

Systems of linear equations and inequalities

Student Activity Sheet 4; Exploring “Systems of inequalities”

- Desmond needs to schedule the lawn mowing jobs each week so that he and Shelly can do all of the mowing and edging that is required. What are some issues that Desmond needs to consider?

- Based on their previous experience, Desmond and Shelly come up with the following time estimates:

Standard-sized interior lot: 1 hour to mow and a half hour to edge

Larger corner lot: 2 hours to mow and 45 minutes to edge

Desmond can spend at most 30 hours a week mowing lots. Shelly can only spend at most 12 hours per week edging.

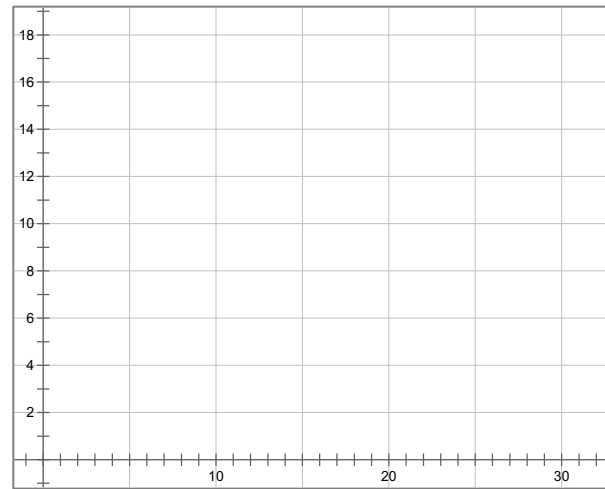
How can Desmond model this information as a system of two linear **inequalities**?

	Standard-sized lots	Large lots	Constraints
Number of lots			
Number of mowing hours per lot			
Number of edging hours per lot			

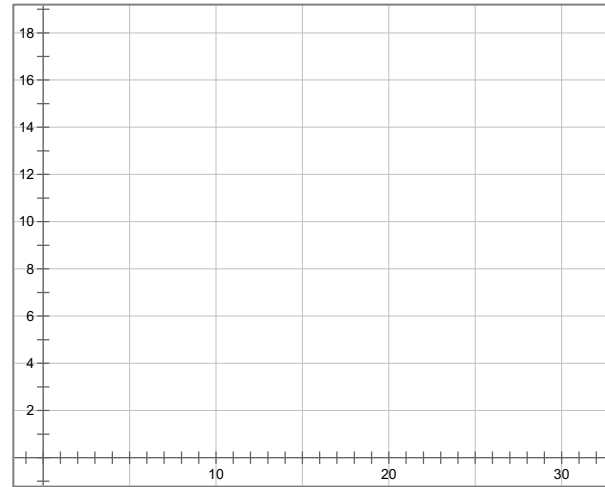
System of inequalities:

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4. Sketch the graph of $x + 2y \leq 30$.

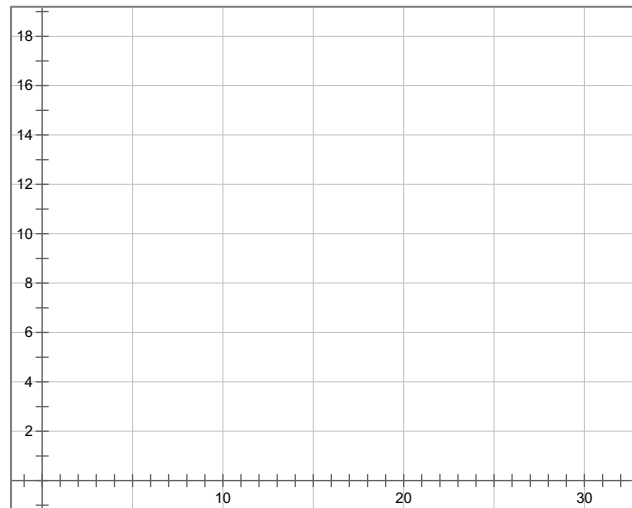


5. Sketch the graph of $\frac{1}{2}x + \frac{3}{4}y \leq 12$.



6. Sketch the graph of the system:

$$\begin{aligned} x + 2y &\leq 30 \\ \frac{1}{2}x + \frac{3}{4}y &\leq 12 \end{aligned}$$



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7. Desmond makes two important observations.

- a. “Because neither variable can be negative, we really have a system of four inequalities, not just two inequalities.”

Write these two new inequalities, along with the original two inequalities, to show the complete system of four inequalities to which Desmond is referring.

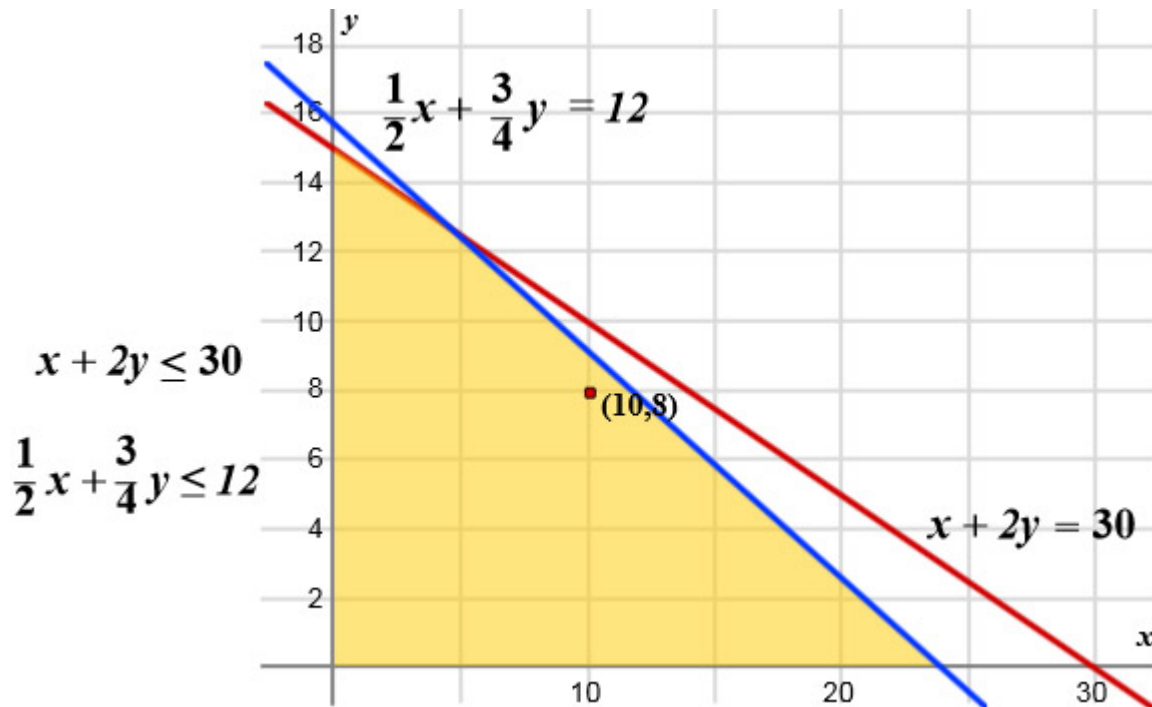
- b. Desmond continues, “Also notice that the point (10,8) is below both of the lines, $x + 2y \leq 30$ and $\frac{1}{2}x + \frac{3}{4}y \leq 12$. That agrees with the observation we made earlier about the mowing schedule that point represents!”

Can you explain what Desmond means by this?

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8. Complete the statements to explain the other points representing combinations of sizes of lots. Use the answer choices provided.



Shelly	above	both	below	Desmond	neither	on
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The point (6,15) falls both lines. This corresponds to Desmond nor Shelly having adequate time required for mowing and edging 6 interior lots and 15 corner lots.

The point (6,12) falls both lines. This corresponds to Desmond and Shelly having exactly the time required for mowing and edging 6 interior lots and 12 corner lots.

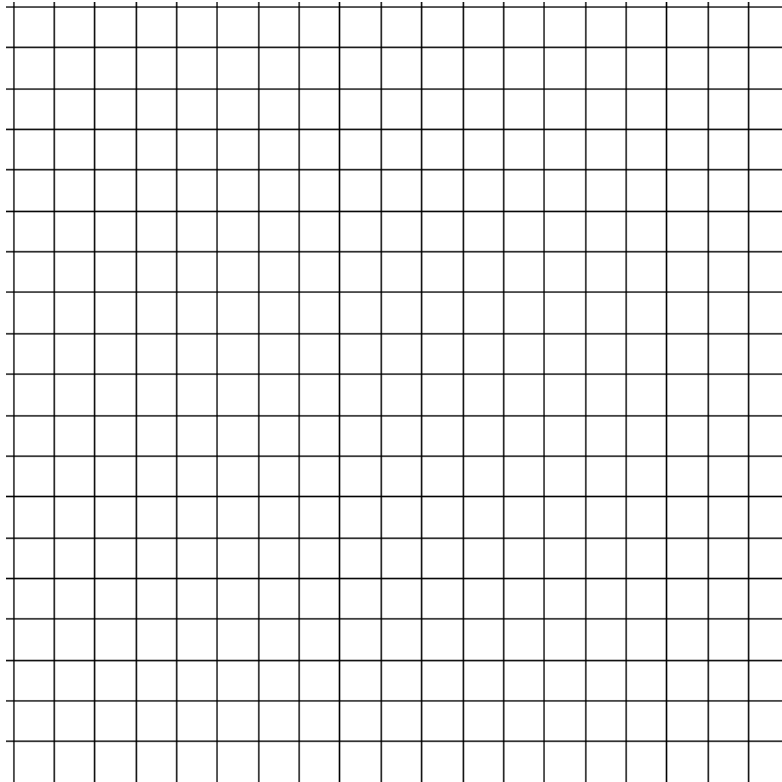
The point (18,6) falls the line $x + 2y = 30$ and the line $\frac{1}{2}x + \frac{3}{4}y = 12$.

This corresponds to having exactly the time required to mow, but having less than the time required to edge, for a weekly schedule of 18 interior lots and 6 corner lots.

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9. Desmond and Shelly decide to allocate more time per week to their respective tasks. Desmond increases his mowing time to a maximum of 36 hours per week. Shelly increases her edging time to a maximum of 15 hours per week. Write the system of inequalities that represents the new constraints. Graph the system of inequalities, shading the solution set. Are the mowing schedules represented by the points (6,15) and (18,6) now feasible?



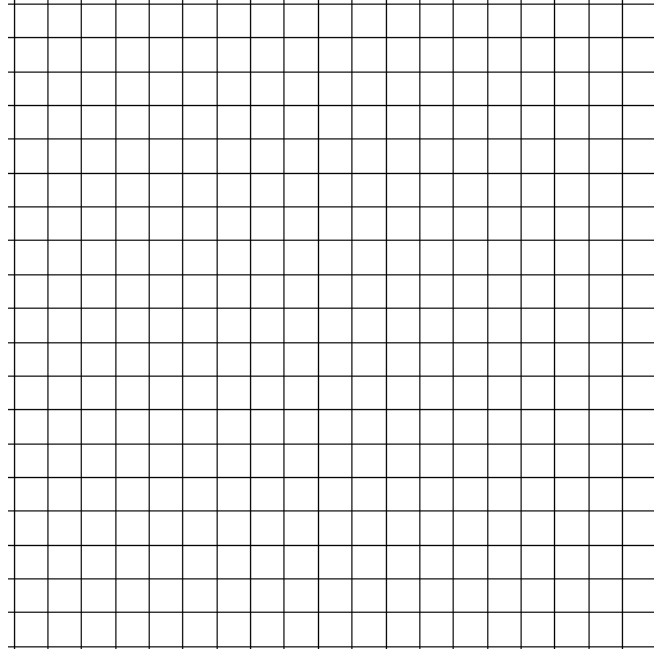
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10. **REINFORCE** Solve each system of inequalities by graphing.

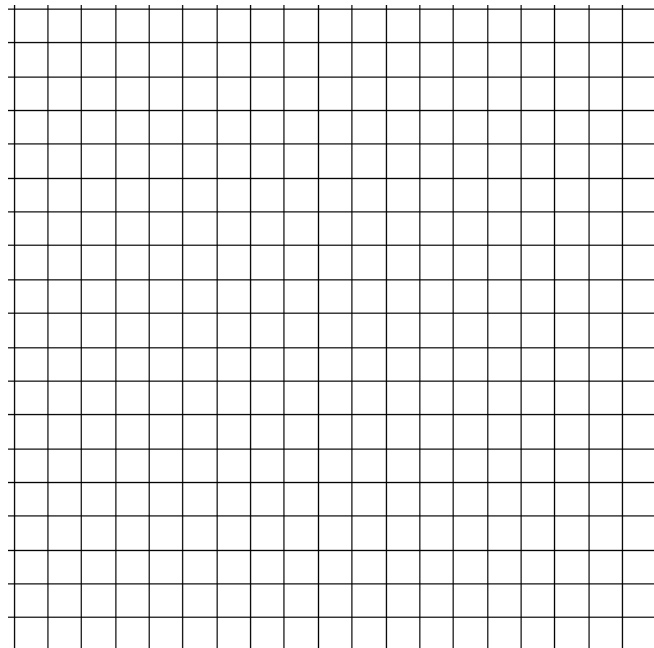
a.

$$y > -\frac{3}{4}x + 4$$
$$y \leq \frac{1}{2}x - 1$$



b.

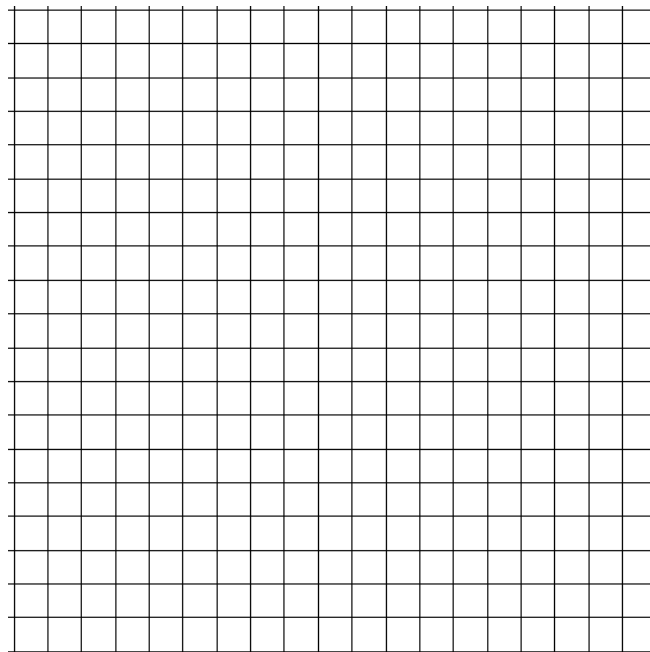
$$y \geq 4x - 10$$
$$y < \frac{1}{3}x + 1$$



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c. $y < -x + 2$
 $y > -6x - 3$



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11. **REINFORCE** The souvenir shop at the ballpark sells signed baseballs for \$2 each and signed miniature bats for \$6 each. Jay can spend at most \$12 to buy no more than 4 items. Create a system of inequalities to model this situation, and then graph the solution set. Which solution results in Jay spending all his money to buy 4 items?

