NAME_____ ALGEBRA II – SUMMER REVIEW PACKET 2023

To maintain a high quality program, students entering Honors or CP Algebra II are expected to remember the basics of the mathematics taught in their Algebra I course. In order to review the basic concepts prior to taking Algebra II, the mathematics department has prepared this review packet. For each algebra topic addressed, this packet contains several review examples with online tutorials followed by problems for the student to practice. Virtual copies will be available for students to access the links provided.

Since this material is designed as review, you are responsible for completing this packet on your own. Use of software (other than a graphing calculator) is forbidden. Teachers will grade this packet on completion, and an assessment will be given to assess the student's knowledge of the covered topics within the first week of the new school year.

I. 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) $12a-4a^2+2a^3$ *if* $a=-3$

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

4) $2(3)^x$ if $x = 3$

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

6) $18\left(\frac{1}{3}\right)^x$ *if* $x=2$

II. 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

Tutorials:
http://www.purplemath.com/modules/radicals.htm

Express the following in simplest radical form.

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

4) $\sqrt{169}$ 5) $\sqrt{\frac{49}{64}}$ 6) $\sqrt{\frac{50}{72}}$

III. Properties of Exponents

PROPERTY		EXAMPLE
Product of Powers	$a^m \cdot a^n = a^{m+n}$	$x^4 \cdot x^2 = x^6$
Power of a Power	$(a^m)^n = a^{m+n}$	$(x^4)^2 = x^8$
Power of a Product	$(ab)^m = a^m b^m$	$(2x)^3 = 2^3x^3 = 8x^3$
Negative Power	$a^{-n} = \frac{1}{a^n}$ $(a \neq 0)$	$x^{-3} = \frac{1}{x^3}$
Zero Power	$a^0 = 1$ $(a \neq 0)$	$4^0 = 1$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}$ $(a \neq 0)$	$\frac{x^3}{x^2} = x^{3-2} = x^1 = x$
Power of Quotient	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ $(b \neq 0)$	$\left(\frac{x}{y}\right)^3 = \frac{x^3}{y^3}$

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) $g^5 \cdot g^{11}$ _____

2) $(b^6)^3$ _____

3) w^{-7} _____

4) $\frac{y^{12}}{y^8}$ _____

5) $(3x^7)(-5x^3)$ _____

6) $(-4a^5b^0c)^2$ _____

7) $\frac{-15x^7}{25x^9}$ _____

8) $\left(\frac{4x^9}{12x^4}\right)^3$ _____

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

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) $\frac{2}{3}x + 4 = 6x - \frac{3}{4}$

$12\left(\frac{2}{3}x + 4 = 6x - \frac{3}{4}\right)$

$8x + 48 = 72x - 9$

$57 = 64x$

$\frac{57}{64} = x$

Solve for the indicated variable:

1) $3n + 1 = 7n + 5$

2) $2[x + 3(x - 1)] = 18$

3) $6(y + 2) - 4 = -28$

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

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

6) $\frac{x-3}{3} = \frac{2x+6}{4}$

V. 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) $4(5x^2 + 3x - 4) + 3(-2x^2 - 2x + 3)$

$20x^2 + 12x - 16 - 6x^2 - 6x + 9$

$14x^2 + 6x - 7$

c) $3x(2x + 5)^2$

$3x(2x + 5)(2x + 5)$

$3x(4x^2 + 20x + 25)$

$12x^3 + 60x^2 + 75x$

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) $(5x - 6)^2$

VI. Factoring Polynomials

Examples:

Factoring out the GCF	Difference of Squares	Perfect Square Trinomial
a) $6x^2 + 21x$	b) $x^2 - 64$	c) $x^2 - 10x + 25$
$3x(2x + 7)$	$(x - 8)(x + 8)$	$(x - 5)^2$

Mixed Methods	Mixed Methods	Mixed Methods
d) $3x^2 + 27x + 60)$	e) $2x^4 + 4x^3 - 30x^2$	f) $5x^2 - 45$
$3(x^2 + 9x + 20)$	$2x^2(x^2 + 2x - 15)$	$5(x^2 - 9)$
$3(x + 5)(x + 4)$	$2x^2(x + 5)(x - 3)$	$5(x - 3)(x + 3)$

Tutorials:
Factoring Trinomials (only when a = 1)
http://www.wtamu.edu/academic/anns/mps/math/mathlab/int_algebra/int_alg_tut28_facttri.htm
Factoring Polynomials (video):
https://www.khanacademy.org/math/algebra-basics/quadratics-polynomials-topic/factoring-quadratic-expressions-core-algebra/v/factoring-polynomials-1

1. $x^2 - x - 56$

2. $x^2 + 14x + 48$

3. $y^2 - 15y + 54$

4. $5p^2 + 60p + 100$

5. $w^4 - 14w^3 + 45w^2$

6. $2x^3 + 4x^2 - 48x$

7. $4x^2 - 100$

8. $x^2 - 121$

9. $2x^2 + 20x + 50$

VII. Linear Equations in Two Variables

Examples:

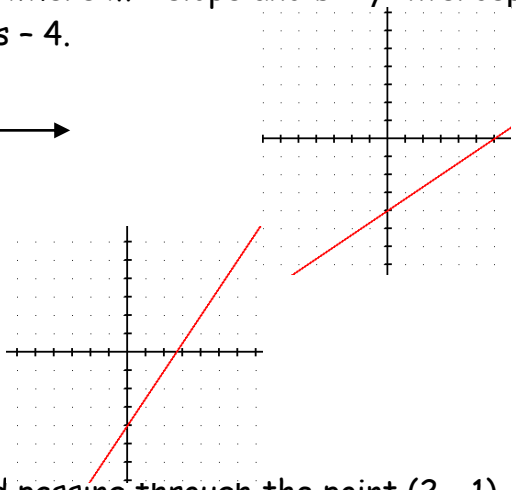
a) Find the slope of the line passing through the points (-1, 2) and (3, 5).

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

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

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

4) (9, 4) $m = \frac{-2}{3}$ 5) (-2, 4) m = -3 6) (-6, -3) (-2, -5)

VIII. Solving Systems of Equations

Solve for x and y: $x = 2y + 5 \quad 3x + 7y = 2$ 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: $3x + 5y = 1 \qquad 2x + 3y = 0$ Using **linear combination** (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)

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

Tutorials:
Solve systems of equations (videos):

- https://www.khanacademy.org/math/algebra-basics/core-algebra-systems/core-algebra-systems-tutorial/v/solving-linear-systems-by-substitution
- https://www.khanacademy.org/math/algebra-basics/core-algebra-systems/core-algebra-systems-tutorial/v/solving-systems-of-equations-by-elimination

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) $3x + 3y = -6$
   $6x + 3y = 0$

IX. Fraction Operations

1. Add the following fractions:

a) $\frac{2}{5} + \frac{2}{3} =$

b) $1\frac{2}{3} + 1\frac{3}{5} =$

c) $2\frac{1}{3} + 1\frac{1}{4} =$

2. Subtract the following fractions:

a) $\frac{3}{4} - \frac{2}{12} =$

b) $3 - 1\frac{1}{5} =$

c) $3\frac{2}{4} - 1\frac{1}{6}$

3. Multiply the following fractions:

a) $5 \times 3\frac{1}{2} =$

b) $\frac{8}{7} \times \frac{7}{24} =$

c) $3\frac{2}{3} \times 1\frac{1}{3} =$

4. Divide the following fractions:

a) $5 \div \frac{1}{4} =$

b) $\frac{3}{8} \div \frac{1}{4}$

c) $\frac{10}{9} \div \frac{55}{3}$