Full Name: Po Shan Connie Chan Email: pchan1@mymail.slcc.edu MATH 1010-043
Last update: Jul/15/2012

Maximizing the Profit of a Business

Math 1010 Intermediate Algebra Group Project 2

In this project your group will solve the following situtation:

A manufacturer produces the following two items: computer desks and bookcases. Each item requires processing in each of two departments. Department A has 55 hours available and department B has 39 hours available each week for production. To manufacture a computer desk requires 4 hours in department A and 3 hours in department B while a bookcase requires 3 hours in department A and 2 hours in department B. Profits on the items are $72 and $23 respectively. If all the units can be sold, how many of each should be made to maximize profits?
Let X be the number of computer desks that are sold and Y be number of bookcases sold.

1. Write down a linear inequality for the hours used in Department A.
$4X + 3Y \leq 55$

2. Write down a linear inequality for the hours used in Department B
$3X + 2Y \leq 39$

There are two other linear inequalities that must be met. These relate to the fact that the manufacturer cannot produce negative numbers of items. These inequalities are as follows:
$X \geq 0; Y \geq 0$

3. Next, write down the profit function for the sale of X desks and Y bookcases:
(Profit Function) $P = 72X + 23Y$

You now have four linear inequalities and a profit function. These together describe the manufacturing situation. These together make up what is known mathematically as a linear programming problem. Write all of the inequalities and the profit function together below. This is typically written one on top of another, with the profit function last.

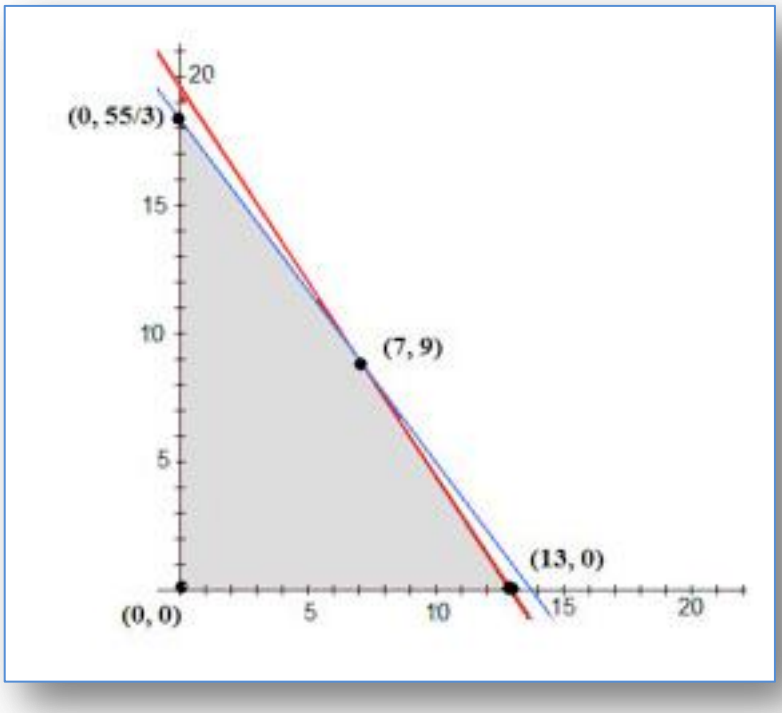
$$4X + 3Y \leq 55$$

$$3X + 2Y \leq 39$$

$$X \geq 0, Y \geq 0$$

4. To solve this problem, you will need to graph the intersection of all four inequalities on one common XY plane. Do this on the grid below. Have the bottom left be the origin, with the horizontal axis representing X and the vertical axis representing Y.

Red line shows the graph of inequality $4X + 3Y \leq 55$.
Blue line shows the graph of inequality $3X + 2Y \leq 39$.



5. The above shape should have 4 corners. Find the coordinates of the ordered pairs that make up these corners. For the intersection of the two slanted lines you will have to solve the 2 by 2 system made up of their equations.
Those four corners are (0, 0), (13, 0), (0, 55/3) and (7, 9).

(i) $3X + 2Y = 39$
(ii) $4X + 3Y = 55$
Multiply (i) by 4 and (ii) by 3 and then subtract (i) from (ii) as:
$Y = 55*3 – 39*4 = 165 – 156 = 9$

Next from (i) $3X + 2*9 = 39$
$3X = 39 – 18 = 21$
$X = 7$
Point of intersection are (7, 9).

6. The last thing to do is to plug each of the points you found in part 5 into the profit function to determine which ordered pair gives the maximum profit. Do this and write a sentence describing how many of each type of furniture you should build and sell and what is the maximum profit you will make.

$P = 72X + 23Y$

$P(0, 0) = 72(0) + 23(0) = 0$
$P(0, 55/3) = 72(0) + 23(55/3) = 421.67$
$P(13, 0) = 72(13) + 23(0) = 936$
$P(7, 9) = 72(7) + 23(9) = 711$

After checking the answer with my classmate-Teresa Larson's work, we both got the same solution as: Maximum profit will be $936 for selling 13 of computer desks, but 0 of bookcases will be sold.

7. Reflective Writing
Did this project change the way you think about how can be applied to the real world?
Write one paraghraph stating what ideas changed and why. If this project did not change the way you think, write how this project gave further evidence to support your exiting opinion about apply math. Be specific.

Yes, actually it change the way I think. This project make me use my math skills that I have learn before to be related in our life for the first time. I started with my own at the beginning, somehow there were many question come out due to my foreign language. And then I got a great benefited after asked my classmate for help and being able to transact those problem together effectively. When I was going through this project with sharing the opinion to my classmate, it is already a direct corelation assigment that let us to experience what is the real world.