5-1 Exponents and Scientific Notation

Problem	Operation	Exponents
$2^2 \cdot 2^5$	Multiplication	Add $2^{2+5} = 2^7$
$\frac{x^7}{x^4}$	Division	Subtract $x^{7-4} = x^3$
$(x^3)^4$	raise to an exponent	Multiply $x^{3 \cdot 4} = x^{12}$

Problem	Problem Operation	Exponents
$3x^2 + 4x$	Addition / Subtraction	Only combine like terms $3x^2 + 4x$ (no like terms)

$5x^3 = 5^1 x^3$

$5 = 5^1 = \frac{5}{1}$

$5x^3 \cdot 5x^4 = 5^1 x^3 \cdot 5^1 x^4$

$5^{1+1} \cdot x^{3+4} = 5^2 x^7$

$5x^3 \cdot 5^2 x^4 = 5^1 x^3 \cdot 5^2 x^4$

$= 5^{1+2} \cdot x^{3+4} = 5^3 x^7$

You can only add or subtract like terms.

Like terms - have the same variable to the same power.

$4x^2 + 4x =$

$8x^2 + 4x^2 =$

Multiply * Add the exponents

$a^2b^4 \cdot a^3 = a^{2+3}b^4 = a^5b^4$

Division * Subtract the exponents

$\frac{a^5bc^2}{a^2c} = a^{5-2}bc^{2-1} = a^3bc$

*A variable or # without an exponent is to the 1st power

$2 = 2^1 = \frac{2}{1}$

$2^2 \cdot 2^5 = 2^7$

$x^7 \cdot x^3 = x^{10}$

$y \cdot y^2 \cdot y^4 = y^{1+2+4} = y^7$

$3x^6(5x) = 3^1 x^6 \cdot 5^1 x^1$

$= 3 \cdot 5 \quad x^{6+1} = 15x^7$

$(2^2 x^3)(4x^2)$

$(2^2 x^3)(2^2 x^2)$

$2^4 x^5$

$(3x^4)(3x^7)$

$3^{1+1} \cdot x^{4+7}$

$3^2 x^{11}$

$$\frac{x^7}{x^4} = x^3$$

$$\frac{5^8}{5^2} = 5^6$$

$$\frac{20x^6}{4x^5}$$

$$5x$$

$$\frac{3^5 y^{10} z^7}{3^3 y^8 z^7}$$

$$3^2 y^2$$

$$z^{7-7} = z^0$$

Anything to the zero power = 1

$5^0 = 1$ $\quad x^0 = 1$

$a^2 b^0 c^3 = a^2 \cdot 1 \cdot c^3 = a^2 c^3$

$(a^2 b^3)^0 = 1$

7^0 -7^0 $(-7^2)^0$

1 $-1 \cdot 7^0$ 1

$= -1$

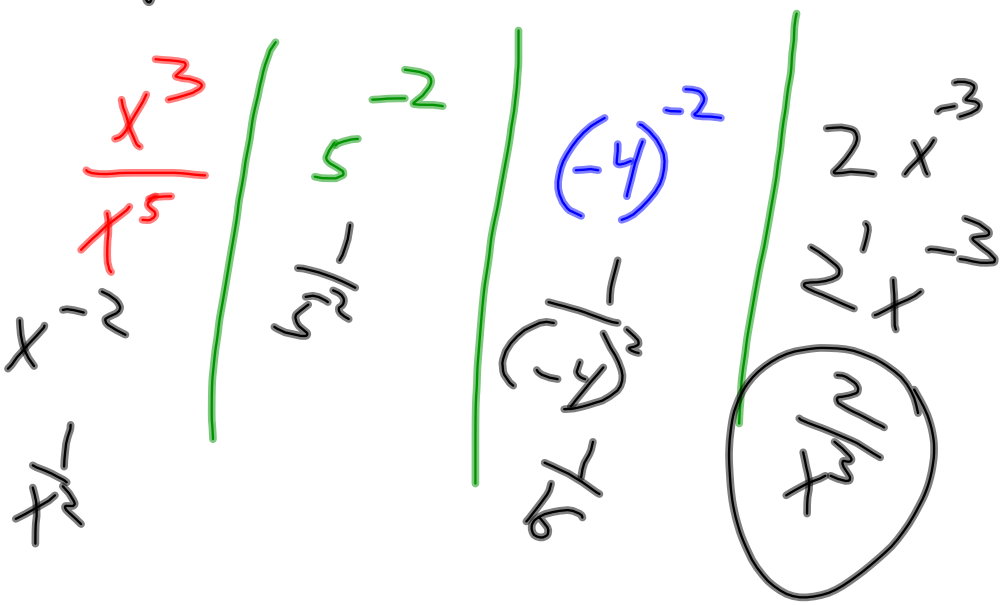
Negative exponents

Make the exponent positive by moving only that item from the numerator to the denominator or from the denominator to the numerator.

$4^{-2} = \frac{1}{4^2} = \frac{1}{16}$ $\qquad \frac{1}{5^{-2}} = 5^2 = 25$

$$\frac{2^{-3} m^2 n^{-1}}{a^{-2} b} = \frac{a^2 m^2}{2^3 n b}$$

* You never have a negative exponent



$3x^{-1}$ | $(3x)^{-1}$ | $\frac{m^5}{m^{15}}$ | $\frac{3^3}{3^6}$

$3x$ | $\frac{1}{3x}$ | $\frac{1}{m^{10}}$ | w^{-3}

$2^{-1}+3^{-2}$ | $\frac{1}{t^{-5}}$

$\frac{1}{2}+\frac{1}{w^2}$ | t^5

$$\frac{x^{-7}}{x^{-2}}$$

Scientific Notation

6.34×10^{5}

* The value of the number must be $1 \leq x < 10$. (Almost always place the decimal between the first two numbers

2.3×10^{3} 1.6×10^{-4}

Write in scientific notation:

730,000 7.3×10^{5}

.00000104

1.04×10^{-5}

Write in standard notation (as a number)

7.7×10^{8} 770000000

1.025×10^{-3} .001025

770,000,000