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# EXEMPLAR

Units & Lessons

MATHEMATICS

**Grade 8**

Grant funded by:



W.K.  
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## Lesson 2: These Lines Don't Touch

**Focus Standard(s):** 8.EE.8a, 8.EE.8b

**Additional Standard(s):** 8.EE.5, 8.EE.6, 8.EE.7a, 8.EE.7b, 8.F.1, 8.F.2, 8.F.3, 8.F.4

**Standards for Mathematical Practice:** SMP.3, SMP.5, SMP.7, SMP.8

**Estimated Time:** 50 minutes

**Resources and Materials:**

- Glue
- Graph paper
- Index Cards
- Red and blue colored pencils
- Rulers
- Uncooked spaghetti noodles
- Handout 2.1: Do Now
- Handout 2.2: Spaghetti
- Handout 2.3: Color by Solution
- Khan Academy Homework: [https://www.khanacademy.org/math/algebra-basics/core-algebra-systems/core-algebra-systems-tutorial/e/graphing\\_systems\\_of\\_equations](https://www.khanacademy.org/math/algebra-basics/core-algebra-systems/core-algebra-systems-tutorial/e/graphing_systems_of_equations)

**Lesson Target(s):**

- Students will identify the number of solutions to systems of equations through their understanding of slope.
- Students will analyze graphs to determine the number of solutions in a system of equations.

**Guiding Question(s):**

- How can knowing the rate of change help determine the number of solutions in a system of equation?

## Vocabulary

### Academic Vocabulary:

- Parallel lines
- Rate of change

### 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
- 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 graph systems of equations to demonstrate their understanding of how the rate of change can be used to determine the number of solutions.

### Anticipatory Set/Introduction to the Lesson: Do Now

Distribute **Handout 2.1: Do Now**. Instruct students to draw a line to match each system of equations to its graph. Select students to report out upon completion of work. Have students share how the method used for matching the system with the solution. Expect students to use graphing for a solution and evaluation using the point of intersection as strategies at this time (SMP.8).

### Activity 1: Spaghetti

Distribute **Handout 2.2: Spaghetti**, graph paper, glue, and uncooked spaghetti. Pair students together to graph the system of equations on one coordinate plane (SMP.5).

- ✓ Actively monitor students using graph paper, glue, and spaghetti to graph the systems of equations.

Construct a chart on the board with three columns: System, Sketch, and Solution. Select students to write system, sketch the graph, and identify the solution to the system on the board.

Once all students have participated, facilitate a whole group discussion using prompting questions.

Prompting Questions:

- What do you notice about all the lines graphed?
- What do you notice about all the equations?
- Where is the solution to these systems?

Instruct students to Turn and Talk to share which terms in the equations impacts the number of solutions and why they believe this to be true (SMP.3).

Select several pairs share discussions. Guide whole group conversation toward an understanding of rate of change determining whether lines will intersect.

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

- Have students who have not made the connection of no solution to a system (parallel lines) sharing a common rate of change highlight the rate of change in the equation.

### **Activity 2: Color by Solution**

Distribute **Handout 2.3: Color by Solution** and colored pencils.

T: Locate the equation number and its corresponding shape.

S: Color the systems of equations with no solution red. Color the system of equations with one solution blue (SMP.7).

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

- Have students who have not made the connection of no solution to a system (parallel lines) sharing a common rate of change highlight the rate of change in the equation.

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

- Students write a statement to explain the number of solutions without graphing.

### Reflection and Closing: Share Out

On an index card, students will answer the following questions and turn in as they exit the classroom.

✓ **Exit Ticket:**

- What do systems with one solution have in common with systems with no solutions?
- How are systems with one solution different than systems with no solution?

### Homework

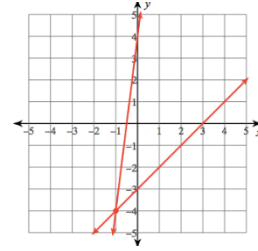
Students will complete and record three problems from the [Khan Academy Homework](#).

Handout 2.1: Do Now

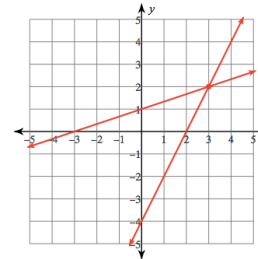
Name: \_\_\_\_\_ Date: \_\_\_\_\_

Directions: Draw a line from each system of equations to its graph.

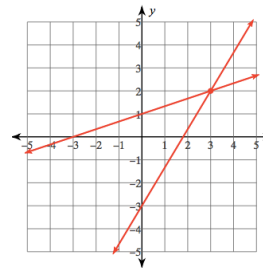
$$y = 2x - 4$$
$$y = \frac{1}{3}x + 1$$



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



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



## Handout 2.2: Spaghetti

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1.  $y = -x + 2$   
 $y = -x + 1$

2.  $y = 7x + 3$   
 $y = 7x + 2$

3.  $y = 5x + 3$   
 $y = 5x + 4$

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

5.  $y = 6x - 2$   
 $y = 6x - 4$

6.  $y = -8x + 4$   
 $y = -8x - 1$

7.  $y = 2x - 3$   
 $y = 2x + 4$

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

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

10.  $y = 7x - 4$   
 $y = 7x - 3$

11.  $y = 7x - 4$   
 $y = 7x - 3$

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

13.  $y = -\frac{7}{3}x + 4$   
 $y = -\frac{7}{3}x + 2$

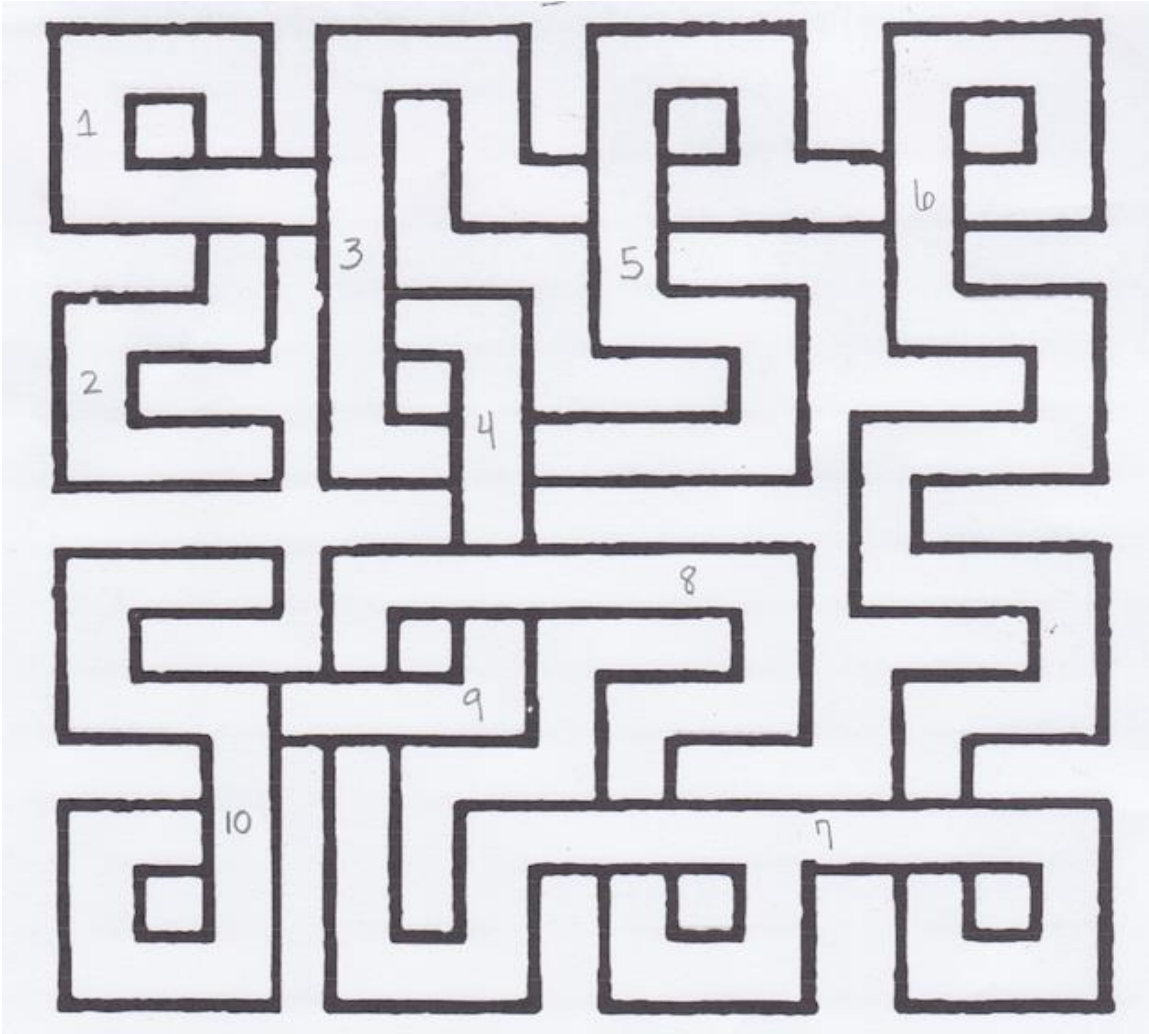
14.  $y = -x + 1$   
 $y = -x + 2$

15.  $y = 2x - 1$   
 $y = 2x + 4$

## Handout 2.3: Color by Solution

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Locate the equation number and its corresponding shape. If the system of equations has no solution, color the shape red. If the system of equations has one solution, color the shape blue.





1.  $y = \frac{1}{3} - 1$

$$y = \frac{1}{4}x + 3$$

2.  $y = 2x$   
 $y = 2x + 3$

3.  $x + y = 8$   
 $y = -x - 7$

4.  $y = 4$   
 $2x + y = 9$

5.  $y = 5x - 3$   
 $y = 5x + 3$

6.  $x = y + 2$   
 $y = x + 2$

7.  $y = x$   
 $y = x - 5$

8.  $y = -4x + 2$   
 $4x = y + 5$

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

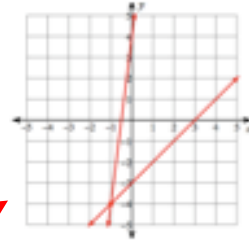
10.  $y = \frac{1}{2}x + 3$   
 $y = \frac{1}{2}x + 4$

Handout 2.1: Do Now **Answer Key**

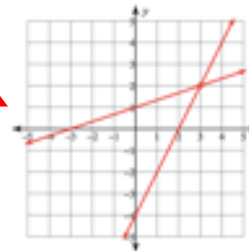
**Do Now**

**Directions:** Draw a line from each system of equations to its graph.

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

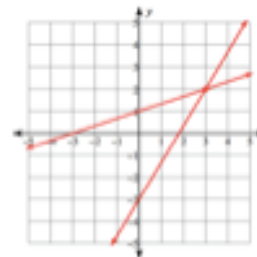


$$y = 8x + 4$$
$$y = x - 3$$

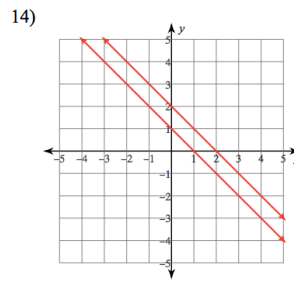
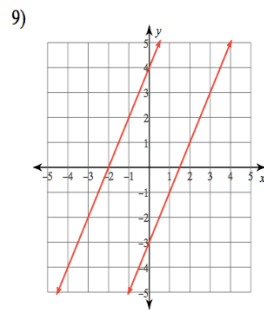
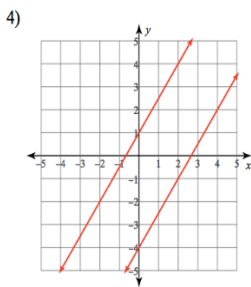
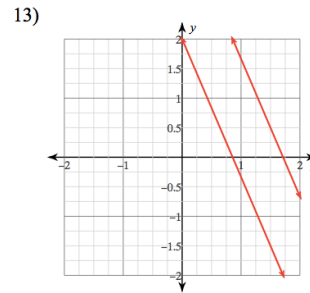
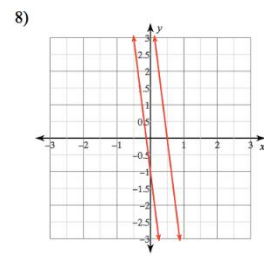
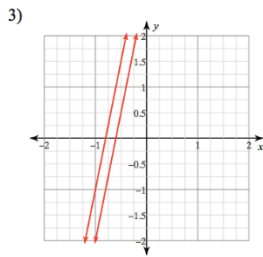
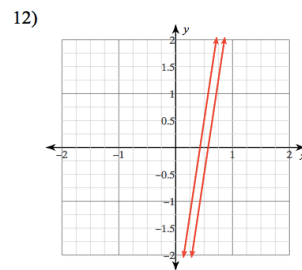
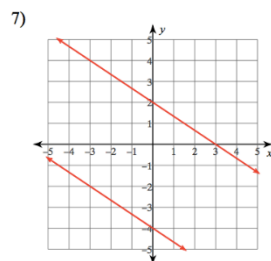
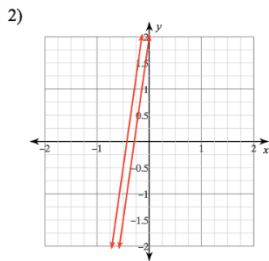
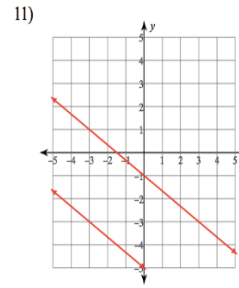
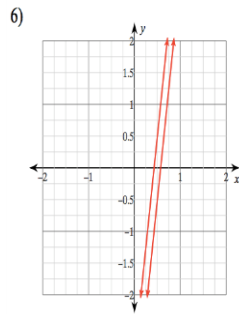
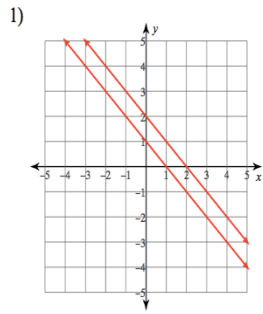


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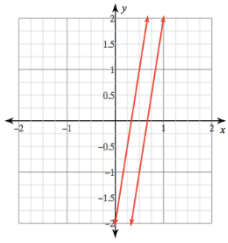
$$y = \frac{5}{3}x - 3$$
$$y = \frac{1}{3}x + 1$$



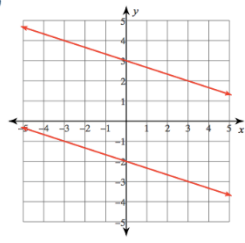
## Handout 2.2: Spaghetti Answer Key



5)



10)



**Handout 2.3: Color by Solution Answer Key**

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

$$y = \frac{1}{4}x + 3$$

**One Solution**

2.  $y = 2x$

$$y = 2x + 3$$

**No solutions**

3.  $x + y = 8$

$$y = -x - 7$$

**No solutions**

4.  $y = 4$

$$2x + y = 9$$

**One solution**

5.  $y = 5x - 3$

$$y = 5x + 3$$

**No solution**

6.  $x = y + 2$

$$y = x + 2$$

**No solution**

7.  $y = x$

$$y = x - 5$$

**No solutions**

8.  $y = -4x + 2$

$$4x = y + 5$$

**One solutions**

9.  $y = 5x - 1$

$$y = \frac{1}{4}x + 3$$

**One solution**

10.  $y = \frac{1}{2}x + 3$

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

**No solution**

For training or questions regarding this unit,  
please contact:

[exemplarunit@mdek12.org](mailto:exemplarunit@mdek12.org)