

Graphing Systems of Linear Inequalities – A Co-Teaching Lesson Plan

Co-Teaching Approaches

A “(Y)” in front of the following list items indicates the approach is outlined in the lesson. An “(N)” in front of the following list items indicates the approach is not outlined in the lesson.

- (Y) Parallel Teaching
- (Y) Station Teaching
- (Y) Alternative Teaching
- (Y) Team Teaching
- (N) One Teach/One Observe
- (N) One Teach/One Assist

Subject

Graphing Systems of Linear Inequalities

Strand

Equations and Inequalities

Topic

Graphing Systems of Linear Inequalities

SOL

Primary:

- A.5 The student will
- d) represent the solution to a system of inequalities graphically.

Related:

- A.5 The student will
- a) solve multistep linear inequalities in one variable algebraically and represent the solution graphically.

A.6 The student will

- a) determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line;
- b) write the equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line; and
- c) graph linear equations in two variables.

Outcomes

Students will be able to accurately graph systems of inequalities and determine the solution region.

Materials

- Graphing calculators
- Colored pencils or markers
- Graph paper (or individual white boards with the coordinate plane)
- Graphing Inequalities review sheet (attached)
- Graphing Inequalities, Teacher Notes review sheet (attached)
- Graphing Systems of Inequalities activity sheet (attached)
- Teacher Notes for Graphing Systems of Inequalities activity sheet (attached)
- What Can I Buy? activity sheet (attached)

Vocabulary

inequality, solution, solution regions, system of inequalities

Co-Teacher Actions

Lesson Component	Co-Teaching Approach(es)	General Educator (GE)	Special Educator (SE)
Anticipatory Set	Parallel Teaching	Students will review graphing inequalities to prepare for the new lesson. GE facilitates Graphing Inequalities review sheet with half of the class. Ge discusses proper methods for graphing inequalities, as necessary.	Students will review graphing inequalities to prepare for the new lesson. SE facilitates Graphing Inequalities review sheet with half of the class. SE discusses proper methods for graphing inequalities, as necessary.
Lesson Activities/ Procedures	Team Teaching/ Station Teaching	GE distributes copies of the Graphing Systems of Inequalities activity sheet, graph paper (or individual white boards with the coordinate plane), and colored pencils or markers. As students work	SE distributes copies of the Graphing Systems of Inequalities activity sheet, graph paper (or individual white boards with the coordinate plane), and colored pencils or markers. As students work

Lesson Component	Co-Teaching Approach(es)	General Educator (GE)	Special Educator (SE)
		<p>example 1, GE models the graphing for all to see.</p> <p>Students complete the remaining examples as a station activity.</p> <p>GE runs Example 2 station. Students show their understanding independently for example 4.</p>	<p>example 1. GE models the graphing for all to see.</p> <p>Students complete the remaining examples as a station activity.</p> <p>SE runs Example 3 station. Students show their understanding independently for example 4.</p>
Guided/ Independent Practice	Alternative Teaching	GE distributes the What Can I Buy? activity sheet and facilitates student progress, checking for accuracy as they complete the activity.	SE takes a small group of students to complete the What Can I Buy? activity sheet. These students may need additional support and guidance to be successful on this activity.
Closure	Team Teaching	<p>Class discussion question</p> <p>How would you write a system of linear inequalities where (2, 4) is a solution and (-3, 2) is not a solution? Justify your answer with a graph.</p>	<p>Class discussion question</p> <p>How would you write a system of linear inequalities where (2, 4) is a solution and (-3, 2) is not a solution? Justify your answer with a graph.</p>
Formative Assessment Strategies	Team Teaching	<p>Exit slip</p> <p>How would you graph this system of linear inequalities?</p> <p>$x \geq 0, y \geq 0, \text{ and } 2x + 3y < 12$</p> <ul style="list-style-type: none"> • Is (3, 2) a solution to the system? • Is (0, 0) a solution to the system? • How can you justify the difference in your answers to these questions? 	<p>Exit slip</p> <p>How would you graph this system of linear inequalities?</p> <p>$x \geq 0, y \geq 0, \text{ and } 2x + 3y < 12$</p> <ul style="list-style-type: none"> • Is (3, 2) a solution to the system? • Is (0, 0) a solution to the system? • How can you justify the difference in your answers to these questions?

Lesson Component	Co-Teaching Approach(es)	General Educator (GE)	Special Educator (SE)
Homework	Team Teaching	<p>Journal writing</p> <p>Explain the situation when a system of two inequalities would have no solution. Give an example to support your reasoning.</p>	SE same as GE.

Specially Designed Instruction

- Teacher can scaffold the lesson by breaking down the lengthy process of graphing and shading by providing step-by-step directions (i.e., write in slope intercept form, plot the y intercept, count the slope (rise over run), solid or dotted line, shade above or below)

Accommodations

- Teacher provides a straight edge to create accurate graphs.
- Teacher provides graphs with labeled axes.
- Teacher provide checklists of steps for the students to refer to as they solve.
- Students can use the Desmos graphing calculator to check their work.

Modifications

- For those students who require a modified curriculum, they could graph linear inequalities on a number line, or graph linear equations.

Notes

- “Special educator” as noted in this lesson plan might be an EL teacher, speech pathologist, or other specialist co-teaching with a general educator.

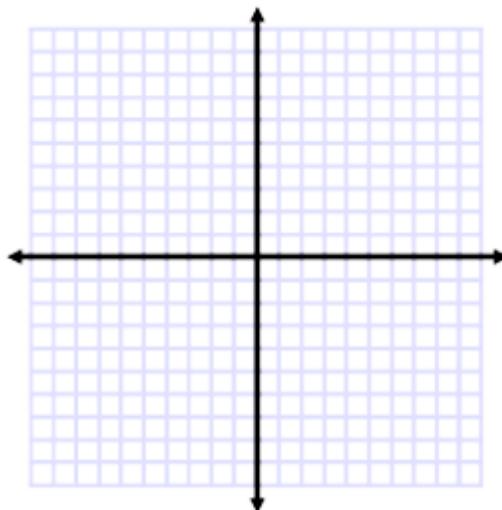
Note: The following pages are intended for classroom use for students as a visual aid to learning.

Graphing Inequalities

Graphing Inequalities

$$2x + 3y < 21$$

1. Isolate y by writing the inequality in slope-intercept form.
2. What is the y -intercept of the inequality?
3. What is the slope of the inequality?
4.
 - a) Plot the y -intercept on the graph
 - b) Using the slope, find another point on the line.
 - c) Draw a line. But wait! Should it be a dotted line or solid line?
 - For $<$ or $>$, use a dotted line because the values on the line **are not** included in the solution set.
 - For \leq or \geq , use a solid line because the values on the line **are** included in the solution set.
 - d) Shade the solution region.
 - For $<$ or \leq , shade **below** the line.
 - For $>$ or \geq , shade **above** the line.



5. Find and name five solutions.

Graphing Inequalities, Teacher Notes

Graphing Inequalities *Teacher Notes

$$2x + 3y < 21$$

1. Isolate y by writing the inequality in slope-intercept form.

$$y < -\frac{2}{3}x + 7$$

2. What is the y-intercept of the inequality?

7

3. What is the slope of the inequality?

$-\frac{2}{3}$

4. a) Plot the y-intercept on the graph

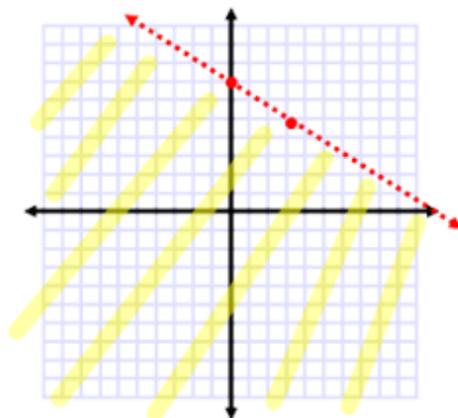
b) Using the slope, find another point on the line.

c) Draw a line. But wait! Should it be a dotted line or solid line?

- For $<$ or $>$, use a dotted line because the values on the line **are not** included in the solution set.
- For \leq or \geq , use a solid line because the values on the line **are** included in the solution set.

d) Shade the solution region.

- For $<$ or \leq , shade **below** the line.
- For $>$ or \geq , shade **above** the line.



5. Find and name five solutions.

Answers will vary.

Graphing Systems of Inequalities

Graphing Systems of Inequalities

Name _____ Date _____

Using sheets of graph paper (or a white board with the coordinate plane) and colored pencils or markers in different colors, complete each of the following systems of inequalities. Show your work.

Example 1

$$2x - y > -3$$

$$4x + y \geq 5$$

1. Isolate y .
2. Graph each inequality, using a different color for each. Shade below the dotted line in the first inequality. Shade above the solid line in the second inequality.
3. Identify the solution region.
4. To check: Pick a point from the solution set, and test it in the system.

Example 2

$$x - y \leq -2$$

$$x - y > 2$$

1. Isolate y .
2. Graph each inequality, using a different color for each. Shade above the solid line in the first inequality. Shade below the dotted line in the second inequality.
3. Identify the solution region.
4. To check: Pick a point from the solution set, and test it in the system.

Graphing Systems of Inequalities, cont.

Example 3

$$x < 1$$

$$x \leq -2$$

1. Graph each inequality, using a different color for each. Shade to the left of the dotted line in the first inequality. Shade to the left of the solid line in the second inequality.
2. Identify the solution region.

Example 4

$$x + y \leq -2$$

$$x - 2y > 8$$

1. Isolate y .
2. Graph each inequality, using a different color for each.
3. Identify the solution region.

Teacher Notes for Graphing Systems of Inequalities

Teacher Notes for Graphing Systems of Inequalities

Using sheets of graph paper (or a white board with the coordinate plane) and colored pencils or markers in three different colors, complete each of the following systems of inequalities.

Example 1

$$\begin{aligned}2x - y &> -3 \\ 4x + y &\geq 5\end{aligned}$$

1. Isolate y .
 $y < 2x + 3$
 $y \geq -4x + 5$
2. Graph each inequality, using a different color for each. Shade below the dotted line in the first inequality, and shade above the solid line in the second inequality.
3. Identify the solution region.
The solution to this system of inequalities is the region where the colors of shading overlap. This is the area that both inequalities have in common. This solution is "unbounded" and continues indefinitely to the right.
4. To check: Pick a point from the solution set, and test it in the system.

Example 2

$$\begin{aligned}x - y &\leq -2 \\ x - y &> 2\end{aligned}$$

1. Isolate y .
 $y \geq x + 2$
 $y < x - 2$
2. Graph each inequality using a different color for each. Shade above the solid line in the first inequality, and shade below the dotted line in the second inequality.
3. Identify the solution region.
This system of inequalities has no solution. There is no place where the colors of shading overlap.
4. To check: Pick a point from the solution set, and test it in the system.

Teacher Notes for Graphing Systems of Inequalities, cont.

Example 3

$$x < 1$$

$$x \leq -2$$

1. Graph each inequality using a different color for each. Shade to the left of the dotted line in the first inequality, and shade to the left of the solid line in the second inequality.
2. Identify the solution region.
The solution to this system of inequalities is the region where the colors of shading overlap.

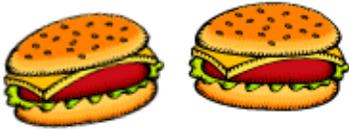
Example 4

$$x + y \leq -2$$

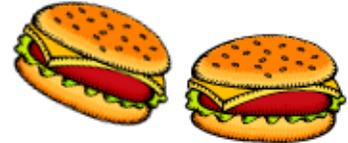
$$x - 2y > 8$$

1. Isolate y .
 $y \leq -x - 2$
 $y < 1/2x - 4$
2. Graph each inequality, using a different color for each. Shade below the solid line in the first inequality. Shade below the dotted line in the second inequality.
3. Identify the solution region.
The solution to this system of inequalities is the region where the colors of shading overlap.

What Can I Buy?



What Can I Buy?



Name _____

Date _____

You are very hungry, so you go to a fast food restaurant. You have exactly \$15.02. You love Big Burgers and cheeseburgers. Based on past experience, you know that you can eat only 7 sandwiches. Big Burgers cost \$3.70, while cheeseburgers cost \$.98. How many Big Burgers and how many cheeseburgers can you buy? (Disregard the issue of sales tax in this problem.)

- Write a system of equations for this problem. Let B represent the number of Big Burgers and C represent the number of a cheeseburgers you can buy.
- Graph this system of equations. It is recommended that you use a graphing calculator to do this.
- You can buy _____ Big Burgers and _____ cheeseburgers.
- Now, suppose you decide that you don't want to spend all your money. Also, you realize that it would be fine to eat fewer than 7 sandwiches. Write a system of inequalities for this new problem.
- Graph this system of inequalities.
- How many different sandwich combinations can you buy to fulfill your new criteria? Complete the chart at right, showing all the possible combinations.
- Notice that systems of inequalities have *many* solutions.

Big Burgers	Cheeseburgers
0	1
0	2
0	
0	
0	
0	
0	
0	
1	
1	
1	
1	
1	
1	
1	
1	
2	
2	
2	
2	
2	
2	
2	
3	
3	
3	
3	
4	