

# Linear Functions and Proportionality

A linear function has the table of values below. The information in the table shows the number of pages a student can read in a certain book as a function of time in minutes. Assume a constant rate.

Time in minutes ( $x$ )	2	6	11	20
Total number of pages read in a certain book ( $y$ )	7	21	38.5	70

- a. Write the rule or equation that represents the linear function that describes the total number of pages read,  $y$ , in  $x$  minutes.
  
  
  
  
  
  
  
  
  
  
- b. How many pages can be read in 45 minutes?
  
  
  
  
  
  
  
  
  
  
- c. A certain book has 396 pages. The student has already read  $\frac{3}{8}$  of the pages. Write the equation that describes the number of pages read as a function of time for reading this book, including the number of pages that have already been read.
  
  
  
  
  
  
  
  
  
  
- d. Approximately how much time, in minutes, will it take to finish reading the book?

1. A food bank distributes cans of vegetables every Saturday. They keep track of the cans in the following manner in the table. A linear function can be used to represent the data. The information in the table shows the function of time in weeks to the number of cans of vegetables distributed by the food bank.

Number of weeks ( $x$ )	1	12	20	45
Number of cans of vegetables distributed ( $y$ )	180	2,160	3,600	8,100

- Describe the function in terms of cans distributed and time.
  - Write the equation or rule that represents the linear function that describes the number of cans handed out,  $y$ , in  $x$  weeks.
  - Assume that the food bank wants to distribute 20,000 cans of vegetables. How long will it take them to meet that goal?
  - Assume that the food bank has already handed out 35,000 cans of vegetables and continues to hand out cans at the same rate each week. Write a linear function that accounts for the number of cans already handed out.
  - Using your function in part (d), determine how long in years it will take the food bank to hand out 80,000 cans of vegetables.
2. A linear function has the table of values below. The information in the table shows the function of time in hours to the distance an airplane travels in miles. Assume constant speed.

Number of hours traveled ( $x$ )	2.5	4	4.2
Distance in miles ( $y$ )	1,062.5	1,700	1,785

- Describe the function in terms of distance and time.
- Write the rule that represents the linear function that describes the distance traveled in miles,  $y$ , in  $x$  hours.

- c. Assume that the airplane is making a trip from New York to Los Angeles, which is approximately 2,475 miles. How long will it take the airplane to get to Los Angeles?
- d. The airplane flies for 8 hours. How many miles will it be able to travel in that time interval?

3. A linear function has the table of values below. The information in the table shows the function of time in hours to the distance a car travels in miles.

Number of hours traveled ( $x$ )	3.5	3.75	4	4.25
Distance in miles ( $y$ )	203	217.5	232	246.5

- a. Describe the function in terms of distance and time.
- b. Write the rule that represents the linear function that describes the distance traveled in miles,  $y$ , in  $x$  hours.
- c. Assume that the person driving the car is going on a road trip that is 500 miles from the starting point. How long will it take the person to get to the destination?
- d. Assume that a second car is going on the road trip from the same starting point and traveling at the same constant rate. However, this car has already driven 210 miles. Write the rule that represents the linear function that accounts for the miles already driven by this car.
- e. How long will it take the second car to drive the remainder of the trip?

4. A particular linear function has the table of values below.

Input ( $x$ )	2	3	8	11	15	20	23
Output ( $y$ )	7	10		34		61	

- a. What is the equation that describes the function?
- b. Complete the table using the rule.

5. A particular linear function has the table of values below.

Input ( $x$ )	0	5	8	13	15	18	21
Output ( $y$ )	6	11	14		21		

- a. What is the rule that describes the function?
- b. Complete the table using the rule.

A linear function has the table of values below. The information in the table shows the number of pages a student can read in a certain book as a function of time in minutes. Assume a constant rate.

Time in minutes ( $x$ )	2	6	11	20
Total number of pages read in a certain book ( $y$ )	7	21	38.5	70

- a. Write the rule or equation that represents the linear function that describes the total number of pages read,  $y$ , in  $x$  minutes.

$$y = \frac{7}{2}x$$

$$y = 3.5x$$

- b. How many pages can be read in 45 minutes?

$$y = 3.5(45)$$

$$y = 157.5$$

*In 45 minutes, the student can read 157.5 pages.*

- c. A certain book has 396 pages. The student has already read  $\frac{3}{8}$  of the pages. Write the equation that describes the number of pages read as a function of time for reading this book, including the number of pages that have already been read.

$$\frac{3}{8}(396) = 148.5$$

$$y = 3.5x + 148.5$$

- d. Approximately how much time, in minutes, will it take to finish reading the book?

$$398 = 3.5x + 148.5$$

$$249.5 = 3.5x$$

$$\frac{249.5}{3.5} = x$$

$$71.285714 \dots = x$$

$$71 \approx x$$

*It will take about 71 minutes to finish reading the book.*

1. A food bank distributes cans of vegetables every Saturday. They keep track of the cans in the following manner in the table. A linear function can be used to represent the data. The information in the table shows the function of time in weeks to the number of cans of vegetables distributed by the food bank.

Number of weeks ( $x$ )	1	12	20	45
Number of cans of vegetables distributed ( $y$ )	180	2,160	3,600	8,100

- a. Describe the function in terms of cans distributed and time.

*The total number of cans handed out is a function of the number of weeks that pass.*

- b. Write the equation or rule that represents the linear function that describes the number of cans handed out,  $y$ , in  $x$  weeks.

$$y = \frac{180}{1}x$$

$$y = 180x$$

- c. Assume that the food bank wants to distribute 20,000 cans of vegetables. How long will it take them to meet that goal?

$$20,000 = 180x$$

$$\frac{20,000}{180} = x$$

$$111.1111 \dots = x$$

$$111 \approx x$$

*It will take about 111 weeks to distribute 20,000 cans of vegetables, or about 2 years.*

- d. Assume that the food bank has already handed out 35,000 cans of vegetables and continues to hand out cans at the same rate each week. Write a linear function that accounts for the number of cans already handed out.

$$y = 180x + 35,000$$

- e. Using your function in part (d), determine how long in years it will take the food bank to hand out 80,000 cans of vegetables.

$$80,000 = 180x + 35,000$$

$$45,000 = 180x$$

$$\frac{45,000}{180} = x$$

$$250 = x$$

$$\frac{250}{52} = \text{number of years}$$

$$4.8076 \dots = \text{number of years}$$

$$4.8 \approx \text{number of years}$$

*It will take about 4.8 years to distribute 80,000 cans of vegetables.*

2. A linear function has the table of values below. The information in the table shows the function of time in hours to the distance an airplane travels in miles. Assume constant speed.

Number of hours traveled ( $x$ )	2.5	4	4.2
Distance in miles ( $y$ )	1,062.5	1,700	1,785

- a. Describe the function in terms of distance and time.

*The total distance traveled is a function of the number of hours spent flying.*

- b. Write the rule that represents the linear function that describes the distance traveled in miles,  $y$ , in  $x$  hours.

$$y = \frac{1,062.5}{2.5}x$$

$$y = 425x$$

- c. Assume that the airplane is making a trip from New York to Los Angeles, which is approximately 2,475 miles. How long will it take the airplane to get to Los Angeles?

$$2,475 = 425x$$

$$\frac{2,475}{425} = x$$

$$5.82352 \dots = x$$

$$5.8 \approx x$$

*It will take about 5.8 hours for the airplane to fly 2,475 miles.*

- d. The airplane flies for 8 hours. How many miles will it be able to travel in that time interval?

$$y = 425(8)$$

$$y = 3,400$$

*The airplane would travel 3,400 miles in 8 hours.*

3. A linear function has the table of values below. The information in the table shows the function of time in hours to the distance a car travels in miles.

Number of hours traveled ( $x$ )	3.5	3.75	4	4.25
Distance in miles ( $y$ )	203	217.5	232	246.5

- a. Describe the function in terms of distance and time.

*The total distance traveled is a function of the number of hours spent traveling.*

- b. Write the rule that represents the linear function that describes the distance traveled in miles,  $y$ , in  $x$  hours.

$$y = \frac{203}{3.5}x$$

$$y = 58x$$

- c. Assume that the person driving the car is going on a road trip that is 500 miles from the starting point. How long will it take the person to get to the destination?

$$\begin{aligned} 500 &= 58x \\ \frac{500}{58} &= x \\ 8.6206 \dots &= x \\ 8.6 &\approx x \end{aligned}$$

*It will take about 8.6 hours to travel 500 miles.*

- d. Assume that a second car is going on the road trip from the same starting point and traveling at the same constant rate. However, this car has already driven 210 miles. Write the rule that represents the linear function that accounts for the miles already driven by this car.

$$y = 58x + 210$$

- e. How long will it take the second car to drive the remainder of the trip?

$$\begin{aligned} 500 &= 58x + 210 \\ 290 &= 58x \\ \frac{290}{58} &= x \\ 5 &= x \end{aligned}$$

*It will take 5 hours to drive the remaining 290 miles of the road trip.*

4. A particular linear function has the table of values below.

Input (x)	2	3	8	11	15	20	23
Output (y)	7	10	25	34	46	61	70

- a. What is the equation that describes the function?

$$y = 3x + 1$$

- b. Complete the table using the rule.

5. A particular linear function has the table of values below.

Input (x)	0	5	8	13	15	18	21
Output (y)	6	11	14	19	21	24	27

- a. What is the rule that describes the function?

$$y = x + 6$$

- b. Complete the table using the rule.