Name_____ Date_____ Teacher_____

Watertown Public Schools

Algebra 2 Honors/CP Summer Packet

Summer 2018

This packet contains topics that you are expected to know prior to entering Algebra 2. You have learned these skills over the past few years. These examples focus on both mathematical skills and problem solving. Algebra II is a critical course and one of the best predictors of college success. Mastery of the problem solving skills outlined in this packet are a critical baseline for your success. This packet should be completed independently and **turned in with completed work on the first day of school for a grade**. Upon your completion, your parent/guardian needs to sign the packet.

Do NOT fake your way through this packet. Make sure you understand how to do the problems. If you are unsure of how to do these problems, utilize some of the resources below.

This summer packet will count as 3 homework grades and an assessment will be given after going over the packet that will count as a graded quiz.

A TI-83 or TI-84 graphing calculator is **HIGHLY recommended** for Algebra II and future math courses both at Watertown High school and in college. You can check ebay, Costco, Walmart, pawn shops or other stores for discounted prices.

We look forward to working with you in Algebra II and remind you that success is built by the efforts you make every day.

Below are helpful links to help you remember some topics.
Algebra Resources

- **Khan Academy** Take control of your learning by working on the skills you choose at your own pace. ... Math, science, computer programming, history, art, economics, and more.
- **Algebasics** has video tutorials explaining the basics of algebra, equations, ratio and proportion, absolute value, polynomials, factoring, linear equations, radicals, applications, and much more.
- **Algebra-Class.com** offers help with solving equations, graphing equations, writing equations, inequalities, functions, exponents and monomials, polynomials, and the quadratic equation. It also has a list of resources.
- **Algebra.help** contains lessons on topics that include equations, simplifying, factoring, distribution, and trinomials, as well as equation calculators and worksheets. This site also has an extensive list of math resources and study tips.
- **Algebra Help** covers topics such as fractions, percents, decimals, algebraic expressions, addition, multiplication, and word problems. Each section includes explanations and examples.
- **College-Cram.com** allows students to choose the algebra subject they are struggling with from a drop down menu, select the appropriate chapter, and pick your resources. The pages will feature formula solvers, bottomless worksheets, flashcards, quizzes, interactive overviews, and brief lessons and study sheets.
- **Interactive Mathematics** has a large section on algebra, including information on factoring and fractions, the quadratic equation, exponents and radicals, systems of equations, matrices and determinants, and inequalities.
- **Math Expression** has videos, worksheets, and lessons to help you develop your algebra skills. Math topics include algebra, exponents, symmetry, fractions, measurements, angles, and more. The site also includes a list of useful resources.
- **Purplemath** contains lessons with explanations on everything from absolute value and negative numbers to intercepts, variables, and factoring. In addition, this site includes a forum that allows students to ask questions and receive answers, as well as a list of homework tips and guidelines.

The packet is expected to be completed for the first day of class.

Must show your work in the packet.

*******Signatures are required on the back of this page and the first page to taken off and turned in day one of school. *******

If you have any questions regarding this packet, please email your Algebra II teacher listed on your schedule.

Mrs. Edmond Edmondni@watertownps.org Mr. Miller Millerer@watertownps.org

Parent/Guardian Name (printed):_____

Printed Parent/Guardian Signature:_____ Date: _____

******MUST SHOW ALL WORK THAT IS NEEDED TO SOLVE A PROBLEM FOR CREDIT!!!!*******

A. Simplifying Polynomial Expressions

I. Combining Like Terms

- You can add or subtract terms that are considered "like", or terms that have the same variable(s) with the same exponent(s).

Ex. 1: $5x - 7y + 10x + 3y$

$5x - 7y + 10x + 3y$

$15x - 4y$

Ex. 2: $-8h^2 + 10h^3 - 12h^2 - 15h^3$

$-8h^2 + 10h^3 - 12h^2 - 15h^3$

$-20h^2 - 5h^3$

II. Applying the Distributive Property

- Every term inside the parentheses is multiplied by the term outside of the parentheses.

Ex. 1: $3(9x-4)$

$3 \cdot 9x - 3 \cdot 4$

$27x - 12$

Ex. 2: $4x^2(5x^3 + 6x)$

$4x^2 \cdot 5x^3 + 4x^2 \cdot 6x$

$20x^5 + 24x^3$

III. Combining Like Terms AND the Distributive Property (Problems with a Mix!)

- Sometimes problems will require you to distribute AND combine like terms!!

Ex. 1: $3(4x-2)+13x$

$3 \cdot 4x - 3 \cdot 2 + 13x$

$12x - 6 + 13x$

$25x - 6$

Ex. 2: $3(12x-5)-9(-7+10x)$

$3 \cdot 12x - 3 \cdot 5 - 9(-7) - 9(10x)$

$36x - 15 + 63 - 90x$

$-54x + 48$

PRACTICE SET 1

Simplify.

1. $8x - 9y + 16x + 12y$

2. $14y + 22 - 15y^2 + 23y$

3. $5n - (3 - 4n)$

4. $-2(11b - 3)$

5. $10q(16x + 11)$

6. $-(5x - 6)$

7. $3(18z - 4w) + 2(10z - 6w)$

8. $(8c + 3) + 12(4c - 10)$

9. $9(6x - 2) - 3(9x^2 - 3)$

10. $-(y - x) + 6(5x + 7)$

B. Solving Equations

I. Solving Two-Step Equations

A couple of hints:

1. To solve an equation, UNDO the order of operations and work in the reverse order.
2. REMEMBER! Addition is "undone" by subtraction, and vice versa. Multiplication is "undone" by division, and vice versa.

Ex. 1: $4x-2=30$

$+2 \quad +2$

$4x=32$

$\div 4 \quad \div 4$

$x=8$

Ex. 2: $87=-11x+21$

$-21 \qquad -21$

$66=-11x$

$\div -11 \quad \div -11$

$-6=x$

II. Solving Multi-step Equations With Variables on Both Sides of the Equal Sign

- When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

Ex. 3: $8x+4=4x+28$

$-4 \qquad -4$

$8x=4x+24$

$-4x \quad -4x$

$4x=24$

$\div 4 \quad \div 4$

$x=6$

III. Solving Equations that need to be simplified first

- In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

Ex. 4: $5(4x-7)=8x+45+2x$

$20x-35=10x+45$

$-10x \qquad -10x$

$10x-35=45$

$+35 \quad +35$

$10x=80$

$\div 10 \quad \div 10$

$x=8$

PRACTICE SET 2

Solve each equation. You must show all work.

1.) $5x - 2 = 33$

2.) $140 = 4x + 36$

3.) $8(3x - 4) = 196$

4.) $45x - 720 + 15x = 60$

5.) $132 = 4(12x - 9)$

6.) $198 = 154 + 7x - 68$

7.) $-131 = -5(3x - 8) + 6x$

8.) $-7x - 10 = 18 + 3x$

9.) $12x + 8 - 15 = -2(3x - 82)$

10.) $-(12x - 6) = 12x + 6$

C. Solving for a variable

Perform algebraic operations in order to isolate a variable on one side of the equation.

Ex. 1: $3xy = 18$, Solve for x.

$$\frac{3xy}{3y} = \frac{18}{3y}$$

$$x = \frac{6}{y}$$

Ex. 2: $5a - 10b = 20$, Solve for a.

$$+10b = +10b$$

$$5a = 20 + 10b$$

$$\frac{5a}{5} = \frac{20}{5} + \frac{10b}{5}$$

$$a = 4 + 2b$$

PRACTICE SET 3

Solve each equation for the specified variable.

1. $Y + V = W$, for V

2. $9wr = 81$, for w

3. $2d - 3f = 9$, for f

4. $dx + t = 10$, for x

5. $P = (g - 9)180$, for g

6. $4x + y - 5h = 10y + u$, for x

D. Writing Linear Equations

Need at least one point (x_1, y_1) and a slope m

1. Substitute the point (x_1, y_1) and the sloe m into the point slope form
2. Solve for y

EXAMPLE

Write the point-slope form and then the slope-intercept form of the equation of the line with slope -3 that passes through the point $(2, -4)$.

SOLUTION

$y - y_1 = m(x - x_1)$

$y - (-4) = -3(x - 2)$ Substitute the given values

$\boxed{y + 4 = -3(x - 2)}$ Simplify

This is the equation of the line in *point-slope form*.

$y + 4 = -3x + 6$ Distribute

$\boxed{y = -3x + 2}$ Subtract 4 from both sides

This is the equation of the line in *slope-intercept form*.

Now find the two forms of the equation of the line. To find the point-slope form of the line, use either point provided.
Use $(2, -4)$.

$y - y_1 = m(x - x_1)$

$y - (-4) = -2(x - 2)$ Substitute the given values

$\boxed{y + 4 = -2(x - 2)}$ Simplify

This is the equation of the line in *point-slope form*.

$y + 4 = -2x + 4$ Distribute

$\boxed{y = -2x}$ Subtract 4 from both sides

This is the equation of the line in *slope-intercept form*.

Parallel Lines: Two lines that are parallel have the SAME slope.

Example:

y = 3x + 9 and y = 3x – 6 are parallel lines because they have the same slope: m = 3.

A line that is parallel to y = -8x + 7 has a slope of -8.

Perpendicular Lines: have slopes that are the negative reciprocals of each other.

Example:

- $y = 3x + 9$ and $y = -\frac{1}{3}x + 9$ are perpendicular lines because their slopes are the "negative flip" of each other.
- A line that is perpendicular to y = -8x + 7 has a slope of .

MUST SHOW ALL WORK TO GET EQUATIONS BELOW.

1. Write the equation of a line that has the slope -4/9 and passes through the point (18, -2)

2. Write the equation of a line that passes through the points (1, 3) and (5, 11)

3. Write the equation of a line containing the point (-4, 6) and parallel to $3x - 2y = 8$.

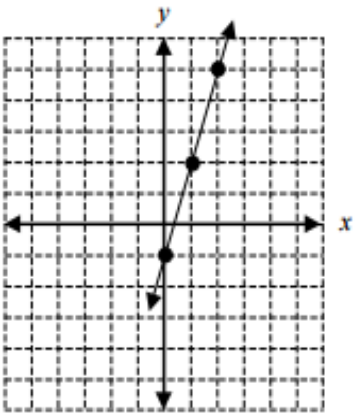
4. Write the equation of a line containing the point (2, -1) and perpendicular to $x - 3y = 4$.

E. Graphing Linear Equations
Slope-Intercept

The slope-intercept form for the equation of a line with slope m and y-intercept b is $y = mx + b$.

Ex. $y = 3x - 1$

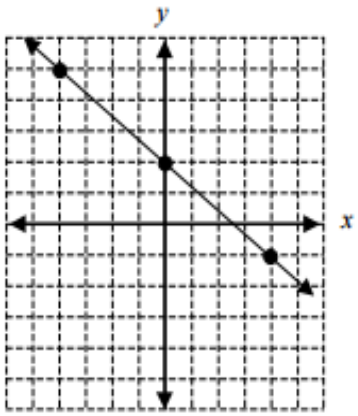
Slope: 3 y-intercept: -1



Place a point on the y-axis at -1. Slope is 3 or 3/1, so travel up 3 on the y-axis and over 1 to the right.

Ex. $y = -\frac{3}{4}x + 2$

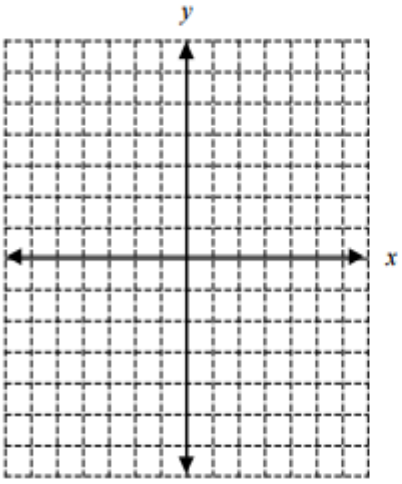
Slope: $-\frac{3}{4}$ y-intercept: 2



Place a point on the y-axis at 2. Slope is -3/4 so travel down 3 on the y-axis and over 4 to the right. Or travel up 3 on the y-axis and over 4 to the left.

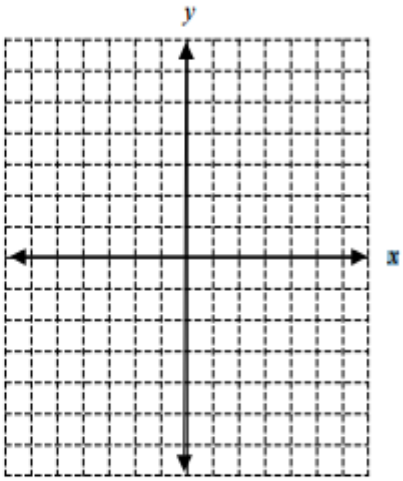
1. $y = 2x + 5$

Slope: _____ y-intercept: _____



2. $y = \frac{1}{2}x - 3$

Slope: _____ y-intercept: _____



F. Graphing Linear Equations
Standard Form

An equation in standard form can be graphed using several different methods. Two methods are explained below.

a. Re-write the equation in $y = mx + b$ form, identify the y-intercept and slope, then graph as in Part II above.

b. Solve for the x- and y- intercepts. To find the x-intercept, let $y = 0$ and solve for x. To find the y-intercept, let $x = 0$ and solve for y. Then plot these points on the appropriate axes and connect them with a line.

Ex. $2x - 3y = 10$

a. Solve for y.

$-3y = -2x + 10$

$y = \frac{-2x + 10}{-3}$

$y = \frac{2}{3}x - \frac{10}{3}$

OR

b. Find the intercepts:

let $y = 0$:

$2x - 3(0) = 10$

$2x = 10$

$x = 5$

So x-intercept is (5, 0)

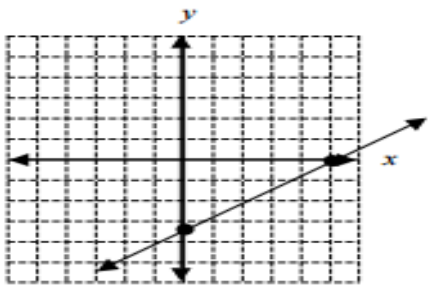
let $x = 0$:

$2(0) - 3y = 10$

$-3y = 10$

$y = -\frac{10}{3}$

So y-intercept is $\left(0, -\frac{10}{3}\right)$

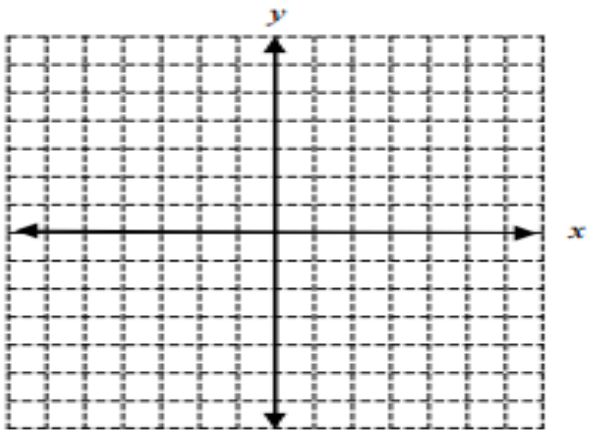


On the x-axis place a point at 5.

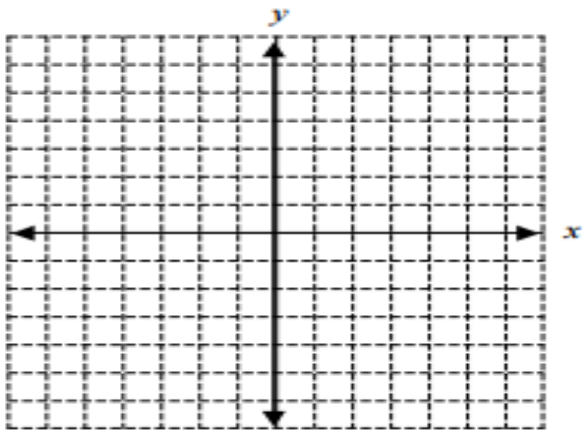
On the y-axis place a point at $-\frac{10}{3} = -3\frac{1}{3}$

Connect the points with the line.

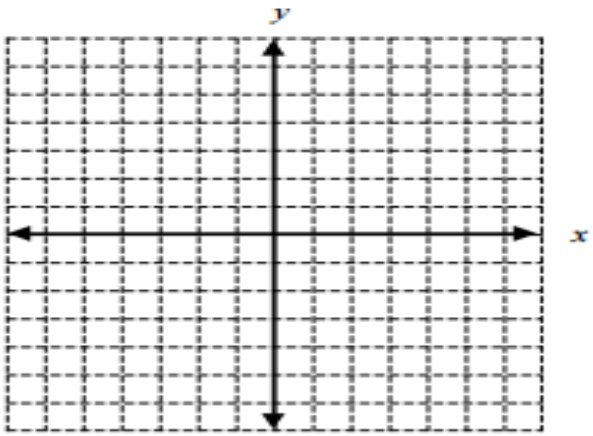
1. $3x + y = 3$



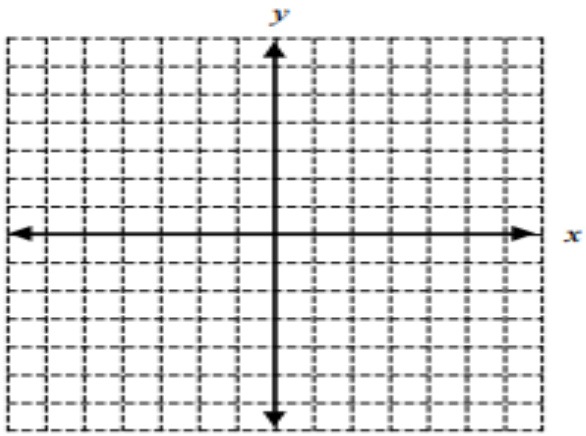
2. $5x + 2y = 10$



3. $y = 4$



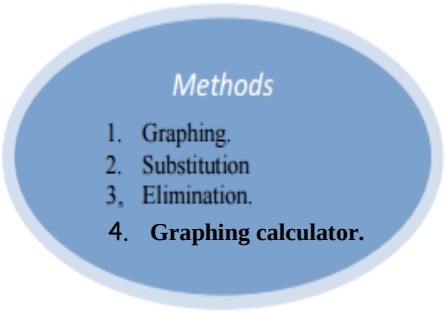
4. $4x - 3y = 9$



G. System of Linear Equations

Possible types of solutions for a linear system

One solution	All real solutions	No solution
x = # and y = # (x,y)	# = same # Ex: 8 = 8	# = different # Ex: $7 \neq 9$
Lines intersection once. Different slopes	Same line (same slope and y-intercept), infinite intersections	Lines are parallel and never intersection (same slope & different y -intercept



Steps:

By Graphing: ----best if both equations are in slope intercept form → y = mx + b

1. Graph both equations
2. The point of intersection is the solution to the system (x, y)

By Elimination ---- best if both equations are in standard form → Ax + By = C

1. Arrange the equation with like terms in columns.
2. Make one set of variables cancel out by being the same # one positive one negative.
3. Multiply each term of one or both equation by an appropriate #.
4. Add the equations
5. Solve for the remaining variable.
6. Substitute the value obtained from step 5 into either of the original equations, and solve for other variable.
7. Check the solution in the other original equation.

By Substitution: ---Best if at least one equation has one variable is by itself or almost by itself.

1. Solve for one of the variables if not already done so. x = _____ or y = _____
2. Sub the expression from step 1 into the other equation and solve for the other variable.
3. Sub in the value of that variable into one of the original equations or into x = or y = equation.
4. Plug your ordered pair into the other equation and if you get a true statement your answer is correct.

By Calculator: best if both equations are in slope intercept form, or if you have large values then rewrite in slope intercept form.

1.) Make sure both equations are written in terms of y=
2.) Turn calculator on and Press Y = button and clear out anything in y=
3.) In Y_1 enter the 1st equation
4.) In Y_2 enter the 2^{nd} equation
5.) Press Zoom 6 or zoom fit # 0
6.) 2^{nd} Calc
7.) #5 Intersect
8.) Hit enter 3 times
9.) The actual point of intersection will appear on the bottom screen
10.) Check the solution – plug in both values and see if statement is a true statement (both sides =)

Solving Systems of Equations Examples:

Solve for x and y: x = 2y + 5 3x + 7y = 2 Using **substitution** method: 3(2y + 5) + 7y = 2 6y + 15 + 7y = 2 13y = -13 y = -1 x = 2(-1) + 5 x=3 Solution: (3, -1)	Solve for x and y: 3x + 5y = 1 2x + 3y = 0 Using **linear combination /elimination** (also known as addition/ subtraction) method: 3(3x + 5y = 1) -5(2x + 3y = 0) 9x + 15y = 3 -10x - 15y = 0 -1x = 3 x = -3 2(-3) + 3y = 0 y=2 Solution: (-3, 2)

Tutorials:
Solve systems of linear equations: http://www.regentsprep.org/regents/math/math-topic.cfm?TopicCode=syslin
Solve systems of equations (video): http://www.youtube.com/watch?v=qxHCEwrpMw0
Systems of Linear Equations: http://www.purplemath.com/modules/systlin1.htm

Solve each system of equations by any method above (some methods are better to use than others depending on the form of the equations –see above comments on best method Write your answer as an ordered pair. (Exact answers only)

1) $y = 2x + 4$
$-3x + y = -9$

2) $2x + 3y = 6$
$-3x + 2y = 17$

3. $\begin{cases} 3x + 2y = 2 \\ 9x - 8y = -4 \end{cases}$

4. $\begin{cases} y = -3x + 1 \\ 6x + 2y = 10 \end{cases}$

5. $\begin{cases} y = 2x - 2 \\ 7.5y = 15x - 15 \end{cases}$

H. Graphing systems of Inequalities

Methods

Graph both inequalities on the same coordinate plane and their intersection (overlapping region) is the solution. < and > are dotted lines ,≤ and ≥ are solid line.

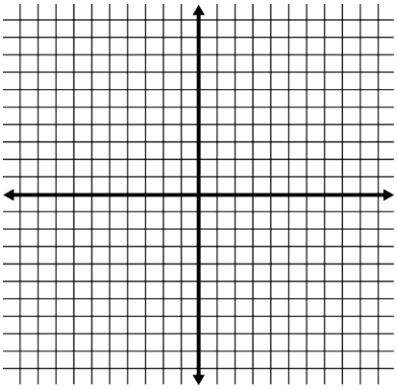
In Slope-intercept form y ____ mx + b	In standard form Ax + By ____ C
1. Graph the inequality as if it were a line (make <u>dashed</u> if <u>not including</u>) Identify the slope as fraction→ m = ___ Identify the y-int → b = ____	Ignore the inequality sign during the cover up method **1. Find x –intercept:** Cover up the By value and solve for x. Plot (x value , 0) on the x-axis **Find y-intercept:** Cover up the Ax value and solve for y. Plot (0, y value) on the y-axis
2. Shade each region as indicated Greater than (or equal to) → shade above Less than (or equal to) →shade below	2. <u>Use a test point</u> – plug in a point <u>not</u> on the line into the inequality to determine if you shade above or below.
3. Find the region that is in common.	

Graph the following inequality system and

state a solution

y > -2x – 5

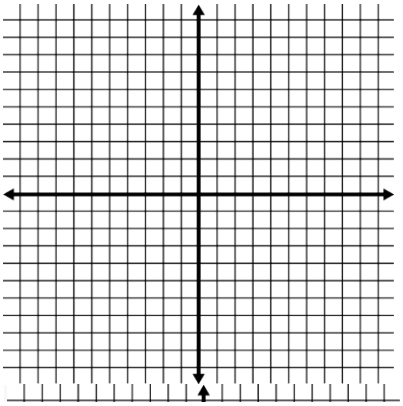
y ≤x + 3



Example 2:

2x + 3y < 6

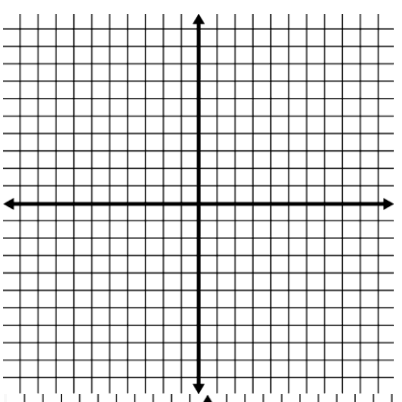
y≥ - 2/3x + 4



Example 3.

y ≤3

-x + 3y > -9



I. Multiplying Binomials

I. Reviewing the Distributive Property

The distributive property is used when you want to multiply a single term by an expression.

Ex 1: $8(5x^2 - 9x)$

$8 \cdot 5x^2 + 8 \cdot (-9x)$

$40x^2 - 72x$

II. Multiplying Binomials – the FOIL method

When multiplying two binomials (an expression with <u>two</u> terms), we use the "FOIL" method. The "FOIL" method uses the distributive property <u>twice</u>!

FOIL is the order in which you will multiply your terms.

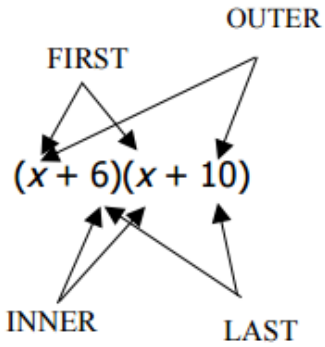
First

Outer

Inner

Last

Ex. 1: $(x + 6)(x + 10)$



First	$x \cdot x$ ------> x^2
Outer	$x \cdot 10$ -----> $10x$
Inner	$6 \cdot x$ ------> $6x$
Last	$6 \cdot 10$ -----> 60

$x^2 + 10x + 6x + 60$

$x^2 + 16x + 60$
(After combining like terms)

Recall: $4^2 = 4 \cdot 4$

$x^2 = x \cdot x$

Ex. $(x + 5)^2$

$(x + 5)^2 = (x + 5)(x+5)$

Now you can use the "FOIL" method to get a simplified expression.

$= x^2 + 5x + 5x + 25$

$= x^2 + 10x + 25$

Multiply. Write your answer in simplest form.

1.) $(x + 7)(x – 12)$

2.) $(x – 8)(x + 81)$

3.) $(-2x + 10)(-9x + 5)$

4.) $(-x + 5)^2$

5.) $(2x – 3)^2$