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Lesson Plan: Solving Systems of Equations Graphically
Cover Page

Watch Your Step...You May Collide!

Introduction:

In Algebra systems of equations are taught graphically, by substitution and by elimination. This lesson is to show that systems of equations graphically are no more difficult than graphing two lines and seeing where they intersect. This is a lesson taught using mostly cooperative learning, thus letting the students discover the answer rather than being spoon-fed the answers.

Standards:

NYS Learning Standards in Mathematics and Science

Standard 3: Mathematics

Standard 6: Interconnectedness

NCTM Standards in connections, especially:

- Recognize and use connections among mathematical ideas
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole

Objectives:

1. Students will understand that most pairs of straight lines will intersect at one point.
2. Students will understand how to graph two lines to find that point of intersection.
3. Students will understand how to check their work.

Instructional Protocol:

1. Walking with string experiment.
2. Introduction of Systems of Equations
3. Discovery cooperative learning project
4. Go over the example to make sure for understanding.
5. Two problems for in class trials.
6. Homework.

Watch Your Step...You May Collide!

1. Clear the middle of the class and choose two students to help with a presentation.
2. Have each start in adjacent corners of the room, and then walk to the opposite corner of the room.
 - a. Each student should leave a trail of yarn behind them
 - b. Pull the yarn into a straight line
 - c. Observe that two straight lines will meet at one point only
 - i. Have the students imagine that the string goes on forever in both directions.
 - ii. Review Line vs. Line Segment
3. It is assumed that the students understand how to graph. This could be a time to review graphing if needed.
4. This is where the cooperative learning assignment is implemented. See the attached sheet on how to run this activity.
5. Repeat this activity three times with the following systems of equations.
 - a. $y = 2x + 3$ and $y = -2x - 5$
 - i. Solution $(-2, -1)$
 - b. $y = 4x + 3$ and $x + y = 8$
 - i. Solution $(1, 7)$
 - c. $y = 2x + 3$ and $2y = 6x + 4$
 - i. Solution $(1, 5)$
6. Allow students to begin attached worksheet for individual work.
 - a. Students may work together, but
 - b. Each student is responsible to hand in his or her own sheet.
7. If there is time, students may begin their homework out of the textbook.

Keep in mind that I teach in the block schedule. This lesson might be altered for a 40-minute class. Also pay close attention to the protocol for the cooperative activity. It is important that the student do not only understand the steps, but that they are solving systems of equations.

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Lesson Plan: Systems of Equations
In Class Cooperative Learning Assignment.

For this assignment each student will be in a group of four. Each group will have a leader, recorder, materials handler, and presenter. The leader takes control of the organization of the problem solving. The recorder does all of the writing. The materials handler gathers any materials needed, and also keeps time for the group. The presenter will have to come up and present a stage of the problem at the end. Each group will first receive a card that says the following:

Task 1: Graph the equation $x + y = 5$

Two minutes will be given. At that time each group will be given a second task.

Task 2: Graph the equation $y = 2x - 1$ on the same graph as task 1.

Two more minutes will be given. Students must complete task one before moving onto task two. At that point the students will be given two cards. One will say:

Task 3: Determine where the two graphs intersect. Then check your answer by plugging that point into both equations.

Solution: (,)

The students will solve the problem, check their answers, and then write the solution on the solution card. When time expires each team must hold up their card with their answer on it. This will allow the teacher to determine whether the students understood the problem, or if the students are lost.

If the students have understood the problem, then one student from each team will have to solve a piece of the problem in front of the class. They will be called at random. One will have to graph the first line, another the second, a third to find the point of intersection, and the last to check. If more you have more groups then the check can be split into two jobs.

At this point make sure that you tell the class that this was a system of equation, and let them know how it would have been written as a problem. Then proceed to give each group two more problems, and have the students mix up the responsibilities.

Name: _____

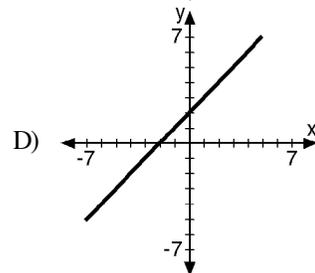
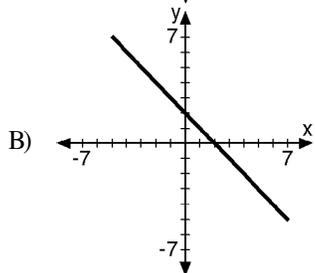
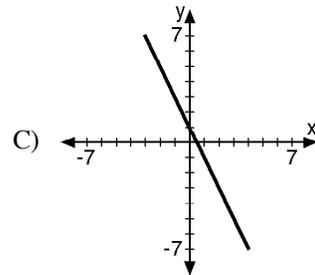
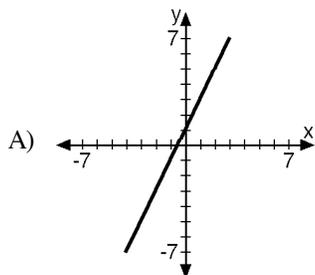
1) Which of the following sets of ordered pairs are *all* solutions to the equation $y = 3x - 4$?

A) $(-4, -16), (1, 1), (10, 26)$

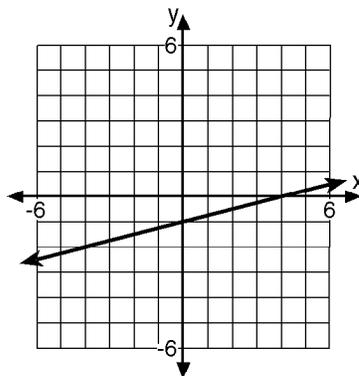
C) $(-4, 16), (1, -1), (10, 26)$

B) $(-4, -16), (1, -1), (10, 26)$

D) $(-4, -16), (1, -1), (10, -26)$

2) Which of the following represents the graph of the equation $y = 2x + 1$?

3) Which equation correctly describes the line graphed?



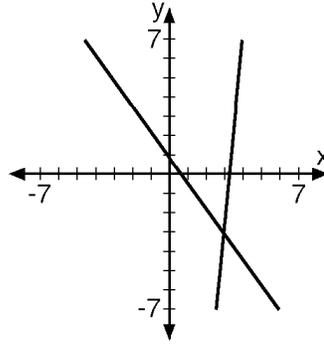
A) $x + 4y = 4$

B) $-x + 4y = 4$

C) $-x - 4y = -4$

D) $x - 4y = 4$

4) What is the solution to the system of equations graphed below?



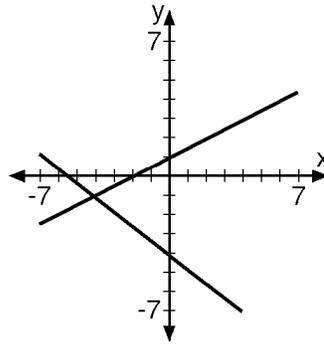
A) (-3,-3)

B) (3,-3)

C) (3,3)

D) (-3,3)

5) Determine the solution to the system of equations whose graph is shown:



Questions 6 through 10 refer to the following:

Solve the given system of equations graphically:

6) $2x + y = 5$ and $y = -1$

7) $y = -x$ and $y = x + 2$

8) $x + y = 2$ and $x - y = -4$

9) $y = 3x$ and $3x + y = 12$

10) $2x - y = 2$ and $3x + y = 13$