Lesson 14: Linear Programming Story Problems (3.6)

By the end of the lesson, you will be able to:

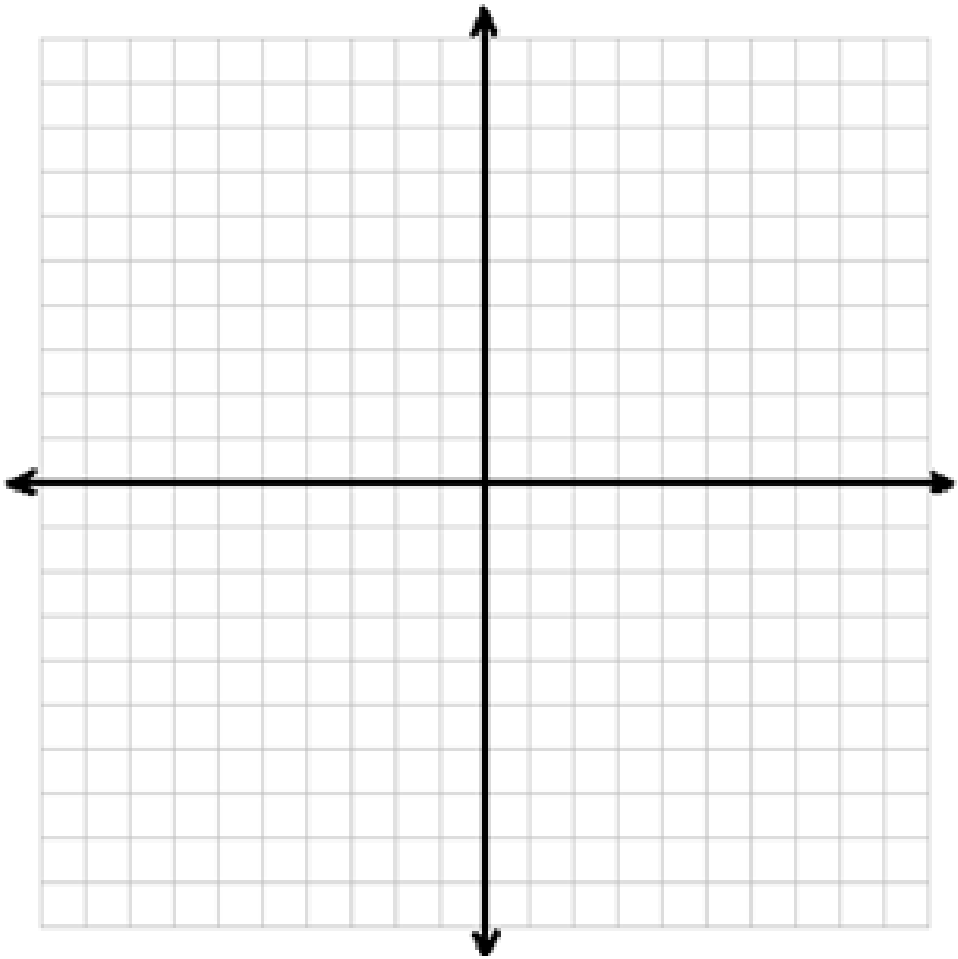
~ Solve Linear Programming Story Problems

~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.

$$x - 3y \leq 0$$
$$x - 3y \geq -15$$
$$4x + 3y \geq 15$$
$$x \leq 6$$

$$f(x, y) = 5x + 2y$$



Lesson 14: Linear programming story problems (3.6)

~Review~

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~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)

Linear Programming Story Problems

Example 1:

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:

x = number of hours tutoring
y = number of hours delivering

Example 1 continued:

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.

2nd- set up the constraints (inequalities)

for total hours worked:

for hours tutoring:

for hours delivering:

3rd- write an equation for her weekly profit and label it f(x,y)

Lesson 14: Linear programming story problems (3.6)

Example 1 continued:

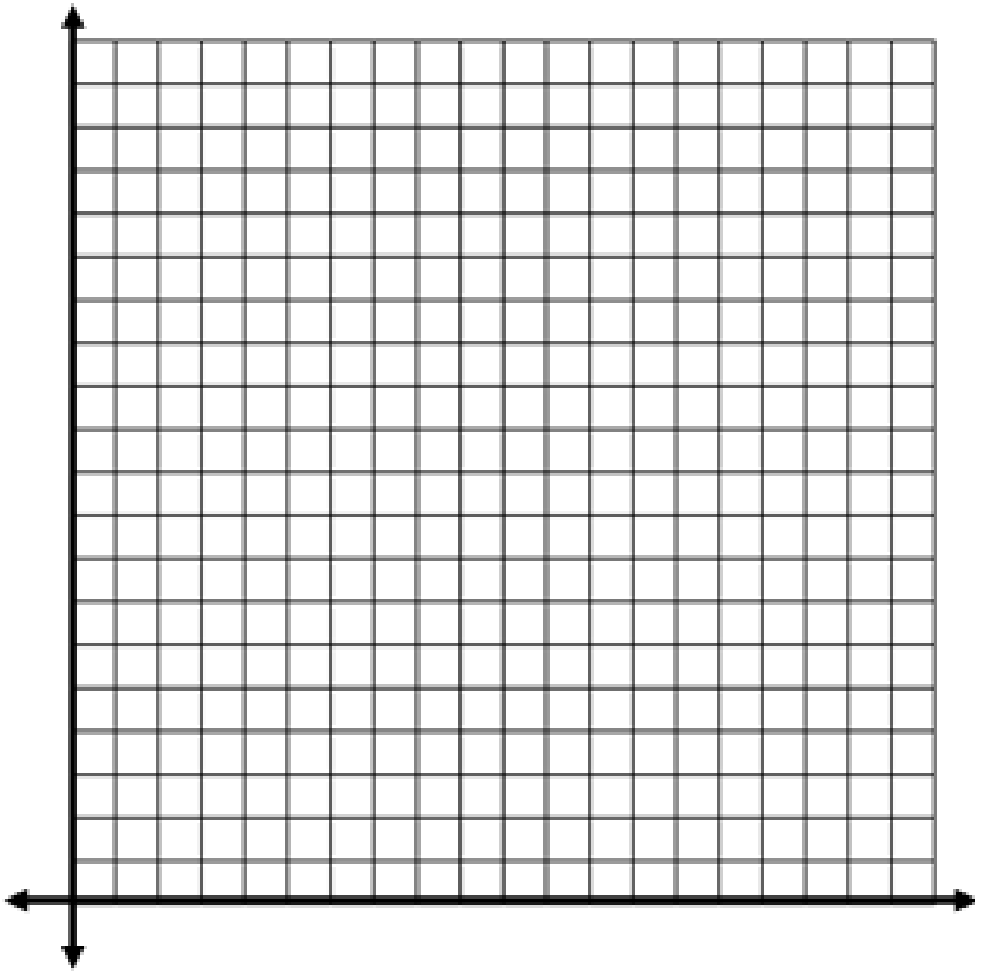
4th- graph all constraints (inequalities)

$$x + y \leq 20$$

$$x \geq 3 \qquad x \leq 8$$

$$y \geq 0 \qquad y \leq 20$$

5th- identify vertices of the feasible region.



Lesson 14: Linear programming story problems (3.6)

- Find X and Y int so you can get the correct Calculator Window.
- Also, solve for y so you can enter the equation in the calculator to graph and find vertices.

Example 1 continued:

6th - find max of Rosalyn's weekly earnings.

(X,Y)	10X+7Y	F(X,Y)

Linear Programming Story Problems

Example 2:

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:

x =

y =

Example 2 continued:

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?

2nd- set up the constraints (inequalities)

For total amount of paper:

For units of Notebook paper:

For units of newspaper:

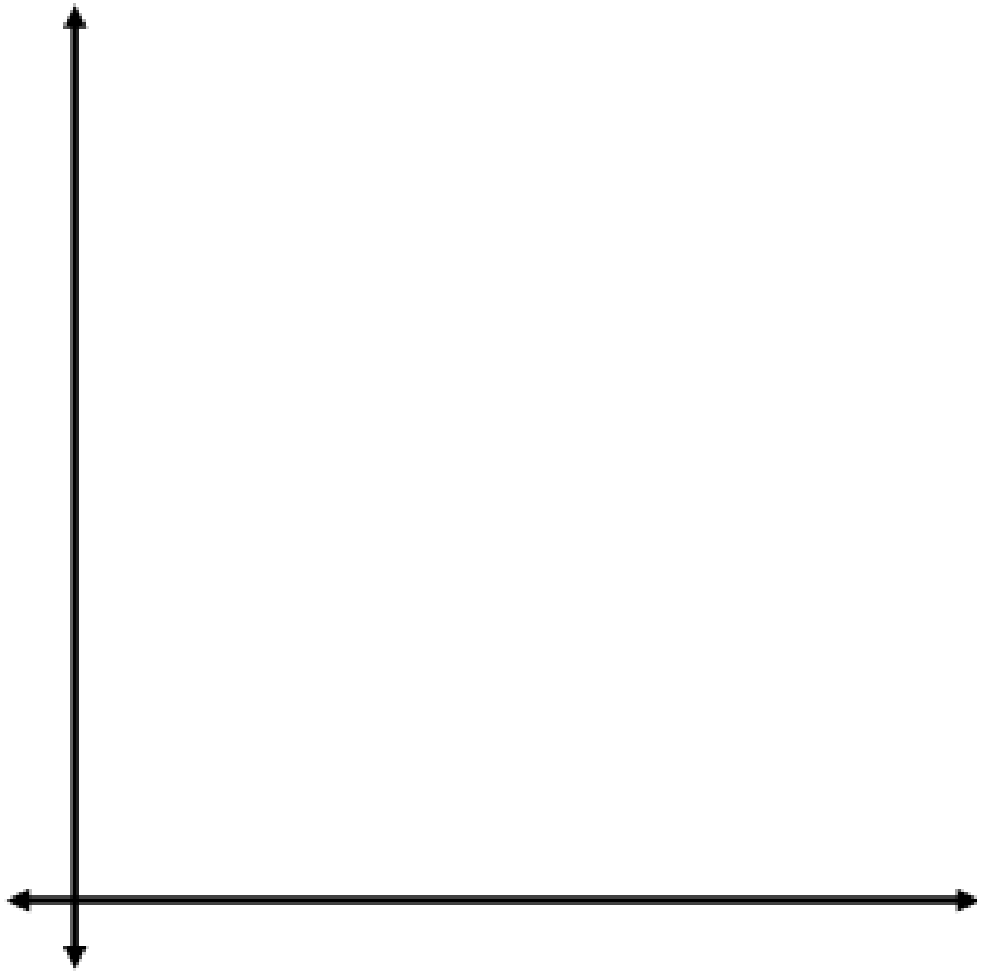
3rd- write an equation for the mill's daily profit and label it f(x,y)

Lesson 14: Linear programming story problems (3.6)

Example 2 continued:

4th- graph all constraints (inequalities)

5th- identify vertices of the feasible region.

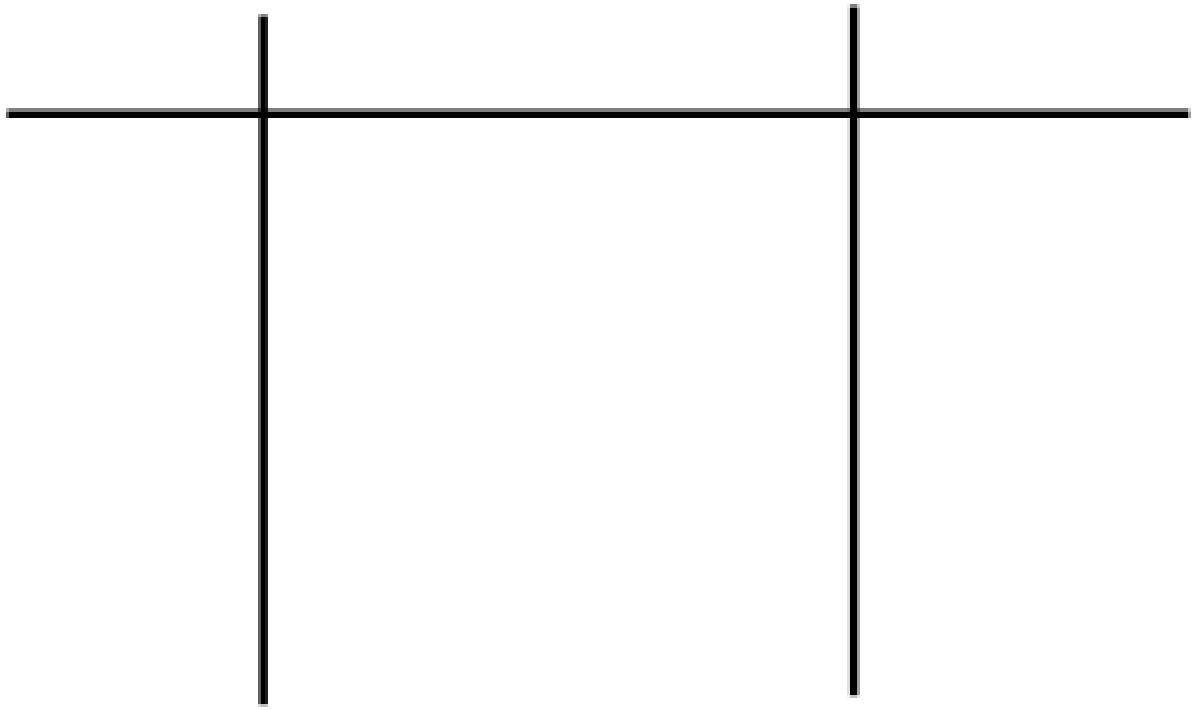


Lesson 14: Linear programming story problems (3.6)

- Find X and Y int so you can get the correct Calculator Window.
- Also, solve for y so you can enter the equation in the calculator to graph and find vertices.

Example 2 continued:

6th - find the amount of each paper to produce to maximize profit.



Linear Programming Story Problems

Example 3:

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:

x =

y =

Example 3 continued:

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.

2nd- set up the constraints (inequalities)

Total time for appointments:

for office visits:

for surgeries:

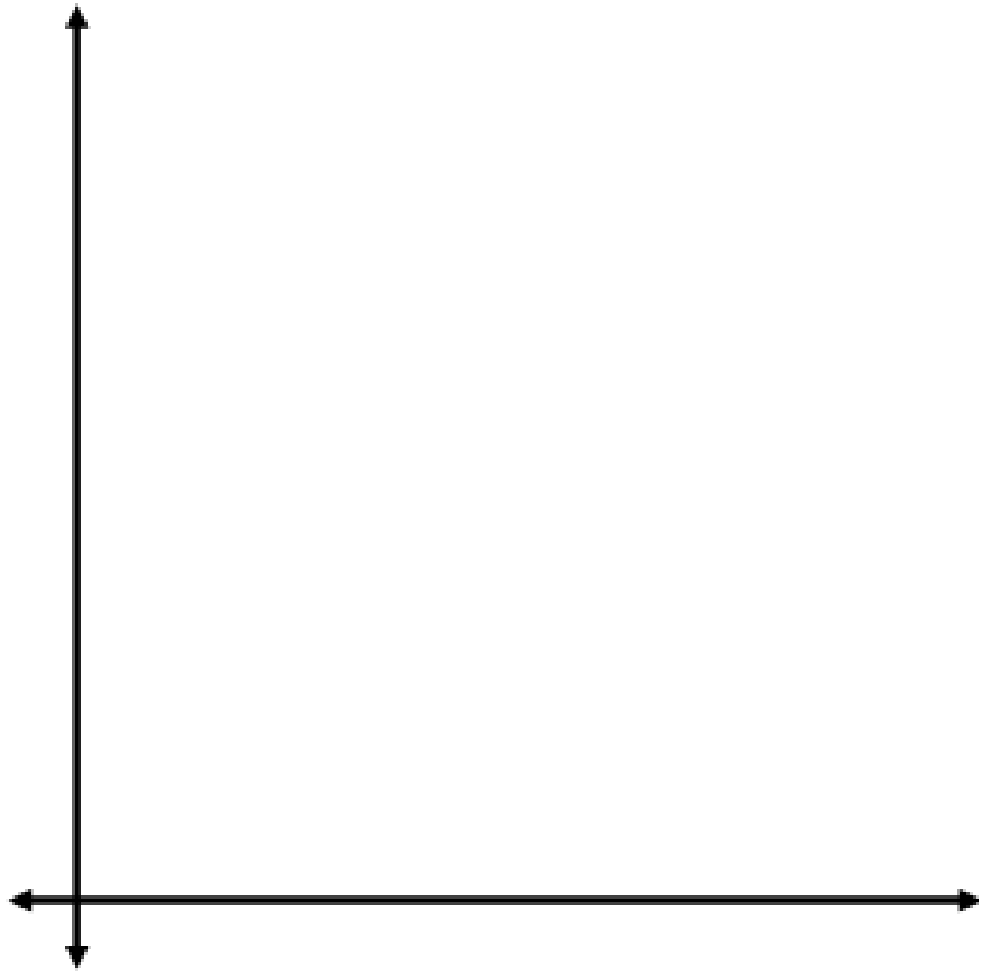
3rd- write an equation for the veterinarian's daily profit and label it f(x,y)

Lesson 14: Linear programming story problems (3.6)

Example 3 continued:

4th- graph all constraints (inequalities)

5th- identify vertices of the feasible region.

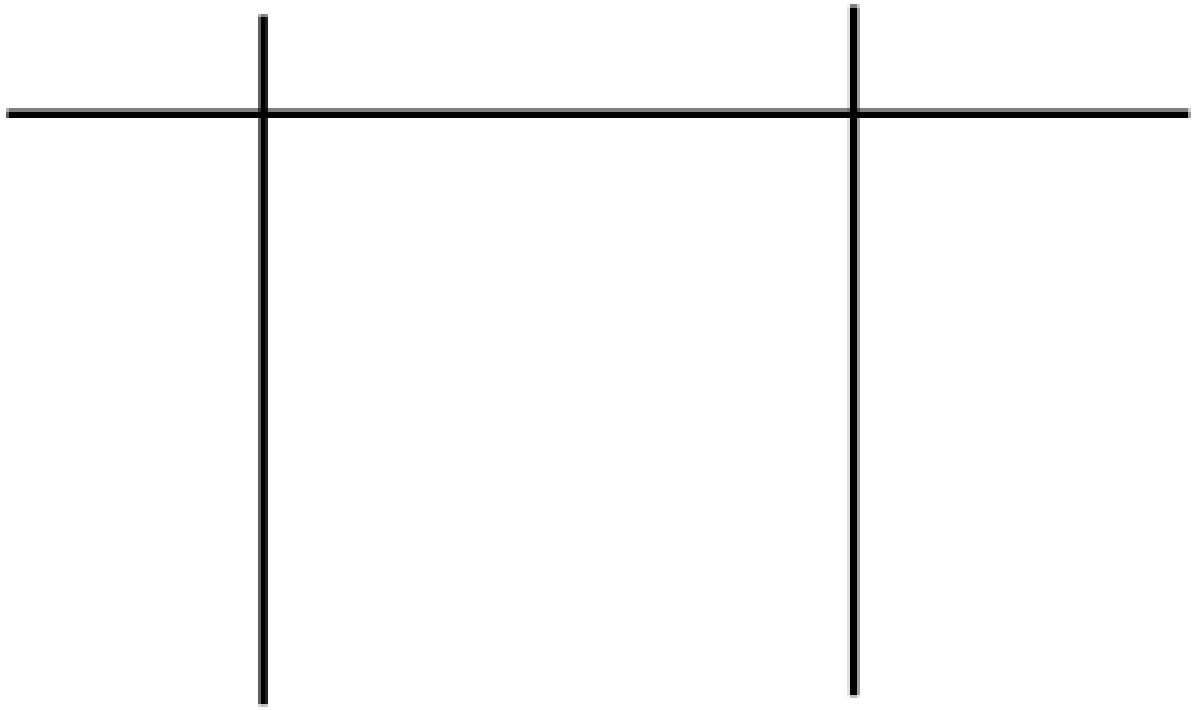


Lesson 14: Linear programming story problems (3.6)

- Find X and Y int so you can get the correct Calculator Window.
- Also, solve for y so you can enter the equation in the calculator to graph and find vertices.

Example 3 continued:

6th - find how many visits and surgeries will maximize profit.



Lesson 14: Linear Programming Story Problems (3.6)

By the end of the lesson, you will be able to:

~ Solve Linear Programming Story Problems

Can you?

Lesson 14: Linear Programming Story Problems (3.6)

Homework:

Assignment 14

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?

1ST- DEFINE OUR VARIABLES:

2ND- SET UP THE CONSTRAINTS (INEQUALITIES)

FOR TOTAL OZ OF PERFUME:

FOR TOTAL COST OF PERFUME:

FOR BOTTLES OF GENTLE ROSE:

FOR BOTTLES OF RICH GARDENIA:

LINEAR PROGRAMMING STORY PROBLEMS

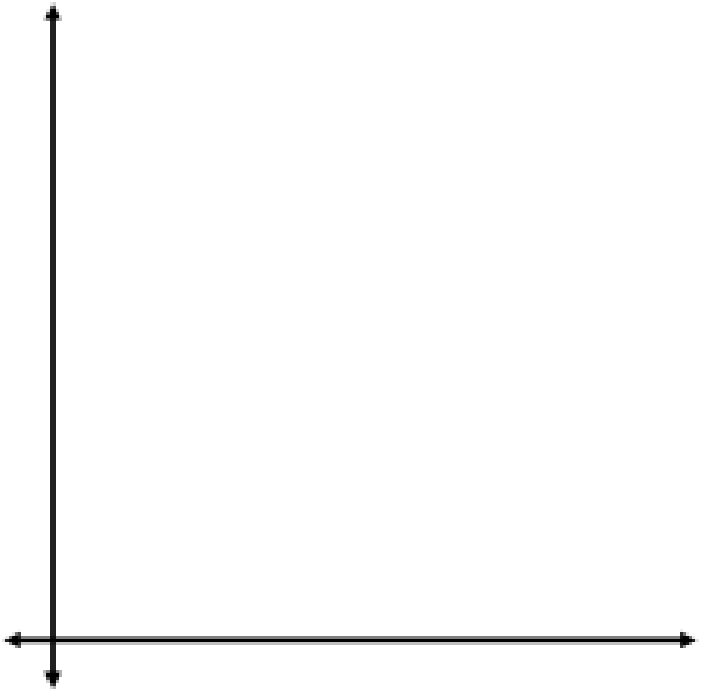
A local herb shop is producing 2 perfumes: gentle rose and rich gardenia. the owner, who has equipment that can make up to 3000 oz of perfume, cannot afford to spend more than $9000. gentle rose is 2 oz and cost $3 to make with a profit over cost of $4. Rich gardenia is 1.5 oz and cost $6 with a profit 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)

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.



$2X + 1.5Y \leq 3000$

X-INT: ( )

Y-INT: ( )

$3X + 6Y \leq 9000$

X-INT: ( )

Y-INT: ( )

Calculator WINDOW

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 = Gentle Rose (Bottles) y = Rich Gardenia (Bottles)

2ND- SET UP THE CONSTRAINTS (INEQUALITIES)

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

~~total~~ cost: $3x + 6y \leq 9000$

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

FOR OZ 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?

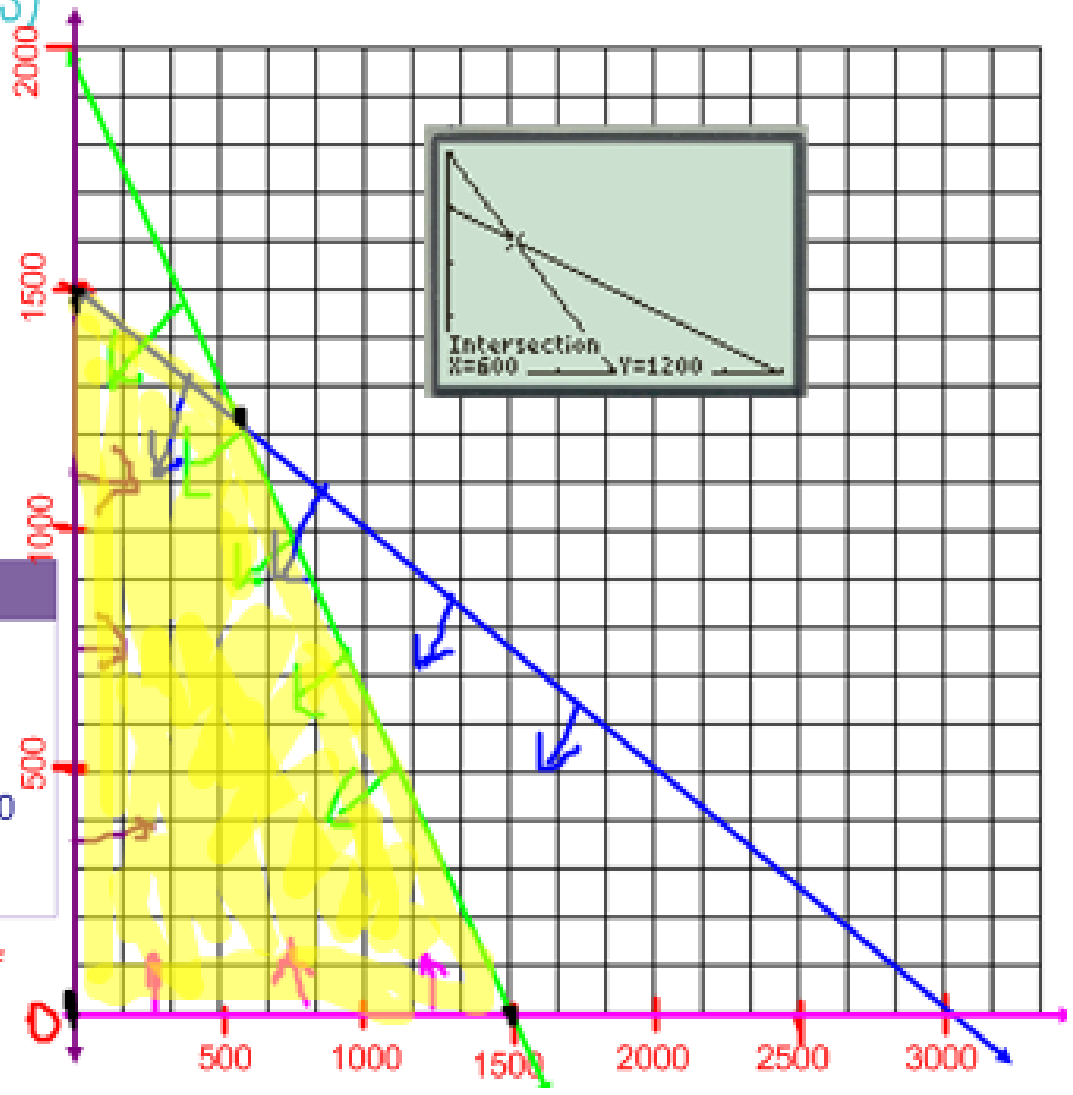
3RD- WRITE AN EQUATION FOR THE HERB SHOP'S PROFIT AND LABEL IT F(X,Y)

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

LINEAR PROGRAMMING STORY PROBLEMS

4TH- GRAPH ALL CONSTRAINTS (INEQUALITIES)

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



5TH- IDENTIFY VERTICES OF THE FEASIBLE REGION AND FIND THE AMOUNT OF EACH PERFUME TO PRODUCE TO MAXIMIZE PROFIT.

(X,Y)	[illegible]	F(X,Y)
(0,0)	4(0) + 5(0) =	f(0,0)=0
(1500, 0)	4(1500) + 5(0) =	f(1500,0)=6000
(600, 1200)	4(600) + 5(1200) =	f(600, 1200)=8400
(0,1500)	4(0) + 5(1500) =	f(0,1500)=7500

The maximum profit is $8400 by making 600 bottles of Gentle Rose and 1200 bottles of Rich Gardenia.

$2x + 1.5y \leq 3000$

x-int: $(1500, 0)$

$2x = 3000$

y-int: $(0, 2000)$

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

$y = 2000$

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

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

$3x + 6y \leq 9000$

x-int: $(3000, 0)$

$\frac{3x}{3} = \frac{9000}{3}$

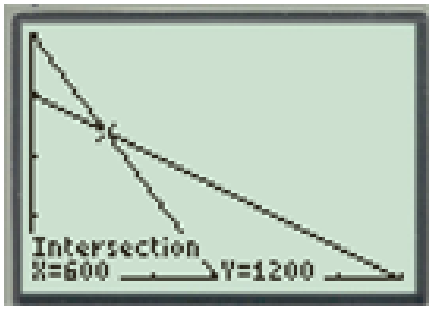
y-int: $(0, 1500)$

$\frac{6y}{6} = \frac{9000}{6}$

$y = 1500$

$6y \leq 9000 - 3x$

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



Xmax = 3000
Xmin = 0
Xscl = 500
Ymax = 2000
Ymin = 0
Yscl = 500