

Name: Answer Key Per: 1,3,5 Date: 9/8/14  
 Serafino • Algebra 2E

# 1A:1 Foundations of Algebra: Numbers, Expressions & Equations

Notes / Prerequisite Homework Packet

## Number Sets:

Since we'll be dealing with lots and lots of numbers, we might as well be able to talk about them and call them by category/name. That's what is being asked when you "classify" something. What group does it belong to? Fill in what you can – in our notes, we will discuss what each classification actually means.

	equals $=$	$\approx$ approx	Integers	Whole	Natural	Rational	Irrational	Real	Imaginary	Transcendental
	0		✓	✓		✓		✓		
8	$\sqrt{64}$		✓	✓	✓	✓		✓		
	-2.5					✓		✓		
	-2		✓			✓		✓		
	0.8625					✓		✓		
	$2.\bar{3}$	$\approx 2.3$				✓		✓		
	$\frac{\sqrt{3}}{5}$						✓	✓		
	$\sqrt[3]{7}$						✓	✓		
	$\frac{400}{3}$					✓		✓		
	$\pi$						✓	✓		✓
	$\sqrt{-12}$								✓	
	27		✓	✓	✓	✓		✓		
	$e$									✓
-2	$\sqrt[3]{-8}$		✓			✓		✓		
	17i								✓	
	1		✓		✓	✓		✓		

## Expressions

**EXPRESSIONS:** In an expression, there is no equal sign. Nothing to solve. Just stuff to do (operations, in order). In an expression you can simply (combining like terms) and/or evaluate (give a numerical value).

**Simplify:** Here, there will be numbers and variables. Again, nothing to solve. Just perform operations and combine like terms.

a.  $(3x - 2)(x + 9)$

$$3x^2 + 25x - 18$$

b.  $(2x - 5)^2$

$$4x^2 - 20x + 25$$

c.  $(8x^2 - 1)(5x^3 - 2x + 7)$

$$40x^5 - 21x^3 + 56x^2 + 2x - 7$$

d.  $7(5 - 2x) - 5 + 3(1 - x)$

$$-17x + 33$$

e.  $x(x - 3)(x + 5)$

$$x^3 + 2x^2 - 15x$$

f.  $(2x^2 - 3x + 5) - (7x^2 + 8x - 11)$

$$-5x^2 - 11x + 16$$

**Evaluate:** You'll be directed to evaluate when you are given all numbers (no variable, or you're given a value for the variable). So literally, evaluate means "state the value" of the expression after you do the operations (in order).

a.  $-5^3$

$$-125$$

b.  $(-5)^2$

$$25$$

c.  $(1 - 3)^2 + 3^0$

$$5$$

d.  $-2(5 + 3)^2$

$$-128$$

e.  $2\sqrt{3} * 4\sqrt{3}$

$$24$$

f.  $5 - 2(4)$

$$-3$$

**Working with Fractions**

Question: If you multiply  $\frac{3}{5}$  times "x", what is that expression called?  $\frac{3}{5}x$  or  $\frac{3x}{5}$  ?

Answer: Either is correct; the "x" is really  $\frac{x}{1}$  so the x technically goes with the numerator.

If you don't remember how to perform operations with fractions, use "1/2" as a test. See if what you did makes sense.

a.  $\frac{4}{3} \cdot \frac{2}{5}$

$$\frac{8}{15}$$

b.  $\frac{4}{3} + \frac{2}{5}$

$$\frac{26}{15}$$

c.  $\frac{4}{3} \div \frac{2}{5}$

$$\frac{10}{3}$$

d.  $\frac{5}{3} \left( \frac{3}{4}x + \frac{2}{5} \right)$

$$\frac{5x}{4} + \frac{2}{3}$$

e.  $7 \left( \frac{5}{6}x \right) \div \left( \frac{10}{6}x \right)$

$$\frac{7}{2}$$

**EQUATIONS:** In an equation, there is an equal sign. You will have to **solve** (figure out the value of) the variable so original statement is true. Note: *As long as you do the exact same thing to both sides, you're always fine. There is no "wrong" way to start, unless you violate a mathematical rule.*

Here, knowing what a "term" means important. Each "side" of the equation has one or more "term". When you add/subtract something from a side, you must add or subtract from that like term. When you divide/multiply, you must do the same thing to every term on that side.

a.  $15(x + 4) = 30$

$$x = -2$$

b.  $3(x + 4) + 9 = 6(x + 8)$

$$x = -9$$

c.  $-5x - 4 = -20$

$$x = \frac{16}{5}$$

d.  $-3x^2 + 5 = -70$

$$x = \pm 5$$

e.  $2(x - 5) = 16 - 2(13 - 2x)$

$$x = 0$$

f.  $a - 6 = -6 - (3a - 7) - 2a$

$$a = \frac{7}{6}$$

Note: all the equations above are the same type of equation except for "d". What am I getting at?

Some more equations:

g.  $\frac{x-3}{2} = \frac{28}{8}$

$$x = 10$$

h.  $\sqrt{x+5} = 3$

$$x = 4$$

**Equations with "Strange" Solutions.** See what happens when you solve these. You need to know what to write when this happens because it can happen any time.

i.  $11 + 3x - 7 = 6x + 5 - 3x$

$$\cancel{3x} + 4 = \cancel{3x} + 5$$

$$4 = 5$$

No solution



"No number will make that equation true"

j.  $6x + 5 - 2x = 4(1 + x) + 1$

$$\cancel{4x} + 5 = \cancel{4x} + 5$$

$$5 = 5$$

$$0 = 0$$

All real #'s



"ANY real number will make it true"