

Falls Church High School Math Department

Dear 2009-2010 student,

Congratulations on your promotion to Algebra 2. Attached to this letter you will find a list of supplies needed for Algebra 2, and a packet of materials for you to work on over the summer. This packet is designed to help you prepare for Algebra 2. It provides a review of topics from Algebra 1 and Geometry and will be available on our school website if you lose this copy!

This packet is due on the first day you return to class in September. **It is worth 30 points in homework and must be complete on the first day of school for full credit. Your credit will be scaled down after the first day by 10 points for each class period it is incomplete.** By the end of the first week of school you will be given a **test** on the material from this packet. The test will count as part of your first quarter grade and will be used to plan your review and JAG/after school remediation as necessary. If you fail the test, **you must begin remediation** upon your teacher's request. Remediation may be during JAG or after school depending on your teacher's request.

If you need more review over the summer, there are many resources to be found at the county library and on the Internet. If you find that you have questions, you can ask them and get additional practice from "Ask Dr. Math", You can also view lists of questions previously asked by other students, with answers provided. The site is www.mathforum.org/dr.math/ or visit www.algebra1.com; or www.purplemath.com for additional review. If you would like additional questions that are interactive, visit <http://education.jlab.org/solquiz/>. **Choose Algebra 1,** random questions, all objectives. There are explanations for all questions you get incorrect as you review.

Algebra 2 continues the foundation for our advanced math courses, and we expect a high level of performance from all students over the coming year. We expect you to take the initiative to inquire about concepts that you don't understand including any information in this packet. The Algebra 2 Team hopes you enjoy your summer vacation and looks forward to seeing you in September!

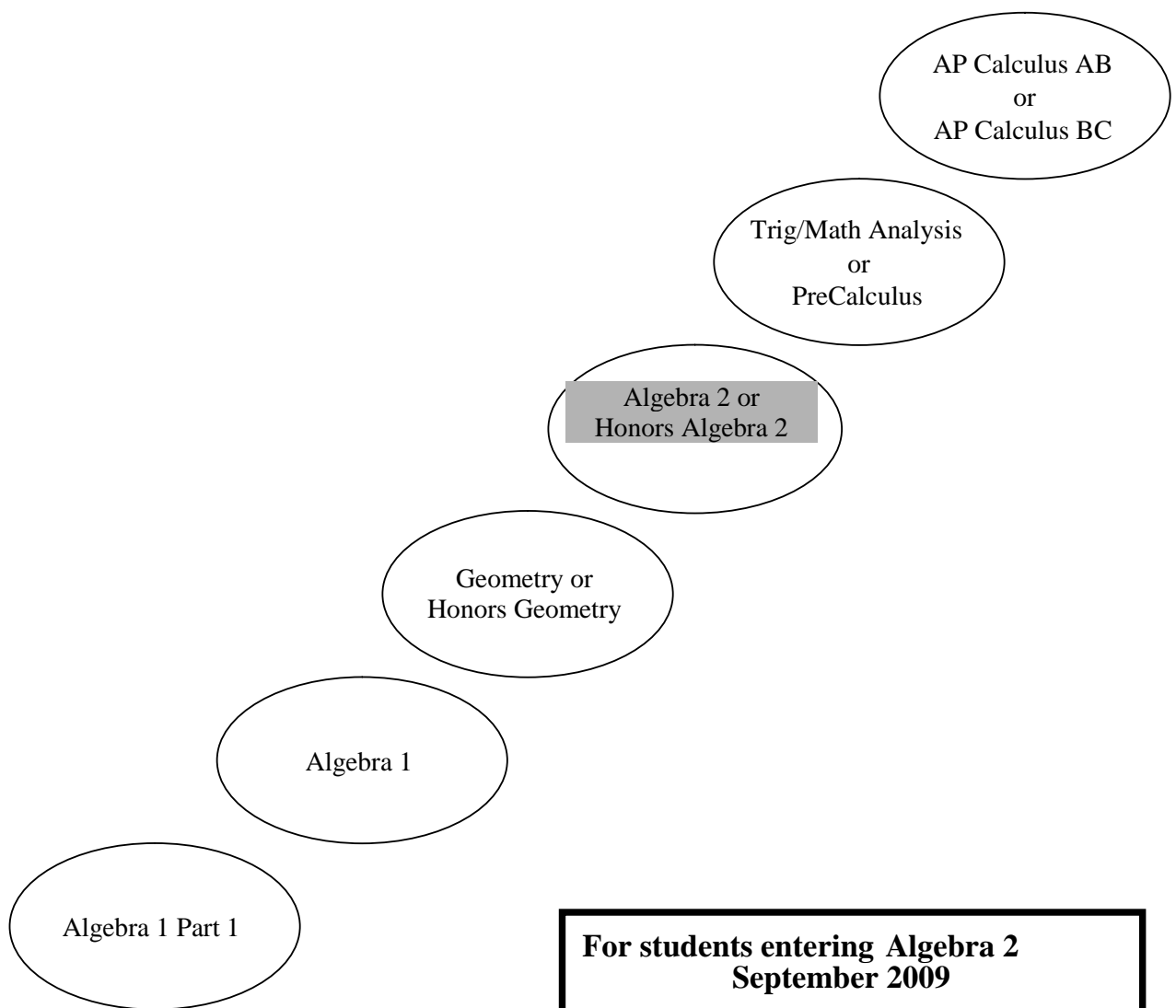
Enjoy,
The Algebra 2 Team

Supplies for next year:

During the summer you may find all or some of these tools on sale at Office Depot, Staples, Target, Wal Mart, or other large chain stores. Take advantage of discounts offered you on any of the following items during the summer and just before school begins:

- **Ti 83 or 84 series graphing calculator**
- **Pencils**
- **Erasers**
- **Ruler**
- **Checking pens**
- **Highlighters**
- **Graph paper**
- **Book cover**
- **White board Markers, 1 set of 4 colors**
- **Notebook paper with 3 ring binder or a 3-5 subject Spiral notebook for notes/class and home assignments or A spiral that is all graph paper as you will create graphic representations throughout the year.**

Falls Church High School
Mathematics Department
Summer Packet
2009-10



Vocabulary Review

coefficient - A number multiplied by a variable in a term of an expression. For example, in the expression

$$2x^2 + 5x \quad , 2 \text{ is the coefficient of } x^2, \text{ and } 5 \text{ is the coefficient of } x .$$

coordinates - The unique ordered pair of real numbers associated with each point in a coordinate plane. The first number of the ordered pair is the x-coordinate; the second number is the y- coordinate.

direct variation - A linear function defined by an equation of the form $y = kx$, where k is not equal to zero and remains constant for each ratio $y:x$ of the function.

distributive property - Each term inside a set of parentheses can be multiplied by a factor outside the parentheses. For example,

$$2(2x + 5) = 4x + 10$$

domain - The set of input values of a function for which the function is defined;

equation – A number sentence that declares the equality of two expressions; every equation contains an equal sign separating the left side from the right side

expression – A number phrase consisting of numerals, variables, known constants, and mathematical operations

factor - When two or more numbers or variables are multiplied, each of the numbers or variables is a factor of the product.

factor of a polynomial – Any of two or more smaller polynomials that, when multiplied together, equal the larger polynomial. For example,

$$(x + 2)(x + 5) = x^2 + 7x + 10$$

That means that $(x + 2)$ is a factor of the quadratic, and so is $(x + 5)$

function - A relationship between two variables in which the value of the dependent variable is dependent on the value of the control variable. There can only be one value of the dependent variable for each value of the control variable.

inequality - A statement formed by placing an inequality sign between two numerical or variable expressions

linear inequality - An inequality who graph on a coordinate plane is a region bounded by a line, called the boundary line

matrix - An arrangement of numbers in rows and columns. The number of rows by the number of columns gives the dimension of the matrix.

quadratic equation - Any equation that can be written in the form $ax^2 + bx + c = 0$, a is not equal to 0 .

range – the set of output values of a function

root – in a function, any domain (x) value whose output (y) value equals zero; a solution to the equation “function = 0”. On a graph, any x-value where the graph crosses the x axis

slope-intercept form of an equation - An equation of the form $y = mx + b$, where m represents the slope and b represents the y-intercept of the line. Both values are constant.

solution to a system - Values for the variables that make all equations in a system of equations true

solution of a system of inequalities - Values for variables that make all inequalities of the system of inequalities true

standard form of a linear equation - An equation in the form $ax + by = c$ where a , b , and c are integers and a and b are not both zero

system of inequalities - Two or more inequalities in the same variables that share the same solution

variation – a specific relationship between the input values (x) and the output values (y) of a function. When the product of each x,y pair is constant, the variation is called “inverse”; when the ratio of each x,y pair is constant, the variation is “direct”.

Vertex – the turning point on a graph. To find the vertex of a quadratic function use the equations $x = \frac{-b}{2a}$. Determine the output using this input value for the function.

x-intercept - A point where a graph intersects the x-axis; also called a horizontal intercept (x,0)

x/y table – a table representing points on a graph, where each row consists of an x-value (input) and its corresponding y-value (output). The table also represents solutions to an equation that may or may not be a function.

y-intercept - A point where a graph intersects the y-axis; also called a vertical intercept (0,y)

zero of a function – same as “root”: an x-value that, when input into a function, causes the output (y-value) to equal zero. Any x-intercept of the graph.

Zero property of equality – when two or more factors multiply to equal zero, one of the factors must be equal to zero. The equation

$$(x + 2)(x - 1)(x + 5) = 0 \text{ means that } x + 2 = 0, \text{ or } x - 1 = 0, \text{ or } x + 5 = 0$$

Notation

$f(x)$ represents a function, where the contents of the parentheses – which can be a number, a variable, or an expression - are input to the function to create the output.

$x \in \mathbb{R}$ states that the x-values (inputs) of a relation can be any real number, and the domain includes all real numbers.

D: [2, 20) represents interval notation for the domain. The values inside the notation indicate the least and greatest value of the interval, the endpoints. If the [] are used the interval includes the endpoints, and if () are used, the interval does not include the endpoints identified. The domain and range are often identified using interval notation. The notation identified indicates the domain is all real numbers from 2 through 20 including 2 but not 20. *An important note is that the infinity symbol is ALWAYS preceded or followed by (or).*

D: $2 \leq x < 20$ represents inequality notation for the domain and means the domain is all real numbers from 2 through 20 including 2 but not 20.

Evaluating Expressions and Scientific Notation

Evaluate if $a = 5$, $b = -7$, and $c = 8$

1. $a(b+c)$

2. $-a^3(bc^2)$

3. $\frac{a^2}{b}(-bc)$

4. $a^2 + 2b - c$

5. $(a^2)^3 \cdot (a^3)^2$

Write your answer as an exponent.

6. $10 \bullet 10 \bullet 10 \bullet 10$

7. $a^4 \bullet a^5$

8. $\frac{w^0}{w^4}$

9. $\sqrt[3]{2^7}$

10. Write in scientific notation: $\frac{7.5 \bullet 10^2}{1500}$

Order of Operations and Statistics

Calculate according to the order of operations.

11. $32 \div 8 - 4^2 + 10 \bullet 3 \div (5 \bullet 6)$

12. $(a^2b^2)^2 + (a^2b)^2 \bullet b^2$

13. Solve $|x| = 5$

14. Graph $y = |x|$

15. Graph the quadratic function $y = x^2$. Use an x/y table of values for your input to determine your output values. Identify the roots, y-intercept, and vertex.

16. Graph: $y = -x^2 + 2$. Compare your graph to problem 15. Using full sentences identify similarities and differences between the graphs and their equations.

17. Graph: $y = -(x-4)^2 + 2$. Compare this graph with Problem 16. Using full sentences, identify similarities and differences between the graphs and their equations.

18. Use the given data set to find the mean, median, and mode.

35 44 31 56 53 45 60 62 56 41 56

Solving Equations - Notes

Linear equations

Example 1:

$$4x - 7 = -23$$

$$4x - 7 + 7 = -23 + 7$$

$$4x = -16$$

$$\frac{4x}{4} = \frac{-16}{4}$$

$$x = -4$$

Example 2:

$$7x = 2x - 20$$

$$7x - 2x = 2x - 20 - 2x$$

$$5x = -20$$

$$\frac{5x}{5} = \frac{-20}{5}$$

$$x = -4$$

Systems of Equations

Solve:

$$y = 7 - 3x$$

$$2x - 3y = 12$$

Solution:

$$2x - 3(7 - 3x) = 12$$

substitute

$$2x - 21 + 9x = 12$$

distribute

$$11x - 21 = 12$$

combine like terms

$$11x - 21 + 21 = 12 + 21$$

add 21 to both sides

$$11x = 33$$

simplify

$$\frac{11x}{11} = \frac{33}{11}$$

divide both sides by 11

$$x = 3$$

$$y = 7 - 3(3)$$

substitute x to find the value of y

The solution to the system is $(3, -2)$

Solving for a variable

Solve: $d = rt$ for r

Solution:

$$d = rt$$

$$\frac{d}{t} = \frac{rt}{t}$$

divide both sides by t

$$r = \frac{d}{t}$$

SOLVING EQUATIONS

Solve the following linear equations.

19. $-\frac{2}{3}x = 10$

20. $6 - 8y = -26$

21. $|4x| = 39 - 9x$

22. $\frac{1}{3}x - 4 = 15$

23. $7x = \frac{1}{2}x - 20$

24. $8x + 5 = \frac{-3}{4}x - 17$

25. $\frac{-2x}{7} = \frac{5x - 28}{4}$

26. $2(3x + 5) = -4(x + 4)$

Solve each equation for the variable indicated.

27. $x + 3y = -9$ solve for y

28. $P = 2L + 2W$ solve for L

29. $V = \pi r^2 h$ solve for h

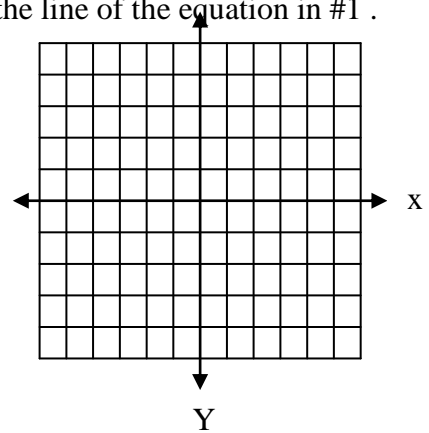
30. $5x - y = 8$ solve for y

Find ordered pairs that satisfy the linear equation.

31. $y = -3x + 1$

x	y
-4	
-2	
0	
2	
4	

32. Graph the line of the equation in #1 .



Solve the following equations for y in terms of x. (y = mx + b format)

33. $-3x + y = -2$

34. $5x + 2y = 1$

35. $8y - 3x = -6$

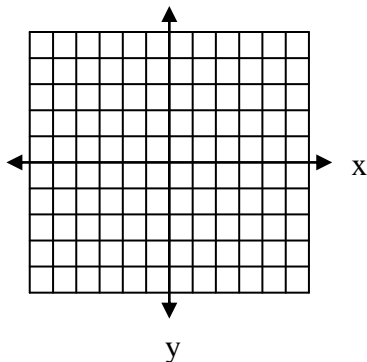
36. $3x + 2y - 6 = 0$

Find the x-intercept and y-intercept of each linear equation.

37. $-5x + 3y = 15$

38. $3x + 2y = 6$

39 Using the x and y intercepts graph the linear equation $3x + 2y = 6$



Find the slope of the line given two points on the line.

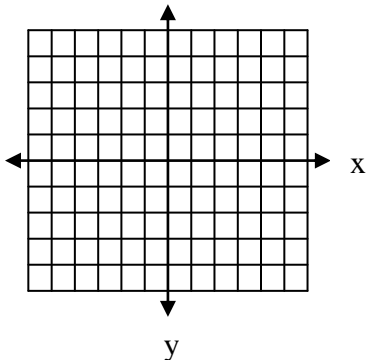
40. $(-3,1)$ and $(-7,4)$

41. $(9,2)$ and $(3,-1)$

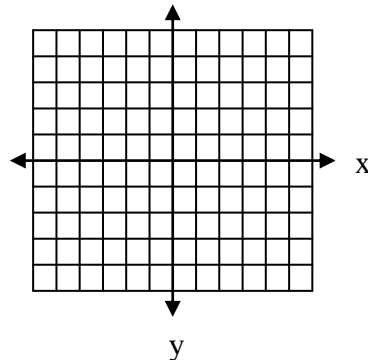
42. $(2,5)$ and $(9,1)$

Graph the line of the equation.

43. $y = -\frac{3}{2}x + 3$



44. $y = 4x - 2$



Find the slope and the y-intercept of each linear equation.

45. $4x + 3y = 9$

46. $-7x - 4y = 16$

47. $6x - y = 4$

48. $12x = 2y + 1$

Find the equation of the line given the slope and a point on the line.

49. $m = 2$ $(3, 2)$

50. $m = -\frac{1}{4}$ $(2, 1)$

Find the equation of a line given two points on the line.

51. $(-1, 2)$ and $(3, 4)$

52. $(2, 5)$ and $(4, 2)$

53. Describe the graph of the equation $y = 7$.

54. What is the slope of the line represented by the equation $x = 5$?

55. What is the equation for the y-axis?

Solve the system of equations by elimination (aka “linear combination”) method

56.a .
$$\begin{aligned} 4x + 3y &= -15 \\ -x + y &= 2 \end{aligned}$$

56. b.
$$\begin{aligned} x + 3y &= -6 \\ 6y - 2x &= 1 \end{aligned}$$

57. Solve the system of equations by the substitution method.

$$\begin{aligned} y &= -x + 5 \\ x - 4y &= 10 \end{aligned}$$

Solve the following systems of equations (use any method).

58.
$$\begin{aligned} y &= 5 - 4x \\ 3x - 2y &= 12 \end{aligned}$$

59.
$$\begin{aligned} 2x + 3y &= -1 \\ 5x - 2y &= -12 \end{aligned}$$

Functions, Domain/Range, Input/Output

For each Function, complete the x/y table for the given domain values

60. $F(x) = \frac{1}{2}x + 3$

X	-2	10	0	8	-6	-3	7
Y							

61. $F(x) = 2x^2 - 3$

X	-2	3	0	1	-5	-3	7
Y							

62. For the function $g(x) = \frac{4x - 3}{x + 1}$ why is -1 *not* an element of the domain?

Polynomials – Rules of Arithmetic

Add: $(3x^2 - 2x + 2) + (5x^3 - 2x^2 + 3x - 4) = 5x^3 + x^2 + x - 2$

Remove parentheses and collect like terms.

Subtract: $(9x^5 + x^3 - 2x^2 + 4) - (2x^5 + x^4 - 4x^3 - 3x^2) = 7x^5 - x^4 + 5x^3 + x^2 + 4$

Change signs of second polynomial and collect like terms.

Multiply: a. $2x(5x + 3) = 10x^2 + 6x$ **Use Distributive Property**

b. $(x + 5)(x + 4) = x^2 + 9x + 20$ **FOIL**

Divide: $\frac{x^3 + 10x^2 + 8x}{2x} = \frac{x^2}{2} + 5x + 4$

Try it! Simplify according to the indicated operation:

63. $(4x^4 - 7x^3 - 9x + 1) + (6x^3 + 9x^2 + 9x)$

64. $(6x + 1) - (-7x + 2)$

65. $(6x^3 + 3x^2 - 1) - (4x^2 - 3x + 3)$

66. $(-2x)(x^3)$

67. $3x(-x + 5)$

68. $8x(-x^5 + 6x^2 + 9)$

69. $(x + 5)(x - 3)$

70. $(x + 7)^2$

71. $(2x + 5)^2$

72. $(2x^2 - x)(5x^2 - 7x + 1)$

73. $\frac{2x^3 + 6x^2 + 4x}{2x}$

74. $\frac{6n^2 + 3n - 8}{3}$

75. $\frac{9x^2y^2 + 3x^2y - 6xy^2}{3xy}$

76. $\frac{18w^6 - 27w^5 - 3w^3}{9w^3}$

Quadratic Expressions & Functions – Factoring and Solving

Factoring

Example 1: Use the abc method to factor (factors of a times c that add to b)

$$x^2 - 5x - 14 = (x + 2)(x - 7)$$

Example 2 [Perfect Trinomial Square]:

a. $x^2 + 8x + 16 = (x + 4)(x + 4) = (x + 4)^2$

b. $4x^2 + 12x + 9 = (2x + 3)(2x + 3) = (2x + 3)^2$

Example 3 [Difference of Two Squares]: $x^2 - 49 = (x + 7)(x - 7)$

Example 4 [Advanced Factoring]: Use the abc method to factor (factors of a times c that add to b)

$$6x^2 - x - 15 = (3x - 5)(2x + 3)$$

Example 5 [Factoring Completely]:

$$6x^2 - 9x - 6 = 3(2x^2 - 3x - 2) = 3(2x + 1)(x - 2)$$

Solving Quadratic Equations and Functions

Solve: $7x^2 = 63$

$$7x^2 = 63$$

$$x^2 = 9 \quad \text{divide both sides by 7.}$$

Solution:

$$\sqrt{x^2} = \pm\sqrt{9} \quad \text{take the square root of each side, find both roots.}$$

$$x = \pm 3$$

Solve by factoring:

$$x^2 - 10x + 24 = 0$$

Solution:

$$x^2 - 10x + 24 = 0$$

$$(x - 6)(x - 4) = 0 \quad \text{factor}$$

$$x - 6 = 0 \quad \text{or} \quad x - 4 = 0$$

$$x = 6 \quad \quad \quad x = 4 \quad \text{set each factor equal to zero then solve for } x.$$

Factor.

77. $x^2 - 5x + 6$

78. $m^2 - 4m - 45$

79. $x^2 + 8x - 9$

80. $24 + 10x + x^2$

81. $x^2 + 4x + 4$

82. $9x^2 - 24x + 16$

Factor

83. $64 + 80x + 25x^2$

84. $25x^2 + 10x + 1$

85. $x^2 - 16$

86. $x^2 - 81$

87. $4x^2 - 25$

88. $25x^2 - 64$

89. $4x^6 - y^2$

90. $9x^2 - 16$

91. $2x^2 + 15x + 7$

92. $5x^2 - 2x - 7$

93. $6x^2 + 31x + 5$

94. $10x^2 + 21x - 10$

95. $14x^2 + 33x + 18$

96. $15x^2 - 28x - 32$

Factor Completely.

97. $2x^2 - 2x - 12$

98. $6x^2 + 18x - 24$

99. $10x^2 + 15x - 10$

100. $30x^2 - 5x - 10$

Solve the following Quadratics

101. $x^2 = 25$

102. $5x^2 = 20$

103. $(x-3)^2 = 49$

104. $x^2 - 5x + 6 = 0$

105. $2x^2 - 3x - 5 = 0$

106. $3x(2x-5) = 0$