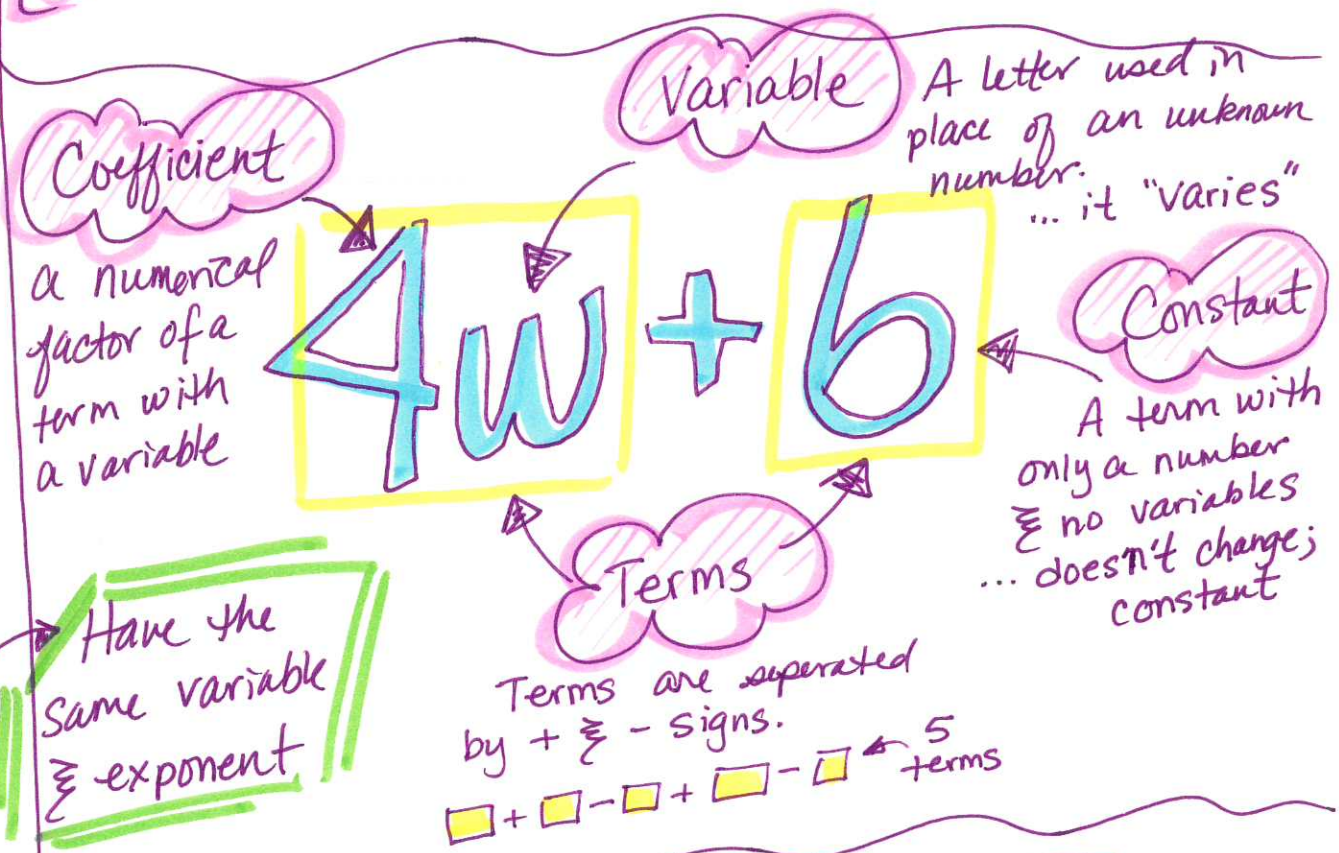
Algebraic Basics

Expressions

Do not have an equal sign & do not need to be solved.

- Algebraic – has letters (variables)
- Numeric – only numbers

Example & Label



Like (same) Terms

Have the same variable & exponent

Combine Like Terms

(a) $23a + 4b - 16a + 4$

$7a + 4b + 4$

(b) $-3x + 2y + 6 + 4y$

$6y - 3x + 6$

(c) $7\frac{1}{2}m + 4n + m - 10$

$8\frac{1}{2}m + 4n - 10$

(d) $3.7a + 2b + 0.4b - 9$.

$2.4b + 3.7a - 9$

Algebraic Equations

Equations

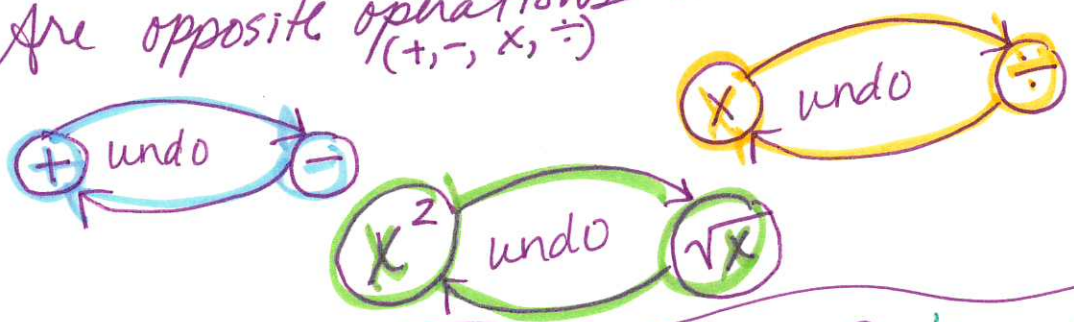
Have an equal sign $=$ should be solved for a final answer. They are solved by isolating the variable.

Isolating the Variable

Means getting the variable alone (isolate) on one side of the equal sign by using inverse operation!

Inverse Operation

Are opposite operations that "undo" each other. $(+, -, \times, \div)$



TRY it!

ⓐ $x + 23 = 90$
$-23 \quad -23$

$\boxed{x = 67}$

$67 + 23 = 90$ ✓

ⓑ $x - 12 = 74$
$+12 \quad +12$

$\boxed{x = 86}$

$86 - 12 = 74$ ✓

ⓒ $\frac{4}{4}x = \frac{48}{4}$

$\boxed{x = 12}$

$4(12) = 48$ ✓

ⓓ $\frac{(3)x}{1\ 3} = 18^{(3)}$ or $x \div 3 = 18^{(3)}$

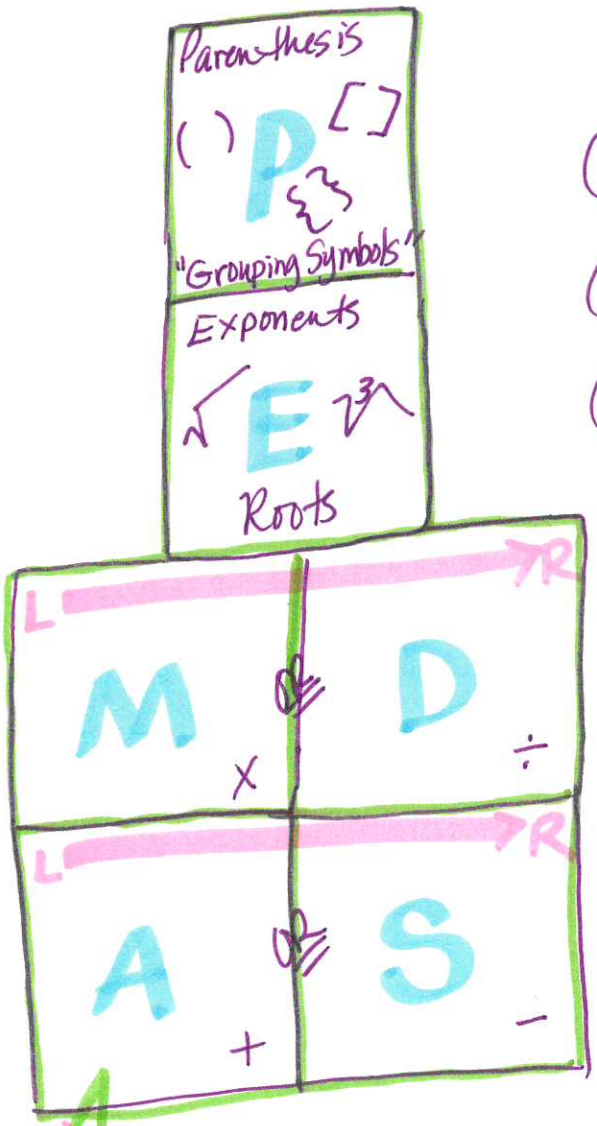
$\boxed{x = 54}$

ⓔ $12y - 5 = 55$
$+5 \quad +5$

$\frac{12y}{12} = \frac{60}{12}$

$\boxed{y = 5}$

Order of Operations



(P) $17-5^2\div(2+3)$

(e) $17-5^2\div 5$

(d) $17-(25\div 5)$

(s) $17-5$

12

P e m d a s

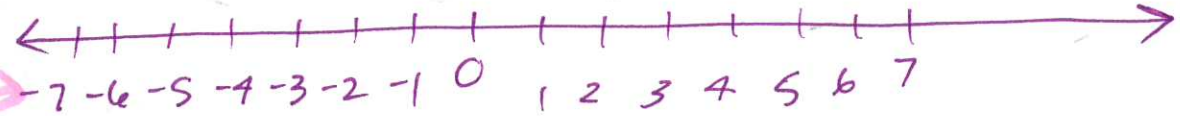
Always

Mult/divide & Add/subtract from left to right!

(Sentence)

Algebraic Addition

Integer



Adding

If...

Same sign:

If the #'s are positive → Answer is positive

$+3+(+4)=\boxed{7}$

If the #'s are negative → Answer is negative

$-3+(-4)=\boxed{-7}$

Subtraction

$-25+(+40)$

It is called "Algebraic Addition"

No subtraction Allowed! ☺

Change subtraction signs to addition, then change the sign of the subtrahend to its opposite!

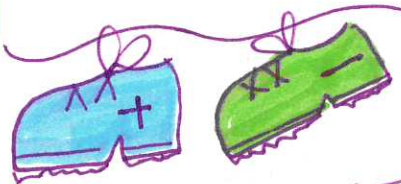
$-25-40$

① $18+(+13)=\boxed{31}$

② $8+(+14)=\boxed{22}$

③ $14+(-12)=\boxed{2}$

Mult. & Division



Don't match: Negative Day = Negative

Do match: 2 pos. or 2 neg. → positive!

ⓐ $24\div(-6)=\boxed{-4}$

ⓑ $\frac{-60}{-4}=\boxed{15}$

ⓒ $-8(9)=\boxed{-72}$

ⓓ $-7(-10)=\boxed{70}$

Laws of Exponents

Law	Illustration	
Product Rule	$x^a \cdot x^b = x^{a+b}$	① $10^4 \cdot 10^2 = 10^{4+2} = 10^6$ ($10\cdot10\cdot10\cdot10\cdot10\cdot10$ $\quad 10^6$) ② $(-2a^2b)(7a^3b)$ $\quad -2\cdot7\cdot a^{2+3}\cdot b^{1+1} = \boxed{-14a^5b^2}$
Power Rule	$(x^a)^b = x^{ab}$	① $(8^2)^3$ $\quad 8^2\cdot8^2\cdot8^2 = 8^{2\cdot3}$ or $\boxed{8^6}$ $\quad 8\cdot8\cdot8\cdot8\cdot8\cdot8 = \boxed{8^6}$ ② $(-2m^5)^2\cdot m^3 = (-2m^5)(-2m^5)(m^3) = 4m^{10}\cdot m^3 = \boxed{4m^{13}}$ OR $4m^{10+3} = \boxed{4m^{13}}$
Quotient Rule	$\frac{x^a}{x^b} = x^{a-b}$	① $\frac{10^4}{10^2} = \frac{10\cdot10\cdot10\cdot10}{10\cdot10} = \boxed{10^2}$ or $10^{4-2} = \boxed{10^2}$ ② $\frac{27x^5}{42x} = \frac{9x^{5-1}}{14} = \boxed{\frac{9x^4}{14}}$ $\quad \frac{y^4}{y^4} = y^{4-4} = y^0 = 1$
Negative Exponent Rule	$x^{-a} = \frac{1}{x^a}$	Negative means negate (opposite) ① $\frac{5^{-2}}{1} = \frac{1}{5^2} = \boxed{\frac{1}{25}}$ ② $2^{-8}\cdot2^5 = 2^{-8+5} = \frac{2^{-3}}{1} = \frac{1}{2^3} = \frac{1}{2\cdot2\cdot2} = \boxed{\frac{1}{8}}$ Opposites: positive → neg. Numer. → den. Mult. → div.
Zero Exponent Rule	$x^0 = 1$	$\frac{(y^2)^2}{y^4} = \frac{y^4}{y^4} = y^{4-4} = \boxed{y^0 = 1}$ $\quad 34m^0 = 34\cdot1 = \boxed{34}$