

PRODUCT OF POWERS PROPERTY

How do you simplify $7^2 \times 7^6$?

If you recall the way **exponents** are defined, you know that this means:

$$(7 \times 7) \times (7 \times 7 \times 7 \times 7 \times 7 \times 7)$$

If we remove the parentheses, we have the product of eight 7s, which can be written more simply as:

$$7^8$$

This suggests a shortcut: all we need to do is add the exponents!

$$7^2 \times 7^6 = 7^{(2+6)} = 7^8$$

In general, for all real numbers a , b , and c ,

$$a^b \times a^c = a^{(b+c)}$$

To multiply two powers having the same base, add the exponents.

If you remember only this one and forget the rest, you can use it to figure out most of the other properties.

ZERO EXPONENTS

Many beginning students think it's weird that anything raised to the power of zero is 1. ("It should be 0!") You can use the product of powers property to show why this must be true.

$$7^0 \times 7^1 = 7^{(0+1)} = 7^1$$

We know $7^1 = 7$. So, this says that $7^0 \times 7 = 7$. What number times 7 equals 7? If we try 0, we have $0 \times 7 = 7$. No good.

In general, for all real numbers a , $a \neq 0$, we have:

$$a^0 = 1$$

Note that 0^0 is undefined. ([Click here to see why.](#))

NEGATIVE EXPONENTS