NAME___________________________________

ADVANCED/HONORS ALGEBRA 2 - SUMMER PACKET

Part I. Order of Operations (PEMDAS)

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

Tutorial: 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) $25 - (2^3 + 5 \times 2 - 3)$

3) $\dfrac{-2 \bullet (-30) + 0.5 \bullet 20}{4^2 - 6}$

4) $\dfrac{15 - [8 - (2 + 5)]}{18 - 5^2}$

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

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

3) $\dfrac{-b + \sqrt{b^2 - 4ac}}{2a}$ *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) $2\left(\dfrac{1}{3}\right)^x$ *if* $x = 2$

7) $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ if P = 650, r = 6%, n = 2, t = 15

8) If k ☺ $n = k^3 - 3n$, then evaluate 7 ☺ 5

Part 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://www.freemathhelp.com/Lessons/Algebra_1_Simplifying_Radicals_BB.htm

Express the following in simplest radical form.

1) $\sqrt{50}$ 2) $\sqrt{24}$ 3) $\sqrt{192}$ 4) $\sqrt{169}$ 5) $\sqrt{147}$

6) $\sqrt{\frac{13}{49}}$ 7) $\sqrt{\frac{6}{27}}$ 8) $\frac{3}{\sqrt{6}}$

Part IV. Properties of Exponents – Complete the example problems.

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

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) $g^5 \bullet g^{11}$ __________ 2) $(b^6)^3$ __________

3) w^{-7} __________ 4) $\frac{y^{12}}{y^8}$ __________

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

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

Part V. 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

Examples:

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

b) $2(5x - 4) - 10x = 6x + 3(2x - 5)$
$10x - 8 - 10x = 6x + 6x - 15$
$-8 = 12x - 15$
$7 = 12x$
$\frac{7}{12} = x$

c) $\frac{2}{3}x + 5 = 6x - \frac{3}{4}$
$12\left(\frac{2}{3}x + 5 = 6x - \frac{3}{4}\right)$
$8x + 60 = 72x - 9$
$69 = 64x$
$\frac{69}{64} = x$

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

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

Part VI. Operations With Polynomials

To add or subtract polynomials, just combine like terms.
To multiply polynomials, multiply the numerical coefficients and apply the rules for exponents.
Tutorials:
Polynomials (adding & subtracting): http://www.purplemath.com/modules/polyadd.htm,
Polynomials (multiplying): http://www.purplemath.com/modules/polymult.htm,

Examples:

a) $(x^2 + 3x - 2) - (3x^2 - x + 5)$
$x^2 + 3x - 2 - 3x^2 + x - 5$
$-2x^2 + 4x - 7$

b) $3x(2x + 5)^2$
$3x(4x^2 + 20x + 25)$
$12x^3 + 60x^2 + 75x$

c) $4(5x^2 + 3x - 4) + 3(-2x^2 - 2x + 3)$
$20x^2 + 12x - 16 - 6x^2 - 6x + 9$
$14x^2 + 6x - 7$

d) $(4x - 5)(3x + 7)$
$12x^2 + 28x - 15x - 35$
$12x^2 + 13x - 35$

Perform the indicated operations and simplify:

1) $(7x^2 + 4x - 3) - (-5x^2 - 3x + 2)$

2) $(7x - 3)(3x + 7)$

3) $(4x + 5)(5x + 4)$

4) $(n^2 + 5n + 3) + (2n^2 + 8n + 8)$

5) $(5x^2 - 4) - 2(3x^2 + 8x + 4)$

6) $-2x(5x + 11)$

7) $(2m + 6)(2m + 6)$

8) $(5x - 6)^2$

Part VII. Factoring Polynomials

Examples:

Factoring out the GCF

a) $6x^2 + 21x$

$3x(2x + 7)$

Difference of Squares

b) $x^2 - 64$

$(x - 8)(x + 8)$

Perfect Square Trinomial

c) $x^2 - 10x + 25$

$(x - 5)^2$

Trinomial

d) $3x^2 + 7x + 2$

$(3x + 1)(x + 2)$

Trinomial

e) $2x^2 - 13x + 15$

$(2x - 3)(x - 5)$

Trinomial

f) $6x^2 + x - 1$

$(3x - 1)(2x + 1)$

Tutorials:

Factoring Trinomials (skip substitution method):

http://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut28_facttri.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) $x^2 - 121$

Part VIII. Linear Equations in Two Variables

Examples:

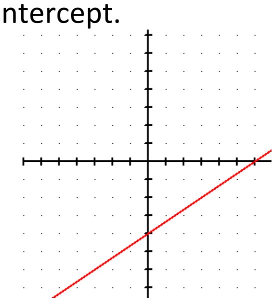
a) Find the slope of the line passing through the points (-1, 2) and (3, 5).

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

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.

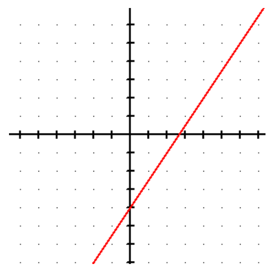
Graph accordingly. ⟶



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

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

1) (-3, -4) (-4, 6)

3) (-5, 3) (-11, 3)

2) (-4, -6) (-4, -8)

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

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

5) (-2, 4) m = -3

6) (-6, -3) (-2, -5)

Part IX. Solving Systems of Equations

Solve for x and y: $x = 2y + 5 \quad 3x + 7y = 2$	Solve for x and y: $3x + 5y = 1 \quad 2x + 3y = 0$
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)	Using **elimination** (addition/ subtraction) method: $3(3x + 5y = 1)$ $-5(2x + 3y = 0)$ $9x + 15y = 3$ $\underline{-10x - 15y = 0}$ $-1x = 3$ $x = -3$ $2(-3) + 3y = 0$ $y=2$ Solution: (-3, 2)

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

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

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

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

3) $x - 2y = 5$
$3x - 5y = 8$

4) $3x + 7y = -1$
$6x + 7y = 0$

Part X. Solve Absolute Value Equations

To solve an absolute value equation, isolate the absolute value on one side of the equal sign, and establish two cases:

Case 1: $\lvert a\rvert = b$ **set** $a = b$	**Case 2:** $\lvert a\rvert = b$ **set** $a = -b$
Set the expression inside the absolute value symbol equal to the other given expression.	Set the expression inside the absolute value symbol equal to the negation of the other given expression

. . . and always CHECK your answers.

The two cases create "derived" equations. These derived equations may not always be true equivalents to the original equation. Consequently, the roots of the derived equations MUST BE CHECKED in the original equation so that you do not list extraneous roots as answers.

Example: **Solve:** $\lvert 2x-3\rvert = 17$

Case 1: $2x-3=17$

$2x = 20$

$x = 10$

Case 2: $2x-3=-17$

$2x=-14$

$x=-7$

Check your solutions:

$\lvert 2x-3\rvert = 17$ | $\lvert 2x-3\rvert = 17$

$\lvert 2(10)-3\rvert = 17$ | $\lvert 2(-7)-3\rvert = 17$

$\lvert 20-7\rvert = 17$ | $\lvert -14-3\rvert = 17$

$\lvert 17\rvert = 17$ | $\lvert -17\rvert = 17$

1) $\lvert x+15\rvert = 37$

2) $\left\lvert \frac{1}{3}x-3\right\rvert = -1$

3) $\lvert 16x-4x\rvert = 4x-12$

4) $\lvert x-4\rvert - 5 = 0$

5) $\lvert 4x+3\rvert = 15-2x$

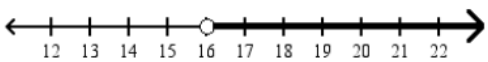
Part XI. Solving Inequalities

Solving linear inequalities is the same as solving linear equations... with one very important exception... when you multiply or divide an inequality by a negative value, it changes the direction of the inequality

Solve: $2x+4>36$

$2x>32$

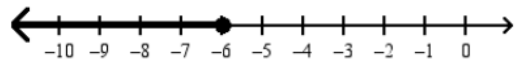
$x>16$



Solve: $17-3x\geq 35$

$-3x\geq 18$

$x\leq -6$



Solve the inequality and graph on a number line.

1) $7(7x-9)\leq 84$

2) $2+3(x+5)\geq 4(x+3)$

3) $\frac{1}{3}(2x-3)>x+2$

Part XII. Graphing Linear Inequalities:

Graphing an inequality starts by graphing the corresponding straight line. After graphing the line, there are only two additional steps to remember.

1.	Choose a point **not** on the line and see if it makes the inequality true. If the inequality is true, you will shade THAT side of the line -- thus shading OVER the point. If it is false, you will shade the OTHER side of the line -- not shading OVER the point.
2.	If the inequality is LESS THAN OR EQUAL TO or GREATER THAN OR EQUAL TO, the line is drawn as a solid line. If the inequality is simply LESS THAN or GREATER THAN, the line is drawn as a dashed line.

Graph $x + 2y \geq 4$

Place the equation in slope intercept form $x + 2y \geq 4$

Since it is a greater than or equal to it is a solid line

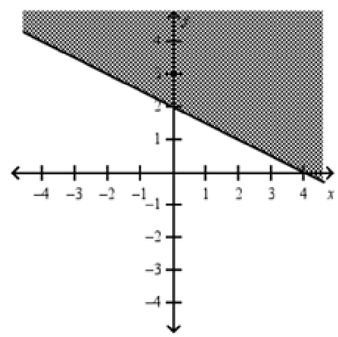
(note if it was just > or < it would be dashed

Test Point: (0,0)

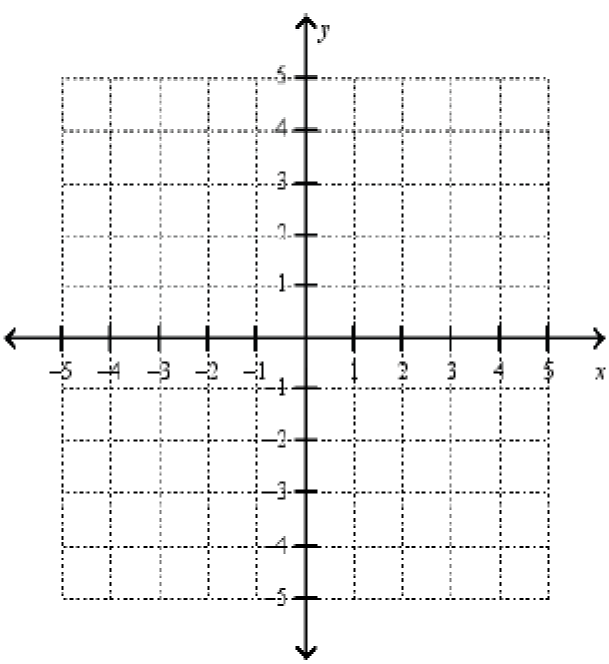
$0 + 2(0) \geq 4$

$0 \geq 4$

False: Shade the region that does not include (0,0)



1) Graph $2x + y > 4$



2) Graph $2y \leq 4x + 6$