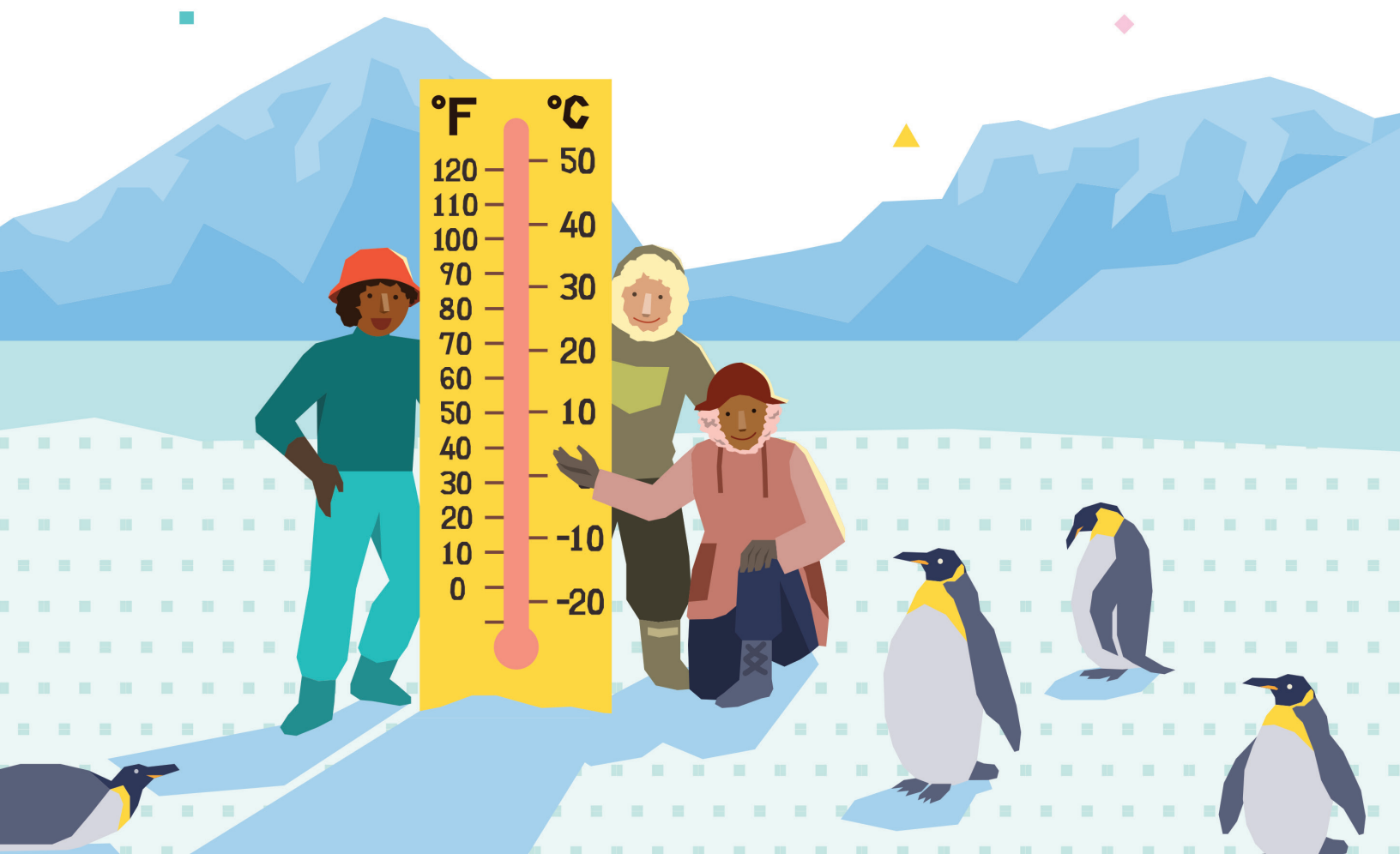


GRADE 8

Sample lesson





Amplify.

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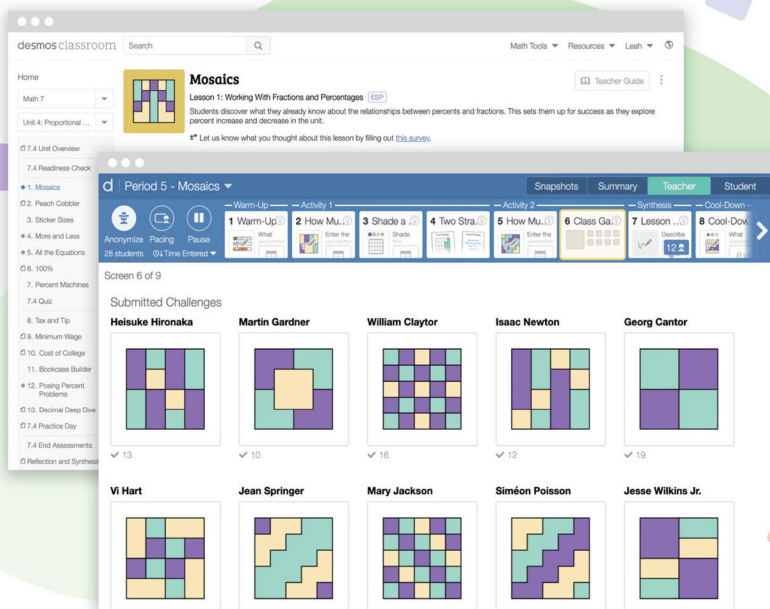


Welcome to Amplify Desmos Math

Every student is brilliant, but not every student **feels** brilliant in math class. Research shows that students who believe they have brilliant ideas to add to the math classroom learn more.¹ Our aim is for students to see themselves and their classmates as having powerful mathematical ideas. In the words of the NRC report **Adding It Up**, we want students to develop a “productive disposition—[the] habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy.”²

Amplify Desmos Math does this by tapping into students' natural curiosity from the start of every lesson with:

- Low floor, high ceiling tasks
- Relevant, real-world problems
- Diverse mathematical role models
- Collaborative digital experiences



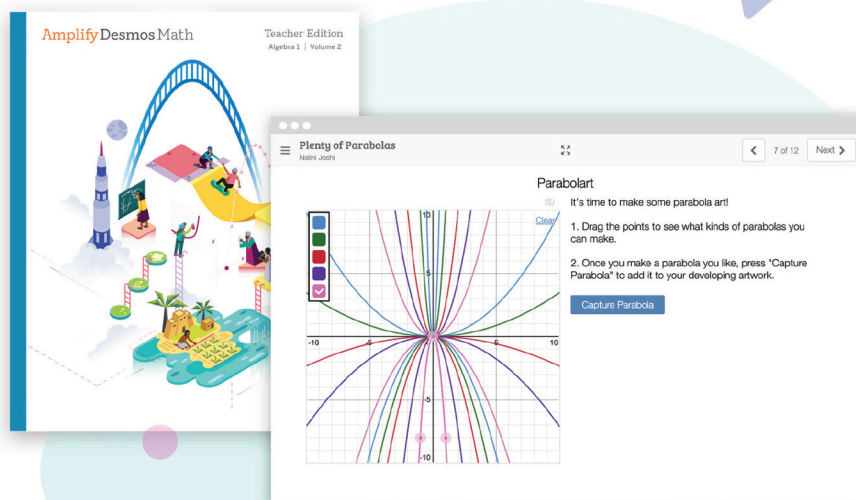
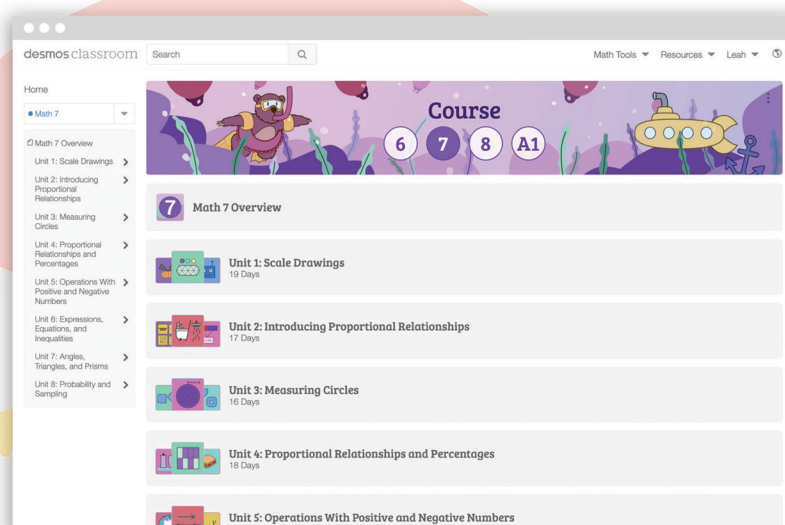
For students

Every student feels connected and a part of the conversation when participating in an Amplify Desmos Math lesson. And when students are actively engaged with the content, they achieve more.

For teachers

The program delivers what math educators want and need:

- Standards-aligned print and digital lessons that capture students' interests every day
- The right mix of informal and more substantive diagnostic and summative assessments
- Differentiation support
- Additional practice sets
- Spanish language supports



For leaders

The program delivers what school and district leaders want and need:

- A coherent core program based on the industry-leading IM K–12 Math™ by Illustrative Mathematics®
- A unified team from Amplify and Desmos Classroom dedicated to making implementation a success

¹ Uttal, D. H. (1997). Beliefs about genetic influences on mathematics achievement: A cross-cultural comparison. *Genetica*, 99(2–3), 165–172. <https://doi.org/10.1007/bf02259520>

² National Research Council. (2001). *Adding It Up: Helping Children Learn Mathematics*. Washington, DC: National Academy Press. doi.org/10.17226/9822

What can Desmos Classroom technology do for you?

Our digital lessons (and the technology developed by Desmos Classroom that brings them to life) are designed to make some of the most challenging parts of teaching easier for you. We know it can be difficult to understand what students are thinking while working, and to elevate student voices when there are so many ideas floating around the classroom. If students aren't getting the material, it often feels impossible to keep them engaged.

Repeated Challenges

The table shows the submarine's starting position and the action taken.

For each challenge, enter the submarine's final position.

Complete as many challenges as you want!

Start	Action	Final
0	Add 2 floats Add 3 anchors	-1


Try Another

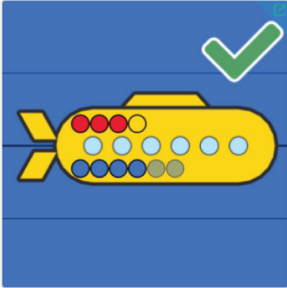
The Desmos Classroom technology found in Amplify Desmos Math works on three different fronts to ensure lessons are memorable and effective:

- 1. Students are given interesting problems that show the power and consequences of their thinking and actions** (and we offer opportunities for them to revise their thinking along the way!). Sometimes that can mean showing whether a response is right or wrong, but often it doesn't. What does that mean? In many lessons, students add their thinking to the activity and, rather than tell them whether it's right or wrong, we show them what it implies for the model, later allowing students to interpret and revise their work. We call this interpretive feedback.

2. **Teachers are given more information about what students are thinking during class to make leading conversations easier.** Selecting and discussing student work can be a really powerful teaching move, but it can feel challenging when students are working privately on worksheets. The Desmos Classroom technology essentially underpins each lesson with the power of Peg Smith and Mary K. Stein's *5 Practices for Orchestrating Productive Classroom Discussions*.

What do you notice?



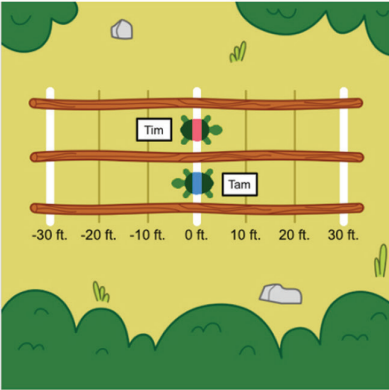


add 5 floats
take away 5 anchors
add 6 floats and take away 1 anchor

Remove 100 floats
Remove 105 anchors

3. **Everyone in the classroom is connected through intuitive interaction tools.** Students can see what others have said on some screens, while teachers can always see where students are and what they're doing, enabling them to make great teaching moves. And, of course, teachers have a lot of control over what students can see and how fast the class is moving.

Screen 1 of 13 Warm-Up: Tell a Story



- Press play to watch a short animation.
- Write a story about Tim and Tam.

Mariel Vázquez

Tim and Tam are like cars on a highway, heading in opposite directions. They might see just the top of a shell over that branch, but only if they're paying attention. Tam is in a bit of a rush, while Tim is cruising and enjoying the ride.

David Blackwell

Tam and Tim are twin turtles. They both start a race at the 0 line. The gun fires and the turtles are off...but in opposite directions, who knows why. Tim is walking slowly and Tam is walking more quickly. After a bit of time, Tim has walked forwards 10 feet and Tam has walked backwards 20 feet. The two turtles are now 30 feet apart from each other.

Elbert Frank Cox

Tim and Tam are brother and sister and they are walking in opposite directions.

Grade 8 Teacher Edition



On or Off the Line?

Interpreting Points On or Off the Line

Let's interpret the meaning of points on and off lines.



Focus and Coherence

Today's Goals

- Goal:** Determine a point that satisfies two relationships simultaneously using tables or graphs.
- Language Goal:** Interpret points on a graph of two simultaneous equations in context. **(Reading, Writing, Speaking, and Listening)**

Students consider pairs of linear equations in various contexts and interpret the meaning of various points on and off the lines, including the point of intersection. **Note:** The goal of this lesson is not for students to write equations or learn the language *system of equations*, but rather to investigate the mathematical structure with two stated facts by using familiar representations and to develop the need for new solving strategies.

◀ Prior Learning

In Lesson 8, students applied their knowledge of solving equations given real-world contexts.

▶ Future Learning

In Lesson 10, students will create a graph that represents two linear relationships in context, and interpret the point of intersection.

Rigor and Balance

- Students build **conceptual understanding** for the meaning of a solution to two simultaneous linear equations that can be used to model a real-world context.

Standards

Addressing

8.EE.C.8

Analyze and solve pairs of simultaneous linear equations.

Also Addressing: 8.EE.C

Building On

8.EE.C.7.A

Building Toward

8.EE.C.8





Math Identity and Community

- In **Activity 2**, consider inviting students to think about what a student who responded differently might have been thinking.

Lesson at a Glance 45 min

Warm-up

 Independent |  5 min

Students elicit ways to describe different characteristics that arise when more than one line is graphed on a coordinate plane.



Instructional Routines:

- **Which One Doesn't Belong?**

8.EE.C, 8.EE.C.8



Activity 1

 Pairs |  15 min

Students graph simultaneous linear equations in a real-world context to discover the point of intersection satisfies both solutions and to interpret its meaning in context.



Instructional Routines:

- **Decide and Defend**

8.EE.C, 8.EE.C.8
MP2, MP3



Activity 2

 Pairs |  15 min

Students analyze two simultaneous lines in a real-world context to determine whether a point lies on one line, both lines, or neither line.



Instructional Routines:

- **MLR6: Three Reads**

8.EE.C, 8.EE.C.8
MP2



Synthesis and Summary



 Whole Class |  5 min

Key Takeaway: Review how two simultaneous linear equations can be used to represent information from the same scenario.

8.EE.C, 8.EE.C.8



Exit Ticket

 Independent |  5 min

Students demonstrate their understanding by determining the values that meet conditions from the same scenario.

8.EE.C, 8.EE.C.8




Pacing Modifications

Consider these modifications if you are short on time.

- | | |
|-------------------|----------------------------------|
| Warm-up | • Omit the Warm-up. |
| Activity 2 | • Assign as additional practice. |

Prep Checklist

 All resources are available in print or online.

Every lesson includes:

- | | |
|---|---|
|  Exit Ticket PDF |  Student Screens |
|---|---|

Additional required materials:

- Activity 1**
- colored pencils
 - Activity 1 PDF, as needed

Warm-up Which One Doesn't Belong?

Purpose: Students elicit ways to describe different characteristics that arise when more than one line is graphed on a coordinate plane.

1 Launch

Use the **Which One Doesn't Belong?** routine. Because there is no single correct answer, attend to students' explanations and ensure the reasons given are correct.

2 Connect

Display the graphs.

Invite students share why each graph does not belong and why. Then invite them to share similarities and differences among the different graphs.

Ask:

- "Do you think the lines will intersect in Choice A? Why or why not?" *Answers may vary.*
- "If you know the equations of the lines, can you determine whether they intersect? Why or why not?" *Yes, if the slopes are the same, then the lines are parallel. This means they will never intersect.*

Highlight students' use of concepts and language introduced in previous lessons about lines, such as slope and intercepts. Discuss that, for two distinct lines, the lines will either be parallel or they will intersect.

Warm-up Student Screens

Unit 4
Lesson
9

Name: _____ Date: _____

1 Warm-Up
Which one doesn't belong?



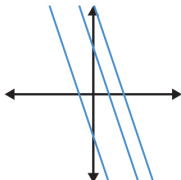
On or Off the Line?

Let's interpret the meaning of points on and off lines.

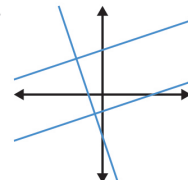
Warm-up Which One Doesn't Belong?

Which graph doesn't belong? Explain your thinking.

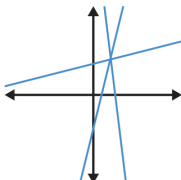
A.



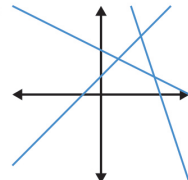
B.



C.



D.



Sample responses:

- Graph A is the only graph with no intersecting points.
- Graph B is the only graph with an intersecting point that has negative coordinates.
- Graph C is the only graph with three lines intersecting at a single point.
- Graph D is the only graph with three different intersecting points.

Lesson 9 On or Off the Line? 419

D Differentiation

Accessibility: Visual-spatial Processing

As students *interpret visual representations*, provide colored pencils and suggest they use color coding to draw or annotate key features on the graphs that they may have in common or that are unique to one figure.

MLD Math Language Development

Multilingual/English Learners

Provide sentence frames to support students as they share their responses. For example, "Graph ___ doesn't belong because ___" or "Graph ___ is the only one that has/doesn't have ___" (**Reading and Speaking**)

Activity 1 Two Dollars

Purpose: Students graph simultaneous linear equations in a real-world context to discover the point of intersection satisfies both solutions and to interpret its meaning in context. (MP2)

1 Launch

Complete Problem 1 as a whole class. Ensure students' responses for Problems 2 and 3 are correct before moving onto Problems 4–7. Provide access to colored pencils.

2 Monitor

Support Getting Started by asking for the values of different coins, written as decimals.

Look for a variety of strategies:

- Noticing that the intersection point of the two lines satisfies both statements.
- Estimating points on the line that were not plotted using the table.

D Differentiation

Look for early student thinking:

- **Problem 3** **Thinking the coins must have a total value of \$2.** Tell students that for this problem, they should only consider the number of coins, and not the total value.
- **Problem 4** **Transposing the number of dimes and quarters when graphing the ordered pairs.** Have students look at the variables given in the table and match them to labels on the graph. Activate background knowledge of how to plot ordered pairs to help graph the lines.
- **Problem 6** **Guessing to determine the solution instead of using the graph.** Students may determine the values before locating the ordered pair on the graph. Ask students what they notice about the point on the graph.

Activity 1 continued >

Activity 1 Student Screens

2 Two Dollars

I have \$2 worth of coins in my pocket.



Activity 1

Activity 1 Two Dollars

- Suppose you have \$2 in your pocket. What is a combination of coins you could have? Try to think of a combination that no one else in the class will write.

Sample responses:

- 8 quarters
- 2 dimes, 1 nickel, and 7 quarters
- 200 pennies

- Suppose you have \$2 in only quarters and dimes.

Complete at least 3 rows in the table showing possible combinations.

Sample response shown.

Number of Quarters	Number of Dimes
0	20
2	15
4	10
6	5
8	0

- Suppose you have any amount, but have a total of 17 coins that are quarters and dimes.

Complete at least 3 rows in the table showing possible combinations.

Sample response shown.

Number of Quarters	Number of Dimes
0	17
2	15
4	13
6	11
8	9
10	7

D Differentiation

Accessibility: Conceptual Processing

To support students in *accessing the context of this activity*, provide coins or coin manipulatives for them to physically handle and invite them to create as many combinations of coins as they can to create \$2.

Math Language Development

Multilingual/English Learners

Bring in a variety of U.S. coins — pennies, dimes, nickels, and quarters — and some dollar bills, or show photos of each. Label each coin and dollar with their name and value, including mentioning that a U.S. dollar is worth 100 cents. This will help support students' access to the language and context in this activity. (Reading and Listening)

Activity 1 Two Dollars (continued)

Purpose: Students graph simultaneous linear equations in a real-world context to discover the point of intersection satisfies both solutions and to interpret its meaning in context. (MP2)

Activity 1 Student Screens

3 Two Dollars

Here is more information about my coins:

3 Connect

Display student work showing correct tables and graphs.

Invite students to share their responses for Problems 6 and 7. For Problem 7, use the **Decide and Defend** routine to support students in strengthening their ability to make arguments and critique the reasoning of others. (MP3)

Highlight that the point (2, 15) meets both conditions: you have a total of \$2 and you have a total of 17 coins, consisting of quarters and dimes. Tell students that this point of intersection lies on both lines of the equations. Identifying the intersection point on the graph can be more efficient than using a table when determining combinations that meet more than one condition.

Ask:

- “Name an ordered pair that is on only one of the lines. What does this point represent in context?”
- “Name an ordered pair that is not on either line. What does this point represent in context?”
- “Is (2, 15) the only combination that works for both lines? Why or why not?”

Name: _____ Date: _____ Period: _____

Activity 1 Two Dollars (continued)

- Use one color to sketch the graph of the line showing the possible combinations of quarters and dimes that have a total value of \$2.
- Use a different color to sketch the graph of the line showing the possible combinations of 17 coins that are quarters and dimes.
- Suppose you have 17 coins, only quarters and dimes, worth \$2. How many quarters and dimes must you have? Describe how you know from the graph.

Number of quarters: 2 Number of dimes: 15

Sample response: (2, 15) is the point of intersection of the two lines on the graph.
ML/EL Learners: Expanding, Bridging

- Which statement could the point (12, 5) represent in context?
 - You have \$2 in quarters and dimes.
 - You have 17 coins total.
 - Both
 - Neither

Explain your thinking.
Sample response: The point (12, 5) is only on the line representing 17 coins combined.
ML/EL Learners: Expanding, Bridging

Lesson 9 On or Off the Line? 421

D Differentiation

Accessibility: Fine Motor Skills

Problem 4 To support students with *creating representations*, provide copies of the graphs using the Activity 1 PDF.

Extension

Invite students to create two linear equations that represent their graphs in Problem 4. Ask them to define their variables.

Sample response: Let q represent the number of quarters and let d represent the number of dimes.

$$d = 20 - \frac{10}{4}q$$

$$d = 17 - q$$

MLD Math Language Development

Multilingual/English Learners

Problems 6, 7 Provide sentence frames to support students as they share their responses and defend them. For example, “There are ___ quarters and ___ dimes because ___,” or “Choice ___ is correct because ___.” (Reading and Speaking)

Activity 2 Elena's Phone Plan

Purpose: Students analyze two simultaneous lines in a real-world context to determine whether a point lies on one line, both lines, or neither line. (MP2)

Activity 2 Student Screens

6 When Is It True?
The graph shows solutions to two linear equations.

1 Launch

MLR6 Use the **Three Reads** routine to ensure that students understand the context of the scenario.

2 Monitor

Support getting started by having students identify the variables on the axes.

Look for a variety of strategies:

- Problem 2** Using the graph or statement to help determine their response.
- Problem 2** Writing an equation to help determine their response.

D Differentiation

Look for early student thinking:

- Problem 2** Thinking the plan could also be **Amp-T&T for the last row**. Invite students to consider the cost of the plan after 2.5 months. Tell them that because the line is increasing and the plan already costs \$165 for 2.5 months, the statement cannot be true for Amp-T&T.

3 Connect

Invite students to share their responses. Poll the class to have students share their responses for Problem 2. If there are any discrepancies, have students justify their response.

Math Identity and Community

Consider inviting students to think about what a student who responded differently might have been thinking.

Highlight that sometimes a condition may satisfy one, both, or neither statement.

Activity 2 Elena's Phone Plan

Elena is shopping for a new cell phone and a plan with unlimited data. Consider the description and graph of her two options.

- Amp-T&T has a \$15 set-up fee, and then charges \$60 per month.
- Des-Mobile has a \$35 set-up fee, and then charges \$40 per month.

10 Discuss Read the information 3 times. Discuss these questions.

- Read 1:** What is this situation about?
- Read 2:** What quantities or relationships do you see?
- Read 3:** What questions would this information help Elena answer?

Answers may vary.
ML/EL Learners: Emerging, Expanding, Bridging

2. For each statement, determine whether it is true for Amp-T&T, Des-Mobile, both plans, or neither plan. Place a check mark in the appropriate box.

	Amp-T&T	Des-Mobile	Both	Neither
At 2 months, Elena's plan costs \$115.		✓		
At 0.5 months, Elena's plan costs \$45.	✓			
At 2.5 months, Elena's plan costs \$100.				✓
At 1 month, Elena's plan costs \$75.			✓	
At 3 months, Elena's plan costs \$155.		✓		

STOP

422 Unit 4 Linear Equations and Linear Systems

D Differentiation

Extension

Launch Before displaying the graphs, display the description of each plan and invite students to determine whether they agree with each student's claim and explain their thinking.

Sample response: I agree with Keya's claim because the monthly rate is less.

Manuel's claim:	Keya's claim:
The plans cost the same long term because Amp-T&T's set-up fee is \$20 less, but Des-Mobile's monthly fee is \$20 less.	Amp-T&T's plan costs less in the short term, but Des-Mobile's plan costs less in the long term.

MLD Math Language Development

MLR6: Three Reads Sample responses shown.

Use this routine to help students make sense of the scenario.

- Read 1:** Invite students to describe this scenario in their own words without using numbers. *Elena is comparing two cell phone plans.*
- Read 2:** Ask students to name or annotate what can be counted or measured and how those quantities are related. *Amp-T&T has a lower set-up fee than Des-Mobile, but a higher monthly rate.*
- Read 3:** Ask students to brainstorm some questions this information might help Elena answer. *Which plan is less expensive for a certain number of months?*

Synthesis and Summary

Key Takeaway: Two simultaneous linear equations can be used to represent information from the same scenario.

Synthesis

Invite students to spend 2 minutes responding to the prompt. Ask them to share their thinking with a partner.

Display several students' responses.

Invite students to share the connections they see between responses.

Summary

Invite students to share their strategies for determining when a point satisfies one, both, or two conditions from the same scenario using a table, statement, and graph.

Ask:

- "What are some advantages of tables? If you used two tables to describe the two relationships, how would you know whether a common point exists? If it did exist, how would you find it?"
- "What are some advantages of a graph?"
- "When using a graph, where can you locate the points whose coordinates make both conditions true?"

Highlight that when looking at a graph with two lines, students can determine the values that make both relationships true by identifying the point of intersection. If a point lies only on one line, then it only makes that relationship true. Only the intersection point makes both statements true.

Synthesis Student Screen

8 Lesson Synthesis

Pick one of these questions and explain your answer to a classmate.

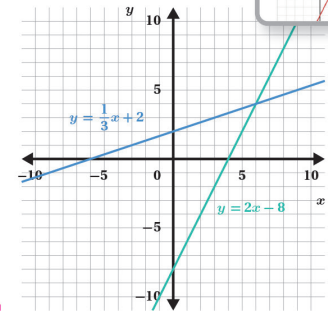
Synthesis

1. What is a combination of values that make both relationships true? How do you know?

Sample response: Both relationships are true when $x = 6$ and $y = 4$. I know because the point $(6, 4)$ is on both lines.

2. What is a combination of values that make one relationship true, but not the other? How do you know?

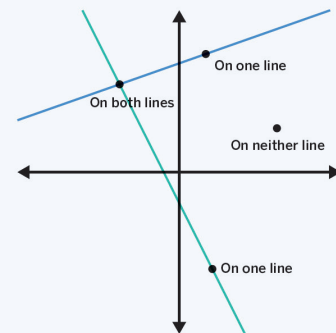
Sample response: The values $x = 0$ and $y = -8$ make the equation $y = 2x - 8$ true and do not make the equation $y = \frac{1}{3}x + 2$ true. I know because the point $(0, -8)$ is only on the line representing $y = 2x - 8$.



Summary

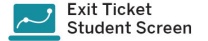
Linear relationships can represent real-world scenarios. Two lines both graphed on the same coordinate plane can simultaneously represent the same scenario.

- The coordinates of a point that is on *both lines* make both relationships true. This is the intersection point.
- The coordinates of a point on *only one line* make only one relationship true.
- The coordinates of a point on *neither line* make neither relationship true.



Exit Ticket

Purpose: Students demonstrate their understanding by determining the values that meet conditions from the same scenario.



Success looks like . . .

- **Goal:** Determine a point that satisfies two relationships simultaneously using tables or graphs.
 - » Identifying the intersection point (12, 0) on the graph.
- **Language Goal:** Interpret points on a graph of two simultaneous equations in context. **(Reading, Writing, Speaking, and Listening)**
 - » Identifying (12, 0) as the point that represents 12 quarters and 0 dimes that are worth \$3.

D Differentiation

If students do not correctly identify the number of quarters or dimes, consider:

- Asking students to look for a point that lies on both lines.
- Reviewing Activity 1.
- Reassessing after Lesson 11.

Name: _____
Date: _____

Exit Ticket

A graph with two lines is shown.

- One line shows combinations of dimes and quarters that are worth \$3 altogether.
- The other line shows combinations of dimes and quarters that total 12 coins.

How many quarters and dimes would you need to have both 12 coins and \$3 at the same time? Explain your thinking.
12 quarters and 0 dimes; Sample response: I looked at the intersection point on the graph.

Self-Assess

a I can determine a point that satisfies two relationships using tables or graphs.

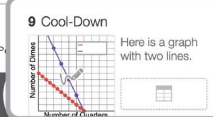
1 2 3 4 5

b I can interpret points that lie on one, both, or neither line(s) of a graph of two simultaneous equations in context.

1 2 3 4 5

Lesson 9 On or Off the Line?

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Practice

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics including interdisciplinary or STEM connections, assessment practice, and ongoing

Practice Student Screens

Name: _____ Date: _____ Period: _____

Practice

For Problems 1–5, use the coordinate plane shown.

Determine whether, line m or line n represents each statement.

- A set of points where the coordinates of each point have a sum of 2.
Line n
- A set of points where the y -coordinate of each point is 10 less than its x -coordinate.
Line m

Determine which labeled point(s) represent each statement.

- The coordinates have a sum of 2.
Points $A, B,$ and C
- The y -coordinate of each point is 10 less than the x -coordinate.
Points $B, D,$ and E
- The coordinates have a sum of 2 and the y -coordinate is 10 less than the x -coordinate.
Point B

For Problems 6 and 7, use this information. Priya and Mai agree to go to the movies after they have earned the same amount of money for the same number of hours worked.

Mai earns \$7 per hour mowing her neighbors' lawns. She also earned \$14 for hauling away bags of recyclables.

h	m
1	\$8.40
2	\$16.80
4	\$33.60

Priya babysits her neighbor's children. The table shows the amount of money m she earns in h hours.

- How many hours do they each have to work before they go to the movies?
10 hours
- How much will each of them have earned?
\$84

424 Unit 4 Linear Equations and Linear Systems Additional Practice for this lesson is available online.

Name: _____ Date: _____ Period: _____

8 Problem 3.3

Eliza and Sahana have agreed to go to the movies. See this story.

8. **Language Arts** Write a story that could be represented by the two lines shown. Be sure to create a scale and label the axes.
Describe what the intersection point represents in your story.
Answers may vary.

9. The two lines graphed represent a system of equations. What is the y -coordinate of the ordered pair that best represents the solution to both equations?

A. 0
B. $\frac{1}{5}$
C. 3
D. 4

Spiral Review

For Problems 10–12, consider the equation $4x - 4 = 4x + \underline{\hspace{2cm}}$. What value or expression could you write in the blank so that the equation is true for:

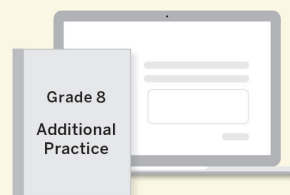
- No values of x ?
Sample response: 7–
- All values of x ?
–4
- One value of x ?
Sample response: $2x$

Lesson 9 On or Off the Line? 425

Practice Problem Item Analysis

	Problem(s)	DOK	Standard(s)
On-lesson			
	1–7	2	8.EE.C, 8.EE.C.8
Language Arts	8	3	8.EE.C, 8.EE.C.8
Test Practice	9	1	8.EE.C, 8.EE.C.8
Spiral Review			
Fluency	10–12	1	8.EE.C.7.A

Need more Practice?



Each lesson includes more practice problems in the Additional Practice book and in the online item banks.

Grade 8

Student Edition

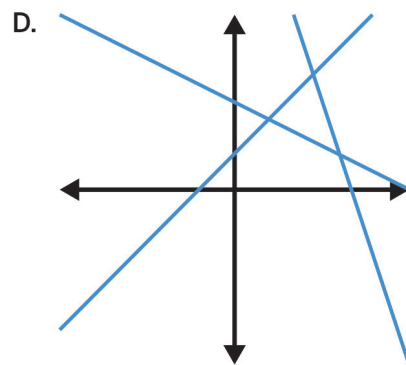
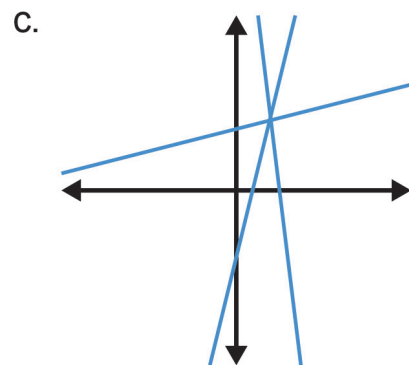
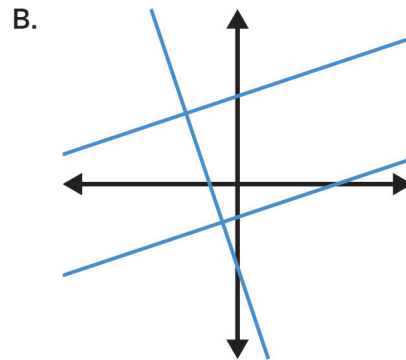
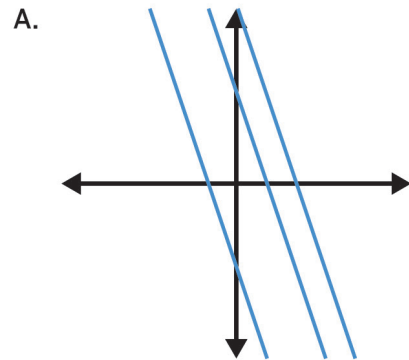
On or Off the Line?

Let's interpret the meaning of points on and off lines.



Warm-up Which One Doesn't Belong?

Which graph doesn't belong? Explain your thinking.



Activity 1 Two Dollars

- Suppose you have \$2 in your pocket. What is a combination of coins you could have? Try to think of a combination that no one else in the class will write.



- Suppose you have \$2 in only quarters and dimes.

Complete at least 3 rows in the table showing possible combinations.

Number of Quarters	Number of Dimes

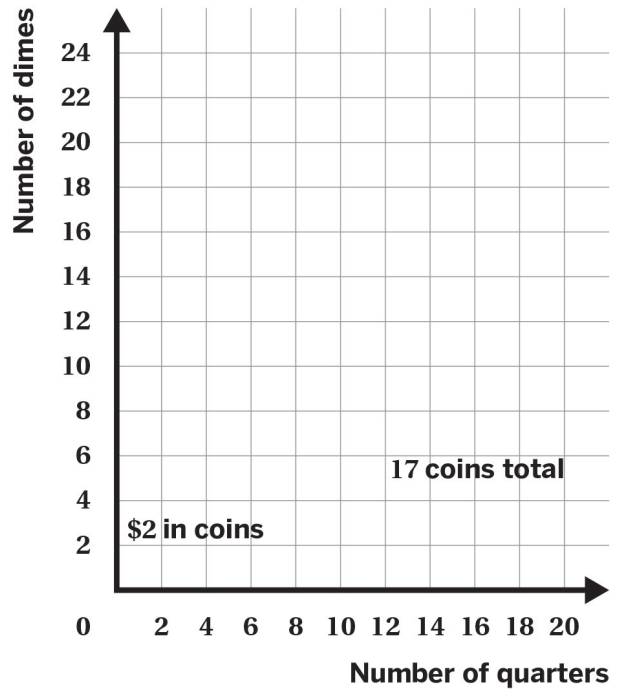
- Suppose you have any amount, but have a total of 17 coins that are quarters and dimes.

Complete at least 3 rows in the table showing possible combinations.

Number of Quarters	Number of Dimes

Activity 1 Two Dollars (continued)

4. Use one color to sketch the graph of the line showing the possible combinations of quarters and dimes that have a total value of \$2.
5. Use a different color to sketch the graph of the line showing the possible combinations of 17 coins that are quarters and dimes.
6. Suppose you have 17 coins, only quarters and dimes, worth \$2. How many quarters and dimes must you have? Describe how you know from the graph.



Number of quarters: _____

Number of dimes: _____


7. Which statement could the point (12, 5) represent in context?
 - A. You have \$2 in quarters and dimes.
 - B. You have 17 coins total.
 - C. Both
 - D. Neither

Explain your thinking.

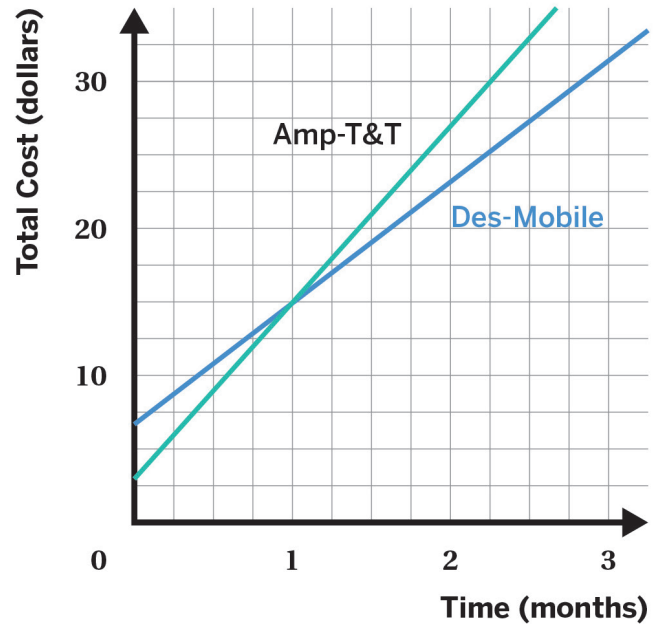
Activity 2 Elena's Phone Plan

Elena is shopping for a new cell phone and a plan with unlimited data. Consider the description and graph of her two options.

- Amp-T&T has a \$15 set-up fee, and then charges \$60 per month.
- Des-Mobile has a \$35 set-up fee, and then charges \$40 per month.

1. **Discuss**  Read the information 3 times. Discuss these questions.

- **Read 1:** What is this situation about?
- **Read 2:** What quantities or relationships do you see?
- **Read 3:** What questions would this information help Elena answer?



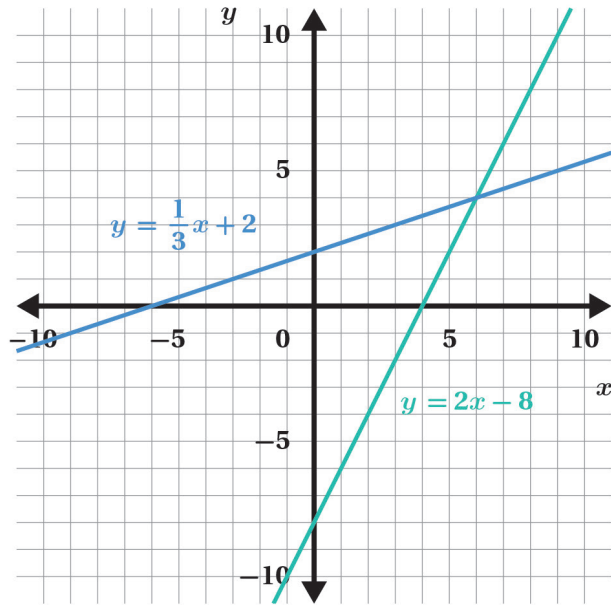
2. For each statement, determine whether it is true for Amp-T&T, Des-Mobile, both plans, or neither plan. Place a check mark in the appropriate box.

	Amp-T&T	Des-Mobile	Both	Neither
At 2 months, Elena's plan costs \$115.				
At 0.5 months, Elena's plan costs \$45.				
At 2.5 months, Elena's plan costs \$100.				
At 1 month, Elena's plan costs \$75.				
At 3 months, Elena's plan costs \$155.				



Synthesis

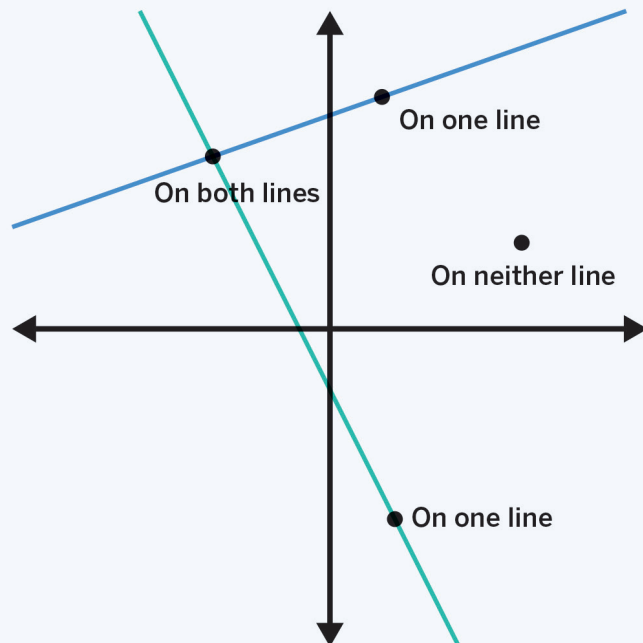
1. What is a combination of values that make both relationships true? How do you know?
2. What is a combination of values that make one relationship true, but not the other? How do you know?



Summary

Linear relationships can represent real-world scenarios. Two lines both graphed on the same coordinate plane can simultaneously represent the same scenario.

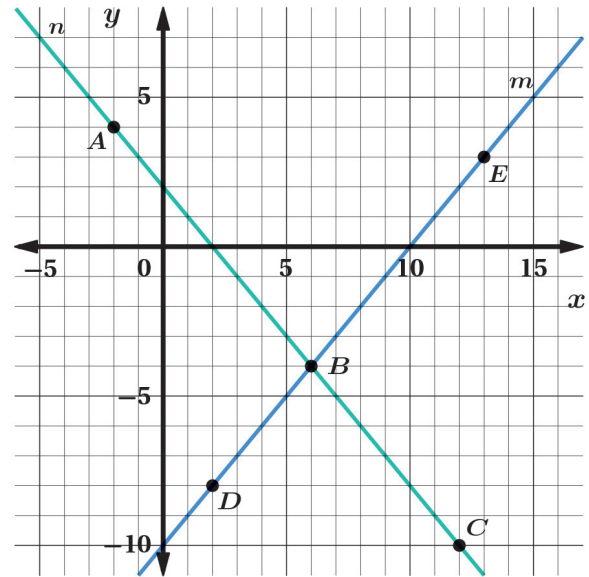
- The coordinates of a point that is on *both lines* make both relationships true. This is the intersection point.
- The coordinates of a point on only *one line* make only one relationship true.
- The coordinates of a point on *neither line* make neither relationship true.



For Problems 1–5, use the coordinate plane shown.

Determine whether, line m or line n represents each statement.

1. A set of points where the coordinates of each point have a sum of 2.
2. A set of points where the y -coordinate of each point is 10 less than its x -coordinate.



Determine which labeled point(s) represent each statement.

3. The coordinates have a sum of 2.
4. The y -coordinate of each point is 10 less than the x -coordinate.
5. The coordinates have a sum of 2 and the y -coordinate is 10 less than the x -coordinate.

For Problems 6 and 7, use this information. Priya and Mai agree to go to the movies after they have earned the same amount of money for the same number of hours worked.

Mai earns \$7 per hour mowing her neighbors' lawns. She also earned \$14 for hauling away bags of recyclables.

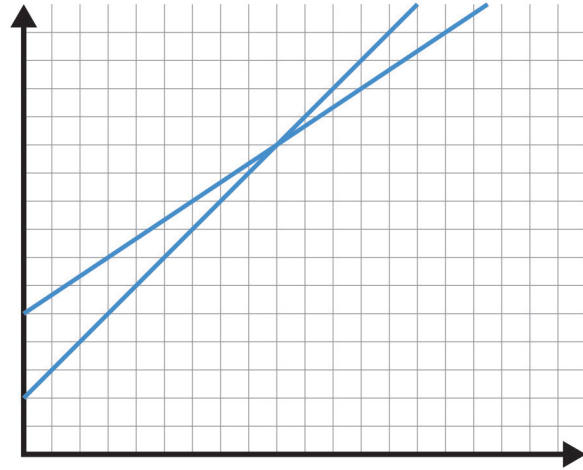
Priya babysits her neighbor's children. The table shows the amount of money m she earns in h hours.

h	m
1	\$8.40
2	\$16.80
4	\$33.60

6. How many hours do they each have to work before they go to the movies?
7. How much will each of them have earned?

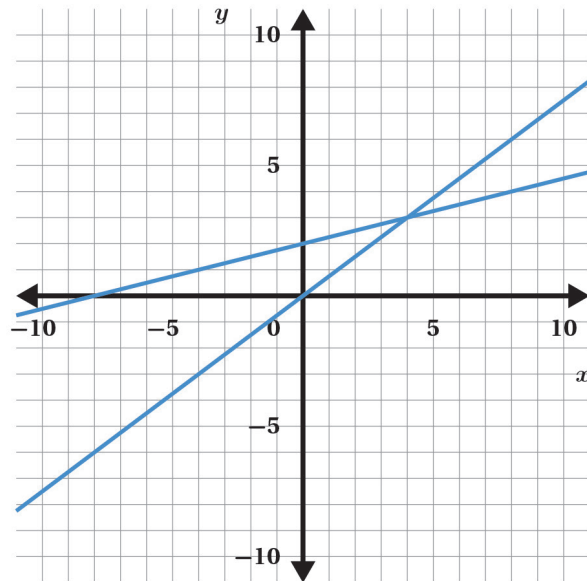
8. **Language Arts** Write a story that could be represented by the two lines shown. Be sure to create a scale and label the axes.

Describe what the intersection point represents in your story.



9. The two lines graphed represent a system of equations. What is the y -coordinate of the ordered pair that best represents the solution to both equations?

- A. 0
- B. $\frac{1}{5}$
- C. 3
- D. 4



Spiral Review

For Problems 10–12. Consider the equation $4x - 4 = 4x + \underline{\hspace{2cm}}$. What value or expression could you write in the blank so that that the equation is true for:

- 10. No values of x ?
- 11. All values of x ?
- 12. One value of x ?

Name: _____ Date: _____

1 Warm-Up
Which one doesn't belong?

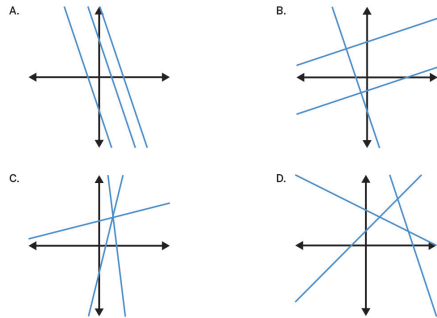
On or Off the Line?

Let's interpret the meaning of points on and off lines.



Warm-up Which One Doesn't Belong?

Which graph doesn't belong? Explain your thinking.



- Sample responses:**
- Graph A is the only graph with no intersecting points.
 - Graph B is the only graph with an intersecting point that has negative coordinates.
 - Graph C is the only graph with three lines intersecting at a single point.
 - Graph D is the only graph with three different intersecting points.

Activity 1 Two Dollars

- Suppose you have \$2 in your pocket. What is a combination of coins you could have? Try to think of a combination that no one else in the class will write.
Sample responses:
 - 8 quarters
 - 2 dimes, 1 nickel, and 7 quarters
 - 200 pennies



- Suppose you have \$2 in only quarters and dimes. Complete at least 3 rows in the table showing possible combinations.
Sample response shown.

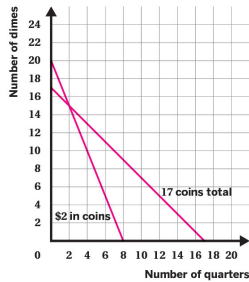
Number of Quarters	Number of Dimes
0	20
2	15
4	10
6	5
8	0

- Suppose you have any amount, but have a total of 17 coins that are quarters and dimes. Complete at least 3 rows in the table showing possible combinations.
Sample response shown.

Number of Quarters	Number of Dimes
0	17
2	15
4	13
6	11
8	9
10	7

Activity 1 Two Dollars (continued)

- Use one color to sketch the graph of the line showing the possible combinations of quarters and dimes that have a total value of \$2.
- Use a different color to sketch the graph of the line showing the possible combinations of 17 coins that are quarters and dimes.
- Suppose you have 17 coins, only quarters and dimes, worth \$2. How many quarters and dimes must you have? Describe how you know from the graph.



Number of quarters: 2 Number of dimes: 15
Sample response: (2, 15) is the point of intersection of the two lines on the graph.
ML/EL Learners: Expanding, Bridging

- Which statement could the point (12, 5) represent in context?
 - You have \$2 in quarters and dimes.
 - You have 17 coins total.
 - Both
 - Neither

Explain your thinking.
Sample response: The point (12, 5) is only on the line representing 17 coins combined.
ML/EL Learners: Expanding, Bridging

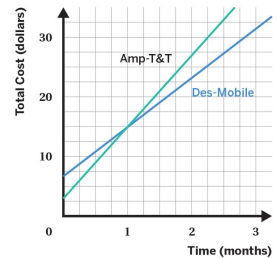
Activity 2 Elena's Phone Plan

Elena is shopping for a new cell phone and a plan with unlimited data. Consider the description and graph of her two options.

- Amp-T&T has a \$15 set-up fee, and then charges \$60 per month.
- Des-Mobile has a \$35 set-up fee, and then charges \$40 per month.

- Discuss** Read the information 3 times. Discuss these questions.
 - Read 1:** What is this situation about?
 - Read 2:** What quantities or relationships do you see?
 - Read 3:** What questions would this information help Elena answer?

Answers may vary.
ML/EL Learners: Emerging, Expanding, Bridging



- For each statement, determine whether it is true for Amp-T&T, Des-Mobile, both plans, or neither plan. Place a check mark in the appropriate box.

	Amp-T&T	Des-Mobile	Both	Neither
At 2 months, Elena's plan costs \$115.		✓		
At 0.5 months, Elena's plan costs \$45.	✓			
At 2.5 months, Elena's plan costs \$100.				✓
At 1 month, Elena's plan costs \$75.			✓	
At 3 months, Elena's plan costs \$155.		✓		

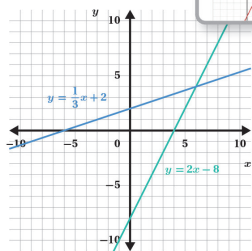
8 Lesson Synthesis

Pick one of these questions and explain your answer to a classmate.

Synthesis

1. What is a combination of values that make both relationships true? How do you know?

Sample response: Both relationships are true when $x = 6$ and $y = 4$. I know because the point $(6, 4)$ is on both lines.



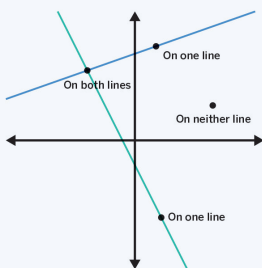
2. What is a combination of values that make one relationship true, but not the other? How do you know?

Sample response: The values $x = 0$ and $y = -8$ make the equation $y = 2x - 8$ true and do not make the equation $y = \frac{1}{3}x + 2$ true. I know because the point $(0, -8)$ is only on the line representing $y = 2x - 8$.

Summary

Linear relationships can represent real-world scenarios. Two lines both graphed on the same coordinate plane can simultaneously represent the same scenario.

- The coordinates of a point that is on both lines make both relationships true. This is the intersection point.
- The coordinates of a point on only one line make only one relationship true.
- The coordinates of a point on neither line make neither relationship true.



Lesson 9 On or Off the Line? 423

9 Cool-Down

Here is a graph with two lines.



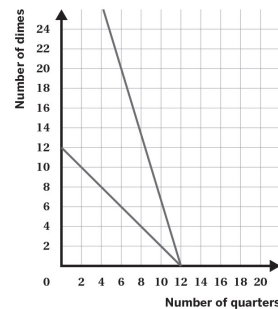
Exit Ticket

A graph with two lines is shown.

- One line shows combinations of dimes and quarters that are worth \$3 altogether.
- The other line shows combinations of dimes and quarters that total to 12 coins.

How many quarters and dimes would you need to have both 12 coins and \$3 at the same time? Explain your thinking.

12 quarters and 0 dimes; Sample response: I looked at the intersection point on the graph.



Self-Assess



a I can determine a point that satisfies two relationships using tables or graphs.

1 2 3 4 5

b I can interpret points that lie on one, both, or neither line(s) of a graph of two simultaneous equations in context.

1 2 3 4 5

Lesson 9 On or Off the Line? 423

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Practice

Name: _____ Date: _____ Period: _____

For Problems 1–5, use the coordinate plane shown.

Determine whether, line m or line n represents each statement.

1. A set of points where the coordinates of each point have a sum of 2.

Line n

2. A set of points where the y -coordinate of each point is 10 less than its x -coordinate.

Line m

Determine which labeled point(s) represent each statement.

3. The coordinates have a sum of 2.

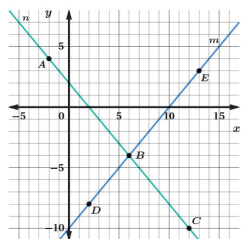
Points $A, B,$ and C

4. The y -coordinate of each point is 10 less than the x -coordinate.

Points $B, D,$ and E

5. The coordinates have a sum of 2 and the y -coordinate is 10 less than the x -coordinate.

Point B



For Problems 6 and 7, use this information. Priya and Mai agree to go to the movies after they have earned the same amount of money for the same number of hours worked.

Mai earns \$7 per hour mowing her neighbors' lawns. She also earned \$14 for hauling away bags of recyclables.

h	m
1	\$8.40
2	\$16.80
4	\$33.60

Priya babysits her neighbor's children. The table shows the amount of money m she earns in h hours.

6. How many hours do they each have to work before they go to the movies?

10 hours

7. How much will each of them have earned?

\$84

8 Problem 3.3

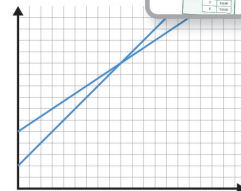
Eliza and Sahana have agreed to go to the movies together.

Name: _____ Date: _____ Period: _____

8. **Language Arts** Write a story that could be represented by the two lines shown. Be sure to create a scale and label the axes.

Describe what the intersection point represents in your story.

Answers may vary.



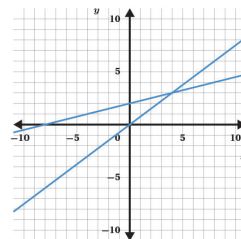
9. The two lines graphed represent a system of equations. What is the y -coordinate of the ordered pair that best represents the solution to both equations?

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B. $\frac{1}{5}$

C. 3

D. 4



Spiral Review

For Problems 10–12, Consider the equation $4x - 4 = 4x + \underline{\hspace{1cm}}$. What value or expression could you write in the blank so that the equation is true for:

10. No values of x ?

Sample response: 7—

11. All values of x ?

—4

12. One value of x ?

Sample response: 2x

