

**Chapter
6**
Exponents and Scientific Notation

Dear Family,

People shop on the Internet, talk to one another using email, and keep digital photo and video albums. Computers represent all this information using numbers.

The number system that computers use is based on powers of 2 and is called the *binary system*. For example, the number 45 is represented as $32 + 8 + 4 + 1 = 2^5 + 2^3 + 2^2 + 2^0$. Try this with your student.

- Find the first eight powers of two, starting with $2^0 = 1$. Write these values on the blanks under the powers of two in the table.

Power	$2^7 =$ _____	$2^6 =$ _____	$2^5 =$ _____	$2^4 =$ _____	$2^3 =$ _____	$2^2 =$ _____	$2^1 =$ _____	$2^0 =$ 1
Digit (0 or 1)								

- Pick any number from 0 to 255. Find the sum of the powers of two that equal your number.
- Put a 1 in the "Digit" row if the power of two is in your number; put a 0 in the "Digit" row if the power of two is not in your number. For example, the digits for 45 are shown below because $45 = 2^5 + 2^3 + 2^2 + 2^0$.

Power	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
Digit	0	0	1	0	1	1	0	1

- Write your number as a binary number. For example, 45 is 00101101.

Computer storage and file sizes are often recorded in kilobytes. A kilobyte is equal to 2^{10} bytes = 1024 bytes. People often round this to 1000 bytes. Ask your student to research what powers of two correspond to megabyte, gigabyte, and terabyte. Find the following information on the Internet or in the library.

- How many kilobytes does a typical page of text use?
- How many megabytes does a typical digital photo use?
- How many gigabytes does one minute of video typically use? How does video compare to audio?

Understanding powers helps make computer terms a bit more familiar!

Chapter 6

Exponents and Scientific Notation (continued)

Lesson	Learning Target	Success Criteria
6.1 Exponents	Use exponents to write and evaluate expressions.	<ul style="list-style-type: none"> I can write products using exponents. I can evaluate expressions involving powers. I can use exponents to solve real-life problems.
6.2 Product of Powers Property	Generate equivalent expressions involving products of powers.	<ul style="list-style-type: none"> I can find products of powers that have the same base. I can find powers of powers. I can find powers of products.
6.3 Quotient of Powers Property	Generate equivalent expressions involving quotients of powers.	<ul style="list-style-type: none"> I can find quotients of powers that have the same base. I can simplify expressions using the Quotient of Powers Property and the Power of a Quotient Property. I can solve real-life problems involving quotients of powers.
6.4 Zero and Negative Exponents	Understand the concepts of zero and negative exponents.	<ul style="list-style-type: none"> I can explain the meanings of zero and negative exponents. I can evaluate numerical expressions involving zero and negative exponents. I can simplify algebraic expressions involving zero and negative exponents.
6.5 Estimating Quantities	Round numbers and write the results as the product of a single digit and a power of 10.	<ul style="list-style-type: none"> I can round very large and very small numbers. I can write a multiple of 10 as a power. I can compare very large or very small quantities.
6.6 Scientific Notation	Understand the concept of scientific notation.	<ul style="list-style-type: none"> I can convert between scientific notation and standard form. I can choose appropriate units to represent quantities. I can use scientific notation to solve real-life problems.
6.7 Operations in Scientific Notation	Perform operations with numbers written in scientific notation.	<ul style="list-style-type: none"> I can explain how to add and subtract numbers in scientific notation. I can explain how to multiply and divide numbers in scientific notation. I can use operations in scientific notation to solve real-life problems.