

## Falls Church High School Math Department

Dear 2006-2007 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.

This packet is due on the first day you return to class in August. You will have the opportunity to ask questions about anything in it when you come back. 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 a first quarter grade and will be used to plan your review and after school remediation as necessary.

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/](http://www.mathforum.org/dr.math/). If you would like additional questions that are interactive, visit <http://education.jlab.org/solquiz/>

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 find out about things 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 the fall!

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:**

**Ti 83 or 84 graphing calculator**

**Pencils**

**Erasers**

**Ruler**

**Checking pens**

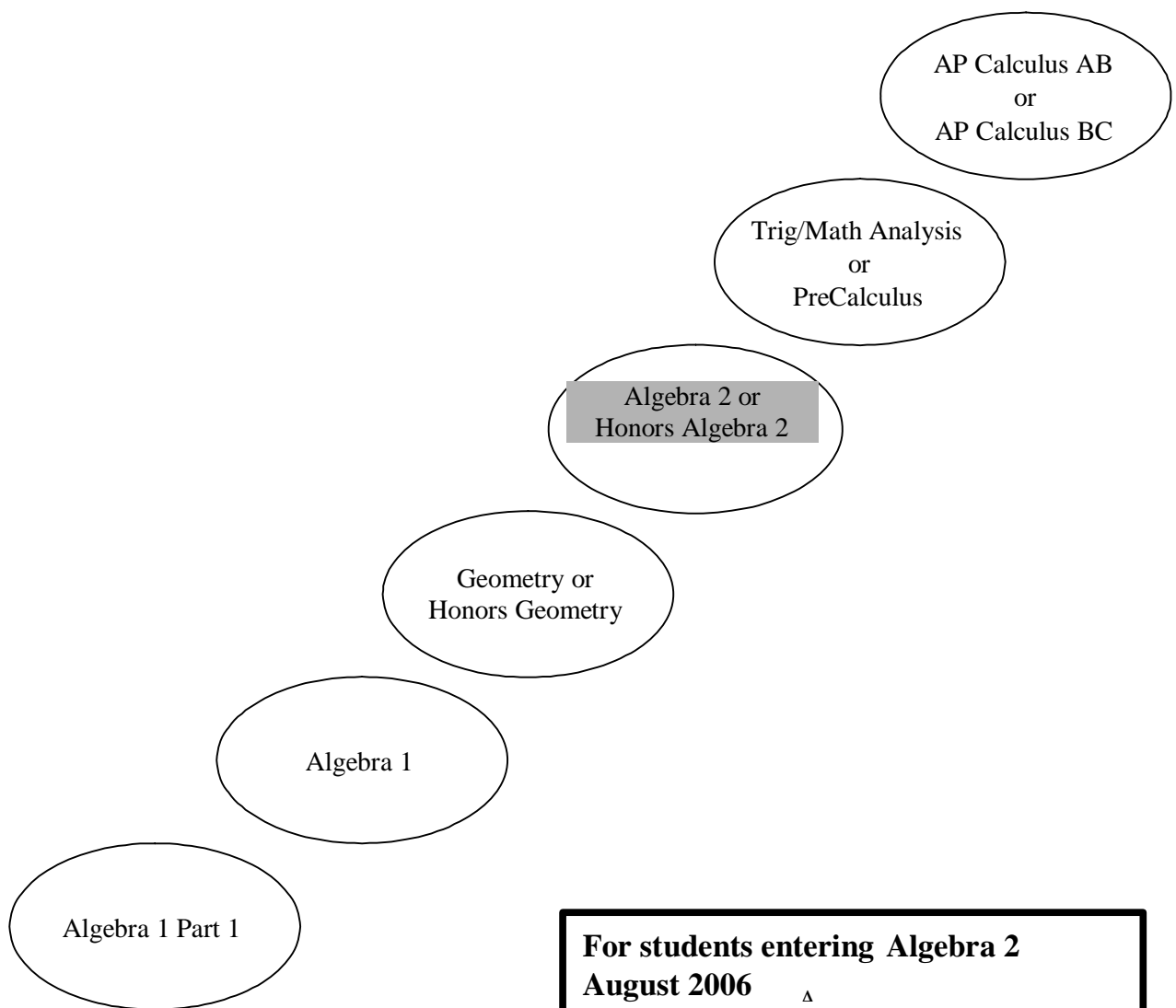
**Highlighters**

**Graph paper**

**Book cover**

**Notebook paper and binder or Spiral notebook for homework (Your teacher will discuss choices during your first class)**

Falls Church High School  
Mathematics Department  
Summer Packet  
2006-07



## 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.

**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 x-values for which the function is defined; the input values of a function

**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 whose 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 y-values of a function; the output values

**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

**solution of a system** - Values for the variables that make a system of equations true

**solution of a system of inequalities** - Values for variables that make a 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

**variation** – a specific relationship between the x-values (inputs) and the y-values (outputs) 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”.

**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 a functional equation.

**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 a 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.

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

## 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.  $10 \cdot 10 \cdot 10 \cdot 10$

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

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

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

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

## Order of Operations and Statistics

### Calculate according to the order of operations.

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

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

### Find the probability of each event when a fair die is rolled.

13.  $P(4)$

14.  $P(\text{not } 4)$

15.  $P(8)$

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

35 44 31 56 53 45 60 62 56 41 56

17. *Given the data set below make a box-and-whisker plot.*

14 20 12 18 12 6 10 23 28 22 13 24 15 18 21

18. *Given the data set below make a stem-and-leaf plot.*

104 103 115 124 139 129 110 144 148 137 134 126 128

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

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

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

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

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

26.  $2b - 3x + 5g = -4b + 4c$

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  $h$

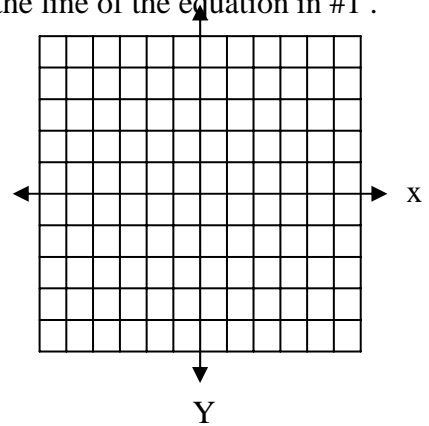
30.  $5x - y = 8$  solve for  $y$

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

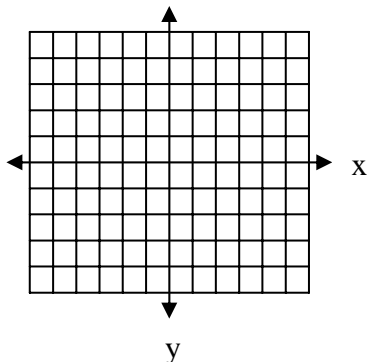
36.  $3x + 2y - 6 = 0$

**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.**

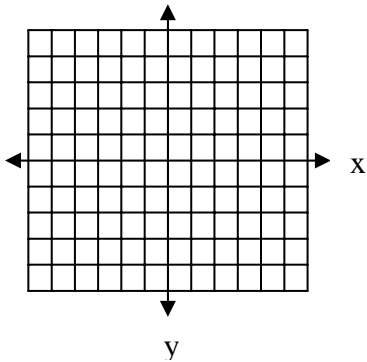
40.  $(-3,1)$  and  $(-7,4)$

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

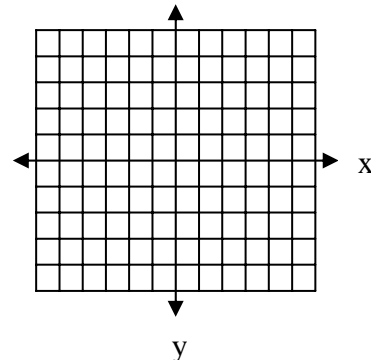
42.  $(2,5)$  and  $(9,1)$

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

<b>X</b>	-2	10	0	8	-6	-3	7
<b>Y</b>							

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

<b>X</b>	-2	3	0	1	-5	-3	7
<b>Y</b>							

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