## **EXPONENTS AND ROOTS**

An exponent is a shorthand way to note how many times to multiply the base number by itself. It's written as a superscript number on the right-hand side of the base number:



Any number raised to the 1 is just the number itself. For instance, 3 raised to the 1 is just 3. On the left, we see 3 raised to the 2, which would be  $3 \cdot 3 = 9$ . Any real number raised to the 0 is equal to 1. It doesn't matter if it is a positive number or a negative number. Any real non-zero number raised to the power of 0 is equal to 1.

A number with an exponent of 2 is said to be "squared," and a number with an exponent of 3 is said to be "cubed."

$4^3 = 4 \cdot 4 \cdot 4 = 64$	$3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243$
$7^2 = 7 \cdot 7 = 49$	$1^9 = 1 \cdot 1 = 1$

A **root** is another way of writing a fractional exponent. It is the opposite operation of applying exponents. In other words, a root essentially "undoes" an exponent.

Instead of using an exponent, roots use a radical symbol to indicate the operation. A radical will have a number underneath the bar and may sometimes have a number in the upper left, called the index. If there is no index number written, it is assumed to be 2



$$\sqrt{16} = 4$$

$$\sqrt{36} = 6$$

 $\sqrt[3]{343} = 7$ 

This is because  $4^2 = 16$ .

This is because  $6^2 = 36$ .

This is because  $7^3 = 343$ .





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