

LOLO AND LOLA'S GARDEN

By Joan Malvas

Gerald looked out the window when he heard his grandparents arguing about something. He was staying with them over the weekend because his parents had to attend a conference out of town.

Walking out to where they were, he heard his *lola* say, “We can’t just guess at the amount of space for them. We need exact figures in order to maximize the space that we have.”

Curious, Gerald asked, “What’s the matter, Lola? What are you and *Lolo* arguing about?”

“Well, your Lolo and I can’t decide on the amount of space that we will use for planting our flowers and vegetables,” Lola answered.

“Yes, we need more space for the vegetables so I want not more than one-half of the space for vegetables be allotted to flowers,” Lolo added.

“I agreed but on the condition that at least 90 square feet is to be used for flowers. With these two requirements, we don’t know how much space to allot for the flowers and vegetables,” said Lola.

Remembering his lesson in school, Gerald said, “Maybe I can help you, Lola. Can you tell me how many square feet are available for planting the flowers and vegetables?”

“450,” Lola answered.

Gerald ran back inside the house and got a paper and pen. When he came back, he and his grandparents sat outside while he showed them how to solve the problem. “The first thing that we have to do is represent it using a system of linear inequalities. If we let x be the number of square feet for the flowers and y be the number of square feet for the vegetables, then we have $x + y \leq 450$, because we know that the available space for planting cannot exceed 450 square feet.”

Continuing, he said, “Since you want the amount of space for flowers (x) to be not more than one half the amount of space for vegetables (y), we have the inequality $x \leq \frac{1}{2}y$.

“Finally, since at least 90 square feet will be for flowers, we have $x \geq 90$.

The resulting system of linear inequalities is thus

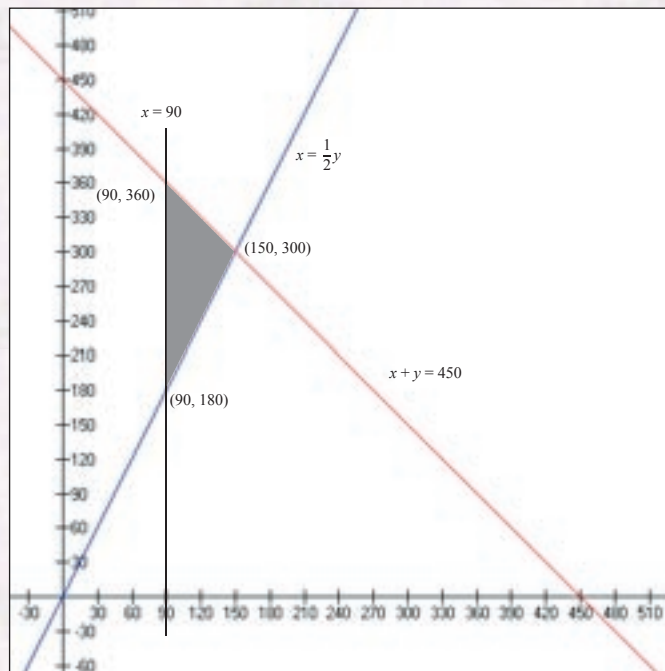


$$x + y \leq 450$$

$$x \leq \frac{1}{2}y$$

$$x \geq 90$$

“After getting this system, we graph the linear inequalities and locate their intersection.”
Here is the graph that Gerald came up with:



“You can get the coordinates of the vertices of the triangle by solving these systems of linear equations. The solutions to these three systems are the intersection of each pair of sides of the triangle.

$$\begin{array}{lll} x = 90 & x + y = 450 & x = 90 \\ x + y = 450 & x = \frac{1}{2}y & x = \frac{1}{2}y \end{array}$$

“The solution to the system of linear inequalities that we got is the shaded triangle that you get including its sides. This means that all of the points in the shaded triangle, including the points in the boundaries or sides, satisfy all your requirements. You only have to choose the coordinates of the point that you want. But since you want to maximize the space to plant your flowers and vegetables in, you can use 150 square feet for the flowers and 300 square feet for the vegetables. This corresponds to the point (150, 300). Note that these two values will satisfy your requirements and they are the largest possible values that you can choose to maximize your space,” Gerald finished.

At that, Lola hugged Gerald while Lolo patted him on the back. “We’re so happy to have a grandson as smart as you. Now we’ll be able to start our garden,” Lola said.



Activity

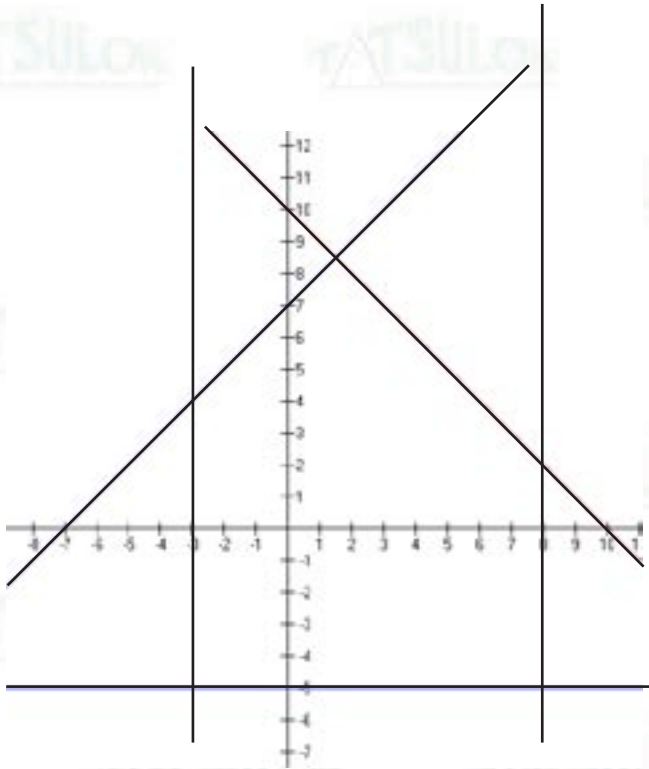
Determine the figure formed by the following system of linear inequalities.

$$\begin{aligned}y &\geq -5 \\x &\leq 8 \\x &\geq -3 \\x + y &\leq 10 \\y &\leq x + 7\end{aligned}$$

What if you changed the direction of all the inequalities? What will be the solution set of the system?

ANSWER:

A polygon, 5-sided figure, but are possible answers



There will be no solution. Though you will still be able to form a polygon, the polygon will not be shaded anymore so it is not a solution.