

Laws of Indices

The first rule: $a^n \times a^m = a^{m+n}$

The second rule: $(a^m)^n = a^{mn}$

The third rule: $a^m \div a^n = a^{m-n}$

The fourth rule: $a^0 = 1$

The fifth rule: $a^{-1} = \frac{1}{a}$ $a^{-m} = \frac{1}{a^m}$

The sixth rule: $a^{\frac{1}{n}} = \sqrt[n]{a}$ $a^{\frac{1}{m}} = \sqrt[m]{a}$
 $a^{\frac{n}{m}} = (a^{\frac{1}{m}})^n = (\sqrt[m]{a})^n$

Indices is a number with the power. For example: a^m ; a is called the base and m is the power. These laws only apply to expression with the same base.

Index help to write a product of numbers very compactly. Index help to show how many times to use the number in a multiplication. It is shown in the top right of the number in small number.

In this example: $4^3 = 4 \times 4 \times 4 = 64$

Rule1: $a^0 = 1$

Any number, except 0, whose index is 0 is always equal to 1.

An example:

$2^0 = 1$

Rule 2: $a^{-m} = \frac{1}{a^m}$

An example:

$2^{-3} = \frac{1}{2^3}$ (using $a^{-m} = \frac{1}{a^m}$)

Rule 3: $a^m \times a^n = a^{m+n}$

In case of multiplication of same base, copy the base and add the indices.

An example:

$3^2 \times 3^4 = 3^{2+4}$ (using $a^m \times a^n = a^{m+n}$)
 $= 3^6$
 $= 3 \times 3 \times 3 \times 3 \times 3 \times 3$
 $= 729$

Rule 4: $a^m \div a^n = a^{m-n}$

In case of division of same base, copy the base and subtract the indices.

An example:

$w^{10} \div w^6 = w^{10-6} = w^4$

Rule 5: $(a^m)^n = a^{mn}$

To raise an expression to the n^{th} index, Copy the base and multiply the indices.

An example:

$(x^2)^4 = x^{2 \times 4} = x^8$

Rule 6: $a^{\frac{m}{n}} = (\sqrt[n]{a})^m$

An example:

$125^{\frac{2}{3}} = (\sqrt[3]{125})^2 = (5)^2 = 25$