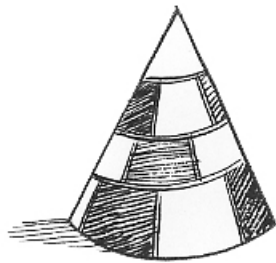
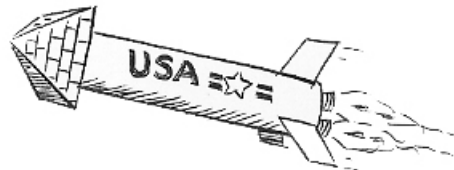


Required Summer Packet

Plane Geometry 1-2A & *Geometry 1-2A*



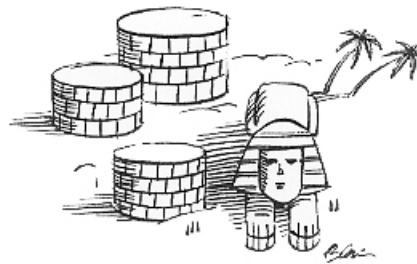
"RUBIK'S CONE"



"NOSE PYRAMID"



"ICE CREAM CUBE"



"GREAT CYLINDERS
OF GIZA"

GEOMETRIC CONFUSION

MATH SUMMER PACKET

INSTRUCTIONS

Attached you will find a packet of exciting math problems for your enjoyment over the summer. The purpose of the summer packet is to review the topics you have already mastered in math and to make sure that you are prepared for the class you are about to enter.

The packet contains a brief summary and explanation of the topics so you don't need to worry if you don't have your math book. You will find many sample problems, which would be great practice for you before you try your own problems. The explanations are divided into sections to match the sample problems so you should be able to reference the examples easily.

This packet will be **due the second day of class**. All of your hard work will receive credit. The answers are provided in the back of the packet; *however*, you must show an amount of work appropriate to each problem in order to receive credit. If you are unsure of how much work to show, let the sample problems be your guide. You will have an opportunity to show off your skills during the first week when your class takes a quiz on the material in the packet.

This packet is to help you maximize your previous math courses and to make sure that everyone is starting off on an even playing field on the first day of school. If you feel that you need additional help on one or two topics, you may want to try math websites such as: www.mathforum.org or www.askjeeves.com. Math teachers will be available for assistance at the high school the week before school. Check the marquee or the school website for specific times, which are to be determined.

Enjoy your summer and don't forget about the packet. August will be here before you know it! If you lose your packet the OPRFHS Bookstore will carry extra copies. You will also be able to access the packets on line at the school website, www.oprfhs.org.

See you in August!

The OPRFHS Math Department

Summer Packet

For Students Entering Plane Geometry Honors or Accelerate Level

Name: _____

Welcome to *Geometry*! This packet contains the topics that you have learned in your previous courses that are most important to geometry. Please read the information, do the problems, and be prepared to turn this in when school begins again.

Enjoy your summer!

***Denotes problems for Geometry A students only**

I. Using your graphing calculator

- Be able to find the intersection of graphs
- You will need to find the roots of equations on your calculator
- Do not be dependent on your calculator for graphing
- Do not be dependent on your calculator for simple algebra, adding fractions, etc.

II. Cartesian Coordinate System

- Quadrants, axes, and graphs
- Different forms of the equation of a line: standard, point-slope
 - Point Slope Form $(y - y_1) = m(x - x_1)$
 - Standard Form $Ax + By = C$
- Slope (incredibly important in geometry); think $\frac{\text{change } y}{\text{change } x} = \frac{\Delta y}{\Delta x}$
- Slope of parallel and perpendicular lines
- \parallel means parallel and \perp means perpendicular

III. Simplifying Algebraic Expressions

- Remember Order of Operations: Parenthesis, Exponents, Multiplication/Division and Addition/Subtraction ("Please Excuse My Dear Aunt Sally")
- When simplifying rational expressions, remember to simplify the numerator and denominator separately before checking if something cancels.
- Rules of Exponents: $(x^3)(x^5) = x^8$, $\frac{x^{14}}{x^{11}} = x^3$, $(x^5)^6 = x^{30}$

Examples: Simplify the following

a) $1 - (2 - 5)^2 + 5 \div 10 \times 4^2$

$$1 - (-3)^2 + 5 \div 10 \times 4^2$$

$$1 - 9 + 5 \div 10 \times 16$$

$$1 - 9 + \frac{1}{2} \times 16$$

$$1 - 9 + 8 = 0$$

b) $\frac{4(9 - 2 \times 3) - 3^2}{4^2 - 3^2}$

$$\frac{4(3) - 3^2}{4^2 - 3^2}$$

$$\frac{12 - 9}{16 - 9}$$

$$\frac{3}{7}$$

IV. Solving Equations & Inequalities

- Be able to solve multi-step equations using order of operations, distributive property and inverse operations.

ex. Solve: $5x - 2(x - 5) = 7x - 2$
 $5x - 2x + 10 = 7x - 2$
 $3x + 10 = 7x - 2$
 $12 = 4x$
 $x = 3$

- Be able to solve inequalities using the same process as solving equations. Just remember that if you multiply or divide by a negative, you must switch the inequality sign.

ex. Solve: $-4(3y - 2) \geq 9(2y + 5)$
 $-12y + 8 \geq 18y + 45$
 $-30y \geq 37$
 $y \geq -\frac{37}{30}$

- Be able to solve proportions: $\frac{2}{x+1} = \frac{10}{x}$

$$2x = 10x + 10 \quad \text{cross multiply}$$
$$-8x = 10$$
$$x = -\frac{5}{4} \quad \text{fraction reduced}$$

V. **Interval notation and conjunctions**

- The word "and" corresponds to "intersection" and to the symbol " \cap ". Any solution of a conjunction must make each part of the conjunction true.
- The word "or" corresponds to "union" and to the symbol " \cup ". For a number to be a solution of a disjunction, it must be in *at least one* of the solutions sets of the individual sentences.
- Interval notation is used in inequalities, domain and range, solution sets, etc. For a boundary point to be included, the symbol "[" or "]" is used. For a boundary point not to be included, the symbol "(" or ")" is used.

Ex. Solve: $-2x-5 < -2$ or $x-3 < -10$
 $-2x < 3$ or $x < -7$ solve each separately
 $x > -\frac{3}{2}$ or $x < -7$

Solution set is $(-\infty, -7) \cup \left(-\frac{3}{2}, \infty\right)$

Ex. Solve: $2x-5 \leq -3$ and $2x-5 \geq -11$

$x \leq 1$ and $x \geq -3$

Solution set is $[-3, 1]$

VI. Solving Systems of Equations & Inequalities

- Methods to Solving Systems: Graphing, Substitution, Elimination

Use the graph at the right to determine whether each system has *no solution*, *one solution*, or *infinitely many solutions*.

a. $y = 2x + 2$

$$4x - 2y = 10$$

Since the graphs of $y = 2x + 2$ and $4x - 2y = 10$ are parallel, there are no solutions.

b. $y = 2x - 5$

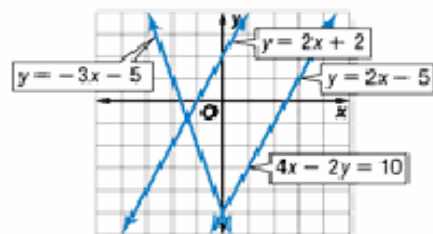
$$4x - 2y = 10$$

Since the graphs of $y = 2x - 5$ and $4x - 2y = 10$ coincide, there are infinitely many solutions.

c. $y = -3x - 5$

$$y = 2x + 2$$

Since the graphs of $y = -3x - 5$ and $y = 2x + 2$ intersect, there is one solution.



Use substitution to solve the system of equations.

$$y - x = -4$$

$$6x + y = 3$$

Solve the first equation for y since the coefficient of y is 1.

$$y - x = -4$$

First equation

$$y - x + x = -4 + x$$

Add x to each side.

$$y = -4 + x$$

Simplify.

Find the value of x by substituting $-4 + x$ for y in the second equation.

$$6x + y = 3$$

Second equation

$$6x + (-4 + x) = 3$$

$$y = -4 + x$$

$$7x - 4 = 3$$

Combine like terms.

$$7x - 4 + 4 = 3 + 4$$

Add 4 to each side.

$$7x = 7$$

Simplify.

$$\frac{7x}{7} = \frac{7}{7}$$

Divide each side by 7.

$$x = 1$$

Simplify.

Substitute 1 for x in either equation to find the value of y .

Choose the equation that is easier to solve.

$$y - x = -4$$

First equation

$$y - 1 = -4$$

$$x = 1$$

$$y - 1 + 1 = -4 + 1$$

Add 1 to each side.

$$y = -3$$

Simplify.

Use elimination to solve the system of equations.

$$5x - 7y = -2$$

$$-4x + 6y = 4$$

Method 1 Eliminate x .

$$5x - 7y = -2$$

$$-4x + 6y = 4$$

Multiply by 4.

Multiply by 5.

$$20x - 28y = -8$$

$$(+)\underline{-20x + 30y = 20}$$

$$2y = 12$$

$$\frac{2y}{2} = \frac{12}{2}$$

$$y = 6$$

Now substitute 6 for y in either equation to find the value of x .

$$5x - 7y = -2$$

First equation

$$5x - 7(6) = -2$$

$$y = 6$$

$$5x - 42 = -2$$

Simplify.

$$5x - 42 + 42 = -2 + 42$$

Add 42 to each side.

$$5x = 40$$

Simplify.

$$\frac{5x}{5} = \frac{40}{5}$$

Divide each side by 5.

$$x = 8$$

Simplify.

The solution is $(8, 6)$.

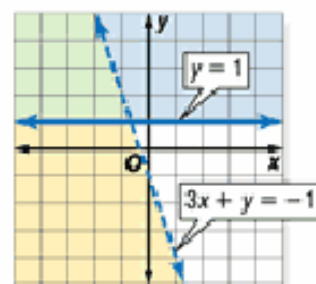
Example 1 Solve by Graphing

Solve the system of inequalities by graphing.

$$y \geq 1$$

$$3x + y < -1$$

The solution includes the ordered pairs in the intersection of the graphs of $y \geq 1$ and $3x + y < -1$. This region is shaded in green at the right. The graphs of $y = 1$ and $3x + y = -1$ are boundaries of this region. The graph of $y = 1$ is included in the graph of $y \geq 1$. The graph of $3x + y = -1$ is dashed and is *not* included in the graph of $3x + y < -1$.



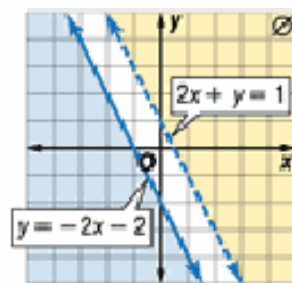
Example 2 No Solution

Solve the system of inequalities by graphing.

$$2x + y > 1$$

$$y \leq -2x - 2$$

The graphs of $2x + y = 1$ and $y = -2x - 2$ are parallel lines. Because the two regions have no points in common, the system of inequalities has no solution.



VII. Simplifying Radicals

- Know that for any real number a , $\sqrt{a^2} = |a|$
- Simplifying radicals, means taking out the factors that are perfect squares.
- Be careful with simplifying algebraic expressions.
- $\sqrt{x^2 - 8x + 16} \neq |x|\sqrt{-8x + 16}$ instead $\sqrt{x^2 - 8x + 16} = \sqrt{(x-4)^2} = |x-4|$
- Examples: Simplify the following
- $\sqrt{48} = 4\sqrt{3}$ $\sqrt{(a+1)^2} = |a+1|$ $\sqrt[3]{54} = 3\sqrt[3]{2}$

VIII. Solving Quadratics

- Standard form of a quadratic equation: $ax^2 + bx + c = 0$
- Be able to solve quadratics using factoring, quadratic formula and graphing
- Remember to set equations equal to 0 before solving

Factoring: $3x^2 = 2 - x$
 $3x^2 + x - 2 = 0$ Set equation equal to 0
 $(3x-2)(x+1) = 0$ Factor equation
 $3x-2 = 0$ and $x+1 = 0$ Set each factor equal to 0
 $x = \frac{2}{3}$ and $x = -1$ Solve each equation

Quadratic Formula: To solve $ax^2 + bx + c = 0$ and $a \neq 0$

$$\text{Then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

ex. Solve $5x^2 + 8x = -3$ using the quadratic formula

$$5x^2 + 8x + 3 = 0 \qquad a = 5, b = 8, c = 3$$

$$x = \frac{-8 \pm \sqrt{8^2 - 4(5)(3)}}{2(5)}$$

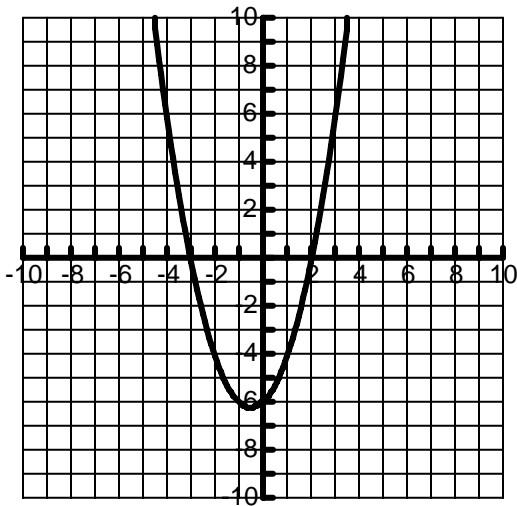
$$x = \frac{-8 \pm \sqrt{4}}{10} \qquad \text{Split the plus and minus apart}$$

$$x = -\frac{3}{5} \quad \text{or} \quad x = -1$$

Solving Quadratics by Graphing:

Graph: $y = x^2 + x - 6$ on your graphing calculator

- the solution(s) are where the graph crosses the x-axis



Solutions: $x = \underline{\quad}$ & $x = \underline{\quad}$

IX. Problem Solving Skills for Word Problems

1. Read the problem carefully.
2. Draw a picture (if you can) illustrating the problem.
3. Identify unknown quantities you're being asked to find.
4. Choose a variable to represent one quantity.
5. Write down, in words, what the variable (you chose in 4) represents.
6. Represent other quantities to be found in terms of the variable (you chose in 4).
7. Write the word problem as an equation (hard step--takes practice).
8. Solve the equation for the unknown quantity.
9. Answer the question asked in the word problem.
10. Check your solution in the original word problem.

X. Basic Formulas

Formula	Use	Formula	Use
$A = \pi r^2$	Area of a circle. r is the radius	$P = 2L + 2W$	Perimeter of a rectangle. L is length, W is width
$C = 2\pi r$	Circumference of a circle. r is the radius	$A = (1/2)BH$	Area of a triangle. B is base length, H is height
$A = LW$	Area of a rectangle. L is length, W is width	$a^2 + b^2 = c^2$	Pythagorean theorem for a right triangle. a, b lengths of legs c length of hypotenuse
$A = s^2$	Area of a square		

Review problems: Complete the following problems, showing work where necessary. Feel free to do your work on separate sheets of paper and remember you will be required to turn this in. An answer key is provided for you but in geometry the work is usually more important than the answer!

*Problems should be completed by Geometry A students only

I. Using the graphing calculator

1. Graph the following on your calculator and sketch the graph:

a) $y = -\frac{2}{3}x + 4$

b) $y = \sqrt{x-4}$

c) $\begin{cases} 2x + y = 5 \\ x - y = 3 \end{cases}$

2. Find the points of intersection of the following: $y = x^2 + 1$
 $y = 2x + 3$

3. Find the roots ($y = 0$) of the following: $y = x^3 - 2x + 1$

II. Cartesian Coordinate System

4. Which pair of lines are perpendicular?

a) $y = 3x - 4$
 $y = 3x + 9$

b) $y = \frac{3}{2}x + 8$
 $y = -\frac{3}{2}x - 4$

c) $y = 3$
 $y = -\frac{1}{3}$

d) $y = -\frac{2}{5}x + 1$
 $y = \frac{5}{2}x - 6$

5. Which pair of lines are parallel?

a) $y = 3x - 4$
 $y = 3x + 9$

b) $y = \frac{3}{2}x + 8$
 $y = -\frac{3}{2}x - 4$

c) $y = 3$
 $y = -\frac{1}{3}$

d) $y = -\frac{2}{5}x + 1$
 $y = \frac{5}{2}x - 6$

6. Write an equation in point-slope form for the line through the given point and slope.

a) $(-2, 8), m = -\frac{4}{3}$

b) $(1, 5), m = -6$

7. Write an equation for the line through the given points. Use the form given only.

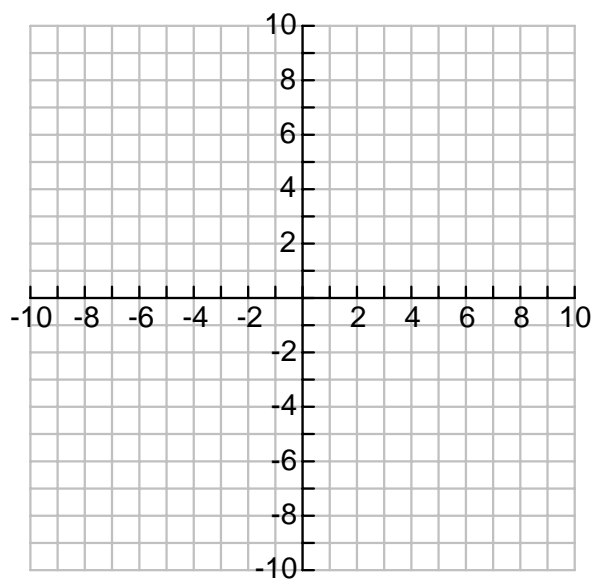
a) $(1, 4), (2, 5)$ Point-slope form

b) $(3, 1), (0, 7)$ Slope Intercept Form

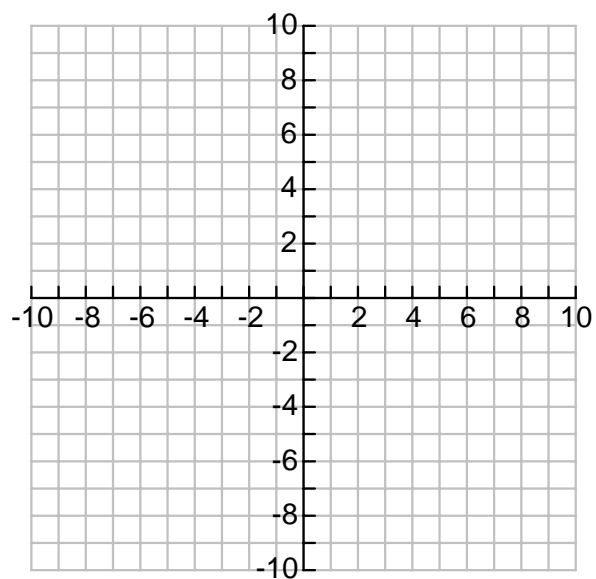
8. Find the equation of the line perpendicular to the given line that contains the following point. Use slope intercept form. $y = -\frac{1}{4}x - 2; (0, 7)$

9. Find the equation of the line parallel to the given line that contains the following point. Use point-slope form. $y = -\frac{3}{4}x + 7; (1, 8)$

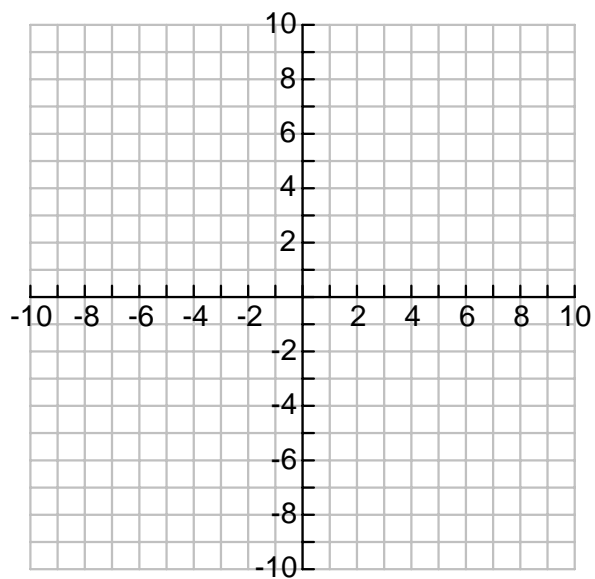
10. Graph the following lines:



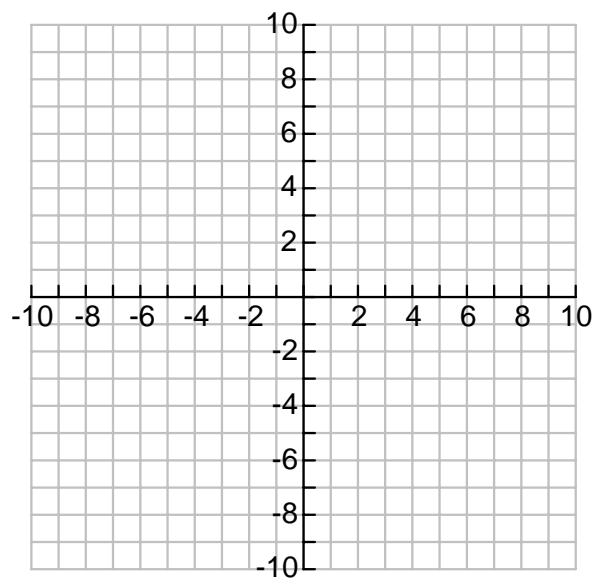
A. $y + 2 = 7$



B. $y + 2x = 7$



C. $4x - 3y = 12$



D. $(y - 3) = 0.4(x + 2)$

III. Simplifying Algebraic Expressions

11. Simplify the following expressions:

a) $19 - (4 + 2 \times 3^2)$

b)
$$\frac{8 \div 4 \times 6 | 4^2 - 5^2 |}{9 - 4 + 11 - 4^2}$$

c) Evaluate: $2(x - 6) - 3x^2$ if $x = -2$

IV. Solving Linear Equations and Inequalities

12. Solve the following equations:

a) $-9x + 4(2x - 3) = 5(2x - 3) + 7$

b) $\frac{1}{3}(45y - 18) = 15(y + 1)$

c) $\frac{1}{2}x - \frac{5}{8} = \frac{3}{4}x + \frac{3}{8}$

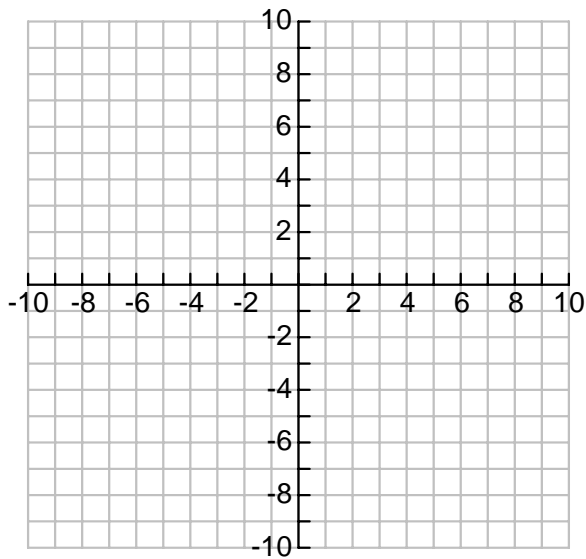
13. Solve the following inequalities: (write your answer in interval notation)

a) $2x + 7 < 19$

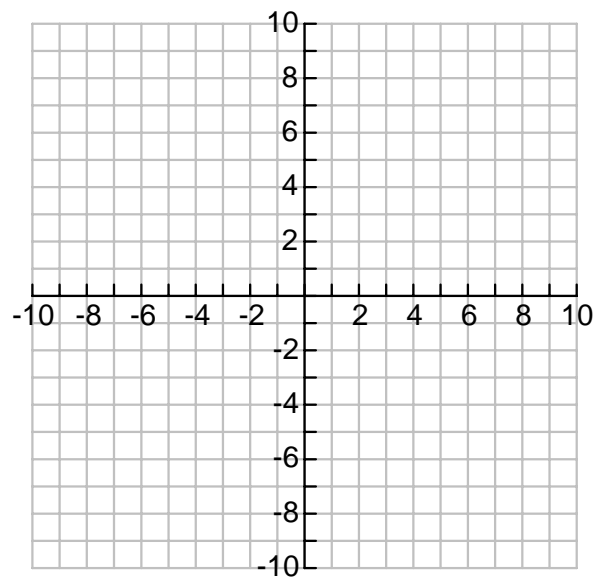
b) $4m + 7 \leq 14(m - 3)$

c) $\frac{1}{4}(8y + 4) - 17 < -\frac{1}{2}(4y - 8)$

14. Graph the solution to the following linear inequalities:



A. $y \geq \frac{2}{3}x + 4$



B. $5x - 2y < 8$

V. Conjectures

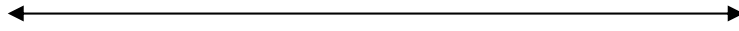
15. Find the intersection of the sets:

$$\{1, 3, 5, 7, 9\} \cap \{3, 5, 11, 13\}$$

16. Find the union of the sets:

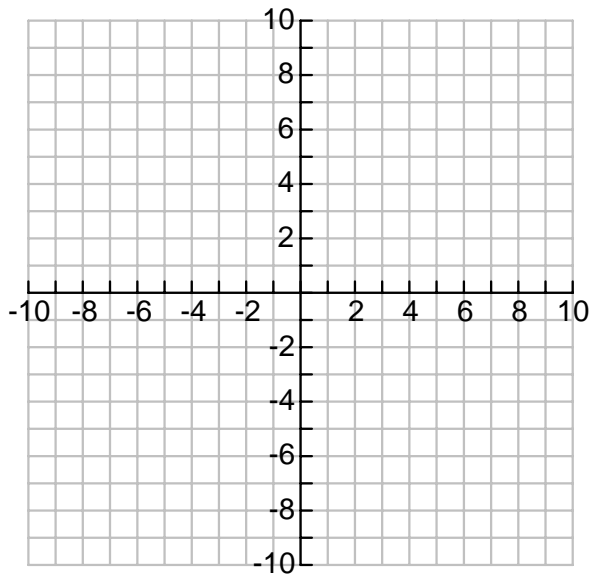
$$\{1, 2, 5, 6, 9\} \cup \{1, 3, 5, 9\}$$

17. Solve and graph the solution set: $-3x > 12$ or $4x \geq -10$

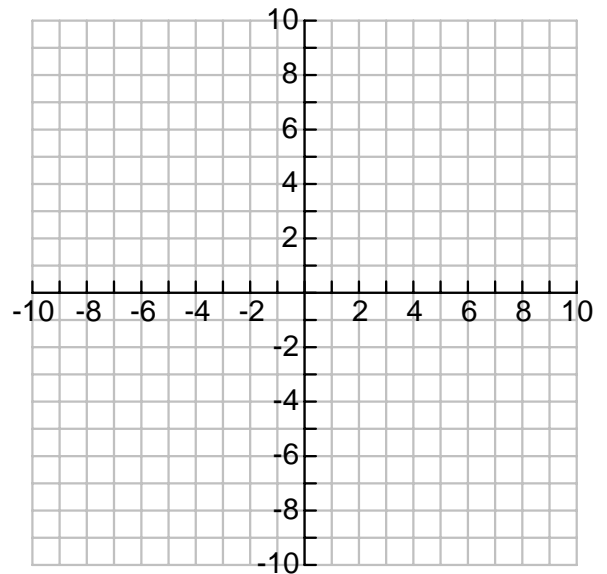


VI. Solving Systems of Linear Equations & Inequalities

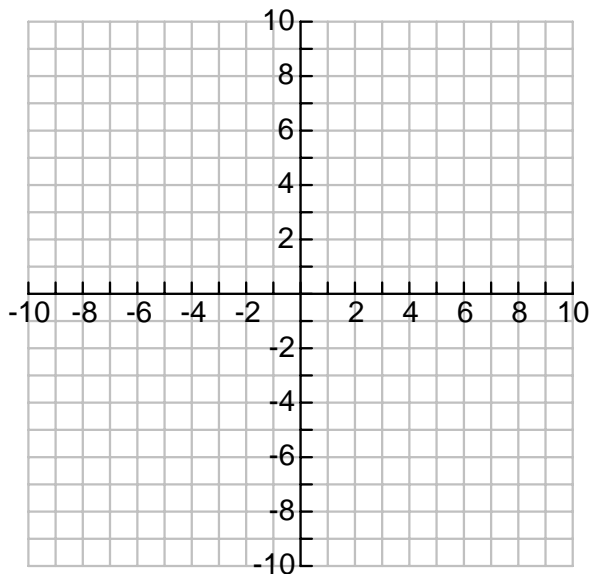
18. Graph the following systems and state the solution.



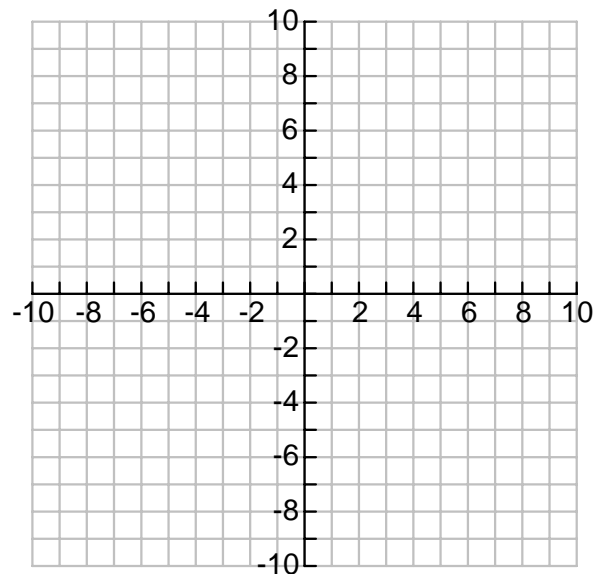
A. $2x - y = 4$ $x + 2y = 2$



B. $2x - y = 4$ $5x - y = 13$



C. $4y = 4x - 12$ $3y = 3x - 9$



D. $6x - 2y = 2$ $9x - 3y = 1$

19. Solve using Substitution or Elimination Method

a). $y = 2x + 11$
 $y = -x + 5$

b). $4x - 5y = 11$
 $6x + 7y = 31$

c). $\begin{cases} 2x + 4y = 2 \\ x = y + 7 \end{cases}$

d). $\begin{cases} -2x + 5y = 26 \\ 3x - 2y = 5 \end{cases}$

20. Substitution Only!

$$\begin{cases} -3x + 2y = 16 \\ y = -x + 3 \end{cases}$$

21. Elimination Only!

$$\begin{cases} 3x + 2y = 17 \\ 3x - 2y = -5 \end{cases}$$

22.* $6x - 4y + 5z = 31$
 $5x + 2y + 2z = 13$
 $x + y + z = 2$

23.* $w + x - y + z = 0$
 $w - 2x - 2y - z = -5$
 $w - 3x - y + z = 4$
 $2w - x - y + 3z = 7$

VII. Simplifying Radicals

24. Simplify the following:

a) $\sqrt{45}$

b) $\sqrt{198}$

c) $\sqrt{325}$

d) $\sqrt{32a^5b^{11}}$

25. Rationalize the denominator for each expression.

a) $\frac{\sqrt{5}}{\sqrt{3}}$

b) $\sqrt{\frac{4}{5b}}$

VIII. Solving Quadratic Equations

26. Multiply the following expressions: (write your answer in descending order)

a). $(a + 3)(a - 7)$

b). $y(3y^2 - 5y - 10)$

c). $(2a + 3)(2a - 3)$

d). $(2d - 5)(3d^2 + d + 1)$

e). $(4y^2 - 7y^3)(4y^2 + 7y^3)$

f). $(4b - 1)(3b + 2)$

g). $(x + 7)(x + 7)^3$

h). $(3m - 1)^2$

27. Factor the following polynomials

a). $y^2 - 10y + 25$

b). $x^2 + 12x + 36$

c). $b^2 - 100$

d). $c^2 + 9$

e). $x^2 + 6x + 5$

f). $x^2 - 7x + 12$

g). $x^2 - 2x - 8$

h). $8x^5 - 32x^3$

28. Solve each equation. If the value is irrational, simplify the radical.

a) $x^2 - 144 = 0$

b) $x^2 + 16 = 0$

c) $x^2 + 8 = 72$

d) $2x^2 - 10 = -4$

e) $4x^2 - 8 = 50$

f) $5x^2 + 25 = 125$

Solve by factoring:

g) $(8x - 3)(4x + 1) = 0$

h) $x^2 + 14x + 13 = 0$

i) $x^2 + 7x = 8$

j) $3x^2 - 11x + 10 = 0$

k) $2x^2 - 21x - 65 = 0$

l) $30x^2 + 121x - 21 = 0$

IX. Problem Solving Skills

29. Kevin rolled a number cube (a die which is one of a pair of dice) 50 times and obtained the following results:

Number which showed up	1	2	3	4	5	6
Number of times it showed up	10	9	5	7	8	11

- a) Based on this experiment, what's the probability of rolling a "2"?
- b) What is the theoretical probability of rolling a "2"?
- c) Based on these results, how many 5's should Kevin expect to get in 300 rolls?
- d) Based on theoretical probability, how many 5's should Kevin expect to get in 300 rolls?
30. Three times the greater of two consecutive odd integers is five less than four times the smaller. Find the two numbers.

31. Solve: $v = \frac{d_2 - d_1}{t}$, solve for d_1

32. Write and solve an inequality for the following:
5 times a number minus 7 is less than 118

33. Write an inequality for the following problem.
One fourth of a number increased by 17 is at least 63.

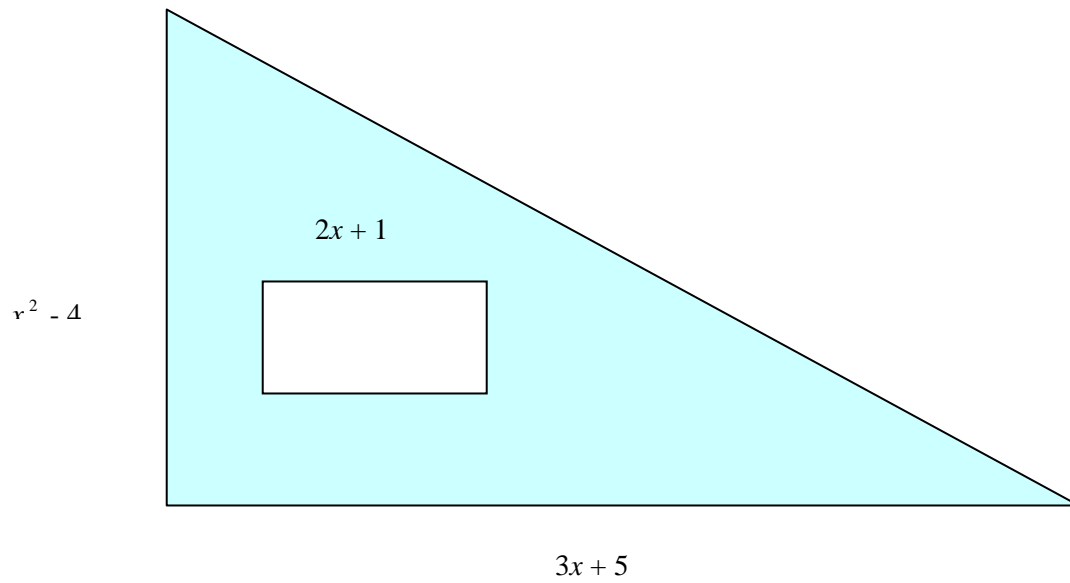
X. Using Basic Formulas

34. Use the formula $P = 2l + 2w$ to find the length of a rectangle whose perimeter is 57 inches and whose width is 13 inches.

35. A rectangle has dimensions $3x + 5$ and $x + 2$. Write an expression for the area of the rectangle as a product and as a polynomial in standard form.

36. Stephanie is planning to build a rectangular garden that is 25m longer than it is wide. If the flowerbed will have an area of 7500 m^2 , find the dimensions of the garden.

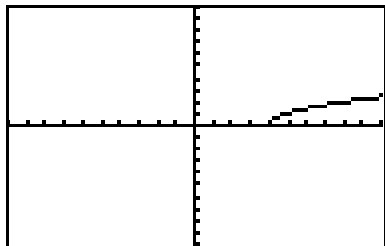
37. Find the area of the shaded region:



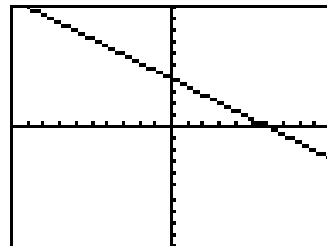
ANSWER KEY

Part 1: Graphing calculator

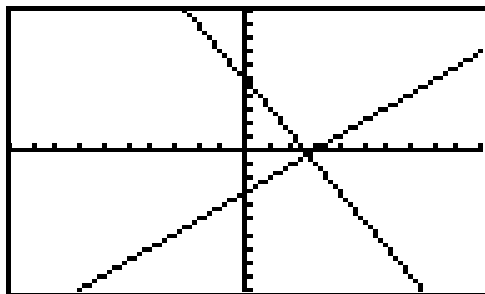
a)



b)



c)



2. $x = -.73205$ and $x = 2.73205$

3. $x = 1, -1.618$ and also $x = .618033$

Part 2: Review Problems

4. D

5. A

6. a) $y - 8 = -\frac{4}{3}(x + 2)$ b) $y - 5 = -6(x - 1)$

7. a) $y - 4 = x - 1$ or $y - 5 = x - 2$

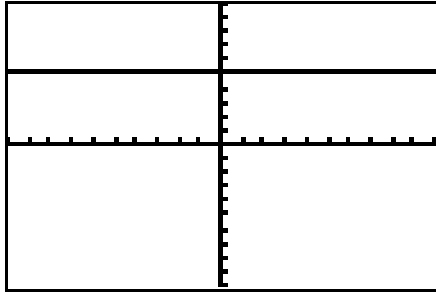
b) $y = -2x + 7$

8. $y = 4x + 7$

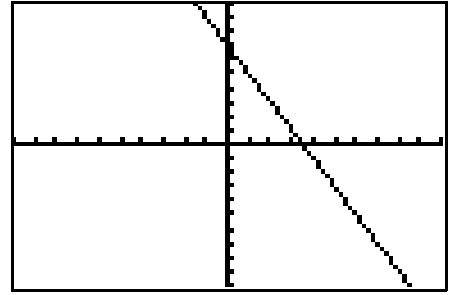
9. $y - 8 = -\frac{3}{4}(x - 1)$

10.

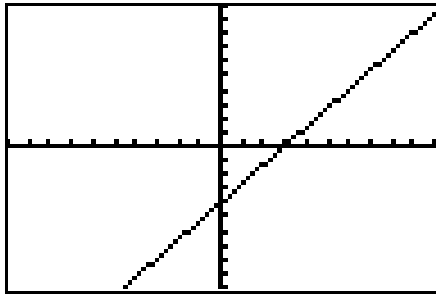
a)



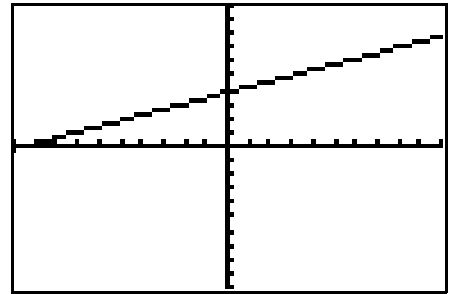
b)



c)



d)



11. a) -3

b) no solution

c) -28

12. a) $x = -\frac{4}{11}$

b) no solution

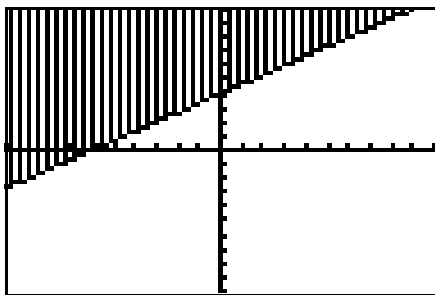
c) $x = -4$

13. a) $(4, \infty)$

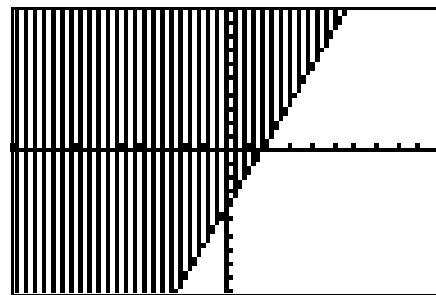
b) $[4.9, \infty)$

c) $(5, \infty)$

14. a)



b)

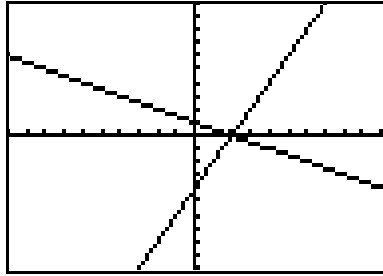


15. $\{3, 5\}$

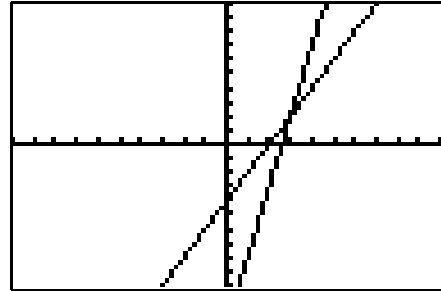
16. $\{1, 2, 3, 5, 6, 9\}$

17. $x < -4$ or $x \geq -\frac{5}{2}$

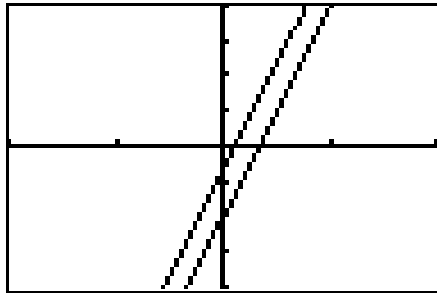
18.



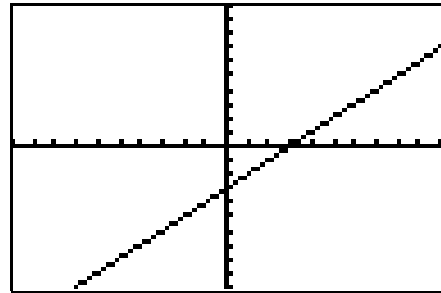
a) Solution (2, 0)



b) Solution (3, 2)



c) Infinite # of Solutions



d) No Solution

19. a) (-2, 7)

b) (4, 1)

c) (5, -2)

d) (7, 8)

20. a) (-2, 5)

21. $\left(2, \frac{11}{2}\right)$

22. (3, -2, 1)

23. (-3, -1, 0, 4)

24. a) $3\sqrt{5}$

b) $3\sqrt{22}$

c) $5\sqrt{13}$

d) $4a^2b^5\sqrt{2ab}$

31. $d_2 - vt = d_1$

32. $n < 25$

33. $\frac{1}{4} + 17 \geq 63$

34. $l = 15.5$ inches

35. $A = 3x^2 + 11x + 10$

36. width = 75m length = 100m

37. $A = \frac{3}{2}x^3 + \frac{5}{2}x^2 - 14x - 14$ units²