



MISSISSIPPI
EXEMPLAR
Units & Lessons
MATHEMATICS

Grade 8

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Grade 8 • Edition 1

Lesson 1: Introduction to Systems of Equations

Focus Standard(s): 8.EE.8a

Additional Standard(s): 8.EE.5, 8.EE.6, 8.EE.7a, 8.EE.7b, 8.F.2, 8.F.3, 8.F.4

Standards for Mathematical Practice: SMP.2, SMP.3, SMP.4

Estimated Time: 50 minutes

Resources and Materials:

- Ball
- Mini whiteboards
- Dry erase markers
- Overhead projector transparencies
- Rulers
- Handout 1.1: Transparency Graphs
- Handout 1.2: It's Transparent

Lesson Target(s):

- Students will apply their understanding of graphing linear equations to systems of equations.
- Students will represent the solution to a system of equations as an ordered pair.

Guiding Question(s):

- What is a system of equations?
- What does the point where two lines intersect represent?

Vocabulary

Academic Vocabulary:

- Coordinate plane
- Ordered pair
- System of equations

Instructional Strategies for Academic Vocabulary:

- Introduce words with student-friendly definitions and pictures
- Model how to use the words in discussion
- Discuss the meaning of word in a mathematical context
- Create pictures/symbols to represent words
- Write/discuss using the words

Symbol

Type of Text and Interpretation of Symbol



Instructional support and/or extension suggestions for students who are EL, have disabilities, or perform well below the grade level and/or for students who perform well above grade level

✓

Assessment (Pre-assessment, Formative, Self, or Summative)

Instructional Plan

Understanding Lesson Purpose and Student Outcomes: Students will play a game to demonstrate their understanding of graphing linear equations in slope-intercept form. Students will be introduced to systems of equations and how they relate to linear equations.

Anticipatory Set/Introduction to the Lesson: Show Me

Distribute whiteboards and dry erase markers. Instruct students to write responses to teacher prompts on white boards and only display when instructed.

T: "Find two numbers whose sum is 5."

S: Write response on whiteboard.

T: "Show me." Write $x + y = 5$ on the board.

✓ S: Show response.

Note: Student responses will vary but must have a sum of 5.

T: "Find two numbers whose difference is 1."

S: Write response on whiteboard.

T: "Show me." Write $x - y = 1$ on the board.

✓ S: Show response.

Note: Student responses will vary but must have a difference of 1.

Challenge students to identify two different numbers whose sum is 5 and difference is 1. Actively monitor students and provide appropriate support.

Prompting Questions:

- When there was just one rule, how many possible answers could there be?
- How many possible answers are there with two rules?
- Why do you think it may be more difficult to find a pair of numbers that satisfies two rules instead of one?

Return class to whole group to explain and define systems of equations. Ask students to make connections between the Show Me Challenge and systems of equations.

Activity 1: Pair-Share Learning

Pair students up with their Elbow Buddy. Distribute a coordinate plane transparency and a ruler to each student. Assign $y = x + 5$ to one partner and $y = 2x + 3$ to the other. Instruct students to write the assigned equation on the white boards and graph it on the transparency coordinate plane.

Prompting Questions:

- Will your lines intersect?
- At what point will your lines intersect?
- How would you write the point of intersection as a ordered pair?
- Does the order you write the numbers of you pair matter?

Instruct students to write the point of intersection on their whiteboards. Guide students in discovering the point of intersection is the only solution to the system. No other pair of numbers can be substituted into the equations to yield true sentences (SMP.2).

Prompting Questions:

- How are coordinate points represented alphabetically?
- What do you notice about our equations?

Model substituting coordinate points into systems of equations as students follow along with mini whiteboards. Write original system of equations with dry erase markers. Erase variables and replace with numerical values from the point of intersection. Teacher and students simplify.

Prompting Question:

- Is the final statement true or false?
- How do you know?
- What does this mean?

If true, relate the understanding that coordinate points satisfy both equations at the same time. If false, guide students into finding possible mistakes.

For students who are EL, have disabilities, or perform well below grade level:

- Student circle y -intercept in linear function, and plot point on y -axis. Student highlights slope in function, then “move” from y -intercept according to slope.

Extensions for students with high interest or working above grade level:

- Students write a statement to describe why the solution is the only pair that will satisfy the system.

Activity 2: Guided Practice

- ✓ Distribute **Handout 1.2: It’s Transparent** (SMP.4). Instruct one student to graph the first linear equation and the other to graph the system. Students check the work of their partner before putting transparencies together to determine the solution.

Prompting Questions:

- What does the y -intercept tell you?
- How should you move from the y -intercept? What number tells you that?

For students who are EL, have disabilities, or perform well below grade level:

- Change linear equations to include integers, not fractions.

Reflection and Closing: Share Out

T: “What is one word that relates to systems of equations?” Give a student a ball.

S: Say Response. Give the ball to another student who then shares and explains.

Repeat game until several students have shared out.

Reflect on how well the students could answer the essential question by examining evidences of student learning.

Homework

T: Write the following equations on the board:

1. $y = 5x + 4$; $y = x - 2$

2. $x = 2$; $y = \frac{3}{2}x - 1$

3. $y = x + 3$; $y = 8x - 4$

4. $y = \frac{1}{3}x + 2$; $y = \frac{4}{3}x - 3$

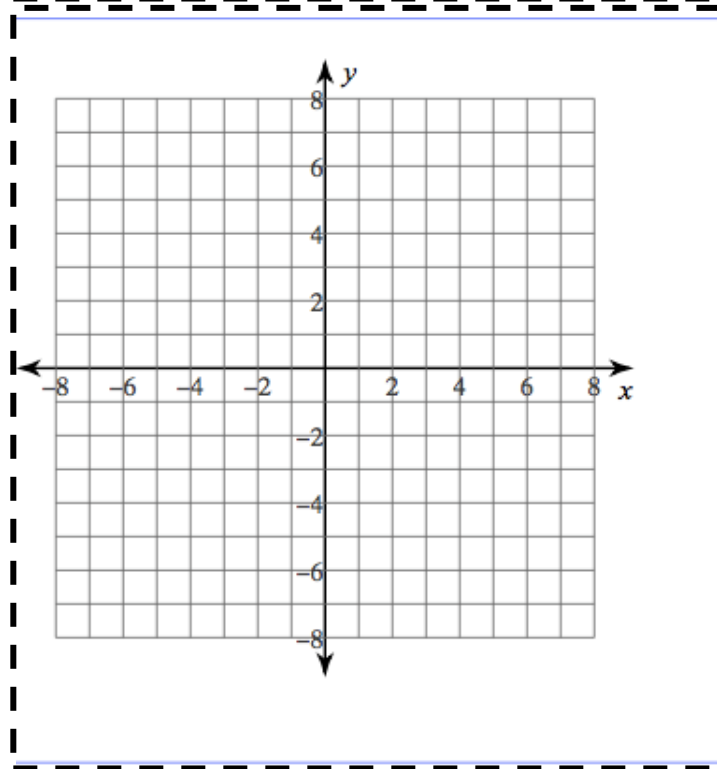
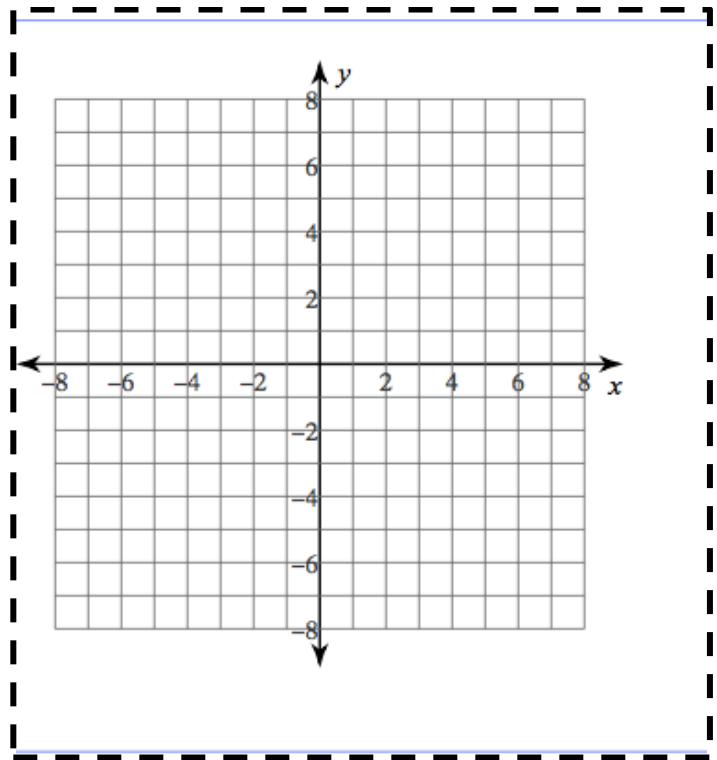
5. $y = \frac{1}{4}x - 1$; $y = \frac{3}{2}x + 4$

S: Graph the systems of equations on graph paper.

Handout 1.1: Transparency Graph

Name: _____

Date: _____



Handout 1.2: It's Transparent

Name: _____

Date: _____

Directions: Complete the chart using your systems of equations.

1) $y = x + 4$

$$y = -2x + 1$$

2) $y = -\frac{3}{2}x + 4$

$$y = \frac{1}{2}x - 4$$

3) $y = \frac{3}{2}x + 2$

$$y = \frac{1}{2}x - 2$$

4) $y = \frac{1}{4}x - 2$

$$y = \frac{5}{4}x + 2$$

5) $y = -\frac{2}{3}x + 1$

$$y = -2x - 3$$

6) $y = \frac{5}{4}x + 4$

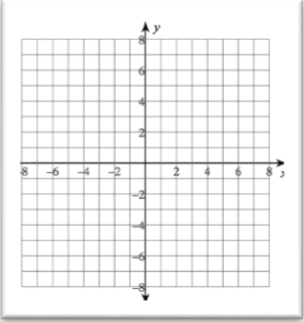
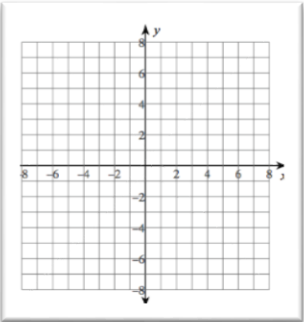
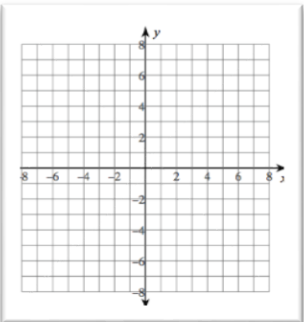
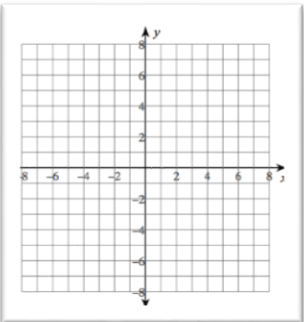
$$y = -\frac{3}{4}x - 4$$

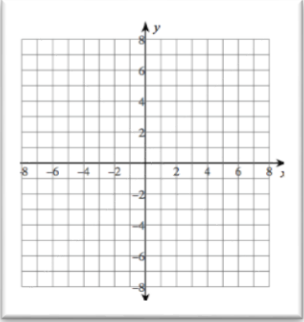
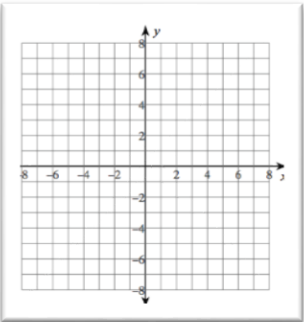
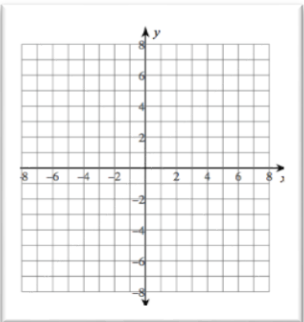
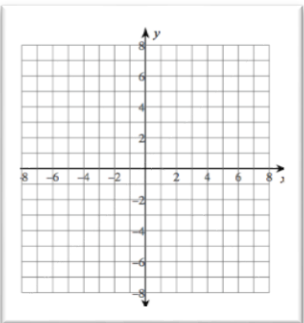
7) $y = \frac{5}{2}x + 3$

$$y = \frac{1}{2}x - 1$$

8) $y = 2x + 2$

$$y = \frac{2}{3}x - 2$$

<u>System of Equations</u>	<u>Sketch of graph</u>	<u>Solution (x,y)</u>
		
		
		
		

<u>System of Equations</u>	<u>Sketch of graph</u>	<u>Solution (x,y)</u>
		
		
		
		

Handout 1.2: It's Transparent!

Answer Key

<u>System of Equations</u>	<u>Sketch of graph</u>	<u>Solution (x,y)</u>
$y = x + 4$ $y = -2x + 1$		(-1, 3)
$y = -\frac{3}{2}x + 4$ $y = \frac{1}{2}x - 4$		(4, -2)
$y = \frac{3}{2}x + 2$ $y = \frac{1}{2}x - 2$		(-4, -4)
$y = \frac{1}{4}x - 2$ $y = \frac{5}{4}x + 2$		(-4, -3)
$y = -\frac{2}{3}x + 1$ $y = -2x - 3$		(-3, 3)
$y = \frac{5}{4}x + 4$ $y = -\frac{3}{4}x - 4$		(-4, -1)
$y = \frac{5}{2}x + 3$ $y = \frac{1}{2}x - 1$		(-2, -2)
$y = 2x + 2$ $y = \frac{2}{3}x - 2$		(-3, -4)

Homework Answer Key

$$\begin{aligned} 1) \quad & y = -5x + 4 \\ & y = x - 2 \\ & \quad (1, -1) \end{aligned}$$

$$\begin{aligned} 3) \quad & y = x + 3 \\ & y = 8x - 4 \\ & \quad (1, 4) \end{aligned}$$

$$\begin{aligned} 5) \quad & y = \frac{1}{4}x - 1 \\ & y = \frac{3}{2}x + 4 \\ & \quad (-4, -2) \end{aligned}$$

$$\begin{aligned} 2) \quad & x = 2 \\ & y = -\frac{3}{2}x - 1 \\ & \quad (2, -4) \end{aligned}$$

$$\begin{aligned} 4) \quad & y = \frac{1}{3}x + 2 \\ & y = -\frac{4}{3}x - 3 \\ & \quad (-3, 1) \end{aligned}$$

For training or questions regarding this unit,
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