

1. Consider the following set of numbers:

$$\{-\sqrt{14}, -\frac{3}{5}, 0, \frac{\pi}{3}, 2.\bar{1}, 2\frac{1}{8}, \sqrt{49}, 8\}$$

List the numbers in the set that are:

- a. natural numbers

$$\sqrt{49}, 8$$

- b. whole numbers

$$0, \sqrt{49}, 8$$

- c. integers

$$0, \sqrt{49}, 8$$

- d. rational numbers

$$-\frac{3}{5}, 0, 2.\bar{1}, 2\frac{1}{8}, \sqrt{49}, 8$$

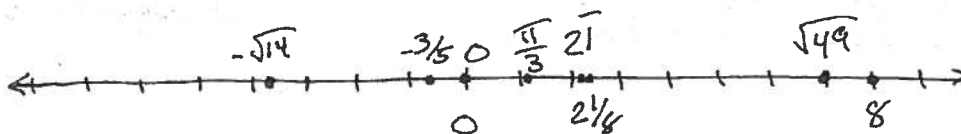
- e. irrational numbers

$$-\sqrt{14}, \frac{\pi}{3}$$

- f. real numbers

All of them

2. Graph each of the numbers from the above set on a number line.



3. Simplify the algebraic expression $\frac{1}{3}(3x + 12) - \frac{3}{4}(8x - 4)$.

$$\frac{1}{3}(3x + 12) - \frac{3}{4}(8x - 4)$$

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

$$= -5x + 7$$

4. Use order of operations to simplify the following arithmetic expressions.

a. $\frac{5(3 - |-4 + 1|) - 3}{1 - \sqrt{2} - \sqrt{2}}$

$$= \frac{5(3 - |-3|) - 3}{\sqrt{2} - \sqrt{2}}$$

$$= \frac{5(3 - 3) - 3}{0}$$

is undefined

b. $\frac{|4| - 5}{(-1)^3} - \left(\frac{1}{2} - \frac{1}{6}\right)^2 (3^2)$

$$= \frac{4 - 5}{-1} - \left(\frac{3}{6} - \frac{1}{6}\right)^2 (9)$$

$$= \frac{-1}{-1} - \left(\frac{2}{6}\right)^2 \cdot 9$$

$$= 1 - \left(\frac{1}{3}\right)^2 \cdot 9$$

$$= 1 - \frac{1}{9} \cdot 9$$

$$= 1 - 1 = 0$$

- 5. Answer the following questions regarding the polynomial

$$-3 + x - 5x.$$

a. How many terms does it have?

3

c. What is the coefficient of the 2nd term?

1

b. What is the constant term?

-3

d. Are there any like terms? If so, list them using commas.

Yes: $x, -5x$

- 6. The measure of an angle's complement is 20 deg less than two times that of its supplement. What is the measure of the original angle?

$$\begin{aligned} 90 - x &= 2(180 - x) - 20 \\ 90 - x &= 360 - 2x - 20 \\ 90 - x &= 340 - 2x \\ \hline +2x & \qquad \qquad +2x \end{aligned}$$

$$\begin{aligned} 90 + x &= 340 \\ -90 & \qquad -90 \\ \hline x &= 250 \end{aligned}$$

The angle is 250°

- 7. Translate the following question into an algebraic equation, solve the equation and then answer the question using a complete sentence.

15 is what percent of 50?

$$\frac{15}{50} = \frac{x \cdot 50}{50} \quad \rightarrow 0.3 = x$$

15 is 30% of 50.

- 8. Is the point (7,-1) a solution to $2x - 7y = 21$? Show your work.

$$\begin{aligned} 2(7) - 7(-1) &\stackrel{?}{=} 21 \\ 14 + 7 &\stackrel{?}{=} 21 \\ 21 &= 21 \end{aligned}$$

Yes, (7, -1) is a solution.

- 9. Determine whether the distinct lines through each set of points are parallel, perpendicular or neither.

(-8,4) and (-3,5); (4,2) and (3,7)

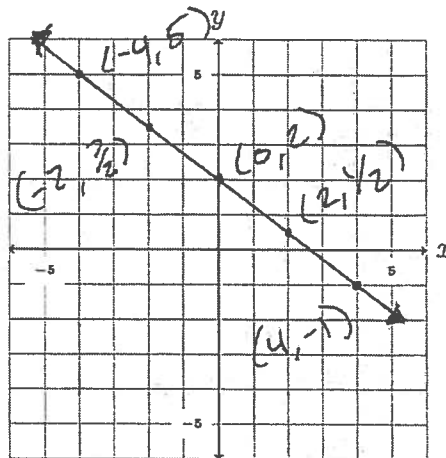
$$m_1 = \frac{5-4}{-3-(-8)} = \frac{1}{5}$$

$$m_2 = \frac{7-2}{3-4} = \frac{5}{-1} = -5$$

The lines are perpendicular.

- [6 pts] 10. Make a table of 5 solutions to the equation $y = -\frac{3}{4}x + 2$. Plot these solutions on the given coordinate plane and then use the points to graph the line.

x	y
-4	$-\frac{3}{4}(-4) + 2 = 5$
-2	$-\frac{3}{4}(-2) + 2 = \frac{7}{2}$
0	$-\frac{3}{4}(0) + 2 = 2$
2	$-\frac{3}{4}(2) + 2 = \frac{1}{2}$
4	$-\frac{3}{4}(4) + 2 = -1$



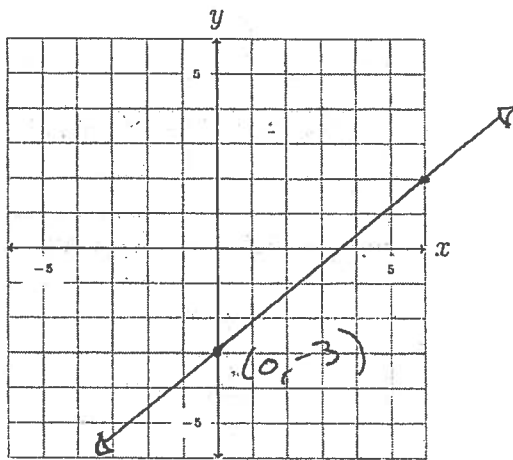
You may have chosen different x values. This is okay.

11. Given $5x - 6y = 18$, do the following:

- Put the equation in slope-intercept form by solving for y .
- Identify the slope and the y -intercept.
- Use the slope and y -intercept to graph the equation.

$$\begin{array}{r}
 a. \quad 5x - 6y = 18 \\
 \underline{-5x} \qquad \underline{-5x} \\
 -6y = -5x + 18 \\
 \underline{-6} \qquad \underline{-6} \\
 y = \frac{5}{6}x - 3
 \end{array}$$

b. $m = \frac{5}{6}$ y -int = $(0, -3)$



12. Solve the equation or inequality. State your answers in set notation. If appropriate, also write your answers on a numberline and in interval notation.

7x.

a. $\frac{45}{x} = \frac{15}{7} \cdot 7x$

$\frac{7 \cdot 45}{15} = \frac{15x}{15}$ $\{2\}$

$21 = x$

b. $2(3x - 6) = -\frac{3}{5}(20 - 10x)$

$6x - 12 = -12 + 6x$

\mathbb{R}

$(-\infty, \infty)$



c. $x = \frac{yt + xrt}{-xrt}$ for y

$\frac{x - xrt}{-xrt} = \frac{yt}{-xrt}$

$\frac{x - xrt}{t} = \frac{yt}{t}$

$\frac{x - xrt}{t} = y$

$\left\{ \frac{x - xrt}{t} \right\}$

d. $15x - 3(x + 2) > 6(2x - 3) + 14$

$15x - 3x - 6 > 12x - 18 + 14$

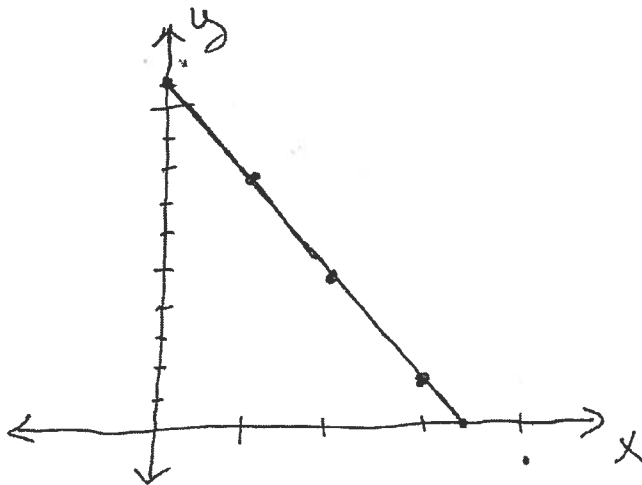
$12x - 6 > 12x - 4$

$\{ \}$

13. You're leaving Eugene after a Ducks game and are fighting traffic back to Portland at the measly speed of 30 miles per hour. The distance from Eugene to Portland is 110 miles. Determine an equation in slope intercept form which gives the number of miles left to go, y , given the number of hours you have been driving, x . Identify the slope and y intercept. Graph the equation you come up with on an appropriate Cartesian Coordinate Plane. Use the equation to determine how long it will take for you to reach home.

$y = -30x + 110$

$m = -30$ $y\text{-int} = (0, 110)$



$0 = -30x + 110$

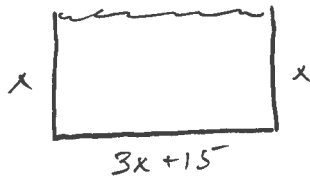
$\frac{-110}{-30} = \frac{-30x}{-30}$

$\frac{-110}{-30} = \frac{-30x}{-30}$

$\frac{11}{3} = x$

It will take $3\frac{2}{3}$ hours
or 3 hours & 40min
to reach home.

14. A rectangular field which runs along a river is fenced in on three sides with the river bordering the fourth side. The total amount of fencing used is 210 yards. Suppose the length is 15 yards more than three times the width and assume the river runs along the length of the field. Find the width and length of the field.



$$x = \text{width in yards}$$

$$3x + 15 = \text{length in yards}$$

$$x + 3x + 15 + x = 210$$

$$5x + 15 = 210$$

$$5x = 195$$

$$x = 39$$

$$3(39) + 15 = 132$$

The width is 39 yards & the length is 132 yards.

15. You stop by a convenience store in Vancouver, WA where the sales tax rate is 7.7% and ring up a six pack of beer, candy bar and box of macaroni for a total of \$10.55. What was the total price of these items before the tax was applied? Round to the nearest penny.

$x = \text{original price}$

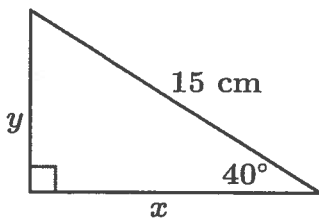
$$x + .077x = 10.55$$

$$1.077x = 10.55$$

$$x \approx 9.80$$

The original price was \$9.80

16. Find the lengths of the sides of the triangle (x and y) accurate to 2 decimal places.



$$\cos(40^\circ) = \frac{x}{15}$$

$$x = 15 \cos(40^\circ)$$

$$\approx 11.49$$

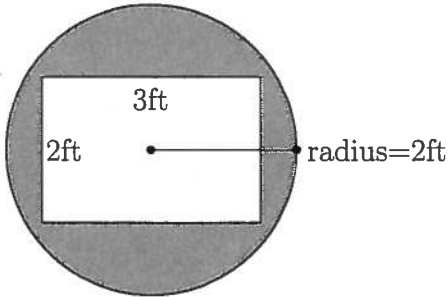
$$\sin(40^\circ) = \frac{y}{15}$$

$$y = 15 \sin(40^\circ)$$

$$\approx 9.64$$

The bottom side is about 11.49 cm & the left side is about 9.64 cm.

17. Find the area of the shaded region below. State your conclusion using both an exact answer and an approximate answer rounded to two decimal places.



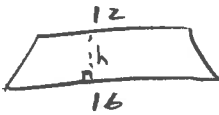
$$A_{\circ} = \pi(2)^2 = 4\pi$$

$$A_{\square} = 6$$

$$A_{\text{grey}} = 4\pi - 6 \\ \approx 6.57$$

The area of the shaded region is $4\pi - 6 \text{ ft}^2$ or about 6.57 ft^2

18. A Cog is a ship with a trapezoid shaped sail. Suppose the top of the sail is 12 meters across, the bottom of the sail is 16 meters across and the area of the sail is 126 m^2 . How tall is the sail? Hint: Pictures are your friend.



$$A = 126 \text{ m}^2$$

$h = \text{height}$

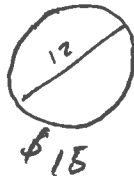
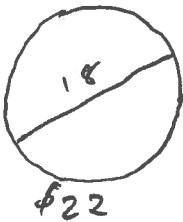
$$126 = \frac{12+16}{2} \cdot h$$

$$126 = 14 \cdot h$$

$$9 = h$$

The height of the sail is 9m.

19. Which one of the following is a better buy: a large pizza with a 18-inch diameter for \$22.00 or medium pizza with a 12-inch diameter for \$15.00?



$\frac{\$}{\text{in}^2}$

$$\frac{22}{\pi(9)^2} \approx 0.09 \text{ \$/in}^2$$

$$\frac{15}{\pi(6)^2} \approx 0.13 \text{ \$/in}^2$$

The large pizza is the better @ only $9\text{¢}/\text{in}^2$.

20. Write the point-slope form of the equation of the line satisfying each of the given conditions. Then use the point-slope form of the equation to write the slope-intercept form of the equation. Make sure and identify both the point-slope form and the slope-intercept form.

a. Passing through $(-3, -1)$ and $(2, 4)$

$$m = \frac{4 + 1}{2 + 3} = 1$$

$$y = 1(x + 3) - 1 \quad \text{point-slope}$$

$$y = x + 3 - 1$$

$$y = x + 2 \quad \text{slp-int}$$

b. Passing through $(-3, -1)$ and $(4, -1)$

$$m = \frac{-1 + 1}{4 + 3} = 0$$

$$y = 0(x + 3) - 1 \quad \text{point-slope}$$

$$y = -1 \quad \text{slp-int.}$$

c. x -intercept $(-\frac{1}{2}, 0)$ and y -intercept $(0, 4)$

$$m = \frac{4 - 0}{0 + \frac{1}{2}} = 8$$

$$y = 8(x - 0) + 4 \quad \text{pt-slp}$$

$$y = 8x + 4 \quad \text{slp-int}$$

d. The line passing through $(4, -7)$ and perpendicular to the line whose equation is

$$x - 2y = 3.$$

$$\begin{array}{r} -x \quad -x \\ \hline -2y = -x + 3 \\ -2 \quad -2 \end{array}$$

$$y = \frac{1}{2}x - \frac{3}{2}$$

So we want

$$m = -2$$

$$y = -2(x - 4) - 7 \quad \text{pt-slp}$$

$$y = -2x + 8 - 7$$

$$y = -2x + 1 \quad \text{slp-int}$$

e. The line passing through (2,4) and with the same y-intercept as the line whose equation is $x - 4y = 8$.

$$\begin{array}{r} -x \quad -x \\ \hline -4y = -x + 8 \\ -4 \quad -4 \\ \hline y = \frac{1}{4}x - 2 \\ \text{y-int} = (0, -2) \end{array}$$

$$m = \frac{4 - 2}{2 - 0} = 3$$

$$y = 3(x - 2) + 4 \quad \text{put-slp}$$

$$y = 3x - 6 + 4$$

$$y = 3x - 2 \quad \text{slp-int}$$

21. Determine whether each ordered pair is a solution of the given inequality.

a. $2x + y \geq 5$ (4,0), (1,3), (0,0)

$$2(4) + 0 \stackrel{?}{\geq} 5 \quad 2(1) + 3 \stackrel{?}{\geq} 5 \quad 2(0) + 0 \stackrel{?}{\geq} 5$$

$$8 \geq 5 \checkmark \quad 5 \geq 5 \checkmark \quad 0 \not\geq 5$$

(4,0) & (1,3) are solutions. (0,0) is not a solution.

b. $y > -2x + 1$ (2,3), (0,0), (0,5)

$$3 \stackrel{?}{>} -2(2) + 1 \quad 0 \stackrel{?}{>} -2(0) + 1 \quad 5 \stackrel{?}{>} -2(0) + 1$$

$$3 \stackrel{?}{>} -4 + 1 \quad 0 \not> 1 \quad 5 > 1 \checkmark$$

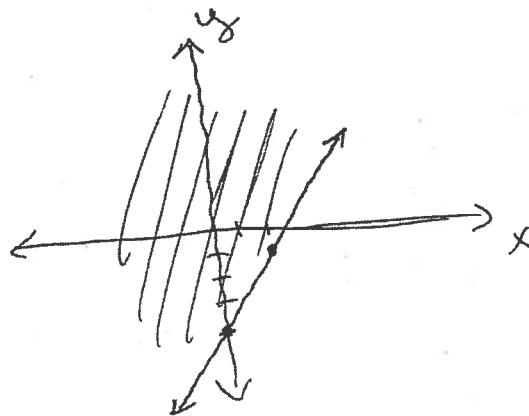
$$3 > -3 \checkmark$$

(2,3) & (0,5) are solutions. (0,0) is not a solution.

22. graph each inequality.

a. $3x - 2y \leq 8$

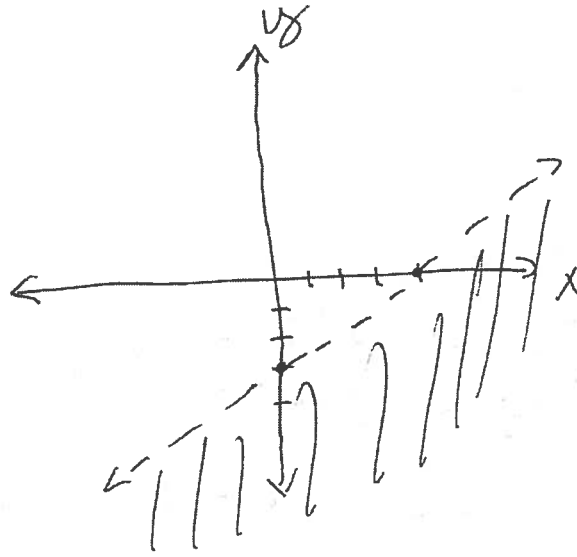
$$\begin{array}{r} -3x \quad -3x \\ \hline -2y \leq -3x + 8 \\ -2 \quad -2 \\ \hline y \geq \frac{3}{2}x - 4 \end{array}$$



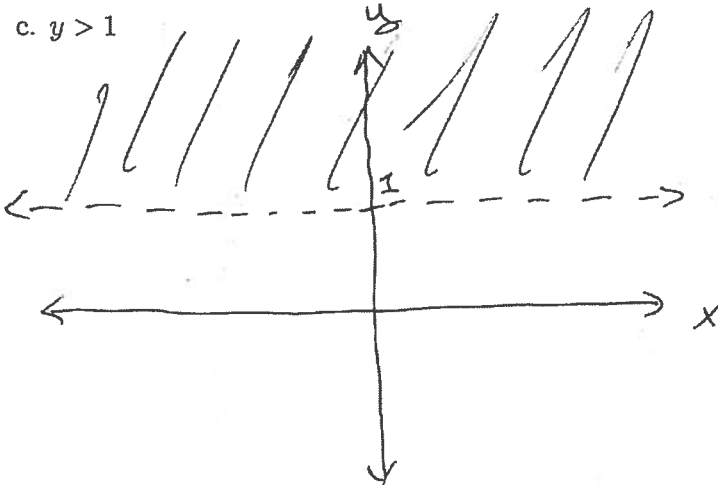
b. $y < \frac{3}{4}x - 3$

$m = \frac{3}{4}$

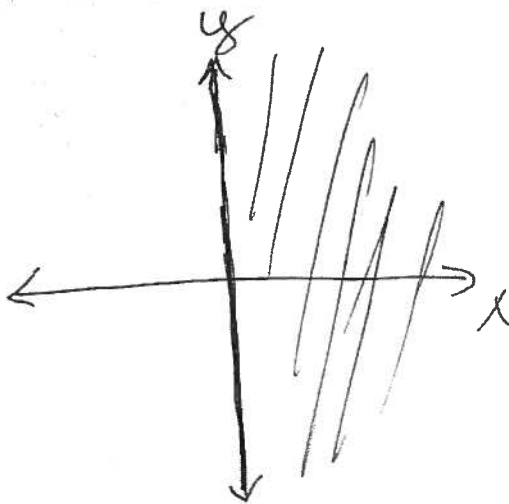
y-int = $(0, -3)$



c. $y > 1$



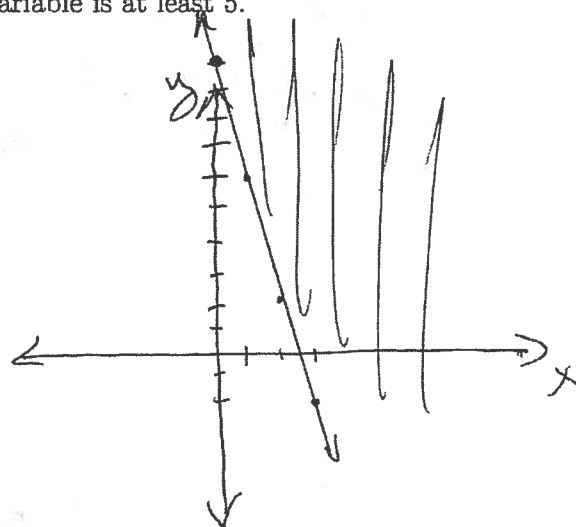
d. $x \geq 0$



□ 23. Write each sentence as a linear inequality in two variables and then graph the inequality.

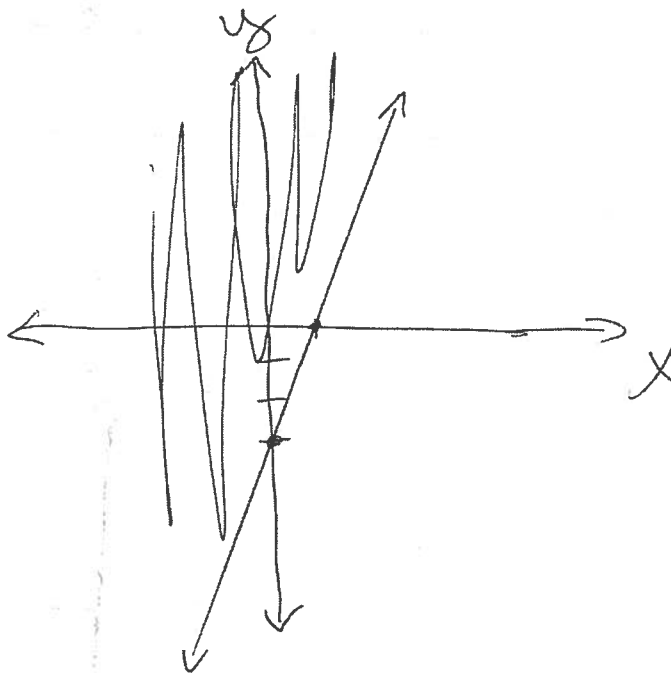
a. The sum of the twice the x -variable and half of the y -variable is at least 5.

$$\begin{array}{r}
 2x + \frac{1}{2}y \geq 5 \\
 -2x \qquad \qquad -2x \\
 \hline
 2 \cdot \frac{1}{2}y \geq (-2x + 5) \cdot 2 \\
 y \geq -4x + 10
 \end{array}$$



b. The difference between the three times x -variable and the y -variable is at most 3.

$$\begin{array}{r}
 3x - y \leq 3 \\
 -3x \qquad \qquad -3x \\
 \hline
 -y \leq -3x + 3 \\
 \frac{-y}{-1} \leq \frac{-3x + 3}{-1} \\
 y \geq 3x - 3
 \end{array}$$



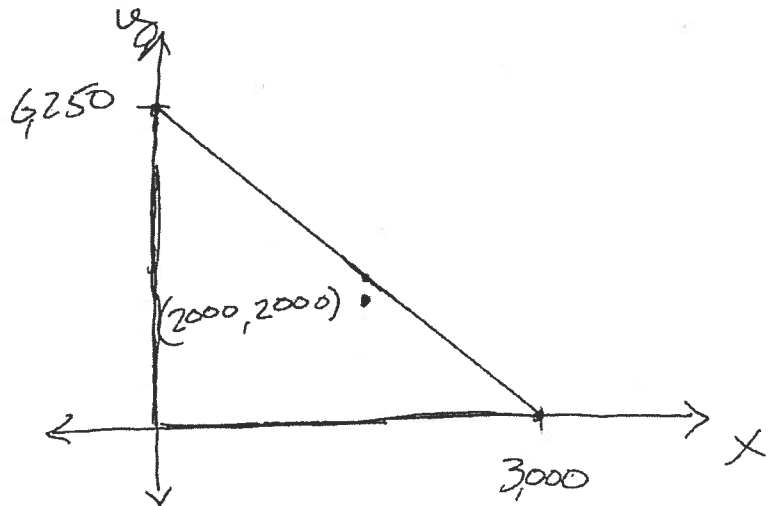
24. Bottled water and medical supplies are to be shipped to survivors of a hurricane, ~~plane~~. Each ~~plane~~ can carry no more than ~~80,000~~ pounds. The bottled water weighs 25 pounds per container and each medical kit weighs 12 pounds. Let x represent the number of bottles of water to be shipped. Let y represent the number of medical kits. Suppose the plane can hold at most 75,000 pounds worth of bottled water and medical kits combined.

a. Set up a linear inequality describing the situation.

$$25x + 12y \leq 75,000$$

b. Graph the inequality. Because x and y must be nonnegative, limit the graph to quadrant I and its boundary only.

x	y
0	6250
3000	0



c. Select an ordered pair satisfying the inequality. What are its coordinates and what do they represent in the situation?

The ordered pair $(2000, 2000)$ represents being able to carry 2000 containers of bottled water & 2000 med kits.

