertical lines and label from left to right: Hundred Millions, Ten Millions, Millions, Hundred Thousands, Ten Thousands, Thousands, Hundreds, Tens, Ones, Tenths, Hundredths, Thousandths.
- The student will draw a decimal on the line between the Ones and Tenths places and write the word “AND” above the decimal.
-
The Place Value Strip can be glued into an interactive notebook or onto a piece of construction paper that is hole-punched and inserted into their binders for future use/reference.

**Place Value Activity Directions:**
- The teacher will give directions for students to form a number to meet specific criteria. The students will use their place value sentence strip and their Number Cards to create the numbers.
- The teacher will specify four numbers to use (ex. 8, 4, 7, 2) and present the following criteria:
  - Build the largest number you can.
  - Build the smallest number you can.
  - Build a number less than 800.
  - Build a number greater than 800.
  - Build a number that is between 300 and 500.
  - Build a different number that is between 300 and 500.
- The teacher will circle the room and help any struggling students and address any common issues with the class.
- Repeat with different digits and different directions.
• The teacher can also show Attachment #3, *Base Ten Blocks Images*, and have students match the number with their Number Cards and Place Value Strip.

**Day 2:**

**Place Value Activity Directions:**
- The teacher will give students addition and subtraction problems to the hundredths place, and students will use base ten blocks and their Place Value Chart to model the problems and answers. (To increase rigor, the teacher can present the problems in a horizontal fashion to verify students understand the importance of lining up the decimal points.)

1) \[89.61 - 26.632 = \]  
2) \[29 + 27.69 = \]  
3) \[71 - 12.3 = \]  
4) \[26 + 13.824 = \]  
5) \[51 - 38.75 = \]  
6) \[54.7 + 9.39 = \]  

1) \[78.9 - 55.779 = \]  
2) \[73 + 48.7 = \]  
3) \[41.3 - 20.65 = \]  
4) \[46 + 39.5 = \]
Day 3:

Place Value Activity Directions:

1. The teacher will give students multiplication and division problems to the hundredths place, and students will use base ten blocks/arrays and their Place Value Chart to model the problems and answers. (To increase rigor, the teacher can present the problems in a horizontal fashion to verify students understand the positions of the dividend and divisor as well as how to line up the numbers for these problems, rather than the decimals.)

1. \(8688 \div 8.2\)

2. \(6475 \div 0.99\)

3. \(711.9 \div 8.4\)

1. \(63.9 \times 7.0\)

2. \(44.84 \times 9.84\)

3. \(88.6 \times 5.01\)

4. \(39.6 \times 5.20\)

5. \(28.15 \times 5.5\)

6. \(14.36 \times 4.9\)

3. \(5.6 \times 6.2\)
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Lesson Activities

Day 1

1. The teacher will distribute base ten blocks to pairs of students. The teacher will distribute Attachment #4, What’s My Sum?, to each student. The teacher will write/display one problem at a time on the board and select pairs to share out how they represented each problem and what their answer is. (Vertical Thinking demonstration on problem c – show problem as standard algorithm. The teacher should not use procedural language such as, “Line the decimals up.” The students should justify alignment of digits based on place value units.)

   a. 2 tenths + 6 tenths (0.8)
   b. 2 ones 3 hundredths + 6 ones 1 hundredths (8.04)
   c. 2 ones 5 tenths + 6 hundredths (2.56)
   d. 1.8 + 13 tenths (3.1)
   e. 1 ten 8 hundredths + 2 ones 4 hundredths (12.12)
   f. 148 thousandths + 7 ones 13 thousandths (7.161)
   g. 0.74 + 0.59 (1.33)
   h. 7.48 + 5.19 (12.67)
   i. 7.44 + 0.77 (8.21)

2. The teacher will distribute a copy of Attachment #5, What’s My Difference?, to each student. The teacher will write/display one problem at a time on the board and select pairs to share out how they represented each problem and what their answer is. (For problem h – Ask, “How can we think of 6 wholes in the same units as 48 hundredths?” Lead students to articulate the need to record 6 ones as 600 hundredths or 6.00 in order to subtract vertically. Ask, “By decomposing 6 wholes into 600 hundredths, did we change its value?” – No, we just converted it to smaller units; similar to exchanging $6 for 600 pennies.)

   a. 5 tenths - 3 tenths (0.2)
   b. 7 ones 5 thousandths - 2 ones 3 thousandths (5.002)
   c. 9 tens 5 tenths - 3 tenths (90.2)
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3. The teacher will distribute Attachment #6, *Sums and Differences Problem Set*, to each student. The students will work individually to solve the problems and will clearly explain their thinking using words, numbers, and pictures. (MP.1, MP.2, MP.3, MP.4, MP.5, MP.6, and MP.7) The teacher will circulate around the room to check student work and help correct misunderstandings.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>d.</td>
<td>83 tenths - 6.4 (1.9)</td>
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<tr>
<td>e.</td>
<td>9.2 - 6 ones 4 tenths (2.8)</td>
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<tr>
<td>f.</td>
<td>0.83 - 0.29 (0.54)</td>
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<tr>
<td>g.</td>
<td>4.83 - 0.59 (4.24)</td>
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<tr>
<td>h.</td>
<td>6 - 0.48 (5.52)</td>
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</table>

Day 2

1. The students will be in pairs with their place value charts and place value disks. The teacher will distribute Attachment #7, *What’s My Product?*, to each student. The teacher will write/display one problem at a time on the board and select pairs to share out how they represented each problems and what their answer is. The teacher will walk the students through using an area model to represent their answer for problem d. (This will happen after the students have found their answer using the place value disks.) The students will use an area model to solve problem e with their partner. (Problems g – h students should use an area model to represent the distributive property.)

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<tbody>
<tr>
<td>a.</td>
<td>3 x 0.2 (0.6)</td>
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<tr>
<td>b.</td>
<td>3 x 0.3 (0.9)</td>
</tr>
<tr>
<td>c.</td>
<td>4 x 0.3 (1.2)</td>
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<tr>
<td>d.</td>
<td>2 x 0.43 (0.86)</td>
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<tr>
<td>e.</td>
<td>2 x 0.423 (0.846)</td>
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<tr>
<td>f.</td>
<td>4 x 0.423 (1.692)</td>
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<tr>
<td>g.</td>
<td>6 x 1.21 (7.26)</td>
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<tr>
<td>h.</td>
<td>7 x 2.41 (16.87)</td>
</tr>
<tr>
<td>i.</td>
<td>8 x 2.34 (18.72)</td>
</tr>
</tbody>
</table>
2. The teacher will present the following three problems to the students for discussion.

“How are these three problems alike?”

31 x 4 (124)

3.1 x 4 (12.4)

0.31 x 4 (1.24)

3. The students will use area models to find the products for the above three problems. “How are the products of all three problems alike?” (Every product has a 1, 2, and 4, and they are always in the same order.) “If the products have the same digits in the same order, do the products have the same value? Why or why not?” (The digits that were multiplied are the same, but their units are different, which means the decimal is in a different place for each value.) The teacher will lead the students through a discussion to conclude that they can multiply the digits first and then think about the units to help place the decimal.

4. The teacher will distribute Attachment #8, *Products Problem Set*, to each student. The students will work individually to solve the problems and will clearly explain their thinking using words, numbers, and pictures. (MP.1, MP.2, MP.3, MP.4, MP.5, MP.6, and MP.7) The teacher will circulate around the room and to check student work and help correct misunderstandings.
Day 3

1. The students will be in pairs with their place value charts and place value disks. The teacher will distribute Attachment #9, *What’s My Quotient?*, to each student. The teacher will write/display one problem at a time on the board and select pairs to share out how they represented each problem and what their answer is. Problem a – “Draw disks to represent 9 tenths on your worksheet. Divide 9 tenths into 3 equal groups. How many tenths are in each group?”

   a. 0.9 ÷ 3 (0.3)
   b. 0.24 ÷ 4 (0.06)
   c. 0.032 ÷ 8 (0.004)
   d. 1.5 ÷ 5 (0.3)
   e. 1.05 ÷ 5 (0.21)
   f. 3.015 ÷ 5 (0.603)

2. The students will compare the relationships between the next three sets of problems: (MP.8)

   a. 4.8 ÷ 6 = 0.8 and 48 ÷ 6 = 8
   b. 4.08 ÷ 8 = 0.51 and 408 ÷ 8 = 51
   c. 63.021 ÷ 7 = 9.003 and 63,021 ÷ 7 = 9,003

4. The teacher will distribute Attachment #10, *Quotient Problem Set*, to each student. The students will work individually to solve the problems and will clearly explain their thinking using words, numbers, and pictures. (MP.1, MP.2, MP.3, MP.4, MP.5, MP.6, and MP.7) The teacher will circulate around the room to check student work and help correct misunderstandings. (Adapted from [www.engageny.org](http://www.engageny.org))
Lesson Closure

1. **Think-Pair-Share:** (Day 1) The teacher closes the lesson by posing three essential questions to the class: (1) How is adding and subtracting with decimals similar to adding and subtracting with whole numbers? (2) How are they different? (3) Why does it make sense mathematically to “line up the decimals” when adding and subtracting? The teacher will ask the students to think about the questions silently for 30 seconds and then pair with another student and share their thoughts with each other.

2. **Exit Ticket:** (Day 2) The teacher will close the lesson by posing an essential question to the class: How do the rules of multiplying whole numbers relate to multiplying decimals? The students will write their answers down on a slip of paper using full sentences, illustrations, examples, stories, arrays, etc. to support their answers. These will be turned into the teacher at the end of class.

3. **Whip Around:** (Day 3) Have all students stand. The teacher randomly calls on a student to answer a question about the lesson, such as, “What patterns did you notice when dividing decimals?” or “What is a dividend?” The student may answer or send the problem to another student of their choice. The student must sit down if he/she passes the problem or if they get it incorrect. Once all students are seated save for one (or time runs out), the activity is finished.

**Essential Questions:**
- How is adding and subtracting with decimals similar to adding and subtracting with whole numbers? How are they different?
- Why does “lining up the decimal points” when you are adding and subtracting with decimals help when finding the answers? Why does this make sense mathematically?
- How can estimation help when you multiply and divide with decimals?
- How can we use models to demonstrate additions, subtractions, multiplication, and division of decimals?
- What happens when we multiply/divide decimals by powers of 10?
- How do the rules of multiplying whole numbers relate to multiplying decimals?
- What patterns do we notice when multiplying and dividing decimals?
- What strategies can we use to solve problems and check solutions involving decimals?
### Standards for Mathematical Practice

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

### Supplemental Activities

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Enrichment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The teacher may allow students who struggle with multiplication and division to use base ten blocks throughout the lesson.</td>
<td>• Students who need enrichment may be given problems written horizontally to gain additional practice with setting problems up in correct vertical form.</td>
</tr>
<tr>
<td>• Students who struggle may be given problems already written in correct vertical form.</td>
<td>• For the Student Exploration Activity at the start of each lesson, students who need enrichment may be allowed to provide parameters to other students.</td>
</tr>
</tbody>
</table>
### Performance Based Assessment Task

**Math Task**

John is purchasing a piece of canvas on which to paint a self-portrait. The canvas is 4.4 feet wide and 2.05 feet long.

1. **In order to determine how much paint he needs for his background color, John wants to know the area of his canvas. What is the area of the canvas?**

2. **In order to frame the canvas, John needs to know the perimeter of the canvas. What is its perimeter?**

3. **John decides the canvas is too big, so he cuts it in half. What is the new area and perimeter of his canvas?**

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**Rubric/ Plausible Student Response(s)**

<table>
<thead>
<tr>
<th>Rubric</th>
<th>Level I</th>
<th>Level II</th>
<th>Level III</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level I</strong></td>
<td>Limited Performance</td>
<td>Not Yet Proficient</td>
<td>Proficient in Performance</td>
</tr>
<tr>
<td><strong>Level II</strong></td>
<td>Student is unable to calculate with decimals.</td>
<td>Students are able to correctly calculate some of the measurements but not all of them.</td>
<td>Students calculates that the area of the canvas is 9.02 ft².</td>
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<tr>
<td><strong>Level III</strong></td>
<td></td>
<td></td>
<td>Students calculates that the perimeter of the canvas is 12.9 ft.</td>
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<td></td>
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<td></td>
<td>Students calculates that the new canvas with dimensions of 2.2 ft. by 2.05 ft. or 4.4 by 1.025. The new area will be 4.51 ft². The new perimeter will be 8.5 ft. or 10.85 ft.</td>
</tr>
</tbody>
</table>
Number Cards

**Directions:**

Cut out each number in the template below and place them into small Ziploc bags for each student.

*Note: This page may be laminated prior to cutting each number out and used as a class set if desired.*

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
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<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
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<td>0</td>
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<td>5</td>
<td>6</td>
<td>7</td>
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<td>9</td>
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</tbody>
</table>
Directions:

1. To begin creating your own place value strip, locate a sentence strip. If a sentence strip is unavailable, cut a sheet of construction paper or cardstock lengthwise.

2. While holding the sentence strip (construction paper/cardstock) horizontally, fold it into fourths and draw a line along the fold to designate four separate sections. Label the sections from left to right: Millions, Thousands, Ones, Decimals.

3. Divide each fourth into thirds by drawing vertical lines. Label the sections from left to right: Hundred Millions, Ten Millions, Millions, Hundred Thousands, Ten Thousands, Thousands, Hundreds, Tens, Ones, Tenths, Hundredths, Thousandths.

4. Draw a decimal on the line between the Ones and Tenths place and write the word “AND” above the decimal.

5. Your new “Place Value Strip” can be glued into an interactive notebook or onto a sheet of construction paper and inserted into a binder for future reference and use.

Sample:
Base Ten Blocks
**What is My Sum Recording Sheet?**

**Directions:**

Use your Place Value Chart and Base Ten Blocks to model each problem. Draw the models you create on the table below and capture your thinking (thought process) in the space provided.

<table>
<thead>
<tr>
<th>Tens</th>
<th>Ones</th>
<th>Tenths</th>
<th>Hundredths</th>
<th>Vertical Thinking</th>
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<tbody>
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</table>

Name: ______________________________     Date:_______________
What is My Difference Recording Sheet?

**Directions:**

Use your Place Value Chart and Base Ten Blocks to model each problem. Draw the models you create on the table below and capture your thinking (thought process) in the space provided.

<table>
<thead>
<tr>
<th>Tens</th>
<th>Ones</th>
<th>Tenths</th>
<th>Hundredths</th>
<th>Vertical Thinking</th>
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</table>
Sums and Differences Problem Set

1. Review each item below. Solve each item and write the sum in standard form. Use a place value chart if necessary.
   
   a. 1 tenth + 2 tenths = _______________ tenths = ________
   
   b. 13 tenths + 9 tenths = _____________ tenths = ______ one(s) _______ tenth(s) = _____
   
   c. 1 hundredth + 2 hundredths = __________ hundredths = ___________
   
   d. 37 hundredths + 5 hundredths = _______ hundredths = ______ tenths ____ hundredths = ___________
   
   e. 7 tenths + 3 hundredths = ______ hundredths = ______

2. Solve each item below using the standard algorithm.

<table>
<thead>
<tr>
<th>a. 0.3 + 0.83 = _________</th>
<th>b. 1.04 + 0.08 = ____________</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. 0.45 + 0.65 = _________</td>
<td>d. 0.97 + 0.04 = _____________</td>
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<td>---------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>e. 8.91 + 0.11 = _________</td>
<td>f. 0.04 + 0.4 = ______________</td>
</tr>
</tbody>
</table>

3. Paige measured how much she grew over a two year time period. In the first year she grew 4.62 cm. In the second year, she grew 7.7 cm. How much taller was she after the two years? ____________
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4. During a science experiment, Mary found the mass of two rocks to be 41.4 grams and 74.3 grams. What is the total mass for the two rocks? ______________________

5. Review each item below. Solve each item and write the difference in standard form. Use a place value chart if necessary.
   a. 5 tenths - 2 tenths = ______________ tenths = ________
   b. 5 ones 9 thousandths – 2 ones = _____ one(s) _______ tenth(s) = _____
   c. 3 hundreds 9 hundredths – 4 hundredths = ______ hundreds ___ hundredths = _______
   d. 37 hundredths - 5 hundredths = ______ hundredths = ______ tenths ____ hundredths = __________

6. Solve each item below using the standard algorithm.
   a. 1.5 – 0.8 = ______
   b. 7.148 – 0.07 = ______
   c. 54.7 – 9.3 = ______
   d. 63.03 – 59.88 = ______
   e. 361.43 – 2.84 = __________
   f. 93 – 32.2 = __________

7. John ate a snack with 80.79 total calories. If the chips he ate were 43.39 calories, how many calories were in the remainder of his snack? ________________

8. Jerry bought 6.95 lbs of cherry and lime flavored jelly beans for his birthday party. If 1.75 lbs were cherry flavored, how many pounds were lime flavored? ___________
What is My Product Recording Sheet?

**Directions:**

Use your Place Value Chart and Base Ten Blocks to model each problem. Draw the models you create on the table below and capture your thinking (thought process) in the space provided.

<table>
<thead>
<tr>
<th>Tens</th>
<th>Ones</th>
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</table>

Name: ______________________________     Date: ____________
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Name: ________________________________     Date: ____________

Products Problem Set

1. Review each item below. Solve each item by drawing disks on a place value chart. Write an
   equation to represent your work, and express the product in standard form.
   a. 3 copies of 2 tenths  
   b. 3 times 6 tenths
   c. 6 times 4 hundredths  
   d. 5 groups of 2 hundredths

2. Use an area model to solve the following problems.
   a. 6 x 7.49
   b. 9 copies of 3.65
   c. 3 times 20.175

3. Hayley earns $5.67 per hour babysitting her younger cousin. If she babysits a total of 9 hours in a
   week, how much will Hayley have earned? ___________

4. Jack bought 15 apples and 12 bananas for soccer practice. One apple costs $1.20, and one banana
   costs $0.88. How much money did Jack spend on fruit for soccer practice? ______________

5. Leslie multiplied 8 by 4.3 and got 32.24. Is her answer correct? Use an area model to justify your
   response.
What is My Quotient Recording Sheet

**Directions:**

Use your Place Value Chart and Base Ten Blocks to model each problem. Draw the models you create on the table below and capture your thinking (thought process) in the space provided.

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<th>Vertical Thinking</th>
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Mississippi College- and Career-Readiness Standards
Mathematics
Exemplar Lesson Plan

Name: _______________________________     Date: ______________

Quotients Problem Set

1. Complete each number sentence below with the correct number of units. Complete the equation that models each number sentence.
   a. 4 groups of _____ tenths is 1.6.  1.6 ÷ 4 = ____________
   b. 8 groups of _____ hundredths is 0.32.  0.32 ÷ 8 = ___________
   c. 5 groups of _____ tenths is 2.0.  2.0 ÷ 5 = ____________

2. Complete each number sentence below. Express the quotient in unit form and in standard form.
   a. 4.5 ÷ 5 = __________ tenths ÷ 5 = _______ tenths = __________
   b. 6.12 ÷ 6 = _________ ones ÷ 6 + _________ hundredths ÷ 6
      = _________ ones + __________ hundredths
      = __________

3. Calculate the quotient for each number sentence below. Use words, numbers, or pictures to describe any relationships you notice between each problem and its quotient.
   a. 21 ÷ 7 = _____________________  2.1 ÷ 7 = _______________
   b. 48 ÷ 8 = _____________________  0.48 ÷ 8 = ______________
   c. 54 ÷ 6 = _____________________  0.054 ÷ 6 = ______________

4. Pamela went to the hardware store and bought 6 identical wooden boards. When Pamela placed all the boards end-to-end, it measured 9 meters. What was the length of each board? __________

5. An 8-story building is 84 feet tall. Estimate the height of each “story” (floor). __________