Exponent Rules

$y = b^x$

When $x = 0$, $y = 1$: $b^0 = 1$ $10^0 = 1$ $28^0 = 1$

When $x = 1$, $y = b$: $b^1 = b$ $8^1 = 8$ $51^1 = 51$

When a base to an exponent is raised to another exponent, keep the base the same and multiply the exponents:

$(b^x)^a = b^{x*a}$ $(2^3)^2 = 2^{3*2} = 2^6$ Think of $(2^3)^2 = (2•2•2)(2•2•2) = 2^6$

When two numbers with the same base are multiplied, keep the base the same and add the exponents:

$b^x • b^a = b^{x+a}$ $3^2 • 3^4 = 3^{2+4} = 3^6$ Think of $3^2 • 3^4 = (3•3)(3•3•3•3) = 3^6$

When two numbers with the same base are divided, keep the base the same and subtract the exponents:

$\frac{b^x}{b^a} = b^{x-a}$ $\frac{4^5}{4^2} = 4^{5-2} = 4^3$ Think of $\frac{4^5}{4^2} = \frac{4 \cdot 4 \cdot 4 \cdot 4 \cdot 4}{4 \cdot 4} = 4^3$

*Note: If the exponent in the denominator is larger, the result will be a number with a negative exponent.

When a number has a negative exponent, put the number in the denominator of a fraction with 1 on top and change the sign of the exponent to positive:

$b^{-x} = \frac{1}{b^x}$ $7^{-3} = \frac{1}{7^3}$

*Note: If the number with the negative exponent is connected to another number, combine the fraction and the other number:

$g^a b^{-x} = g^a • \frac{1}{b^x} = \frac{g^a}{b^x}$ $5x^{-2} = 5\left(\frac{1}{x^2}\right) = \frac{5}{x^2}$ $5^{-4}6^3 = \frac{1}{5^4} • 6^3 = \frac{6^3}{5^4}$

Square roots are a form of exponents; the square root of a number is that number to the $\frac{1}{2}$ power: $\sqrt{b} = b^{\frac{1}{2}}$ $\sqrt{8} = 8^{\frac{1}{2}}$ $\frac{1}{\sqrt{12}} = \frac{1}{12^{\frac{1}{2}}} = 12^{-\frac{1}{2}}$