Powers, Positive and Negative Exponent Notes
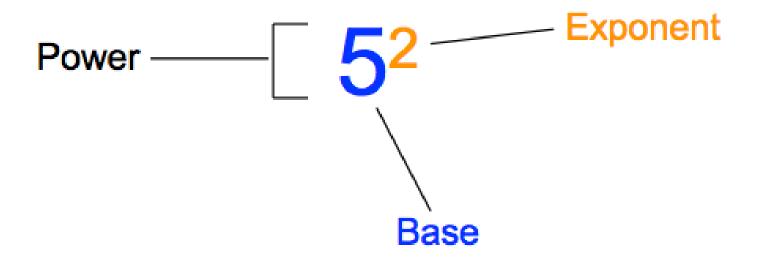
Power ⎡ 5^2 — Exponent

Base

The number that is multiplied is called the base.
The exponent tells how many times the base is the factor.

Handling exponents is second in the order of operations.

Multiplication Properties of Exponents

Product of Powers: to multiply powers having like bases, add the exponents. Ex. $a^3 \cdot a^8 = a^{11}$

Power of a Power: to find a power of a power, multiply the bases.
Ex. $(a^3)^2 = a^6$

Power of a Product: to find a power of a product, find the power of each factor and multiply. Ex. $(3m)^3 = 27m^3$

Simplify the expression.

1. $-(3y)^2$

$-1\,(3^2)(y^2)$

$-1\,(9)(y^2)$

$-9y^2$

Simplify the expression.

2. $(-5a)^3$

$-5^3 \cdot a^3$

$-5 \cdot -5 \cdot -5 \cdot a^3$

$-125a^3$

Simplify the expression.

3. $4x \cdot (x \cdot x^3)^2$

$$4x \cdot x^2 \cdot x^6$$

$$4 \cdot x^1 \cdot x^2 \cdot x^6$$

$$4x^9$$

Simplify the expression.

4. $-(3x)^2 \cdot (7x^4)^2$

$-1 \cdot 3^2 \cdot x^2 \cdot 7^2 \cdot x^8$

$-1 \cdot 9 \cdot 49 \cdot x^2 \cdot x^8$

$\underbrace{-1 \cdot 9 \cdot 49}_{-441} \cdot \underbrace{x^2 \cdot x^8}_{x^{10}}$

$-441 x^{10}$

Simplify the expression.

5. $(-n)^4 (-n)^3 (-n)^2$

$-1^4 \cdot n^4 \cdot -1^3 \cdot n^3 \cdot -1^2 \cdot n^2$

$-1^4 \cdot -1^3 \cdot -1^2 \cdot n^4 \cdot n^3 \cdot n^2$

$1 \cdot -1 \cdot 1 \cdot n^9$

$-1n^9$

Simplify the expression.

6. $-(r^2st^3)^2 (s^4t)^3$

$$-1 \cdot r^4 \cdot s^2 \cdot t^6 \cdot s^{12} \cdot t^3$$

$$-1r^4 s^{14} t^9$$

Simplify the expression.

7. $(6a^4)^2 \cdot (\frac{1}{4}a^3)^2$

$6^2 \cdot a^8 \cdot (\frac{1}{4})^2 \cdot a^6$

$\frac{36}{1} \cdot \frac{1}{4} \cdot \frac{1}{4} \cdot a^{14}$

$\frac{36}{16}$

$\frac{9}{4} a^{14}$