

Lesson 4-1 Powers and Exponents

ISG Interactive Study Guide

See pages 73–74 for:

- Getting Started
- Vocabulary Start-Up
- Notes

EQ Essential Question

Why is it useful to write numbers in different ways?

CCSS Common Core State Standards

Content Standards
8.EE.1

Mathematical Practices
1, 3, 4, 6, 8

Vocab Vocabulary

exponent
power
base

What You'll Learn

- Write expressions using exponents.
- Evaluate expressions containing exponents.

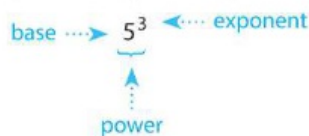
Real-World Link

Computers Data storage capacity is measured in bytes and is based on powers of 2. The standard scientific meanings for the prefixes *mega-* and *giga-* are one million and one billion, respectively. In computer science, a megabyte equals 2^{20} bytes and a gigabyte equals 2^{30} bytes.



Use Exponents

An expression like $5 \cdot 5 \cdot 5$ with equal factors can be written using an exponent. An **exponent** tells how many times a number is used as a factor. A number that is expressed using an exponent is called a **power**. The number that is multiplied is called the **base**. So, $5 \cdot 5 \cdot 5$ equals the power 5^3 .



Read and Write Powers		
Power	Words	Factors
5^1	5 to the first power	5
5^2	5 to the second power or 5 squared	$5 \cdot 5$
5^3	5 to the third power or 5 cubed	$5 \cdot 5 \cdot 5$
5^4	5 to the fourth power or 5 to the fourth	$5 \cdot 5 \cdot 5 \cdot 5$
\vdots	\vdots	\vdots
5^n	5 to the n th power or 5 to the n th	$\underbrace{5 \cdot 5 \cdot 5 \cdot \dots \cdot 5}_{n \text{ factors}}$

$x^2 = x$ SQUARED $y^3 = y$ CUBED

Example 1

Write each expression using exponents.

a. $(-8) \cdot (-8) \cdot (-8)$

The base -8 is a factor 3 times.

$$(-8) \cdot (-8) \cdot (-8) = (-8)^3$$

c. $5 \cdot r \cdot r \cdot s \cdot s \cdot s \cdot s$

$$5 \cdot r \cdot r \cdot s \cdot s \cdot s \cdot s = 5 \cdot (r \cdot r) \cdot (s \cdot s \cdot s \cdot s) = 5 \cdot r^2 \cdot s^4 \text{ or } 5r^2s^4$$

b. $(k + 2)(k + 2)(k + 2)(k + 2)$

The base $(k + 2)$ is a factor 4 times.

$$(k + 2)(k + 2)(k + 2)(k + 2) = (k + 2)^4$$

Group factors with like bases.

$$r \cdot r = r^2, s \cdot s \cdot s \cdot s = s^4$$

Got It? Do these problems to find out.

1a. $\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)$

1b. $x \cdot x \cdot x \cdot x \cdot x$

1c. $(c - d)(c - d)$

1d. $9 \cdot f \cdot f \cdot f \cdot f \cdot g$

Handwritten notes: EXPONENT, BASE → 3, POWER