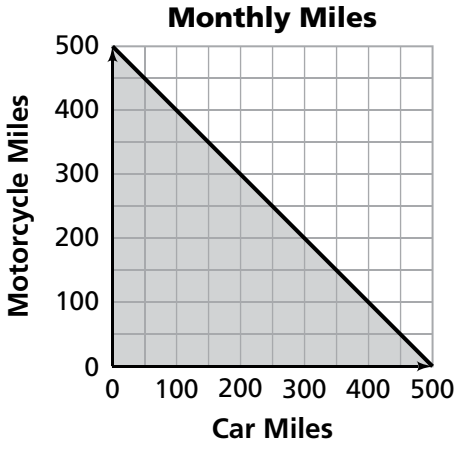
Applications

1. a. Let x represent the number of miles on the car. Let y represent the number of miles on the motorcycle. $x + y \leq 500$. Students may include $x \geq 0$, $y \geq 0$.

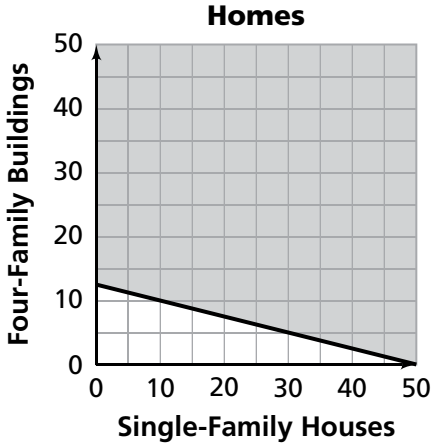
b.



c. Answers may vary. Possible answer: First, I drew the line $x + y = 500$. Then I shaded the region of solutions after checking points on each side of the boundary line to see which region satisfied the inequality.

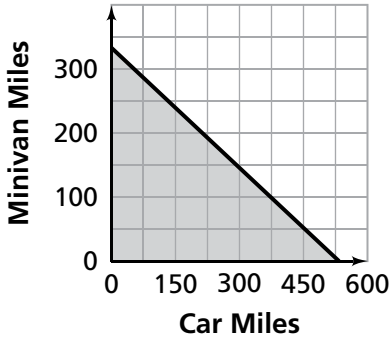
2. a. Let s represent the number of single-family homes. Let f represent the number of four-family homes. $s + 4f \geq 50$. Students may include $s \geq 0$, $f \geq 0$.

b.



3. a. Let x represent the number of car miles. Let y represent the number of minivan miles. $0.75x + 1.25y \leq 400$

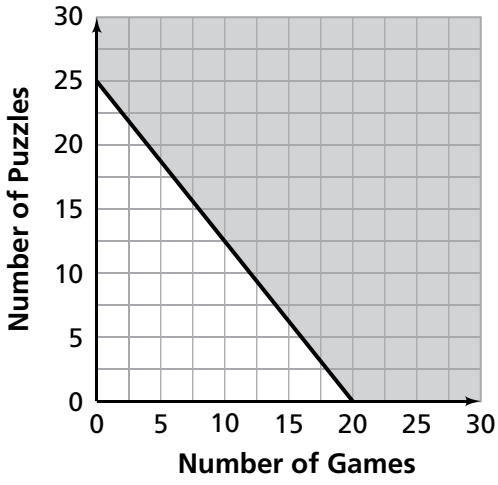
b.



4. a. Possible (*games*, *puzzles*) pairs include (20, 0), (0, 25), and (8, 15).

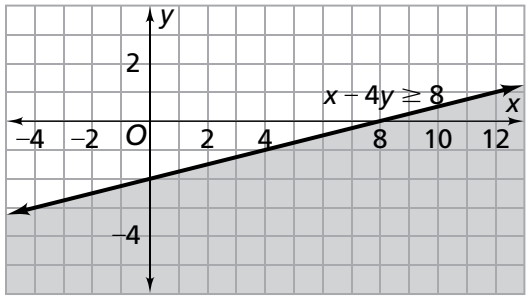
b. Let x represent the number of games. Let y represent the number of puzzles. $10x + 8y \geq 200$

c.



Exercises 5–7 have many possible solutions and nonsolutions. Some of these possibilities are shown in the graph.

5.



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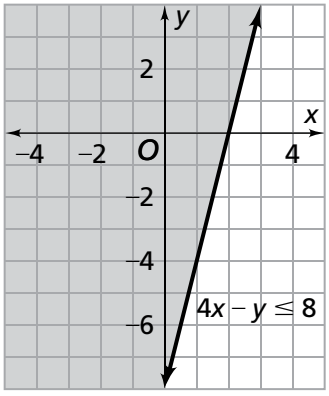

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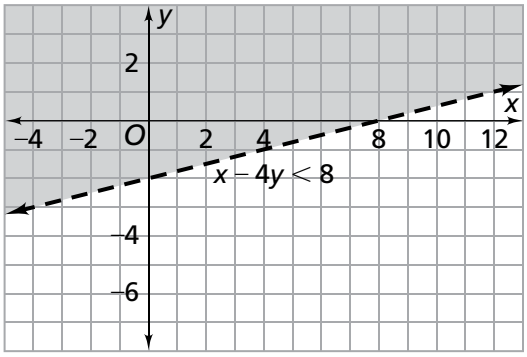
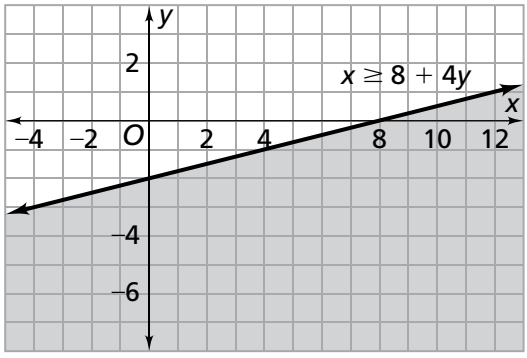
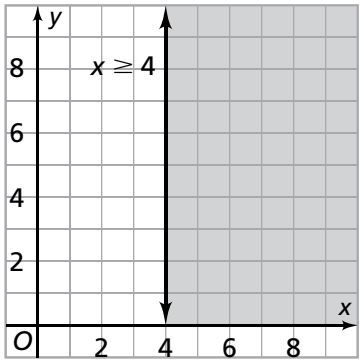


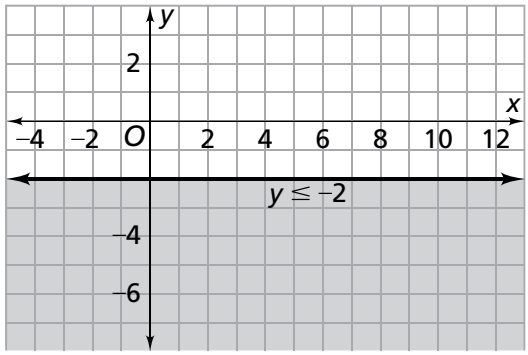
8. a.



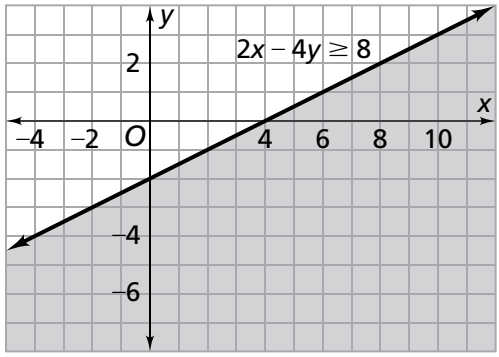
b.



c.



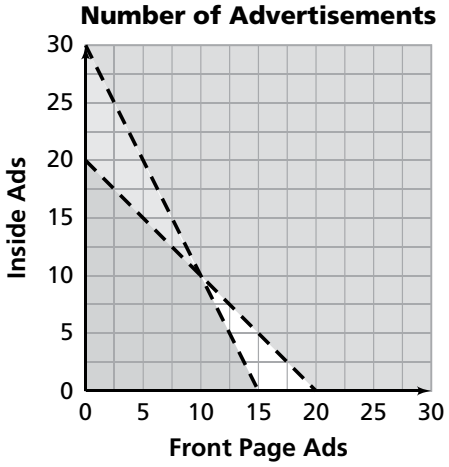
d.



9. a. Possible (*front-page ad, inside-page ad*) pairs include (5, 20), (10, 10), and (0, 30).

b. Let f represent the number of times they advertise on the front page. Let p represent the number of times they advertise inside the paper. It is known that $f \geq 0$ and $p \geq 0$. Also, $2f + p \leq 30$ and $f + p \geq 20$.

c. The solution lies in region A, which is the intersection of the separate solution regions of $2f + p \leq 30$ and $f + p \geq 2$.

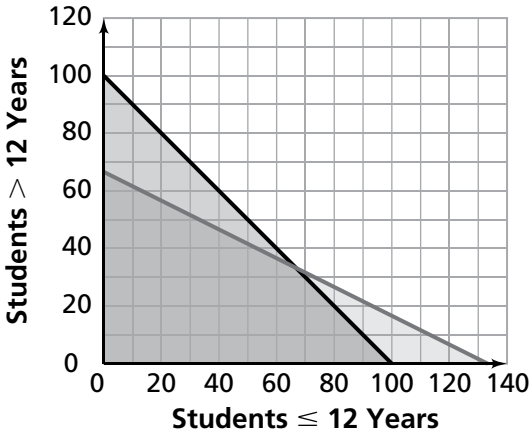


10. a. As many as 100 students 12 years and under can go on the trip because they are limited by the number of chaperones, and the cost is within the budget of $400.

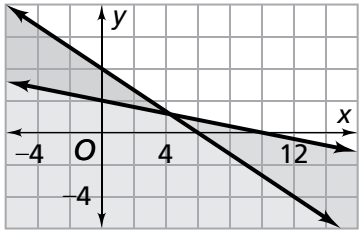
b. 66 students over 12 can go on the trip because the cost is within the budget of $400.

c. Let x represent the number of students 12 and younger going on the trip. Let y represent the number of students older than 12 going on the trip. Then, $x \geq 0$ and $y \geq 0$. Also, $3x + 6y \leq 400$ and $x + y \leq 100$.

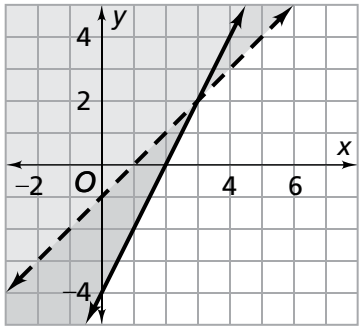
d. The solution lies in the purple region, which is the intersection of the separate solution regions of $x \geq 0$ and $y \geq 0$, $3x + 6y \leq 400$, and $x + y \leq 100$.



11. Possible solutions include (0, 0), (1, 1), and (−1, −1). Possible nonsolutions include (1, 2), (2, 4), and (3, 6).

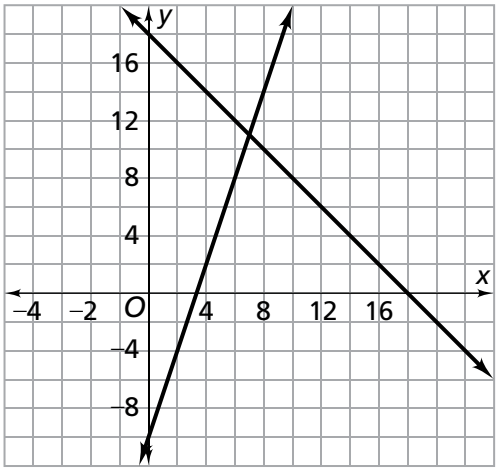


12. Possible solutions include (0, 3), (−1, 1), and (−2, 0). Possible nonsolutions include (3, 0), (0, −2), and (1, −3).

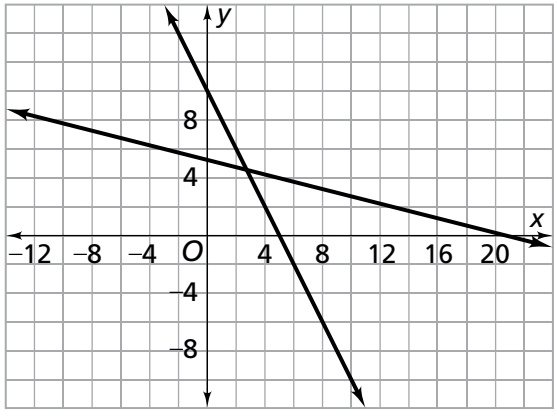


Connections

13. (7, 11)



14. $\left(\frac{19}{7}, \frac{32}{7}\right) \approx (2.7, 4.6)$. Students can use trace or table features of their calculators to get progressively sharper estimates of coordinates for the intersection point.

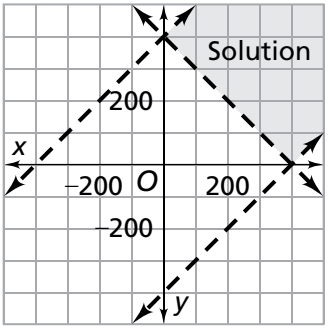


15. A

16. **a.** Some possibilities for the lengths of the other sides are 300 and 300, or 200 and 500. These pairs work because $300 + 300 > 400$ and $200 + 500 > 400$.

b. The city planner needs all three inequalities because the sum of any of the two side lengths of a triangle must be greater than the third side.

c. Since we have to assume that the graph continues without limit into the first quadrant, it is hard to describe the shape of the solution region. One possible description is that it looks like a rectangle that has been infinitely extended on one side.

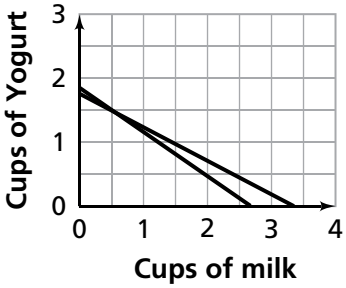


d. Coordinates of any point in the shaded region will be suitable values for the other two side lengths.

e. Coordinates of any point outside the shaded region will not be suitable values for the other two side lengths. For instance (100, 100) will not work because $200 < 400$.

17. **a.** Let m represent the number of cups of milk and let y represent the number of cups of yogurt. The system of equations is $100m + 190y = 335$ and $9m + 13y = 24$.

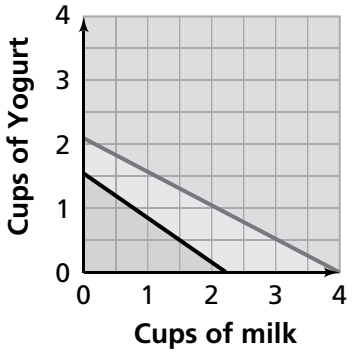
b.



c. Robin needs to use half a cup of milk and 1.5 cups of yogurt, because the graphs of the two equations intersect where $m = 0.5$ and $y = 1.5$.

18. **a.** The system of inequalities will be $100m + 190y \leq 400$ and $9m + 13y \geq 20$.

b.



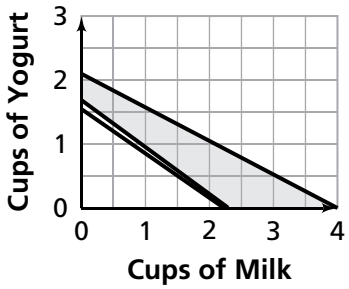
c. Some possibilities for Kadian's smoothie are 1 cup of milk and 1.5 cups of yogurt; or 0.7 cups of milk and 1.4 cups of yogurt; or a cup of yogurt and a cup of milk.

Extensions

19. **a.** If we let m represent the number of cups of milk and y represent the number of cups of yogurt. The system of inequalities, where $m \geq 0$ and $y \geq 0$, is:

$$100m + 190y \leq 400$$
$$9m + 13y \geq 20$$
$$306m + 415y \geq 700$$

b. The graph of solutions for the system of inequalities will look like this:



c. Possible solutions include (3, 0), (0, 2), and (1.5, 1).

20. Answers will vary for this project-like task.