Unit 6, Lesson 4

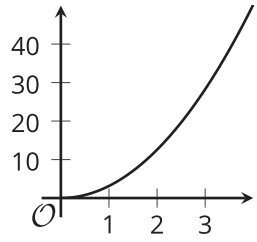
Graphs of Functions

Let's interpret graphs of functions.

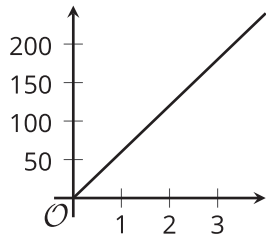
4.1 Equations and Graphs of Functions

The graphs of three functions are shown.

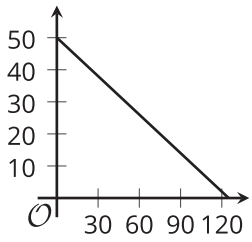
A



B



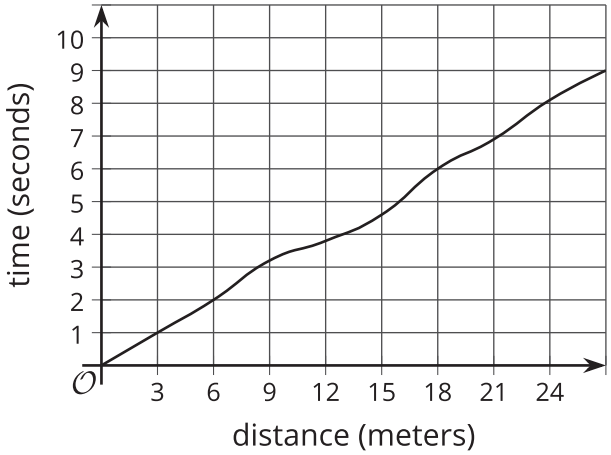
C



1. Match one of these equations to each of the graphs.
   a. $d = 60t$, where d is the distance in miles that someone would travel in t hours if they drove at 60 miles per hour.
   b. $q = 50 - 0.4d$, where q is the number of quarters and d is the number of dimes in a pile of coins worth \$12.50.
   c. $A = \pi r^2$, where A is the area in square centimeters of a circle with radius r centimeters.
2. Label each of the axes with the independent and dependent variables and the quantities they represent.

4.2 Running around a Track

1. Kiran was running around the track. The graph shows the time, t, he took to run various distances, d. The table shows his time in seconds after every three meters.



d	0	3	6	9	12	15	18	21	24	27
t	0	1.0	2.0	3.2	3.8	4.6	6.0	6.9	8.09	9.0

   a. How long did it take Kiran to run 6 meters?

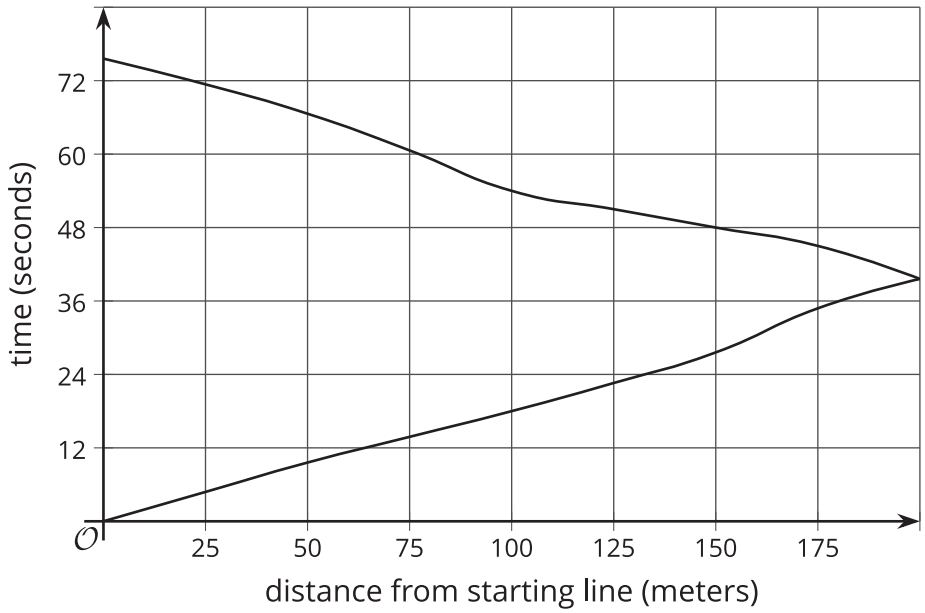
   b. How far had he gone after 6 seconds?

   c. Estimate when he had run 19.5 meters.

   d. Estimate how far he ran in 4 seconds.

   e. Is Kiran's time a function of the distance he has run? Explain how you know.

2. Priya is running once around the track. The graph shows her time given how far she is from her starting point.



a. What was her farthest distance from the starting line?

b. Estimate how long it took her to run around the track.

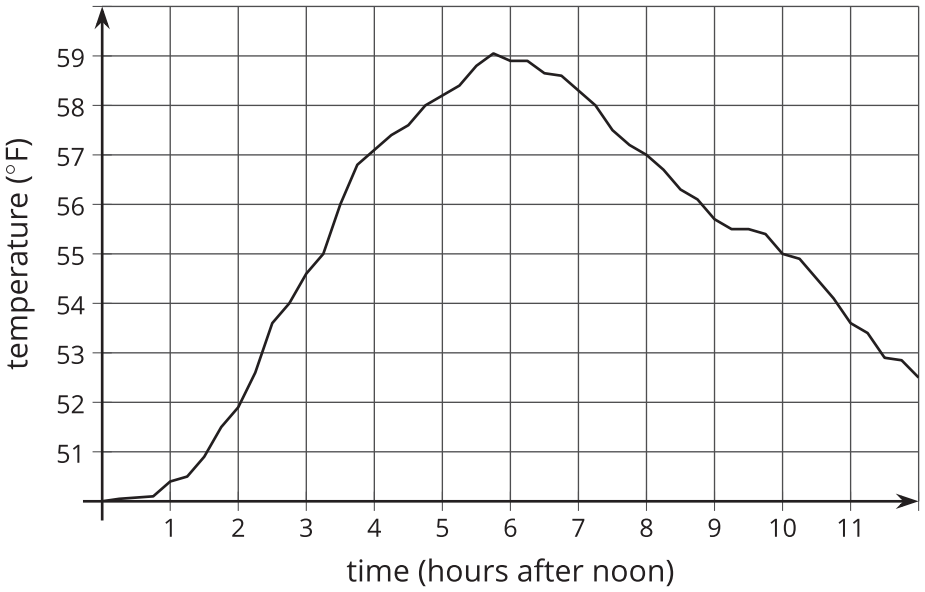
c. Estimate when she was 100 meters from the starting line.

d. Estimate how far she was from the starting line after 60 seconds.

e. Is Priya's time a function of her distance from her starting point? Explain how you know.

4.3 Time and Temperature

The graph shows the temperature between noon and midnight in one day in City A.



1. Is it warmer at 3:00 p.m. or 9:00 p.m.?

2. Approximately when is the temperature highest?

3. Find another time that the temperature is the same as it is at 4:00 p.m.

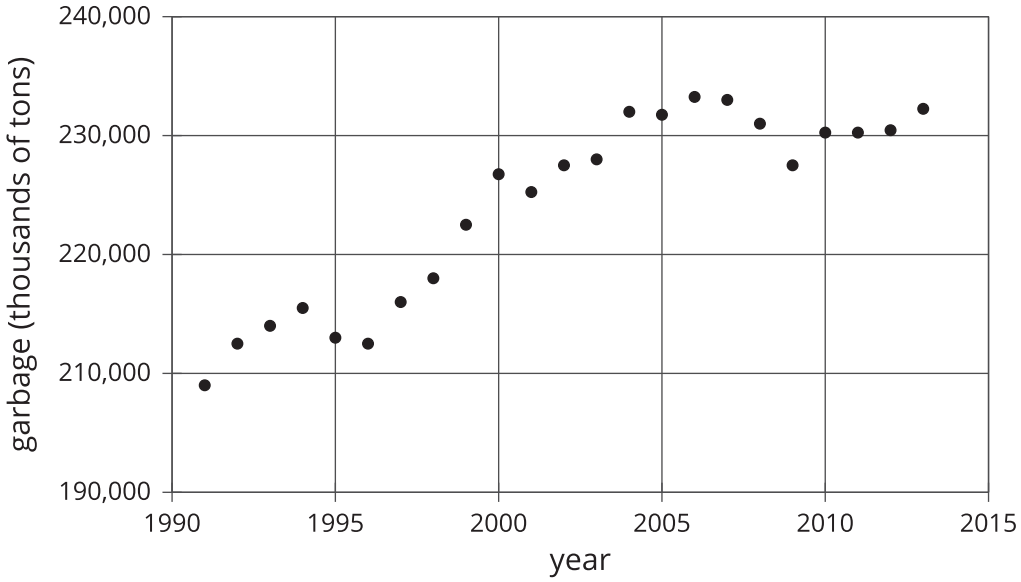
4. Does the temperature change more between 1:00 p.m. and 3:00 p.m. or between 3:00 p.m. and 5:00 p.m.?

5. Does this graph show that temperature is a function of time, or time is a function of temperature?

6. When the input for the function is 8, what is the output? What does that tell you about the time and temperature?

4.4 Garbage

1. The graph shows the amount of garbage produced in the United States each year between 1991 and 2013.

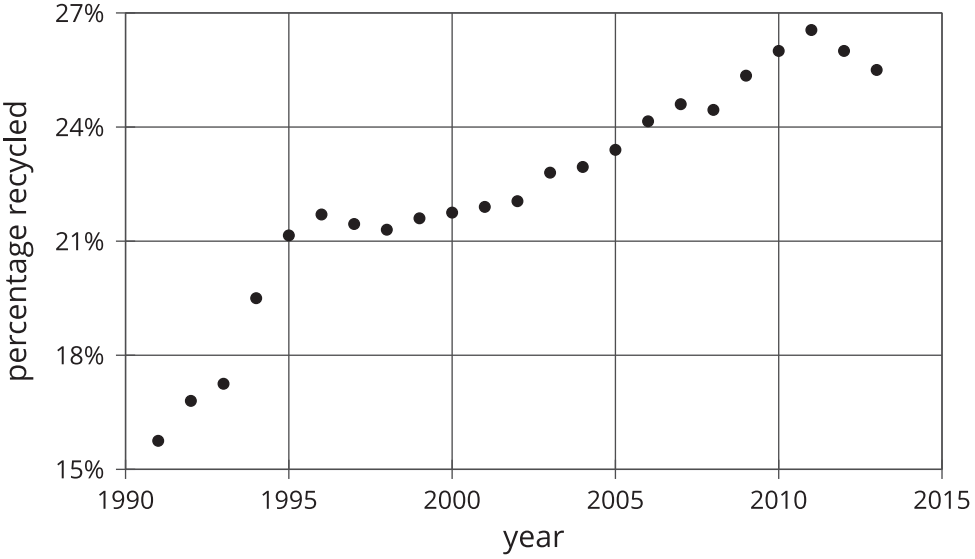


   a. Did the amount of garbage increase or decrease between 1999 and 2000?

   b. Did the amount of garbage increase or decrease between 2005 and 2009?

   c. Between 1991 and 1995, the garbage increased for three years, and then it decreased in the fourth year. Describe how the amount of garbage changed in the years between 1995 and 2000.

2. The graph shows the percentage of garbage that was recycled between 1991 and 2013.



   a. When is the graph increasing?

   b. When is the graph decreasing?

   c. Tell the story of the change in the percentage of garbage recycled in the United States over the time period shown in the graph.

Are you ready for more?

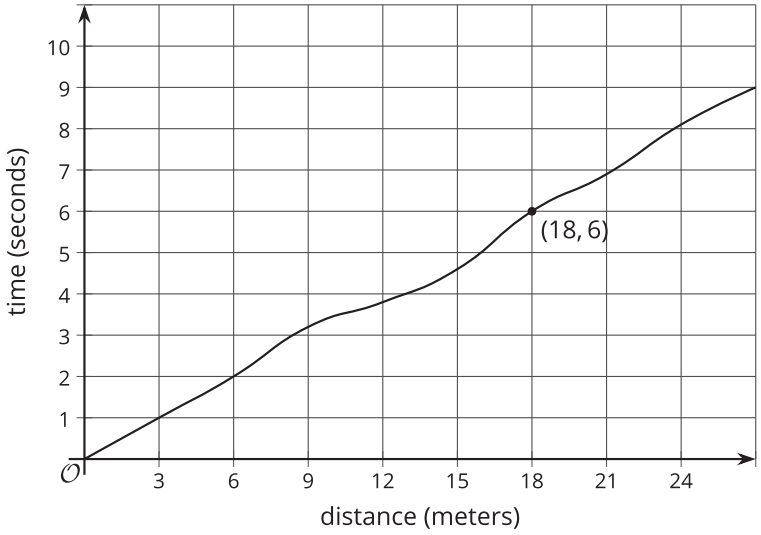
Refer to the graph in the first part of the activity.

1. Find a year where the amount of garbage produced increases from the previous year, but not by as much as it increases the following year.
2. Find a year where the amount of garbage produced increases from the previous year, and then increases by a smaller amount the following year.
3. Find a year where the amount of garbage produced decreases from the previous year, but not by as much as it decreases the following year.
4. Find a year where the amount of garbage produced decreases from the previous year, and then decreases by a smaller amount the following year.

Lesson 4 Summary

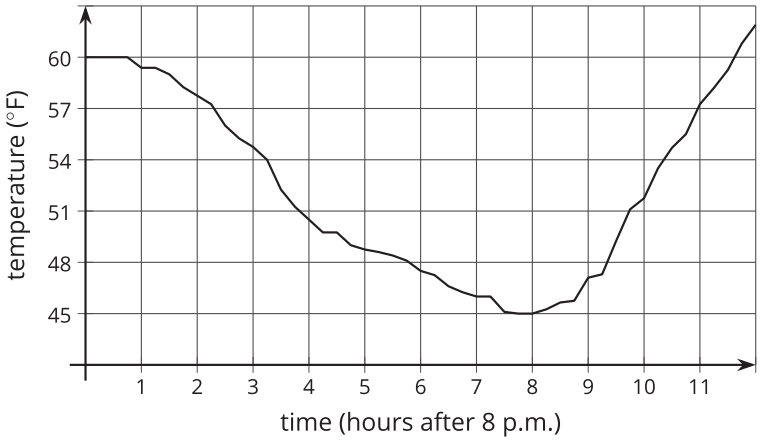
Here is the graph showing Noah's run.

The time in seconds since he started running is a function of the distance he has run. The point $(18, 6)$ on the graph tells us that the time it takes him to run 18 meters is 6 seconds. The input is 18 and the output is 6.



The graph of a function is all the coordinate pairs, (input, output), plotted in the coordinate plane. By convention, we always put the input first, which means that the inputs are represented on the horizontal axis, and the outputs are represented on the vertical axis.

Here is a graph showing the temperature in a town as a function of hours after 8:00 p.m.



The graph of a function tells us what is happening in the context the function represents. In this example, the temperature starts out at 60° F at 8:00 p.m. It decreases during the night, reaching its lowest point about 8 hours after 8:00 p.m., or 4:00 a.m. Then it starts to increase again.