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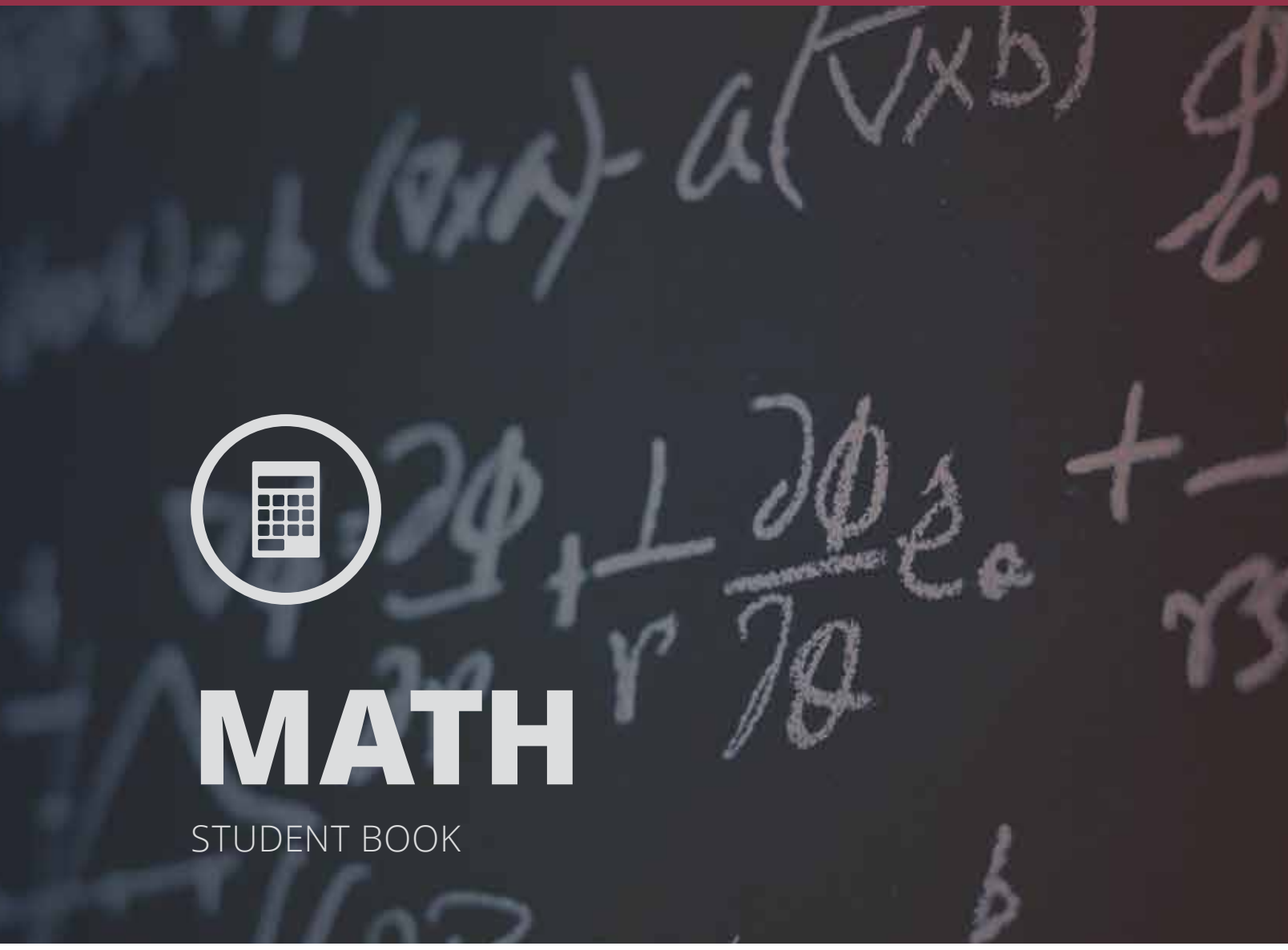

MATH

STUDENT BOOK

7th Grade | Unit 3

Alpha Omega
PUBLICATIONS

Math 703
Decimals

LIFEPAC Test is located in the center of the booklet. Please remove before starting the unit.

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Decimals

Introduction

In this unit, students will work with decimal numbers. They will learn how place value can be used to compare, order, and round decimal numbers. In addition, students will use the rules for adding, subtracting, multiplying, and dividing decimals to estimate and solve problems. They will learn that fractions and decimals are different ways to write equivalent values and that scientific notation is a method for writing large numbers. Students will finish the unit by looking at the metric system and learning how to convert between metric units.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. When you have finished this LIFEPAC, you should be able to:

- Compare and order decimal numbers.
- Round and estimate decimal numbers.
- Add, subtract, multiply, and divide decimal numbers.
- Convert between decimal numbers and fractions.
- Solve application problems that contain decimal numbers and fractions.
- Write and interpret numbers in scientific notation.
- Convert between metric (SI) units.

1. Decimals and Their Operations

Comparing and Ordering Decimals

Have you ever been asked to put a list of words in alphabetical order? You can do a similar thing in math except that it's not called alphabetical order. In math, you learn to put groups of numbers in both *ascending order* and *descending order*. Can you guess what those terms mean? How about a little hint? Think of an airplane flight. Read on to learn what those terms mean and how they apply to math.

Objectives

- Identify the larger decimal in pairs or small groups of decimals.
- Put a group of decimals in ascending and descending order.

Vocabulary

ascending order—numbers going up in value

descending order—numbers going down in value

inequality—sentence showing a relationship between numbers or expressions that are not necessarily equal; uses the symbols >, <, or ≠

Recognizing Decimal Place Values

Decimals are a math concept that you work with each and every day. Every time you use money, you are using decimals. Think about what one dollar and fifty-seven cents looks like when written out using numbers. It looks like $1.57. Notice that a decimal is used to separate the dollars from the cents. This is because dollars are whole while cents are parts of a whole, or in this case part of a dollar.

What are the place values of the 5 and 7 in $1.57? Remember that it takes one hundred cents to equal a whole dollar. So fifty-seven cents is the same as fifty-seven hundredths of a dollar. The 5 is located in the tenths place, and the 7 is located in the hundredths place. Do you remember the other decimal place values that aren't used as often as tenths and hundredths?

Think about it! Remember that all numbers can be represented on a number line. Decimal numbers come between the whole numbers on the number line because the digits to the right of the decimal point represent part of the whole.

Note: Be careful when naming the decimal place values. Notice that they don't start with the ones like the whole number place values.

Take a look at some examples identifying decimal place values.

Example:

- What is the place value of the 3 in the number 0.15634?

Solution:

- The 1 is in the tenths place.
- The 5 is in the hundredths place.
- The 6 is in the thousandths place.
- The 3 is in the ten thousandths place.
- The 4 is in the hundred thousandths place.
- So the 3 is in the ten thousandths place.

Example:

- Which digit is in the thousandths place in the number 2.05738?

Solution:

- The 0 is in the tenths place.
- The 5 is in the hundredths place.
- The 7 is in the thousandths place.
- The 3 is in the ten thousandths place.
- The 8 is in the hundred thousandths place.
- So the 7 is in the thousandths place.

Comparing Decimals

Comparing two numbers is very similar to comparing the size of two objects. For example, suppose you are asked to compare the sizes of a basketball and a baseball. You could say that the basketball is bigger than the baseball. Or you could say that the baseball is smaller than the basketball. When comparing two decimal numbers, you can say that one number is larger or smaller in value than the other.

Instead of using words when you compare decimals, you will use symbols. More specifically, you will use the *inequality* symbols < (less than) and > (greater than). Sometimes, you may even have to use the equal sign because the two numbers being compared are actually equal to one another.

Take a closer look at comparing decimals. The steps for comparing decimal numbers are easy to remember and follow.

Example:

- Which is larger: 0.879 or 0.877?

Solution:

- The first step is to line up the decimal points:
  - 0.879
  - 0.877
- Compare each place value and notice that the first two numbers after the decimal are the same but the third number in is larger in the first number.
  - 0.879 > 0.877

Example:

- Which is larger: 9.087 or 9.0870?

Solution:

- The first step is to line up the decimal points:
  - 9.087
  - 9.0870

- Notice this time that the second number has an additional place value.
- It helps if the two numbers being compared are the same length. You can add zeroes after the last digit in the number without changing its value:
  - 9.0870
  - 9.0870
- At this point, you would usually compare each place value, but you can see that the numbers are identical, or equal, which you can indicate as follows:
  - 9.087 = 9.0870

Example:

- Which is larger: 7.193 or 7.139?

Solution:

- The first step is to line up the decimal points:
  - 7.193
  - 7.139
- Begin by comparing the whole number portion to the left of the decimal point. In this case, both numbers are 7, so you must keep going. If the whole number portion had not been equal, the number with the larger whole number would be the greater value.
- Look at the portion of each number to the right of the decimal point. The first number has 193 after the decimal, and the second number has 139 after the decimal. Compare these numbers digit by digit, beginning with the tenths place, until you either find a difference or reach the end of the numbers. In this case, both numbers have 1 in the tenths place, so look at the hundredths. The first number has 9 in the hundredths place and the second number has 3 in the hundredths place. The first number is greater than the second number. It does not matter that the second number has a greater value in the thousandths place because the first number has already been ruled the greater number based on the value of the hundredths place.
  - 7.193>7.139

You can also compare more than two numbers at a time using the same steps. This is a handy skill especially when you are asked to put numbers in a specified order. Now you're going to learn a little more about putting a group of numbers in order.

Ordering Decimals

You might be asked to put a group of numbers in either ascending or descending order. But what does that mean? Think about an airplane. When the plane takes off, it is ascending, or rising to its flying altitude, but when the plane is preparing to land, it is descending, or losing altitude.

You can also think about a flight of stairs. When you go up the stairs, you are ascending, but when you go down the stairs, you are descending. The terms mean the same things when applied to numbers. When you are asked to put numbers in ascending order, you will want to order them by increasing value, or from smallest to largest. If you are asked to put numbers in descending order, you will want to order them by decreasing value, or from largest to smallest.

Now that you know what those two terms mean, use the skills that you learned for comparing decimal numbers to order decimal numbers. Remember that in order to compare decimal numbers, you need to first line up the decimal points and then identify the first place value (from left to right) that differs. Once you identify where they differ, you can then compare those two numbers to determine which is larger. This will help you put them in the correct order. Take a look at a couple of examples.

Example:

- Put the following list of decimals in ascending order.
  - 25.6, 25.61, 25.67, 25.68, 25.72, 25.73, 25.76, 25.77

Solution:

- 25.6, 25.61, 25.67, 25.68, 25.72, 25.73, 25.76, 25.77

Example:

- Put the following list of decimals in descending order.
- 0.054, 0.164, 0.038, 0.07, 0.162, 0.099, 0.016

Solution:

- 0.164, 0.162, 0.099, 0.07, 0.054, 0.038, 0.016

Let's Review

Decimals are numbers that are located between the whole numbers on a number line. They are used a lot in everyday life, especially when dealing with money. It is important that you are able to work with them in ways other than adding, subtracting, multiplying, and dividing:

- Be sure you are able to identify the place values to the right of the decimal point.
- Make sure that you are able to compare decimals and put them in ascending and descending order.
- Remember that ascending order gets larger while descending order gets smaller.

Complete the following activities.

1.1 Which of the following numbers has the smallest value?

☐ 19.45 ☐ 19.445 ☐ 19.5 ☐ 19.454

1.2 Which number below does not have the same value as the other decimals?

☐ 23.040 ☐ 23.04000 ☐ 23.04001 ☐ 23.04

1.3 A librarian arranged some books on the shelf using the Dewey decimal system. Choose the group of book numbers that is listed in ascending order.

☐ 549.010, 549.101, 549.02, 549.3 ☐ 101.2, 101.04, 104.21, 110.0

☐ 392.4, 397.46, 399.53, 399.062 ☐ 834, 834.19, 834.2, 834.29

1.4 Which number sentence below is *not* correct?

☐ 24.154 < 24.15 ☐ 24.67 = 24.6700

☐ 23.07 < 23.072 ☐ 28.045 > 28.044

1.5 Which symbol makes the following number sentence correct?
4.567 _____ 4.576

☐ < ☐ > ☐ =

1.6 In the number 11.278, the 7 is located in the _____ place.

☐ ones ☐ hundredths

☐ tenths ☐ thousandths

1.7 In the number 0.02415, the 4 is located in the _____ place.

☐ tenths ☐ hundredths ☐ ten thousandths

☐ thousandths

1.8 Which number below has the largest value?

☐ 54.026 ☐ 54.029 ☐ 54.0229 ☐ 54.0269

1.9 The top five students in Mrs. Seller's class have the following GPAs.

Student	GPA
Emily	3.61
Stacy	3.76
David	3.67
John	3.89
Debbie	3.95

Who has the highest GPA?

- ☐ Stacy
- ☐ Emily
- ☐ David
- ☐ Debbie
- ☐ John

Arrange the numbers from smallest to largest.

1.10 3.148 1.483 4.831 8.314

1.11 5.2394 5.2943 5.2439 5.239

1.12 4.0819 4.089 4.081 4.819

1.13 9.0001 9.100 9.0100 9.0010

1.14 6.8267 6.2678 6.6782 6.7826

Rounding and Estimating Decimals

Imagine being asked to solve the following problem using mental math.

12.846 - 9.489

Just the thought of this might make you get a little nervous, but what if there was a way to make the problem easier?

This lesson will help you to understand more about *rounding* and *estimating*, which are both useful skills when using mental math. They are also good skills to have in real-world applications, such as when dealing with money.

Objectives

- Round decimals to specified place values.
- Apply rounding skills to help with estimating.

Vocabulary

estimation—an approximate value close to the actual value

rounding—a method of approximating a number

Rounding Decimal Numbers

A good example of everyday use of decimal numbers is money. Dollars represent whole amounts; cents represent fractional parts of one whole dollar. Since one hundred cents are in a dollar, three hundred and twenty-seven cents is written as $3.27. Ten dollars and fifty cents is written as $10.50.

Because we use decimals in our money system, it is crucial to understand not only how to use and work with decimals, but also how to make them more manageable. One way to make decimal numbers easier to work with is to round them. When rounding decimal numbers, follow these steps:

1. Look at the number to the right of the place you are rounding.
2. If that number is greater than or equal to 5, round the number to the left up.
3. If that number is less than 5, keep the number to the left the same.

Now take a look at an example of rounding with money.

Example:

- Casey and her friends meet up at a pizza restaurant after school. None of them really has that much money, so they decide to put their money together. After they order, Casey determines the amount each person should pay by using her calculator. The price each person should pay comes to $1.538. Everyone is confused about the amount. How much should each person pay? Casey explains that they just need to round the amount to the nearest hundredth.

Solution:

- Which number is in the hundredths place?
- 3
- Look to the right of 3 at the 8. Since 8 is more than 5, the 3 rounds up to 4.
- So $1.538 rounded to the nearest hundredth is $1.54.

Take a look at some more examples of rounding decimals. You will continue to use the same rules for rounding as previously explained.

Example:

- Round 23.802 to the nearest tenth.

Solution:

- Which number is in the tenths place?
- 8
- Look to the right of 8 at the 0. Since 0 is less than 5, the 8 doesn't change.
- So 23.802 rounded to the nearest tenth is 23.8.

Example:

- Round 126.80361 to the nearest thousandth.

Solution:

- Which number is in the thousandths place?
- 3
- Look to the right of 3 at the 6. Since 6 is greater than 5, the 3 rounds up to 4.
- So 126.80361 rounded to the nearest thousandth is 126.804

Example:

- Round 42.4847 to the nearest hundredth.

Solution:

- Which number is in the hundredths place?
- 8
- Look to the right of 8 at the 4. Since 4 is less than 5, the 8 doesn't change.
- So 42.4847 rounded to the nearest hundredth is 42.48.

Do not be tempted to round other place values first. Just because there is a 7 at the end of the number does not mean you should round the 4 to 5 before rounding the 8. Only look at the digit to the immediate right of the place value in question. All other digits do not affect the rounding.

Example:

- Round 77.11195 to the nearest ten thousandth.

Solution:

- Which number is in the ten thousandths place?
- 9
- Look at the number to the right of 9. It is 5, so the 9 rounds up to 10.

This might help! When a 9 is rounded to the nearest whole number, which is 10, the 9 becomes a zero and the digit in the previous place value rounds up. In this example, the 9 became a 0, and the 1 to its left rounded up to 2.

- So 77.11195 rounded to the nearest ten thousandth is 77.1120.

Self Test 1: Decimals and Their Operations

Complete the following activities (5 points, each numbered activity).

1.01 You do not need to line up the decimal points when subtracting two decimal numbers.

- ○ True
- ○ False

1.02 Which list of decimal numbers is in ascending order?

- ☐ 0.13, 0.31, 0.04, 0.5
- ☐ 12.252, 12.26, 12.387, 12.4
- ☐ 1.411, 1.2, 1.056, 1.007
- ☐ 6.009, 6.015, 6.241, 6.2

1.03 Multiply. Do not round your answer. Be sure to include a decimal point in your answer. $1.7 \cdot 11.59 =$

1.04 Which of the following would you round and estimate to a sum of 11?

- ☐ 3.41 + 8.051
- ☐ 4.25 + 8.103
- ☐ 3.65 + 7.992
- ☐ 4.89 + 7.431

1.05 Which statement about $1.23 \div 0.15$ is true?

- ☐ The dividend should become 15.
- ☐ The quotient does not have a hundredths place.
- ☐ The divisor is a whole number.

1.06 1.320 ____ 1.302

- ☐ =
- ☐ <
- ☐ >

1.07 Round 604.2978 to the hundredths place.

- ☐ 604
- ☐ 604.30
- ☐ 604.29
- ☐ 600

1.08 Terrance is planning to make an online purchase. He is buying a tie for $13.42, a shirt for $25.76, and a pair of pants for $19.80. What will be his total before tax?

- ☐ $57.98
- ☐ $47.98
- ☐ $41.16
- ☐ $58.98

1.09 Divide. 3.451 ÷ 1.7 = _____

☐ 203 ☐ 20.3 ☐ 2.03 ☐ 0.203

1.010 Jenna had $180.47 in her checking account. She bought groceries for $75.11 and gas for $29.64. How far below $100 is her checking account now?

☐ $24.28 ☐ $75.72 ☐ $80.47 ☐ $4.74

1.011 When comparing two decimal numbers, you should always line up the decimals and then compare the digits from left to right.

○ True
○ False

1.012 Round 15.6895 to the nearest tenth.

☐ 15.7 ☐ 15.6 ☐ 15.68 ☐ 15.69

1.013 Multiply. 16.3 · 1.18 = _____

☐ 1,923.4 ☐ 192.34 ☐ 19.234 ☐ 1.9234

1.014 Use rounding to estimate the difference of 18.14 - 9.88.

☐ 6 ☐ 9 ☐ 7 ☐ 8

1.015 The school hiking club has completed 4 out of 5 hikes so far this year. They have hiked 4.6 miles, 3.7 miles, 5.1 miles, and 2.9 miles. If their goal is to hike 20 total miles, how many miles does the last hike need to be?

☐ 4.7 miles ☐ 3.7 miles ☐ 2.7 miles ☐ 1.7 miles

1.016 Round 1342.5414 to the nearest thousandth.

1.017 Add. $561.48 + 99.6 =$

1.018 Subtract. $912.3 - 44.87 =$

1.019 Multiply. $35.7 \times 4.86 =$

1.020 Divide. $9.315 \div 3.45 =$

80/100 **SCORE** _____ **TEACHER** _____ _____
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