

Words to Algebra

x is a number
is equals

Algebra
 then
 Switch word
 seven less than x
 $x-7$

Sum means add
 twice and double mean times 2
 product means times
 Quotient means divide
 Squared = exponent 2
 Cubed = exponent 3

Vocabulary

variable - any letter used to represent a number
 coefficient - A number multiplied by a variable
 i.e. $3a \rightarrow 3$ is coefficient, $-a \rightarrow -1$ is coefficient
 constant - a term that is only a number

Term - a number, letter or product of a number + letter, i.e. 3, a, 3a
 monomial: 1 term Binomial: 2 terms

Calculator

Addition
 $+ \text{ and } + = +$
 $- \text{ and } - = -$
 $+ \text{ and } - = +$ if positive number is larger
 $+9 + (-3) = +6$
 $+ \text{ and } - = -$ if negative number is larger
 $+3 + (-9) = -6$

Subtraction
 Add the opposite
 1- Change subtraction to Addition
 2- Change sign of second number
 3- Use adding rules
 i.e. $7 - (-2)$
 $= 7 + 2$
 $= 9$

multiplication / Division

Same signs
 $+ \text{ and } + = +$
 $- \text{ and } - = +$

Different signs
 $+ \text{ and } - = -$
 $- \text{ and } + = -$

Collecting Terms/Adding

• need same variable and exponent to simplify
 $x + x = 2x$
 $5x + 2x = 7x$
 $(3x + 2) + (4x - 1)$
 $= 3x + 2 + 4x - 1$
 $= 7x + 1$

Subtraction

$x - x = 0$
 $(2x + 2) - (3x + 4)$
 $2x + 2 - 1(3x + 4)$
 $2x + 2 - 3x - 4$
 $-x - 2$
 # change all signs in second bracket using distributivity

Multiplication (distributivity)

$x \cdot x = x^2$
 $2 \cdot x = 2x$
 $3 \cdot 4a = 12a$
 $3a(b) = 3ab$
 $4(x - 6) + 3(2x - 6)$
 $= 4x - 24 + 6x - 18$
 $= 10x - 42$
 $3x(x + 2)$
 $= 3x^2 + 6x$

Division

$\frac{x}{x} = 1$
 $\frac{45x - 20}{5}$
 $= 9x - 4$
 $\frac{30x - 24}{6}$
 $= 5x - 4$
 * Divide each part.

Evaluating Expressions

1- substitute the value of the variable into the expression
 2- Use order of operations to solve
 if $x = -3$ then $4x - 6$
 $= 4(-3) - 6$
 $= -12 - 6$
 $= -18$

Watch for Brackets and Negatives i.e. $x = -3$

$10x$	$-10x$	$-10x^2$	$-(10x)^2$	$(-10x)^2$
$= 10 \cdot x$	$= -10 \cdot x$	$= -10 \cdot x^2$	$= -(10 \cdot x)^2$	$= (-10 \cdot x)^2$
$= 10 \cdot -3$	$= -10 \cdot -3$	$= -10 \cdot (-3)^2$	$= -(10 \cdot -3)^2$	$= (-10 \cdot -3)^2$
$= -30$	$= +30$	$= -90$	$= -900$	$= 900$

Other

Word Problem Strategy

Three friends have a total of \$60. Jennifer has \$5 less than Lucy, Sylvie has three times the amount Lucy has. How much does each have?

Step 1: $\underline{\quad} + \underline{\quad} + \underline{\quad} = 60$

Step 2: Let $x =$ Lucy's amount
 Let $x-5 =$ Jennifer's amount
 Let $3x =$ Sylvie's amount

Step 3: $\underline{x} + \underline{x-5} + \underline{3x} = 60$

Step 4: $5x - 5 = 60$

Equations: An equation is a

Statement that two mathematical expressions are equal

Solve

$$5x - 5 = 60$$

As

$$+5 \quad +5$$

$$\frac{5x}{5} = \frac{65}{5}$$

bs

$$x = 13$$

Step 5: if $x = 13$

$$x - 5 = 13 - 5 = 8$$

$$3x = 3 \cdot 13 = 39$$

Step 6 check

$$13 + 8 + 39 = 60$$

Lucy has \$13
 Jennifer has \$8
 and Sylvie has \$39.

Solving Equations: Goal is to isolate the variable by undoing the order of operations. Do the same operation on both sides of the equal sign.

One Step	Two Step	Variables Both Sides		
$\begin{array}{r} x + 3 = 7 \\ -3 \quad -3 \\ \hline x = 4 \end{array}$ <p>* subtract</p>	$\begin{array}{r} -5 + x = 2 \\ +5 \quad +5 \\ \hline x = 7 \end{array}$ <p>* add</p>	$\begin{array}{r} -4x + 7 = 1 \\ -7 \quad -7 \\ \hline -4x = -6 \\ -4 \quad -4 \\ \hline x = 4 \end{array}$ <p>* divide</p>	$\begin{array}{r} -3 + 2x = 11 \\ +3 \quad +3 \\ \hline 2x = 14 \\ \frac{2x}{2} = \frac{14}{2} \\ x = 7 \end{array}$ <p>* divide</p>	$\begin{array}{r} 15 - 2x = -7x \\ +2x \quad +2x \\ \hline 15 = -5x \\ \frac{15}{5} = \frac{-5x}{-5} \\ -3 = x \end{array}$
$\begin{array}{r} -6x = 12 \\ \frac{-6x}{-6} = \frac{12}{-6} \\ \hline x = -2 \end{array}$ <p>* Divide by coefficient</p>	$\begin{array}{r} \frac{x}{2} = 4 \\ \frac{x}{2} \cdot 2 = 4 \cdot 2 \\ \hline x = 8 \end{array}$ <p>* cross multiply</p>	$\begin{array}{r} \frac{x}{2} - 4 = 8 \\ +4 \quad +4 \\ \hline \frac{x}{2} = 12 \\ \frac{x}{2} \cdot 2 = 12 \cdot 2 \\ \hline x = 24 \end{array}$ <p>* cross multiply</p>	$\begin{array}{r} 2(4x + 3) = 22 \\ 8x + 6 = 22 \\ -6 \quad -6 \\ \hline 8x = 16 \\ \frac{8x}{8} = \frac{16}{8} \\ x = 2 \end{array}$ <p>* distribute 1st</p>	$\begin{array}{r} -2(x - 5) = 6(2 - \frac{1}{2}x) \\ -2x + 10 = 12 - 3x \\ +10 \quad +10 \\ \hline -2x = 2 - 3x \\ +3x \quad +3x \\ \hline +x = 2 \end{array}$ <p>* distribute 1st</p>

Tricky Examples