THE KNOX SCHOOL

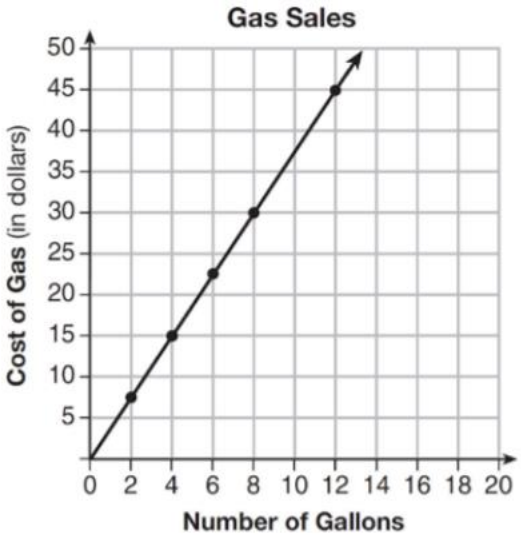
Algebra II
2020 Summer Assignment

Directions: You must show all work, even for multiple choice. Any graphing problem should be done without a graphing calculator.

Due Date: First day of school! You will be held accountable for this material upon your return to school. Yes, that means a test or a quiz on this material is going to happen.

Multiple Choice

1. The graph below was created by an employee at a gas station.



Which statement can be justified by using the graph?

1) If 10 gallons of gas was purchased, $35 was paid.
2) For every gallon of gas purchased, $3.75 was paid.
3) For every 2 gallons of gas purchased, $5.00 was paid.
4) If zero gallons of gas were purchased, zero

2. Given the following expressions:

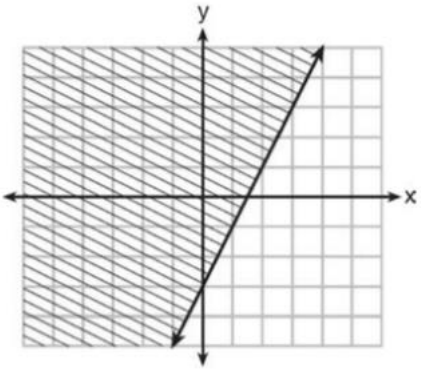
I. $-\frac{5}{8}+\frac{3}{5}$ III. $\left(\sqrt{5}\right)\cdot\left(\sqrt{5}\right)$

II. $\frac{1}{2}+\sqrt{2}$ IV. $3\cdot\left(\sqrt{49}\right)$

Which expression(s) result in an irrational number?

1) II, only
2) III, only
3) I, III, IV
4) II, III, IV

3. Which inequality is represented by the graph below?



1) $y \le 2x-3$
2) $y \ge 2x-3$
3) $y \le -3x+2$
4) $y \ge -3x+2$

4. Which ordered pair is *not* in the solution set of $y > -\frac{1}{2}x+5$ and $y \le 3x-2$?

1) (5,3)
2) (4,3)
3) (3,4)
4) (4,4)

5. If the quadratic formula is used to find the roots of the equation $x^2-6x-19=0$, the correct roots are

1) $3\pm 2\sqrt{7}$
2) $-3\pm 2\sqrt{7}$
3) $3\pm 4\sqrt{14}$
4) $-3\pm 4\sqrt{14}$

6. The expression $3(x^2 - 1) - (x^2 - 7x + 10)$ is equivalent to

1) $2x^2 - 7x + 7$
2) $2x^2 + 7x - 13$
3) $2x^2 - 7x + 9$
4) $2x^2 + 7x - 11$

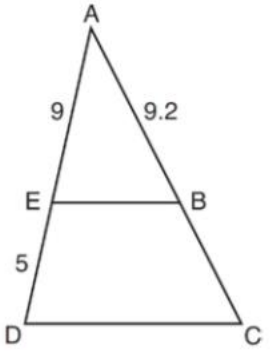
7. When $3x + 2 \leq 5(x - 4)$ is solved for x, the solution is

1) $x \leq 3$
2) $x \geq 3$
3) $x \leq -11$
4) $x \geq 11$

8. What are the roots of the equation $x^2 + 4x - 16 = 0$?

(1) $2 \pm 2\sqrt{5}$
(2) $-2 \pm 2\sqrt{5}$
(3) $2 \pm 4\sqrt{5}$
(4) $-2 \pm 4\sqrt{5}$

9. In the diagram of $\triangle ADC$ below, $\overline{EB} \parallel \overline{DC}$, $AE = 9$, $ED = 5$, and $AB = 9.2$.



What is the length of $\overline{AC}$, to the *nearest tenth*?

1) 5.1
2) 5.2
3) 14.3
4) 14.4

10. The center of circle Q has coordinates $(3,-2)$. If circle Q passes through $R(7,1)$, what is the length of its diameter?

1) 50
2) 25
3) 10
4) 5

11. Beach Bike Rentals charges $5.00 to rent a bike plus $0.20 per mile. Write an equation for the total cost C of renting a bicycle and riding it m miles.

1) $C = 5 + 0.20m$
2) $C = 0.20 + 5m$
3) $m = 5 + 0.20C$
4) $m = 0.20 + 5C$

12. Write the equation of the line below in slope-intercept form.

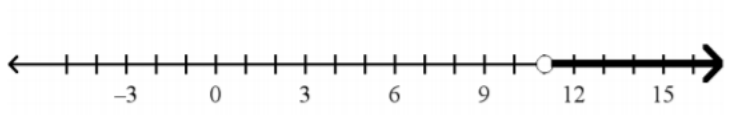
$$y + 3 = 2(x - 1)$$

1) $y = 2x - 5$
2) $y = 2x + 5$
3) $y = -2x + 5$
4) $y = -2x - 5$

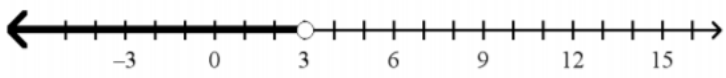
13. Solve the inequality. Choose the appropriate solution below.

$$k - 4 < 7$$

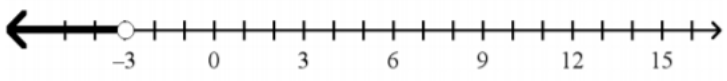
1) $k > 11$



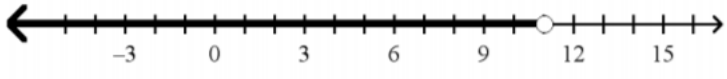
2) $k < 3$



3) $k < -3$



4) $k < 11$



14. Solve the inequality:

$$4a + 3 - 7a > 15 >$$

1) $a > -4$
2) $a > 3$
3) $a < -4$
4) $a < -6$

15. Solve the inequality:

$$-2(6z + 9) \leq -6(2z - 4)$$

1) All real numbers
2) No solution
3) $-24z \leq 42$
4) $z \leq 42$

16. Put into scientific notation: 0.00241

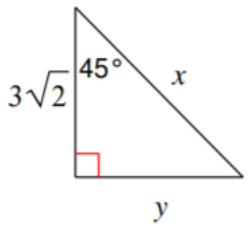
1) 24.1×10^{-4}
2) 241×10^{-5}
3) 2.41×10^{-3}
4) 0.241×10^{-2}

17. Put into scientific notation: 354.21

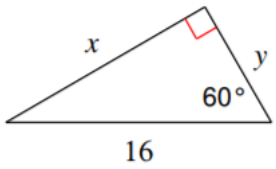
1) 3.5421×10^{-2}
2) 35421×10^{2}
3) 0.35421×10^{3}
4) 3.5421×10^{2}

Free Response Questions-Again, show all work for the following problems.

18. Find the missing sides of the special right triangle below. Use the relationships you learned in geometry. Answers should be left in radical form.



19. Find the missing sides of the special right triangle below. Use the relationships you learned in geometry. Answers should be left in radical form.



20. Solve the system of equations.

$$2x + 2y = 16$$
$$3x - y = 4$$

21. The volume of a cylinder is found by using the formula: $V = \pi r^2 h$. Solve for r.

22. Find the $x\ and\ y$ intercepts for the function: $3x - 2y = 6$.

23. $f(x) = (2x - 1)(x + 3) - 4x + 7$. Multiply and combine like terms. Write answer in standard form.

24. Find the slope and y-intercept for the linear equation below.
$5x - 2y = 8$

25. Find the equation of a line in either point-slope form or slope intercept form that passes through the point $(-3,2)$ that is parallel to the line $2y = 6x - 10$.

26. Find the equation of a line in either point-slope form or slope intercept form that passes through the point $(6, -1)$ that is perpendicular to the line $y = \frac{2}{3}x + 4$.

27. Find the area of a circle that has a circumference of $6\pi\ centimeters$. Leave your answer in terms of π.

28. Solve for x in the equation below. Answer should be in left in fraction form and don't forget to show all work.

$$\frac{1}{2}x + 6 = -2x + 7$$

29. If $f(x) = -5x^2 + 2x - 1,\ find\ f(-1)$.

30. Solve the compound inequality and shade answer on a number line.

$$x + 2 \geq 1 \quad and \quad x - 4 < 3$$

31. The sum of two numbers is 90. Their difference is 12. Write an equation and use it to find the numbers.

#32-34: Simplify completely. Leave no negative exponents.

32. $(a^4b^3)(a^2b)$

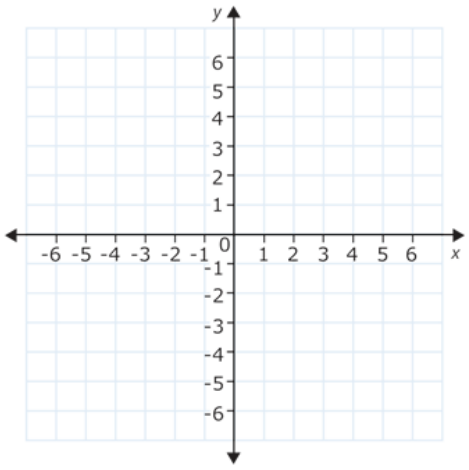
33. $\frac{x^3y^8}{x^4y^3}$

34. $(5x^2y^3)^2$

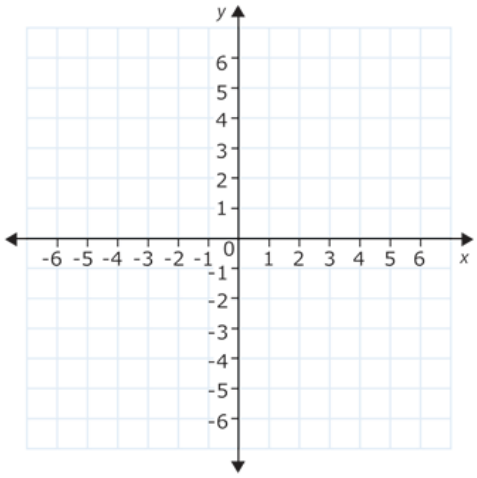
35. Simplify without using a calculator.

$$7\left(\frac{1}{2}\right) - \frac{3}{4} + 5\left(\frac{1}{4}\right)$$

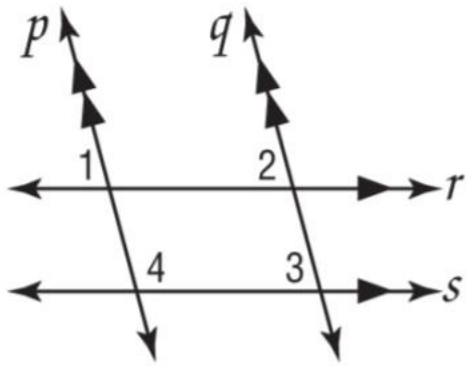
36. Graph the line $y = 4$. What is the slope of this line?



37. Graph the line $3y + 12 = 4x$



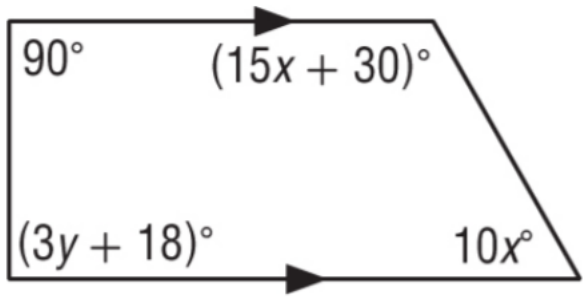
38. In the figure below. $m\measuredangle 1 = 3x + 15, m\measuredangle 2 = 4x - 5, m\measuredangle 3 = 5y$, find the values of x and y.



39. Simplify the radical expression. Leave answers in simplest radical form.

$$\sqrt{45} - 3\sqrt{20} + 4\sqrt{50}$$

40. Find the values of $x \; and \; y$ in the figure below.



Formula Sheet-Math Summer Assignment

Midpoint Formula: $\bar{x} = \frac{x_1+x_2}{2}$ $\bar{y} = \frac{y_1+y_2}{2}$

Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Triangle	$A = \frac{1}{2}bh$	Pythagorean Theorem	$a^2 + b^2 = c^2$
Parallelogram	$A = bh$	Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Circle	$A = \pi r^2$	Arithmetic Sequence	$a_n = a_1 + (n-1)d$
Circle	$C = \pi d$ or $C = 2\pi r$	Geometric Sequence	$a_n = a_1 r^{n-1}$
General Prisms	$V = Bh$	Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1-r}$ where $r \neq 1$
Cylinder	$V = \pi r^2 h$	Radians	$1 \text{ radian} = \frac{180}{\pi} \text{ degrees}$
Sphere	$V = \frac{4}{3}\pi r^3$	Degrees	$1 \text{ degree} = \frac{\pi}{180} \text{ radians}$
Cone	$V = \frac{1}{3}\pi r^2 h$	Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$
Pyramid	$V = \frac{1}{3}Bh$		

Algebra II Vocabulary Terms to Know

Absolute value: A number's distance from zero on a number line. Distance is expressed as a positive value.

Binomial: A polynomial containing 2 terms: (e.g. 3x+5)

Coefficient: The number that multiplies with the variable(s) in an algebraic expression (e.g., 4xy). If no number is specified, the coefficient is 1.

Complex fraction: A fraction with one or more fractions embedded in the numerator and/or denominator (e.g., $\frac{\frac{1}{2}}{\frac{2}{3}}$).

Composition of functions: Combining two functions by taking the output of one and using it as the input of another. If the output of g is used as the input of f, then the composition is referred to as "f of g of x" and is denoted f(g(x)) or f∘g(x).

Constant: Any value that does not change.

Dependent Variable: See Range below.

Difference: A number that is the result of subtraction

Discriminant: An algebraic expression related to the coefficients of a quadratic equation that can be used to determine the number and type of solutions to the equation. If ax^2+bx+c=0, the discriminant is found by calculating $b^2 - 4ac$.

Domain: The set of values of the independent variable(s) for which a function or relation is defined.

Equation: A mathematical sentence stating that the two expressions have the same value. Also read as the definition of equality.

Expression: A mathematical phrase that contains variables, functions, numbers, and/or operations. An expression does **not** contain equal or inequality signs.

Factor: A number or expression that is multiplied by one or more other numbers or expressions to yield a product.

Formula: A rule that shows the relationship between two or more quantities; involving numbers and/or variables.

Independent variable: See Domain.

Index: The “root” of a radical. If no number is written the index is a 2. (e.g., $\sqrt{6}$ *or* $\sqrt[3]{7}$) In the first example, the index is a 2. In the second example, the index is a 3.

Intercept: The points where a curve or line drawn on a rectangular coordinate-system graph intersect the vertical and horizontal axes. X-intercepts are also called roots or zeros.

Line: A collection of an infinite number of points in a straight pathway with unlimited length and having no width.

Linear equation: An algebraic equation in which the variable quantity or quantities are raised to the zero or first power.

Literal equations: An equation that contains more than one variable; an implicit equation; often mathematical formula

Monomial: A polynomial with one term such as 5, -2xyz, or xy4

Parabola: A locus of points whose perpendicular distances to a line, called the directrix, and to a fixed point, called the focus, are equal. The graph of any quadratic function is a parabola and a parabola always has a quadratic equation. The equation for a vertical parabola is y = a(x - h) 2 + k, where (h,k) is the vertex of the parabola.

Parallel:

Perpendicular: Two lines, two line segments, or two planes are said to be perpendicular when they intersect at a right angle.

Point: A specific location in space that has no discernible length or width. Product: The result of multiplying numbers together.

Polynomial: The sum or difference of terms which have variables raised to positive integer powers and which have coefficients that may be real or complex. Standard form for a polynomial in one variable is when the polynomial is written in descending order (highest to lowest power of x) (e.g., $6x^3 - 2x^2 + 7x - 1$. Even though the prefix poly- means many, the word polynomial refers to polynomials with 1 term (monomials), 2 terms (binomials), 3 terms, (trinomials), etc.

Polynomial Function: A function that can be written as f(x) = $a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x^1 + a_0$, where might be real or complex.

Product: The answer to a multiplication problem.

Proportional: Having the same or a constant ratio. Two quantities that have the same ratio are considered directly proportional. Two quantities whose products are always the same are considered inversely proportional.

Quadratic Equation: A second-order polynomial equation in a single variable x with a≠0: $ax^2 + bx + c = 0$. Because it is a second-order polynomial equation, the fundamental theorem of algebra guarantees that it has two solutions that may be both real or both complex.

Quotient: The answer to a division problem.

Radical: The symbol used to indicate a root. The expression is therefore read “x radical n” or "the nth root of x." A radical without an index number is understood to be a square root.

Range: The set of all dependent variables (y values) for which the function or relation is defined.

Real number: The set of all rational and irrational numbers. Real-world problem: A problem that is an application of a mathematical concept in a real-life situation.

Remainder: In a whole-number division problem, the final undivided part that is less than the divisor and “left over” after dividing.

Root: A root of a polynomial is a number x such that P(x)=0. A polynomial of degree n has n complex roots. Also called a zero or an x-intercept.

Sequence: A list of numbers set apart by commas, such as -1, 1, -1, 1, -1, …

Set: A set is a finite or infinite collection of distinct objects in which order has no significance.

Simplify: The process of converting a fraction or mixed number, to an equivalent fraction, or mixed number, in which the greatest common factor of the numerator and the denominator of the fraction is one. Simplify also refers to using the rules of arithmetic and algebra to rewrite an expression as simply as possible.

Slope: The ratio of change in the vertical axis (y-axis) to each unit change in the horizontal axis (x-axis) in the form rise/run or change in y divided by the change in x. Also the constant, m, in the linear equation for the slope-intercept form y =mx + b, where $m = \frac{y_2 - y_1}{x_2 - x_1}$

Symmetry: An intrinsic property of a mathematical object which causes it to remain invariant under certain classes of transformations (such as rotation, reflection, or translation).

System of equations: A group of two or more equations that are related to the same situation and share variables. The solution to a system of equations is an ordered number set that makes all of the equations true.

Term: A single number or variable or a combination of a single number and variable(s) (e.g., 5, 3x, $5x^2y$)

Transformation: An operation on a figure by which another image is created. Common transformations include reflections (flips), translations (slides), rotations (turns) and dilations.

Variable: Any symbol, usually a letter, which could represent a number. A variable might vary as in f(x)=2x+1, or a variable might be fixed as in 2x+1=5.

Vertex: The point common to the two rays that form an angle; the point common to any two sides of a polygon; the point common to three or more edges of a polyhedron. A vertex is also a point on a parabola or other function through which the graph has symmetry.