



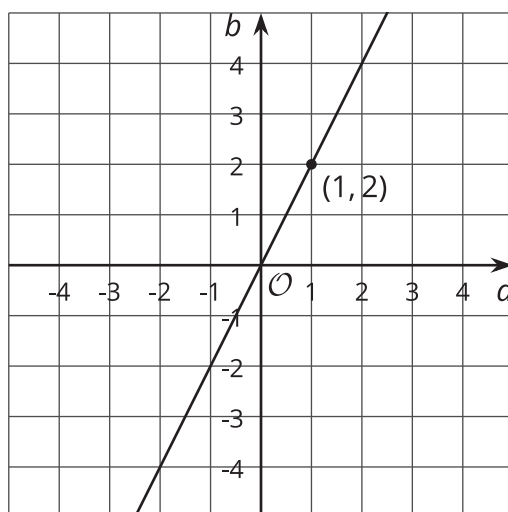
# Connecting Representations of Functions

Let's connect tables, equations, graphs, and stories of functions.

## 7.1 Which Are the Same? Which Are Different?

Here are three different ways of representing functions. How are they alike? How are they different?

$$y = 2x$$

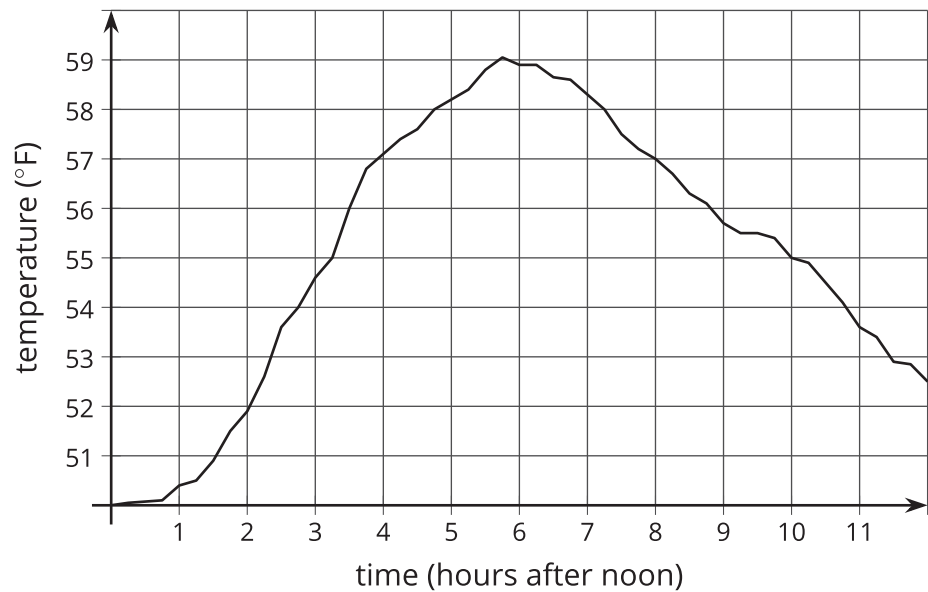


|     |    |    |   |    |    |    |
|-----|----|----|---|----|----|----|
| $p$ | -2 | -1 | 0 | 1  | 2  | 3  |
| $q$ | 4  | 2  | 0 | -2 | -4 | -6 |

7.2

Comparing Temperatures

The graph shows the temperature between noon and midnight in City A on a certain day.



The table shows the temperature,  $T$ , in degrees Fahrenheit for  $h$  hours after noon in City B.

|     |    |    |    |    |    |    |
|-----|----|----|----|----|----|----|
| $h$ | 1  | 2  | 3  | 4  | 5  | 6  |
| $T$ | 82 | 78 | 75 | 62 | 58 | 59 |

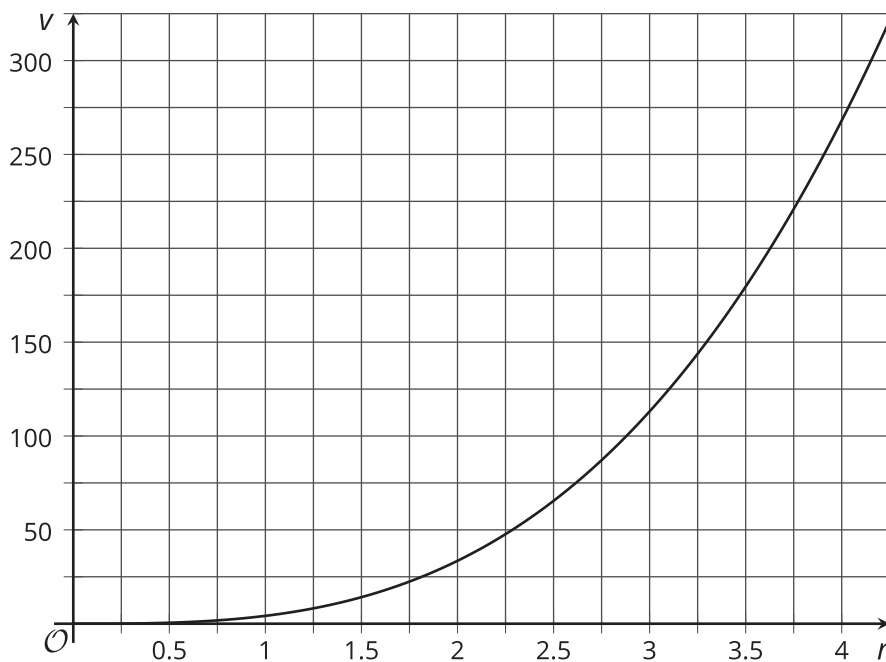
- 1. Which city was warmer at 4:00 p.m.?
- 2. Which city had a bigger change in temperature between 1:00 p.m. and 5:00 p.m.?
- 3. How much greater was the highest recorded temperature in City B than the highest recorded temperature in City A on this day?
- 4. Compare the outputs of the functions when the input is 3.



## 7.3 Comparing Volumes

The volume,  $V$ , of a cube with edge length  $s$  cm is given by the equation  $V = s^3$ .

The volume of a sphere is a function of its radius (in cm), and the graph of this relationship is shown here.



1. Is the volume of a cube with edge length  $s = 3$  greater or less than the volume of a sphere with radius 3 cm?
2. If a sphere has the same volume as a cube with edge length 5 cm, estimate the radius of the sphere.
3. Compare the outputs of the two volume functions when the inputs are 2.

### Are you ready for more?

Estimate the edge length of a cube that has the same volume as a sphere with radius 2.5 cm.

7.4

It's Not a Race

Elena’s family is driving on the freeway at 55 miles per hour.

Andre’s family is driving on the same freeway, but not at a constant speed. The table shows how far Andre's family has traveled in miles,  $d$ , every minute for 10 minutes.

|     |     |     |     |     |     |     |     |     |   |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|
| $t$ | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9 | 10  |
| $d$ | 0.9 | 1.9 | 3.0 | 4.1 | 5.1 | 6.2 | 6.8 | 7.4 | 8 | 9.1 |

- 1. How many miles per minute is 55 miles per hour?
- 2. Who has traveled farther after 5 minutes? After 10 minutes?
- 3. How long did it take Elena’s family to travel as far as Andre’s family had traveled after 8 minutes?
- 4. For both families, the distance in miles is a function of time in minutes. Compare the outputs of these functions when the input is 3.



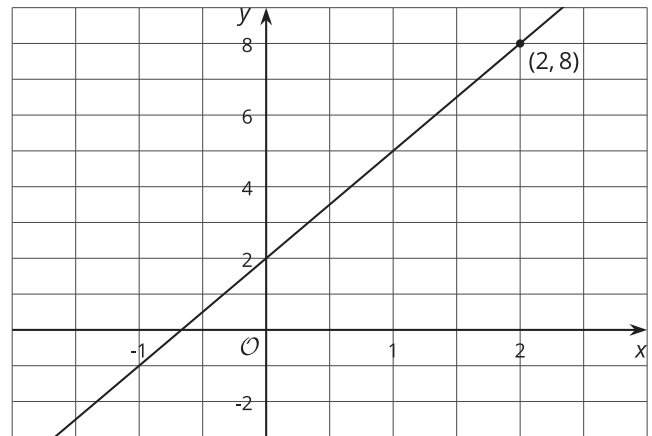
## Lesson 7 Summary

Functions are all about getting outputs from inputs. For each way of representing a function—equation, graph, table, or verbal description—we can determine the output for a given input.

Let's say we have a function represented by the equation  $y = 3x + 2$ , where  $y$  is the dependent variable and  $x$  is the independent variable. If we wanted to find the output that goes with 2, we could input 2 into the equation for  $x$  and find the corresponding value of  $y$ . In this case, when  $x$  is 2,  $y$  is 8 since  $3 \cdot 2 + 2 = 8$ .

If we had a graph of this function instead, then the coordinates of points on the graph would be the input-output pairs.

So we would read the  $y$ -coordinate of the point on the graph that corresponds to a value of 2 for  $x$ . Looking at the following graph of a function, we can see the point  $(2, 8)$  on it, so the output is 8 when the input is 2.



A table representing this function shows the input-output pairs directly (although only for select inputs).

Again, the table shows that if the input is 2, the output is 8.

|     |    |   |   |   |    |
|-----|----|---|---|---|----|
| $x$ | -1 | 0 | 1 | 2 | 3  |
| $y$ | -1 | 2 | 5 | 8 | 11 |