

480/500

Maximizing the Profit of a Business

Math 1010 Intermediate Algebra Group Project- Names Brandon Luong Cory Ortiz

In this project your group will solve the following problem using the Algebra skills you have acquired:

Your group owns a company that manufactures two items: desks and bookcases. Each item requires processing time in each of two departments to be completed. Each week, department A has 48 hours available and department B has 40 hours available for production. A desk requires 2 hours in department A and 4 hours in department B. A bookcase requires 3 hours in department A and 2 hours in department B.

Your company's profit on a desk is \$37, while profit on a bookcase is \$23. Your company has more orders than it can fill, so every desk and bookcase that is built will be sold. However, your company wants to make the most money possible so you want to be smart about the number of each item you build. How many desks and bookcases should be built to maximize profits?

Let x be the number of desks and y be the number of bookcases.

1. Write down a linear inequality for the hours used in Department A to build x desks and y bookcases.

$$48 \geq 2x + 3y \checkmark$$

2. Write down a linear inequality for the hours used in Department B to build x desks and y bookcases.

$$40 \geq 4x + 2y \checkmark$$

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:

$$P = 37x + 23y \checkmark$$

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 with the profit function last. Make sure you write the linear inequalities from **parts 1 and 2 above in slope-intercept form.**

1. $y \leq \frac{2}{3}x + 16 \checkmark$

2. $y \leq -2x + 20 \checkmark$

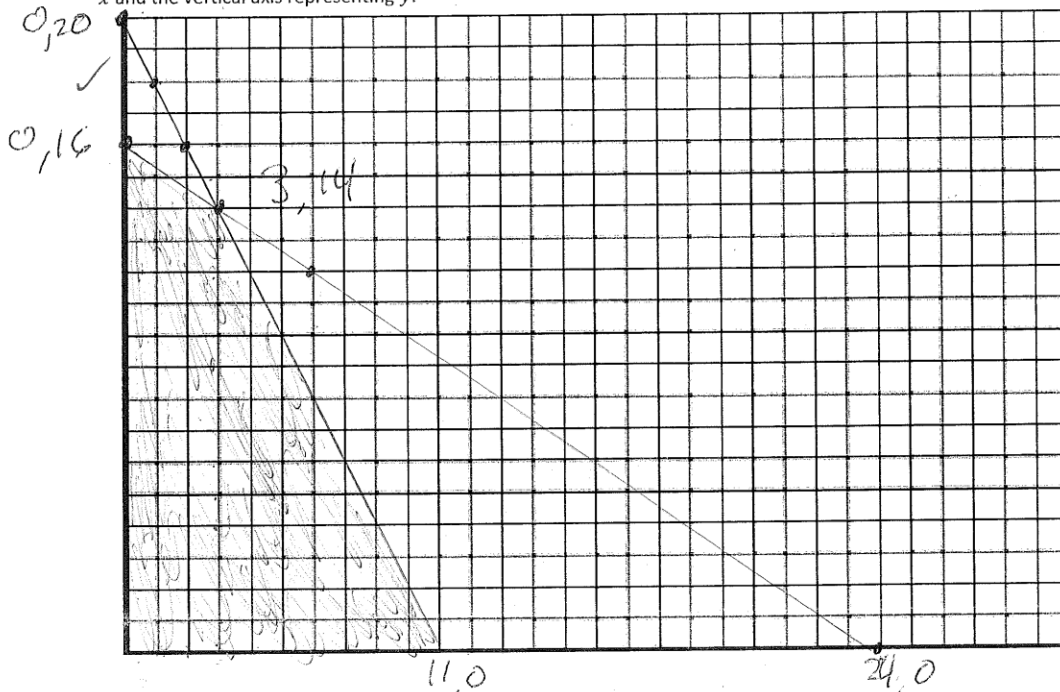
3. $x \geq 0 \checkmark$

4. $y \geq 0 \checkmark$

5. $P = 37x + 23y \checkmark$

200

4. To solve this problem, you will need to graph the **intersection** of all four inequalities on one common x, y 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 .



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.

On the x -axis, it intersects at $(11, 0)$ & $(24, 0)$. On the y -axis, it intersects at $(0, 20)$ & $(0, 16)$. The two lines cross at $(3, 14)$.

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 what is the maximum profit for your company.

$(3, 14)$ $P = 3(73) + 23(14)$ $P = 111 + 322$
 $P = 433$ ✓
 For maximum profits, 3 desks & 14 bookcases should be built for a maximum profit of \$433. ✓

You can read section 4.5 if you need extra help completing this project.

Reflection:

This class, math 1010 has helped me to advance my skills involving algebra. This class was a more challenging class. Several of the challenges I have faced include lack of knowledge, due to my teacher last year, the speed of the class and test preparations. I helped to combat these challenges by studying harder and trying to keep up to date on my class homework. With the help of this class, I have more knowledge to help me solve real life problems with math. This class has also helped me to view the world in a more mathematical prospective.