

INTEGRATED ALGEBRA MIDTERM REVIEW 2017 - 18

Revised

1-22

Name: _____

I can

Key

p. 3 $x > -17$
10

p 5 # 20
closed @
on 4

Unit 1 - Linear Equations and Inequalities

- Evaluate an algebraic expressions
- Solve linear equations
- Solve and graph linear inequalities in 1 variable
- Express solutions in interval notation
- Write compound inequalities from a graph
- Solve and graph compound inequalities and express solutions in interval notation

Unit 2 - Linear Functions

- Graph linear functions in all forms
- Calculate x and y intercepts
- Generate linear equations given two points, or the slope and one point
- Generating linear models using algebraic skills and use their models to make predictions. (Word problems)
- Graph linear inequalities in two variables (lines with shading)
- Evaluate functions

Unit 3 - Systems of Linear Equations

Solve a system of linear equations graphically, by substitution, by elimination

Determine if an ordered pair is a solution of the system.

- Write and solve linear systems to represent real world problems. MIXTURE, D = RT, VALUE-VALUE, Quantity Value

Unit 4 - Systems of linear Inequalities

Solve linear inequalities with two unknowns graphically (lines and shading region of overlap)

- Write a system of linear inequalities to represent a problem.
- Solve a linear programming problem by identifying appropriate constraints, feasible region, vertices, and optimizing the objective function
- Understand the meaning of a solution to a real world application (optimization), and writing the solution in a sentence.
- Write constraint inequalities, write the objective function equation, identify vertices, and solve Linear Programming problems.

You are allowed to create a note sheet on one side of one piece of standard white paper to use during the exam. Good Luck!

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Part 1 -

Solve the Equation. Show all steps. Check your answer! **Onlookers first!!!!**

1.) $4(a + 5) = 2a + 12$

$$4a + 20 = 2a + 12$$

$$2a = -8$$

$$a = -4$$

2.) $4\left(\frac{3x-2}{4} - 2\right) = \left(\frac{3x}{2} - 8\right) 4$

$$3x - 8 = 6x - 32$$

$$24 = 3x$$

$$x = 8$$

3.) $4(2a - 8) = \frac{1}{7}(49a + 70)$

$$8a - 32 = 7a + 10$$

$$a = 42$$

4.) $\frac{3n-2}{5} = \frac{7}{10}$

$$5 \cdot 7 = 10(3n - 2)$$

$$35 = 30n - 20$$

$$55 = 30n$$

$$\frac{55}{30} = n$$

$$n = \frac{11}{6}$$

5.) $7 - 3x = x - 4(2 - x)$

$$7 - 3x = x - 8 + 4x$$

$$7 - 3x = 5x - 8$$

$$15 = 8x$$

$$x = \frac{15}{8}$$

6.) $\frac{3x-5}{7} - 3 = 7$

↑
onlooker!

$$\frac{3x-5}{7} = 10$$

$$3x - 5 = 70$$

$$3x = 75$$

$$x = 25$$

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The Rules:

- When you solve an equation, the variables add to zero, and you end with a **true statement**, the solution set will be: infinitely many solutions

Example:

$$\begin{aligned} 3(x+2) &= 3x+6 \\ 3x+6 &= 3x+6 \\ \frac{-3x}{6} & \quad \frac{-3x}{6} \\ 6 &= 6 \end{aligned}$$

Many Solutions!

- When you solve an equation, the variables add to zero and you end with a **false statement**, the solution set will be: no real solution

$$\begin{aligned} 3(x+2) &= 3x+4 \\ 3x+6 &= 3x+4 \\ \frac{-3x}{6} & \quad \frac{-3x}{6} \\ 6 &\neq 4 \end{aligned}$$

Solutions!

Try These:

7. $2x+5=2x-3$

$$5 = -3$$

\therefore false

no sol.

8. $3(x+1)-5=3x-2$

$$3x+3-5=3x-2$$

$$3x-2=3x-2$$

$$0=0$$

True!



inf. many soln.

SOLVING INEQUALITIES

Recall, when you solve an inequality, if you multiply or divide by a negative number, you must

flip the inequality sign!
SOLVE AND GRAPH THE SOLUTION SET!

9.) $-3(x-2) > 12$

$$-3x + 6 > 12$$

$$\frac{-3x}{-3} > \frac{6}{-3}$$

$$x < -2$$

$$\boxed{x < -2}$$

10.) $2x+7 > x-10$

$$x > -3$$

$$\boxed{x > -17}$$

$$\underline{x > -3}$$

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11.) $-9c + 3 \geq 21$

$$\begin{array}{r} -9c \geq 18 \\ \underline{-9} \quad \downarrow \quad \underline{-9} \\ c \leq -2 \end{array}$$

$c \leq -2$

12.) $5(2h - 6) - 7(h + 7) > 4h$

$$10h - 30 - 7h - 49 > 4h$$

$$3h - 79 > 4h$$

$$-79 > h$$

$$h < -79$$

$h < -79$

SOLVING LITERAL EQUATIONS

Strategy - Highlight the variable you are solving for!

13. Solve $6 = mx + b$ for x

$$6 - b = mx$$

$$\frac{6 - b}{m} = x$$

14. Solve $x = \frac{4 - k}{6}$ for k

$$6x = 4 - k$$

$$6x - 4 = -k$$

$$-6x + 4 = k$$

15. Solve $A = P + Prt$ for t . THINK FACTOR OUT THE GCF to isolate the P!

$$A = P + Pr(t)$$

$$A - P = Pr(t)$$

$$\frac{A - P}{Pr} = t$$

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16. Solve $3x - 4y = 12$ for y

$$-4y = -3x + 12$$

$$y = \frac{3}{4}x - 3$$

17. Solve $\frac{2x+3b}{9} = \frac{x-b}{2}$ for b

Is this a proportion? If so, cross multiply.

$$9(x-b) = 2(2x+3b)$$

$$9x - 9b = 4x + 6b$$

$$5x - 9b = 6b$$

$$5x = 15b \quad \frac{5x}{5} = \frac{15b}{5}$$

INEQUALITIES - REMEMBER THE RULES! When you multiply or divide by a negative...

$$\frac{x-b}{3}$$

18. Solve $3x - 4y > 12$ for y

$$\frac{-4y}{-4} > \frac{-3x}{-4} + \frac{12}{-4}$$

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

19. Solve $2x - 3y > 5y - 8$ for y

$$-3y > 5y - 2x - 8$$

$$\frac{-8y}{-8} > \frac{-2x}{-8} - \frac{8}{-8}$$

$$y < \frac{1}{4}x + 1$$

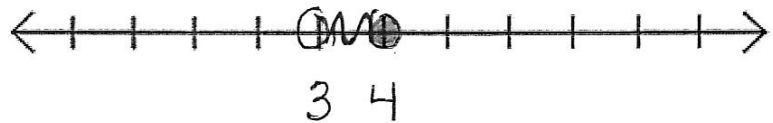
Solving Compound Inequalities Involving AND

Solve each inequality and graph the solutions. OPEN CIRCLE: $<, >$

CLOSED CIRCLE - MORE INK!

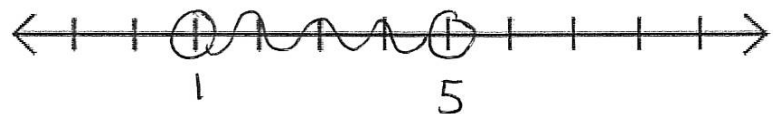
20. $8 < 3x - 1 \leq 11$

$$\begin{array}{r} +1 \quad +1 \quad +1 \\ \hline 9 < 3x < 12 \\ \hline \frac{9}{3} < \frac{3x}{3} < \frac{12}{3} \\ 3 < x < 4 \end{array}$$



21. $-9 < x - 10 < -5$

$$\begin{array}{r} +10 \quad +10 \quad +10 \\ \hline 1 < x < 5 \end{array}$$



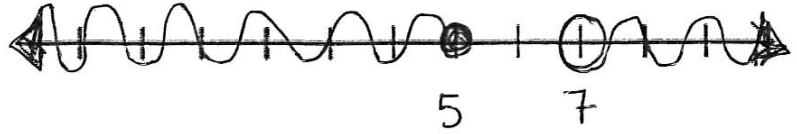
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Solving Compound Inequalities Involving OR

Solve each inequality and graph the solutions. OR – OARS in the Water AND - sANDwich

22. $4x \leq 20$ OR $3x > 21$

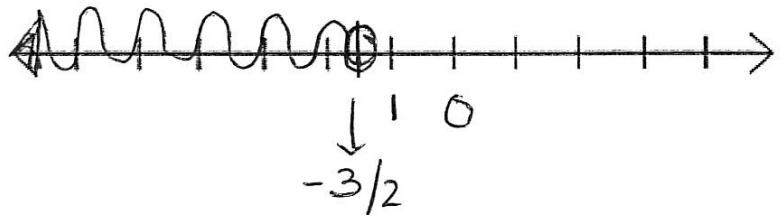
$x \leq 5$ or $x > 7$



23. $-2x + 6 < 12$ OR $\frac{-2x + 5}{2} > 4$

$$\begin{array}{r} -2x < 6 \\ \underline{-2} \quad \downarrow \quad \underline{-2} \\ x > -3 \end{array}$$

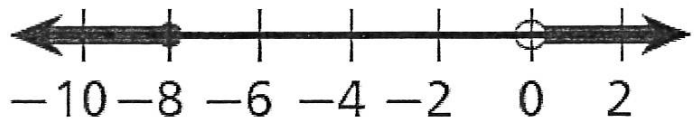
$$\begin{array}{r} -2x + 5 > 8 \\ -2x > 3 \\ x < -3/2 \end{array}$$



Writing a Compound Inequality from a Graph

When writing an inequality from a graph, you must decide:

- 1) AND or OR
- 2) open or closed circle(s)
- 3) what numerical values



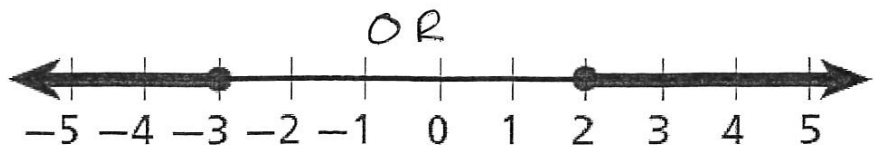
Since the arrows are going in opposite directions...OR

Closed circle at (-8) and open circle at (0)

So, $x \leq -8$ or $x > 0$

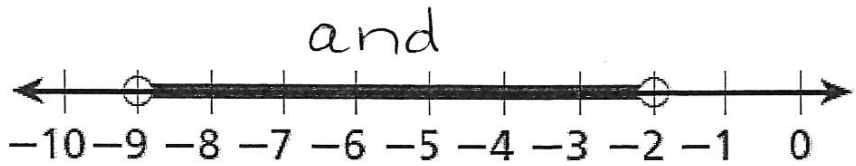
24. Write the compound inequality shown by the graph.

$x \leq -3$ or $x \geq 2$



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25. $-9 < x < -2$



26. Which equation best describes the relationship between the values of x and y shown in the table?

	x	y	
+1	-1	-7	> +2
	0	-5	
+2	2	-1	> +4
+4	4	3	> +4

$$\frac{\Delta y}{\Delta x} = \frac{2}{1} = \frac{4}{2} = \frac{4}{2} = 2$$

$$m = 2$$

$$b = -5$$

$$y = 2x - 5$$

A. $y = x - 5$

B. $y = 2x - 5$

C. $y = 3x - 7$

D. $y = 4x - 7$

B

27. A plumber charges \$13.50 per hour for a plumbing job that requires more than 3 hours to complete. For any job requiring 3 hours or less, there is a flat charge of \$40.50. If h represents the number of hours the job requires, which of the following expressions gives the charge, in dollars, for a job requiring more than 3 hours to complete?

$$13.50h$$

A. $13.5h + 40.5$

B. $13.5h$

C. $13.5h - 40.5$

D. 40.5

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Part 2

WRITING EQUATIONS OF LINES:

Objective: I CAN... Write an equation in slope intercept form and graph the line using slope intercept form.

Slope - Intercept Form: $y = mx + b$; $m = \text{slope}$; $b = y \text{ int}$

Write the equations in slope intercept form. Then identify the slope and the y-intercept.

1. $2x - 3y = 6$

$$-3y = -2x + 6$$

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

Slope: $\frac{2}{3}$

y-int: -2

2. $-4x + 7y = -14$

$$7y = 4x - 14$$

$$y = \frac{4}{7}x - 2$$

Slope: $\frac{4}{7}$

y-int: -2

3. $6y + 2 = 3x$

$$6y = 3x - 2$$

$$y = \frac{3x}{6} - \frac{2}{6}$$

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

Slope: $\frac{1}{2}$

y-int: $-\frac{1}{3}$

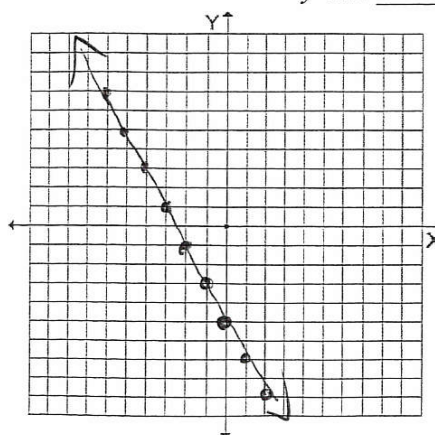
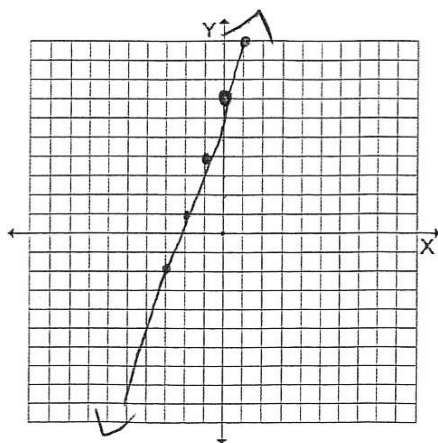
STEPS TO GRAPH A LINE WHEN IN SLOPE INTERCEPT FORM:

1. Plot the y-intercept on the y-axis.
2. From the y-intercept, use the slope = $\frac{\text{rise}}{\text{run}}$ to plot other points.
3. Graph the line through the points.

Identify the slope and y-intercept of the equation, then graph the line.

4. $y = 3x + 7$ Slope: 3 y-int: 7

5. $y = -\frac{2}{3}x - 5$ Slope: $-\frac{2}{3}$ y-int: -5

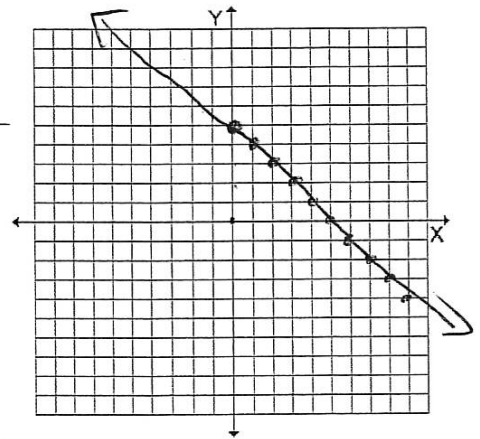


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- a. Write the equation in slope intercept form.
 b. Identify the slope and y-intercept.
 c. Graph the line.

6. $x + y = 5$ Slope: -1 y-int: 5

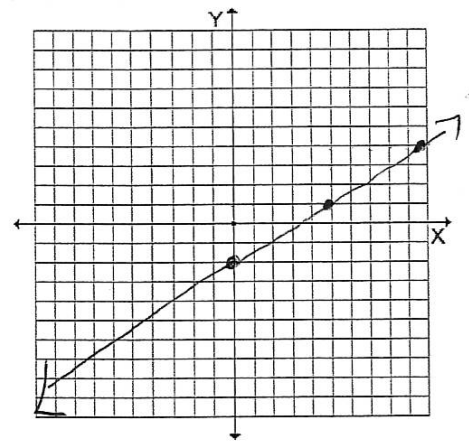
$$y = -1x + 5$$



7. $3x - 5y = 10$ Slope: $\frac{3}{5}$ y-int: -2

$$-5y = -3x + 10$$

$$y = \frac{3}{5}x - 2$$



Writing an equation given the SLOPE and a POINT:

1. Write $y = mx + b$
2. Substitute in the slope (m) and the point (x, y)
3. Solve for the y-intercept (b)
4. Substitute only the slope (m) and the y-intercept (b) into slope-int form: $y = mx + b$

Write an equation of a line given the slope and a point:

8. $(2, 2), m = -5$

$$y = mx + b$$

$$2 = -5(2) + b$$

$$2 = -10 + b$$

$$12 = b \quad m = -5$$

$$y = -5x + 12$$

9. $(8, 1), m = 3$

$$y = mx + b$$

$$1 = 3(8) + b$$

$$1 = 24 + b$$

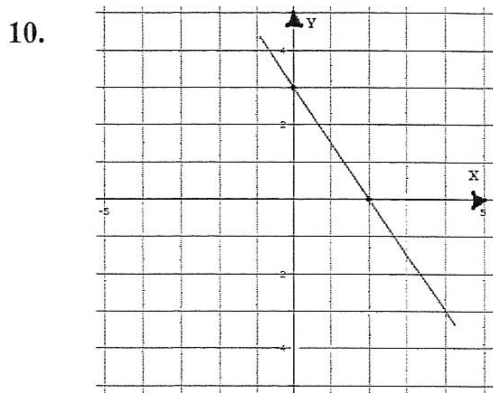
$$-23 = b$$

$$y = 3x - 23$$

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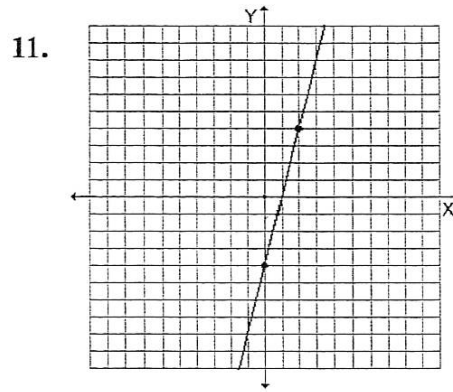
Write an equation from a GRAPH

1. **y-intercept (b)** : Where does the line cross the y-axis?
2. **Slope (m)** : Use $m = \frac{\text{rise}}{\text{run}}$
3. Substitute only **(m)** and **(b)** into slope-intercept form: $y = mx + b$



$b = 3$ $m = \frac{\downarrow 3}{\rightarrow 2} = -\frac{3}{2}$

Equation: $y = -\frac{3}{2}x + 3$



$b = -4$ $m = \frac{\uparrow 4}{\rightarrow 1} = 4$

Equation: $y = 4x - 4$

Writing an Equation Given 2 Points

OBJECTIVE: I CAN... Write an equation in slope intercept form given two points on the line.

Steps to writing the equation given TWO POINTS: (x_1, y_1) and (x_2, y_2)

1. Find the slope: $m = \frac{y_1 - y_2}{x_1 - x_2}$
2. Substitute the slope (**m**) and one point (**x, y**) into slope-intercept form: $y = mx + b$
3. Solve for the y-intercept (**b**)
4. Substitute only the slope (**m**) and the y-intercept (**b**) into slope-intercept form: $y = mx + b$

Write the equation of the line given the two points.

12. $(-5, 7)$ and $(2, -7)$

$m = \frac{-7 - 7}{2 - (-5)} = \frac{-14}{7} = -2 = m$

$y = mx + b$ $y = -2x - 3$

$7 = -2(-5) + b$

$7 = 10 + b$ $b = -3$

13. $(2, 0)$ and $(-2, 6)$

$m = \frac{6 - 0}{-2 - 2} = \frac{6}{-4} = -\frac{3}{2}$

$y = mx + b$

$0 = -\frac{3}{2}(2) + b$

$0 = -3 + b$ $(2 = b)$

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

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14. A candle is 18 in. tall after burning for 3 hours. $(3, 18)$
 After 5 hours, it is 16.5 in. tall. $(5, 16.5)$

Write a linear equation to model the relationship between height h of the candle and time t .
 Time should be the independent variable.
 Predict how tall the candle will be after burning **8 hours**.

Step 1: Convert info into ordered pairs. Do you want (h, t) or (t, h) ?

$(3, 18)$ $(5, 16.5)$

Step 2: Find the rate of change!

$$m = \frac{16.5 - 18}{5 - 3} = \frac{-1.5}{2} = -0.75 \text{ inches/hour}$$

Step 3: How tall was the candle originally? (y intercept)

$y = mx + b$ $18 = -2.25 + b$

$18 = -0.75(3) + b$ $20.25 = b$

a. $h(t) = -0.75t + 20.25$; 14.25 inches
 b. $h(t) = 0.75t + 15.75$; 9.75 inches
 c. $h(t) = -0.75t + 15.75$; 9.75 inches
 d. $h(t) = 0.75t + 20.25$; 14.25 inches

Parallel and Perpendicular Lines

OBJECTIVE: I CAN... Identify, graph, and write equations of parallel and perpendicular lines.

Parallel Lines:

- The slope (m) of parallel lines are the same.

Perpendicular Lines:

- The slope (m) of perpendicular lines are opposite signed reciprocals.

Determine if the lines are parallel, perpendicular, or neither.

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

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

$$-4 = 5$$

false ï

no sol.

16. $y = \frac{1}{2}x + 10$
 $4x + 2y = 7$

$$4x + 2\left(\frac{1}{2}x + 10\right) = 7$$

$$4x + x + 20 = 7$$

$$5x = -13$$

$$x = -13/5$$

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Write the equation of a line that is perpendicular to the given line and passes through the given point.

1. Identify the slope of the original line.
2. Determine the slope of the perpendicular.
3. Sub in the point and the slope of the perpendicular into $y = mx + b$,
4. Solve for b.
5. Use b and slope of perpendicular to write equation!

17. $y = 2x + 10$ $(-2, 3)$

$m = 2$

$m_{\perp} = -\frac{1}{2}$

$y = mx + b$

$3 = -\frac{1}{2}(-2) + b$

$3 = 1 + b$ $(b = 2)$

Equation: $y = -\frac{1}{2}x + 2$

18. $y = -\frac{1}{5}x + 10$ $(4, -3)$

$m_{\perp} = 5$ $x = 4$ $y = -3$

$y = mx + b$

$-3 = 5(4) + b$

$-23 = b$

Equation: $y = 5x - 23$

HOY VUX

A horizontal line will be an equation in the form: $y = c$ Recall Slope (m) = 0

A vertical line will be an equation in the form: $x = c$ Recall Slope (m) = undefined.

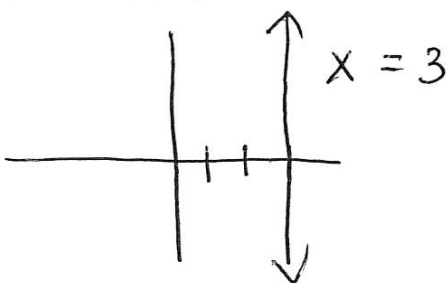
Mnemonic Device to Help Remember: $x = 2$ HOY VUX

19. Write the equation of the vertical line through the point $(-3, 4)$ VUX $\rightarrow x = -3$

20. Write the equation of the horizontal line through the point $(-3, 4)$ HOY $\rightarrow y = 4$

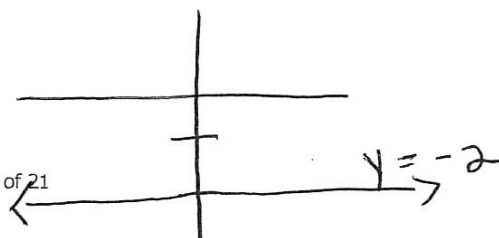
A. Sketch $x = 3$

VUX



B. Sketch $y = -2$

HOY



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APPLICATIONS Write a linear model to represent the scenario given.

21. Write a linear equation using the given information that represents the situation.

a. The table below represents a linear equation. Write a formula for $f(x)$.

3	
x	f(x)
5	4
7	1
9	-2
11	-5

2 { } -3
2 { } -3
2 { } -3

$$m = \frac{\Delta y}{\Delta x} = \frac{-3}{2}$$

point: (5, 4) $4 = -\frac{3}{2}(5) + b$

$$y = -\frac{3}{2}x + 11.5$$

21. $4 = -\frac{3}{2}(5) + b$
 $11.5 = b$

22. A school booster club is having a raffle for a graphing calculator that they purchased for \$80. Their profit or loss is a linear function in which the profit or loss depends upon the number of tickets sold. The booster club figures that if they sell 10 tickets, they will lose \$60. If they sell 30 tickets, they will lose \$20.

Point 1 (10, -60)

Point 2 (30, -20)

$$m = \frac{-20 - (-60)}{30 - 10} = \frac{40}{20} = 2 = m$$

$$y = mx + b$$

$$-60 = 2(10) + b$$

$$-80 = b$$

$$y = 2x - 80$$

23. Biologists have found that the number of chirps some types of crickets make per minute depends upon the temperature. This relationship can be represented by a linear function. When the temperature is 60°F, crickets chirp 92 times per minute. If it is 75°F, they will chirp 152 times per minute.

Point 1 (60, 92)

Point 2 (75, 152)

$$m = \frac{152 - 92}{75 - 60} = \frac{60}{15} = 4 = m$$

$$y = 4x - 148$$

pick one point: $y = mx + b$
 $92 = 4(60) + b$

$$92 = 240 + b$$

$$-148 = b$$

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24. A car is driving down from the top of a Colorado mountain. The elevation at the top of the mountain is 13,500 feet. Every minute of driving, the car's elevation decreases by 150 feet.

Let x = the time in minutes that the car has been driving down the mountain,
 $E(x)$ = the car's elevation in feet.

- a. Write a function formula equation for $E(x)$.

$$E(x) = -150x + 13,500$$

after 5 mins,
 car is at
 12,750 ft.

- b. Evaluate $E(5)$, and explain the meaning of the answer in terms of the car. \rightarrow

$$E(5) = -150(5) + 13,500 = -750 + 13,500 = 12,750 \text{ ft.}$$

- c. Find the answer by setting up and solving an equation: There is a scenic overlook at elevation 12,300 feet. How much time will it take the car to reach the scenic overlook?

$$\begin{aligned} 12,300 &= -150x + 13,500 \\ -1200 &= -150x \\ 8 &= x \end{aligned} \quad \text{8 minutes.}$$

- d. Find the answer by setting up and solving an inequality: The top of the mountain is too cold for trees to grow, but below 11,700 feet there are trees. When will the car be on the part of the mountain that has trees?

$$\begin{aligned} -150x + 13,500 &< 11,700 \\ \underline{-150x} & \quad \text{①} \quad \underline{-1800} \\ -150 & \quad \downarrow \\ x & > 16 \end{aligned} \quad \text{After 16 minutes.}$$

- e. Find the answer by setting up and solving an inequality: The part of the mountain between 9,000 feet and 12,000 feet is in the subalpine climate zone. When will the car be in the subalpine climate zone?

$$\begin{aligned} 9,000 &< -150x + 13,500 < 12,000 \\ \underline{-4,500} & < \underline{-150x} < \underline{-1,500} \\ -150 & & \underline{-150} \end{aligned}$$

$$30 > x > 10$$

$$10 < x < 30$$

Between 10 and 30
 minutes

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PART 3 - SYSTEMS OF EQUATIONS:

1. Is (4, 2) the solution of the linear system?

$$\begin{aligned} -2x - y &= -10 \\ 3x + 3y &= 18 \end{aligned} \quad ?$$

Test (4, 2)
True \rightarrow solution
False \rightarrow not

EQ.1

$$\begin{aligned} -2(4) - 2 & \stackrel{?}{=} -10 \\ -8 - 2 & = -10 \\ -10 & = -10 \quad \checkmark \end{aligned}$$

EQ.2

$$\begin{aligned} 3(4) + 3(2) & = 18 \\ 12 + 6 & = 18 \\ 18 & = 18 \quad \checkmark \quad \ddot{\smile} \end{aligned}$$

Yes!

2. Solve the systems:

$$2x + y = 9$$

a. $-1 \begin{cases} -3x + y = -1 \end{cases}$

(2, 5)

$$2x + y = 9$$

$$3x - y = 1$$

$$5x = 10$$

$$\boxed{x = 2}$$

$$2x + y = 9$$

$$2(2) + y = 9$$

$$\boxed{y = 5}$$

b. $\begin{cases} -5(4x + 3y = -1) \\ 4(5x + 4y = 1) \end{cases}$

$$\begin{aligned} -20x - 15y & = 5 \\ 20x + 16y & = 4 \end{aligned}$$

(-7, 9)

$$\boxed{y = 9}$$

$$4x + 3(9) = -1$$

$$4x + 27 = -1$$

$$4x = -28$$

$$\boxed{x = -7}$$

c. $-2 \begin{cases} 3x - 4y = -5 \\ 5x - 2y = -6 \end{cases}$

d. $\begin{cases} y = -2x + 4 \\ -4x - 2y = -8 \end{cases}$

$$3x - 4y = -5$$

$$-10x + 4y = 12$$

$$-7x = 7 \quad \left(-1, \frac{1}{2}\right)$$

$$\boxed{x = -1}$$

$$3x - 4y = -5$$

$$3(-1) - 4y = -5$$

$$-4y = -2$$

$$\boxed{y = \frac{1}{2}}$$

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Write a system of equations to represent each problem.

3. A ballet company says that 540 tickets have been sold for its upcoming performance. Tickets for the Orchestra seats are \$56. Tickets for the Balcony seats are \$38. The company has sold \$24,120 in tickets. How many Orchestra and Balcony seats were sold?

$$\begin{aligned} \text{let } x &= \# \text{ orch } \text{ \& } x & y &= \# \text{ balcony } \text{ \& } y \\ x + y &= 540 \\ 56x + 38y &= 24,120 \end{aligned}$$

4. It took Ms. Miller's daughter 4.5 hours to fly back to Denver after Christmas due to the wind! It took her only 2 hours and 45 MINUTES (2.75 hours), to fly from Denver to Bradley before Christmas. If the plane took the same route each way, and the route was 1800 miles long, and, if the plane was flying at the same rate each way, what was the speed of the plane and what was the speed of the wind?

	r	t	= d
BDL → DEN w/wind	(r + w)	2.75	1800
agst wind	(r - w)	4.5	1800

$$\begin{aligned} 2.75(r + w) &= 1800 \\ 4.5(r - w) &= 1800 \end{aligned}$$

5. The calorie-nutrient information for an apple and an avocado is given in the table. How many of each should be eaten to get exactly 1250 calories and 90 grams of carbohydrates?

	One Apple = x	One Avacado = y
Calories	100	350
Carbohydrates (grams)	24	14

$$\begin{aligned} 100x + 350y &= 1250 \\ 24x + 14y &= 90 \end{aligned}$$

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6. A hotel has 150 rooms. Those with kitchen facilities rent for \$100 per night and those without kitchen facilities rent for \$80 per night. On a night when the hotel was completely occupied, revenues were \$13,000. How many of each type of room does the hotel have?

let $x = \#$ rooms w/ kitchens

$y = \#$ rooms w/o kitchens

50 w/ Kitch
100 w/o

Quantity $-100(x + y = 150)$

\$ $100x + 80y = 13,000$

$-100x - 100y = -15,000$

$-20y = -2000$

$y = 100$

7. Joanne makes a mixture of dried fruits by mixing dried apples costing \$6.00/kg with dried apricots costing \$8.00/kg. How many kilograms of each are needed to make 20 kg of a mixture worth \$7.20/kg?

let $x = \text{kg apples}$ $y = \text{kg apricots}$

Quantity $x + y = 20$

Value \$ $6x + 8y = 7.20(20)$

$-6(x + y = 20)$

$\rightarrow -6x - 6y = -120$

$6x + 8y = 144$

$6x + 8y = 144$

$2y = 24$

$y = 12$

$x = 8$

8 kg apples
12 kg apricots

8. Michael has 34 coins in nickels and dimes. The total value of the coins is \$2.45. If Michael has d dimes and n nickels, which system of equations can be used to find the number of each coin?

(A) $\begin{cases} d+n=15 \\ 5d+10n=245 \end{cases}$

$d + n = 15$

\$ $10d + 5n = 245$

(B) $\begin{cases} d+n=15 \\ 10d+5n=245 \end{cases}$

(C) $\begin{cases} d+n=34 \\ 5d+10n=245 \end{cases}$

(D) $\begin{cases} d+n=34 \\ 10d+5n=245 \end{cases}$

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Linear INEQUALITIES in 2 Variables:

Fill in the blank with the word *dashed* or *solid*.

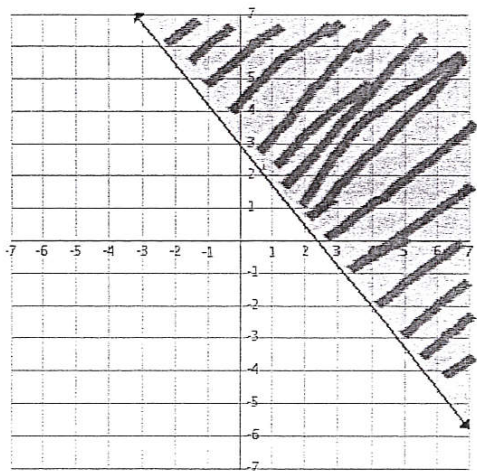
1. If the inequality has a $<$ or $>$, then your graph will have a dashed line.
2. If the inequality has a \leq or \geq , then your graph will have a solid line.

Fill in the blank with the word *above* or *below*.

3. If the inequality has a $y >$ or $y \geq$, then you will shade above
4. If the inequality has a $y <$ or $y \leq$, then you will shade below

You can also graph using intercepts and use a TEST POINT to determine where to shade! The easiest point to test, if it is not on the line, is $(0, 0)$.

9.) State the inequality that represents this graph.



A.) $y \leq \frac{5}{4}x + 3$ C.) $y \geq \frac{-5}{4}x + 3$

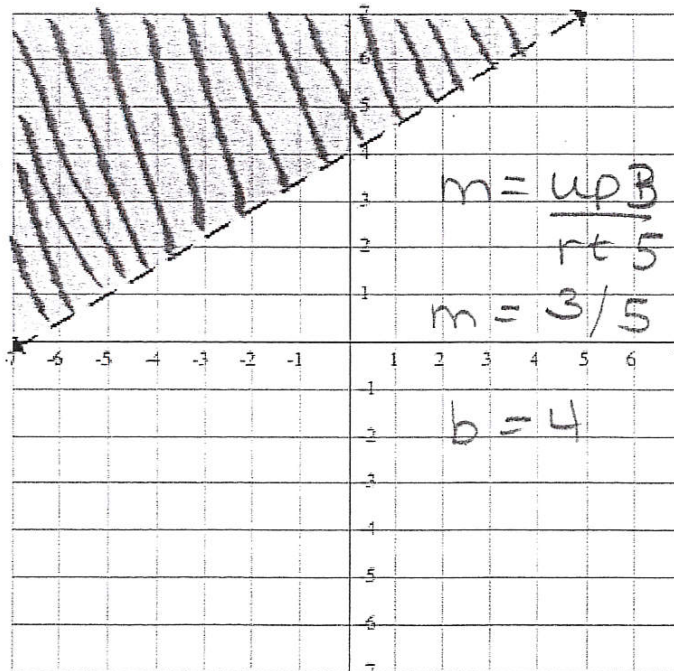
B.) $y \leq \frac{5}{4}x - 3$ D.) $y \leq \frac{-5}{4}x - 3$

none of these!

It should be

$$y \geq \frac{-5}{4}x + 3$$

10.) State the inequality that represents this graph.



$$y > \frac{3}{5}x + 4$$

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13. A contractor needs at least 500 bricks and 10 bags of sand. Bricks weigh 2 lb each and sand weighs 50 lb per bag. The maximum weight that can be delivered is 3000 lb. Write a system of inequalities that represents the situation.
 Let x = # bags of sand Let y = #bricks

Inequality 1: # bricks:

$$y \geq 500$$

Inequality 2: # bags of sand:

$$x \geq 10$$

Inequality 3: Total weight:

$$50x + 2y \leq 3000$$

They should make 24 watercolors and no ink drawings for a max profit of \$114

14. A group of artists decided to produce hand-drawn cards for Valentine's Day and donate the money generated to charity. The artists will produce ink drawings and watercolors. They have volunteered to spend at most 120 hours for preparation of the cards and a maximum of 60 hours for packaging the cards. The preparation of an ink drawing takes 3 hours and the preparation of a watercolor takes 5 hours. The packaging of each requires 2 hours. Profit per ink drawing card is \$2.00 and per watercolor \$4.75. Find the number of ink drawings and watercolors needed to maximize profit. What is the maximum profit?

↑ variables

Step 1: Define variables and write the objective function (what you are trying to maximize).

$x =$ # ink drawings
$y =$ # watercolors

Objective Function: $f(x, y) = 2x + 4.75y$

Step 2: Organize in a Table

CONSTRAINT	X	Y	Total
prep hours	$3x + 5y$	≤ 120	
pkg hours	$2x + 2y$	≤ 60	

Step 3: Write the constraints as a system of inequalities.

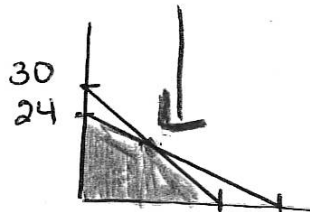
$$\begin{cases} 3x + 5y \leq 120 \\ 2x + 2y \leq 60 \end{cases}$$

solve the system

$$\begin{aligned} 2(3x + 5y) &= 240 \\ -3(2x + 2y) &= -60 \\ \hline 6x + 10y &= 240 \\ -6x - 6y &= -180 \\ \hline 4y &= 60 \end{aligned}$$

$$3x + 5y = 120$$

x	y
0	24
40	0



$$2x + 2y = 60$$

x	y
0	30
30	0

Vertices $P = 2x + 4.75y$

- $(0, 0) \rightarrow 0$
- $(30, 0) \rightarrow 2(30) + 4.75(0) = 60$
- $(15, 15) \rightarrow 2(15) + 4.75(15) = 71.25 + 71.25 = 142.5$
- $(0, 24) \rightarrow 2(0) + 4.75(24) = 114$

$x = 15$

$y = 15$

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11. Use the system of linear inequalities $2x - y \geq 4$
 $y < 2x - 6$. Is the given point a solution?

sub in!
 True \rightarrow solution!
 False \rightarrow not

a) $(0,0)$ $0 \geq 4$ ✓ $0 < -6$ ☹️
 b) $(7,5)$ $9 \geq 4$ ✓ $5 < 8$ ✓

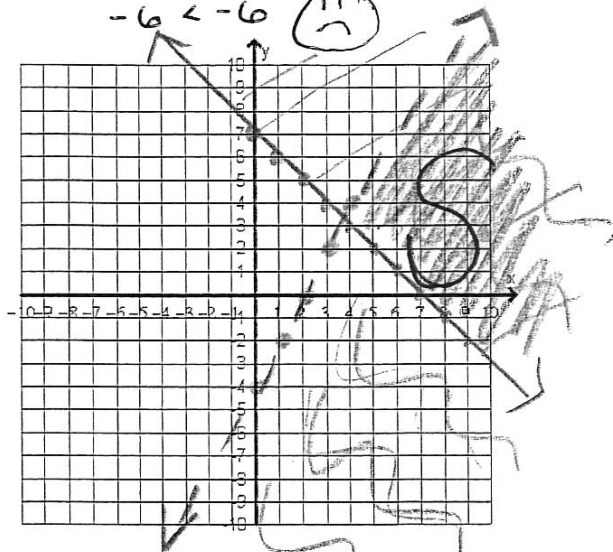
c) $(0,-6)$ $6 \geq 4$ ✓ $-6 < -6$ ☹️

12.) Graph this system. **SHADE!**



A.

$$\begin{cases} y \geq -x + 7 \\ 2x - y > 4 \end{cases} \rightarrow \begin{cases} -y > -2x + 4 \\ y < 2x - 4 \end{cases}$$



B. $x + y < 3$
 $2x - y \geq 5$

$$\boxed{y < -x + 3}$$

$$-y \geq -2x + 5$$

$$\boxed{y \leq 2x - 5}$$

C. $3x + y \leq 5$
 $y \geq 2x - 2$

$$y \leq -3x + 5$$

