Application of Linear Systems

TEACHER NOTES

MATH NSPIRED

Math Objectives

- Students will see how the solution to a system of linear inequalities is the intersection of each of the corresponding half planes.
- Students will see how the solution region can be one of four regions on the graph.
- Students will understand how a system of linear inequalities can be used to solve an application.

Vocabulary

- linear inequality
- function

About the Lesson

- This lesson is a follow-up lesson to the activity *Systems of Linear Inequalities*.
- This lesson involves students writing inequalities to represent an application. Students will then use the graph of the system of inequalities to solve the problem.

Related Lessons

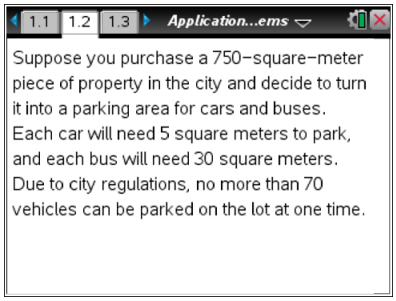
- Prior to this lesson: Systems of Linear Inequalities

TI-Nspire™ Navigator™ System

- Send out the *Application_of_Linear_Systems.tns* file.
- Monitor student progress using Class Capture.
- Use Live Presenter to spotlight student answers.

Activity Materials

- Compatible TI Technologies: TI-Nspire™ CX Handhelds, TI-Nspire™ Apps for iPad®, TI-Nspire™ Software



Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is also appropriate for use with the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions may be required if using other technologies besides the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials

Lesson Files:

Student Activity

- Application_of_Linear_Systems_Student.pdf
- Application_of_Linear_Systems_Student.doc

TI-Nspire document

- Application_of_Linear_Systems.tns

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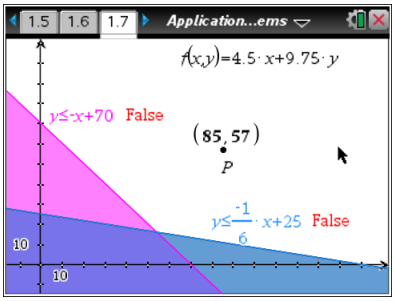
Discussion Points and Possible Answers:

Move to page 1.7.

Tech Tip: If students experience difficulty dragging a point, check to make sure that they have moved the cursor (arrow) until it becomes a hand (☜) getting ready to grab the point. Also, be sure that the word point appears. Then press ctrl ☜ to grab the point and close the hand (✊). When finished moving the point, select esc to release.



1. Write an inequality that represents the number of cars and buses that can park in the 750-square-meter parking lot. Remember that a car needs 5 square meters and a bus needs 30 square meters to park. Use *x* to represent the number of cars and *y* to represent the number of buses.

   Answer: $5x + 30y \leq 750$ **or =**

2. Write an inequality using *x* (number of cars) and *y* (number of buses) to represent the total number of vehicles that are allowed to be parked in the lot at one time according to the city regulations.

   Answer: $x + y \leq 70$ **or** $y \leq -x + 70$

3. On page 1.7 is a graph of the two inequalities from Questions 1 and 2. Move the cursor over each of the two lines graphed to see the inequality. How do your inequalities compare?

   Answer: Answers may vary and are dependent on student answers to Questions 1 and 2**.**

4. On the graph on page 1.7, what do the different shaded areas represent? Explain.

   Answer: The shaded areas represent the solutions to the inequalities. The darkest shaded area is where the shading of the two inequalities overlaps, and all points in this area are the solution to the system of inequalities. The lighter shaded areas are solutions to only one of either of the inequalities.

5. Explain what *true* and *false* on the graph mean for the two inequalities.

   Answer: *True* indicates the point is part of the solution for that inequality and therefore satisfies the inequality. *False* indicates the point does not satisfy the inequality and is not part of the solution.

6. Would negative coordinates make sense in the context of this problem? Explain why or why not.

   Answer: *True* indicates the point is part of the solution for that inequality and therefore satisfies the inequality. *False* indicates the point does not satisfy the inequality and is not part of the solution.

7. On page 1.7, what does the function $f(x, y)$ represent?

   Answer: The function can be used to determine the income based on the number of cars and buses parked in the lot.

8. Based on the information in the table, how many cars and buses would need to be parked in the lot to maximize your income?

   Answer: The point of intersection (54, 16) will yield the maximum income of $399. Therefore, parking 54 cars and 16 buses in the lot will yield the most income.

Wrap Up

Upon completion of the discussion, the teacher should ensure that students are able to:

- Understand the different regions that are generated when a system of inequalities is graphed.
- Understand how to find the solution region for a system of inequalities by looking at the graph.
- Understand how to use a system of linear inequalities to solve a problem.