Spotswood High School
Mathematics Department

To: All students going into Honors Algebra II
From: Honors Algebra 2 Teachers
Re: Summer Project
Date: June 2017

To assist you in having a successful year in Honors Algebra II you will be required to complete a project this summer. This project provides a review of important topics from Algebra I and Geometry. To gain the optimal benefit from this assignment, it is recommended that you work on it at least once every two weeks during the summer months, rather than doing it all at once. Waiting until the end of the summer will only cause stress.

Important information regarding the Summer Project:

1. Due Date: **The First Day of School** –completion of the packet will account for your first grade of the year.
2. Do your best to answer all questions. Show all work neatly in the space provided and **use a pencil, not a pen**!
3. Some reference sheets are included to assist you with the project. It would also be helpful if you still have your Algebra 1 and Geometry notebooks. If you are still having trouble, you can consult the internet for help.
4. You will have a test over the material in the packet within the first few days of school.

Note: Graphing calculators will be used extensively throughout this course and are a tremendous aid in understanding the material. If you do not already own a graphing calculator it is **strongly recommended** that you purchase or borrow a Texas Instrument 83/84-Plus Graphing Calculator. Each classroom has a set of Texas Instrument 83-Plus Graphing Calculators for use at school but these cannot be loaned out to be used at home.

Have a happy and safe summer!

Honors Algebra 2 Teachers
Spotswood High School

✏The Real Number System

Real numbers are numbers that can be pictured as points on a real number line. The numbers we use most often in algebra are real numbers. Some important subsets of the real numbers are listed below.

Natural Numbers ($\mathbb{N}$): 1, 2, 3, …..

Whole Numbers ($\mathbb{W}$): 0, 1, 2, 3, ……

Integers ($\mathbb{Z}$): …., -3, -2, -1, 0, 1, 2, 3, …..

Rational Numbers ($\mathbb{Q}$): Numbers that either are fractions or can be written as fractions such as $\frac{3}{5}$, $-\frac{1}{2}$, 5, 0.75, $0.\overline{3}$, 25%. When written as decimals, rational numbers terminate or repeat.

Irrational Numbers: Numbers that when written as decimals neither repeat nor terminate such as π or $\sqrt{3}$ or 0.21435618.....

Practice

List all sets to which each number belongs.

1. $-\frac{11}{2}$ 2. 2.7652 3. $\sqrt{5}$ 4. $\frac{3}{0}$

5. Order the numbers from least to greatest: $\pi,\ 2.\overline{3},\ \sqrt{11},\ 3.14,\ 2.3$

Tell whether each statement is true or false. If false, give a counterexample.

6. Every natural number is an integer.

7. Every real number is irrational.

8. Every integer is a whole number.

9. Every integer is NOT irrational.

✏Properties of Real Numbers

When you add or multiply real numbers, there are several properties to remember.

Property	**Addition**	**Multiplication**
Closure	$a+b$ is a real number	$a \cdot b$ is a real number
Commutative	$a+b=b+a$	$a \cdot b = b \cdot a$
Associative	$(a+b)+c=a+(b+c)$	$(ab)c=a(bc)$
Identity	$a+0=a$	$a \cdot 1 = a$
Inverse	$a+(-a)=0$	$a \cdot \frac{1}{a} = 1$

The following property involves both addition and multiplication.

Distributive $a(b+c)=ab+ac$

Practice

Classify each statement as sometimes, always, or never true. Give examples or properties to support your answer.

10. $a \cdot b = a$ when $b=3$

11. $3(a+1)=3a+3$

12. $a-(b-c)=a-b-c$

13. $ab\left(\frac{1}{ab}\right)=0$ for $a \neq 0$ and $b \neq 0$

14. $a \div b = b \div a$

✏Properties of Square Roots

Product Property: $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$ where a and b are positive numbers

Quotient Property: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ where a and b are positive numbers and $b \neq 0$

**An expression containing square roots is in simplest form when:

- the radicand has no perfect square factors other than 1.
- the radicand has no fractions.
- there are no square roots in any denominator.

Two radicals are **<u>like radicals</u>** if they have the same index and the same radicand.

Example: $2\sqrt[3]{5}$ and $4\sqrt[3]{5}$ are like radicals. Only like radicals can be added or subtracted.

Practice

Simplify each expression. Rationalize the denominator, if necessary.

15. $\sqrt{162}$

16. $-\sqrt{\frac{1}{121}}$

17. $\sqrt{\frac{50}{9}}$

18. $\frac{\sqrt{288}}{\sqrt{8}}$

Add, subtract, multiply, or divide.

19. $6\sqrt{7} + 7\sqrt{7}$

20. $\sqrt{8} - 15\sqrt{2}$

21. $\frac{3 + 2\sqrt{7}}{\sqrt{7}}$

22. $\frac{4\sqrt{10} - \sqrt{90}}{\sqrt{2}}$

23. $3\sqrt{50} \cdot 3\sqrt{8}$

24. A building has a mural painted on an outside wall. The mural is a square with an area of 14,400 ft^2. What is the width of the mural?

✏Properties of Exponents

Let *a* and *b* be real numbers and let *m* and *n* be rational numbers (fractions).

- $a^m \cdot a^n = a^{m+n}$
- $(a^m)^n = a^{m \cdot n}$
- $(ab)^m = a^m b^m$
- $a^{-m} = \frac{1}{a^m}$
- $\frac{a^m}{a^n} = a^{m-n}$
- $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

Practice
Simplify each expression. Assume all variables are nonzero.

25. $\left(-2x^5y^3\right)^3$

26. $\frac{-24x^4y^{-6}}{14x^{-3}y^3}$

27. $\left(\frac{r^2s^2}{s^3}\right)^2$

✏Functions & Relations

Function Notation: *f(x)* – read "*f of x*"; replaces "*y*" in an equation

Relation – a pairing of input values with output values
Input values – *x* values (domain)
Output values – *y* values (range)
Function – a relation in which each domain value is paired with only one range value.

Practice

For each function, evaluate $f(-1),\ f(0),$ and $f\left(\frac{3}{2}\right)$.

28. $f(x) = -4x + 2$

29. $f(x) = 3x^2 + x$

30. $f(x) = \frac{x}{2} - 1$

31. Give the domain and range for each relation below.

First-Class Stamp Rates						
Year	1900	1920	1940	1960	1980	2000
Rate (¢)	2	2	3	4	15	33

Domain: _____

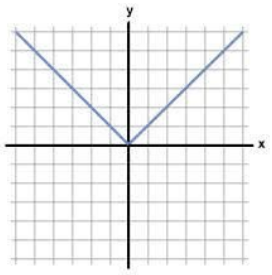
Range: _____

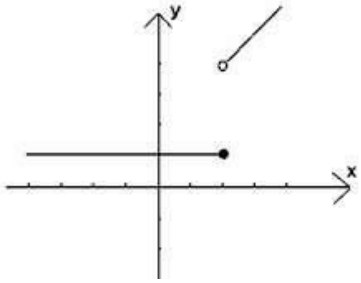
32. $f(x) = \sqrt{2x-3}$

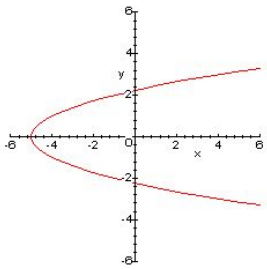
Domain: _____

Range: _____

33. Decide if each graph represents a function. Why or why not?







34. In 1999 the U.S. Mint began releasing quarters to commemorate each of the 50 states. The release schedule specified that each year for a total of 10 years, new quarters commemorating 5 different states would be released. Decide if each relation is a function.

a. from each year to the number of states with new quarters released in that year

b. from each state to the year its quarter was released

c. from each year to the states with new quarters released in that year

d. from each year to the total number of states with quarters released by the end of that year

e. from the number of new quarters released each year to the year

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✏Solving Linear Equations and Inequalities

35. $|6-2n| = 24$

36. $-\frac{x}{5} = 30$

37. $\frac{2}{3}+\frac{3}{4}+\frac{5}{6}+p=3$

38. $7(x+1)=1-2(5-x)$

Solve and graph the inequalities on a number line.

39. $-2 \le x+3 \le 6$

40. $x+\frac{1}{2} \le -3$ or $x-3>-2$

41. Solve and graph the solution. $\left|\frac{1}{4}x-\frac{1}{3}\right|>\frac{1}{3}$

42. Solve for x. $\frac{3}{2x}+\frac{5}{6}=\frac{1}{4}$

✏Writing Linear Equations

Standard Form: $Ax + By = C$

Slope-Intercept Form: $y = mx + b$

Point-Slope Form: $y - y_1 = m(x - x_1)$,

43. Find the slope of the line through the points (-1, 5) and (-6, -10).

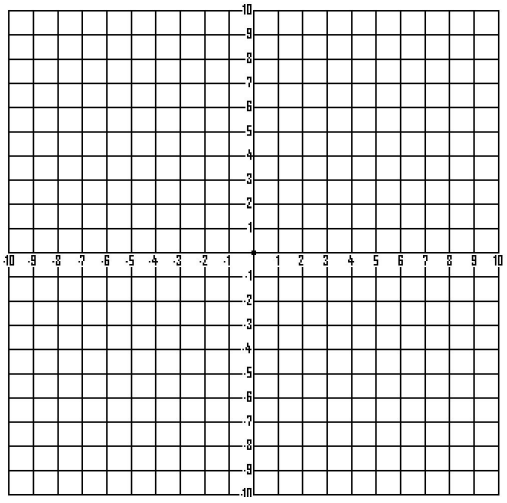
44. Write the equation of the line that passes through the points $(3,5)$ and $(-2,1)$. Give your answer in (a) slope-intercept form and (b) standard form.

✏Graphing Linear Equations and Inequalities

45. Find the x-intercept and y-intercept of the line: $-9y - 12x = 27$. Graph the line.

x-intercept: _____

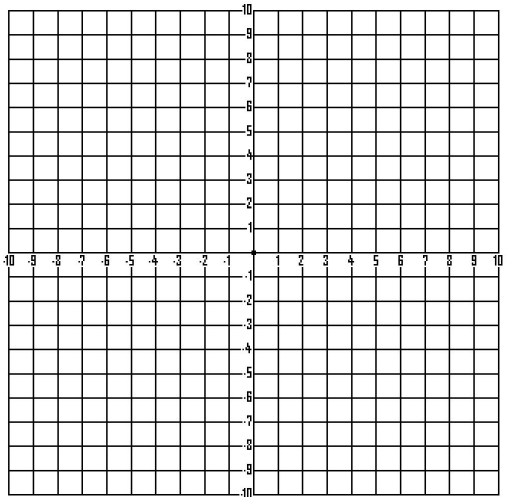
y-intercept: _____



46. Write the equation in slope intercept form. Then sketch the line.

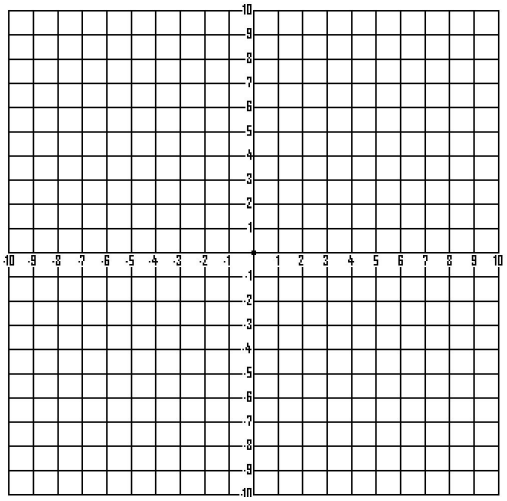
$$2x - 10y = 15$$

Equation: _____



47. Write the inequality in slope-intercept form and graph.

$$-2x - 3y < 6$$



✏ Solving Absolute Value Functions

48. Solve the absolute value equation.

$$\frac{|3x - 4|}{-5} = 6$$

49. Solve the absolute value inequality.

$$-3|5x-8|-5 \geq 6$$

✏ Linear Systems

Classification	Consistent and Independent	Consistent and Dependent	Inconsistent
Number of Solutions	Exactly One	Infinitely Many	None
Description	Different Slopes	Same Slope, Same y-intercept	Same Slope, Different y-intercept
Graph	Intersecting Lines	Coinciding Lines	Parallel Lines

50. Solve the system of equations using elimination or substitution.

$$\begin{cases} 2x+6y=-8 \\ 5x-3y=88 \end{cases}$$

51. A locksmith charges $25 to make a house call and $15 for each lock that is re-keyed. Another locksmith charges $10 to make a house call and $20 for each lock that is re-keyed. For how many locks will the total costs be the same? Use a system of equations to solve the problem.

52. Classify the system and determine the number of solutions.

$$\begin{cases} -x + \frac{3}{4}y = 4 \\ 8x - 6y = -8 \end{cases}$$

Quadratic Equations

53. Use the quadratic formula to find the solutions to the equation.

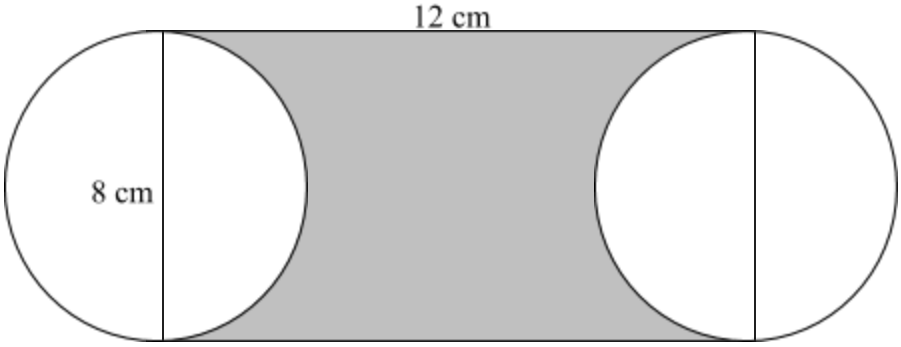
$x^2 - 8x + 14 = 0$

54. Use factoring to find the solutions to the equation.

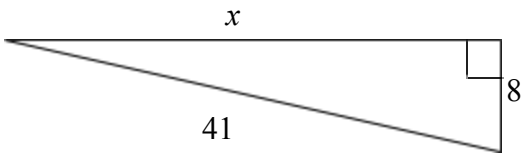
$x^2 - 5x = 6$

✏ Miscellaneous Math Topics

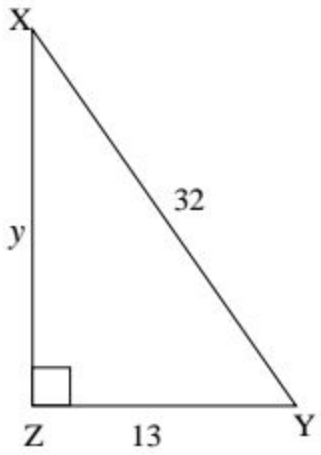
55. Find the area of the shaded region.



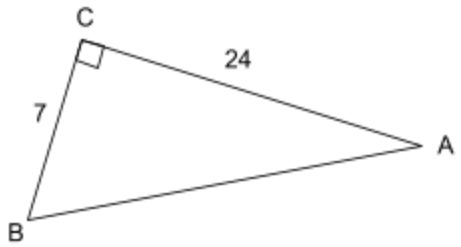
56. Use the Pythagorean Theorem to find x.



57. Solve the right triangle.



58. Find the values of sine, cosine, and tangent for angle A. (Think SOH CAH TOA!)



59. Solve for z in terms of y.

$$y^2z + 7z = y$$

60. $MNPQ \sim RSTU$

Find the measure of *x*, *y*, and *z*.