

B.7 Graphing in the Coordinate Plane

Essential Question How can you use a graph to recognize a pattern and write a rule?

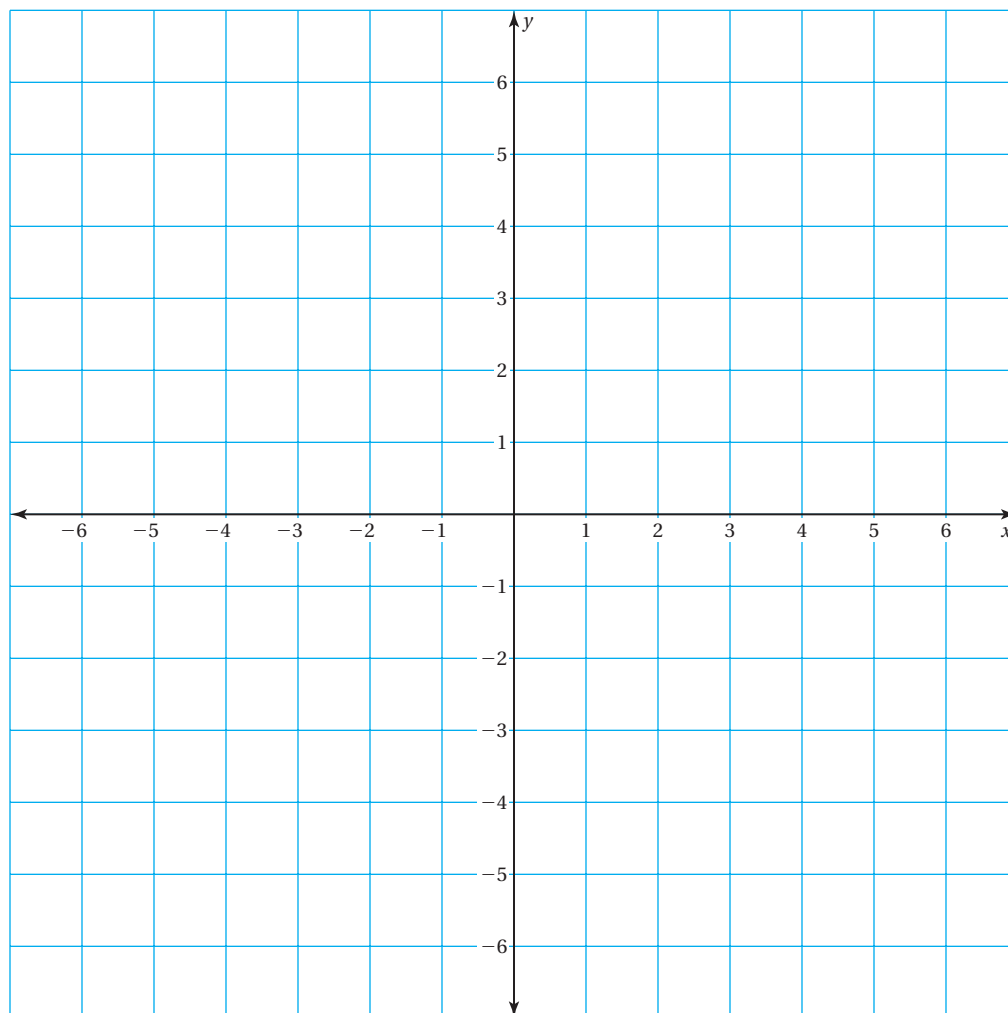
1 ACTIVITY: Graphing in a Coordinate Plane

Work with a partner.

- a. Copy and complete the table.

x	-4	-3	-2	-1	0	1	2	3	4
$y = x - 2$									

- b. Make a list of the ordered pairs represented by the table.
c. Plot each ordered pair.
d. Connect the points. Describe the graph.



2 ACTIVITY: Finding a Pattern

Work with a partner. You have learned how to subtract positive numbers. Complete the following activity to discover how to subtract negative numbers.

- a. Copy and complete the table.

x	0	1	2	3	4
$y = 1 - x$					

- b. Plot the points from the table. Connect the points. Describe the graph.

- c. Extend the graph to the left of the y -axis. Then use the graph to complete the pattern in the table.

x	-4	-3	-2	-1
$y = 1 - x$				

- d. Use your completed table to answer the following.

$$1 - (-4) = \square$$

$$1 - (-3) = \square$$

$$1 - (-2) = \square$$

$$1 - (-1) = \square$$

3 ACTIVITY: Finding a Pattern

Work with a partner.

- Copy and complete tables similar to those in Activity 2 for the equations, $y = 2 - x$, $y = 3 - x$, and $y = 4 - x$.
- For each equation, plot the ordered pairs represented by the table in the same coordinate plane and connect the points.
- Describe how the equations are the same. Describe how the graphs are the same. Describe how the equations are different. Describe how the graphs are different.
- Without plotting points, predict how the equation $y = 5 - x$ would be the same as the other equations. Predict how it would be different.

What Is Your Answer?

- IN YOUR OWN WORDS** How can you use a graph to recognize a pattern and write a rule?
- Write a rule for subtracting a negative number.

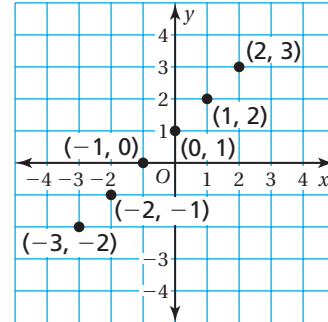
Practice

Use what you learned about graphing in the coordinate plane to complete Exercises 9–12 on page A52.

EXAMPLE 1 Using an Input-Output Table

Plot the data in the input-output table. Describe the pattern.

Input, x	Output, y
-3	-2
-2	-1
-1	0
0	1
1	2
2	3



••• The points lie on a line.

On Your Own

Now You're Ready
Exercises 5–8

Plot the data in the input-output table. Describe the pattern.

1.

Input, x	-2	-1	0	1
Output, y	5	3	1	-1

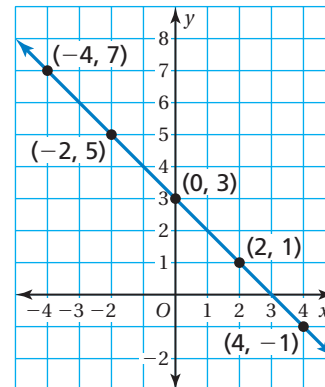
2.

Input, x	-5	-4	-3	-2
Output, y	-3	-2	-1	0

EXAMPLE 2 Graphing a Function

Make an input-output table for $y = 3 - x$. Use the inputs $-4, -2, 0, 2,$ and 4 . Then draw the graph of the function.

x	$3 - x$	y	(x, y)
-4	$3 - (-4)$	7	$(-4, 7)$
-2	$3 - (-2)$	5	$(-2, 5)$
0	$3 - 0$	3	$(0, 3)$
2	$3 - 2$	1	$(2, 1)$
4	$3 - 4$	-1	$(4, -1)$



On Your Own

Now You're Ready
Exercises 9–16

Make an input-output table for the function. Use the inputs $-3, -1, 0, 1,$ and 3 . Then draw the graph of the function.

3. $y = x - 1$

4. $y = 2 - x$

EXAMPLE 3 Standardized Test Practice

Which function is shown in the table?

- (A) $y = 3 - x$ (B) $y = -x - 3$
 (C) $y = x + 3$ (D) $y = x - 3$

Input, x	Output, y
-4	-7
-3	-6
-2	-5
-1	-4
0	-3

Remember

You can check your equation by substituting the input values for x in the equation.

Look at the relationship between the inputs and outputs. Each output y is 3 less than the input x . So, the function is $y = x - 3$.

∴ The correct answer is (D).

On Your Own

Now You're Ready
 Exercises 23–26

Write an equation for the function shown in the table.

5.

Input, x	-2	-1	0	1
Output, y	-8	-7	-6	-5

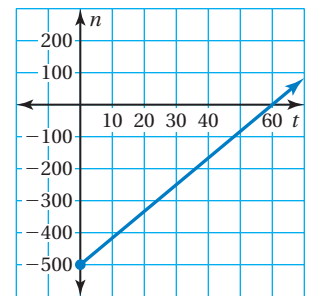
6.

Input, x	-2	-1	0	1
Output, y	2	1	0	-1

EXAMPLE 4 Real-Life Application



An underwater volcano erupts and forms an island. The graph shows the elevation n (in feet) of the volcano in relation to the ocean surface. Let t represent the number of years since its first eruption. What was the elevation of the volcano when it first erupted? Explain.



From the graph, the elevation is -500 feet when $t = 0$.

∴ So, the volcano first erupted 500 feet beneath the ocean surface.

On Your Own

- In Example 4, how many years did it take for the volcano to reach the ocean surface? Explain.
- In Example 4, estimate the elevation of the volcano 30 years after its first eruption. Explain how you found your answer.

Vocabulary and Concept Check

- VOCABULARY** For the function $y = 3x + 4$, which variable is the input and which variable is the output?
- OPEN-ENDED** Name two points on the graph of $y = 2x - 1$.
- REASONING** Which function's graph passes through the origin?

$$y = x - 2$$

$$y = x - 1$$

$$y = x$$

$$y = x + 1$$

- REASONING** Is it possible for a line to pass through the points $(-2, 3)$, $(0, 4)$, and $(1, 5)$? Explain your reasoning.

Practice and Problem Solving

Plot the data in the input-output table. Describe the pattern.

1

5.	Input, x	-1	0	1	2	3
	Output, y	-3	-2	-1	0	1

6.	Input, x	-4	-2	0	2	4
	Output, y	-1	0	1	4	2

7.	Input, x	-2	-1	0	1	2
	Output, y	-3	-1	1	3	5

8.	Input, x	-1	0	1	2	3
	Output, y	7	4	1	-2	-5

Make an input-output table for the function. Use the inputs $-2, -1, 0, 1,$ and 2 . Then draw the graph of the function.

- 2
- | | | | |
|-----------------|-----------------|-------------------|-------------------|
| 9. $y = 3 - x$ | 10. $y = 5 - x$ | 11. $y = -1 - x$ | 12. $y = -4 - x$ |
| 13. $y = x + 2$ | 14. $y = 3x$ | 15. $y = -10 + x$ | 16. $y = -2 + 2x$ |

17. **ERROR ANALYSIS** Describe and correct the error in making the input-output table for $y = 4 - x$.

18. **SHRIMP PRODUCTION** Graph the function shown in the table. Write an equation for the function.

Amelia Island Shrimp Production	
Years, x	Pounds (millions), y
1	2
2	4
3	6
4	8



x	$4 - x$	y	(x, y)
-3	$4 - 3$	1	$(-3, 1)$
-2	$4 - 2$	2	$(-2, 2)$
-1	$4 - 1$	3	$(-1, 3)$
0	$4 - 0$	4	$(0, 4)$

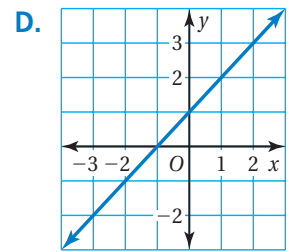
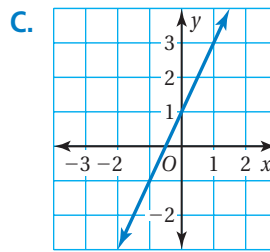
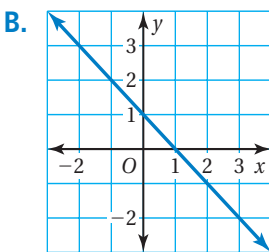
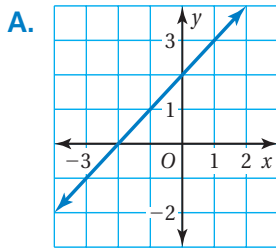
Match the function with its graph.

19. $y = x + 1$

20. $y = x + 2$

21. $y = -x + 1$

22. $y = 2x + 1$



Write an equation for the function shown in the table.

23.

Input, x	-2	-1	0	1	2
Output, y	-3	-2	-1	0	1

24.

Input, x	-4	-2	0	2	4
Output, y	4	2	0	-2	-4

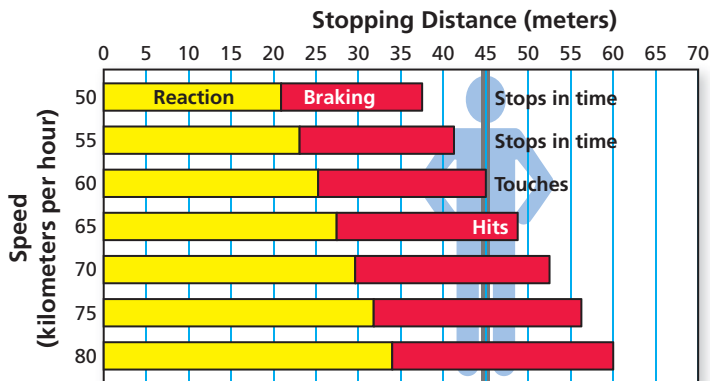
25.

Input, x	-1	0	1	2	3
Output, y	-2	0	2	4	6

26.

Input, x	-4	-2	0	2	4
Output, y	2	1	0	-1	-2

27. **STOPPING DISTANCE** The bar graph shows the stopping distances for a car traveling at different speeds. Let S be the speed, R be the distance traveled before reacting, and T be the total stopping distance.



- Write a function that gives the distance traveled before the driver reacts.
- Write a function that gives the total stopping distance in terms of the speed.
- If a driver sees an object that is 45 meters away, will the car hit the object? Explain.

28. **Critical Thinking** Explain how you would graph the function $y = x^2 + 2$. Draw the graph of the function. How does it compare with the graphs of other functions in this lesson?



Fair Game Review What you learned in previous grades & lessons

Subtract.

29. $69 - 38$

30. $82 - 74$

31. $177 - 63$

32. $451 - 268$

33. **MULTIPLE CHOICE** What is the range of the data set 12, 8, 17, 12, 15, 18, and 30?

(A) 12

(B) 15

(C) 18

(D) 22