Name_____

This assignment will be due the first day of school, and a test will be given on this material the second week of school. Brief notes and explanations are included within each section. If additional information is needed, websites are provided with each topic for extra help.

I. Order of Operations (PEMDAS)

- Parenthesis and other grouping symbols.
- Exponential expressions.
- Multiplication & Division.
- Addition & Subtraction.

Tutorials:
http://regentsprep.org/Regents/math/ALGEBRA/AOP2/indexAOP2.htm
http://www.math.com/school/subject2/lessons/S2U1L2GL.html

Simplify each numerical expression. Show all work! Only use a calculator to check.

1) $6 + 2 \times 8 - 12 + 9 \div 3$

2)

3) ————————

4) ————————

II. Evaluating Algebraic Expressions

To evaluate an algebraic expression:
- Substitute the given value(s) of the variable(s).
- Use order of operations to find the value of the resulting numerical expression.

Tutorials:
http://www.math.com/school/subject2/lessons/S2U2L3GL.html
http://www.purplemath.com/modules/evaluate.htm

Evaluate.

1) $x\left(\frac{y}{2} + 3z^2\right) - 2x$ if $x = \frac{1}{2}, y = 4, z = -2$

2) $12a - 4a^2 + 7a^3$ if a = -3

3) $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ if $a = 1, b = -4, c = -21$

4) $1.2(3)^x$ if x = 3

5) $\dfrac{3(x+y) - 2(x-y)}{5x+y}$ if x = 3 and y = 4

6) $2\left(\frac{1}{3}\right)^x$ if x = 2

7) $A = P(1 + \frac{r}{n})^{nt}$ if P = 650, r = .06, n = 2, t = 15

8) If $k \odot n = k^3 - 3n$,

then evaluate 7 ☺ 5

III. Simplifying Radicals

An expression under a radical sign is in simplest radical form when:
1) there is no integer under the radical sign with a perfect square factor,
2) there are no fractions under the radical sign,
3) there are no radicals in the denominator

Tutorials:
http://regentsprep.org/Regents/math/ALGEBRA/AO1/Lsimplify.htm
http://www.themathpage.com/alg/simplify-radicals.htm

Express the following in simplest radical form. NO DECIMALS ALLOWED!!! MUST BE IN RADICAL FORM!!

1) $\sqrt{50}$　　　　　　2) $\sqrt{24}$　　　　　　3) $\sqrt{192}$　　　　　　4) $\sqrt{169}$

5) $\sqrt{147}$　　　　　　6) $\sqrt{\dfrac{13}{49}}$　　　　　　7) $\sqrt{\dfrac{6}{27}}$　　　　　　8) $\dfrac{3}{\sqrt{6}}$

IV. Properties of Exponents – Complete the example problems.

PROPERTY		EXAMPLE
Product of Powers	$a^m \times a^n = a^{m+n}$	$y^4 \times y^2 =$
Power of a Power	$(a^m)^n = a^{m \times n}$	$(x^4)^2 =$
Power of a Product	$(ab)^m = a^m b^m$	$(2x)^3 =$
Negative Power	$a^{-n} = \dfrac{1}{a^n}$　(a≠0)	$x^{-3} =$
Zero Power	$a^0 = 1$　(a≠0)	$4^0 =$
Quotient of Powers	$\dfrac{a^m}{a^n} = a^{m-n}$　(a ≠ 0)	$\dfrac{x^3}{x^2} =$
Power of Quotient	$\left(\dfrac{a}{b}\right)^m = \dfrac{a^m}{b^m}$　(b ≠ 0)	$\left(\dfrac{x}{y}\right)^3 =$

Tutorials:
http://www.purplemath.com/modules/exponent.htm
http://www.algebralab.org/lessons/lesson.aspx?file=Algebra_ExponentsRules.xml

Simplify each expression. Answers should be written using positive exponents.

1) $g^5 \times g^{11}$ _____　　　　　2) $(b^6)^3$ _____

3) w^{-7} _____　　　　　4) $\dfrac{y^{12}}{y^8}$ _____

5) $(3x^7)(-5x^{-3})$ _____　　　　　6) $(-4a^{-5}b^0c)^2$ _____

7) $\dfrac{-15x^7 y^{-2}}{25x^{-9}y^5}$ _____　　　　　8) $\left(\dfrac{4x^9}{12x^4}\right)^3$ _____

IV. Solving Linear Equations

To solve linear equations, first simplify both sides of the equation. If the equation contains fractions, multiply the equation by the LCD to clear the equation of fractions. Use the addition and subtraction properties of equality to get variables on one side and constants on the other side of the equal sign. Use the multiplication and division properties of equality to solve for the variable. Express all answers as fractions in lowest terms.

Tutorials:
Solving Linear Equations: http://www.purplemath.com/modules/solvelin.htm
Solving Equations: http://regentsprep.org/REgents/math/ALGEBRA/AE2/indexAE2.htm

Examples:

a) 3(x + 5) + 4(x + 2) = 21
   3x + 15 + 4x + 8 = 21
   7x + 23= 21
   7x = -2
   $x = -\dfrac{2}{7}$

b) 2(5x-4)-10x = 6x+3(2x-5)
   $10x - 8 - 10x = 6x + 6x - 15$
   -8 = 12x − 15
   7 = 12x
   7/12 = x

c) $\dfrac{2}{3}x + 5 = 6x - \dfrac{3}{4}$
   $12(\dfrac{2}{3}x + 5 = 6x - \dfrac{3}{4})$
   8x + 60 = 72x − 9
   69 = 64x
   69/64 = x

Solve for the indicated variable:

1)   3n + 1 = 7n − 5

2)   2[x + 3(x − 1)] = 18

3)   6(y + 2) - 4 = -10

4) $2x^2 = 50$

5) 5 + 2(k + 4) = 5(k - 3) + 10

6) $6 + 2x(x − 3) = 2x^2$

7) $\dfrac{2}{3}x - 18 = \dfrac{x}{6}$

8) $\dfrac{x-2}{3} = \dfrac{2x+1}{4}$

V. Factoring Polynomials

Examples:

Factoring out the GCF

Factor: $18x + 24$

GCF= 6 $\dfrac{8x}{6} + \dfrac{24}{6}$

$\boxed{6(3x + 4)}$

Factor: $6a^5b^4 - 18a^4b^3 + 24a^3b^2$

GCF = $6a^3b^2$

$\dfrac{6a^5b^4}{6a^3b^2} - \dfrac{18a^4b^3}{6a^3b^2} + \dfrac{24a^3b^2}{6a^3b^2}$

$\boxed{6a^3b^2\left(a^2b^2 - 3ab + 4\right)}$

Difference of Squares

$(x + 3)(x - 3) = x^2 - 9$

$(a + 4)(a - 4) = a^2 - 16$

$(2x + 5)(2x - 5) = 4x^2 - 25$

$(5x + 1)(5x - 1) = 25x^2 - 1$

Factoring a Trinomial ax^2+bx+c, where $a = 1$

Factor $x^2 + 2x - 63$

$(x\ +\ 9)(x\ -\ 7)$

$\dfrac{63}{\begin{array}{l}1\cdot63\\3\cdot21\\7\cdot9\end{array}}$ $+9 - 7 = +2$

Check by FOIL
$(x + 9)(x - 7)$
$x^2 - 7x + 9x - 63$
$x^2 + 2x - 63$ ✓

Factoring a Trinomial ax^2+bx+c, where $a \neq 1$

Factor $2x^2 - 5x - 12$

$2x^2 + 3x - 8x - 12$

$x(2x + 3) - 4(2x + 3)$

$(2x + 3)(x - 4)$

$2\cdot 12 = \dfrac{24}{\begin{array}{l}1\cdot24\\2\cdot12\\3\cdot8\\4\cdot6\end{array}}$

Check: $(2x + 3)(x - 4)$
$2x^2 - 8x + 3x - 12$
$2x^2 - 5x - 12$ ✓

Tutorials:
Factoring Polynomials (video): https://www.youtube.com/watch?v=HinoXYey2n4
Factoring a Trinomial: http://www.algebrahelp.com/lessons/factoring/trinomial/
Factoring: http://regentsprep.org/Regents/math/ALGEBRA/AV6/indexAV6.htm

Factor completely.

1) $16y^2 + 8y$

2) $18x^2 - 12x$

3) $6m^2 - 60m + 10$

4) $6y^2 - 13y - 5$

5) $20x^2 + 31x - 7$

6) $12x^2 + 23x + 10$

7) $x^2 - 2x - 63$

8) $8x^2 - 6x - 9$

9) $x^2 - 121$

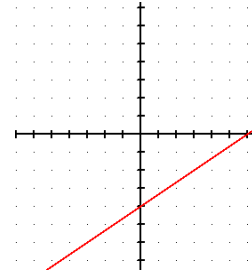# VI. Linear Equations in Two Variables

Examples:
a) Find the slope of the line passing through the points (-1, 2) and (3, 5).

$$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1} \quad \rightarrow \quad m = \frac{5-2}{3-(-1)} = \frac{3}{4}$$

b) Graph y = 2/3 x - 4 with slope-intercept method.

Reminder: y = mx + b is slope-intercept form where m =. slope and b = y-intercept.
Therefore, slope is 2/3 and the y-intercept is – 4.

Graph accordingly. ———————————————→

c) Graph 3x - 2y - 8 = 0 with slope-intercept method.

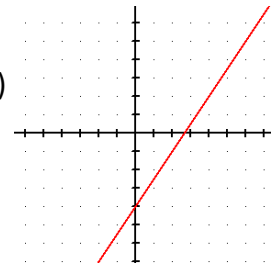Put in Slope-Intercept form: y = -3/2 x + 4

m = 3/2   b = -4

d) Write the equation of the line with a slope of 3 and passing through the point (2, -1)

y = mx + b
-1 = 3(2) + b
-7 = b   Equation: y = 3x – 7

Tutorials:
Using the slope and y-intercept to graph lines: http://www.purplemath.com/modules/slopgrph.htm
Straight-line equations (slope-intercept form): http://www.purplemath.com/modules/strtlneq.htm
Slopes and Equations of Lines: http://regentsprep.org/Regents/math/ALGEBRA/AC1/indexAC1.htm

Find the slope of the line passing through each pair of points:

   1) (-3, -4) (-4, 6)   2) (-4, -6) (-4, -8)   3) (-5, 3) (-11, 3)

Write an equation, in slope-intercept form using the given information.

                                              6) (-6, -3) (-2, -5)
   4) (5, 4) $m = \frac{-2}{3}$ 5) (-2, 4)   m = -3

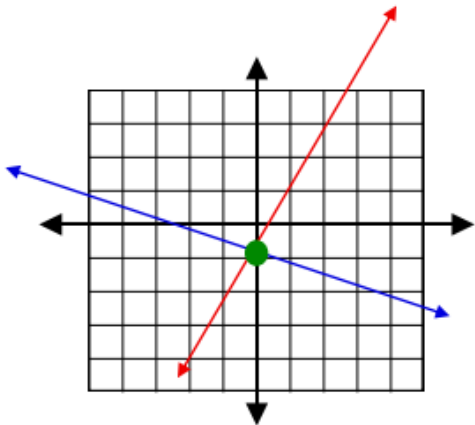# VII. Solving Systems of Equations by Graphing

Examples: To solve a system of equations by graphing, simply graph the lines on the same coordinate plane, and state the solution.

$y = 2x - 1$
$\quad m = 2, b = -1$
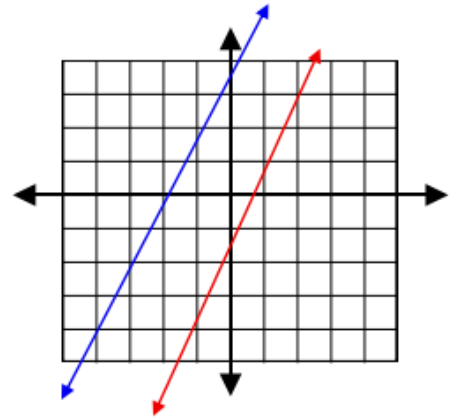$x + 3y = -3$
$\quad x \text{ - int.} = -3, y \text{ - int.} = -1$

Solution: (0, -1)

$y = 2x - 1$
$\quad m = 2, b = -1$
$-4x + 2y = 8$
$\quad x \text{ - int.} = -2, y \text{ - int.} = 4$

These lines are parallel, and therefore, will never intersect.
Solution: No solutions (or ∅)
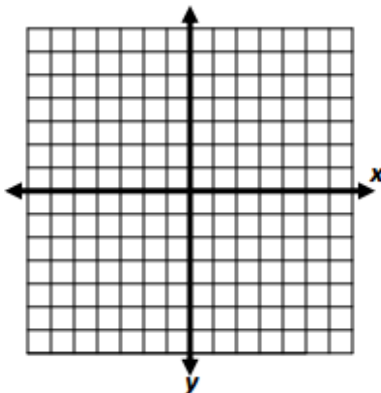
Tutorials:
Solving systems of equations by graphing:
http://www.regentsprep.org/regents/math/algebra/AE3/GrSys.htm
Solving systems of equations by graphing: http://www.purplemath.com/modules/systlin2.htm

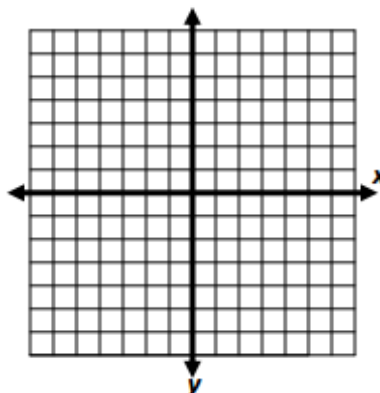Solve each system of equations by graphing.

1. $y = -x + 6$
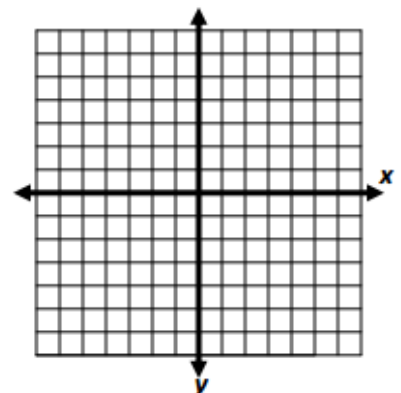 $\quad y = x - 2$

2. $2x + y = 3$
   $\quad 4x + 2y = 6$

3. $x + 2y = 0$
   $\quad y + 3 = -x$

VIII. Solving Systems of Equations Algebraically

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 **Elimination** (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://regentsprep.org/Regents/math/ALGEBRA/AE3/indexAE3.htm
Solve systems of equations using Elimination Method (video):
https://www.youtube.com/watch?v=8kRG7jlBMAY
Systems of Linear Equations: http://www.purplemath.com/modules/systlin1.htm

Solve each system of equations by the substitution method. Write your answer as an ordered pair.

1) y = 2x + 4

-3x + y = - 9

2) x – 2y = 5

3x – 5y = 8

Solve each system of equations by the elimination method. Write your answer as an ordered pair.

3) 3x + 7y = -1

6x + 7y = 0

4) 2x + 3y = 6

-3x + 2y = 17

Solve each system of equations by either the elimination or the substitution method. Write your answer as an ordered pair.

5) -3x + 3y = 4

-x + y = 3

6) 2x + 8y = 6

-5x - 20y = -15

IX. Graphing Quadratic Equations

To graph quadratic equations, identify the vertex by finding the x-value $x = \dfrac{-b}{2a}$ and plugging this x-value into the function to find the y-value. Remember, the standard form of Quadratics is $y = ax^2 + bx + c$.

Complete the table by filling in the grey section of the chart with the vertex and finding two points to the left and two points to the right of the vertex. Plot the points from the chart and connect the curve.

Tutorials:

Graphing Quadratic Equations (Video):

https://www.khanacademy.org/math/algebra/quadratics/solving_graphing_quadratics/v/quadratic-functions-2
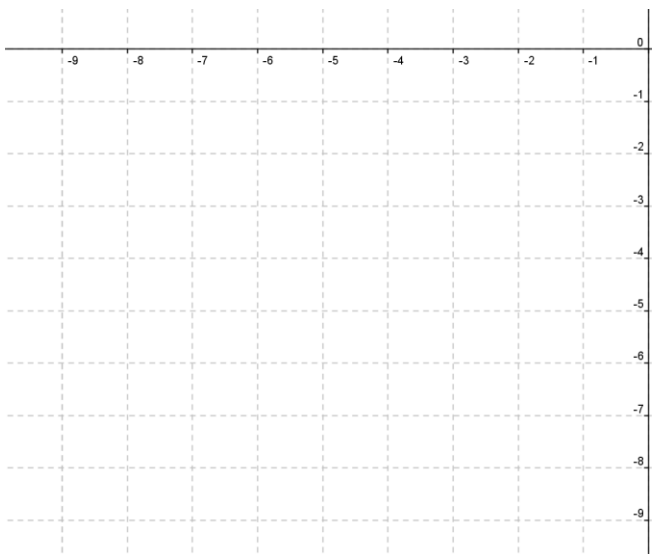
Graphing Quadratic Equations: http://www.purplemath.com/modules/grphquad.htm

For each equation, identify the vertex, fill in the chart, and graph the function:

1.) $y = x^2 + 10x + 16$

Vertex: _____

x	y

2.) $y = -2x^2 - 4x - 3$

Vertex: _____

x	y