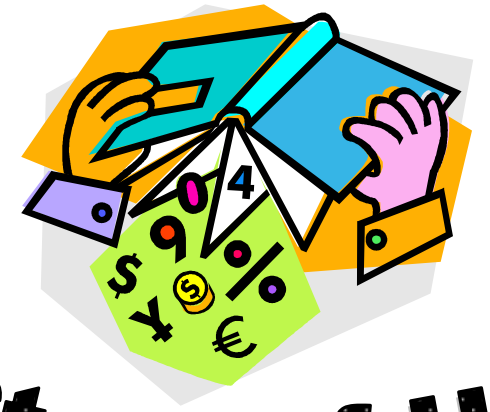
Mathematics:



"A Story of Units"

Parent Handbook

Grade 5
Module 1

Grade 5 • Module 1

Place Value and Decimal Fractions

OVERVIEW

In Module 1, students' understanding of the patterns in the base ten system are extended from Grade 4's work with place value of multi-digit whole numbers and decimals to hundredths to the thousandths place. In Grade 5, students deepen their knowledge through a more generalized understanding of the relationships between and among adjacent places on the place value chart, e.g., 1 tenth times any digit on the place value chart moves it one place value to the right. Toward the module's end students apply these new understandings as they reason about and perform decimal operations through the hundredths place.

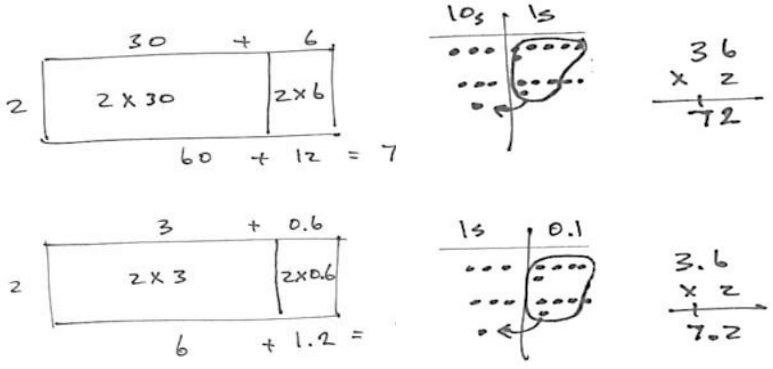
Topic A opens the module with a conceptual exploration of the multiplicative patterns of the base ten system using place value disks and a place value chart. Students notice that multiplying by 1000 is the same as multiplying by 10 x 10 x 10. Since each factor of 10 shifts the digits one place to the left, multiplying by 10 x 10 x 10—which can be recorded in exponential form as 10^3 shifts the position of the digits to the left 3 places, thus changing the digits' relationships to the decimal point. Application of these place value understandings to problem solving with metric conversions completes Topic A.

Topic B moves into the naming of decimal fraction numbers in expanded, unit (e.g., 4.23 = 4 ones 2 tenths 3 hundredths), and word forms and concludes with using like units to compare decimal fractions. Now in Grade 5, students use exponents and the unit fraction to represent expanded form, e.g., $2 \times 10^2 + 3 \times (1/10) + 4 \times (1/100) = 200.34$. Further, students reason about differences in the values of like place value units and expressing those comparisons with symbols (>, <, and =). Students generalize their knowledge of rounding whole numbers to round decimal numbers in Topic C initially using a vertical number line to interpret the result as an approximation, eventually moving away from the visual model.

In the latter topics of Module 1, students use the relationships of adjacent units and generalize whole number algorithms to decimal fraction operations. Topic D uses unit form to connect general methods for addition and subtraction with whole numbers to decimal addition and subtraction, e.g., 7 tens + 8 tens = 15 tens = 150 is analogous to 7 tenths + 8 tenths = 15 tenths = 1.5.

Topic E bridges the gap between Grade 4 work with multiplication and the standard algorithm by focusing on an intermediate step—reasoning about multiplying a decimal by a one-digit whole number. The area model, with which students have had extensive experience since Grade 3, is used as a scaffold for this work.

Topic F concludes Module 1 with a similar exploration of division of decimal numbers by one-digit whole number divisors. Students solidify their skills with and understanding of the algorithm before moving on to long division involving two-digit divisors in Module 2.



Terminology

New or Recently Introduced Terms

- Thousandths (related to place value)
- Exponents (how many times a number is to be used in a multiplication sentence)
- Millimeter (a metric unit of length equal to one thousandth of a meter)
- Equation (statement that two mathematical expressions have the same value, indicated by use of the symbol =; e.g., 12 = 4 x 2 + 4)

Familiar Terms and Symbols

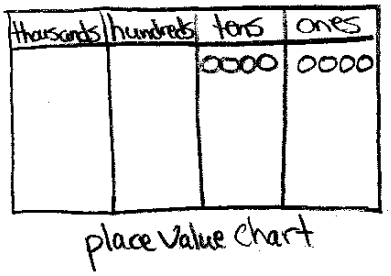
- Centimeter (cm, a unit of measure equal to one hundredth of a meter)
- Tenths (as related to place value)
- Hundredths (as related to place value)
- Place value (the numerical value that a digit has by virtue of its position in a number)
- Base ten units (place value units)
- Digit (a numeral between 0 and 9)
- Standard form (a number written in the format: 135)
- Expanded form (e.g., 100 + 30 + 5 = 135)
- Unit form (e.g., 3.21 = 3 ones 2 tenths 1 hundredth)
- Word form (e.g., one hundred thirty-five)
- Number line (a line marked with numbers at evenly spaced intervals)
- Bundling, making, renaming, changing, regrouping, trading
- Unbundling, breaking, renaming, changing, regrouping, trading
- >, <, = (greater than, less than, equal to)
- Number sentence (e.g., 4 + 3 = 7)

Suggested Tools and Representations

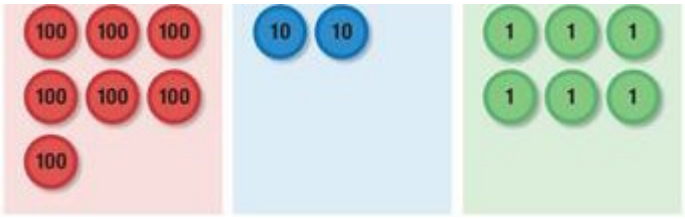
- Place value charts
- Place value disks
- Number lines

**The sample questions/responses contained in this manual are straight from http://www.engageny.org/. They are provided to give some insight into the kinds of skills expected of students as the lesson is taught.

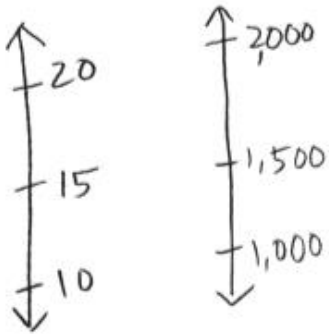
Place value charts: Place value charts allow for students to determine the value of each digit of a number (ones, tens, hundreds, etc.) by relating its position to its value. Place value charts may also be used with number disks/dots to address the same concept.



Place Value Disks (Number Disks): The value 726 is shown using number disks: 7 hundreds 2 tens 6 ones



Number Line: The number line is used to develop a deeper understanding of whole number units, fraction units, measurement units, decimals, and negative numbers. Throughout Grades K-5, the number line models measuring units. Vertical number lines are used to aid in rounding/estimation.

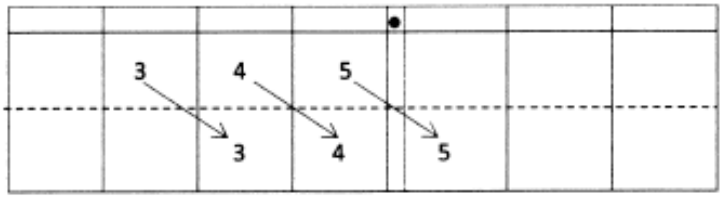


Lesson 1

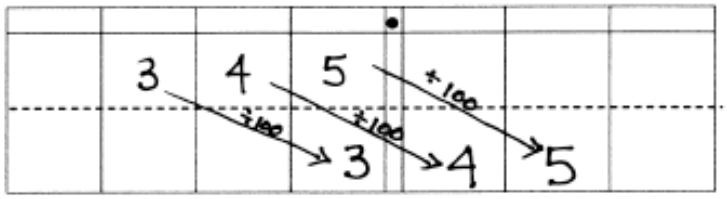
Objective: Reason concretely and pictorially using place value understanding to relate adjacent base ten units from millions to thousandths.

Record the digits of the dividend on the top row of the place value chart. Draw arrows to show how the value of each digit changes when you divide. Record the quotient on the second row of the place value chart. The first one has been done for you.

a. 345 ÷ 10 = 34.5



b. 345 ÷ 100 = 3.45



Lesson 2

Objective: Reason abstractly using place value understanding to relate adjacent base ten units from millions to thousandths.

Find the products.

a. 19,340 x 10 = 193,400

b. 19,340 x 100 = 1,934,000

c. 19,340 x 1000 = 19,340,000

d. Explain how you decided on the number of zeros in the products for (a) (b) and (c)

I looked at the first number and added zeros at the end based on how much it was being multiplied by. Then I adjusted the commas based on the amount of digits

Lesson 3

Objective: Use exponents to name place value units and explain patterns in the placement of the decimal point.

Write the following in exponential form (e.g. $100 = 10^2$).

a) 10,000 = 10^4

b) 1,000 = 10^3

c) 10 x 10 = 10^2

d) 100 x 100 = 10^4

e) 1,000,000 = 10^6

f) 1000 × 1000 = 10^6

Write the following in standard form (e.g. $5 \times 10^2 = 500$).

a) 9×10^3 = 9,000

b) 39×10^4 = 390,000

c) $7200 \div 10^2$ = 72

d) $7{,}200{,}000 \div 10^3$ = 7,200

e) 4.025×10^3 = 4,025

f) 40.25×10^4 = 402,500

Lesson 4

Objective: Use exponents to denote powers of 10 with application to metric conversions.

Convert the larger metric units into smaller metric units.

a) Convert 3 meters to centimeters. 3 m × 100 = 300 cm

b) Convert 0.9 meters to centimeters. 0.9 m × 100 = 90 cm

c) Convert 8.1 liters to milli-liters 8.1 L × 1,000 = 8,100 mL

d) Convert 0.537 liters to milli-liters. 0.537 L × 1,000 = 537 mL

e) Convert 90.5 kilometers to meters 90.5 km × 1,000 = 90,500 m

f) Convert 0.234 km to meters. 0.234 km × 1,000 = 234 m

g) Convert 6.4 kilograms to grams 6.4 kg × 1,000 = 6,400 g

h) Convert 0.6 kilograms to grams 0.6 kg × 1,000 = 600 g

Lesson 5

Objective: Name decimal fractions in expanded, unit, and word forms by applying place value reasoning.

Write a decimal for each of the following. Use a place value chart to help if necessary.

a. $7 \times 10 + 4 \times 1 + 6 \times \left(\frac{1}{10}\right) + 9 \times \left(\frac{1}{100}\right) + 2 \times \left(\frac{1}{1000}\right)$ 74.692

b. $5 \times 100 + 3 \times 10 + 8 \times 0.1 + 9 \times 0.001$ 530.809

c. $4 \times 1000 + 2 \times 100 + 7 \times 1 + 3 \times \left(\frac{1}{100}\right) + 4 \times \left(\frac{1}{1000}\right)$ 4207.034

Mr. Pham wrote 2.619 on the board. Christy says its two and six hundred nineteen thousandths. Amy says its 2 ones 6 tenths 1 hundredth 9 thousandths. Who is right? Use words and numbers to explain your answer.

Both girls are right. Christy used word form and Amy used unit form. Both are equal to 2.619

Lesson 6

Objective: Compare decimal fractions to the thousandths using like units and express comparisons with >, <, =.

Use >, <, or = to compare the following. Use a place value chart to help if necessary.

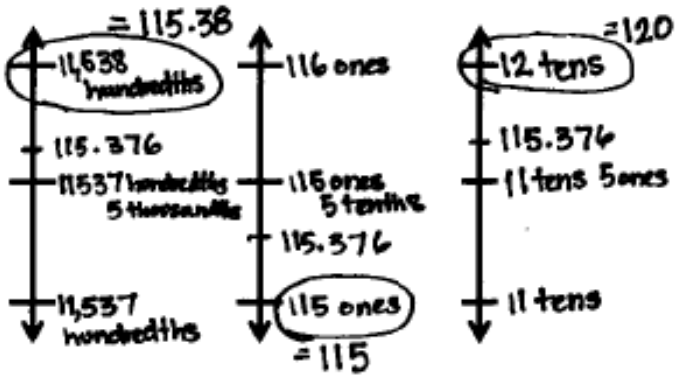
a) 16.3	<	16.4
b) 0.83	=	$\frac{83}{100}$
c) $\frac{205}{1000}$	=	0.205
d) 95.580	=	95.58
e) 9.1	>	9.099
f) 8.3	=	83 tenths

Lesson 7

Objective: Round a given decimal to any place using place value understanding and the vertical number line.

115.376

a. hundredths b. ones c. tens



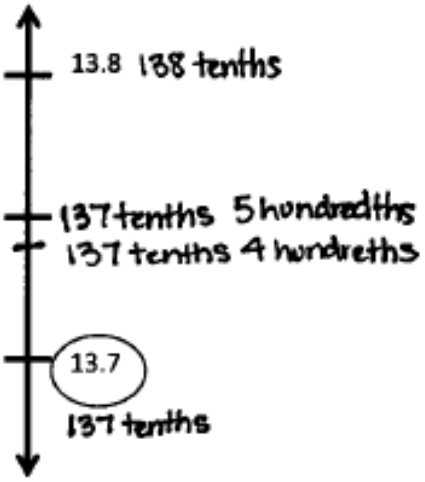
Tens	Ones	Tenths	Hundredths	Thousandths
11	5	3	7	6
	115	3	7	6
		1153	7	6
			11,537	6

Lesson 8

Objective: Round a given decimal to any place using place value understanding and the vertical number line.

A decimal number has two digits to the right of its decimal point. If we round it to the nearest tenth, the result is 13.7.

a. What is the maximum possible value of this number? Use words and the number line to explain your reasoning. Include the midpoint on your number line.



The number can't be the midpoint or higher because then it would be closer to 138 tenths. So the highest it can go and still just have 2 decimal places is 13.74.

Lesson 9

Objective: Add decimals using place value strategies and relate those strategies to a written method.

Solve then write your sum in standard form. You may craw a place value mat on a separate sheet to help you, if necessary.

a. 1 tenth + 2 tenths = 3 tenths = 0.3

b. 14 tenths + 9 tenths = 23 tenths = 2 one(s) 3 tenth(s) = 2.3

Solve using the standard algorithm.

b. 0.3 + 0.82 = 1.12

$$\begin{array}{r} 0.3 \\ +\ 0.82 \\ \hline 1.12 \end{array} \quad = \quad \begin{array}{r} 0.30 \\ +\ 0.82 \\ \hline 1.12 \end{array}$$

c. 1.03 + 0.08 = 1.11

$$\begin{array}{r} 1.03 \\ +\ 0.08 \\ \hline 1.11 \end{array}$$

Lesson 10

Objective: Subtract decimals using place value strategies and relate those strategies to a written method.

Subtract then write your difference in standard form. If necessary, you may use a place value chart to solve.

a. 5 tenths – 2 tenths = 3 tenths = 0.3

b. 5 ones 9 thousandths – 2 ones = 3 ones 9 thousandths = 3.009

Solve using the standard algorithm.

a. 1.4 – 0.7 = 0.7

$$\begin{array}{r} 1.4 \\ -\ 0.7 \\ \hline 0.7 \end{array} \qquad \begin{array}{r} 14 \text{ tenths} \\ -\ 7 \text{ tenths} \\ \hline 7 \text{ tenths} \end{array}$$

b. 91.49 – 0.7 = 90.79

$$\begin{array}{r} {}^{\circ}9\,{}^{14}\!\not{1}.\not{4}9 \\ -\ 0.70 \\ \hline 90.79 \end{array}$$

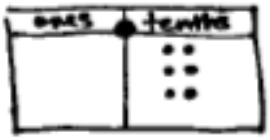
c. 191.49 – 10.72 = 180.77

$$\begin{array}{r} 1\,{}^{\circ}9\,{}^{14}\!\not{1}.\not{4}9 \\ -\ 10.72 \\ \hline 180.77 \end{array}$$

Lesson 11 Objective: Multiply a decimal fraction by single-digit whole numbers, relate to a written method through application of the area model and place value understanding, and explain the reasoning used.

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 = 0.2×3



$= 0.6$

b. 5 groups of 2 hundredths 0.02×5

$= 0.1$

Draw a model similar to the one pictured below. Find the sum of the partial products to evaluate each expression.

a. 7×3.12

7	3 ones	+ 1 tenth	+ 2 hundredths
	7 x 3 ones	7 x 1 tenth	7 x 2 hundredths

21 + 0.7 + 0.14 = 21.84

Lesson 12

Objective: Multiply a decimal fraction by single-digit whole numbers, including using estimation to confirm the placement of the decimal point.

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

a. 2.5×4 0.1 1 (10) 100

I know it is 10 because 2.5 rounds to 3 and $3 \times 4 = 12$. Also, 2.5 is 25 tenths and 25 tenths $\times 4 = 100$ tenths, which is 10.

Lesson 13

Objective: Divide decimals by single-digit whole numbers involving easily identifiable multiples using place value understanding and relate to a written method.

Complete the number sentence. Express the quotient in units and then in standard form.

a. 4.2 ÷ 7 = 42 tenths ÷ 7 = 6 tenths = 0.6

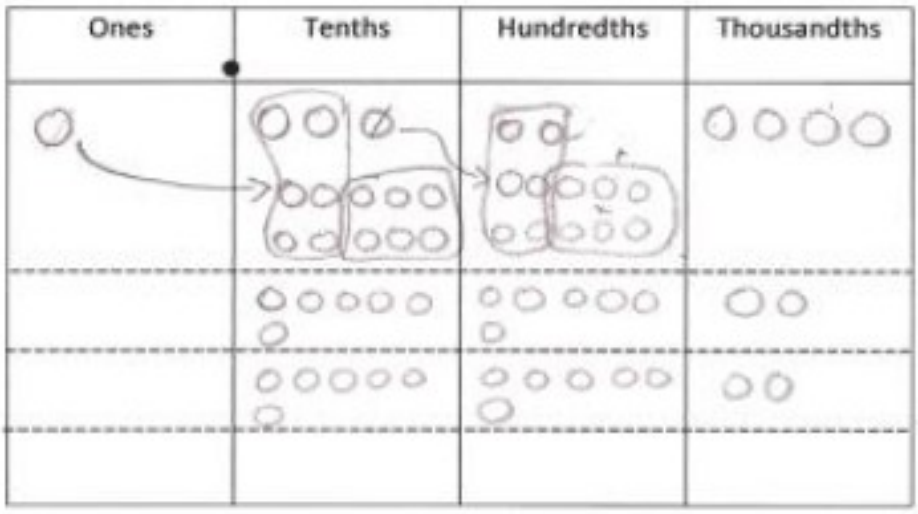
b. 2.64 ÷ 2 = 2 ones ÷ 2 + 64 hundredths ÷ 2

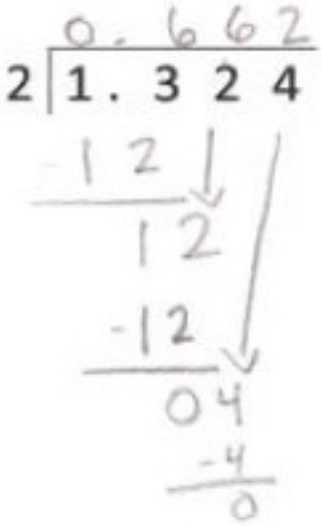
= 1 ones + 32 hundredths

= 1.32

Lesson 14 Objective: Divide decimals with a remainder using place value understanding and relate to a written method.

1.324 ÷ 2 = 0.662



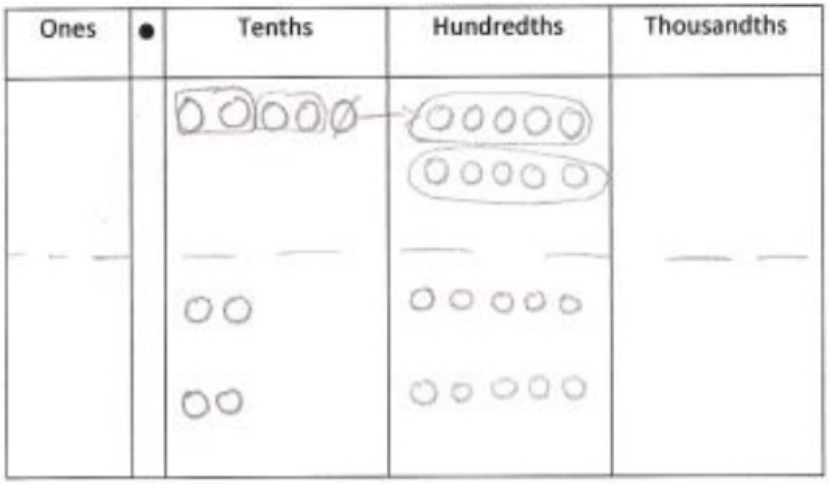


Lesson 15

Objective: Divide decimals using place value understanding including remainders in the smallest unit.

Draw number disks on the place value chart to solve, and show your steps using long division

a. $0.5 \div 2 =$ 0.25

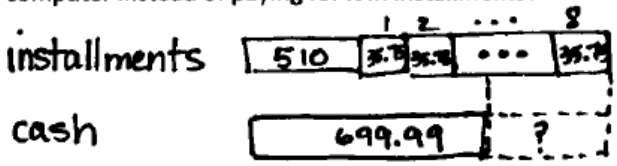


$$\begin{array}{r} 0.25 \\ 2\overline{)0.50} \\ -04\downarrow \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

Lesson 16

Objective: Solve word problems using decimal operations.

Mr. Hower can buy a computer with a down payment of $510 and 8 installments of $35.75. If he pays cash for the computer, the cost is $699.99. How much money will he save if he pays cash for the computer instead of paying for it in installments?



35.75 x 8

3 tens 5 ones 7 tenth 5 hundredth

8	24 tens	40 ones	56 tenth	40 hund

240 + 40 + 5.6 + 0.40

280 + 6.00 = $286.00

510
+ 286
$796

699.99 → 700

700 − 796 = 96 + 0.01

= $96.01

Mr. Hower will save $96.01 if he pays cash.