



Function Representations

These materials, when encountered before Algebra 1, Lesson 5: Using Function Notation to Describe Rules (Part 2), support success in that lesson.

Goals

- Coordinate (orally and in writing) tables, graphs, and equations of the same function.

Lesson Narrative

In this lesson, students connect representations of functions using equations, tables, and graphs. In the associated Algebra 1 lesson, students make similar connections along with situations and function notation. Students are supported by spending additional time focusing on only a few of the connections at a time.

Students must attend to precision (MP6) when they connect different representations of the same function and draw a graph of a function including points from a table.

Standards

Building Toward HSF-IF.C

Instructional Routines

- MLR8: Discussion Supports
- Notice and Wonder

Student Facing Learning Goals

Let's examine different representations of functions.

5.1 Notice and Wonder: Representing Functions

Warm-up

5 min

Activity Narrative

The purpose of this *Warm-up* is to elicit the idea that a single function can have many representations, which will be useful when students connect the representations in a later activity. While students may notice and wonder many things about these representations, that they all represent the same function are the important discussion points.

When students articulate what they notice and wonder, they have an opportunity to attend to precision in the language they use to describe what they see (MP6). They might first propose less formal or imprecise language, and then restate their observation with more precise language in order to communicate more clearly.

Standards

Building Toward HSF-IF.C

Instructional Routines

- Notice and Wonder



Launch

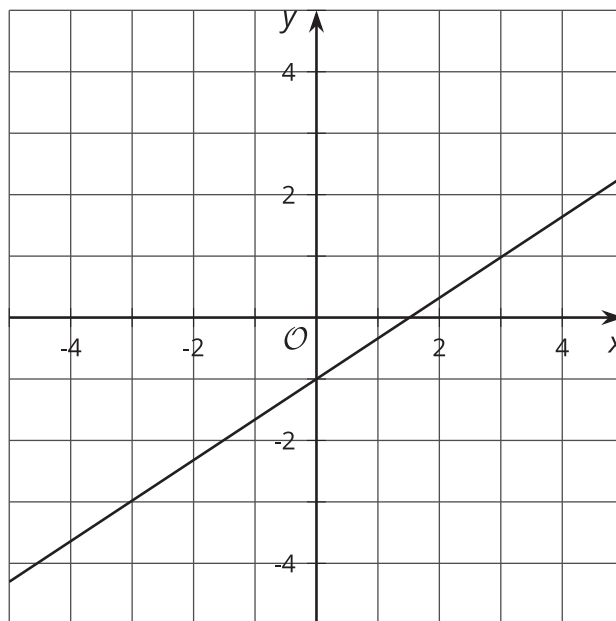
Arrange students in groups of 2. Display the equation, graph, and table for all to see. Ask students to think of at least one thing they notice and at least one thing they wonder. Give students 1 minute of quiet think time and then 1 minute to discuss with their partner the things they notice and wonder.

Student Task Statement

What do you notice? What do you wonder?

$$f(x) = \frac{2}{3}x - 1$$

x	y
-1	$-\frac{5}{3}$
0	-1
1	$-\frac{1}{3}$
2	$\frac{1}{3}$
3	1



Student Response

Things students may notice:

- All 3 representations are related to the same function.
- The slope is $\frac{2}{3}$, and the y-intercept is -1.
- The table shows some of the input-output pairs, but not every possible one.

Things students may wonder:

- Why are these points in the table rather than others?
- Is this function related to a real situation?
- Are there other common representations that are not shown here?

Activity Synthesis

Ask students to share the things they noticed and wondered. Record and display their responses without editing or commentary. If possible, record the relevant reasoning on or near the representations. Next, ask students, "Is there anything on this list that you are wondering about now?" Encourage students to observe what is on display and to respectfully ask for clarification, point out contradicting information, or voice any disagreement.

If the idea that all the representations are connected to the same function does not come up during the conversation,



ask students to discuss this idea.

🕒 15 min

5.2 A Seat at the Tables

Activity Narrative

In this activity, students use equations to find values and complete tables. In the associated Algebra 1 lesson, students examine functions in different representations including equations and tables such as these. As students use the equations to build the tables they look for and make use of structure (MP7).

Standards

Building Toward HSF-IF.C

Instructional Routines

- MLR8: Discussion Supports

Student Task Statement

Use the equations to complete the tables.

1. $y = 3x - 2$

x	y
1	
3	
-2	

2. $y = 5 - 2x$

x	y
0	
3	
5	

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

x	y
-4	
3	
6	



4. $y = 2x - 10$

x	y
3	
7	
-8	

Student Response

1.

x	y
1	1
3	7
-2	-8

2.

x	y
0	5
3	-1
5	-5

3.

x	y
-4	0
3	$\frac{7}{2}$
6	5

4.

x	y
3	-4
7	4
-8	-26



Activity Synthesis

The purpose of the discussion is to connect representations of the functions. Select students to share their solutions. Here are some questions for discussion:

- “What is a visual way these functions could be represented? How would the table help create that representation?” (A graph is a visual representation of a function. A table can be used to get points on the graph to help see the function.)
- “What might a table look like if the equation did not represent a function?” (There would be two of the same x -value with different y -values.)

Access for English Language Learners

- | *MLR8 Discussion Supports.* Before whole-class discussion, remind students to use mathematical language, such as “input,” “output,” “ x -value,” and “ y -value.”
- | *Advances: Speaking, Representing*

5.3 Function Finder

 20 min

Activity Narrative

In this activity, students use values given in a table to draw and write other representations, then invent a function for their partner to guess the rule. Students look for and express regularity in repeated reasoning when they use the patterns in the table and graph to write an equation (MP8). In the associated Algebra 1 lesson, students connect different representations of functions. This activity supports students by strengthening their understanding of the connection between table representations and equations.

Standards

Building Toward HSF-IF.C

Launch

Arrange students in groups of 2.

Access for Students with Disabilities

- | *Representation: Internalize Comprehension.* Use color coding and annotations to highlight connections between representations in a problem. For example, color code the x -values and the x -axis.
- | *Supports accessibility for: Visual-Spatial Processing*

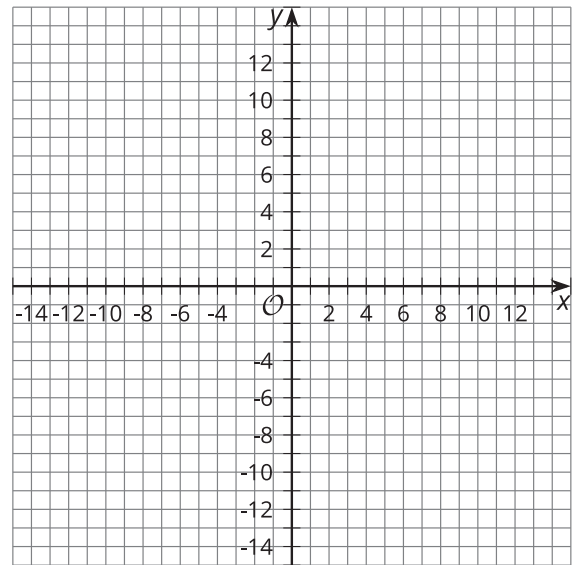
Student Task Statement

1. Use the values in the table to graph a possible function that would have the values in the table.



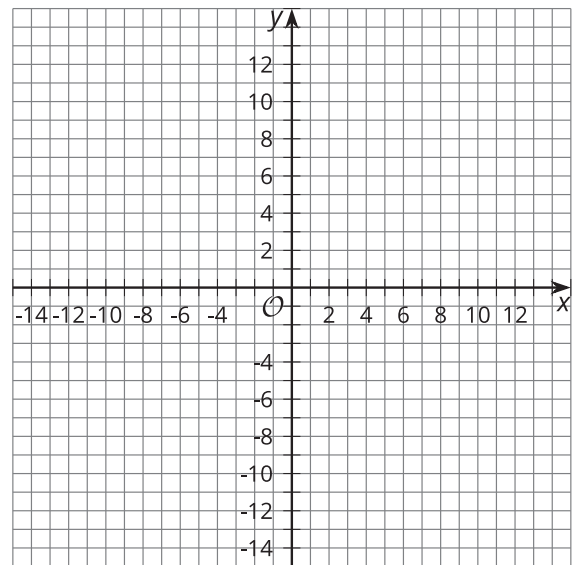
a.

x	y
1	3
2	5
3	7
5	11



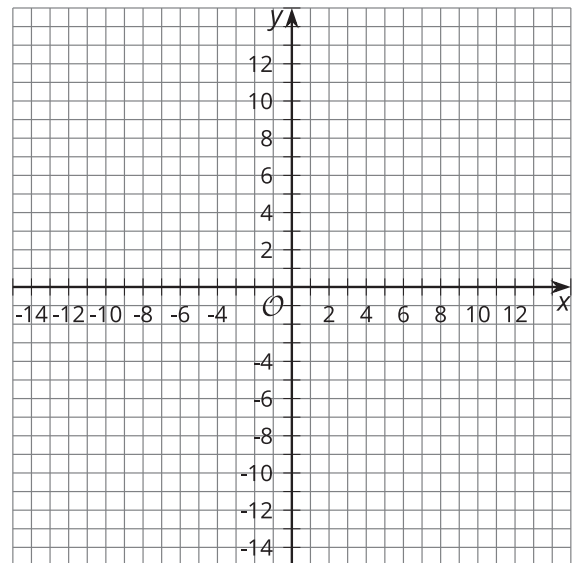
b.

x	y
-2	0
0	1
2	2
4	3



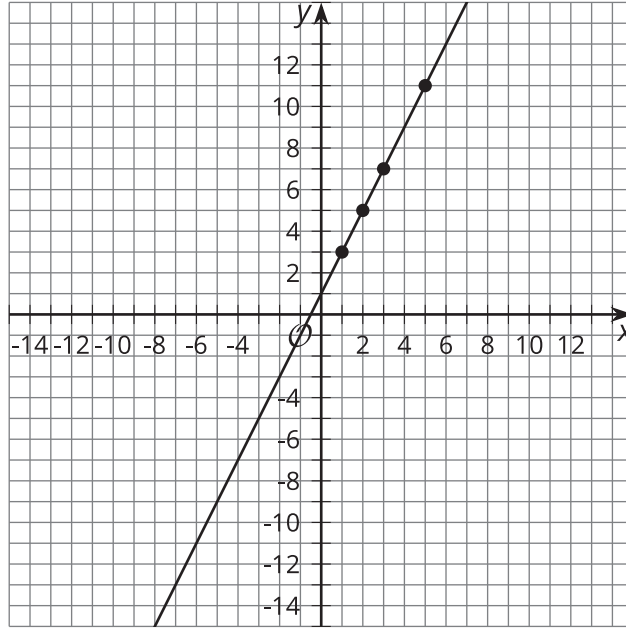
c.

x	y
-2	14
-1	12
1	8
2	6

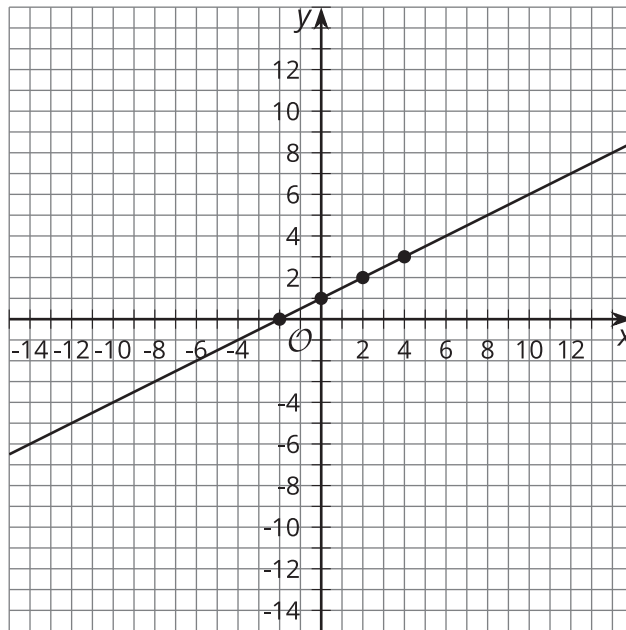


2. For each of the tables, write a linear equation (like $y = ax + b$) so that the table can be created from the equation.
3. Invent your own linear equation. Then, create a table or graph, including at least 4 points, to trade with your partner. After getting your partner's table or graph, guess the equation that your partner invented.

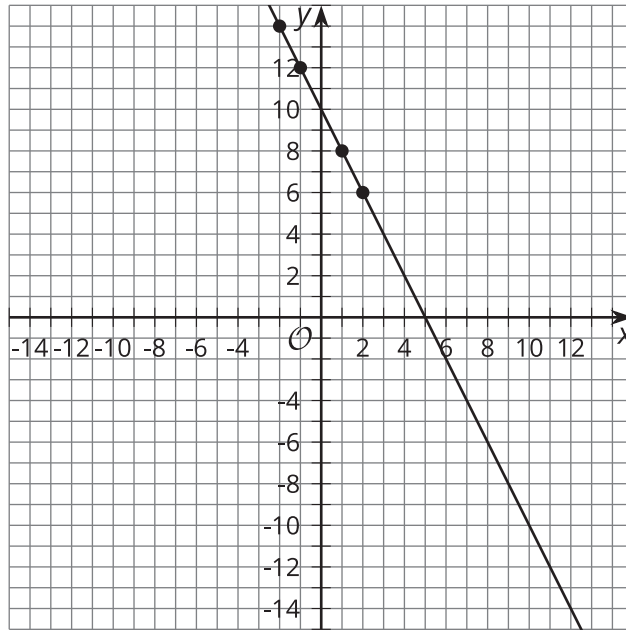
Student Response



1. a.



b.



- c.
2. a. $y = 2x + 1$ (or equivalent)
 b. $y = \frac{1}{2}x + 1$ (or equivalent)
 c. $y = -2x + 10$ (or equivalent)
3. Sample response: $y = 2x + 3$

x	y
0	3
5	13
10	23
-8	-13

Activity Synthesis

The purpose of the discussion is to connect the representations of the functions. Select students to share their solutions, including several of the equations that students invented. Here are some questions for discussion:

- “Are there other functions that could be drawn based on the tables other than the equations you wrote?” (Yes, the functions need to include those 4 points, but it could wiggle up and down between those points or curve in different ways. It could even be a graph of just those 4 points.)
- “Is it easier to create a table from an equation or an equation from a table?” (I think it’s easier to create a table from an equation since I can think of a number for x and substitute it in to get a y -value. Thinking of a rule that might apply to all of the entries in a table is more difficult.)
- “When a person is doing science or figuring out how the world works, do you think they start with an equation and find points that match their equation or start with points like in the table and find an equation to match?” (They usually collect data that could look like the values in the table and then try to understand how to write an equation to describe the values they have.)

