Meaningful Approaches to Algorithms for Decimals

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NCTM 2014

Emphases

Students extend their methods for operating on whole numbers to operating on decimal numbers. They develop, discuss, and use efficient, accurate, and generalizable methods. They make math drawings, relate the drawing to a written method, and explain the method using place value and properties of operations.

Students eventually become fluent with all operations on decimals without making a drawing.

Mathematical Practices

Students do

	math sense-making
about	mathematical structure
using	math drawings
to support	math explaining.

G5 NBT Decimal Standards 5.NBT.1, 2, 3, 4, 7

5.NBT Understand the place value system.

1. 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 1/10 of what it represents in the place to its left.

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.

3. Read, write, and compare decimals to thousandths.

4. Use place value understanding to round decimals to any place.

Perform operations with multi-digit whole numbers and with decimals to hundredths.

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.

G5 NBT Decimal Standards Extend Concepts From Grade 4

5.NBT Understand the place value system.

Generalize place value relationships in both directions

1. 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 1/10 of what it represents in the place to its left.

Extend from tenths and hundredths in Grade 4 to thousandths

3. Read, write, and compare decimals to thousandths.
   a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g.,
   $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
   b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

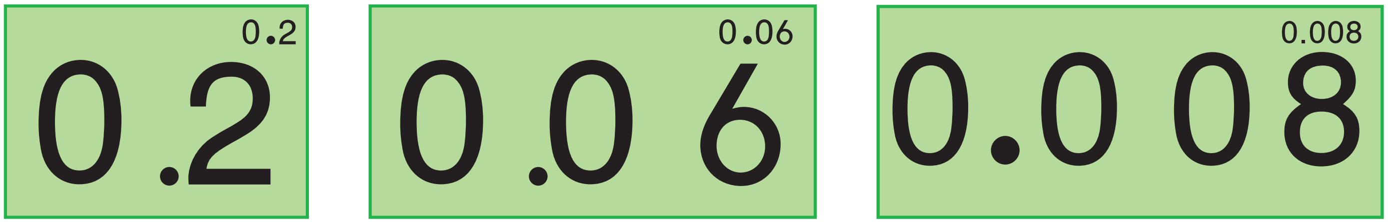
The value of a place is 10 times the value of the place to its right

Place Value

$\times$ 10 (larger) $\qquad\qquad$ $\div$ 10 (smaller)

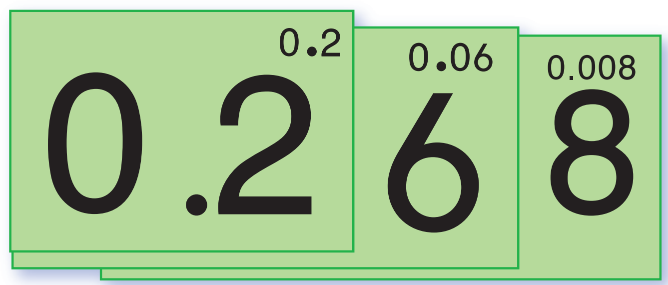
Thousands	Hundreds	Tens	ONES	Tenths	Hundredths	Thousandths
1,000.	100.	10.	1.	0.1	0.01	0.001
$\frac{1000}{1}$	$\frac{100}{1}$	$\frac{10}{1}$	$\frac{1}{1}$	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
\$1,000.00	\$100.00	\$10.00	\$1.00	\$0.10	\$0.01	\$0.001

G5 Secret Code Cards to the Thousandths



Tenths Card **Hundredths Card** **Thousandths Card**

Ask students to place the cards on top of each other to display the number in standard form.

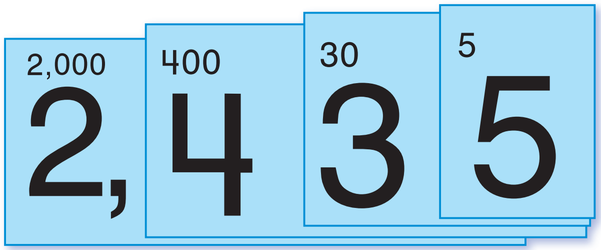


Assembled Cards

G5 Secret Code Cards to the Thousands

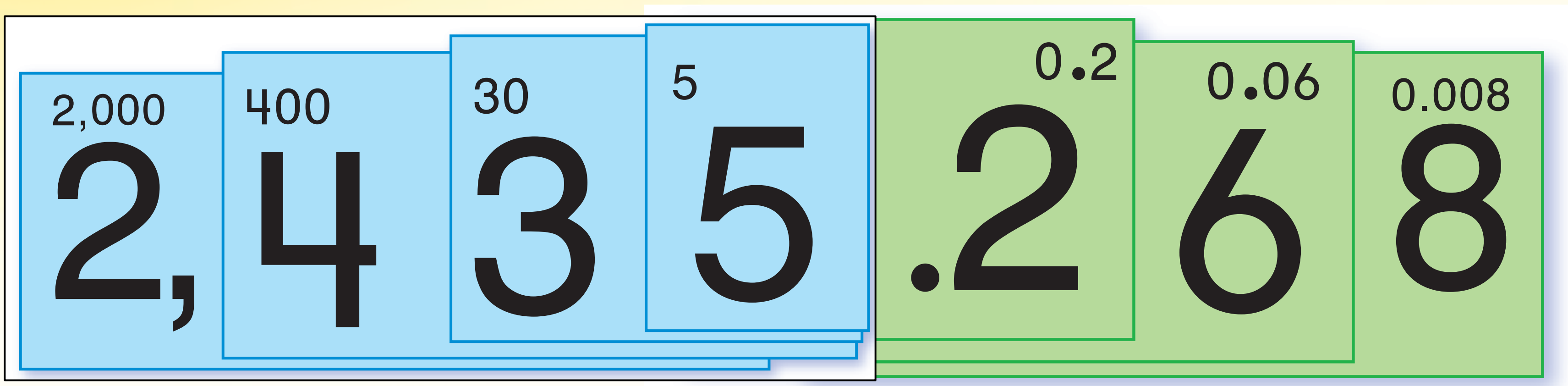
2,000 + **400** + **30** + **5**

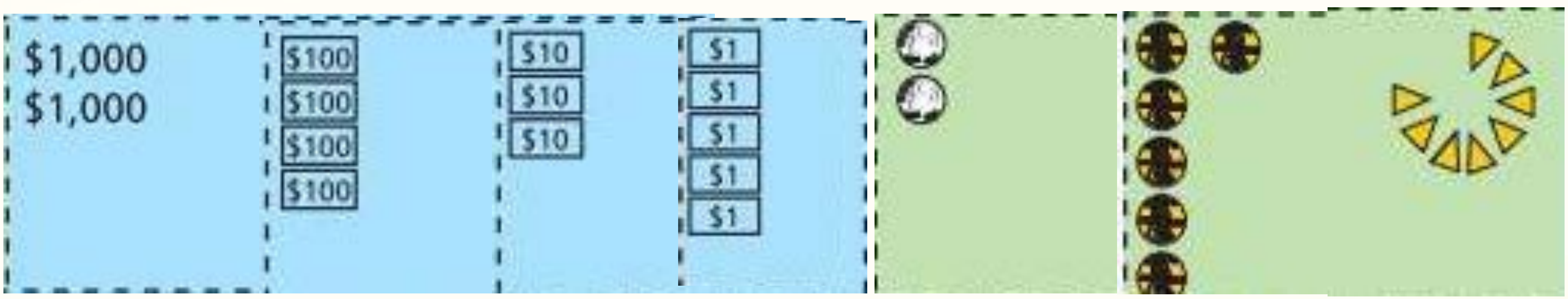
Ask students to place the cards on top of each other to display the number in standard form.



Assembled Cards

G5 Secret Code Cards Show Money Values





G5 5.NBT.7 Adding and Subtracting Decimals

Extend from adding and subtracting whole numbers in Grades K through G4 to adding and subtracting with decimals to hundredths.

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.

To add and subtract multi-digit numbers, you use like units: 2.NBT.7. Add and subtract within 1000, 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. Understand that in adding or subtracting three digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

So for decimals align like units and add or subtract as with multi-digit numbers.

Align like units and add or subtract as with multi-digit numbers.

You can line up decimals points under each other to put like units under each other. But students need to understand that they do this so they can add or subtract like units. They can think:

dollars and dollars, dimes and dimes, pennies and pennies.

0.37 + 0.9 rewrite as

D P

0. 3 7

0. 9

You can add a decimal point and zeros after a whole number: 46 + 0.72

46.00

0.72

G5 Generalizing Composing and Decomposing for Decimals

5.NBT.1 Generalize place value relationships in both directions

1. **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 1/10 of what it represents in the place to its left.**

Because these one-for-ten left-to-right trades work regularly across all positions for whole numbers and for decimals,

composing (make 1 new unit from 10 units to the right) and

decomposing (make 10 new units to the right from 1 unit on the left)

work the same way for adding and subtracting decimals as they did for whole numbers.

Students can extend their G4 general compact methods for adding and for subtracting whole numbers to adding and subtracting decimals.

G5 Avoid the Common Subtraction Error

\$6 − 37¢

or

$6 - 0.37$

\$ D P

$$\begin{array}{r} 6.00 \\ -\ 0.37 \\ \hline \end{array}$$

Common Error

$$\begin{array}{r} 6.00 \\ \underline{-0.37} \\ 6.37 \end{array}$$

Draw the Magnifying Glass

$$\begin{array}{r} {}^{5}\cancel{6}.{}^{\overset{9}{\cancel{10}}}\cancel{0}{}^{10}\cancel{0} \\ -\ 0.37 \\ \hline 5.63 \end{array}$$

G5 Multiplying Decimals 5.NBT.2 and 7 and 5.NF.5b

5.NBT Understand the place value system.

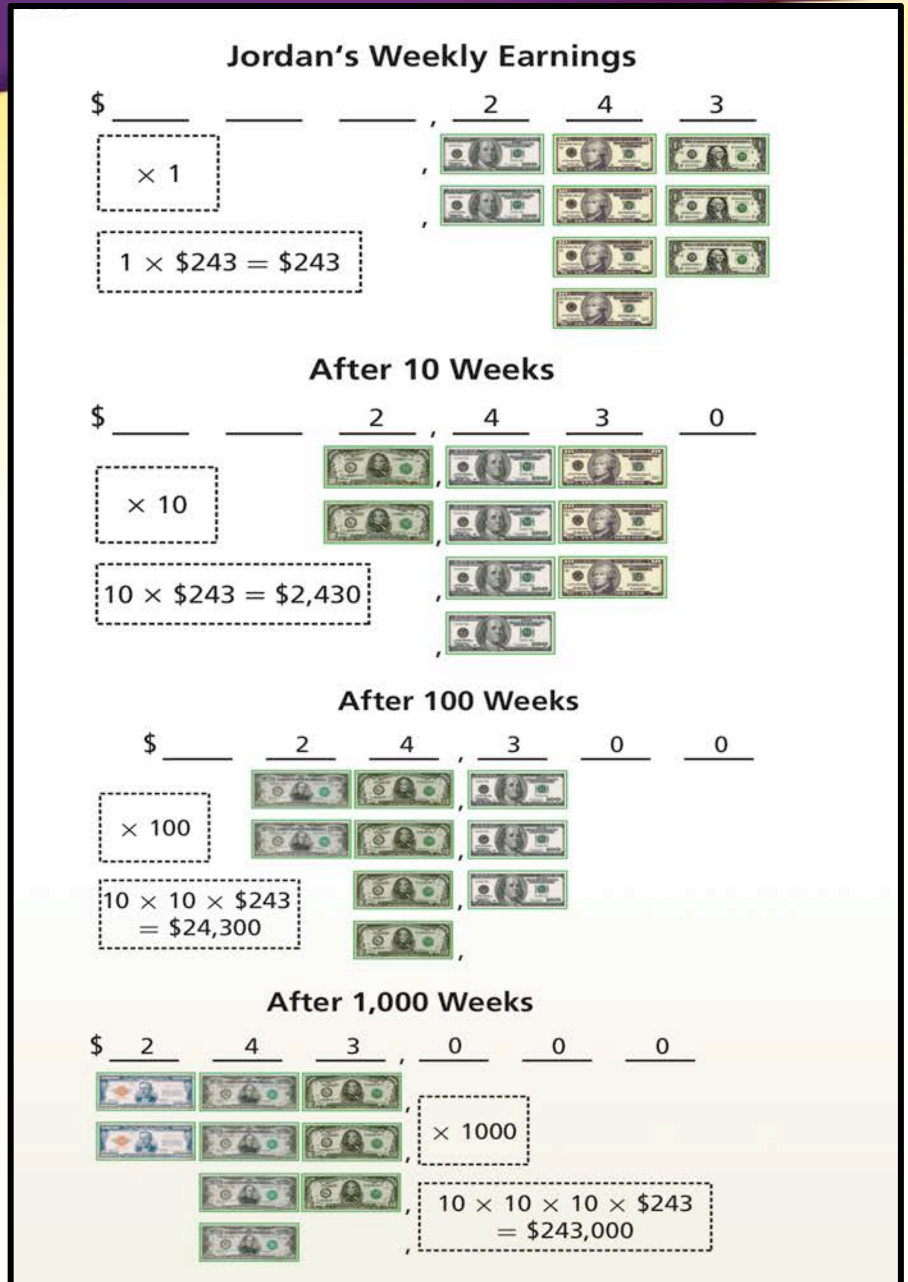
2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

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.

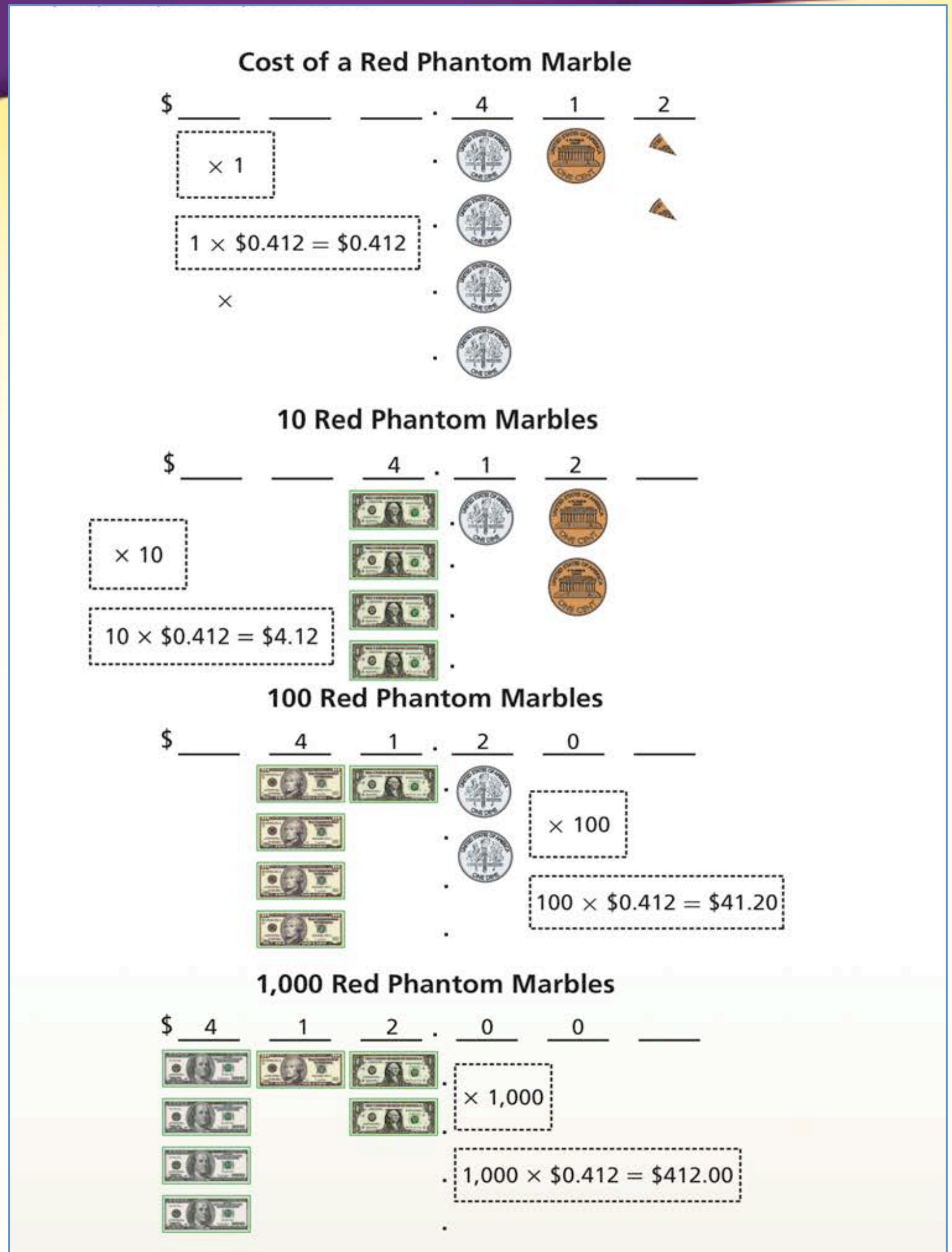
5.NF.5. Interpret multiplication as scaling (resizing), by:

b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

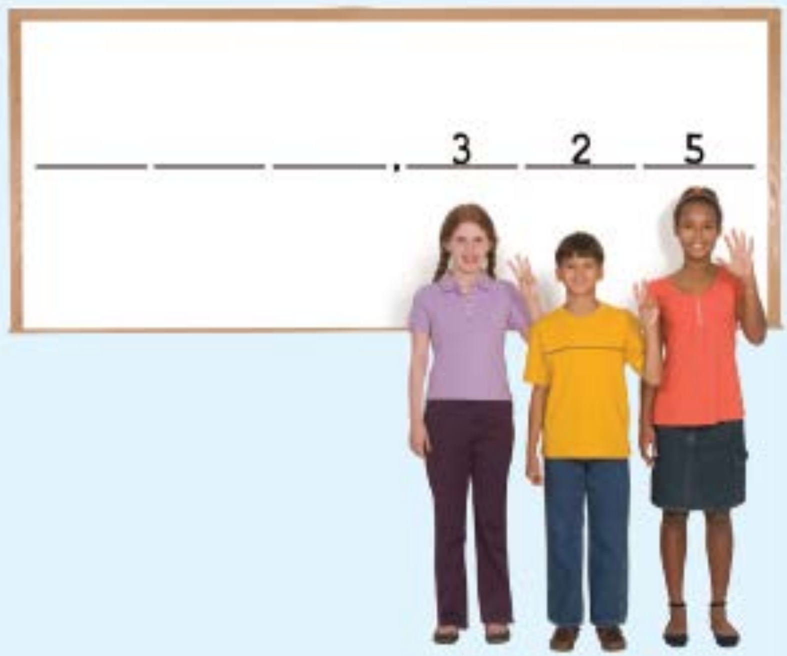
G5 The Whole Number Zero Shift Pattern for Whole Numbers



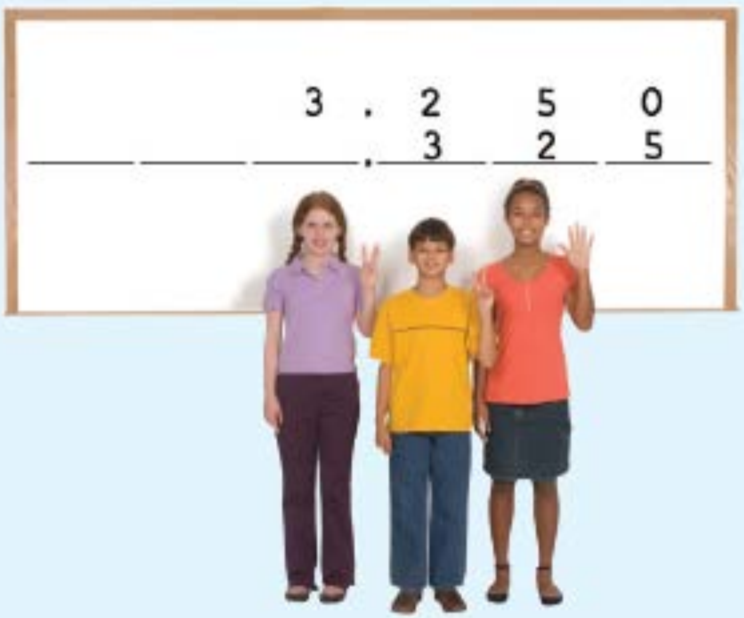
G5 The Whole Number Zero Shift Pattern Applies to Decimals



G5 The Decimal Shift Pattern Explained by Students



Beginning Position



Problem 1: 325 × 10
Move 1 place to the left.

G5 The Decimal Places in Whole Number x Decimal = Decimal Places in the Decimal

$$\begin{array}{r} 0.31 \\ \underline{\times \quad 5} \\ 1.55 \end{array} \qquad \begin{array}{r} 0.31 \\ \underline{\times \quad 50} \\ 15.50 \end{array} \qquad \begin{array}{r} 0.31 \\ \underline{\times \quad 500} \\ 155.00 \end{array}$$

The number of decimal places in a whole number x decimal product = the number of decimal places in the decimal.

Because any multidigit number is composed of ones, tens, and hundreds (etc.), this is true for any multidigit number.

So you can multiply such problems as if they were two whole numbers and then count the decimal places and put that many places in the product.

G5 The Shifts for a Decimal Times a Whole Number with Money

Leon's Earnings

$ 2 1 3 . ___ ___

× 1

1 × $213 = $213

Save 0.1 Each Month

$ ___ 2 1 . 3 0

× 0.1

0.1 × $213 = $21.30

Students then explore the shift using 0.01 as a factor.

Save 0.01 Each Month

$ ___ ___ 2 . 1 3

× 0.01

0.01 × $213 = $2.13

G5 The Decimal Places in Decimal x Whole Number = Decimal Places in the Decimal

The number of decimal places in a decimal x a whole number product = the number of decimal places in the decimal.

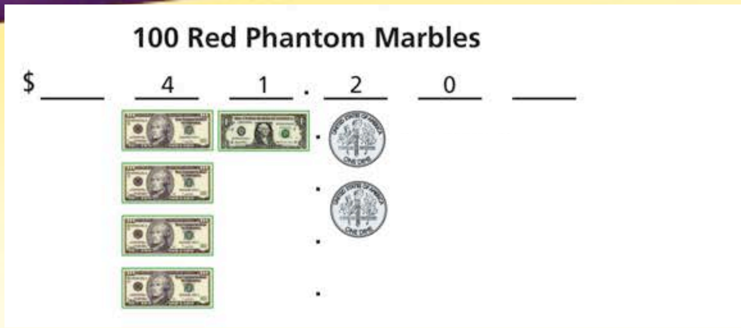
5 x 31	0.5 x 31	0.05 x 31
155	0.1 x 5 x 31	0.01 x 5 x 31
	0.1 x 155	0.01 x 155
	15.5	1.55

31	31	31
x 5	x 0.5	x 0.05
155	15.5	1.55

Because any multidigit number is composed of ones, tens, and hundreds (etc.), this is true for any multidigit number.

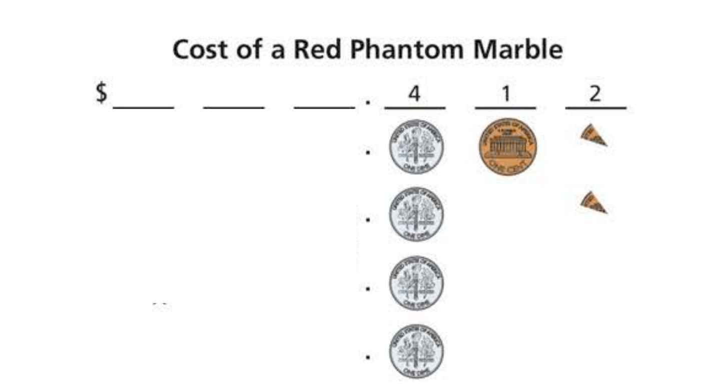
So you can multiply such problems as if they were two whole numbers and then count the decimal places and put that many places in the product.

G5 The Decimal Multiplier Shift Patterns Apply to Decimals



1 x $41.20 = $41.20

0.1 x $41.20 = $4.12



0.01 x $41.20 = $0.412

G5 The Decimal Places in Decimal x Decimal = Total Decimal Places in the Decimal Factors

The number of decimal places in a decimal x decimal product = the total number of decimal places in the decimal factors.

0.2 x 0.3	0.2 x 0.03	0.02 x 0.03
2 x 0.1 x 3 x 0.1	2 x 0.1 x 3 x 0.01	2 x 0.01 x 3 x 0.01
2 x 3 x 0.1 x 0.1	2 x 3 x 0.1 x 0.01	2 x 3 x 0.01 x 0.01
6 x 0.01	6 x 0.001	6 x 0.0001
0.06	0.006	0.0006

Because any decimal number is composed of tenths and hundredths (etc.), this is true for any decimal number and generalizes to decimals with more places.

So you can multiply decimal x decimal problems as if they had two whole numbers. Then count the decimal places in each factor to find the total number of decimal places in the product.

G5 Relate Decimal Patterns to Fractions

The number of decimal places in a decimal x decimal product
= the total number of decimal places in the decimal factors.

0.2 x 0.3	0.2 x 0.03	0.02 x 0.03
2 x 0.1 x 3 x 0.1	2 x 0.1 x 3 x 0.01	2 x 0.01 x 3 x 0.01
2 x 3 x 0.1 x 0.1	2 x 3 x 0.1 x 0.01	2 x 3 x 0.01 x 0.01
6 x 0.01	6 x 0.001	6 x 0.0001
0.06	0.006	0.0006
2/10 x 3/10	2/10 x 3/100	2/100 x 3/100
6/100	6/1000	6/10000

G5 The Shift Pattern Direction Depends on the Multiplier

Whole Number Multipliers	**Decimal Number Multipliers**
1. When you multiply by 10, the number gets <u>10</u> times as big. The digits shift <u>1</u> place(s) to the <u>left</u>.	2. When you multiply by 0.1, the number gets <u>$\frac{1}{10}$</u> as big. The digits shift <u>1</u> place(s) to the <u>right</u>.

5.NF.5. Interpret multiplication as scaling (resizing), by:

b. …, explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; …

G5 Shift Patterns and the Number of Decimal Places in the Product

We have explained patterns for the number of decimal places in the answer.

The number of decimal places in a whole number x a decimal product = the number of decimal places in the decimal.

The number of decimal places in a decimal x a whole number product = the number of decimal places in the decimal.

The number of decimal places in a decimal x a decimal product = the total number of decimal places in the decimal factors.

So you can multiply all of these problems as if they had two whole numbers. Then count the decimal places in each factor to find the total number of decimal places in the product.

G5 Practicing All Multiplication Problems

5.NBT.5. Fluently multiply multi-digit whole numbers using the standard algorithm.

Grade 5 practice with decimal multiplication problems serves fluency for this whole number standard because you multiply as usual and then count the number of decimal places in each factor to find the total number of decimal places in the answer.

13. $4.6 \times 0.12 = 0.552$	14. $8.5 \times 8.5 = 72.25$	15. $246.1 \times .09 = 22.149$	16. $7.7 \times 3.2 = 24.64$
17. $1.1 \times 0.11 = 0.121$	18. $4.3 \times 2.4 = 10.32$	19. $7.8 \times 0.15 = 1.17$	20. $3.8 \times 4.5 = 17.1$

G5 Dividing a Decimal by a 1-Digit Number

▶ Divide a Decimal by a One-Digit Number

Three friends set up a lemonade stand and made $20.25. They will share the money equally. Study the steps below to see how much money each person should get.

When the $20 is split 3 ways, each person gets $6. There is $2 left.

$$\begin{array}{r} \mathbf{6} \\ 3\overline{)20.25} \\ \mathbf{-18} \\ \hline \mathbf{2} \end{array}$$

We change the $2 to 20 dimes and add the other 2 dimes. There are 22 dimes.

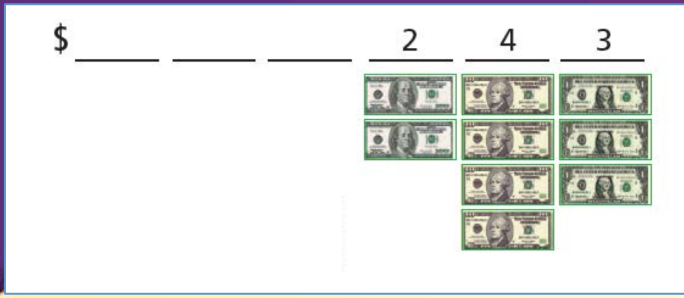
$$\begin{array}{r} 6. \\ 3\overline{)20.25} \\ -18 \\ \hline 2.2 \end{array}$$

When we split 22 dimes 3 ways, each person gets 7 dimes. There is 1 dime left.

$$\begin{array}{r} 6.\mathbf{7} \\ 3\overline{)20.25} \\ -18 \\ \hline 2.2 \\ \mathbf{-2.1} \\ \hline \mathbf{.1} \end{array}$$

We change the dime to 10 cents and add the other 5 cents. Now we split 15 cents 3 ways.

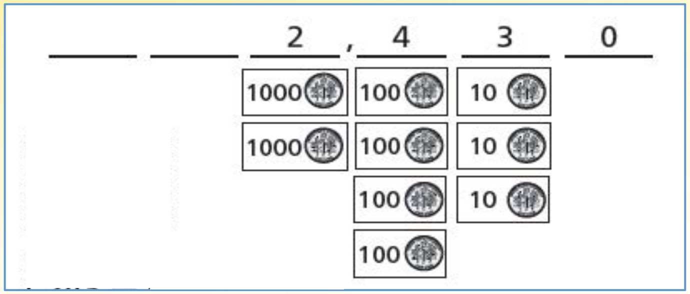
$$\begin{array}{r} 6.7\mathbf{5} \\ 3\overline{)20.25} \\ -18 \\ \hline 2.2 \\ -2.1 \\ \hline .15 \\ \mathbf{-.15} \\ \hline \end{array}$$



$\div 1$

$\$243 \div 1 = \$243$

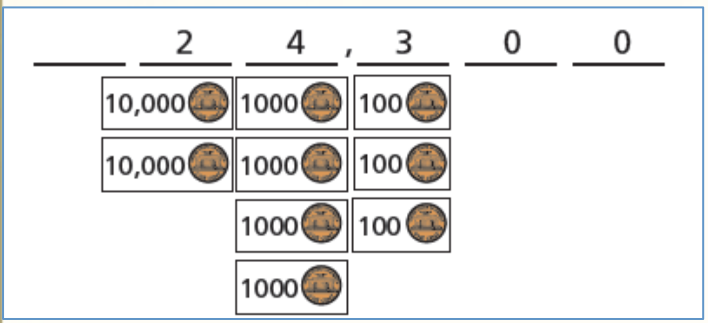
Jordan’s Earnings in Dollars



$\div 0.1$

$243 \div 0.1 = 2{,}430$

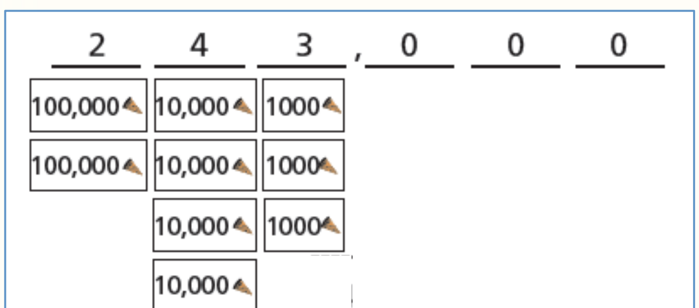
Jordan’s Earnings in Dimes



$\div 0.01$

$243 \div 0.01 = 24{,}300$

Jordan’s Earnings in Pennies



$\div 0.001$

$243 \div 0.001 = 243{,}000$

Jordan’s Earnings in Tenths of a Cent

G5 Dividing by Decimals

What does it mean to divide 6 by 0.1?

Dividing by 0.1 asks: How many of the small one-tenths are in 6?

For each of the 6 units, there are 10 one-tenths (ten 0.1s).

So there are 10 x 6 one-tenths in 6.

6 ÷ 0.1 = 60

The 6 shifts 1 place to the left. The answer is 10 times as much as 6.

So ÷ 0.1 is the same as x 10.

6 ÷ 0.1 = 60 is the same as 0.1 x 60 = 6

The shifts for division and multiplication are in the opposite directions.

G5 Change a Decimal Divisor to a Whole Number by Multiplying by One

▶ Change Decimal Divisors to Whole Numbers

You can use the strategy below to change a division problem with a decimal divisor to an equivalent problem with a whole number divisor.

Discuss each step used to find $6 \div 0.2$.

Step 1: Write $6 \div 0.2$ as a fraction.

$$6 \div 0.2 = \frac{6}{0.2}$$

Step 2: Make an equivalent fraction with a whole number divisor by multiplying $\frac{6}{0.2}$ by 1 in the form of $\frac{10}{10}$. Now you can divide 60 by 2.

$$\frac{6}{0.2} \times 1 = \frac{6}{0.2} \times \frac{10}{10} = \frac{60}{2}$$

G5 Dividing by Hundredths and Thousandths

23. $\dfrac{6}{0.02} = \dfrac{6}{0.02} \times 1 = \dfrac{6}{0.02} \times \dfrac{100}{100} = \dfrac{600}{2} \longrightarrow 0.02.\overline{)\,6.00.}$

24. $\dfrac{6}{0.002} = \dfrac{6}{0.002} \times 1 = \dfrac{6}{0.002} \times \dfrac{1{,}000}{1{,}000} = \dfrac{6{,}000}{2} \longrightarrow 0.002.\overline{)\,6.000.}$

You may have to put one or more 0s at the end of the dividend when you make the divisor a whole number.

G5 Shift Patterns for Dividing Decimals by Decimals

$ ___ ___ 0 . 3 1 2

÷ 1

$0.312 ÷ 1= $0.312

Cost of Cat's Eye Marble in Dollars

___ ___ 3 . 1 2 ___

3 | 0.1 | 0.02

÷ 0.1

0.312 ÷ 0.1= 3.12

Cost of Cat's Eye Marble in Dimes

___ 3 1 . 2 ___ ___

30 | 1 | 0.2

÷ 0.01

0.312 ÷ 0.01= 31.2

Cost of Cat's Eye Marble in Pennies

3 1 2 . ___ ___ ___

300 | 10 | 2

÷ 0.001

0.312 ÷ 0.001= 312

Cost of Cat's Eye Marble in Tenths of a Cent

G5 Dividing a Decimal by Hundredths and Thousandths

15. $\dfrac{0.06}{0.02} \times 1 = \dfrac{0.06}{0.02} \times \dfrac{100}{100} = \dfrac{0.06 \times 100}{0.02 \times 100} = \dfrac{6}{2}$

$$0.02\overline{)0.06}\quad 3.$$

16. $\dfrac{0.06}{0.002} \times 1 = \dfrac{0.06}{0.002} \times \dfrac{1,000}{1,000} = \dfrac{0.06 \times 1,000}{0.002 \times 1,000} = \dfrac{60}{2}$

$$0.002\overline{)0.060}\quad 30.$$

You may have to put one or more 0s at the end of the dividend when you make the divisor a whole number.

G5 Is it Multiplication or Division? Get Larger or Smaller?

► Multiply or Divide?

Read the problem. Then answer the questions.

1. A turtle walks 0.2 mile in 1 hour. How far can it walk in 0.5 hour?

   a. Do you need to multiply or divide to solve? multiply

   b. Will the answer be more or less than 0.2 miles? less

   c. What is the answer? 0.1 mile

2. Gus ran 3.6 miles. He took a sip of water every 0.9 mile. How many sips did he take?

   a. Do you need to multiply or divide to solve? divide

   b. Will the answer be greater or less than 3.6? greater

   c. What is the answer? 4 sips

3. Last year 135 cows on Dixie's Dairy Farm had calves. This year 0.6 times that many cows had calves. How many cows had calves this year?

   a. Do you need to multiply or divide to solve? multiply

   b. Will the answer be greater or less than 135? less

   c. What is the answer? 81 cows

G6 NS Decimal Standard 6.NS.3

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

The CCSS do not specify a grade for fluency with fractions.

In Grade 5 students do all operations except general division of fractions, which is in Grade 6 (6.NS.1).

In Grade 7 all operations with fractions are extended to operations with rational numbers in Grade 7.

So in Grade 6 students should overview all operations with fractions to relate them to division of fractions and to become fluent with operations with fractions before extending these operations in Grade 7.

In Grade 6 students should also relate operations with decimals to operations with fractions to understand how the meanings are alike (e.g., you add like units) but the notations create different methods (you find a new equivalent unit in different ways). This enriches and deepens student understanding of number systems.

▶ Discussion and Summary

Fill in the blanks and discuss how the parts of each problem are related.

Place Value

× 10 (larger) ÷ 10 (smaller)

	Thousands	Hundreds	Tens	ONES	Tenths	Hundredths	Thousandths
	1,000.	100.	10.	1.	0.1	0.01	0.001
	$\frac{1000}{1}$	$\frac{100}{1}$	$\frac{10}{1}$	$\frac{1}{1}$	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
	$1,000.00	$100.00	$10.00	$1.00	$0.10	$0.01	$0.001
1 a.	2,000 2,	300 3	60 6	1 1	0.6 .6	0.03 3	0.002 2
b.	$1,000 $1,000	$100 $100 $100	$10 $10 $10 $10 $10 $10	$1			

c. 2,361.632 = 2,000 + 300 + 60 + 1 + 0.6 + 0.03 + 0.002

2 a. 0 .6 3 2

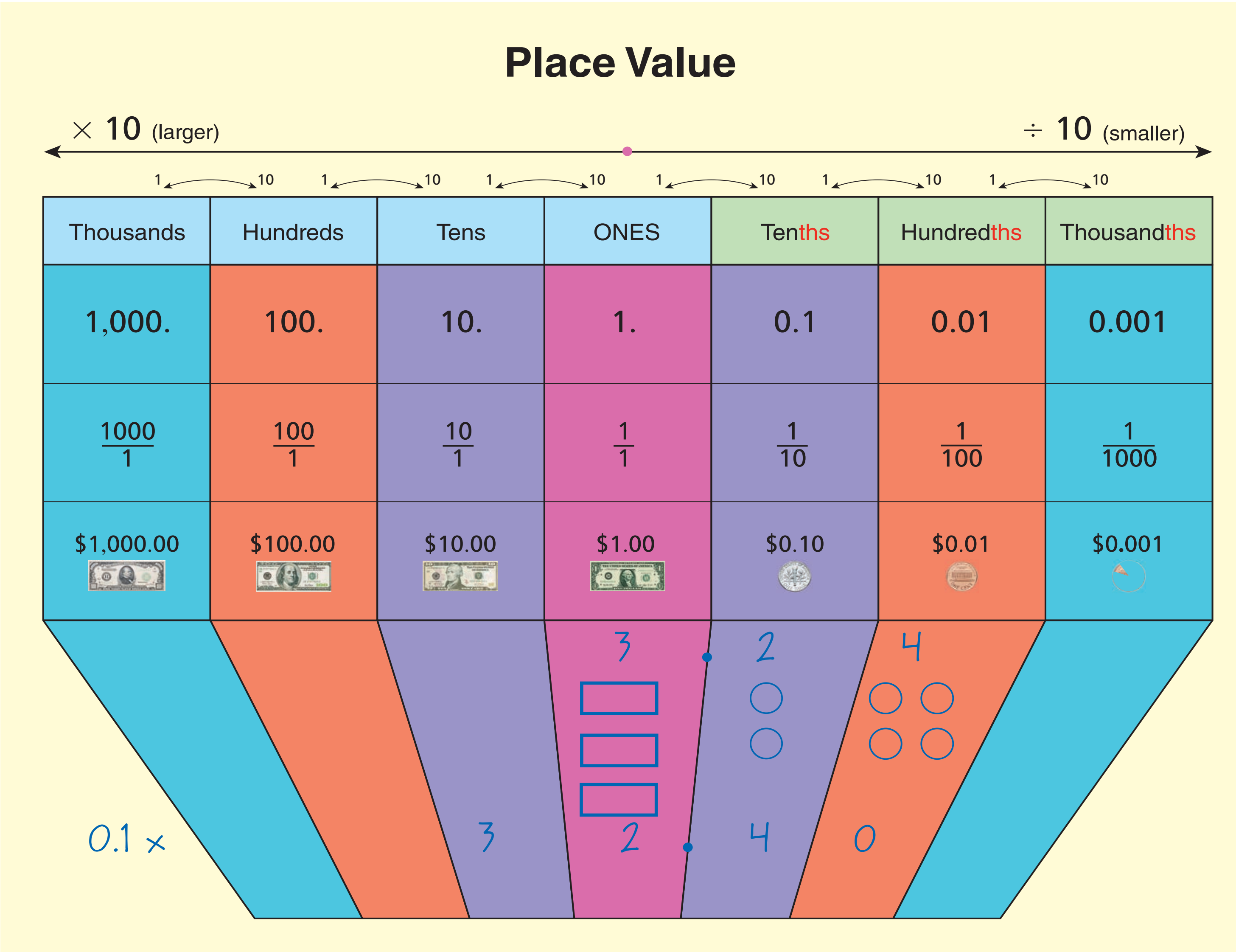
b. $+ \frac{6}{10} + \frac{3}{100} + \frac{2}{1,000}$

c. $+ \frac{600}{1,000} + \frac{30}{1,000} + \frac{2}{1,000}$

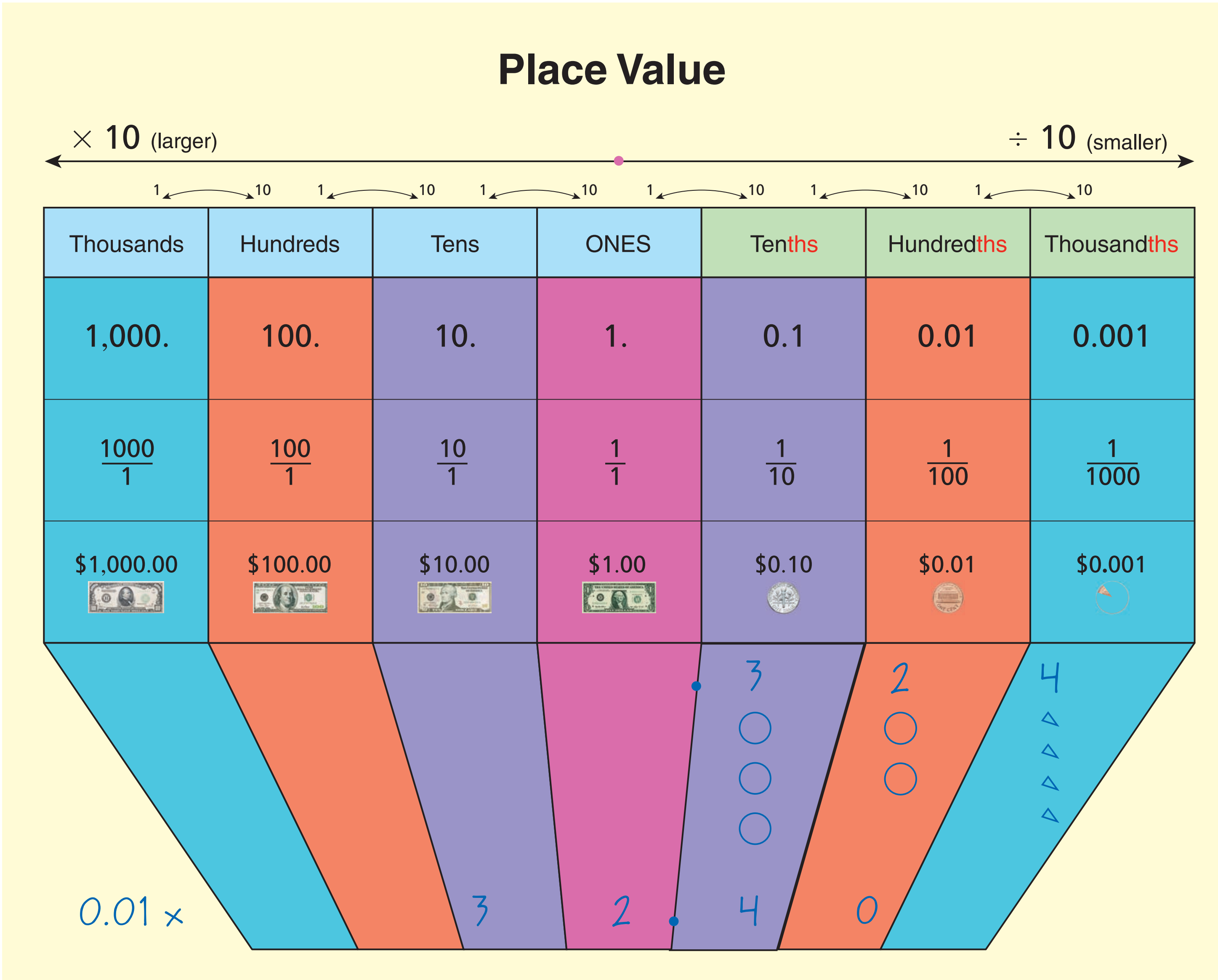
d.

	0	.6	0	0
+	0	.0	3	0
+	0	.0	0	2
	0	.6	3	2

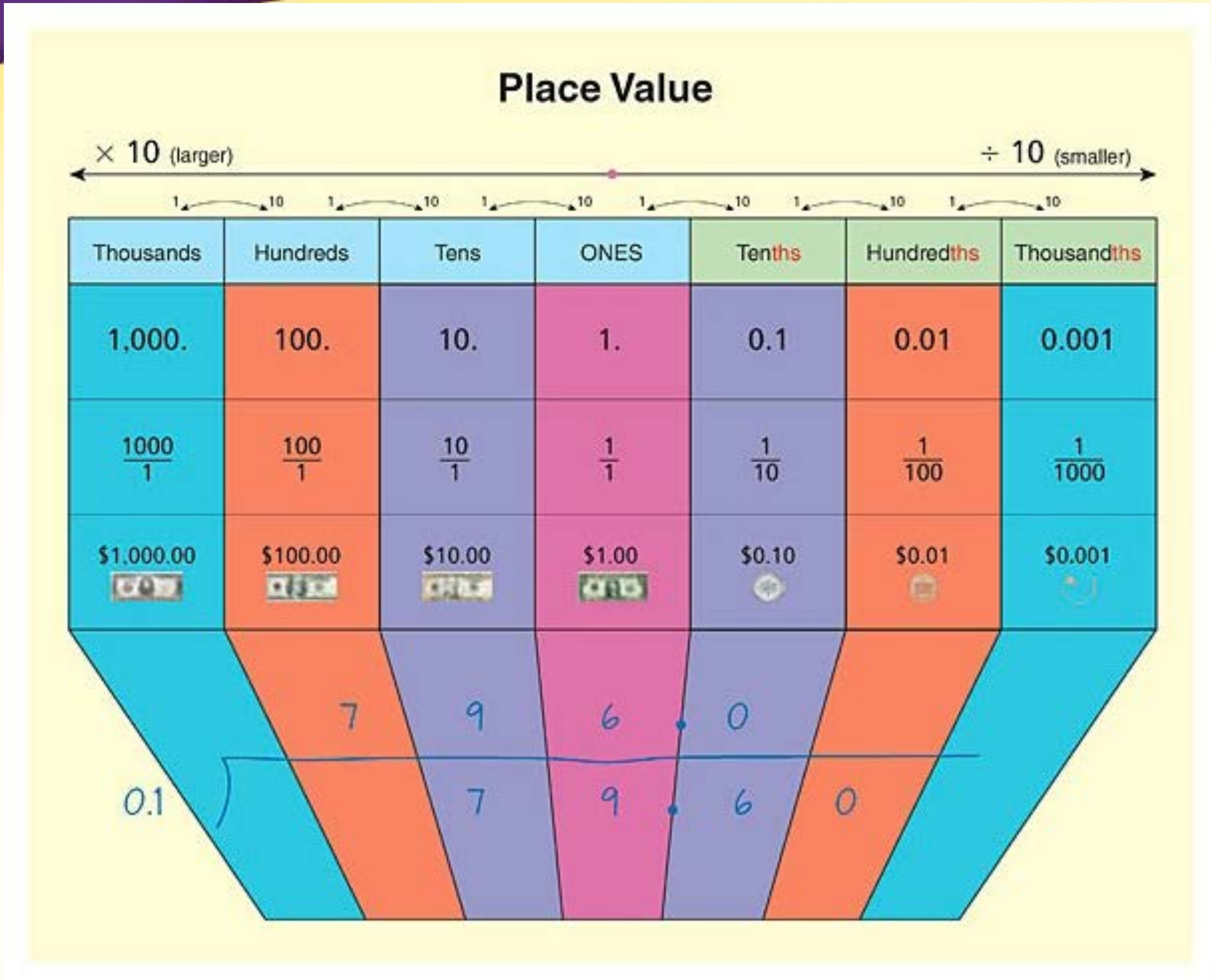
G6 Seeing the Shift to the Right for x 0.1 on the Place Value Poster



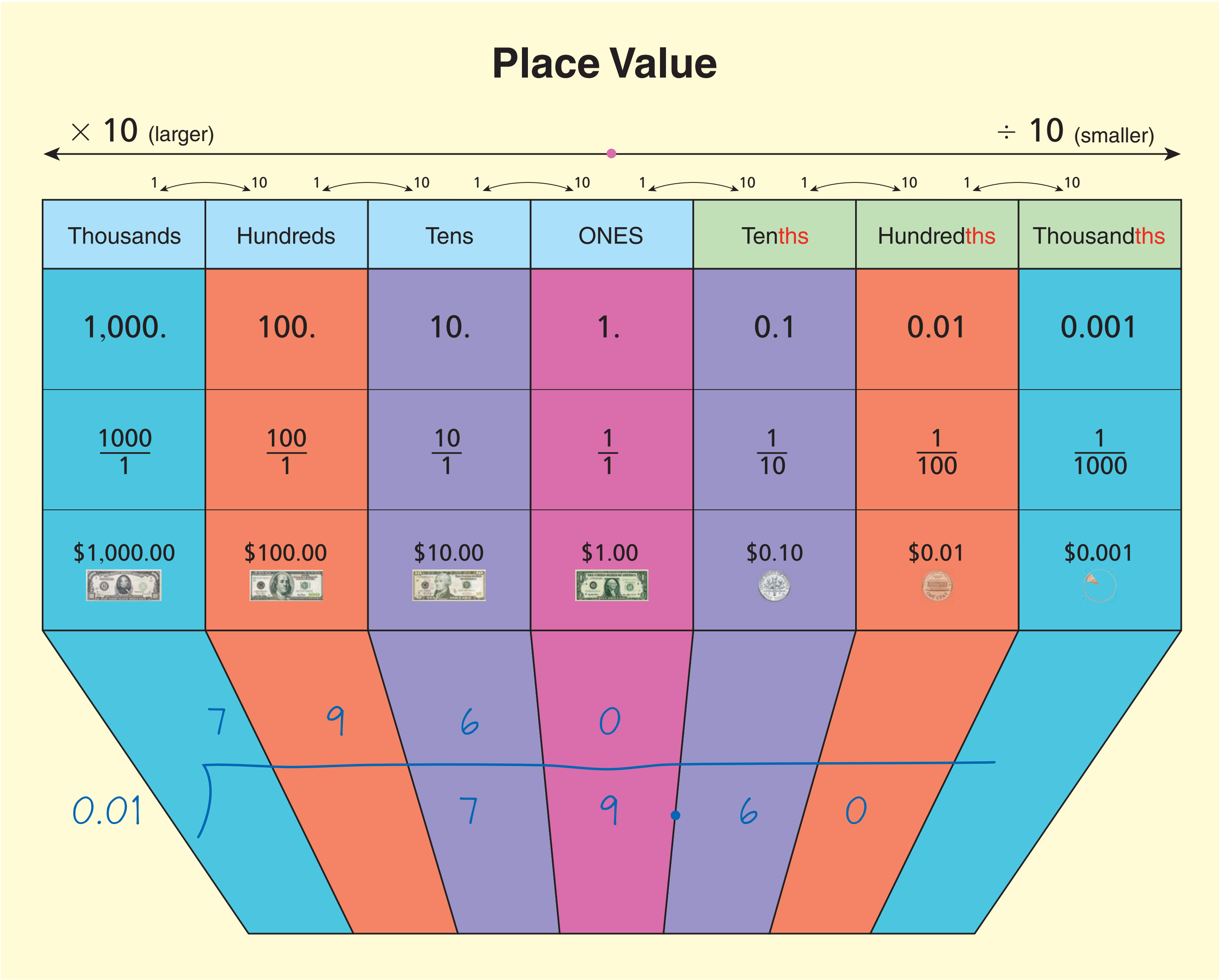
G6 Seeing the Shift to the Right for x 0.01 on the Place Value Poster



G6 Seeing the Shift to the Left for ÷ 0.1 on the Place Value Poster



G6 Seeing the Shift to the Left for ÷ 0.01 on the Place Value Poster



G6 Decimal Shift Directions for Multiplying and Dividing

For decimals less than 1:

Multiplying by 0.1 shifts all digits one place smaller (to the right) because you are finding one-tenth of each digit.

So x 0.1 is the same as ÷ 10.

Dividing by 0.1 shifts all digits one place larger (to the left) because you are finding how many of the small one-tenths are in each digit.

So ÷ 0.1 is the same as x 10.

The shifts for multiplying and dividing by a decimal are in the opposite direction of the shifts for multiplying and dividing by a whole number:

Multiplying by a decimal less than 1 makes a smaller number and dividing by a decimal less than 1 makes a larger number.

Dividing by a whole number makes a smaller number and multiplying by a whole number makes a larger number.

G6 Do Multiplying and Dividing Make Greater or Less?

▶ Greater, Equal, or Less

1. Explore what happens when you multiply 4 by different numbers.

Case 1: Multiply 4 by a number greater than 1.

$4 \cdot 1.5 =$ 6

4 units
1.5 units | ? sq. units

Is the product less than, greater than, or equal to 4?
greater than

Case 2: Multiply 4 by 1.

$4 \cdot 1 =$ 4

4 units
1 unit | ? sq. units

Is the product less than, greater than, or equal to 4?
equal to

Case 3: Multiply 4 by a number less than 1.

$4 \cdot 0.5 =$ 2

4 units
0.5 units | ? sq. units

Is the product less than, greater than, or equal to 4?
less than

2. Multiply 10 by 1, a number greater than 1, and a number less than 1. Tell how each product compares to 10.
Numbers and products will vary. Students should find that the products are equal to, greater than, and less than 10 respectively.

3. Explore what happens when you divide 3 by different numbers.

Case 1: Divide 3 by a number greater than 1.

$3 \div 1.5 =$ 2

? units
1.5 units | 3 sq. units

Is the quotient less than, greater than, or equal to 3?
less than

Case 2: Divide 3 by 1.

$3 \div 1 =$ 3

? units
1 unit | 3 sq. units

Is the quotient less than, greater than, or equal to 3?
equal to

Case 3: Divide 3 by a number less than 1.

$3 \div 0.5 =$ 6

? units
0.5 units | 3 sq. units

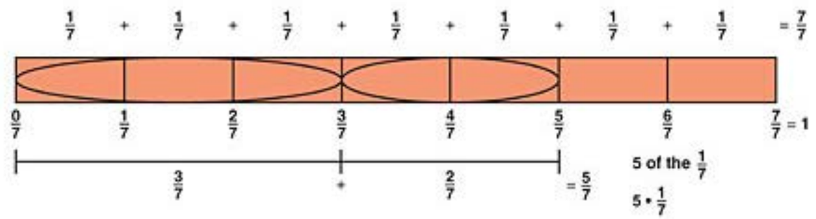
Is the quotient less than, greater than, or equal to 3?
greater than

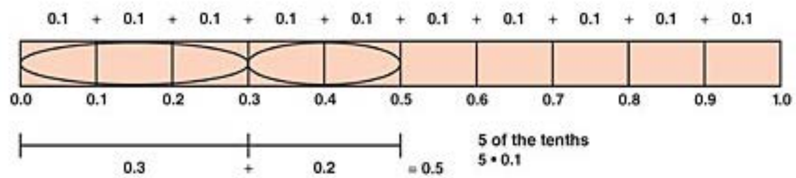
G6 Adding and Subtracting Unit Fractions and Decimals

▶ Adding and Subtracting Unit Fractions and Decimals

The **denominator** of a fraction tells the number of equal parts the whole is divided into, and, therefore, the number of unit fractions that are made. The **numerator** tells how many of these unit fractions the fraction represents.

numerator → $\frac{n}{d}$ ← denominator





Add.

4. $\frac{3}{9} + \frac{2}{9} =$ $\frac{5}{9}$
5. $\frac{3}{6} + \frac{2}{6} =$ $\frac{5}{6}$
6. $0.03 + 0.02 =$ 0.05

Subtract.

7. $\frac{5}{7} - \frac{3}{7} =$ $\frac{2}{7}$
8. $\frac{5}{7} - \frac{2}{7} =$ $\frac{3}{7}$
9. $\frac{5}{9} - \frac{3}{9} =$ $\frac{2}{9}$
10. $\frac{5}{6} - \frac{2}{6} =$ $\frac{3}{6}$
11. $0.5 - 0.3 =$ 0.2
12. $0.5 - 0.2 =$ 0.3
13. $0.05 - 0.03 =$ 0.02
14. $0.05 - 0.02 =$ 0.03

To add or subtract fractions with like denominators, add or subtract the numerators.

To add or subtract decimals with like places, add or subtract the numbers in the places.

G6 Finding a Common Denominator for Fractions and Decimals

▶ Finding a Common Denominator

Example 1 $\frac{4}{5} + \frac{3}{10}$

Jo Anne's Solution

I look at the denominators to see what I need to multiply by.

$$\frac{4}{5} + \frac{3}{10} = \frac{4 \cdot 2}{5 \cdot 2} + \frac{3}{10} = \frac{8}{10} + \frac{3}{10} = \frac{11}{10} = 1\frac{1}{10}$$

$\cdot\ 2$

Mark's Solution

I see $5 \cdot 2 = 10$.

$$\frac{4 \cdot\ }{5 \cdot 2} = \frac{\ }{10}$$

So, I multiply 4 and 5 by 2.

$$\frac{4 \cdot 2}{5 \cdot 2} = \frac{\ }{10}$$

I find how many tenths.

$$\frac{4 \cdot 2}{5 \cdot 2} = \frac{8}{10}$$

Now I can add.

$$\frac{4}{5} + \frac{3}{10} = \frac{8}{10} + \frac{3}{10}$$
$$= \frac{11}{10} = 1\frac{1}{10}$$

> To compare, add, or subtract two fractions when the denominator of one is a factor of the denominator of the other, change the fraction with the lesser denominator to an equivalent fraction that uses the greater denominator.

Example 2 $0.2 + 0.03$

Shauna's Solution

0.2 is two dimes. That is 20 pennies, so $0.2 = 0.20$.
I add like places.

$$\begin{array}{r} 0.20 \\ +\ 0.03 \\ \hline 0.23 \end{array}$$

> To compare, add, or subtract decimals with different numbers of places, put zeros on the end of the decimal with fewer places to make the number of decimal places in the two numbers equal.

Thank you!

Questions or comments?

Find these slides:

http://www.math.uga.edu/~sybilla/

Also at the Mathematics Teaching Community (google it!):

https://mathematicsteachingcommunity.math.uga.edu

Tags: standard-algorithms, decimals, numbers-operations-base-ten