5th Grade CCGPS Math ***Units 2-3: Numbers and Operations in Base Ten*** Student Study Guide

Dear Student:

Please review the Math standards below to prepare for the end-of-unit assessment on ***during the week of December 16th , 2013 (Part 1) and the week of January 7th , 2014 (Part 2).*** *This will require that you take your interactive math notebook home each night to review your notes, handouts, and examples from class. Set aside enough study time each day prior to the assessment to ensure that you will do your best. Thanks!* ☺

Units 2-3 Common Core Math Standards:

Understand the place value system.
• **MCC5.NBT.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
Perform operations with multi-digit whole numbers and with decimals to the hundredths.
MCC5.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.

PLACE VALUE AND DECIMALS													
millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones	and	tenths	hundredths	thousandths	ten-thousandths	hundred-thousandths	millionths
						3	.	2	5				
						4	.	1	7	2			
					2	5	.	0	3				
						0	.	1	6	8			
				1	3	2	.	7					

Note that **0.168** has the same value as **.168**. However, the zero in the ones place helps us remember that **0.168 is a number less than one.** From this point on, when writing a decimal that is less than one, we will always include a zero in the ones place.

Phrase	Decimal
fifty-six hundredths	0.560
nine tenths	0.900
thirteen and four hundredths	13.040
twenty-five and eighty-one hundredths	25.810
nineteen and seventy-eight thousandths	19.078

Decimal	Phrase
0.0050	five thousandths
100.6000	one hundred and six tenths
2.2800	two and twenty-eight hundredths
71.0620	seventy-one and sixty-two thousandths
3.0589	three and five hundred eighty-nine ten-thousandths

Expanded Form

We can write the whole number 159 in expanded form as follows: 159 = (1 x 100) + (5 x 10) + (9 x 1). Decimals can also be written in expanded form. Expanded form is a way to write numbers by showing the value of each digit. This is shown in the example below.

Example 4:

Decimal		Expanded form
4.1200	=	$(4 \times 1) + (1 \times \frac{1}{10}) + (2 \times \frac{1}{100})$
0.9000	=	$(0 \times 1) + (9 \times \frac{1}{10})$
9.7350	=	$(9 \times 1) + (7 \times \frac{1}{10}) + (3 \times \frac{1}{100}) + (5 \times \frac{1}{1000})$
1.0827	=	$(1 \times 1) + (0 \times \frac{1}{10}) + (8 \times \frac{1}{100}) + (2 \times \frac{1}{1000}) + (7 \times \frac{1}{10000})$

MCC5.NBT.3 *Read, write and compare decimals to thousandths.*

- Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

Decimal numbers are compared in the same way as other numbers: by comparing the different place values from left to right. We use the symbols <, > and = to compare decimals as shown below.

Example 1:

Comparison	Meaning
0.2 > 0.15	0.2 is greater than 0.15
0.15 < 0.2	0.15 is less than 0.2
0.2 = 0.2	0.2 is equal to 0.2
0.15 = 0.15	0.15 is equal to 0.15

When comparing two decimals, it is helpful to write one below the other. This is shown in the next example.

Example 2: Which is greater, 0.57 or 0.549?

Analysis: Let's compare these decimals using a place-value chart.

ones	and	tenths	hundredths	thousandths
0	**.**	**5**	**7**	**0**
0	**.**	**5**	**4**	**9**

Answer: 0.57 is greater than 0.549.

Notation: 0.57 > 0.549

As you can see in the example above, 0.57 has fewer decimal digits than 0.549. It is easier to compare two decimals when you have the same number of decimal digits, so an extra zero was written to the right of the digit 7 in the decimal 0.57. We are able to do this because 0.57 and 0.570 are equivalent decimals.

Example 4: Order these decimals from least to greatest: 3.87, 3.0875, 3.87502, 3.807

We have been asked to order four decimal numbers. Let's start by writing one decimal beneath the other in their original order.

3.87000
3.08750
3.87502
3.80700

Next, examine each decimal, writing one or more zeros to the right of the last digit, so that all decimals have the same number of decimal digits.

3.87000
3.08750
3.87502
3.80700

Now we can compare two decimals at a time. We will write a number in a circle next to each decimal to denote its order.

3.87000 ③
3.08750 ①
3.87502 ④
3.80700 ②

From least to greatest, we get: 3.08750, 3.80700, 3.87000, 3.87502

Answer: Ordering these decimals from least to greatest we get: 3.0875, 3.807, 3.87, 3.87502

MCC5.NBT.4 *Use place value understanding to round decimals to any place.*

27.17469 rounded to the nearest whole number is 27
36.74691 rounded to the nearest whole number is 37
12.34690 rounded to the nearest tenth is 12.3
89.46917 rounded to the nearest tenth is 89.5
50.02139 rounded to the nearest hundredth is 50.02
72.63539 rounded to the nearest hundredth is 72.64
46.83531 rounded to the nearest thousandth is 46.835
9.63967 rounded to the nearest thousandth is 9.640

Rules for rounding decimals.
1. Retain the correct number of decimal places (e.g. 3 for thousandths, 0 for whole numbers)
2. If the next decimal place value is 5 or more, increase the value in the last retained decimal place by 1.

MCC5.NBT.7*. Add and subtract decimals to hundredths. Explain the relationship between concrete models, drawings, and written representations.*

Procedure: To add decimals, follow these steps:

1. Line up all the decimal points in a column.
2. When needed, write one or more extra zeros to the right so that both decimals have the same number of decimal digits.
3. Start on the right, and add each column in turn. (Add digits in the same place-value position.)
4. If you need to carry, remember to add the tens digit of that column to the next column.
5. Place the decimal point in the sum.

Example 2: Subtract: 8.06 - 8.019

Step 1: You must first line up the decimal points in a column.

$$\begin{array}{r} 8.06 \\ -\ 8.019 \\ \hline \end{array}$$

Step 2: The decimals in this problem do not have the same number of decimal digits. You can write an extra zero to the right of the last digit of the first decimal so that both decimals have the same number of decimal digits.

$$\begin{array}{r} 8.060 \\ -\ 8.019 \\ \hline \end{array}$$

Step 3: Start on the right, and subtract each column in turn. (Subtract digits in the same place-value position.)

$$\begin{array}{r} {\scriptstyle 1} \\ 8.060 \\ -\ 8.019 \\ \hline 1 \end{array}$$

Step 4: If the digit you are subtracting is bigger than the digit you are subtracting from, you have to borrow a group of ten from the column to the left.

$$\begin{array}{r} {\scriptstyle 5\ 1} \\ 8.0\cancel{6}0 \\ -\ 8.019 \\ \hline 1 \end{array} \rightarrow \begin{array}{r} {\scriptstyle 5\ 1} \\ 8.0\cancel{6}0 \\ -\ 8.019 \\ \hline 41 \end{array} \rightarrow \begin{array}{r} {\scriptstyle 5\ 1} \\ 8.0\cancel{6}0 \\ -\ 8.019 \\ \hline 041 \end{array} \rightarrow \begin{array}{r} {\scriptstyle 5\ 1} \\ 8.0\cancel{6}0 \\ -\ 8.019 \\ \hline 0\ 041 \end{array}$$

Step 5: Be sure to place the decimal point in the difference.

Decimals multiplied by powers of 10

When multipying a decimal by a positive power of ten (positive exponent), move the decimal point one place to the right for each zero you see after the 1

Examples:

1) 0.56 × 10

There is only one zero, so move the decimal point one place to the right.

0.56 × 10 = 5.6

2) 0.56 × 100

There are 2 zeros, so move the decimal point two places to the right

0.56 × 100 = 56

3) 0.056 × 1000

There are three zeros, so move the decimal point 3 places to the right.

0.056 × 1000 = 56

4) 0.056 × 100,000

0.056 × 100,000 = 0.056 × 1000 × 100 = 56 × 100 = 5600

Mini-Lesson: Division of a Decimal by a Power of a Ten

If a decimal number is divided by a power of 10, the digits in the dividend remains unchanged but the decimal point is moved to the left by a number of places equal to the number of trailing zeros in the power of 10.

E.g. $4183 \div 10 = 418.3$ {Move the decimal point by one place to the left}

$4183 \div 100 = 41.83$ {Move the decimal point by two places to the left}

$4183 \div 1000 = 4.183$ {Move the decimal point by three places to the left}

$4183 \div 10\,000 = 0.4183$ {Move the decimal point by four places to the left}

$0.4183 \div 10 = 0.04183$ {Move the decimal point by one place to the left}

$0.04 \div 100 = 0.0004$ {Move the decimal point by two places to the left}

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Dividing Decimals by Whole Numbers

Unit 13 > Lesson 5 of 11

Example 1: The Lachance family drove cross country on a 4,615.8 mile trip in 49 days. Find the average number of miles driven per day.

Analysis: We need to divide 4,615.8 by 49 to solve this problem.

Step 1: **Estimate the quotient using compatible numbers.**

$$\begin{array}{r} \text{quotient} \\ \text{divisor}\overline{)\text{dividend}} \end{array} \qquad 49\overline{)4{,}615.8} \rightarrow \begin{array}{r} 90 \\ 50\overline{)4{,}500} \end{array}$$

Step 2: **Use long division to find the quotient.**

Decide where to place the first digit of the quotient.

$$\begin{array}{r} \downarrow \\ 49\overline{)4\,615.8} \end{array}$$

49 does not go into 4 and 49 does not go into 46. Therefore, we mus
with 461 divided by 49. The first digit of the quotient will be in the ten

Round to estimate the quotient digit.

$$49\overline{)4{,}615.8}$$ Think: $50\overline{)461}$ or $5\overline{)45}$ Try 9.

Multiply, subtract and compare.

$$\begin{array}{r} 9 \\ 49\overline{)4{,}615.8} \\ 441 \\ \hline 20 \end{array}$$

Multiply the quotient digit by the divisor: 9 x 49 = 441
Subtract: 461 - 441 = 20
Compare: Is the difference less than the divisor? Yes: 20 < 49

Bring down the next digit from the dividend. Continue dividing.

$$\begin{array}{r} 9 \\ 49\overline{)4{,}615.8} \\ 441 \\ \hline 205 \end{array}$$

Bring down the 5.

$$\begin{array}{r} 94 \\ 49\overline{)4{,}615.8} \\ 441 \\ \hline 205 \\ 196 \\ \hline 9 \end{array}$$

4 x 49 = 196

$$\begin{array}{r} 94 \\ 49\overline{)4{,}615.8} \\ 441 \\ \hline 205 \\ 196 \\ \hline 98 \end{array}$$

Bring down the 8.

$$\begin{array}{r} 94\,2 \\ 49\overline{)4{,}615.8} \\ 441 \\ \hline 205 \\ 196 \\ \hline 98 \\ 98 \\ \hline 0 \end{array}$$

2 x 49 = 98

Place the decimal point in the quotient.

$$\begin{array}{r} 94.2 \\ 49\overline{)4{,}615.8} \\ 441 \\ \hline 205 \\ 196 \\ \hline 98 \\ 98 \\ \hline 0 \end{array}$$

Check your answer: Multiply the divisor by the quotient to see if you get the dividend.

$$\begin{array}{r} 94.2 \\ \times \quad 49 \\ \hline 847\,8 \\ 3\,768\,0 \\ \hline 4{,}615.8 \end{array}$$

Step 3: **Compare your estimate with your quotient to verify that your answer makes sense.**

Our quotient of 94.2 makes sense since it is close to our estimate of 90.

Answer: The average number of miles driven per day was 94.2.

Dividing Decimals by Decimals

Unit 13 > Lesson 7 of 11

Problem 1: Do you see a pattern in each table below? Use mental arithmetic to find each quotient, then mouse over the red text.

quotient
divisor)dividend

Table 1	Table 2	Table 3
6)54	5)35	9)45
60)540	50)350	90)450
600)5,400	500)3,500	900)4,500

The patterns in the tables above were created by multiplying the divisor and the dividend by the same power of 10. In each pattern, the quotient remains the same. Thus, multiplying both the divisor and dividend by the same power of 10 maintains the equality of the expression.

Problem 2:xxx Continue each pattern below by multiplying the divisor and the dividend by 10 **until the divisor is a whole number**. Then find each quotient.

0.02 11.2)0.224 ? ?	200 0.08) 16 ? ?	4.8300 25.84)124.8072 ? ?

Answer:

0.02 11.2)0.224	200 0.08) 16	4.8300 25.84)124.8072

$$112\overline{)2.24}\quad 0.02 \qquad 0.8\overline{)160}\quad 200 \qquad 258.4\overline{)1{,}248.072}\quad 4.830$$

$$8\overline{)1{,}600}\quad 200 \qquad 2{,}584\overline{)12{,}480.72}\quad 4.83$$

Let's compare Problems 1 and 2 above. In both problems, the quotients remain the same even though the divisors and dividends are multiplied by powers of 10. However, the divisors in Problem 1 are whole numbers; whereas the divisors in Problem 2 are decimals. Let's look at some examples of dividing by a decimal divisor.

$$\text{divisor}\overline{)\text{dividend}}\quad \text{quotient}$$

Example 1: $0.8\overline{)9.6}$

Analysis: The divisor is 0.8. To make it a whole number, we will multiply both the dividend and the divisor by 10.

Multiply the divisor by a power of 10 to make it a whole number.	**Multiply the dividend by the same power of 10. Place the decimal point in the quotient.**	**Divide the dividend by the whole-number divisor to find the quotient.**
$08.\overline{)9.6}$	$08.\overline{)96.}$	$8\overline{)96.}$ $\underline{8}$ 16 $\underline{16}$ 0

Answer: The quotient of 9.6 and 0.8 is 12.

In Example 1, we changed the divisor to a whole number before performing the division. To do this, **we multiplied both the divisor and the dividend by the same power of 10**. Note that the quotient of 9.6 and 0.8 is the same as the quotient of 96 and 8. Let's look at why this is possible:

Both the divisor and dividend were multiplied by 10: $\frac{9.6 \times 10}{0.8 \times 10}$. Since $\frac{10}{10} = 1$, this is

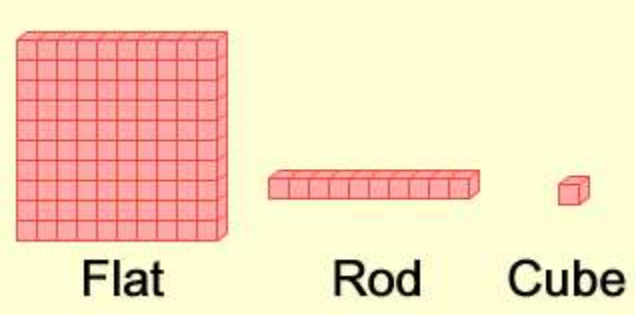
Thus, the quotient of 9.6 and 0.8 and the quotient of 96 and 8 are both 12. Let's look at another example.

Example 2: $0.35\overline{)13.93}$

Analysis: The divisor is 0.35. To make it a whole number, we will multiply both the dividend and the divisor by 100.

Multiply the divisor by a power of 10 to make it a whole number.	**Multiply the dividend by the same power of 10. Place the decimal point in the quotient.**	**Divide the dividend by the whole-number divisor to find the quotient.**
$035.\overline{)13.93}$	$035.\overline{)1,393.}$	$35\overline{)1,393.0}$ → 39.8; 105; 343; 315; 280; 280; 0

Answer: The quotient of 13.93 and 0.35 is 39.8



A flat is worth 1 whole.

A rod is worth one tenth (0.1).

A cube is worth one hundredth (0.01).

***Websites and Resource for **Math Tutorials and Extra Practice** (aligned to the 5th Grade Common Core State Standards):

http://www.helpingwithmath.com/by_grade/gr5_cc_skills.htm

http://www.k-5mathteachingresources.com/5th-grade-number-activities.html

http://www.khanacademy.org/

http://nsdl.org/commcore/math?id=5

https://sites.google.com/a/norman.k12.ok.us/mr-wolfe-s-math-interactive-whiteboard/5th-grade

http://pinterest.com/teaching4real/5th-grade-common-core/

http://www.mathscore.com/math/standards/Common%20Core/5th%20Grade/

http://www.ixl.com/math/standards/common-core/grade-5

http://intermediateelem.wikispaces.com/Fifth+Grade+Math+Resource+Backup

http://mail.clevelandcountyschools.org/~ccselem/?OpenItemURL=S07BB59E1