

Exponents

Exponents are a tool we can use to write numbers in a simpler way. An exponent is a little number that we write above and to the right of another number, like this:

$$3^2$$

When we see an expression like this, the little 2 is the exponent, and the 3 is called the “base.” The exponent tells us the number of times to multiply the base by itself. So the expression 3^2 is telling us to multiply 3 by itself 2 times, since the base is 3 and the exponent is 2. Here are some others:

$$2^3$$

Multiply 2 by itself 3 times

$$5^4$$

Multiply 5 by itself 4 times

Let’s expand these examples just to be clear what we really mean. When we say to multiply 3 by itself 2 times, we mean that

$$3^2 = 3 \cdot 3 = 9$$

In the same way, multiplying 2 by itself 3 times means that $2^3 = 2 \cdot 2 \cdot 2 = 8$. And multiplying 5 by itself 4 times means that $5^4 = 5 \cdot 5 \cdot 5 \cdot 5 = 625$.

Exponents are really helpful to us as we go further in math, because if we want to express a multiplication like $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$ in a simpler way, we can use an exponent and write it as 7^{11} .

Let’s do an example.



Example

Use an exponent to write the expression.

$$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$$

In this expression, we're multiplying 4 by itself 6 times. Which means we need the base to be 4 and the exponent to be 6. Therefore, we can write the expression as

$$4^6$$

Let's do another example, but this time we'll take an exponential expression and expand it.

Example

Write the expression in expanded form.

$$6^3$$

This expression tells us to use 6 as a factor 3 times, which means we can rewrite it without an exponent as

$$6 \cdot 6 \cdot 6$$



We don't have to find the result of the multiplication, but we could also do that and say

$$6^3 = 6 \cdot 6 \cdot 6 = 216$$

We can use exponents with variables as well. So if we want to multiply x by itself 3 times, we can write that as x^3 :

$$x \cdot x \cdot x = x^3$$

This is also true when the base is negative.

Example

Write the expression in expanded form.

$$(-2)^3$$

This expression tells us to use -2 as a factor 3 times, which means we can rewrite it without an exponent as

$$(-2) \cdot (-2) \cdot (-2)$$

We don't have to find the result of the multiplication, but we could also do that and say

$$(-2)^3 = (-2) \cdot (-2) \cdot (-2) = -8$$

