Westside

Algebra 2 Prep

Name ____________________________Period ________

Algebra 2 Prep Summer Enrichment Activity

IMPORTANT INSTRUCTIONS FOR STUDENTS!!!

We understand that students come to Algebra II with different strengths and needs. For this reason, students have options for completing the packet and getting assistance!

- **Students should try to answer all the questions if possible; you must show all work.**
- **Use the examples provided for assistance.**

Now! Get Ready, Get Set, and Do Your Best!

Solving Equations

Example: Solve the equation.

$-4b = 28$ Problem

$\frac{-4b}{-4} = \frac{28}{-4}$ Divide both sides by –4

$b = -7$ Answer

Check: $-4b = 28$

$-4(-7) = 28$ Substitute -7 for b into the equation

$28 = 28$ correct

Example: Solve the equation.

$4x - 6 = 2x + 12$	Problem
$4x - 6 = 2x + 12$ $\underline{-2x \quad\quad -2x \quad\quad\quad .}$	Subtract 2x from both sides
$2x - 6 = 12$ $\underline{\quad +6 \quad +6 \quad\quad\quad .}$	add 6 to both sides of the equation
$\frac{2x}{2} = \frac{18}{2}$	divide by 2 on both sides

$x = 9$ Answer

Check: $4x - 6 = 2x + 12$

$4(9) - 6 = 2(9) + 12$ Substitute 9 for x into the equation

$30 = 30$ correct

Example: Solve the equation.

$2(4c+8) = 3(2c+6)$	Problem
$8c+16 = 6c+18$ $\underline{-6c \quad\quad -6c \quad\quad .}$	Use the distributive property to multiply Subtract 6c from both sides of the equation.
$2c + 16 = 18$ $\underline{\quad -16 \quad -16 \quad\quad .}$	Simplify. Subtract 16 from both sides of the equation.
$\frac{2c}{2} = \frac{2}{2}$	Divide by 2 on both sides of the equation.
$c = 1$	Answer

Check:

$2(4c+8) = 3(2c+6)$	Original Equation
$2[4(1)+8] = 3[2(1)+6]$	Substitute 1 for c into the equation
$2(12) = 3(8)$	
$24 = 24$	Correct

***Exercises:* Solve each equation. Then check your solution.**

1. $18 = x - 4$

2. $-12 = c + 9$

3. $\frac{x}{4} = -8$

4. $\frac{1}{3} n = 7$

5. $5d = -60$

6. $\frac{-1}{2} x = 12$

7. $-7n = 56$

8. $8 - x = 4x + 28$

9. $7y - 3y = 2y + 6$

10. $4x + 3 = 7x + 2$

11. $5n - 7 = 4n + 9$

12. $5.2x - 8.3 = 13.3 - 2x$

13. $4.4s + 6.2 = 8.8s - 1.8$

14. $-2(x + 4) = 2(x - 5)$

15. $5(2 + 4y) = 50$

16. $4(y + 1) - 2 = 4y + 2$

Describe Number Patterns

Write Equations: Sometimes a pattern can lead to a general rule that can be written as an equation.
Example: **Suppose you purchase some roses. You could make a chart to show the relationship between the number of roses and the cost. There will also be a delivery fee.**

The following table shows the relationship of number of roses purchased and the cost.

Number of roses	1	2	3	4	5
Cost	17	29	41	53	65

The difference in the x values is 1, and the difference in the y values is 12. This pattern shows that y is always twelve times x plus 5. If you take the point (5, 65), to figure out the constant. You can take the x-value, 5 and multiply it by 12 which equals 60. You still need to add 5 to get the 65. This suggests the relation y = 12x + 5. Since the relation is also a function, we can write the equation in functional notation as f(x) = 12x + 5.

Exercises:

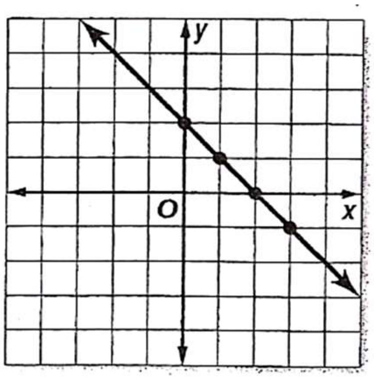
17. Write an equation for the function in functional notation. Then complete the table.

x	-2	-1	0	1	2	3
y	-2	1	4			

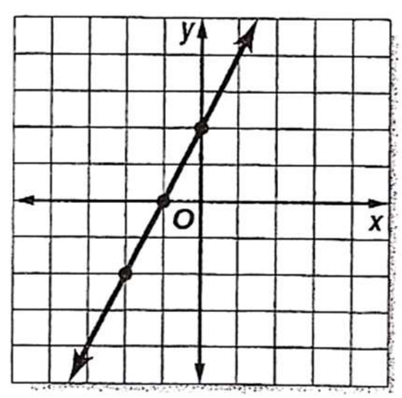
18. Write an equation for the function in functional notation. Then complete the table.

x	-2	-1	0	1	2	3
y	9	7	5			

19. Write an equation in functional notation.



20. Write an equation in functional notation.



Equations of Linear Function

Standard Form	$Ax + By = C$
Slope-Intercept Form	$y = mx + b$, where m is the given slope and b is the y-intercept
Point-Slope Form	$y - y_1 = m(x - x_1)$, where m is the given slope and (x_1, y_1) is the given point

***Example 1*: Write an equation of a line in standard form whose slope is -3 and whose y-intercept is 2.**

$y = mx + b$

$y = -3x + 2$

$+3x \quad +3x$

$3x + y = 2$

***Example 2*: Graph 2x – 4y = 8**

$2x - 4y = 8$	Original equation
$-4y = -2x + 8$	Subtract 2x from each side
$\frac{-4y}{-4} = \frac{-2x + 8}{-4}$	Divide each side by -4
$y = \frac{1}{2}x - 2$	Simplify

The y-intercept of $y = \frac{1}{2}x - 2$ is -2 and the slope is $\frac{1}{2}$. So, graph the point (0, -2). From this point, move up 1 unit and right 2 units. Draw a line passing through both points.

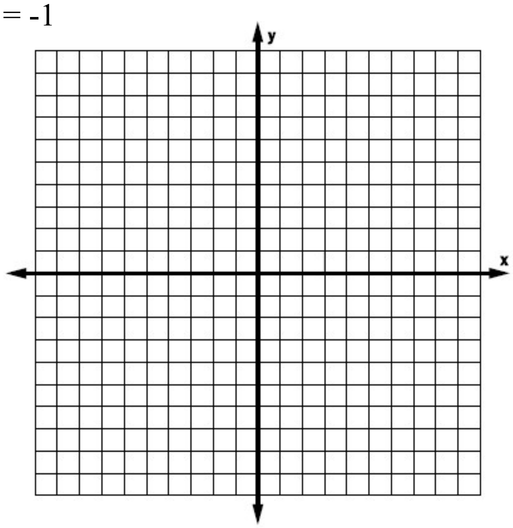
Exercises:

Write an equation of the line in Standard Form with the given information.

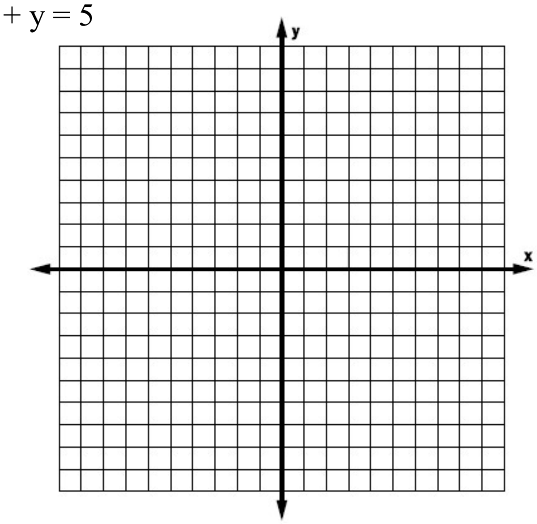
21. Slope: 4, y-intercept -5
22. Slope: -1, point (2, 4)
23. Slope: -3, y-intercept 4

Graph each equation.

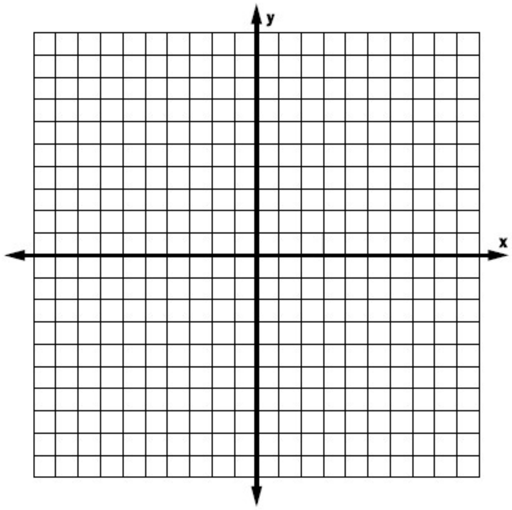
24. $2x - y = -1$



25. $2x + y = 5$



26. x + y = -3

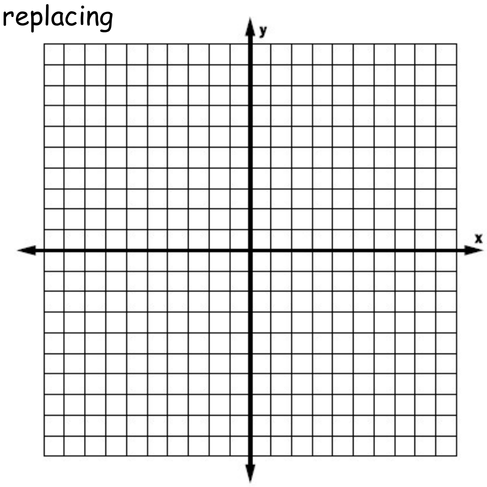


Graphing Systems of Equations

Solve by Graphing One method of solving a system of equations is to graph the equations on the same coordinate plane.

***Example:* Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, name it with the ordered pair.**

a. **x + y = 2**
x – y = 6
The graphs intersect. Therefore, there is one solution. The point (4, -2) is where the two graphs intersect. Check this estimate by replacing x with 4 and y with -2 in each equation.
x + y = 2
4 + (-2) = 2 ✓
x – y = 6
4 – (-2) = 4 + 2 or 6 ✓
The solution is (4,-2).

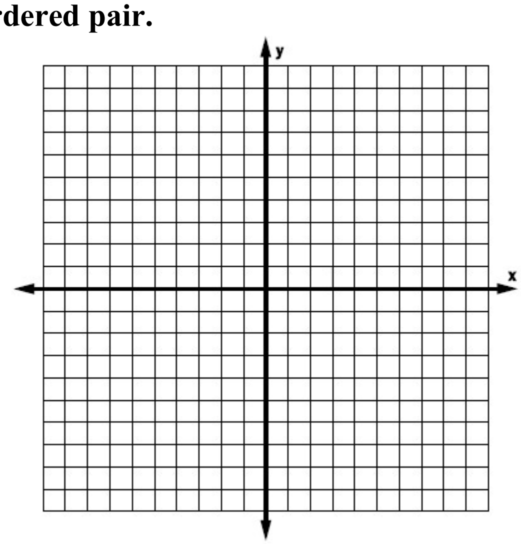


b. **y = 3x + 1**
2y = 6x + 2
The graphs are the same equation. Therefore, the solution is infinitely many solutions.

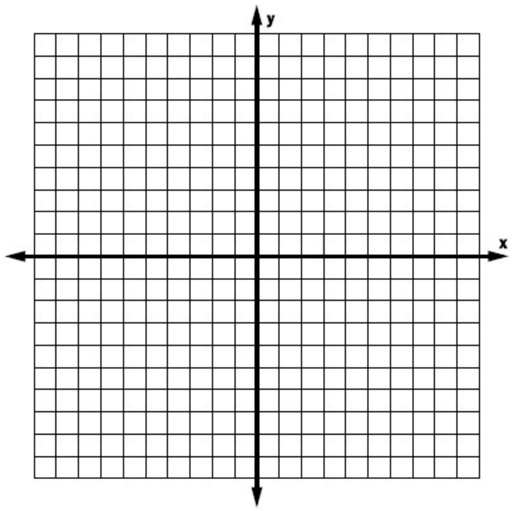
Exercises:

Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, list the ordered pair.

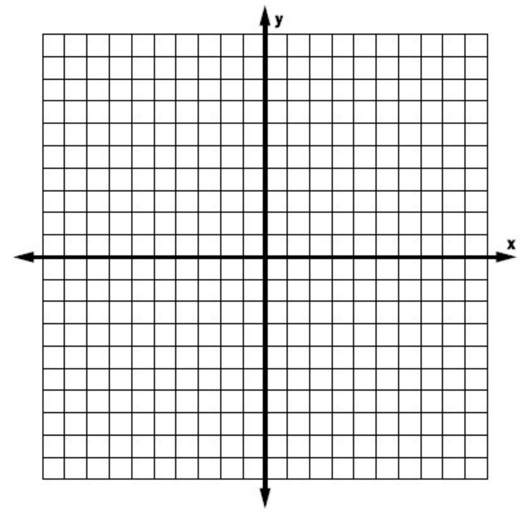
27. y = -2x + 1
y = 2x – 3



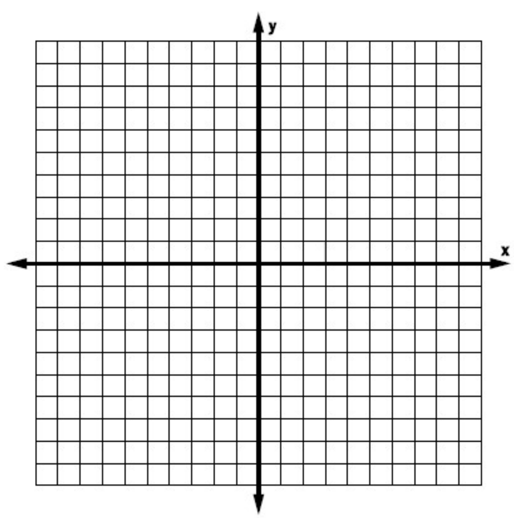
28. $y = 2x$
$x + y = -3$



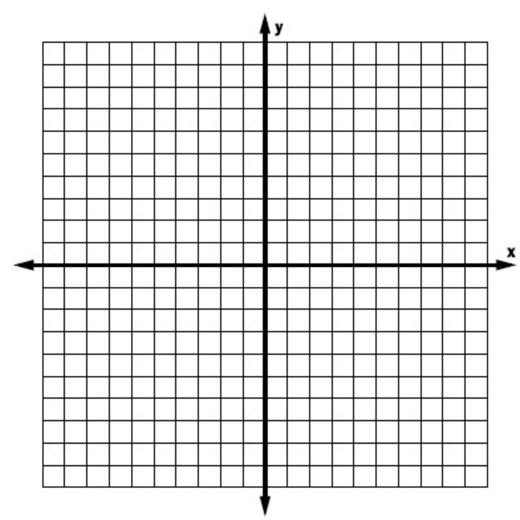
29. $x - 4y = -4$
$y = -1/2\,x - 2$



30. $3x + y = 8$
$3x - y = -2$



31. $3x + 2y = 6$
$3x + 2y = -4$



Solving Systems of Equations by Substitution

***Example 1:* use substitution to solve the system of equations.**
$y = 3x$
$2x - y = -6$
Substitute $3x$ for y in the second equation.

$2x - y = -6$	*second equation*
$2x - 3x = -6$	substitute $y = 3x$
$-1x = -6$	*combine like terms*
$x = 6$	*Divide each side by -1 and simplify.*

Use $y = 3x$ to find the value of y.

$y = 3x$	*First equation*
$y = 3(6)$	substitute $x = 6$
$y = 18$	*simplify*

The solution is (6, 18).

***Example 2:* Solve for one variable, then substitute.**
$x + 3y = 7$
$2x - 4y = -6$
Solve the first equation for x since the coefficient of x is 1.

$x + 3y = 7$	*First equation*
$x + 3y - 3y = 7 - 3y$	*Subtract 3y from each side*
$x = 7 - 3y$	*Simplify*

Find the value of y by substituting $7 - 3y$ for x in the second equation.

$2x - 4y = -6$	*Second equation*
$2(7- 3y) - 4y = -6$	$x = 7 - 3y$
$14 - 6y - 4y = -6$	*Distributive Property*
$14 - 10y = -6$	*Combine like terms.*
$14 - 10y - 14 = -6 -14$	*Subtract 14 from each side.*
$-10y = -20$	*Simplify.*
$y = 2$	*Divide each side by -10 and simplify.*

Use $y = 2$ to find the value of x.
$x = 7- 3y$
$x = 7 - 3(2)$
$x = 1$
The solution is (1, 2).

***Exercises:* Use substitution to solve each system of equations. If the system does not have exactly one solution, state whether it has *no* solution or *infinitely many solutions*.**

32. $y = 2x$
$3x - y = 1$

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

34. $x = 2y - 5$
$x = 2y + 4$

Elimination Using Addition and Subtraction

Example 1: **Use addition to solve the system of equations**

$$x - 3y = 7$$
$$3x + 3y = 9$$

Write the equations in column form and add to eliminate y.

$$\begin{array}{rl} & x - 3y = 7 \\ (+) & \underline{3x + 3y = 9} \\ & 4x \quad = 16 \\ & \frac{4x}{4} \quad = \frac{16}{4} \\ & x \quad = 4 \end{array}$$

Substitute 4 for x either equation and solve for y.

$x - 3y = 7$	original
$4 - 3y = 7$	substitute 4 for x
$-4 \qquad -4$	subtract 4 to both sides
$\frac{-3y}{-3} = \frac{3}{-3}$	divide both sides by -3
$y = -1$	

The solution is (4, -1).

Example 2: **The sum of two numbers is 25 and their difference is 1. Find the numbers.**

Let x represent one number and y represent the other number.

$$\begin{array}{rl} & x + y = 25 \\ (+) & \underline{x - y = 1} \\ & 2x \quad = 26 \\ & \frac{2x}{2} \quad = \frac{26}{2} \\ & x = 13 \end{array}$$

Substitute 13 for x in either equation.

$$13 + y = 25$$
$$-13 \qquad -13$$

$$y = 12$$

The numbers are 13 and 12.

Exercises: **Use elimination to solve each system of equations.**

35. $3x - 2y = -3$
    $4x + 2y = 10$

36. $2x - 3y = 14$
    $x + 3y = -11$

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

Multiplying a Polynomial by a Monomial

Product of Monomial and Polynomial: The Distributive Property can be used to multiply a polynomial by a monomial.

Example 1: Find $-4x^2 (3x^2 + 5x - 6)$.

$-4x^2 (3x^2 + 5x - 6)$
$= -4x^2 (3x^2) + (-4x^2)(5x) + (-4x^2)(-6)$
$= -12x^4 + (-20x^3) + (24x^2)$
$= -12x^4 - 20x^3 + 24x^2$

Example 2: Simplify $-2(5x^2 + 6x) - x (x^2 + 3x)$

$-2(5x^2 + 6x) - x (x^2 + 3x)$
$= -2(5x^2) + (-2)(6x) + (-x)(x^2) + (-x)(3x)$
$= -10x^2 + (-12x) + (-x^3) + (-3x^2)$
$= (-x^3) + [-10x^2 + (-3x^2)] + (-12x)$
$= -x^3 - 13x^2 - 12x$

Exercises: Find each product.

38. $2x(4x^2 + 3x - 5)$
39. $x(3x^2 + 2x - 8)$
40. $-3xy(2y + 5x^2)$
41. $-2c(c^2 + 4c - 5)$
42. $8x (x^3 - 2x^2 + 3x - 5)$
43. $-4b (2b^3 + 4b - 5)$

Factoring Using the Greatest Common Factor

***Example 1:* Use GCF to factor $12mn + 60m^2$**

Find the GCF of $12mn$ and $60m^2$
$12mn = 2 \cdot 2 \cdot 3 \cdot m \cdot n$
$60 m^2 = 2 \cdot 2 \cdot 3 \cdot 5\ m \cdot m$
GCF $= 2 \cdot 2 \cdot 3 \cdot m$ or $12m$
Write each term as the product of the GCF and its remaining factors.
$12mn + 60m^2 = 12m (1 \cdot n) + 12m (5 \cdot m)$
$= 12m (n) + 12m (5m)$
$= 12m (n + 5 m)$
$12mn + 60m^2 = 12m (n + 5 m)$

***Example 2:* Factor $6ax + 3ay + 2bx + by$ by grouping.**

$6ax + 3ay + 2bx + by$
$= (6ax + 3ay) + (2bx + by)$
$= 3a (2x + y) + b (2x + y)$
$= (3a + b)(2x + y)$

Check using the FOIL method.
$(3a + b)(2x + y)$
$= 3a(2x) + (3a)(y) + (b)(2x) + (b)(y)$
$= 6ax + 3ay + 2bx + by$

Exercises: Factor each polynomial.

44. $12x^2 + 18x$
45. $40xy^2 + 20x^2y - 10x$
46. $c^4 - 9c^3 + 5c^2$
47. $8x^2 - 4x$
48. $8d^3 + 6d^2 - 10d$
49. $35y^4 - 28y^3$

Multiplying Polynomials

Multiply Binomials: To multiply two binomials, you can apply the Distributive Property twice. You can use FOIL (First, Outer, Inner and Last) method.

Example 1: **Find (x + 5)(x – 7)**

$(x + 5)(x - 7)$
$= x(x - 7) + 5(x - 7)$
$= (x)(x) + x(-7) + 5(x) + 5(-7)$
$= x^2 - 7x + 5x - 35$
$= x^2 - 2x - 35$

Example 2: **Find (x – 2) (x + 5) using FOIL method.**

$(x - 2)(x + 5)$
First Outer Inner Last
$= (x)(x) + (x)(5) + (-2)(x) + (-2)(5)$
$= x^2 + 5x + (-2x) - 10$
$= x^2 + 3x - 10$

Exercises: Find each product.

50. $(x + 4)(x + 5)$
51. $(2x + 1)(2x + 1)$
52. $(x + 5)(x - 3)$
53. $(2x - 3)(3x - 5)$
54. $(4x + 1)(4x - 1)$
55. $(4n + 3)(5n - 4)$