Lesson 1: Properties of Exponents

1.1: Which One Doesn't Belong: Exponents and Equations

A. $2^3 = 9$

B. $9 = 3^2$

C. $2 \cdot 2 \cdot 2 \cdot 2 = 16$

D. $a \cdot 2^0 = a$

1.2: Name That Power

Find the value of each variable that makes the equation true. Be prepared to explain your reasoning.

1. $2^3 \cdot 2^5 = 2^a$
2. $3^b \cdot 3^7 = 3^{11}$
3. $\frac{4^3}{4^2} = 4^c$
4. $\frac{5^8}{5^d} = 5^2$
5. $6^m \cdot 6^m \cdot 6^m = 6^{21}$
6. $(7^n)^4 = 7^{20}$
7. $2^4 \cdot 3^4 = 6^s$
8. $5^3 \cdot t^3 = 50^3$

1.3: The Power of Zero

1. Use exponent rules to write each expression as a single power of 2. Find the value of the expression. Record these in the table. The first row is done for you.

expression	power of 2	value
$\frac{2^5}{2^1}$	2^4	16
$\frac{2^5}{2^2}$		
$\frac{2^5}{2^3}$		
$\frac{2^5}{2^4}$		

$\frac{2^5}{2^5}$

$\frac{2^5}{2^6}$

$\frac{2^5}{2^7}$

2. What is the value of 5^0?

3. What is the value of 3^{-1}?

4. What is the value of 7^{-3}?

Are you ready for more?

Explain why the argument used to assign a value to the expression 2^0 does not apply to make sense of the expression 0^0.

1.4: Matching Exponent Expressions

Sort expressions that are equal into groups. Some expressions may not have a match, and some may have more than one match. Be prepared to explain your reasoning.

2^{-4} $\frac{1}{2^4}$ -2^4 $-\frac{1}{2^4}$ 4^2 4^{-2} -4^2 -4^{-2}

$2^7 \cdot 2^{-3}$ $\frac{2^7}{2^{-3}}$ $2^{-7} \cdot 2^3$ $\frac{2^{-7}}{2^{-3}}$ $(-4)^2$

Lesson 1 Summary

Exponent rules help us keep track of a base's repeated factors. Negative exponents help us keep track of repeated factors that are the *reciprocal* of the base. We can define a number to the power of 0 to have a value of 1. These rules can be written symbolically as:

$$b^m \cdot b^n = b^{m+n}$$
$$(b^m)^n = b^{m \cdot n}$$
$$\frac{b^m}{b^n} = b^{m-n}$$
$$b^{-n} = \frac{1}{b^n}$$
$$b^0 = 1$$
$$a^n \cdot b^n = (a \cdot b)^n$$

Here, the base b can be any positive number, and the exponents n and m can be any integer.