Lesson 14: Linear Programming Story Problems (3.6)

~review~

Graph the system of inequalities. Name the coordinates of the vertices of the feasible region. Find the maximum and minimum values of the given function for this region.

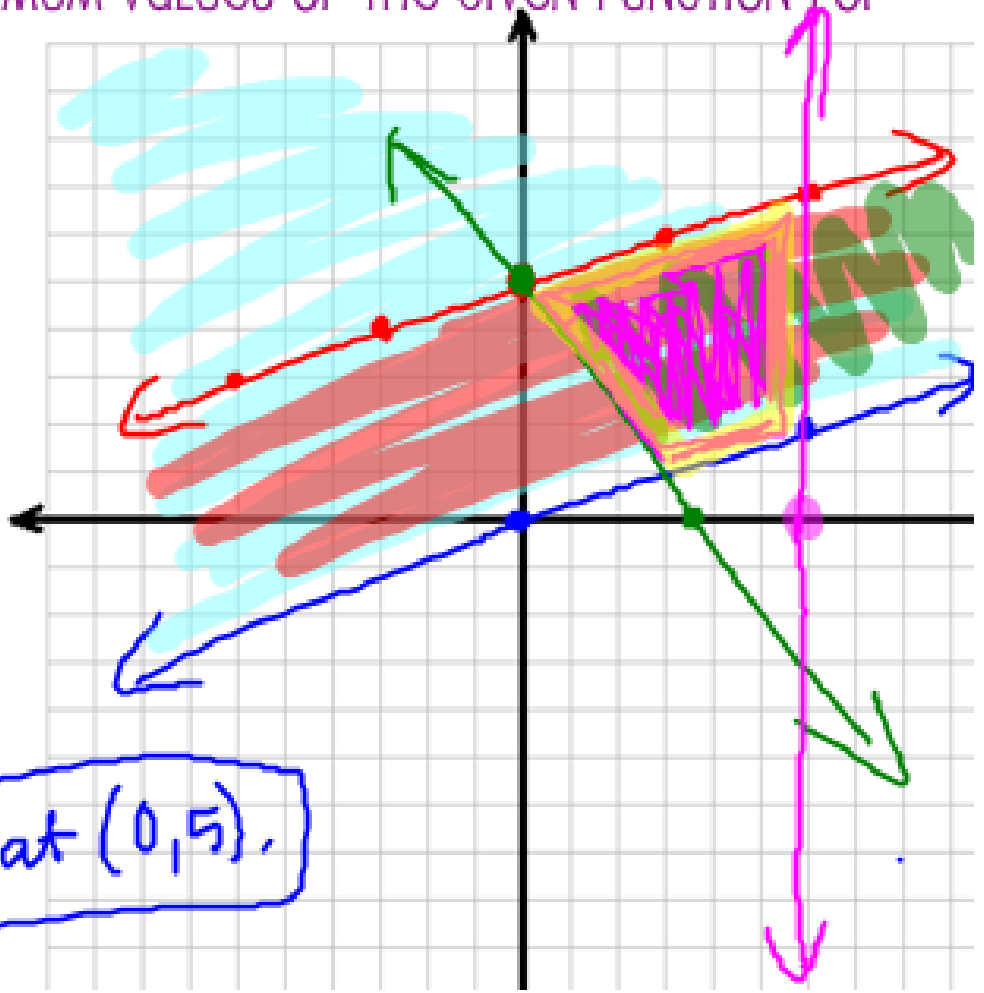
$X - 3Y \leq 0$

$X - 3Y \geq -15$

$4X + 3Y \geq 15$

$X \leq 6$

$F(X,Y) = 5X + 2Y$



(X,Y)	5X+2Y	F(X,Y)
(3,1)	5(3)+2(1)=17	f(3,1)=17
(6,2)	5(6)+2(2)	f(6,2)=34
(6,7)	5(6)+2(7)	f(6,7)=44
(0,5)	5(0)+2(5)	f(0,5)=10

Max is 44 at (6,7). Min is 10 at (0,5).

$x - 3y \leq 0$

x-int: $(0,0)$

y-int: $(0,0)$

Pick $x = 6$ $(6,2)$

$6 - 3y \leq 0$

$-6 \quad -6$

$\frac{-3y}{-3} \leq \frac{-6}{-3}$

$y \geq 2$

Test $(-1,-1)$

$-1 - 3(-1) \leq 0$

$-1 + 3 \leq 0$

$2 \leq 0$ ✗

$x - 3y > -15$

x-int: $(-15,0)$

y-int: $(0,5)$

$\frac{-3y}{-3} > \frac{-x-15}{-3}$

$y \leq \frac{1}{3}x + 5$

Test $(0,0)$

$0 - 3(0) \geq -15$

$0 \geq -15$ ✓

$4x + 3y > 15$

x-int: $(3\frac{3}{4}, 0)$

$\frac{4x}{4} \geq \frac{15}{4}$

$x \geq \frac{15}{4}$

$x \geq 3\frac{3}{4}$

y-int: $(0,5)$

$\frac{3y}{3} \geq \frac{15}{3}$

$y \geq 5$

Test $(0,0)$

$0 + 0 \geq 15$

$0 \geq 15$ ✗

LINEAR PROGRAMMING STORY PROBLEMS

ROSALYN WORKS NO MORE THAN 20 HOURS A WEEK DURING THE SCHOOL YEAR. SHE IS PAID $10 AN HOUR FOR TUTORING GEOMETRY STUDENTS AND $7 AN HOUR FOR DELIVERING PIZZAS FOR PIZZA KING. SHE WANTS TO SPEND AT LEAST 3 HOURS BUT NO MORE THAN 8 HOURS A WEEK TUTORING. FIND ROSALYN'S MAXIMUM EARNINGS.

1ST- DEFINE OUR VARIABLES:

LET'S SAY THAT X=NUMBER OF HOURS TUTORING AND Y=NUMBER OF HOURS DELIVERING

2ND- SET UP THE CONSTRAINTS (INEQUALITIES)

FOR TOTAL HOURS WORKED: $x+y \leq 20$

FOR HOURS TUTORING: $x \geq 3$ $x \leq 8$

FOR HOURS DELIVERING: $y \geq 0$

LINEAR PROGRAMMING STORY PROBLEMS

3RD- WRITE AN EQUATION FOR HER WEEKLY PROFIT AND LABEL IT F(X,Y)

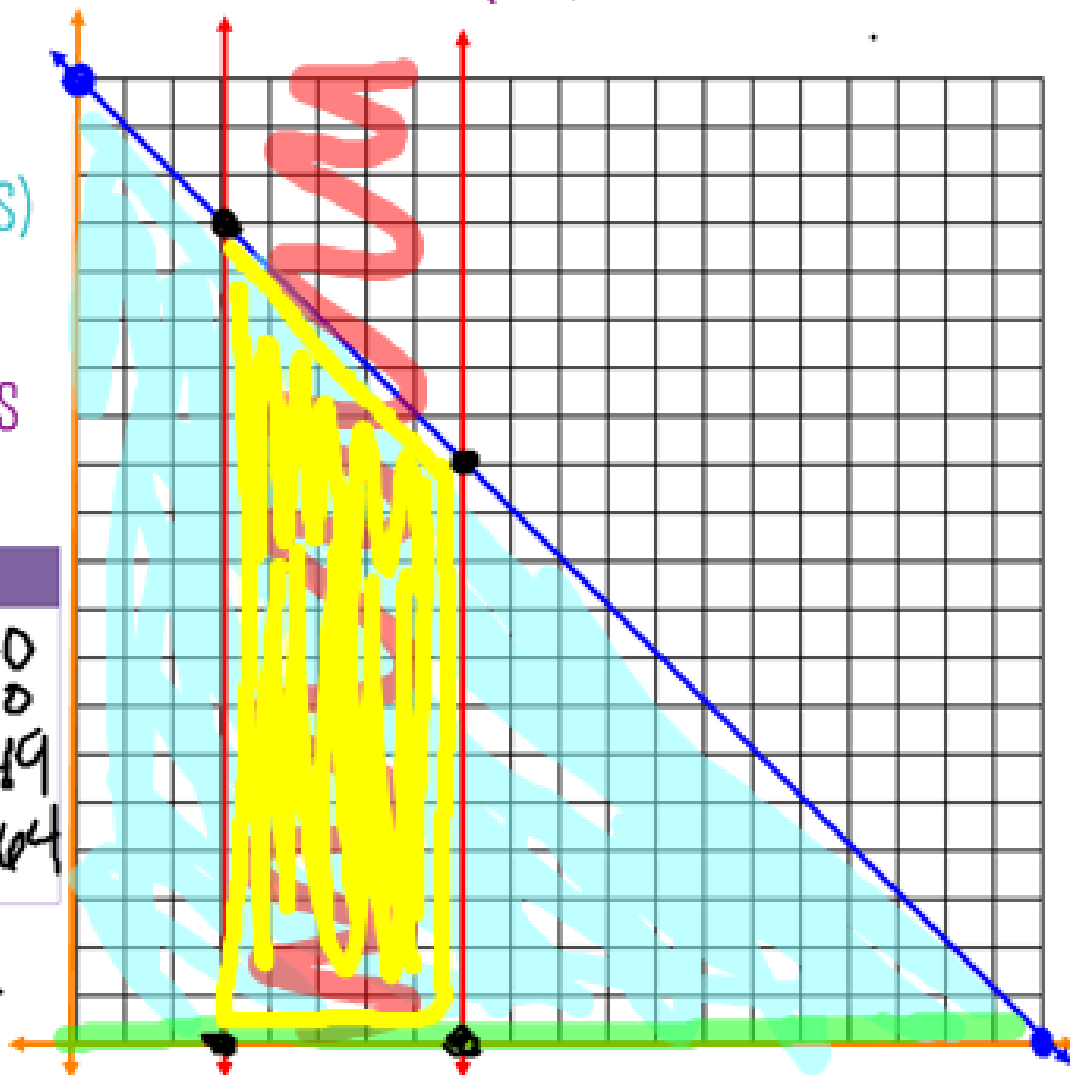
$f(x,y) = 10x + 7y$

4TH- GRAPH ALL CONSTRAINTS (INEQUALITIES)

5TH- IDENTIFY VERTICES OF THE FEASIBLE REGION AND FIND MAXIMUMS AND MINIMUMS OF ROSALYN'S WEEKLY EARNINGS.

(X,Y)	10X+7Y	F(X,Y)
(3,0)	10(3)+7(0)	f(3,0)=30
(8,0)	10(8)+7(0)	f(8,0)=80
(3,17)	10(3)+7(17)	f(3,17)=149
(8,12)	10(8)+7(12)	f(8,12)=164

Rosalyn's max profit is $164 working 8hr tutoring & 12 hrs delivering pizzas.



$x + y \leq 20$ $x \geq 3$ $x \leq 8$ $y \geq 0$

x-int: $(20, 0)$

y-int: $(0, 20)$

Test $(0, 0)$

$0 + 0 \leq 20$

$0 \leq 20$ ✓

LINEAR PROGRAMMING STORY PROBLEMS

A LOCAL HERB SHOP IS PRODUCING 2 PERFUMES: GENTLE ROSE AND RICH GARDENIA. THE OWNER, WHO HAS EQUIPMENT THAT CAN MAKE UP TO $\leq$ 3000 OZ OF PERFUME, CANNOT AFFORD TO SPEND MORE THAN $\leq$ $9000. GENTLE ROSE IS 2 OZ AND COST $3 TO MAKE WITH A PROFIT OVER COST OF $4. RICH GARDENIA IS 1.5 OZ AND COST $6 WITH A PROFIT OVER COST OF $5. HOW MANY BOTTLE OF EACH PERFUME SHOULD BE MADE FOR MAX PROFIT AND WHAT IS THE MAX PROFIT?

1ST- DEFINE OUR VARIABLES:

x = bottles of Gentle Rose y = bottles Rich Gardenia

2ND- SET UP THE CONSTRAINTS (INEQUALITIES)

FOR TOTAL OZ OF PERFUME: $2x + 1.5y \leq 3000$

FOR TOTAL COST OF PERFUME: $3x + 6y \leq 9000$

FOR BOTTLES OF GENTLE ROSE: $x \geq 0$

FOR BOTTLES OF RICH GARDENIA: $y \geq 0$

LINEAR PROGRAMMING STORY PROBLEMS

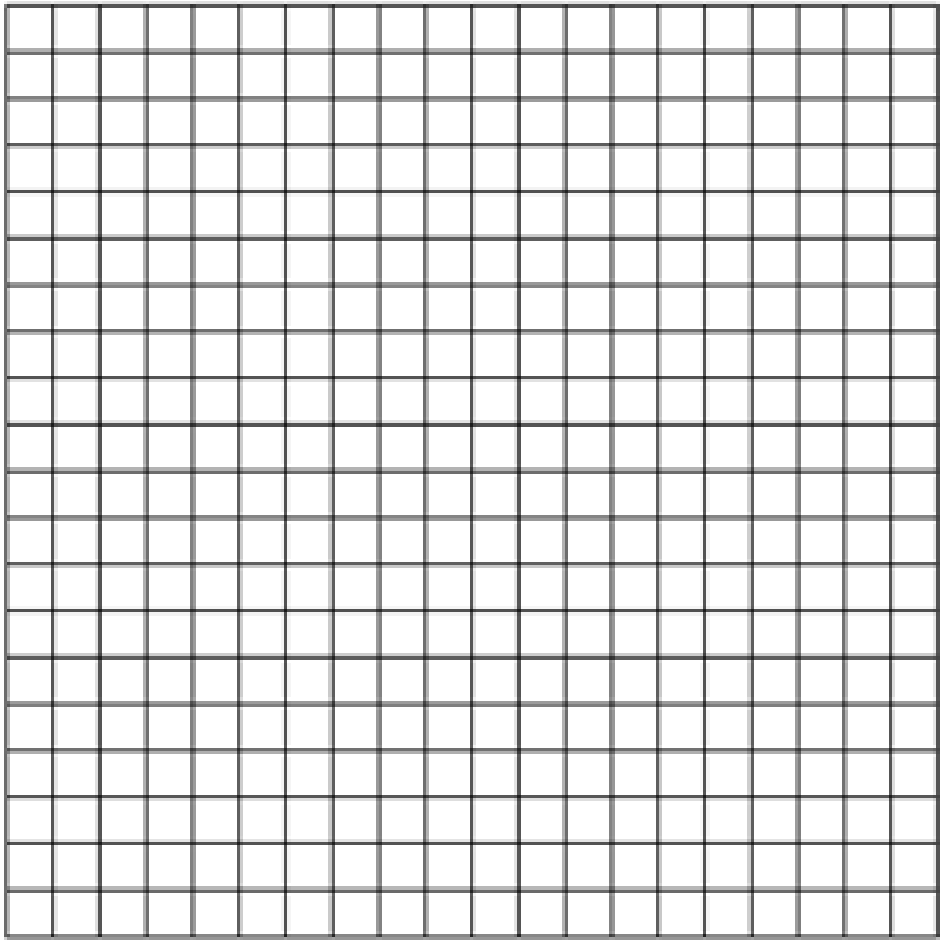
A LOCAL HERB SHOP IS PRODUCING 2 PERFUMES: GENTLE ROSE AND RICH GARDENIA. THE OWNER, WHO HAS EQUIPMENT THAT CAN MAKE UP TO 3000 OZ OF PERFUME, CANNOT AFFORD TO SPEND MORE THAN $9000. GENTLE ROSE IS 2 OZ AND COST $3 TO MAKE WITH A PROFIT OVER COST OF $4. RICH GARDENIA IS 1.5 OZ AND COST $6 WITH A PROFIT OVER COST OF $5. HOW MANY BOTTLE OF EACH PERFUME SHOULD BE MADE FOR MAX PROFIT AND WHAT IS THE MAX PROFIT?

3RD- WRITE AN EQUATION FOR THE HERB SHOP'S PROFIT AND LABEL IT F(X,Y)

$$f(x,y) = 4x + 5y$$

Linear Programming Story Problems

4th- Graph all constraints (inequalities)



5th- Identify vertices of the feasible region and find the amount of each perfume to produce to maximize profit.

(x,y)	$4x+5y$	F(x,y)

$2x + 1.5y \leq 3000$

X-int: $(1500, 0)$

$\frac{2x}{2} \leq \frac{3000}{2}$

$x \leq 1500$

y-int: $(0, 2000)$

$\frac{1.5y}{1.5} \leq \frac{3000}{1.5}$

$y \leq 2000$

$\frac{1.5y}{1.5} \leq \frac{(3000 - 2x)}{1.5}$

$y \leq \frac{(3000 - 2x)}{1.5}$

$3x + 6y \leq 9000$

X-int: $(3000, 0)$

$3x \leq 9000$

y-int: $(0, 1500)$

$6y \leq 9000$

$y \leq 1500$

$\frac{6y}{6} \leq \frac{9000 - 3x}{6}$

$y \leq \frac{(9000 - 3x)}{6}$

Calc Window

Xmin = 0

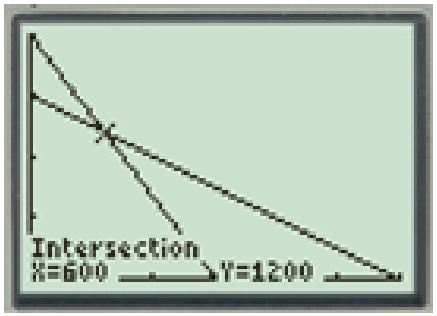
Xmax = 3000

Xscl = 500

Ymin = 0

Ymax = 2000

Yscl = 500



$2X + 1.5Y \leq 3000$

X-INT: ( )

Y-INT: ( )

$3X + 6Y \leq 9000$

X-INT: ( )

Y-INT: ( )

Calculator WINDOW

Linear Programming Story Problems

The Northern Wisconsin Paper Mill can make notebook paper or newsprint. The mill can produce at most 200 units of paper a day. At least 10 units of notebook paper and 80 units of newspaper are required daily by regular customers. If the profit on a unit of notebook paper is $500 and the profit on a unit of newsprint is $350, how many units of each paper should the manager have the mill produce each day to maximize profits?

1st- Define our variables:

2nd- Set up the constraints (inequalities)

For total amount of paper:

For units of notebook paper:

For units of newspaper:

Linear Programming Story Problems

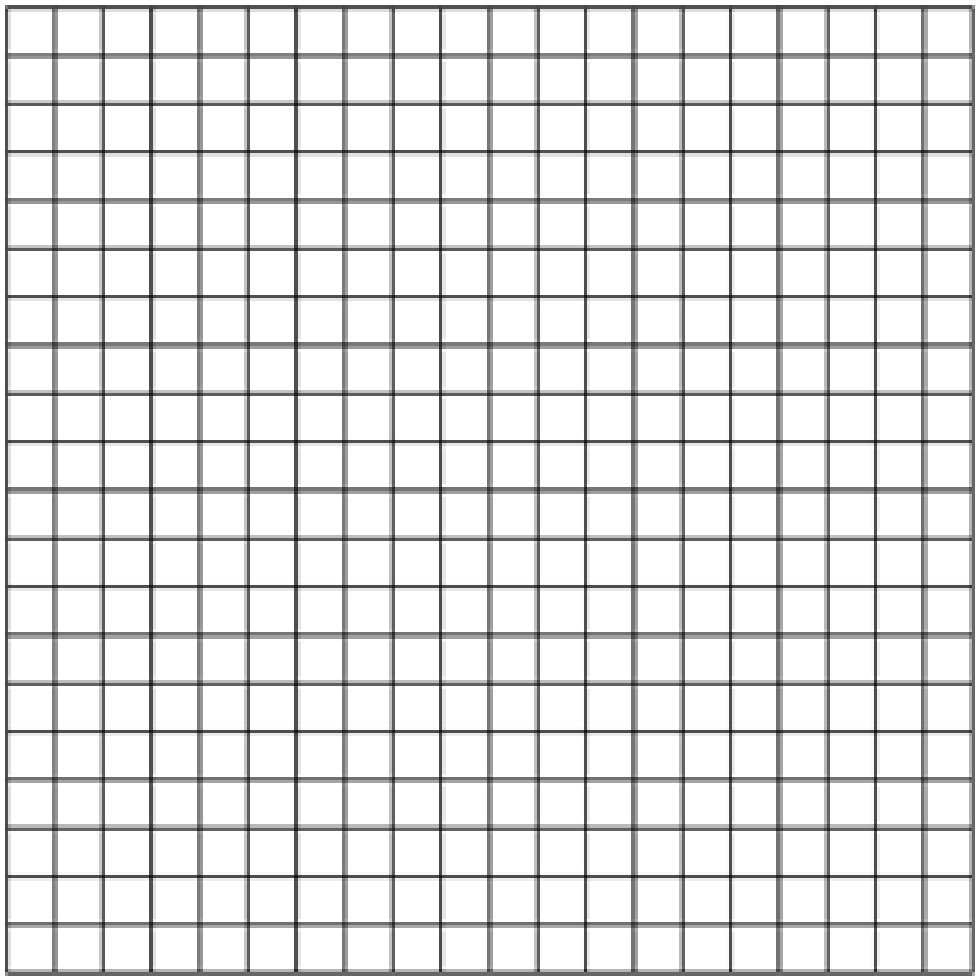
The Northern Wisconsin Paper Mill can make paper or newsprint. The mill can produce at most 200 units of paper a day, at least 10 units of notebook paper and 80 units of newspaper are required daily by regular customers. If the profit on a unit of notebook paper is $500 and the profit on a unit of newsprint is $350, how many units of paper should the manager have the mill produce each day to maximize profits?

3rd- Write an equation for the mill's daily profit and label it F(x,y)

Lesson 14: Linear Programming Story Problems (3.6)

Linear Programming Story Problems

4th- Graph all constraints (inequalities)



5th- Identify vertices of the feasible region and find the amount of each paper to produce to maximize profit.

(x,y)	10x+7y	F(x,y)

Linear Programming Story Problems

As a receptionist for a veterinarian, one of Dolores Alvarez's tasks is to schedule appointments. She allots 20 minutes for a routine office visit and 40 minutes for a surgery. The veterinarian cannot do more than 6 surgeries per day. The office has 7 hours available for appointments. If an office visit costs $55 and most surgeries cost $125, find a combination of office visits and surgeries that will maximize the income the veterinarian practice receives per day.

1st- Define our variables:

2nd- Set up the constraints (inequalities)

Total time for appointments:

For office visits:

For surgeries:

Linear Programming Story Problems

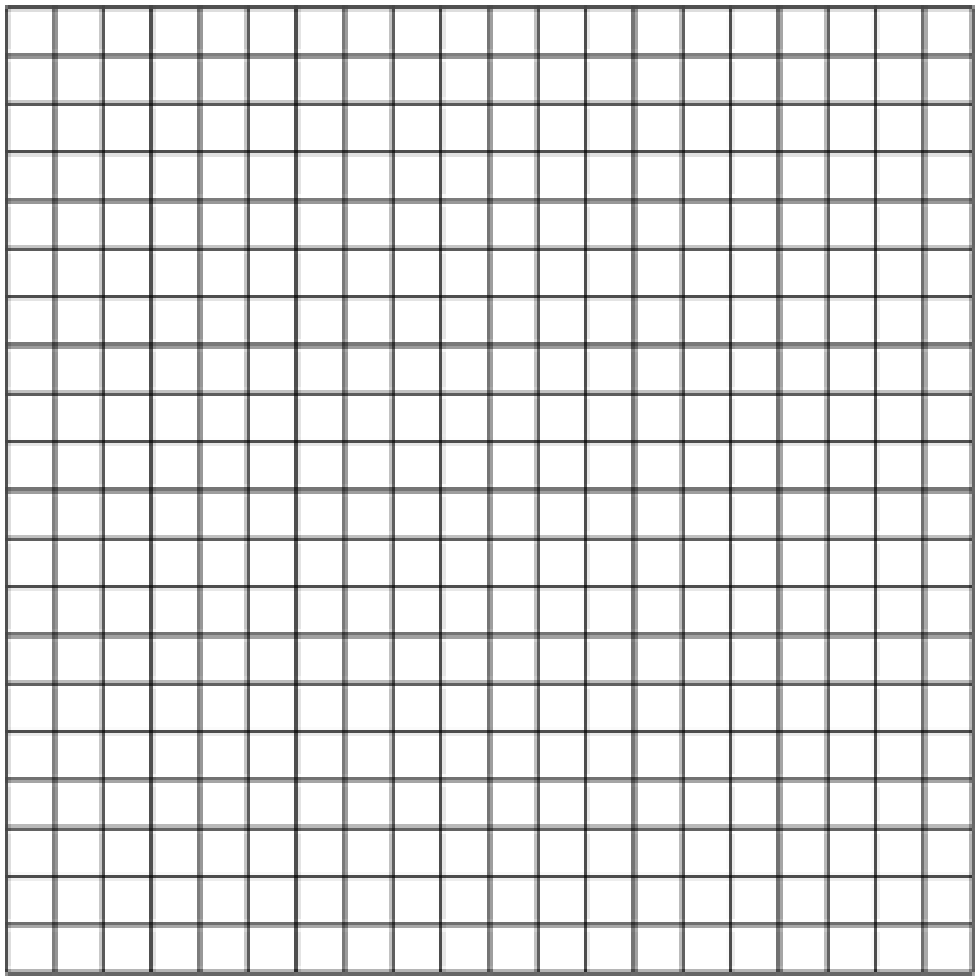
As a receptionist for a veterinarian, one of Dolores Alvarez's tasks is to schedule appointments. She allots 20 minutes for a routine office visit and 40 minutes for a surgery. The veterinarian cannot do more than 6 surgeries per day. The office has 7 hours available for appointments. If an office visit costs $55 and most surgeries cost $125, find a combination of office visits and surgeries that will maximize the income the veterinarian practice receives per day.

3rd- Write an equation for the veterinarian's daily profit and label it F(x,y)

Lesson 14: Linear Programming Story Problems (3.6)

Linear Programming Story Problems

4th- Graph all constraints (inequalities)



5th- Identify vertices of the feasible region and find how many visits and surgeries will maximize profit.

(x,y)	10x+7y	F(x,y)

~Journal #14~

Due at the beginning of next class

~Assignment #14~

Due at the end of next class