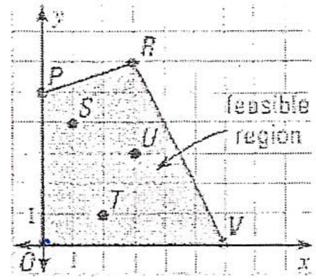
Name:______________________ Date:______________ Period:______ Key

Linear Programming Investigation

Investigation

1. What are the vertices of the feasible region?



2. What are the coordinates labeled in the feasible region?

O(0 , 0)   R(3 , 6)

V(6 , 0)   P(0 , 5)

3. Evaluate the objective function C = 2x + 4y for each labeled point in the feasible region and the vertices.

Point	O	V	R	P	S	U	T
C = 2x + 4y	0	12	30	20	1,4 18	(3,3) 18	2,1 8

4. At which labeled point does the maximum value of C occur? R

5. At which labeled point does the minimum value of C occur? O

6. What is the maximum value? 30

7. What is the minimum value? 0

The optimal values of the objective function occur at the (3,6) of the feasible region.

Name:____________________ Date:__________ Period:_____ Notes – Sec 3.4

Example 1. Solving a linear programming problem

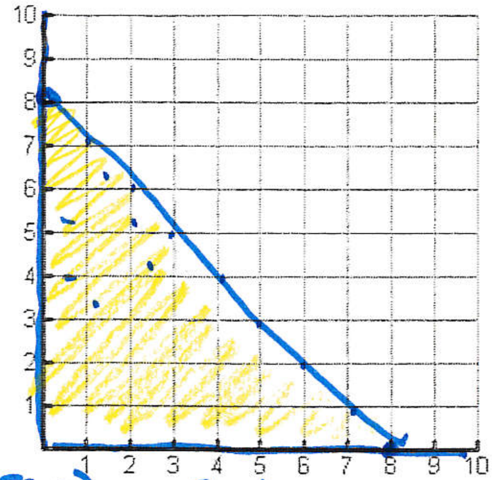
Find the maximum and minimum values of the objective function $C = 3x + 4y$

Subject to the constraints:

$x \geq 0$

$y \geq 0$

$x + y \leq 8$ $\quad y \leq -1x + 8$



Identify the vertices of the feasible region:

(0,0) (0,8) (8,0)

Evaluate the objective function at each vertex:

$C = 3x + 4y$

$(0,0) \rightarrow 0 \quad (0,8) \rightarrow 32 \quad (8,0) \rightarrow 24$

Minimum Value: 0 at (0,0) Maximum Value: 32 at (0,8)

Example 2. Solving a linear programming problem

Find the maximum and minimum values of the objective function $C = -x + 3y$

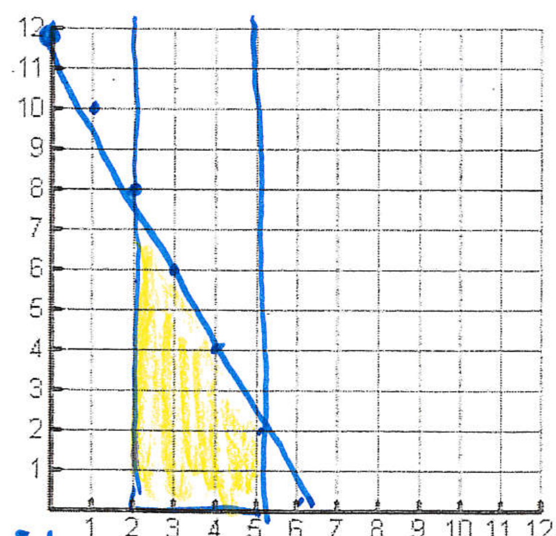
Subject to the constraints:

$x \geq 2$

$x \leq 5$

$y \geq 0$

$2x + y \leq 12$ $\quad y \leq -2x + 12$



Identify the vertices of the feasible region:

(2,0) (5,0)

(2,8) (5,2)

Evaluate the objective function at each vertex:

$C = -1x + 3y$

$(2,0)\ C = -2$

$(2,8)\ C = -2 + 24 = 22$

$(5,0)\ C = -5$

$(5,2)\ C = -5 + 6 = 1$

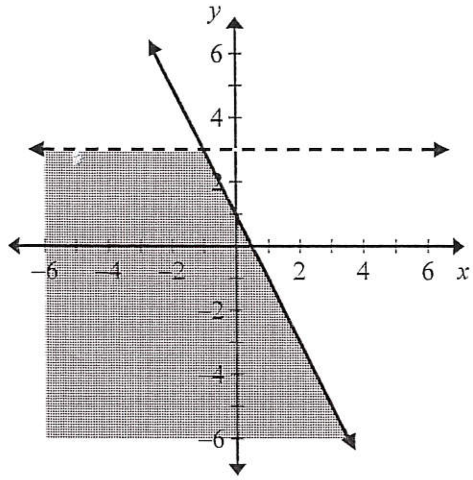
Minimum Value: -5 at (5,0)

Maximum Value: 22 at (2,8)

Integrated Algebra Linear Programming Practice 1

Key

1. **Which system of inequalities is graphed below?**



A. $\begin{cases} y < 3 \\ y < -2x+1 \end{cases}$

B. $\begin{cases} y < 3 \\ y \leq -2x+1 \end{cases}$

C. $\begin{cases} y > 3 \\ y > -2x+1 \end{cases}$

D. $\begin{cases} y > 3 \\ y \geq -2x+1 \end{cases}$

2. **Which point is in the solution set for the system of inequalities $x - y > 1$ and $y < 2x - 1$?**

A. $(-2, -4)$

B. $(-1, 1)$

C. $(0, -2)$

D. $(2, 2)$

3. **In a community service program, students earn points for two tasks: painting over graffiti and picking up trash. The following constraints are imposed on the program.**

   1) A student may not serve more than 10 total hours per week.

   2) A student must serve at least 1 hour per week at each task.

   Let g = the number of hours a student spends in a week painting over graffiti.
   Let t = the number of hours a student spends in a week picking up trash.

   Which system represents the imposed constraints?

   (A) $\begin{cases} g+t \le 10 \\ g \ge 1 \\ t \ge 1 \end{cases}$

   $t \le -1g + 10$

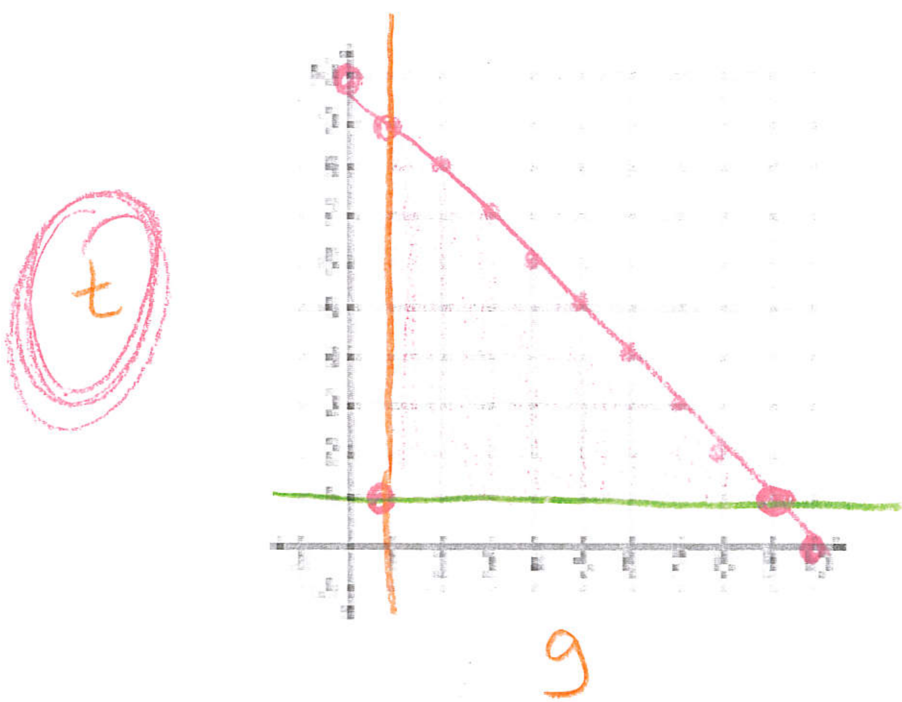
x	y
0	10
10	0

   (B) $\begin{cases} g+t \le 10 \\ g \ge 0 \\ t \ge 0 \end{cases}$

   (C) $\begin{cases} g+t \le 8 \\ g \ge 1 \\ t \ge 1 \end{cases}$

   (D) $\begin{cases} g+t \le 8 \\ g = t \end{cases}$

   Graph the constraints. Identify the vertices!



(1,1)
(1,9)
(9,1)

Key.

SOLVING SYSTEMS OF INEQUALITIES – Word Problems

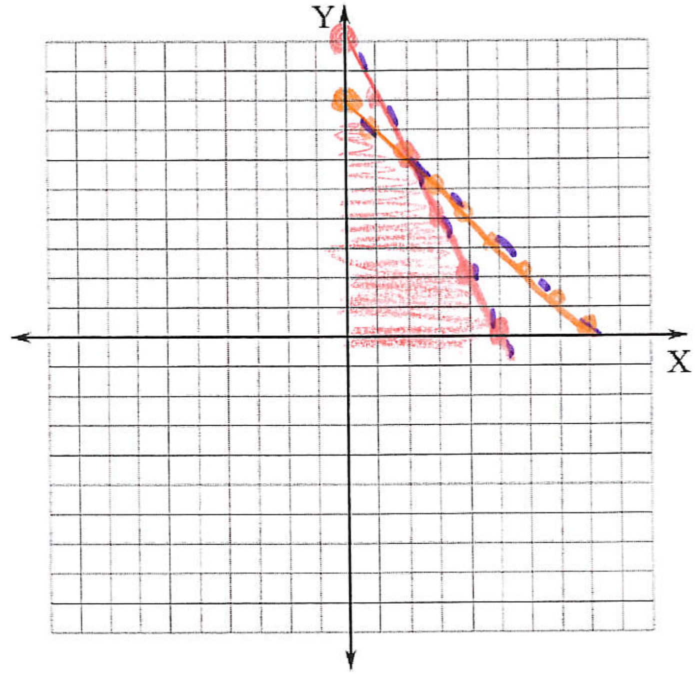
1. For a hiking trip, you are making a mix of x ounces of peanuts and y ounces of chocolate pieces. You want the mix to have less than 70 grams of fat and weigh less than 8 ounces. An ounce of peanuts has 14 grams of fat, and an ounce of chocolate pieces has 7 grams of fat. Write and graph a system of inequalities that models the situation.

$x + y < 8$

$14x + 7y < 70$

$y < -1x + 8$

$y < -2x + 10$



2. You are fishing in a marina for perch and rockfish, which are two species of bottomfish. Gaming laws in the marina allow you to catch no more than 15 perch, no more than 10 rockfish per day, and no more than 15 total bottomfish per day. Write and graph a system of inequalities that model the situation.

let x = # perch

y = # rockfish

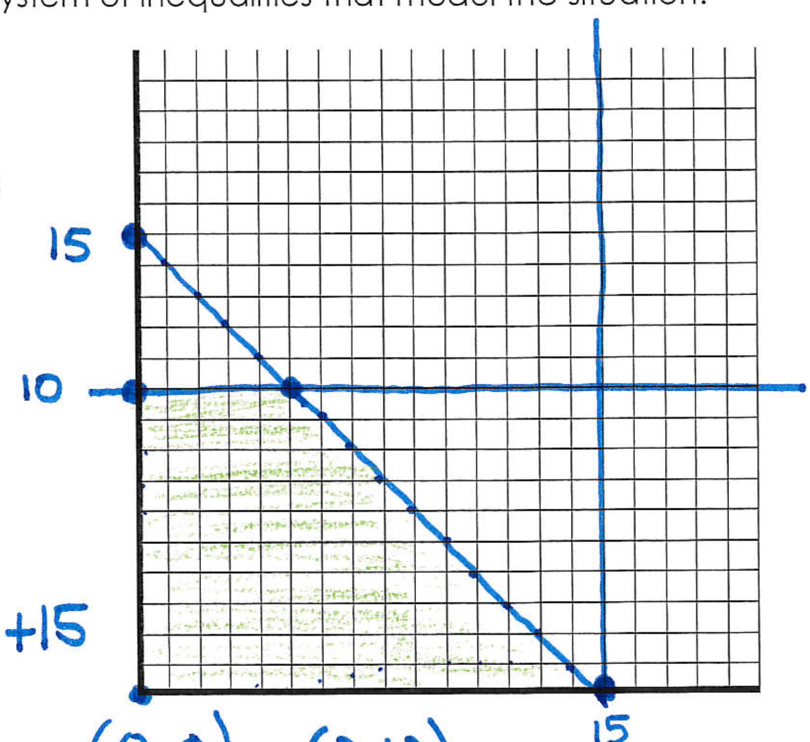
$x \le 15$

$y \le 10$

$x + y \le 15$

$y \le -1x + 15$

x	y
0	15
15	0



(0,0) (0,10)

(15,0) (5,10)

3 Mike makes $7 an hour working at the grocery store and $10 an hour delivering newspapers. He cannot work more than 20 hours per week. Graph two inequalities that Mike can use to determine how many hours he needs to work at his job if he wants to earn at least $90.

let x = # hrs working @ store

y = # hrs delivering papers

$x + y \leq 20 \rightarrow y \leq -1x + 20$

$7x + 10y \geq 90 \qquad y \geq -\frac{7}{10}x + 9$

x	y
0	9
12.86	0