Unit 6, Lesson 1

Properties of Exponents

Let's use integer exponents.

1.1 Which Three Go Together: Exponents and Equations

Which three go together? Why do they go together?

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.
   Discuss with your partner any patterns you notice that show a relationship between the middle and right columns.

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 the expressions into groups so that each group has the same value. 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.