

Negative Exponents

If a is a real number other than 0 and n is a positive integer, then

$$a^{-n} = \frac{1}{a^n}$$

In layman's terms, this means that any real number or variable that contains a negative exponent, you flip the number. Don't complicate this! Once you move a negative exponent to its opposite place (meaning numerator and denominator), the negative exponents become positive.

Examples:

$$5^{-2} = \frac{1}{5^2} = \frac{1}{25}$$

Never leave a number with an exponent. Figure it out!

$$(-4)^{-4} = \frac{1}{(-4)^4} = \frac{1}{256}$$

Be careful with numbers in parentheses. A negative exponent outside parentheses is applied to everything in the parentheses.

$$2x^{-3} = \frac{2}{x^3}$$

In this problem, the exponent is applied only to the x variable and not the 2. Move only the variable.

$$(3x)^{-1} = \frac{1}{3x}$$

In this problem, the negative exponent belongs to everything inside parentheses. Move the entire term to the denominator.

$$\frac{m^5}{m^{15}} = m^{5-15} = m^{-10} = \frac{1}{m^{10}}$$

For this problem, we follow the rules for exponents by subtracting the exponents and always making sure that the answer has only positive exponents.

$$2^{-1} + 3^{-2} = \frac{1}{2} + \frac{1}{3^2} = \frac{1}{2} + \frac{1}{9} = \frac{9}{18} + \frac{2}{18} = \frac{11}{18}$$

For the above problem, you first need to move the numbers so you have positive exponents. Next, figure out the exponent. Remember that when adding or subtracting fractions you always need to have a common denominator.

$$\frac{x^{-9}}{x^2} = \frac{1}{x^2 x^9} = \frac{1}{x^{11}}$$

First, move the x^{-9} to the bottom to make it positive. Then follow the rules for exponents when multiplying to get the answer.

$$\frac{5p^4}{p^{-3}} = 5p^4 p^3 = 5p^7$$

In this problem, we need to bring up the p^{-3} to make it positive in the numerator and then follow the rules for exponents.

$$\frac{2^{-3}}{2^{-1}} = \frac{2}{2^3} = \frac{2}{8} = \frac{1}{4}$$

Both exponents are negative so they get moved. Simplify the 2^3 and remember to reduce your answer if possible.

$$\frac{2x^{-7}y^2}{10xy^{-5}} = \frac{2y^2y^5}{10xx^7} = \frac{y^7}{5x^8}$$

Do not do these problems in your head. Write them down. Move all negative exponents to make them positive first and then combine like terms following the rules of exponents.

$$\frac{(3x^{-3})(x^2)}{x^6} = \frac{3x^2}{x^3x^6} = \frac{3x^2}{x^9} = \frac{3}{x^7}$$