

Lesson 7: Powers of 10 (2 Days)

☐ Getting Started

What's the biggest number you can think of? Can you say it? How do you write it? The bigger that numbers get, the harder they are to say and write. For example, how might you say 646,242,576,192,834,515? What parts or places in this number do you already know? What parts or places do you need to know?

During this lesson, you're going to explore REALLY big numbers. The most important thing for you to know is this: numbers go to infinity. They never stop getting bigger. This means that even if you think you've come up with the biggest possible number, there will always be a bigger one! In fact, no matter how big a number is, it will always be closer to one than to infinity. Crazy, right?

Stuff You Need

- *On Beyond a Million* by David M. Schwartz
- calculator
- colored pencils* (Activity 2 - optional)
- fine point dry-erase markers (kit)
- glue or glue stick
- laminated decimal place value chart (kit)
- scissors

Ideas to Think About

- What are powers of ten?
- How do you use powers of 10 to represent really big numbers?
- What is an exponent?
- How do you read and write numbers in exponent form?

Things to Know

- **Powers of 10:** numbers made by multiplying 10 by itself (for example, $10 \times 10 \times 10 = 1,000$)

Activities

☐ Activity 1: Beyond a Million

You're going to read *On Beyond a Million* by David M. Schwartz. As you read the book, pay attention to how "power counting" works and look for examples of really big numbers in the real world. When you finish reading the book, use what you've read to answer the questions and fill in the blanks on the "Beyond a Million" sheet. If needed, you can refer back to the book while you work on the sheet.

☐ Activity 2: Big Number Facts

Look back through *On Beyond a Million* by David M. Schwartz. What are some of your favorite facts presented in the "Did you know?" section? Pay close attention to the facts that include numbers greater than one million.

Where else can you find big numbers in the real world? For example, how many gallons of water make up the Atlantic Ocean? How many people live in Asia? How many hamburgers do Americans eat in one year? Facts related to science and geography can often include big numbers.

You're going to use some of the facts presented in the book along with your own research to complete the "Did You Know?" sheet. For your own research, you may use the Internet, magazines, newspapers, or other books. The sheet provides eight spaces for you to fill in with facts that include big numbers. Here are the requirements:

- You must focus on facts with numbers greater than one million.
- Only four of your facts and numbers can come from the book. The other four must come from another source. If you prefer, you can use fewer than four facts from the book.
- You must use words and pictures (simple is okay) for each fact you present. Adding color to your pictures is optional.

An example has been provided on the page. Once you've completed the "Did You Know?" sheet, share it with a friend or family member. You might ask them to try to guess the numbers that your facts include. For example, "How many seconds do you think you've already lived on your sixth birthday?" Be sure that you can say the numbers in your facts correctly.

Day 2☐ **Activity 3: Powers of 10 and Decimals**

First watch the following video. Be sure to have your laminated decimal place value chart and a dry-erase marker handy, and pause the video as needed.

**Powers of 10 and Decimals**

www.beyondthepage.com/link/8609/

Use the information you learned in the video to complete the "Powers of 10" sheet.

☐ **Activity 4: Basic Skills Review #2**

You will complete the "Basic Skills Review #2" sheet. This review includes skills that you've already practiced. Use scratch paper as needed. Be sure to label units. For example, if a problem is about time, your answer should include a unit of time such as "seconds" or "minutes."

Wrapping Up

It's pretty fun working with big numbers. During the next lesson, you'll learn another way to represent powers of 10 and practice multiplying and dividing whole numbers and decimals by powers of 10.

Learning Gates

Take the [Learning Gates quiz](#) for this lesson.

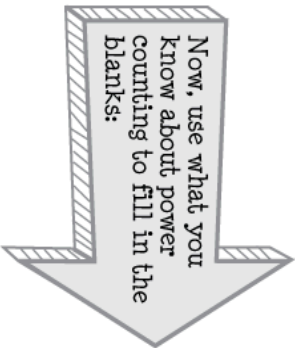
BEYOND A MILLION

Fill in the blanks to show the pattern:

1, 10, _____, **1,000,** _____, _____, **1,000,000,** _____

What number will be next in the pattern? Write it in word form. _____

In your own words, what is power counting? _____

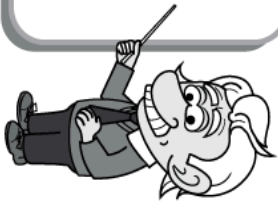


$10 \times 10 =$ _____

$10 \times 10 \times 10 =$ _____

$10 \times 10 \times 10 \times 10 =$ _____

$10 \times 10 \times 10 \times 10 \times 10 =$ _____



What do you notice about the number of 10s being multiplied and the number of 0s in the product? _____

What is the product when you multiply ten 10s? _____

What comes after the millions? _____

How many 0s are in one trillion? _____

Write these in order from least to greatest: **1 quadrillion, 1 billion, 1 million, 1 trillion, 1 quintillion.**

What is a googol? _____

DID YOU KNOW?

Instructions: Fill in each box with a number fact and related image. Four of the facts can come from *On Beyond a Million*.

The US has about 250,000,000 people in it.



Powers of 10

Instructions: Cut out the numbers on the right of the sheet and place them in the correct boxes on the left. When you've placed the numbers correctly, glue them to the sheet.

$10 \times 10,000,000 =$

$0.01 \times 10 =$

$100,000 \times 10 =$

$1,000 \div 10 =$

$0.01 \div 10 =$

$0.1 \times 10 =$

$100 \times 10 =$

$0.1 \div 10 =$

$10 \times 1,000 =$

**1****100,000,000****0.001****1,000****0.01****0.1****1,000,000****10,000****100**



Basic Skills Review #2

1.

$$4,187 \times 9 = \underline{\hspace{2cm}}$$

2.

Is this angle acute or obtuse or right?



3.

Round 34.152 to the tenths and the hundredths.

4.

James started running at 7:45. He took a break at 8:18. Then he started running again at 8:24 and stopped at 8:31. How long did he run in all?

5.

$$60 \text{ inches} = \underline{\hspace{2cm}} \text{ feet}$$

6.

Mrs. Walker bought a can of paint that will cover 400 square feet. She's painting a bedroom that is 17 feet by 22 feet. Will she have enough paint left over to also paint her 3 foot by 7 foot closet?

7.

$$3,455 \div 7 = \underline{\hspace{2cm}}$$

8.

Mark bought 5 t-shirts at a thrift store. Each one cost \$2.25. He paid \$20.00. How much change did he get back?

9.

Carlos made a smoothie using 8 ounces of strawberries, 16 ounces of bananas, $\frac{1}{2}$ cup of blueberries, $\frac{1}{4}$ cup of protein powder, $\frac{1}{2}$ cup of yogurt, and $\frac{1}{2}$ cup of juice. How many cups of smoothie did he make?

10.

Mallory weighed her 4 cats. Two of them weighed 8 pounds, one weighed 7 pounds, and one weighed 9 pounds. How many ounces did they weigh in all?

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Getting Started

? Ideas to Think About

- What are powers of ten?
- How do you use powers of 10 to represent really big numbers?
- What is an exponent?
- How do you read and write numbers in exponent form?



Things to Know

- **Powers of 10:** numbers made by multiplying 10 by itself (for example, $10 \times 10 \times 10 = 1,000$)

⦿ Skills

- 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

Introducing the Lesson

Your child will explore and work with really big numbers during this lesson. You can refer to this as "working with powers of 10" and "power counting." Starting at the number 10, your child will multiply by 10 to arrive at numbers beyond a million. While exponents will be introduced, he won't work with them directly until the next lesson. Make sure that your child understands that powers of 10 are not the same as multiples of 10. Powers of 10 are numbers made by multiplying 10 by itself. Examples include 10, 100, 1,000, 10,000, and so forth. Multiples of 10 are products of 10 and another number and include 10, 20, 30, 40, and so on. Some numbers, like 100 and 1,000, are both powers and multiples of 10.

Activities

Activity 1: Beyond a Million

During this activity, your child will read *On Beyond a Million* by David M. Schwartz and then answer questions based on the book.

If your child demonstrates an interest in learning more about big numbers in our world, share the following web link with him.



Everyday Large Number for a Modern World

www.beyondthepage.com/link/8465/

Answer Key:

- 1, 10, 100, 1,000, 10,000, 100,000, 1,000,000, 10,000,000
- What number will be next in the pattern? Write it in word form. (one hundred million)

- In your own words, what is power counting? (possible answers: making a number that is 10 times bigger than the one before, adding a zero to a number)
- Fill in the blanks:
 $10 \times 10 = (100)$
 $10 \times 10 \times 10 = (1,000)$
 $10 \times 10 \times 10 \times 10 = (10,000)$
 $10 \times 10 \times 10 \times 10 \times 10 = (100,000)$
- What do you notice about the number of 10s being multiplied and the number of 0s in the product? (they are the same)
- What is the product when you multiply ten 10s? (10,000,000,000)
- What comes after the millions? (billions)
- How many 0s are in one trillion? (12)
- Write these in order from least to greatest: (1 million, 1 billion, 1 trillion, 1 quadrillion, 1 quintillion)
- What is a googol? (10 multiplied 100 times, 1 with 100 zeros)

Activity 2: Big Number Facts

Your child will use the book *On Beyond a Million* along with additional research to create a big number facts sheet ("Did You Know?"). As he works on this, be sure to monitor his Internet search. He will follow these requirements for his facts sheet:

- He must focus on facts with numbers greater than one million.
- Only four of his facts and numbers can come from the book. The other four must come from another source. If he prefers, he can use fewer than four facts from the book.
- He must use words and pictures (simple is okay) for each fact he presents. Adding color to the pictures is optional.

When your child is ready to present his fact sheet, help him, as needed, say the numbers on it correctly.

Day 2

Activity 3: Powers of 10 and Decimals

During this activity, your child will discover the rules for multiplying and dividing decimals by a power of 10.

Answer Key:

- $10 \times 10,000,000 = (100,000,000)$
- $0.01 \times 10 = (0.1)$
- $100,000 \times 10 = (1,000,000)$
- $1,000 \div 10 = (100)$
- $0.01 \div 10 = (0.001)$
- $0.1 \times 10 = (1)$
- $100 \times 10 = (1,000)$
- $0.1 \div 10 = (0.01)$
- $10 \times 1,000 = (10,000)$

Activity 4: Basic Skills Review #2

Your child will complete another Basic Skills Review.

Answer Key:

1. $4,187 \times 9 = (37,683)$
2. Is this angle acute, obtuse, or right? (acute)
3. Round 34.152 to the tenths and the hundredths. (34.2, 34.15)
4. James started running at 7:45. He took a break at 8:18. Then he started running again at 8:24 and stopped at 8:31. How long did he run in all? (7:45 to 8:18 = 33 minutes, 8:24 to 8:31 = 7 minutes, $33 + 7 = 40$ minutes)
5. 60 inches = (60 inches $\div$ 12 inches in a foot = **5 feet**)
6. Mrs. Walker bought a can of paint that will cover 400 square feet. She's painting a bedroom that is 17 feet by 22 feet. Will she have enough paint left over to also paint her 3 foot by 7 foot closet? (**yes**), $17 \times 22 = 374$ square feet, $3 \times 7 = 21$ square feet, $374 + 21 = 395$ square feet)
7. $3,455 \div 7 = (493 \text{ R } 4)$
8. Mark bought 5 t-shirts at a thrift store. Each one cost \$2.25. He paid \$20.00. How much change did he get back? (**\$8.75**, $\$2.25 \times 5 = \$11.25$, $\$20.00 - \$11.25 = \$8.75$)
9. Carlos made a smoothie using 8 ounces of strawberries, 16 ounces of bananas, $\frac{1}{2}$ cup of blueberries, $\frac{1}{4}$ cup of protein powder, $\frac{1}{2}$ cup of yogurt, and $\frac{1}{2}$ cup of juice. How many cups of smoothie did he make? (**$4 \frac{3}{4}$ cups**, 8 ounces = 1 cup, 16 ounces = 2 cups, 1 cup + 2 cups + $\frac{1}{2}$ cup + $\frac{1}{4}$ cup + $\frac{1}{2}$ cup + $\frac{1}{2}$ cup = $4 \frac{3}{4}$ cups)
10. Mallory weighed her 4 cats. Two of them weighed 8 pounds, one weighed 7 pounds, and one weighed 9 pounds. How many ounces did they weigh in all? ($8 + 8 + 7 + 9 = 32$ pounds, 32 pounds $\times$ 16 ounces in a pound = **512 ounces**)

Wrapping Up**Questions to Discuss**

- Write 100,000,000,000 on a piece of paper, and ask your child to do the following:
Say the number (100 billion)
Say what number is ten times more than 100 billion (one trillion)
- Ask your child what one-thousandth times 10 equals (.01 or one hundredth)

Things to Review

Review what happens to whole numbers and decimal numbers when you multiply and divide by 10

Review the names and numerical representations of large power of 10 numbers