

# Zero as an exponent

This lesson will cover how to find the value of a nonzero number (or a variable) raised to the power 0.

The rule for 0 as an exponent:

Any nonzero real number raised to the power 0 is equal to 1, which means anything that looks like  $a^0$  is equal to 1 if  $a$  is not equal to 0. (It's important for  $a$  to be nonzero, because  $0^0$  is undefined.)

The reason this is true comes from the quotient rule for exponents. We know that  $x^n/x^n$  is 1, since the numerator and denominator are equal. But according to the quotient rule for exponents, we also know that

$$\frac{x^n}{x^n} = x^{n-n} = x^0$$

Therefore, we know that  $x^0 = 1$ . As long as  $x \neq 0$ , the rule will hold, so let's look at an example.

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## Example

Simplify the expression.

$$9^0$$

Just remember that any nonzero real number raised to the power 0 is equal to 1, so



$$9^0 = 1$$

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Let's look at another example.

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### Example

Simplify the expression.

$$99,102^0$$

Look different? Don't worry! Just remember that any nonzero real number raised to the power 0 is equal to 1, so

$$99,102^0 = 1$$

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Let's try some examples with variables.

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### Example

Simplify the expression.

$$y^0$$

It's also true that any variable raised to the power 0 is equal to 1 (as long as the value of the variable isn't 0), so



$$y^0 = 1$$

We do need to assume that  $y \neq 0$ .

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Good news! The rule is still true if you have more than one variable, or a combination of variables and numbers.

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### Example

Simplify the expression.

$$(3xy + a)^0$$

We know that any nonzero real number raised to the power 0 is equal to 1, and that the expression  $3xy + a$  really is just a representation of a number. This means that

$$(3xy + a)^0 = 1$$

We do need to make the assumption that the value of the expression  $3xy + a$  isn't 0.

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