ALGEBRA: EXPRESSIONS AND EQUATIONS

ORDER OF OPERATIONS

(PE)(MD)(AS)

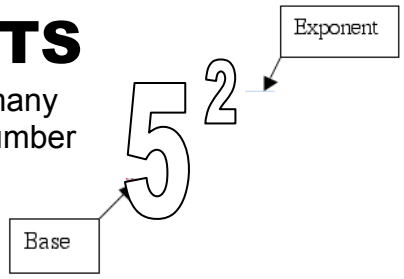
1. (PE)
   Do parentheses and exponents FIRST
2. (MD)
   Solve all multiplying and dividing from left to right. (It may be divide first)
3. (AS)
   Solve all adding and subtracting from left to right. (It may be subtract first).

EXAMPLES:

EXPRESSION	EVALUATION	OPERATION
50 - 12 ÷ 3 · 6=	50 - ***12 ÷ 3*** · 6=	Division
	50 - ***4 · 6***=	Multiplication
	50 - 24=	Subtraction
	26	
22 - (8 + 6) + 20=	22 - (***8 + 6***) + 20=	Parentheses (Add)
	22 - 14 + 20=	Subtraction
	8 + 20=	Addition
	28	

EXPONENTS

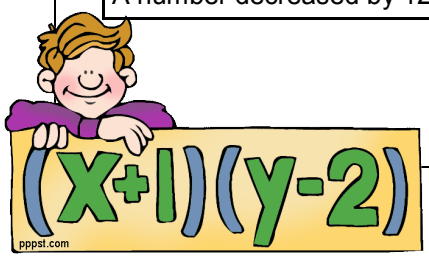
Exponents tell how many times to multiply a number by itself.



$3^2 = 3 \cdot 3 = 9$
$4^3 = 4 \cdot 4 \cdot 4 = 64$
$3^3 = 3 \cdot 3 \cdot 3 = 27$

WRITING EXPRESSIONS

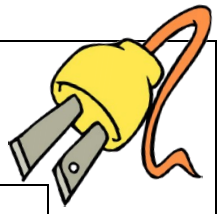
PHRASE	EXPRESSION
8 more than a number	8 + n
7 less than a number	n - 7
The product of a number and 11	11n
The quotient of 6 and a number	$\frac{6}{n}$
A number decreased by 12	n - 12



OPERATION KEYWORDS

Addition	increased by more than combined, together total of sum added to
Subtraction	decreased by minus, less difference between/of less than, fewer than
Multiplication	of times, multiplied by product of increased/decreased by a factor of (this type can involve both addition or subtraction *and* multiplication!)
Division	per, a out of ratio of, quotient of percent (divide by 100)
Equals	is, are, was, were, will be gives, yields sold for

EVALUATING EXPRESSIONS



You evaluate an expression by replacing the variable with the given number and performing the indicated

Evaluate means PLUG IT IN!

Examples

Replace a with 15 and then multiply:

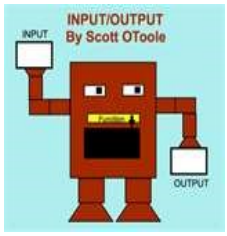
$10a =$ *Replace a with 15
$10(15) =$ *( ) is another way to write mult.
150 *Multiply together

Replace x with 3.2 and then add:

$4.5 + x =$
$4.5 + 3.2 =$
7.7

INPUT OUTPUT TABLE

Input	Output
6	4
9	7
12	?
15	?
n	n - 2



A function table is a table of ordered pairs that follow a rule. A rule tells how one number is related to another.
Rule: Subtract 2
n - 2

WRITING EQUATIONS

Problem: Jeanne has $17 in her piggy bank. How much money does she need to buy a game that costs $68?
Solution: Let x represent the amount of money Jeanne needs.

Then the following equation can represent this problem:
17 + x = 68

SOLVING EQUATIONS

One-Step Equations

To solve a one-step equation, do the inverse of whatever operation is being done to the variable. Because it is an equation, what is done to one side of the equation must be done to the other side of the equation.

Solve an addition equation by subtraction.

$$x + 3 = 7$$
$$-3 \quad -3$$
$$x = 4$$

Solve a subtraction equation by addition.

$$x - 8 = 5$$
$$+8 \quad +8$$
$$x = 13$$

Solve a multiplication equation by division.

$$\frac{5x}{5} = \frac{35}{5}$$
$$x = 7$$

Solve a division equation by multiplication.

$$\frac{x}{7} = 3$$
$$(7)\frac{x}{7} = 3\,(7)$$
$$x = 21$$

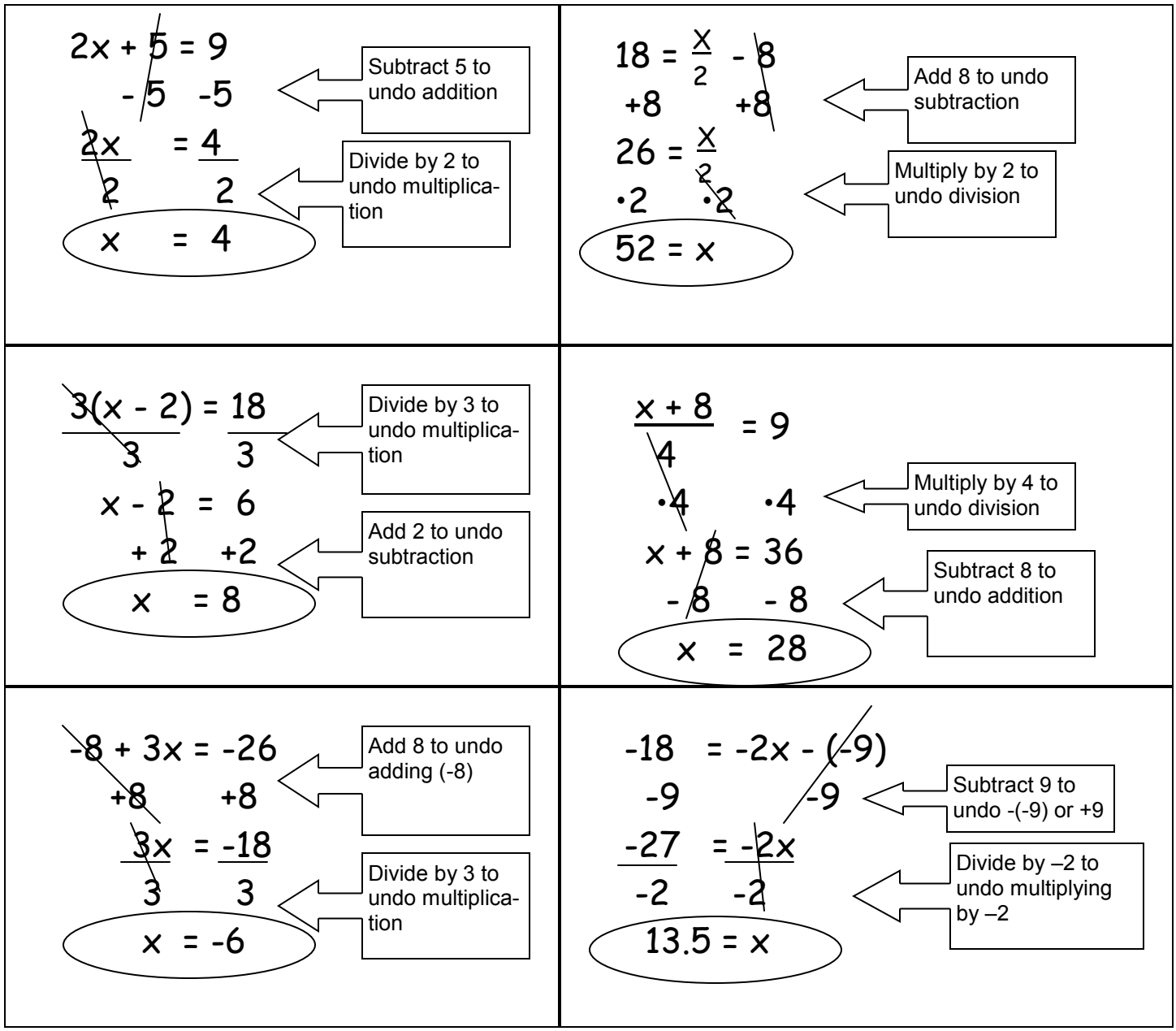
TWO-STEP EQUATIONS

Two-step equations are exactly like what they sound like: equations that take TWO STEPS to solve.
You have to use INVERSE OPERATIONS to solve each equation.

add ⟺ subtract
multiply ⟺ divide

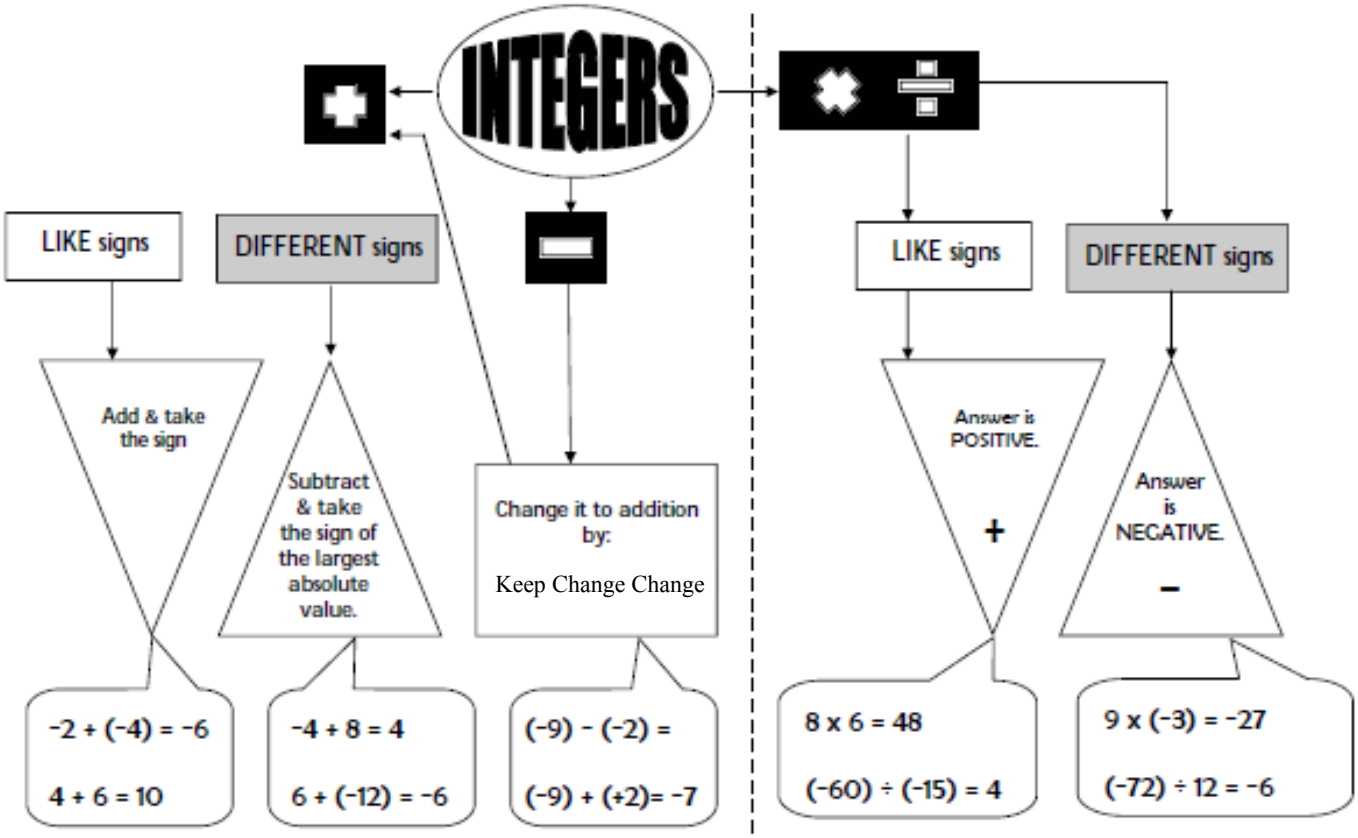
The goal is to get the variable by itself on one side of the equal sign. You need to do the inverse operation of what is furthest from the variable without crossing an equal sign.

Below are examples of 2-step equations and how to solve using algebraic notation:



INTEGER RULES

RULES FOR OPERATIONS



FOUND AT http://www.sw-georgia.resa.k12.ga.us/integer%20rules.pdf

ADDING INTEGERS

Same Sign: Add and keep the sign

2 + 2 = 4

Positive + Positive = Positive

(-2) + (-2) = (-4)

Negative + Negative = Negative

Different Signs: Subtract and keep the sign of the larger value (from zero)

(-9) + 2 = (-7)

Big Negative + Small Positive = Negative

(-2) + 9 = 7

Small Negative + Big Positive = Positive

MULTIPLYING AND DIVIDING INTEGERS

Positive x Positve = Positive

Negative x Negative = Positive

Negative x Positive = Negative

Positive x Negative = Negative

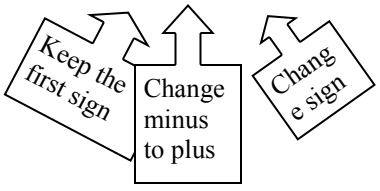
Division (same pattern)

SUBTRACTING INTEGERS

Subtracting a negative is like ADDING A POSITIVE!

2 - (-2) =

2 + 2 = 4

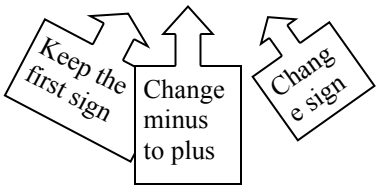


KEEP CHANGE CHANGE

Subtracting a positive IS subtracting or like ADDING A NEGATIVE!

-8 - 4 =

-8 + (-4) = - 12



Subtracting Integers

Subtraction is the same as **adding the opposite**. so rewrite subtraction problems as addition problems and then use addition rules.

-6 – 3 = -6 + -3 = -9

4 – -9 = 4 + 9 = 13

2 – 7 = 2 + -7 = -5