September 2018

Dear Incoming Geometry Honor Student:

The following packet was created to assist you in preparing you for your first Honors level Mathematics course at Arlington High School. While this is not mandatory, you are strongly urged to complete it as the Honors course will use these topics to extend the basic standards of Common Core Geometry. Should you have difficulty with a particular topic contained in this packet, please feel free to visit the free websites http://www.emathinstruction.com or http://www.khanacademy.org for videos on the respective topics that you may have difficulty remembering. The answers will be provided on the school website on Blackboard. We look forward to meeting you and expanding your knowledge of Geometry.

Sincerely,

The Geometry Honors Teachers

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Simplifying radicals

Write each of the following square roots in simplest radical form.

(a) $\sqrt{8}$

(b) $\sqrt{45}$

(c) $\sqrt{48}$

(d) $-\sqrt{75}$

(e) $\sqrt{72}$

(f) $-\sqrt{500}$

Multiplying and Dividing Radicals

Write each of the following products in **simplest radical form**. The first is done as an example for you.

(a) $3\sqrt{12} =$

$= 3 \cdot \sqrt{4} \cdot \sqrt{3}$

$= 3 \cdot 2 \cdot \sqrt{3}$

$= 6\sqrt{3}$

(b) $4\sqrt{45} =$

(c) $\dfrac{1}{2}\sqrt{32} =$

(d) $-2\sqrt{288} =$

(e) $\dfrac{\sqrt{108}}{3} =$

(f) $\dfrac{-\sqrt{320}}{16} =$

(g) $\sqrt{\dfrac{1}{2}} \cdot \sqrt{\dfrac{1}{18}} =$

(h) $\sqrt{\dfrac{3}{4}} \cdot \sqrt{\dfrac{27}{4}} =$

Completing the Square (with a = 1 and a ≠ 1) and solving

1. Place each of the following quadratic functions, written in standard form, into vertex form by completing the square. Then, identify the coordinates of its turning point.

(a) $y = x^2 - 12x + 40$

(b) $y = x^2 + 4x + 14$

(c) $y = x^2 - 24x + 146$

2. Use the Method of Completing the Square to write each of the following quadratic functions in the vertex form $y = a(x-h)^2 + k$. Identify the turning point of the quadratic from this form. State whether it is a maximum or minimum.

(a) $y = 5x^2 + 20x + 23$

(b) $y = -2x^2 + 4x + 7$

$(c)\, y = 3x^2 + 9x + 1$

Multiplying binomials (including conjugate pairs)

Write each of the following as an equivalent trinomial.

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

(b) $(x-1)^2$

(c) $(x+4)^2$

(d) $(2x-1)^2$

(e) $(3x+2)^2$

(f) $(x+y)^2$

(g) $(x-2)(x+2)$

(h) $(4-y)(4+y)$

(i) $(3y+x)(3y-x)$

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

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

(l) $(4x-3)(2x+1)$

Factoring including a $\neq 1$

1. Solve each of the following:

   (a) $(3x+1)(x-2)=0$

   (b) $5(x-3)(x+8)=0$

2. Solve each of the following by factoring:

   (a) $2x^2-19x+35=0$

   (b) $4x^2-52x=120$

   (c) $25x^2-9=0$

   (d) $\frac{1}{4}x^2-49=0$

3. Solve each of the following by factoring:

   (a) $30x^2-80x=0$

   (b) $x^2-x=0$

4. Solve each of the following by factoring a binomial gcf out of each term:

   (a) $(2x-1)(x+5)+(2x-1)(x-2)=0$

   (b) $(x-8)(5x+4)-(x-8)(2x+6)=0$

Writing equations of lines (including point slope)

1. Find the equation of the line that passes through each of the following pairs of points in

   i.   Point-slope form $(y - y_1) = m(x - x_1)$

   ii.   Slope-intercept form $y = mx + b$ form.

(a) $(1, 7)$ and $(4, 22)$ (b) $(-2, 13)$ and $(2, 3)$

(c) $(4, 6)$ and $(10, 0)$ (d) $(0, -10)$ and $(16, 2)$

2. Write the equations of lines that fit the following descriptions. Sketch a picture if needed.

   (a) A vertical line that passes through the point $(4, -7)$.

   (b) A horizontal line that passes through the point $(-2, 3)$.

   (c) A line parallel to the x-axis that passes through the point $(-2, 15)$.

   (d) A line perpendicular to the x-axis that passes through the point $(5, 1)$.

Translating English to Algebra

Translate each of the following statements into an algebraic expression.

(a) If x represents a number, then write an expression for a number that is three more than twice the value of x.

(b) If s represents Sally's age and her father is 4 years less than five times her age, then write an expression for her father's age in terms of the variable s.

(c) If x represents a number, then write an expression for three times the sum of x and 10.

(d) If n represents a number, then write an expression for 7 less than four times the difference of n and 5.

(e) If x represents a number, then write an expression for the ratio of 3 less than x to 2 more than x.

(f) If x represents a number, then write an expression for the sum of twice x with twice a number one larger than x.

(g) If n represents a number, then write an expression for the quotient of twice n with three less than n.

(h) If y represents a number, then write an expression for three-quarters of the difference of y and 8.

(i) If x represents a number, then write an expression for one half the sum of x and 4.

Function notation

1. Given the function $f(x) = 3x - 1$, find the following:

(a) $f(-2)$ (b) $f(x) = 0$ (c) $f(3)$ (d) $f(x) = \dfrac{1}{3}$

2. Given the function $g(x) = x^2 - 9$, find the following:

   a. $g(-2)$ b. $g(2)$ c. $g(0)$ (d) $g(-3)$

Conversions

1. How many centimeters are there in 2 yards if there are 2.54 centimeters per inch? Show your work and express your answer without rounding.

2. If there are 1000 grams in a kilogram and 454 grams in a pound, how many pounds are there per kilogram? Round to the *nearest tenth* of a pound.

3. Water is flowing out of an artesian spring at a rate of 10 cubic feet per minute. How many minutes will it take for the water to fill up a 400 gallon tank. There are 7.5 gallons of water per cubic foot. Show or explain how you arrive at your answer.

4. A senior citizen speed walks 100 yards in 30 seconds.

(a) Determine the number of feet per second the runner is traveling at. Show your work.

(b) If there are 5280 feet in a mile and 3600 seconds in an hour, determine the senior citizen's speed in miles per hour. Round to the nearest tenth.

Systems of equations (both methods)

1. Solve each of the following systems by the Method of Elimination.

(a) $x - y = 7$

$x + y = 5$

(b) $2x + 5y = 3$

$-2x - y = 5$

(c) $x - y = 15$

$4x + 2y = 30$

(d) $2x + 3y = 17$

$5x + 6y = 32$

(e) $2x + 3y = 16$

$5x - 2y = 21$

(f) $6x - 7y = 25$

$15x + 3y = 42$

2. Solve each of the following system of equations by substitution.

(a) $y = x + 8$

$y = 4x - 1$

(b) $y = -3x + 5$

$2x + y = 6$

(c) $4x + 3y = 37$

$y = x - 4$

(d) $x - 5y = -49$

$y = -2x + 1$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. Solve the equation $x^2 - 4x - 12 = 0$ two ways:

(a) By Factoring

(b) By the Quadratic Formula

2. Solve the equation $x^2 + 6x + 3 = 0$ two ways. Express your answers both times in simplest radical form.

   (a) By Completing the Square   (b) By the Quadratic Formula

3. Solve the equation $2x^2 - 13x + 20 = 0$ two ways:

   (a) By Factoring   (b) By the Quadratic Formula

4. If the quadratic formula is used to solve the equation $x^2 - 4x - 41 = 0$, the correct roots are

   (1) $4 \pm 3\sqrt{10}$ (3) $-4 \pm 3\sqrt{10}$

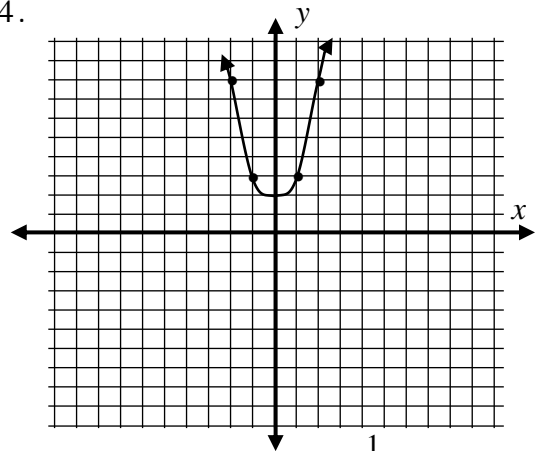   (2) $2 \pm 3\sqrt{5}$ (4) $-2 \pm 3\sqrt{5}$

Function Transformations

1. Given the function $f(x)$ shown in the table below, which of the following represents the value of $g(4)$ given that $g(x) = 2f(x) + 3$?

(1) 7   (3) 3

(2) 32   (4) 11

x	$f(x)$
0	4
1	7
2	10
3	13
4	16
5	19

2. The quadratic function $f(x) = x^2 + 2$ is shown graphed on the grid below. Two additional functions are defined as $g(x) = \frac{1}{2}f(x)$ and $h(x) = f(x) - 4$.

(a) Graph $g(x)$ on the grid and label it. What is the effect of multiplying $f(x)$ by $\frac{1}{2}$?

(b) Graph $h(x)$ on the grid and label it. What is the effect of subtracting 4 from $f(x)$?

3. Find equations for $g(x)$ and $h(x)$ in terms of x.