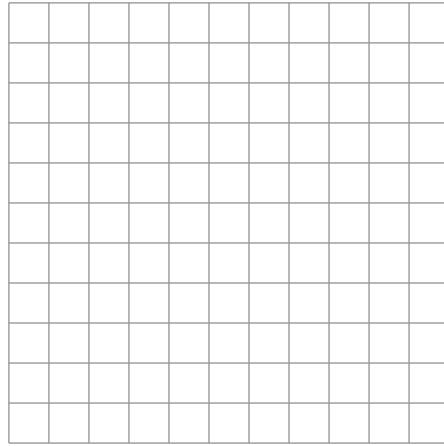


**Additional Practice**

1.01

- 1.** Sketch a  $2 \times 2$  square on the grid.



- 2.** How many tiles does the square cover in the grid?

- 3.** Figures 1–3 represent the square growing in size.

Here are the number of tiles in Figures 1–3 of the pattern.

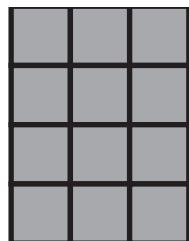
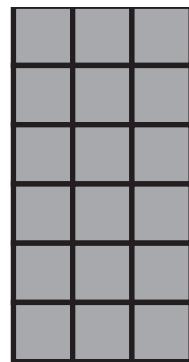
Figure #	Number of Tiles
1	9
2	16
3	25

- a** Draw three figures to match the patterns in the table.

Figure 1	Figure 2	Figure 3

- b** How many tiles will there be in Figure 4?

**4.** Here is a visual pattern.

**Figure 1****Figure 2****Figure 3**

**a** Describe what Figure 4 will look like.

**b** How many tiles will there be in Figure 4?

**Problems 5–6.** This table shows the number of tiles in Figures 1–3.

Figure #	Number of Tiles
1	6
2	12
3	18

**5.** Do you agree that Figure 5 will have  $24 + 6$  tiles? Circle one. Explain your reasoning.

Yes      No      I'm not sure

**6.** How many tiles will there be in Figure 6?

**Additional Practice****1.02**

- 1.** Here is a sequence that has a *constant ratio*.

200, 100, 50, ...

What is the next term? Explain your thinking.

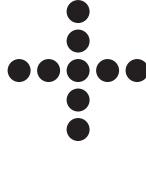
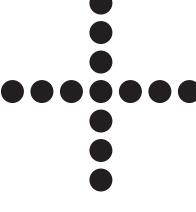
**Problems 2–4:** Fill in the blanks to complete each sequence. Each sequence has a *constant difference*.

- 2.** 10, 13, 16, ..... , ..... , 25
- 3.** ..... , 11, 17, ..... , 29, .....
- 4.** 1.5, 1.0, 0.5, ..... , ..... , .....

- 5.** Which sequence has a *constant ratio* of 4?

- A. 16, 64, 256, ...
- B. 24, 20, 16, ...
- C. 80, 20, 5, ...
- D. 4, 8, 12, ...

- 6.** Here is a visual pattern. Sketch Figure 4.

Figure 1	Figure 2	Figure 3	Figure 4
			

- 7.** How many dots will Figure 6 have? Show or explain your reasoning.
- 8.** What rule does the sequence for this visual pattern follow?
- A. Constant ratio of 2
  - B. Constant ratio of 4
  - C. Constant difference of 2
  - D. Constant difference of 4
- 9.** A sequence has a first term of 12 and a constant ratio of  $\frac{1}{2}$ . What are the first four terms of the sequence?
- A.  $12, 12\frac{1}{2}, 13, 13\frac{1}{2}$
  - B.  $\frac{1}{2}, 12\frac{1}{2}, 24\frac{1}{2}, 36\frac{1}{2}$
  - C.  $12, 6, 3, \frac{3}{2}$
  - D.  $12, 24, 36, 48$

# Additional Practice

1.03

1. This sequence has a *constant ratio* of 5. Fill in the missing terms.

$$\frac{1}{5}, 1, 5, \dots, \dots, \dots$$

2. This sequence has a *constant difference* of 7. Find the missing terms.

$$\dots, \dots, 8, \dots, \dots$$

3. Here is the start of a sequence:  $-2, 1, 4, \dots$

a Write a rule for this sequence.

b Write the next three terms of this sequence.

**Problems 4–5:** Here is a start of a sequence:  $1, 6, \dots$

4. Write a rule and the next three terms the sequence could follow.

Rule:

Terms:

5. Write a *different* rule and the next three terms the sequence could follow.

Rule:

Terms:

6. Brenden is saving money to buy a new phone. He started with \$200 and is saving an additional \$50 each month. Write a recursive definition to model the situation.

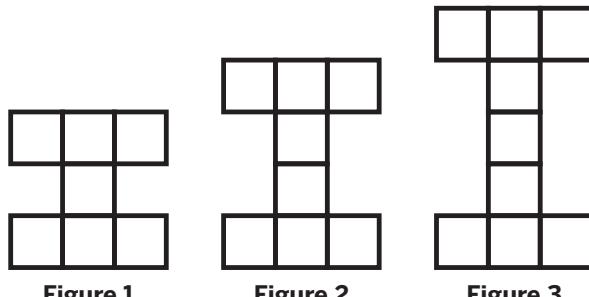
First term:

Rule:

**Problems 7–9:** Here is a visual pattern.

7. Complete the table with the number of tiles in each figure.

Figure #	Tiles
1	
2	
3	



8. Write a recursive definition to model the situation.

First term:

Rule:

9. How many tiles would be in Figure 10? Show or explain your thinking.

**Additional Practice****1.04**

- 1.** Determine whether each sequence is arithmetic, geometric, or neither.

<b>Sequence</b>	3, 10, 17, 24	1, 10, 100, 1000	12, 6, 3, $\frac{3}{2}$	1, 4, 9, 25
<b>Arithmetic, Geometric, Or Neither</b>				

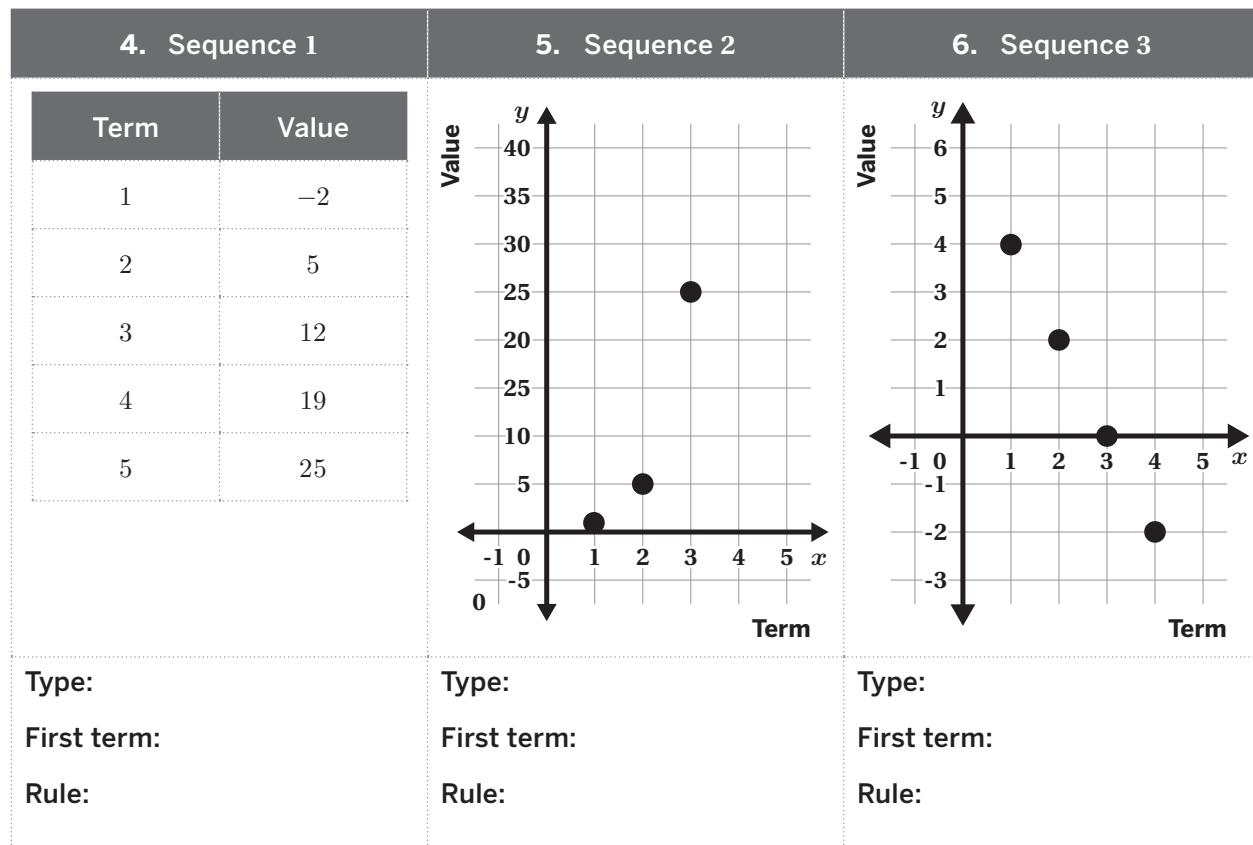
- 2.** Complete each arithmetic sequence with its missing terms.

- a** -10, -4, ..... , 8, ..... , 20
- b** 14, ..... , 214, ..... , 414
- c** ..... , 4.25, 5.50, ..... , .....
- d** 12, ..... , -2, -9 , .....

- 3.** Complete each geometric sequence with its missing terms.

- a** 10, 20, ..... , 80, ..... , 320
- b** 12, ..... , 3, ..... ,  $\frac{3}{4}$
- c** ..... , 4, 12, ..... , .....
- d** 1, ..... , 25, 125, .....

**Problems 4–6:** For the following sequences, identify the **type** of sequence, the **first term**, and the **rule** of the following sequences.



**Problems 7–9:** Given the first term and rule:

- a Circle if it is an arithmetic sequence, geometric sequence, or neither.
- b Write the first 4 terms of each sequence.

<b>7. First Term:</b> 2  <b>Rule:</b> Multiply the previous term by 4	<b>8. First Term:</b> 1  <b>Rule:</b> Add 1 to the previous number and square it	<b>9. First Term:</b> -12  <b>Rule:</b> Add 4 to the previous number
<b>Arithmetic Sequence</b> <b>Geometric Sequence</b> <b>Neither</b>	<b>Arithmetic Sequence</b> <b>Geometric Sequence</b> <b>Neither</b>	<b>Arithmetic Sequence</b> <b>Geometric Sequence</b> <b>Neither</b>

**Additional Practice****1.05**

- 1.** Hannah's family decides to save money for a vacation. They start by saving \$100 in the first month, and each subsequent month they save 1.5 times the amount they saved the previous month. Select *all* the expressions that represent how much money they will save in the 5th month.

A.  $100 + 1.5^5$

D.  $100 \cdot 1.5 \cdot 1.5 \cdot 1.5 \cdot 1.5 \cdot 1.5$

B.  $100 + 1.5 + 1.5 + 1.5 + 1.5 + 1.5$

E.  $100 \cdot 1.5^5$

C.  $100 \cdot 5^{1.5}$

- 2.** The tables below show the number of red and yellow globs each day.

Day	0	1	2	3	4
Red Globs	50	70	90	110	

Day	0	1	2	3	4
Yellow Globs	5	10	20	40	

- a** Determine how many globs there will be on Day 4 and complete each table. Show or explain your thinking.

- b** Will there be more red or yellow globs on Day 10? Show or explain your thinking.

- c** Which group of globs grows by a *constant difference*? Show or explain your thinking.

- 3.** In a body of water, each foot of water screens out 60% of the light above it. The equation  $l = 1 \cdot 0.40^d$  represents this situation.

- a** Explain what the 1 and the 0.40 represent in this situation.

- b** What percent of light is available after passing through 5 feet of water? Show your thinking.

**Problems 4–5:** Here is a table representing a pattern.

4. Circle the equation that represents the table.

- A.  $y = 50 + 10x$
- B.  $y = 50 \cdot 10x$
- C.  $y = 50 - 10x$
- D.  $y = 50 \cdot \left(\frac{1}{10}\right)^x$

5. Explain your thinking.

$x$	$y$
0	50
1	40
2	30
3	20
4	10

6. Kai is saving pennies in a jar that already contained 20 pennies. The first day he saves 6 more pennies. The second day, he saves 12 more pennies. The third day, he saves 24 more pennies, and so on.

- a Complete the table to show the amount of pennies in the jar, after  $n$  days.

Day $n$	0	1	2	3	...	$n$
Number of Pennies	20					

- b Write an explicit expression for this situation.  
c Use your expression to determine how many pennies are in the jar on the 8th day? Show or explain your thinking.

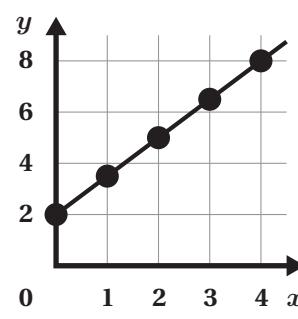
7. Determine whether each table or graph shows a constant difference or a constant ratio. Circle your choice.

$x$	$y$
0	4
1	8
2	16
3	32

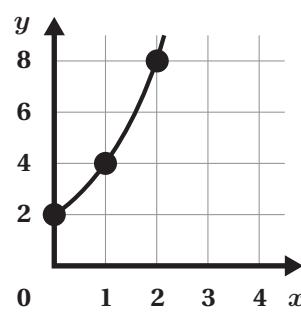
Constant Difference  
Constant Ratio

$x$	$y$
0	4
1	8
2	12
3	16

Constant Difference  
Constant Ratio



Constant Difference  
Constant Ratio



Constant Difference  
Constant Ratio

**Additional Practice**

1.06

- 1.** Match each sequence to its explicit expression.

**Sequence**

a. 3, 12, 48, 192

b. 3, 4, 7, 11

c. 3, 6, 12, 24

d. 3, 7, 11, 15

**Explicit Expression**

.....  $3 \cdot 2^{(n - 1)}$

.....  $3 \cdot 4^{(n - 1)}$

.....  $3 + 4(n - 1)$

.....  $3 + 2(n - 1)$

- 2.** Determine whether each table represents a line relationship, an exponential relationship, or neither. Circle your choice.

<i>x</i>	<i>y</i>
0	1
1	3
2	5
3	7
4	9

Linear Relationship

Exponential Relationship

Neither

<i>x</i>	<i>y</i>
0	1
1	3
2	9
3	19
4	33

Linear Relationship

Exponential Relationship

Neither

<i>x</i>	<i>y</i>
0	1
1	3
2	9
3	27
4	81

Linear Relationship

Exponential Relationship

Neither

- 3.** Select *all* the expressions that could represent the number of tiles in Figure *n* of this pattern

- A.  $3 + 2n$
- B.  $4 + 1(n - 1)$
- C.  $6n - 1$
- D.  $5 + 2(n - 1)$
- E.  $4n + 1$

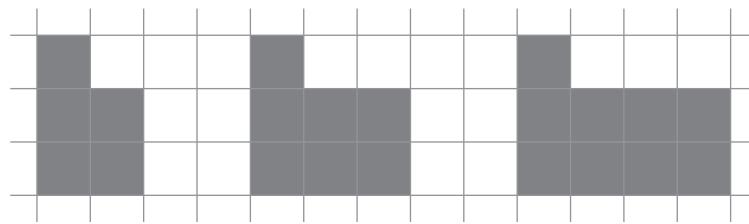


Figure 1

Figure 2

Figure 3

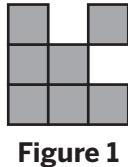
- 4.** The first four terms in a sequence are 2, 6, 18, 54.

- a** Is this an arithmetic sequence or a geometric sequence? Explain your thinking.
- b** What is the common difference (if arithmetic sequence) or common ratio (if geometric sequence)? How did you determine this value?
- c** Write an explicit expression for term  $n$  of this sequence?

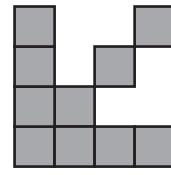
**Problems 5–7:** Here is a visual pattern.

- 5.** Complete the table with the number of tiles in Figures 1–4.

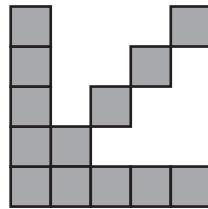
Figure	# of Tiles
1	
2	
3	
4	
...	...
12	



**Figure 1**



**Figure 2**



**Figure 3**

- 6.** Write two explicit expressions for the number of tiles in Figure  $n$ .

- 7.** Use one of your expressions to determine the number of tiles in Figure 12. Show or explain your thinking.

**Additional Practice****2.10**

- 1.** Which value of  $x$  is a solution to the inequality  $-x - 4 > 0$ ?

- A.  $x = -5$       C.  $x = 0$   
 B.  $x = -1$       D.  $x = 2$

- 2.** Which is the solution to the inequality  $2x - 3 \leq x$ ?

- A.  $x \geq 3$       C.  $x \geq -3$   
 B.  $x \leq 3$       D.  $x \leq -3$

- 3.** Consider the inequality  $\frac{8x - 5}{3} \geq 2x + 1$ . Select *all* of the values that are a solution to the inequality.

- A.  $x = -1$        D.  $x = 4$   
 B.  $x = 0$        E.  $x = 5$   
 C.  $x = 2$        F.  $x = 6$

- 4.** Lin is solving the inequality  $8x - 6 < 3x + 19$ . She solves the equation  $8x - 6 = 3x + 19$  and gets  $x = 5$ . Which statements show how the solution to the equation  $8x - 6 = 3x + 19$  helps Lin solve the inequality  $8x - 6 < 3x + 19$ ? Select *all* that apply.

- A. She can substitute 5 into the inequality to determine the correct solution.  
 B. She can substitute 4 or 6 into the inequality to determine the correct solution.  
 C. She can substitute  $-1$  or  $1$  into the inequality to determine the correct solution.  
 D. She knows that the solution must be either all the values less than 5 or all the values greater than 5.  
 E. She knows that the solution must be either all the values less than or equal to 5 or all the values greater than or equal to 5.

5. Solve the inequality  $\frac{1}{4}(-7x - 8) \geq \frac{5x + 16}{4}$ . Show your thinking.

6. Solve each inequality for the variable  $y$ . Show your thinking.

a  $-3y + 1 \leq 4(x - 5)$

b  $2x - 1 - 8x > 3(3 - 2y)$

c  $-\frac{4}{3}\left(\frac{1}{8}y + 6\right) \geq 4x - 5$

7. Consider the inequality  $-2x + 1 < \frac{1}{2}x - 14$ .

a What value of  $x$  makes  $-2x + 1$  and  $\frac{1}{2}x - 14$  equal?

b For what values of  $x$  is  $-2x + 1$  less than  $\frac{1}{2}x - 14$ ? Greater than  $\frac{1}{2}x - 14$ ?

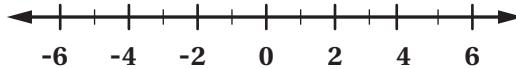
c What is the solution to  $-2x + 1 < \frac{1}{2}x - 14$ ? Explain your thinking.

8. Tyler argues that  $x = 0$  is a solution to the inequality  $-4x < -24$  because it is possible to divide both sides by  $-4$  and get  $x < 4$ . Diego argues that  $x = 0$  is not a solution to the inequality. Who is correct? Explain your thinking.

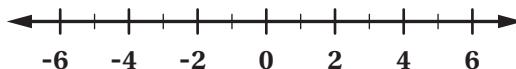
**Additional Practice****2.11**

**Problems 1–3.** Graph all the solutions to each equation.

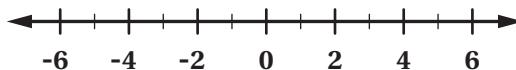
1.  $|x - 4| = 1$



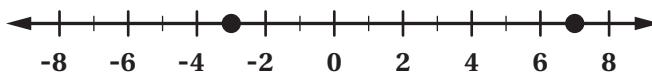
2.  $|x - 3| = 2$



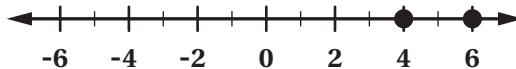
3.  $|x - 1| = 3$



4. What value of  $t$  would make  $|x - t| = 5$  match the graph?

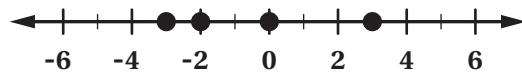


5. Which equations' solutions are shown by the graph?



- A.  $|x - 1| = 5$
- B.  $|x - 5| = 1$
- C.  $|x + 5| = 1$
- D.  $|x + 1| = 5$

6. Piper is thinking of a number somewhere between  $-6$  and  $6$ . Here are some guesses from their friends. No guess was more than  $3$  away. Only one guess was correct. What is Piper's number? Explain your thinking.



# Additional Practice

2.13

**Problems 1–3:** Selena can spend up to \$25 on bagels and croissants at the bakery. A bagel costs \$2 and a croissant costs \$3.

- $b$  is the number of bagels.
- $c$  is the number of croissants.

1. Which inequality represents the situation?
  - A.  $2b + 3c \leq 25$
  - B.  $2b + 3c \geq 25$
  - C.  $3b + 2c \leq 25$
  - D.  $3b + 2c \geq 25$
2. Explain how you know that  $b = 2$  and  $c = 3$  are solutions to this situation.
3. Determine another option for the number of bagels and the number of croissants that Selena can buy at the bakery.
4. Write an ordered pair for a point that is not a solution to  $x + 5y \geq 42$ .

- 5.** Anthony is at an art store and needs to buy red and green paint tubes for a project. A red paint tube costs \$6 and a green paint tube costs \$7. Anthony cannot spend more than \$49 on red and green paint at the art store.

- $g$  is the number of green paint tubes
- $r$  is the number of red paint tubes

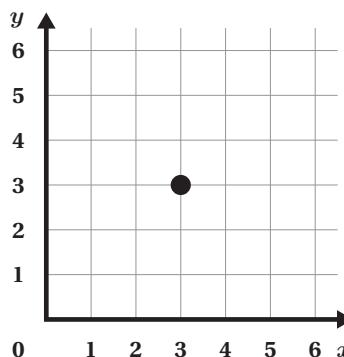
Anthony says that the inequality  $6g + 7r \geq 49$  represents all the green and red paint tubes that he can buy at the art store for his project. Do you agree with him? Explain your thinking.

- 6.** Determine if each ordered pair in the table is a solution to the inequality. Circle Yes or No in the table.

$$2x + 7y \leq 67$$

Ordered Pair	Is the ordered pair a solution?
(2,4)	Yes or No
(3,7)	Yes or No
(4,9)	Yes or No

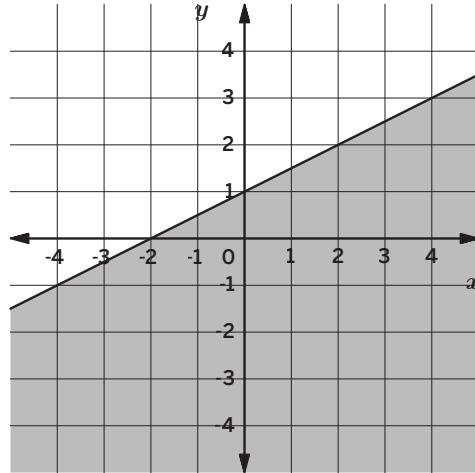
- 7.** Is the point in the graph below a solution to the inequality  $x + 0.5y \geq 4$ ? Circle one.



Yes      No      Maybe

**Additional Practice****2.14**

- 1.** Refer to the graph of the inequality  $x - 2y \geq -2$ . Select *all* the points that are solutions to the inequality.
- A.  $(-3, 4)$        D.  $(1, 3)$   
 B.  $(-1, -2)$        E.  $(2, 2)$   
 C.  $(0, 0)$        F.  $(4, -1)$



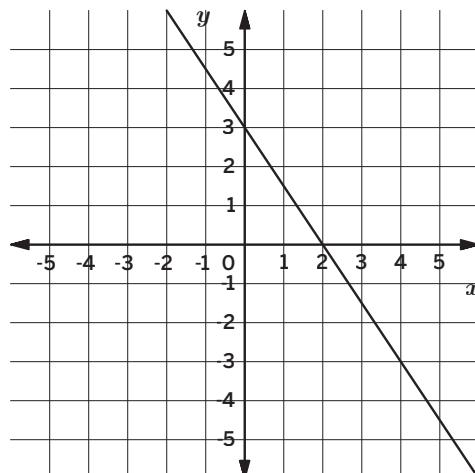
- 2.** Which of the following ordered pairs makes the value of the expression  $6x - 3y$  less than 10?
- A.  $(0, -5)$       C.  $(2, -1)$   
B.  $(1, 3)$       D.  $(4, 0)$

- 3.** Refer to the graph of the equation  $2y + 3x = 6$ .

**a** Are either of the points  $(1, 1.5)$  or  $(3, -1)$  solutions to the equation? Explain your thinking.

**b** Select *all* the points that are solutions to the inequality  $2y + 3x \leq 6$ .

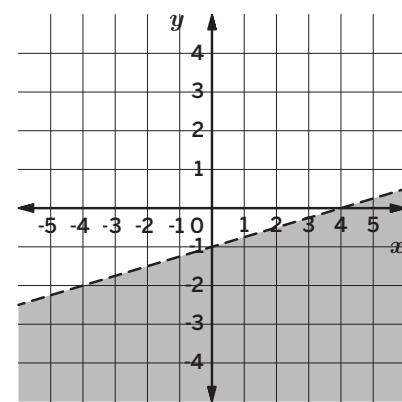
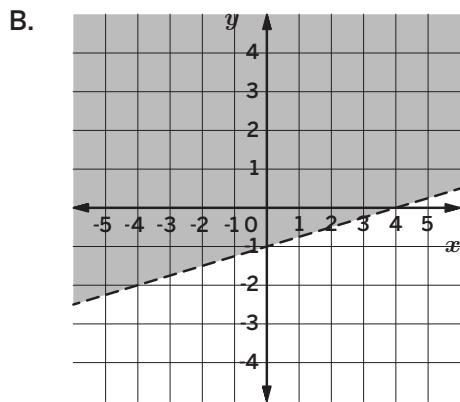
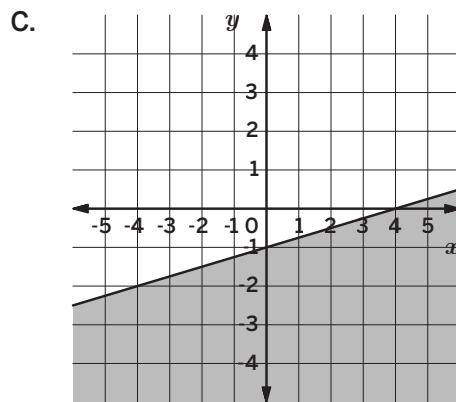
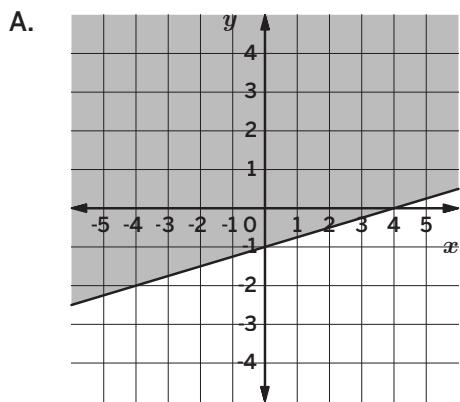
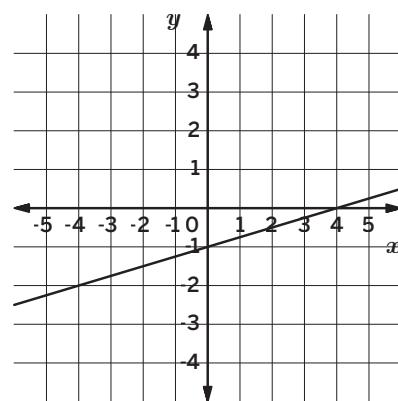
- A.  $(-1, 1)$        D.  $(4, 3)$   
 B.  $(2, 0)$        E.  $(5, -4)$   
 C.  $(0, 2)$



- 4.** Select *all* the ordered pairs that are solutions to the inequality  $8x - 3y > 24$ .

- A.  $(0, 0)$        D.  $(3, -8)$   
 B.  $(0, 3)$        E.  $(3, 0)$   
 C.  $(1, -1)$        F.  $(4, 1)$

5. Refer to the graph of the equation  $x - 4y = 4$ . Which of the following represents the solution set to the inequality  $x - 4y \leq 4$ ?



6. Consider the inequality  $3x + 7y > -6$ . Priya argues that  $(-4, 2)$  is a solution to the inequality and Shawn argues that  $(3, -2)$  is a solution. Who is correct? Explain your thinking.

**Additional Practice****3.01**

- 1.** Which would *not* be a good survey question?
  - A. How many servings of fruits and vegetables do you eat daily?
  - B. What are your favorite healthy snacks?
  - C. Why do people dislike eating healthy foods?
  - D. How much water do you drink daily?
  
- 2.** Determine which type of data these questions produce.

Question	Categorical or Quantitative?
What is your favorite type of music?	
How many cups of coffee or tea do you drink daily?	
What is your average screen time in hours per day?	

- 3.** Select *all* the questions that would produce categorical data.
  - A. What mode of transportation do you use most often?
  - B. How many cups of coffee or tea do you drink daily?
  - C. Which season do you prefer the most?
  - D. Where do you spend your time after school?
  - E. How many pets do you have?
  
- 4.** Maya claims that students who play musical instruments have better grades than those who do not. Write two survey questions that Maya could ask to investigate the claim.

**1.** .....

**2.** .....

5. Liam wants to know about the types of movies his classmates prefer. Write a survey question that would give him *categorical* data about his classmates' movie preferences.
  
  
  
  
  
  
  
  
6. A survey asks students how many hours they spend on homework each week and whether they prefer group work or individual work. Identify what data is collected and whether it is categorical or quantitative.

**Problems 7–8:** Here are some responses to the question: *What is your grade level in school?*

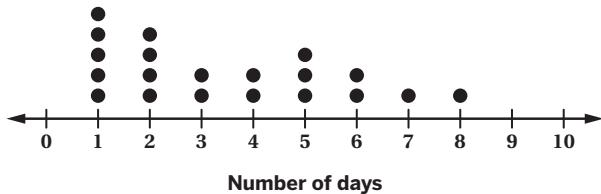
9th Grade              10th grade              8th grade

7. Brett is not sure whether the data is categorical or quantitative. Explain why this type of data is unclear.
  
  
  
  
  
  
  
  
8. What is another question that might generate data that is unclear?

**Additional Practice****3.04**

- 1.** The dot plot shows the number of days in May that a city had a low temperature less than  $40^{\circ}\text{F}$ , for each year from 2010 to 2024. In how many years was the low temperature in May less than  $40^{\circ}\text{F}$  for 5 days or more?

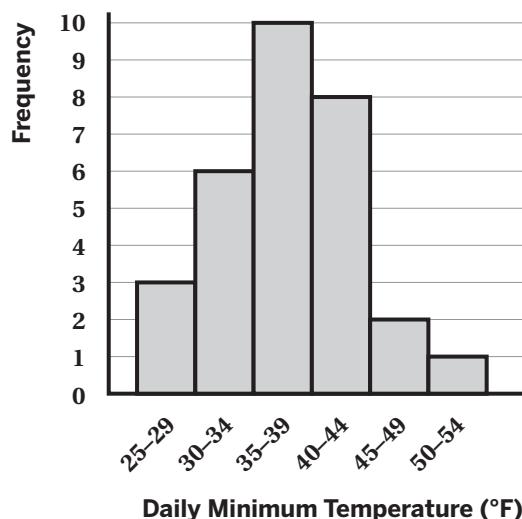
- A. 3
- B. 5
- C. 7
- D. 8



**Problems 2–3:** Elena created a histogram about the different minimum temperature in his hometown of Hartford, Connecticut, in degrees Fahrenheit, for each day in March 2020. The histogram below shows how many days the temperatures were in each temperature range.

- 2.** Select *all* of the statements that must be true.

- A. There were 5 days when the minimum temperature was in the range of  $30\text{--}34^{\circ}\text{F}$ .
- B. There were 11 days when the minimum temperature was  $40^{\circ}\text{F}$  or higher.
- C. The most common minimum temperature range was  $35\text{--}39^{\circ}\text{F}$ .
- D. There are 31 days of minimum temperature data collected.

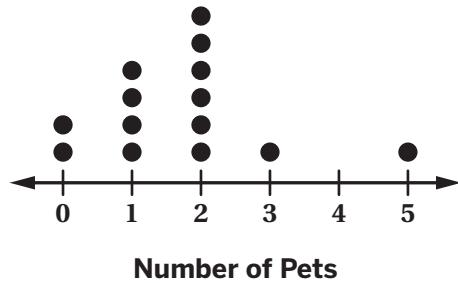


- 3.** Elena claims that half the minimum temperatures are  $37^{\circ}\text{F}$  or less and half are  $37^{\circ}\text{F}$  or greater. Tyler claims that half of the minimum temperatures are  $39^{\circ}\text{F}$  or less and half are  $40^{\circ}\text{F}$  or greater.

Who do you agree with, if either? Explain your thinking.

**Problems 4–6:** Sharla asked her scout troop about the number of family pets they each had. She collected the data on the dot plot shown below.

4. How many members of Sharla's scout troop were surveyed?



5. How many of the surveyed members have two or more pets?

6. Write one true statement that can be answered using the dot plot above that is different from Problems 4 and 5.

7. Jerome collected the data below about the length of the stop light cycle, in seconds, at three different intersections in his town over the course of an hour.

60	62	85	120	75	106
90	110	90	90	78	120
80	82	115	95	92	95

Would this data be best displayed using a dot plot or histogram?  
Explain your thinking.

## Additional Practice

3.05

- 1.** The following data set represents the number of minutes ten students spend walking to school each morning. What is the median?

7, 9, 9, 10, 15, 15, 16, 18, 18, 20

- 2.** What is the IQR of the following data set?

32, 35, 36, 41, 41, 44, 46, 52, 56, 61

- A. 16
- B. 24
- C. 42.5
- D. 52

- 3.** A food truck owner tracks the number of customers they have each hour they are open for a month. They determine the median number of customers per hour is 62. What information does this tell the food truck owner about the number of customers per hour?

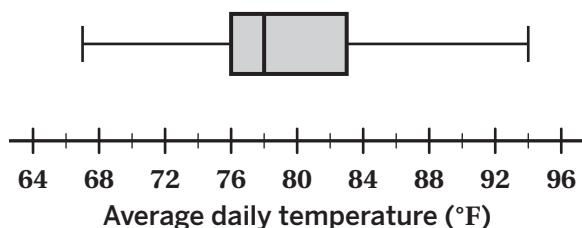
- A. The average number of customers per hour for the food truck is 62.
- B. Most of the time, the food truck has 62 customers per hour.
- C. Twenty-five percent of the time, the food truck has 62 customers per hour.
- D. Half of the time, the food truck has 62 or fewer customers per hour, and half the time, the food truck has 62 or more customers per hour.

- 4.** Calculate the median of the following data set.

32, 35, 35, 41, 42, 44, 49, 51, 56, 60

5. The box plot represents the distribution of average daily temperatures of a town during 20 days of summer. Determine the five-number summary that represents this data.

a Minimum     b Q1     c Median



d Q3     e Maximum

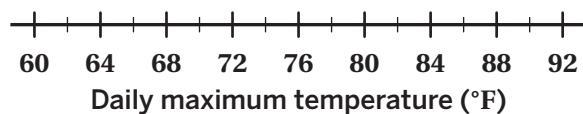
6. The table summarizes the daily maximum temperatures of Charlotte, North Carolina, in degrees Fahrenheit, for the first 18 days of May 2020.

70	75	84	82	70	72	66	63	64
70	66	64	70	81	81	84	82	79

a Determine the five-number summary of the data.

Minimum: ..... Q1: ..... Median: ..... Q3: ..... Maximum: .....

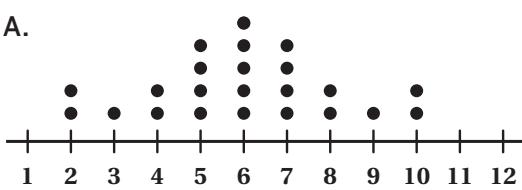
b Create a box plot that represents the data.



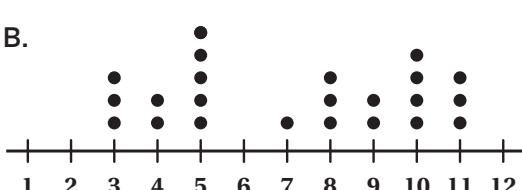
**Additional Practice****3.06**

- 1.** Which distribution shape has a long right tail?
  - A. Bell-shaped
  - B. Bimodal
  - C. Skewed
  - D. Uniform
  
- 2.** A dot plot has a uniform distribution. Which of the following is always *true*?
  - A. There are more data values near the center.
  - B. The data values are distributed equally for the same frequency.
  - C. There are more data values on the left or on the right side of the center.
  - D. There are few data values near the center of the data, with two peaks on the left and right of the center.
  
- 3.** Select *all* dot plots that have a symmetric, or approximately symmetric, distribution.
 

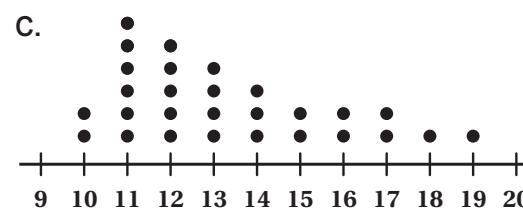
A.



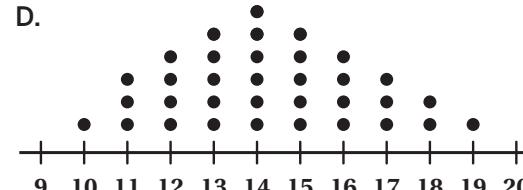
B.



C.

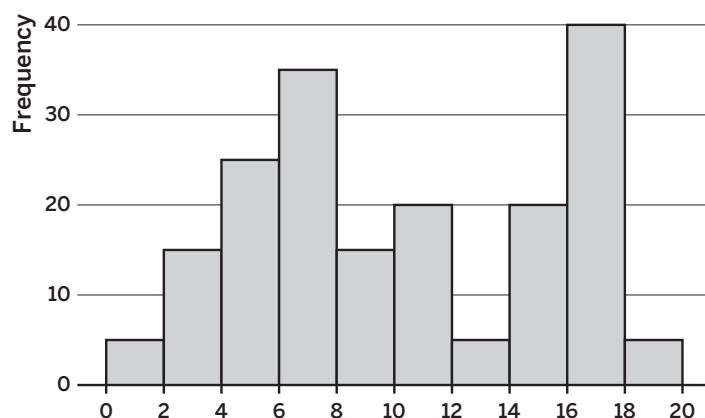


D.

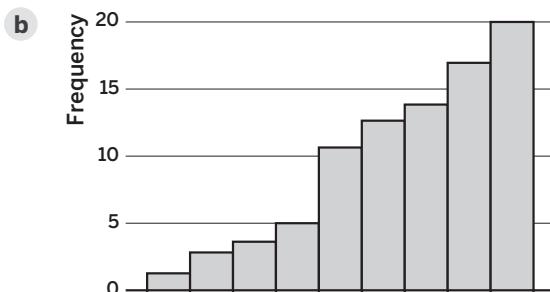
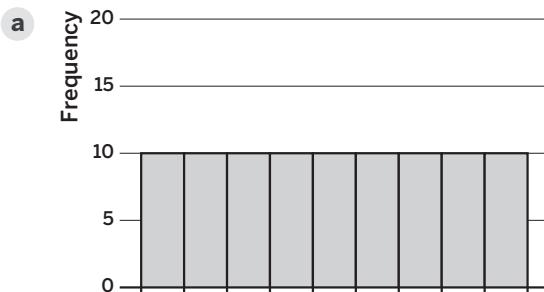


- 4.** Which describes the shape of the distribution of data shown in the histogram?

- A. Bimodal
- B. Bell-shaped
- C. Skewed
- D. Symmetric



5. Describe the shape of each distribution shown.



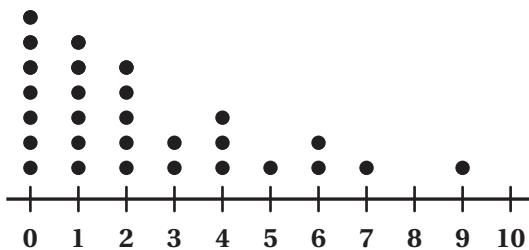
6. A histogram has a symmetric distribution. Which of the following could be possible shapes of the distribution? Select *all* that apply.

- A. Bell-shaped
- B. Bimodal
- C. Skewed
- D. Uniform

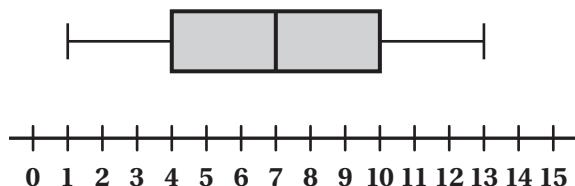
7. Which statements correctly describe how the data is distributed in the given dot plot?

Select *all* that apply.

- A. The data is bimodal.
- B. The data is skewed.
- C. The data is distributed symmetrically.
- D. The data is bunched mostly in the lower values of 0–2.
- E. The data is uniform.



8. Consider the box plot shown. Lin claims that the distribution of the data is both symmetric and uniform. Andre argues that the distribution is symmetric, but not uniform. Who is correct? Explain your thinking.



**Additional Practice****3.07**

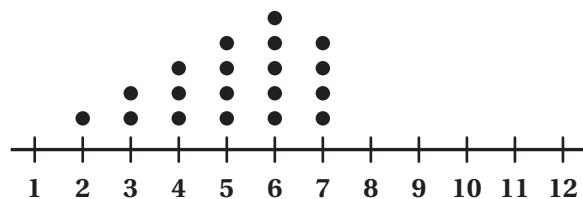
- 1.** Consider the following data set: 13, 22, 5, 4, 7, 13, 8, 11, 10, 41. What is the mean?

- A. 10
- B. 10.5
- C. 13
- D. 13.4

- 2.** Consider the data shown in the dot plot.

What is the median?

- A. 4
- B. 4.5
- C. 5
- D. 6



- 3.** For each distribution shape, determine whether it is more appropriate to use the mean or median as a measure of center.

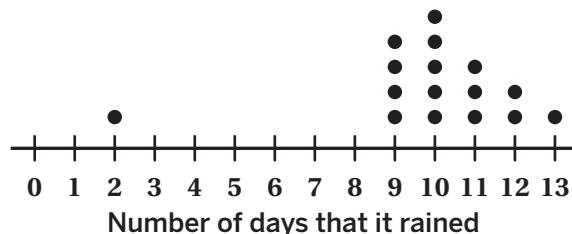
**a** Uniform

**b** Skewed

**c** Symmetric

**d** Bell-shaped

- 4.** The number of days that it rained in one month for several cities is displayed in the dot plot. Which is greater, the mean or the median? Explain your thinking using the shape of the distribution.



- 5.** The data set represents the scores of Han's assignments. Is 56 an outlier? Explain your thinking.

56, 78, 78, 80, 83, 85, 88, 94, 97, 100

- 6.** The following data set represents the number of pounds of paper recycled by 12 different classrooms in a school year. What effect does eliminating the least value, 8, from the data set have on the mean and the median?

8, 45, 48, 51, 52, 58, 60, 64, 65, 68, 69, 70

- A. Only the mean will increase.
- B. Only the median will increase.
- C. Both the mean and median will increase, and the mean will increase more.
- D. Both the mean and median will increase, and the median will increase more.

- 7.** Consider the following data set: 2, 13, 4, 9, 1, 0, 11, 5, 5, 24, 2, 8. Mai claims that there is an outlier in this data set. Han thinks that there are no outliers. Who is correct? Explain your thinking.

- 8.** Consider the following data set: 45, 45, 46, 46, 50, 50, 50. Shawn claims that the values 50, 55, 55, 60, and 10 are added to the data set, the median will be greater than the mean. Do you agree? Explain your thinking.

**Additional Practice****3.08**

- 1.** The data set represents the grams of protein in all the breakfast bars in a box.

8, 8, 8, 8, 8, 8, 8, 8

**a** What is the mean?

**b** What is the standard deviation?

- 2.** Which of the following data sets has the same mean as the data set 3, 3, 3, 3, 3, 3?

A. -3, -3, -3, -3, -3, -3

B. -2, -2, -2, 4, 4, 4

C. 1, 1, 1, 5, 5, 5

D. 1, 4, 1, 4, 1, 4

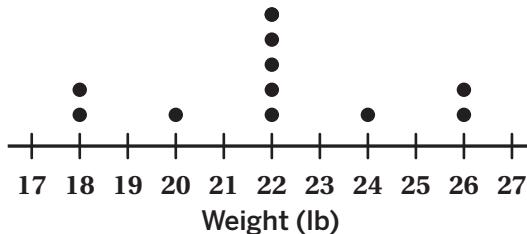
- 3.** The dot plot represents the weights of 11 watermelons. Determine which of the following best estimates the standard deviation of the weights of the watermelons.

A. 2 lb

C. 22 lb

B. 10 lb

D. 44 lb



- 4.** The mean of Data set A is 30.1 and the standard deviation is 4.3. The mean of Data set B is 15.9 and the standard deviation is 2.5.

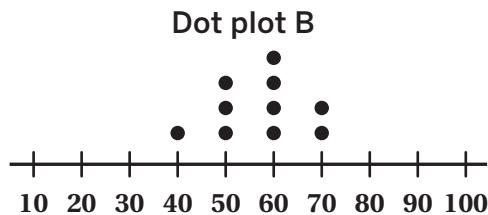
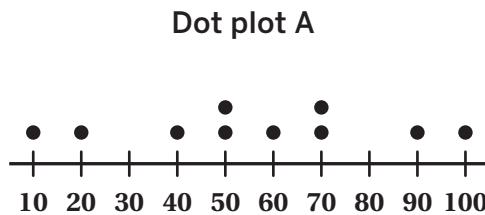
**a** Which data set shows greater variability? Explain your thinking.

**b** Complete each statement to describe what differences you would expect to see when comparing dot plots of the two data sets.

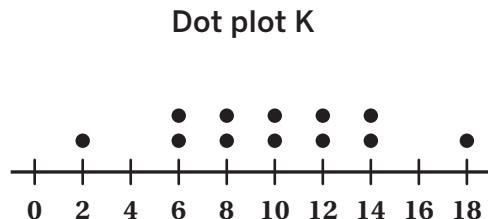
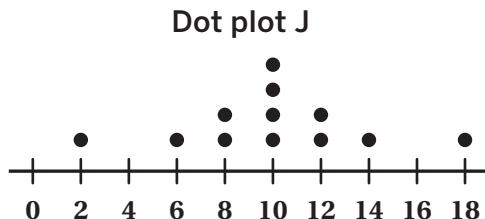
Data set A's dot plot will have most of the data centered around ..... with the data, on average, ..... units above or below that value.

Data set B's dot plot will have most of the data centered around ..... with the data, on average, ..... units above or below that value.

5. Refer to the two dot plots. Which dot plot shows greater variability? Explain your thinking.

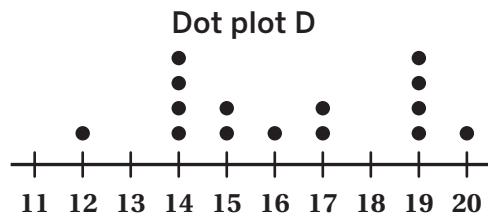
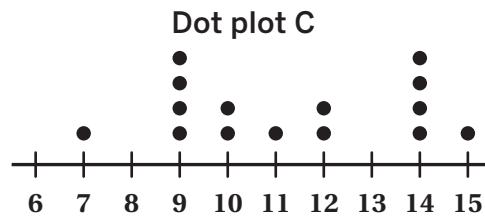


6. Which of the following statements is true about Dot plots J and K?



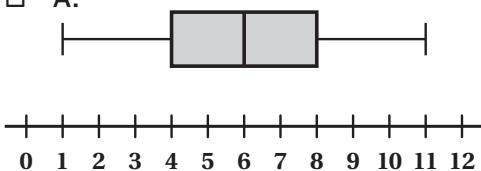
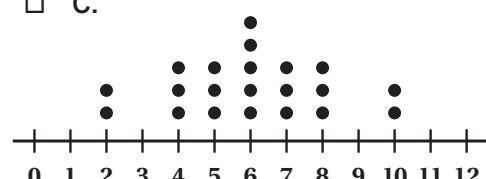
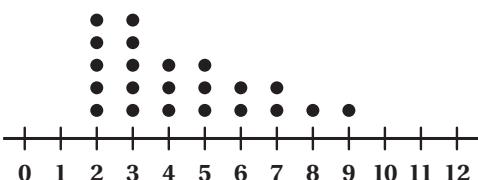
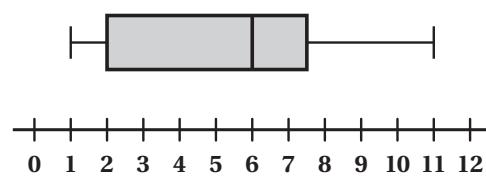
- A. The dot plots have the same mean and the same standard deviation.
- B. The dot plots have the same mean, but different standard deviations.
- C. The dot plots have the same standard deviation, but different means.
- D. The dot plots have different means and different standard deviations.

7. Refer to the two dot plots. Priya claims that the standard deviation of the data in Dot plot D is greater than the standard deviation of the data in Dot plot C. Do you agree with Priya? Explain your thinking.

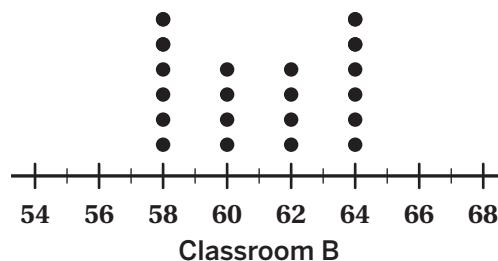
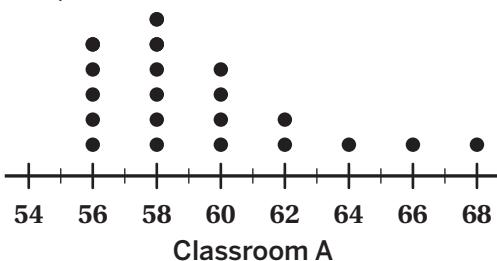


**Additional Practice****3.10**

- 1.** A set of data has values that are clustered closely near the center. Which of the following is a *true* statement?
- A. The distribution is uniform.  
B. The distribution is skewed.  
C. The distribution has high variability.  
D. The distribution has low variability.
- 2.** Which of the following distributions are symmetric? Select *all* that apply.

 A. C. B. D.

- 3.** The heights, in inches, of 20 students from two different classrooms are shown in the dot plots.



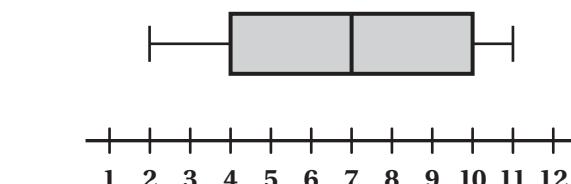
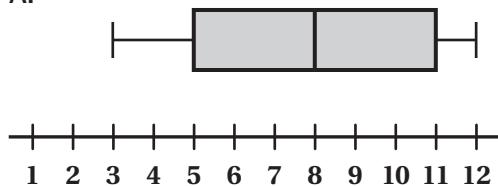
- a** What are the appropriate measures of center and variability to use with each data set? Explain your thinking.

- b** Which classroom shows a greater typical height? Explain your thinking.

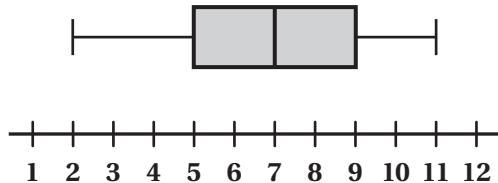
- c** Which classroom shows a greater variability? Explain your thinking.

4. Consider the box plot shown. Which of the following box plots has a smaller measure of variability but the same minimum and maximum values?

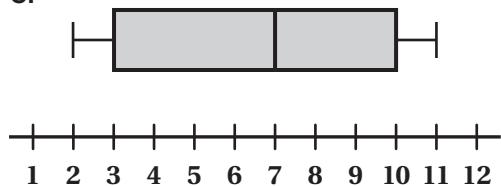
A.



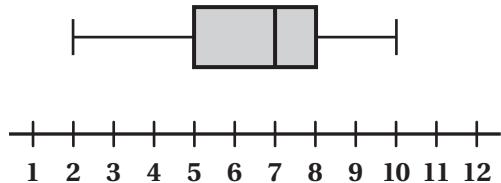
B.



C.

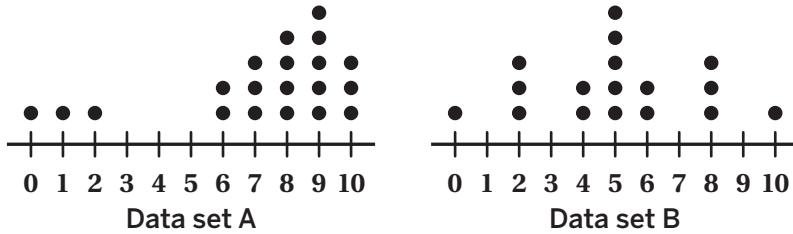


D.



5. Consider the two graphs.

- a For which data set would the most appropriate measure of center be the mean? Explain your thinking.



- b For which data set would the most appropriate measure of variability be the IQR? Explain your thinking.

6. The mean height of 30 trees in one orchard is 20.4 ft with a standard deviation of 0.8 ft. The mean height of 30 trees in a second orchard is 20.1 ft with a standard deviation of 4.5 ft. Both distributions are close to being symmetric in shape. Trees that are 20 ft or taller need to be pruned. Which orchard do you think has more trees that need pruning? Explain your thinking.

# Additional Practice

3.11

- 1.** Consider this data set: 0, 0, 1, 1, 2, 4, 4, 5, 6, 20. Which measure of center is greater: the mean or the median?

- 2.** Consider this data set: 30, 30, 32, 33, 35, 35, 35, 36, 38, 90.

**a** Determine the mean and median.

**b** Eliminate the greatest value, 90, from the data set. Determine the mean and median.

**c** Was the mean or median affected by eliminating the greatest value?

- 3.** Consider this data set: 70, 70, 70, 75, 75, 75, 78, 78, 79, 80.

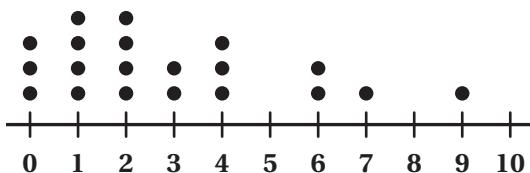
**a** Do the mean and standard deviation of the data set increase or decrease if the 80 is changed to an 8?

**b** If the 80 is changed to an 8, would the median or the mean be a more appropriate measure of center? Explain your thinking.

- 4.** Consider this data set: -8, 5, 5, 6, 8, 8, 9, 10, 10, 10. If the least value is eliminated from the data set, which measure is affected more: the mean or the median? Explain your thinking.

5. Refer to the dot plot.

- a Which measure of center do you think is more appropriate for this data set? Explain your thinking.



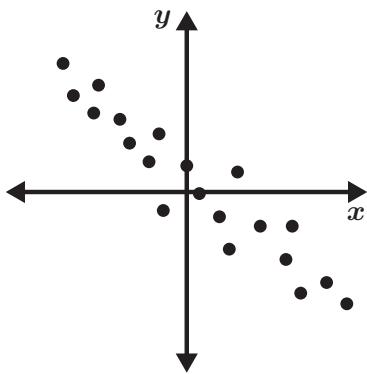
- b Which measure of variability do you think is more appropriate for this data set? Explain your thinking.
- c If the maximum value is replaced by a value that is twice as large, which measures of center and variability would change? Explain your thinking.

**Additional Practice**

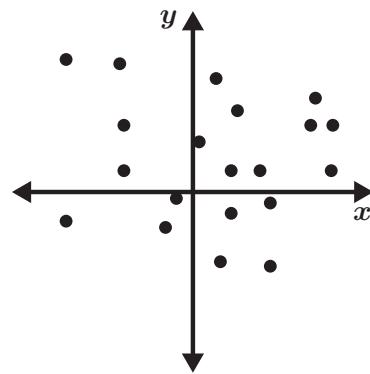
3.13

**Problems 1–4:** Determine whether each scatterplot has a strong linear relationship, weak linear relationship, or no linear relationship. Circle your choices for each problem.

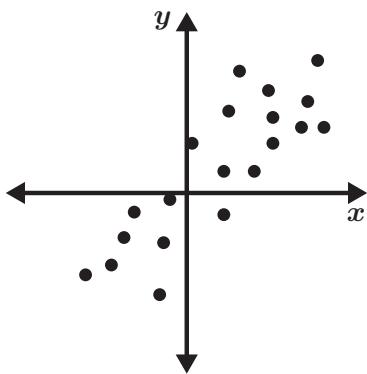
1. Strong      Weak      None



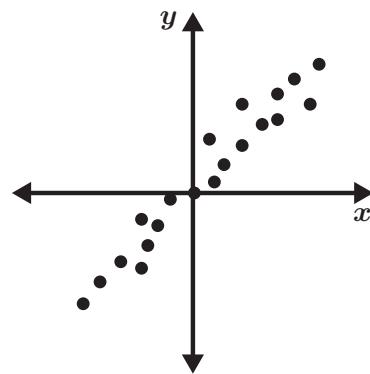
2. Strong      Weak      None



3. Strong      Weak      None



4. Strong      Weak      None



5. A scatter plot is found to have a correlation coefficient of  $r = 0.88$ . What does this tell you about the data? Select *all* that apply.

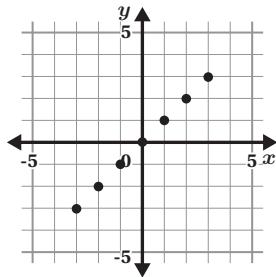
- A. The data has a weak association.
- B. The data has a strong association.
- C. The trend of the data has a positive association.
- D. The trend of the data has a negative association.

- 6.** Which correlation coefficient indicates the *weakest* association?
- A.  $r = 0.75$   
B.  $r = 0.23$   
C.  $r = -0.32$   
D.  $r = -0.94$
- 7.** Merilyn was talking about the strength of linear associations. She said that all data with negative  $r$ -values are weak associations and all data with positive  $r$ -values are strong associations. What is incorrect about Merilyn's thinking? How would you convince her otherwise?

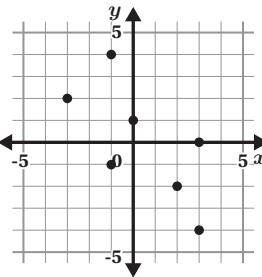
**Additional Practice****3.14**

- 1.** Match each scatter plot to its correlation coefficient,  $r$ .

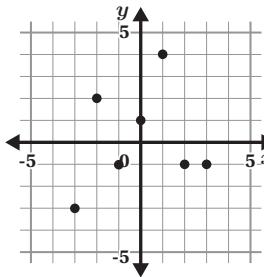
A.  $r = 0.92$ .



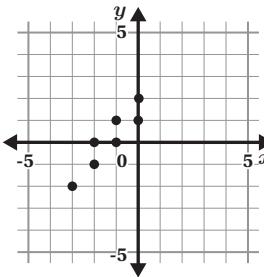
B.  $r = 0.16$ .



C.  $r = 1$ .



D.  $r = -0.68$ .



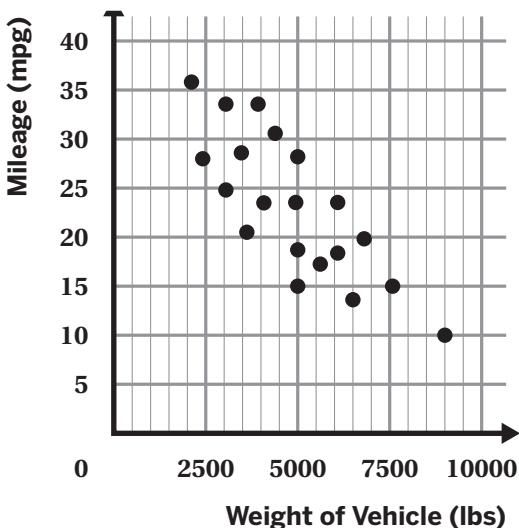
- 2.** A scatter plot is found to have a correlation coefficient of  $r = -0.49$ . Select *all* the conclusions you can make about the data.
- A. There is a weak association between the two variables.
  - B. There is a strong association between the two variables.
  - C. There is no association between the two variables.
  - D. As one variable increases, the other increases.
  - E. As one variable increases, the other decreases.
- 3.** The data in the table represents the number of cans students collected during a school food drive. Elena graphs the data and claims the correlation coefficient for the data would likely be a number between 0.5 and 1. Lin argues that the correlation coefficient would likely be a number between 0 and 0.5. Who do you agree with? Explain your thinking.

Day	1	2	3	4	5	6	7	8
Number of Cans	20	50	45	53	60	62	71	80

**Problems 4–6:** Marcus is interested in buying a new car that gets good gas mileage. He found data about two variables:

- Weight of vehicle (in pounds)
- Mileage of vehicle (miles/gallon)
- $r = -0.78$

Here is a scatter plot for the data.



4. The point (2200, 36) represents a Honda Civic. What do the coordinates tell us about the Honda Civic?

5. Based on the  $r$ -value of  $r = -0.88$ , what relationship is there between the variables? Circle one.

Positive      Negative      Neither

6. What is the strength of the relationship? Circle one.

Weak      Strong

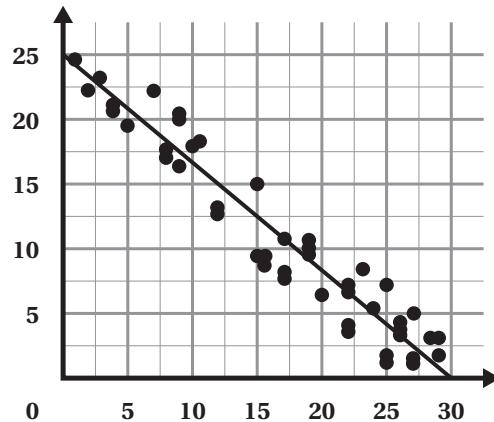
7. Which of the following claims can be made about the relationship between the weight of a car and its average mileage?

- A. The lighter the vehicle, the better its gas mileage.
- B. The heavier the vehicle, the better its gas mileage.
- C. There is a negative association between the weight of a vehicle and its average gas mileage.
- D. There is a positive association between the weight of a vehicle and its average gas mileage.

**Additional Practice****3.15**

- 1.** Which is the best estimate for the slope of the line?

- A.  $-\frac{5}{6}$
- B.  $-\frac{1}{2}$
- C.  $\frac{1}{2}$
- D.  $\frac{5}{6}$



**Problems 2–5.** The scatter plot shows the amount of a discount on a product and the number of products that are sold in Store A owned by a company.

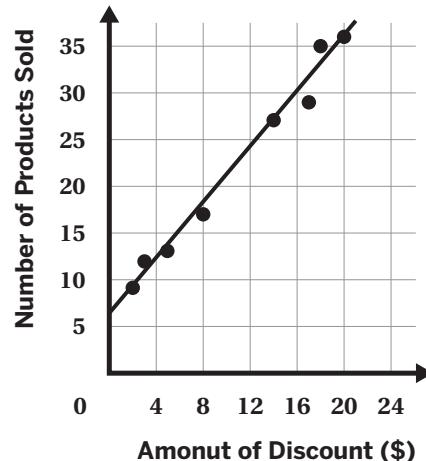
- 2.** The scatter plot includes a point at (8, 17). Describe what this point means in context.

- 3.** What is another point that would fit this trend line? What does it represent?

- 4.** The equation for the line that best fits this data is  $y = 1.48x + 6.15$ . What do the numbers 1.48 and 6.15 mean in this context?

- 5.** The company decides to collect the same data at their other two stores. The equation of their lines of best fit are shown in the table.

Which store is the *least* profitable, or sells the *least* amount of products with each \$1 of discount?  
Explain your thinking.



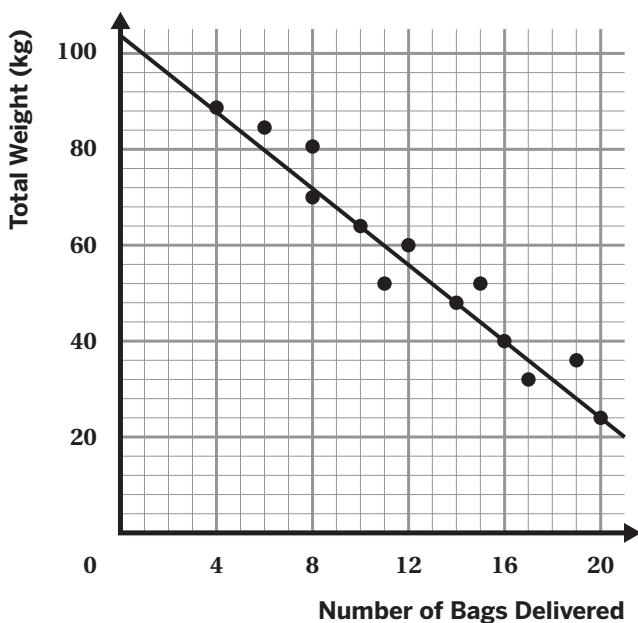
Store	Line of Best Fit
A	$y = 1.4x + 6.15$
B	$y = 0.85x + 5$
C	$y = 1.72x + 5.5$

6. The scatter plot shows the total weight of bags of groceries to be delivered to customers and the number of bags delivered. The equation for the line of fit is given by  $y = -4x + 105.6$ , where  $y$  represents the total weight in kilograms and  $x$  represents the number of bags that are delivered. The slope of the line is  $-4$  and the  $y$ -intercept is  $105.6$ .

Which of the following statements are *true*?

Select *all* that apply.

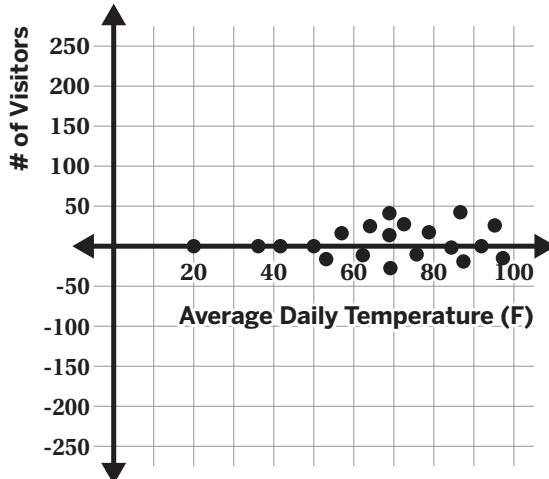
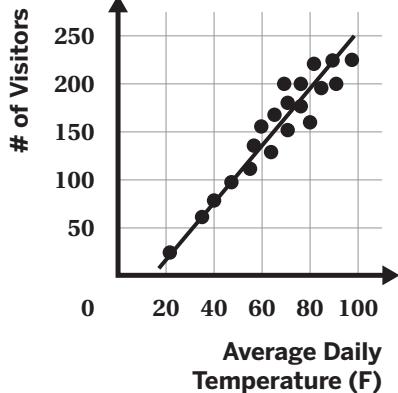
- A. Each additional bag delivered increases the total weight by about 4 kilograms.
- B. Each additional bag delivered decreases the total weight by about 4 kilograms.
- C. Each additional bag delivered decreases the total weight by about 105.6 kilograms.
- D. Before any bags are delivered, the total weight of the groceries is 105.6 kilograms.
- E. After about 106 bags are delivered, the total weight is 0 kilograms.



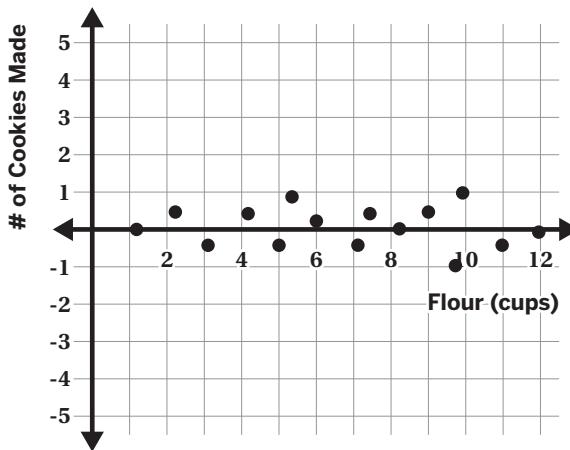
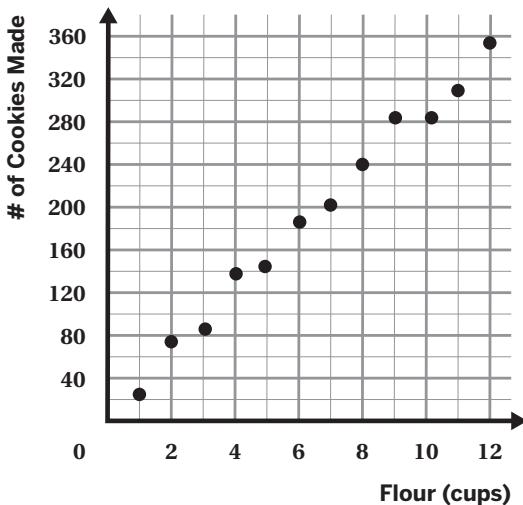
**Additional Practice**

3.16

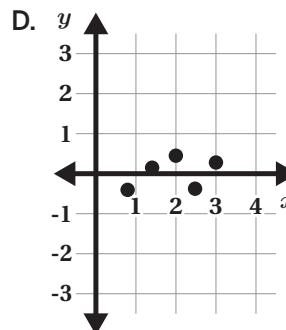
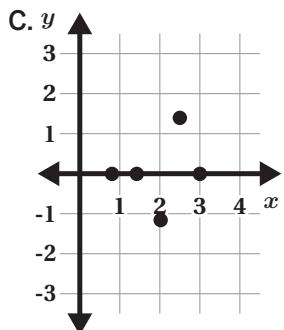
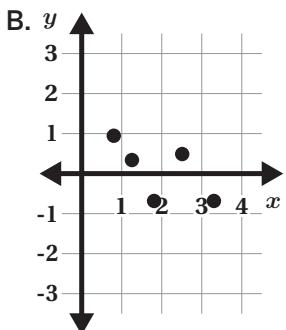
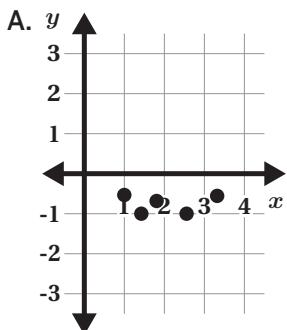
**Problems 1–2:** The scatterplot shows the number of visitors to a local beach, the average daily temperature, and a line that best fits the data. The residual plot is also shown.



- Predict the number of visitors at the beach when it is 70°F.
- How can you tell that the graphed line is a good fit for the data? Use the residual plot if it helps your thinking.
- Here is a scatter plot and its corresponding residual plot. Draw a line of fit on the scatter plot that corresponds to the residual plot.



- 4.** These residual plots are from the same set of data, but each one represents a different line of fit. Which residual plot shows the best line of fit?



**Problems 5–6:** This scatter plot shows the relationship between the number of months training for a marathon to the completion time (in minutes).

- 5.** Which  $r$ -value could represent the correlation coefficient for this data?

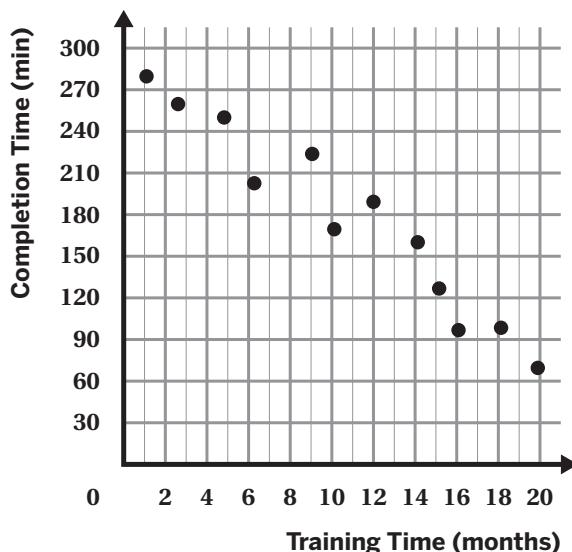
A. 0.82  
C. 0.26

B.  $-0.82$   
D.  $-0.26$

- 6.** Which equation could represent the line of best fit?

A.  $y = 290x + 12$   
C.  $y = -290x + 12$

B.  $y = 12x + 290$   
D.  $y = -12x + 290$



Explain your thinking.

# Additional Practice

3.17

**Problems 1–3:** This scatter plot shows the relationship between the number of hours a person exercises each week and their resting heart rate, in beats per minute.

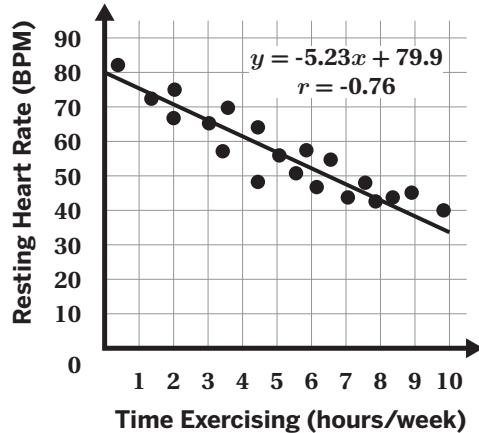
1. The equation for the line of best fit is  $y = -5.23x + 79.9$ .

- a. What does the 79.9 mean in this situation?
- b. What does the  $-5.23$  mean in this situation?

2. Nina exercised for 4 hours this week.

Use the equation of line of best fit to predict her resting heart rate.

3. Do you think the prediction is accurate? Use the  $r$ -value to explain your thinking.



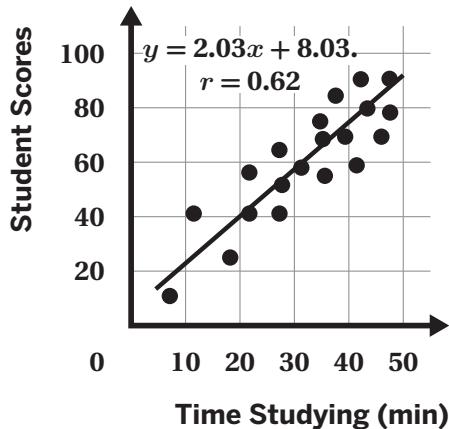
**Problems 4–6:** The scatter plot shows the relationship between the amount of time spent studying for a recent math test (in minutes) and the scores the students earned on the test.

4. The equation for the best fit line is  $y = 2.03x + 8.03$ .

What does the 2.03 mean in this situation?

5. Rajah studied for this test for 40 minutes.

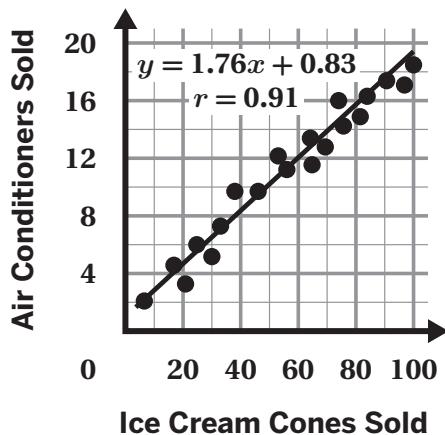
Use the equation of line of best fit to predict his score on the test.



6. Do you think the prediction is accurate? Use the  $r$ -value to explain your thinking.

**Problems 7–9:** The scatter plot shows the relationship between the number of ice cream cones and the number of air conditioners sold in a month.

7. Describe the relationship between the number of ice cream cones sold and the number of air conditioners sold in a month.



8. Do you think one variable causes the other? Explain your thinking.

9. What else might affect this relationship? Explain your thinking.

# Additional Practice

4.01

1. Here is Rule A. Rule A takes a number and assigns the number a letter as output.

Rule A

Input	2	3	2	6
Output	A	C	B	F

Is Rule A a function? Explain your thinking.

- Problems 2–3: Here is Rule B. Rule B takes a number and assigns a number as output.

Rule B

Input	3	6	9	12
Output	2	4	6	?

2. Is Rule B a function? Explain your thinking.

3. Predict what the output could be when the input is 12.

**Problems 4–5:** Here is Rule C. A machine uses Rule C to turn inputs into outputs. Rule C adds 3 to the input and then multiplies by 2 to get the output.

Rule C

Input	1	9	11	20
Output	8	?	28	46

- 4.** Is Rule C a function? Explain your thinking.
  
  
  
  
  
- 5.** Predict what the output could be when the input is 9.
  
  
  
  
  
- 6.** Here is Rule D. Rule D takes a number and assigns a random number that is greater as the output.

Rule D

Input	2	2	3	4
Output	3	4	4	6

Is Rule D a function? Explain your thinking.

**Additional Practice****4.02**

- 1.** The function notation statement  $C(3) = 21$  means, “The cost of 3 tickets is \$21.” What is the input value? The output value?

- 2.** The table shows the distance in meters that Elena walks her dog for different times. Which equation represents her walking the dog 280 m in 4 minutes?

- A.  $f(2) = 140$       C.  $f(140) = 2$   
 B.  $f(4) = 280$       D.  $f(280) = 4$

Time (minutes)	Distance (m)
2	140
4	280

- 3.** The function  $R$  represents the number of feet above the loading platform that a roller coaster is  $n$ , as a function of time  $t$ , in seconds. Match each verbal statement with its corresponding function notation. Not all of the function notation equations will be used.

**Verbal statement**

a. At the start, the roller coaster is at the loading platform.

**Function notation**

.....  $R(110) = 0$

b. The roller coaster is  $n$  ft above the loading platform after  $t$  seconds.

.....  $R(0) = 0$

.....  $R(75) = 130$

c. After 75 seconds, the roller coaster is 130 ft above the loading platform.

.....  $R(0) = 110$

.....  $R(130) = 75$

d. The roller coaster is 75 ft above the loading platform after 130 seconds.

.....  $R(t) = n$

.....  $R(n) = t$

e. After 110 seconds, the roller coaster is at the same height as the loading platform.

- 4.** Suppose a function  $D$  takes a date in October as its input and tells whether a student has a soccer game as its output.

- a** Complete the following to use function notation to represent the statement, "A student has a soccer game on October 12."

$$D(\text{.....}) = \text{.....}$$

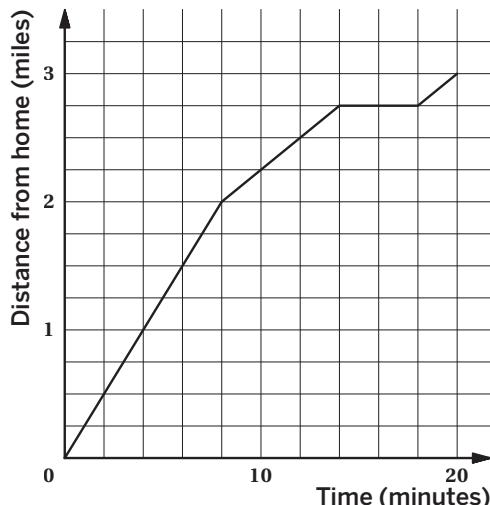
- b** Write a statement to describe the meaning of  $D(25) = \text{No soccer game}$ .

- 5.** The function  $C$  gives the cost, in dollars, of buying  $n$  packs of gum. Which of the following statements are true? Select *all* that apply.

- A.  $C(4) = 6$  means 6 packs of gum cost \$4.
- B.  $C(4) = 6$  means 4 packs of gum cost \$6.
- C.  $C(3)$  represents the cost of 3 packs of gum.
- D.  $C(3)$  represents the packs of gum that cost \$3.
- E. The equation  $C(5) = 7.5$  means that five packs of gum cost \$7.50.

- 6.** Shawn is riding a bike to a friend's house. The graph represents the function  $D$ , Shawn's distance from home, in miles, after  $t$  minutes.

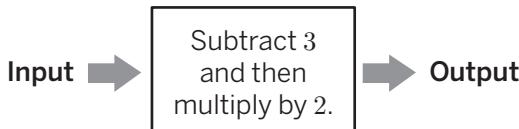
- a** How far away from home is Shawn after 10 minutes?
- b** After 20 minutes, Shawn is 3 miles from home. Lin writes this verbal statement in function notation as  $D(3) = 20$ . Is she correct? Explain your thinking.



- c** Kiran claims that distance is a function of time, and time is a function of distance. Do you agree? Explain your thinking.

**Additional Practice****4.03**

- 1.** Use the function machine to complete the table.



Input	Output
-2	
4	
1.5	
6	

- 2.** Match each statement with a description of the function it represents.

**Statement****Description**

- a.  $f(x) = 5x - 3$  ..... To get the output value, subtract 3 from the input value, and then multiply the result by 5.
- b.  $g(x) = 3(x - 5)$  ..... To get the output value, subtract 5 from the input value, and then multiply the result by 3.
- c.  $h(x) = 5(x - 3)$  ..... To get the output value, multiply the input value by 5, and then subtract 3 from the result.
- d.  $j(x) = 3x - 5$  ..... To get the output value, multiply the input value by 3, and then subtract 5 from the result.

- 3.** One tomato plant costs \$6. The function  $C$  represents the cost, in dollars, of  $x$  tomato plants, where the cost of 1 tomato plant is \$6.

- a** Complete the table.

$x$	0	1	2	3	4	5	6
$C$							

- b** Write a function notation statement to represent the function  $C$ .

4. Consider the function  $B(x) = 7.5x + 30$ . What is the value of  $B(4)$ ?

A. 30  
B. 40.5

C. 41.5  
D. 60

5. A local swimming pool offers membership Plans Q and R as described in the table. The function representing each plan gives the total cost, in dollars, for  $m$  months of membership.

Plan Q
\$50 per month, plus a \$25 application fee $Q(m) = 50m + 25$

Plan R
\$400 per year $R(m) = 400$

- a Complete the following to describe the meaning of the statement  $Q(3) = 175$ .

The total cost of Plan ..... is \$ ..... after ..... months.

- b Which is greater,  $Q(6)$  or  $R(6)$ ?

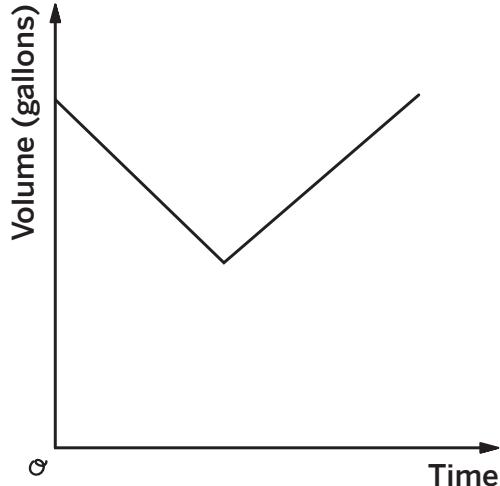
- c Which is less,  $Q(10)$  or  $R(10)$ ?

6. A dolphin is swimming at a constant speed of 3 mph. The total distance the dolphin has traveled in  $t$  hours can be represented by the function  $D(t) = 3t$ .

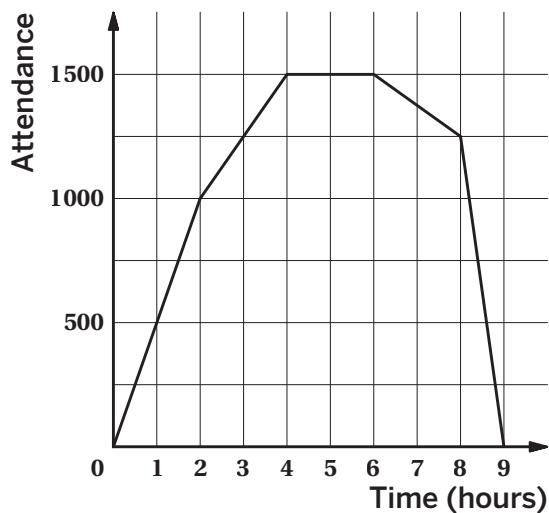
Determine the value of  $D(2.5)$  and explain what it means in this situation.

**Additional Practice****4.04**

- 1.** The graph represents the volume of water in a tank as a function of time. Which of the descriptions matches the graph?
- A 2,000-gallon water tank starts out empty. It is filled for 5 hours, slowly at first, and faster later.
  - A full 10-gallon water tank is drained for 30 seconds until it is half full. Afterwards, it gets refilled.
  - An empty 20-gallon water tank is filled at a constant rate for 3 minutes until it is half full. Then it is emptied at a constant rate for 3 minutes.
  - An empty 100-gallon water tank is filled in 50 minutes. Then a dog jumps in and splashes around for 10 minutes, letting 7 gallons of water out. The tank is refilled afterwards.

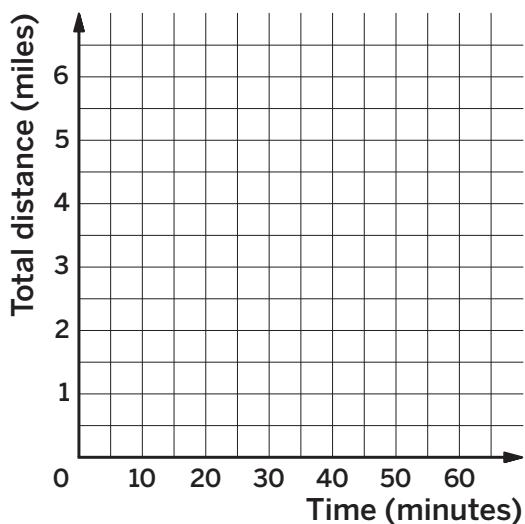


- 2.** The graph shows the attendance at an arts festival as a function of time in hours. Which of the following statements about the graph are true? Select all that apply.
- A. The number of people increases the first 4 hours, then stays the same for 2 hours, and then decreases the last 3 hours.
  - B. The number of people decreases the first 4 hours, then stays the same for 2 hours, and then increases the last 3 hours.
  - C. The average rate of change of the function for the interval  $[0, 5]$  is 375 people per hour.
  - D. The interval  $[0, 9]$  represents the hours during which the festival attendance varied.
  - E. The average rate of change of the function for the interval  $[6, 9]$  is  $-500$  people per hour.



- 3.** Lin runs for 30 minutes at a constant rate and goes a total distance of 3 miles. She stops and rests for 10 minutes. She then runs for 25 more minutes at a constant rate and during that time goes 2 more miles.

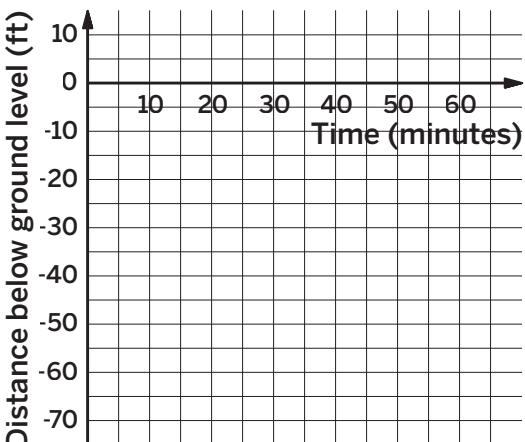
- a** Sketch a graph to represent this scenario.
- b** What is the domain of this scenario and what does it represent?



- c** What is the range of this scenario and what does it represent?

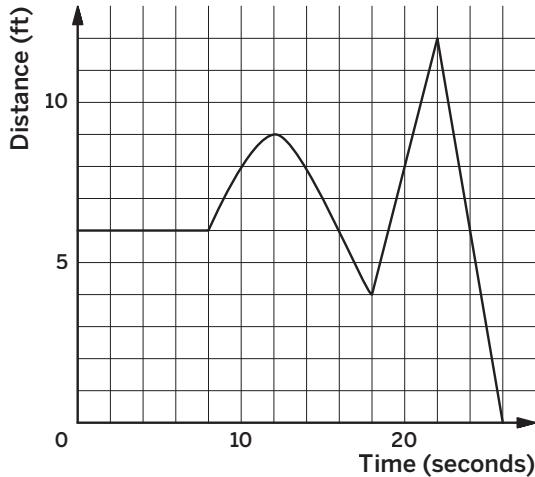
- 4.** Priya goes on a tour of a cave. The tour starts at ground level and then descends for 20 minutes to a depth of 65 ft below ground level. The tour stays at this level for 15 minutes, and then ascends for 15 minutes to a depth of 25 ft below ground level. The tour stays at this level for 10 minutes, and then spends the last 5 minutes ascending to ground level.

- a** Sketch a possible graph describing Priya's distance relative to ground level as a function of time.
- b** Kiran and Mai are arguing about which time interval represents the "fastest" ascent or descent of the tour. Kiran says that the descent on the interval  $[0, 20]$  was the fastest. Mai claims that the ascent on the interval  $[60, 65]$  was the fastest. Who is correct? Explain your thinking.



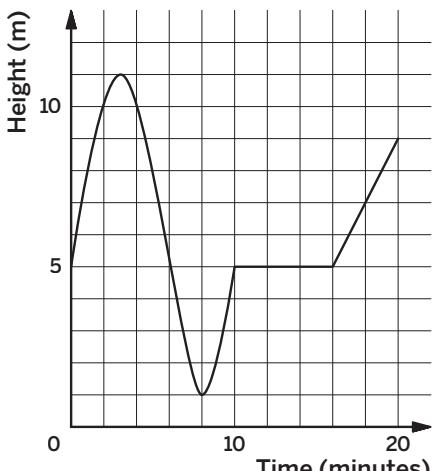
**Additional Practice****4.05**

- 1.** The graph represents Clare's distance from her front door as she gets ready to go to school. Determine which of the following statements are true. Select *all* that apply.
- A. The minimum of the graph is located at (18, 4).
  - B. The graph has one horizontal intercept.
  - C. From 12 seconds to 18 seconds, Clare is moving closer to her front door.
  - D. The graph has two local maximums.
  - E. Clare was farthest from her front door after about 26 seconds.

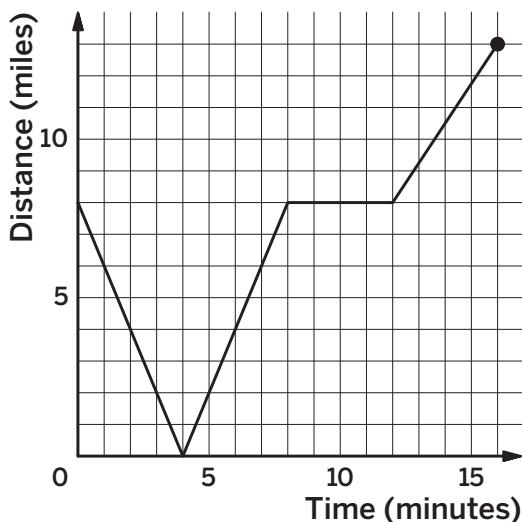


- 2.** Consider the graph of the function shown. Match each feature of the graph with a corresponding statement in function notation.

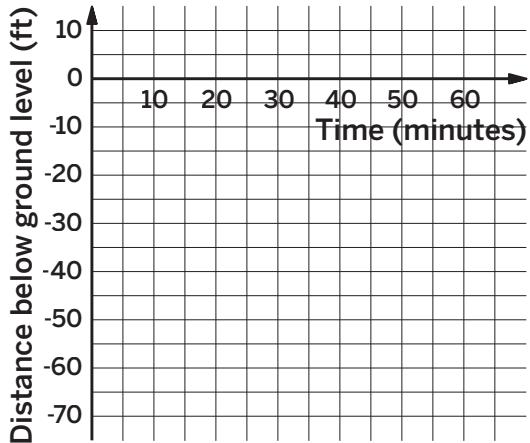
Feature	Statement
a. Starting height	..... $h(8) = 1$
b. Minimum height	..... $h(0) = 5$
c. Maximum height	..... $h(t) = 5$ , between $t = 10$ and $t = 16$
d. Height remains constant	..... $h(3) = 11$



- 3.** The graph represents the function  $D$ , which gives the distance that Kiran is away from home as a function of time  $t$ . For what time interval does Kiran's distance from home decrease?
- $[0, 4]$
  - $[4, 7]$
  - $[7, 12]$
  - $[12, 15]$



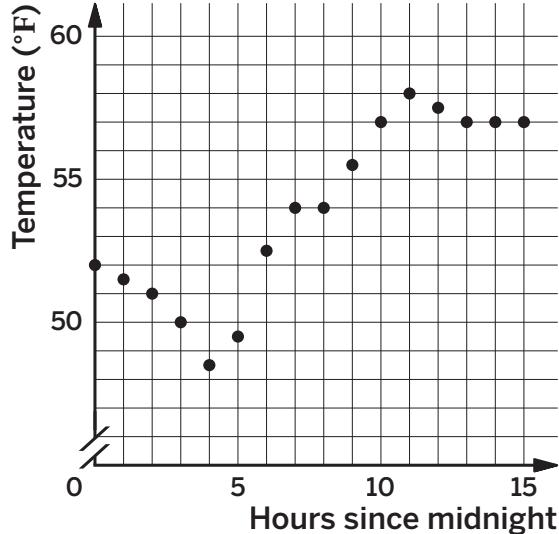
- 4.** Priya goes on a tour of a cave. The tour starts at ground level and then descends for 20 minutes to a depth of 65 ft below ground level. The tour stays at this level for 15 minutes, and then ascends for 15 minutes to a depth of 25 ft below ground level. The tour stays at this level for 10 minutes, and then spends the last 5 minutes ascending to ground level.
- Sketch a possible graph describing Priya's distance relative to ground level as a function of time.
  - Kiran and Mai are arguing about which time interval represents the "fastest" ascent or descent of the tour. Kiran says that the descent on the interval  $[0, 20]$  was the fastest. Mai claims that the ascent on the interval  $[60, 65]$  was the fastest. Who is correct? Explain your thinking.



**Additional Practice****4.06**

- 1.** The temperature was recorded at several times during the day. The function  $T$  represents the temperature in degrees Fahrenheit given the number of hours since midnight  $n$ . Use the graph to determine if the average rate of change for each interval is *positive*, *negative*, or *zero*.

- a**  $n = 0$  to  $n = 4$
- b**  $n = 7$  to  $n = 8$
- c**  $n = 11$  to  $n = 13$
- d**  $n = 13$  to  $n = 15$
- e**  $n = 4$  to  $n = 7$

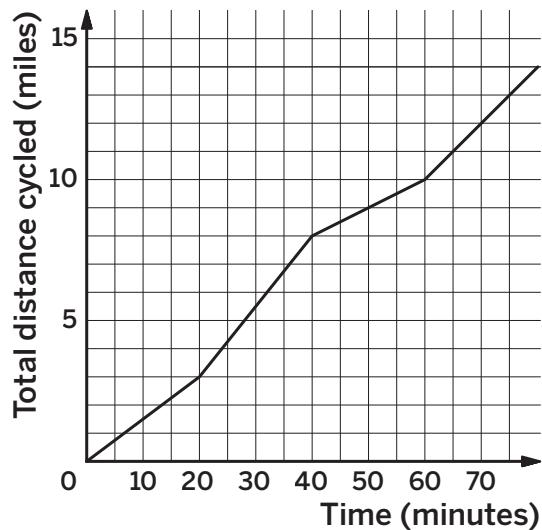


- 2.** Refer to the graph in Problem 1. Determine each value.

- a**  $f(3)$
- b**  $f(6)$
- c**  $f(11)$

- 3.** The graph shows the total distance, in miles, that Kiran cycled as a function of time, in minutes.

- a** Was Kiran cycling faster between 20 and 35 minutes or between 50 and 65 minutes? Explain your thinking.
- b** Was Kiran cycling faster between 30 and 50 minutes or between 50 and 80 minutes? Explain your thinking.



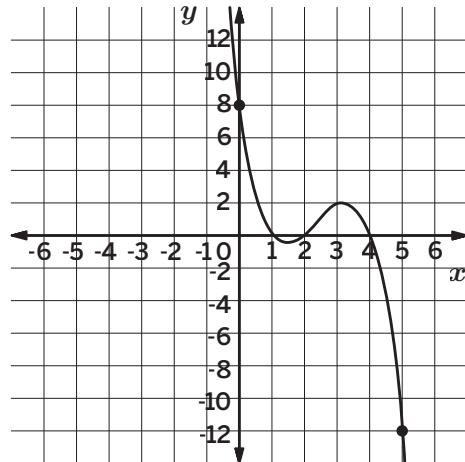
- 4.** The heights of a tree from when it was first planted through Year 21 are shown in the table. The function  $H$  gives the height of the tree in Year  $t$ .

Year	0	3	6	9	12	15	18	21
Height (ft)	2	4.5	8.1	11.4	15.6	19.2	23.1	26.4

- a** Determine the average rate of change for  $H$  between Years 3 and 9.
- b** Is the average rate of change for  $H$  between Years 12 and 21 greater than, less than, or equal to the rate of change between Years 3 and 9? Explain your thinking.

- 5.** Use the graph to determine the average rate of change between  $x = 0$  and  $x = 5$ .

- A. -4
- B. 4
- C. -5
- D. 5



- 6.** The number of people who visited an aquarium each day for a week is shown in the table. The function  $N$  gives the number of visitors on Day  $d$ . Shawn claims that the average rate of change between Days 1 and 3 is greater than the average rate of change between Days 3 and 6. Do you agree? Explain your thinking.

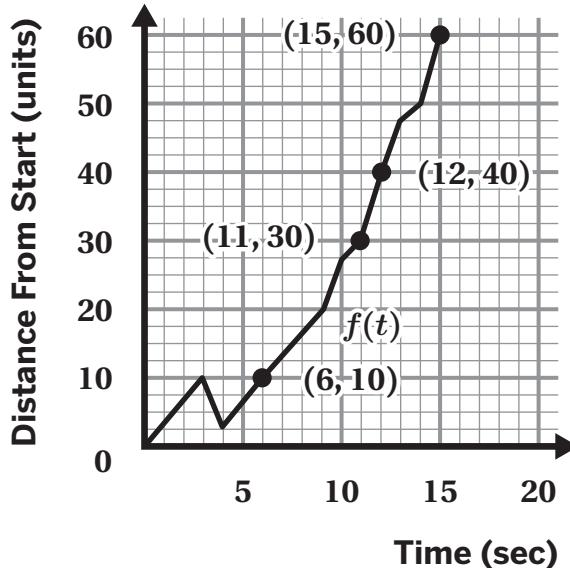
Day	1	2	3	4	5	6	7
Visitors (thousands)	4.5	4.8	5.2	3.9	4.4	5.6	6.1

**Additional Practice**

4.07

**Problems 1–2:** Fatima built a model train for a competition in her technology class.

$f(t)$  represents the distance of Fatima's model train, in meters, after  $t$  seconds.



- 1.** Use the graph to determine the missing value in each function statement.

$$f(11) = \dots$$

$$f(\dots) = 10$$

$$f(12) = \dots$$

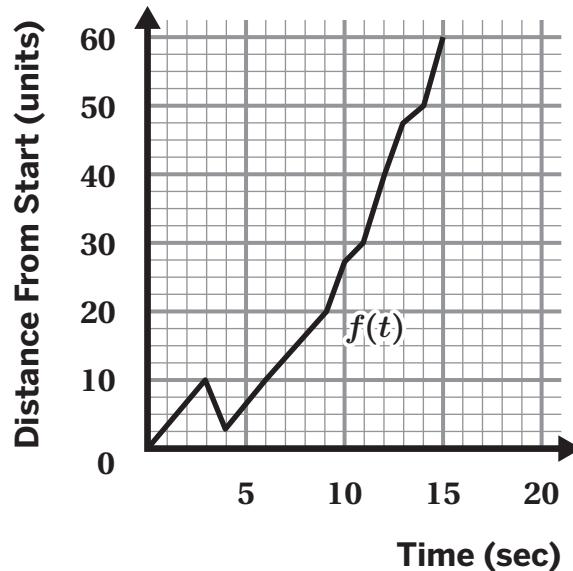
$$f(\dots) = 60$$

- 2.** Over what interval did Fatima's model train travel the slowest?

- a. 0 to 3 seconds
- b. 4 to 6 seconds
- c. 11 to 12 seconds
- d. 12 to 15 seconds

3. Kyler built a model train to race against Fatima. Use this information to make a graph that could represent the distance of Kyler's model train,  $k(t)$ , after  $t$  seconds:

- $k(5) < f(5)$
- $k(10) = f(10)$
- The average rate of change of  $k(t)$  and  $f(t)$  is the same from  $t = 10$  to  $t = 11$ .
- $f(t)$  has a greater maximum than  $k(t)$ .



**Additional Practice**

4.09

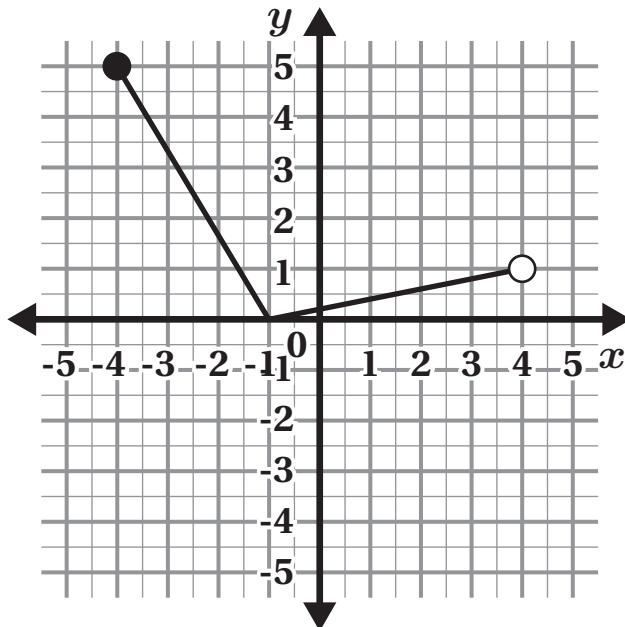
**Problems 1–2:** Carlos and Madeline disagree about the domain of  $f(x)$ .

- Carlos says the domain is  $0 \leq x \leq 5$
- Madeline says the domain is  $-4 < x \leq 4$

**1.** Whose answer is correct? Circle one.

Carlos      Madeline      Neither

**2.** Explain why either (or both) of the students are incorrect.



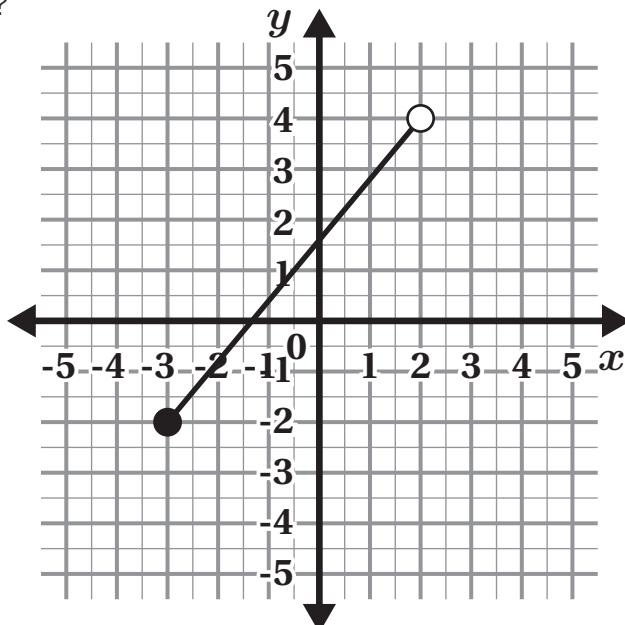
**Problems 3–4:** You are given the graph of a function.

**3.** What is the domain of the function shown?

- A.  $-3 < x \leq 2$
- B.  $-3 \leq x < 2$
- C.  $-2 \leq x < 4$
- D.  $-2 < x \leq 4$

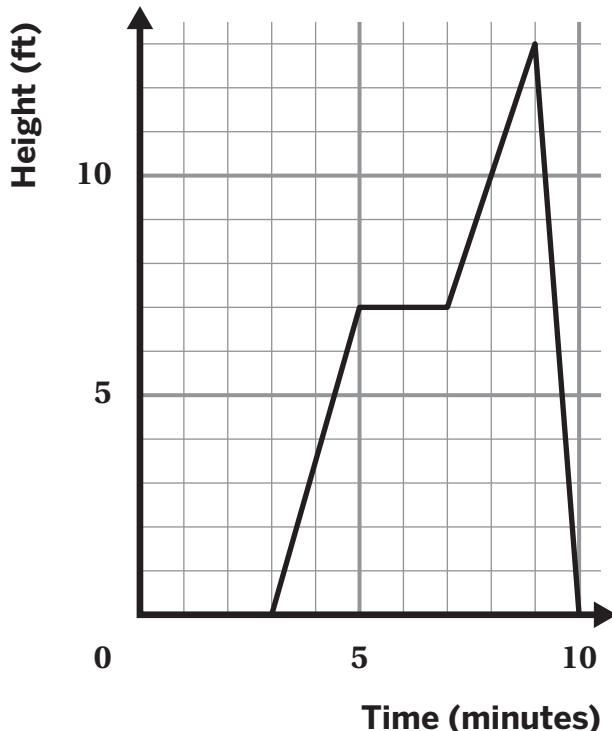
**4.** What is the range of the function shown?

- A.  $-3 < x \leq 2$
- B.  $-3 \leq x < 2$
- C.  $-2 \leq x < 4$
- D.  $-2 < x \leq 4$



**Problems 5–8:** A squirrel is searching for food on the ground and in trees. The graph represents the function,  $h(t)$ , which represents the height of the squirrel as a function of time  $t$ .

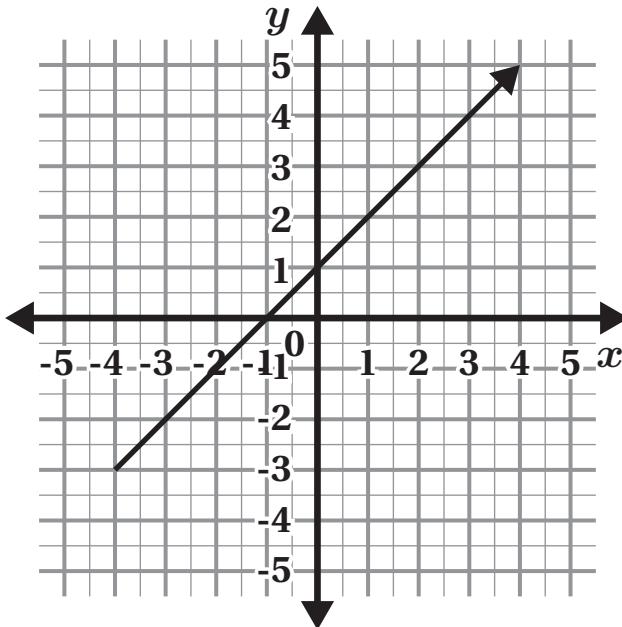
5. Write a compound inequality to describe the domain of  $h(t)$ .
6. What does the domain represent in this situation?
7. Write a compound inequality to describe the range of  $h(t)$ .
8. What does the range represent in this situation?



# Additional Practice

4.10

**Problems 1–2:** See the graph of  $f(x)$ .



**1.** What is the domain of  $f(x)$ ?

- a.  $x \geq 0$
- b.  $x \geq -4$
- c.  $x \leq 0$
- d.  $x \leq -4$

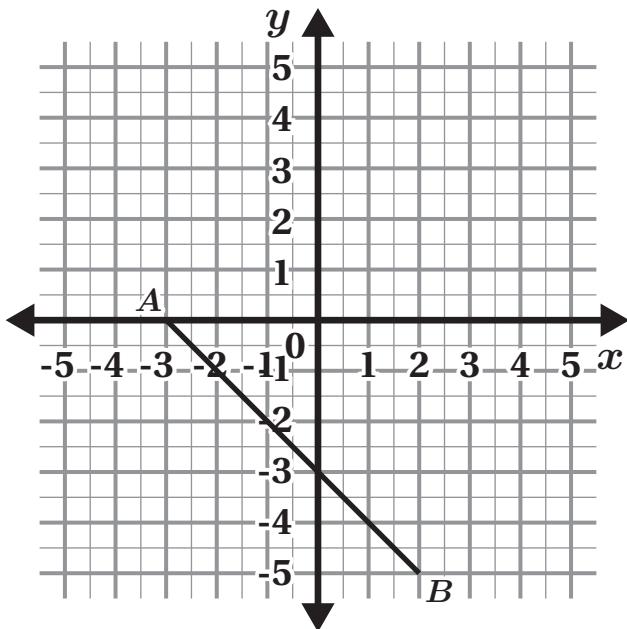
**2.** What is the range of  $f(x)$ ?

- a.  $f(x) \geq -3$
- b.  $f(x) \geq 0$
- c.  $f(x) \leq 3$
- d.  $f(x) \leq 0$

- 3.** Fill in the blanks for the domain and range of  $y = -x - 3$  from point  $A$  to point  $B$ .

$$\dots \leq x \leq \dots$$

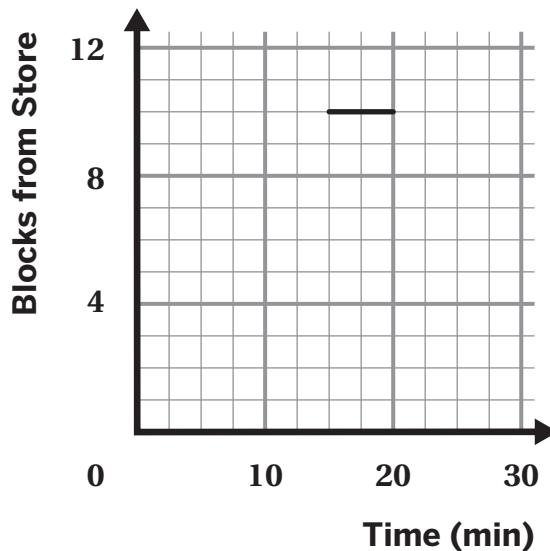
$$\dots \leq y \leq \dots$$



- 4.** Lia leaves her home to go to the grocery store. This is her path:

- She walks to the store, which is 10 blocks away, at a speed of half a block per minute.
- She is in the store for 5 minutes.
- She runs back home at a speed of 2 blocks per minute.

The graph shows part of her path. Sketch the graph of the missing pieces of Lia's path.



**Additional Practice**

4.11

**Problems 1–3:** Determine the value of each piecewise-defined function,  $f(x)$ .

1.  $f(0) = \dots$

2.  $f(4) = \dots$

$$f(x) = \begin{cases} 2x + 1, & 0 \leq x < 4 \\ 9, & x \geq 4 \end{cases}$$

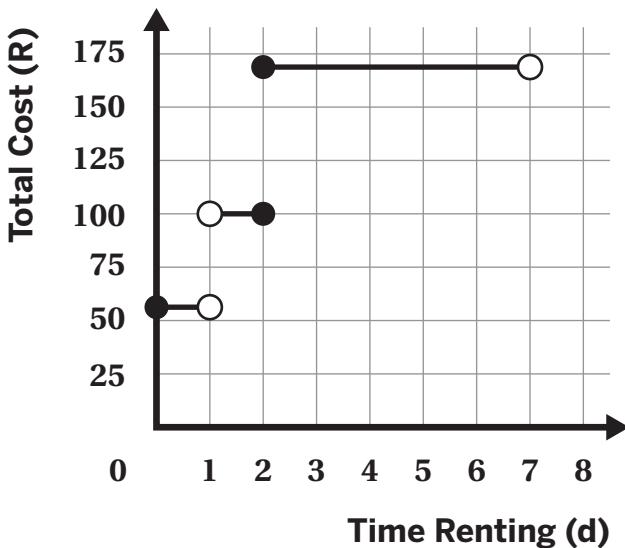
3.  $f(6) = \dots$

**Problems 4–5:** A car rental company charges \$55 to rent a car for the first day, \$110 for up to two days, and \$170 for more than two days but less than a week. Let  $R$  represent the dollar price of renting a car for  $d$  days. Complete the table.

4. Complete the table.

Time renting (d)	0	0.75	1	1.25	2.5
Total cost (R)					

5. The rental company tried to represent their pricing with this graph. What is correct and what should change to make the graph more accurate?



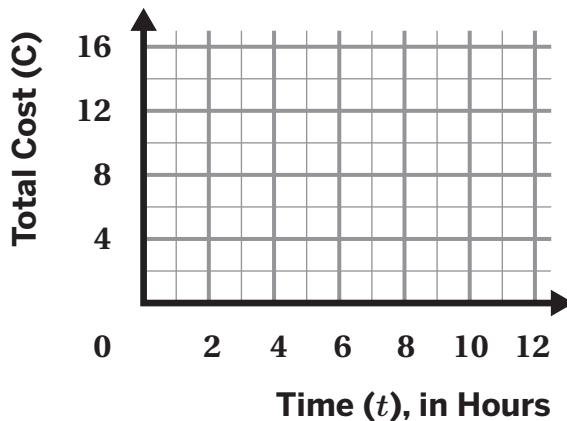
**Problems 6–7:** The cost of parking at the beach is \$4 for the first hour, \$8 for up to two hours, \$12 for up to three hours, and \$16 for more than three hours.

Let  $C$  represent the dollar price of parking for  $t$  hours.

6. Complete the table.

Hours parking ( $t$ )	Total cost ( $C$ )
0	
0.75	
1	
1.25	
2	
2.5	
4	

7. Graph the function  $C$  for  $0 \leq t \leq 12$



**Problems 8–9:** A graph of a piecewise-defined function is given.

8. Determine the following values:

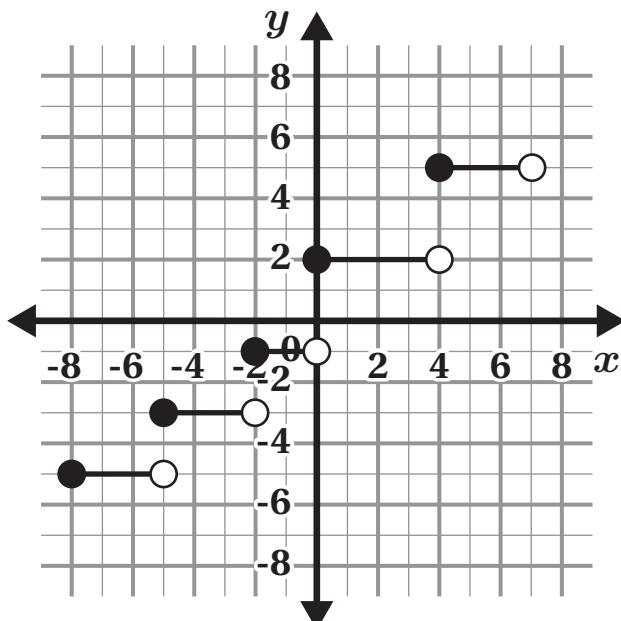
a  $r(-5) = \dots$

b  $r(0) = \dots$

c  $r(8) = \dots$

9. Complete  $r(x)$  so that it matches the graph

$$r(x) \begin{cases} -5, & -8 \leq x < -5 \\ -3, & \dots \leq x < -2 \\ \dots, & -2 \leq x < 0 \\ 2, & \dots \leq x < \dots \\ \dots, & 4 \leq x < 7 \end{cases}$$



**Additional Practice****4.12**

**Problems 1–2:** UPS charges shipping fees depending on the weight of the package.

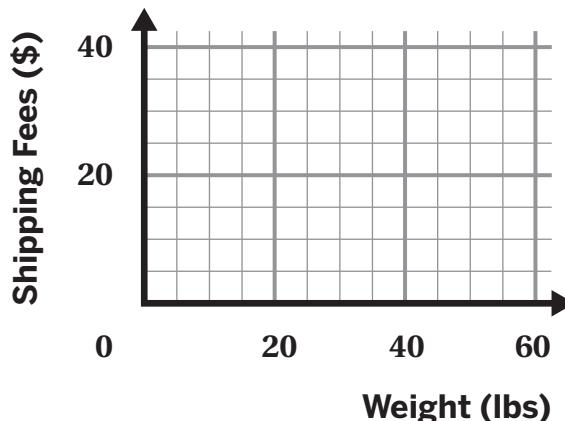
- Packages weighing more than 0 to 5 pounds cost \$8.
- Packages weighing from more than 5 pounds to 10 pounds cost \$15.
- Packages weighing more than 10 pounds to 20 pounds cost \$20.
- Packages weighing more than 20 to 50 pounds cost \$30.

Let  $c(x)$  represent the shipping fee for an order that weighs  $x$  pounds.

- 1.** Complete the table.

Weight in lbs ( $x$ )	Shipping Fee (\$)
0	
3	
5	
10	
19	
20	
30	
40	
50	

- 2.** Make a graph that represents the function  $T(x)$ .



- 3.** Sandra is an electrician who charges the following for her services:

- \$75 for coming to the property
- \$50 for more than 0 minutes to 1 hour
- \$60 for the second hour, or any part of it
- \$75 an hour for any time over 2 hours

$$f(x) = \begin{cases} 75 & x = 0 \\ 125 & 0 < x < 1 \\ 185 & 1 < x < 2 \\ 75x & x \geq 2 \end{cases}$$

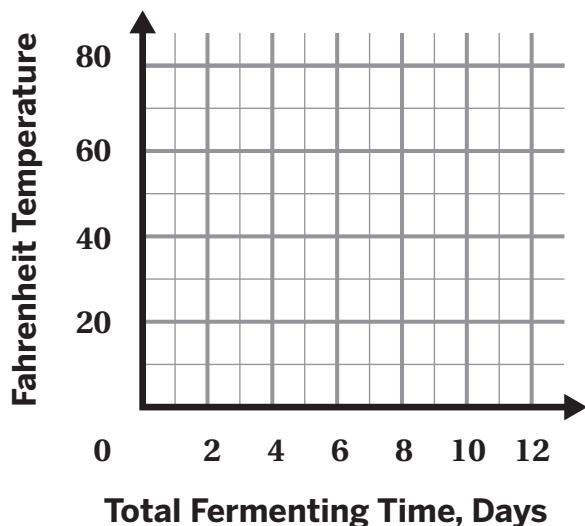
Sandra wrote this piecewise-defined function to represent her charges. Identify at least two things that are incorrect in Sandra's function. Explain your thinking.

**Problems 4–7:** Bethany is making kimchi, a tangy cabbage dish, with her grandmother. The directions for making kimchi are:

- Ferment the cabbage for the first 3 days at a temperature of  $70^{\circ}\text{F}$
- Store the dish at a temperature of  $50^{\circ}\text{ F}$  for the next 3 days
- Store the dish in a  $35^{\circ}\text{F}$  refrigerator for the next 6 days

- 4.** Here is part of the piecewise function,  $F$ , and the graph that models this situation. Fill in the missing numbers and symbols.
- 5.** Complete the graph to represent this situation.

$$F(t) = \begin{cases} 70 & 0 \leq t < 3 \\ 50 & 3 \leq t < 6 \\ 35 & 6 \leq t \end{cases}$$



- 6.** What does  $F(9)$  represent in this situation?
- 7.** What is the value of  $F(9)$ ?

**Additional Practice**

4.13

**Problems 1–3:** Let  $p(n)$  represent the value of term  $n$  in this sequence: 3, 8, 13, 18, 23, ....

Write the number that makes each equation true.

1.  $p(1) = \dots$       2.  $p(9 - 1) = \dots$       3.  $p(n) = p(n - 1) + \dots$

4. Match each sequence with one of the definitions.

**Sequence**

a.  $2, 6, 18, 54, \dots$

**Definition**

$f(1) = 2$

$f(n) = f(n - 1) + 15$

b.  $2, 17, 32, 47, \dots$

$f(1) = 2$

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

c.  $2, 3, \frac{9}{2}, \frac{27}{4}, \dots$

$f(1) = 2$

$f(n) = 3 \cdot f(n - 1)$

**Problems 5–6:** Write the first four terms of each sequence.

5.  $a(1) = \frac{1}{4}$   
 $a(n) = 2 \cdot a(n - 1)$

6.  $c(1) = \frac{1}{4}$   
 $c(n) = c(n - 1) + 2$

....., ....., ....., .....

....., ....., ....., .....

**Problems 7–8:** Here are the first five terms of some sequences. Write a recursive definition for each one.

7.  $30, 25, 20, 15, 10$

$f(1) = 30$   
 $f(n) = f(n - 1) - 5$

8.  $4, 12, 36, 108, 324$

$g(1) = 4$   
 $g(n) = 3 \cdot g(n - 1)$

9. An arithmetic sequence  $a(n)$  and geometric sequence  $g(n)$  both have the same first and third term. Determine a recursive definition for each.

Arithmetic Sequence

Geometric Sequence

10. Write a recursive definition that will make the values of the table shown.

$$f(1) = \dots$$

$$f(n) = \dots$$

Terms, $n$	Value
1	500
2	250
3	125
4	62.5
5	31.25

**Additional Practice**

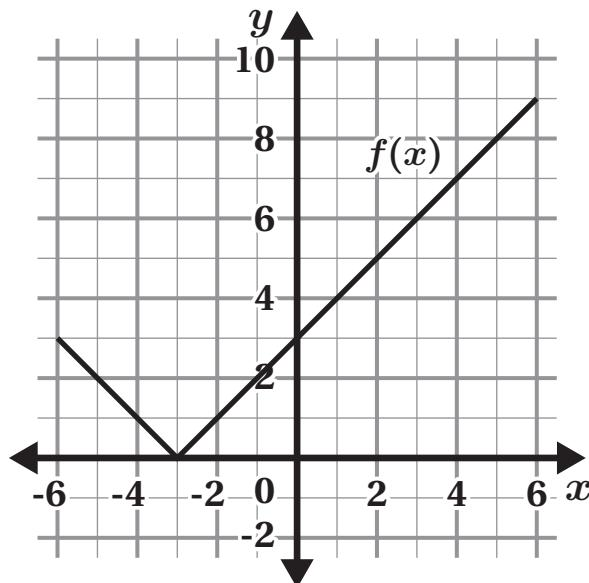
4.15

**Problems 1–3:** Use the graph of  $f(x)$  to determine each value.

1.  $f(0) = \dots$

2.  $f(2) = \dots$

3.  $f(-3) = \dots$



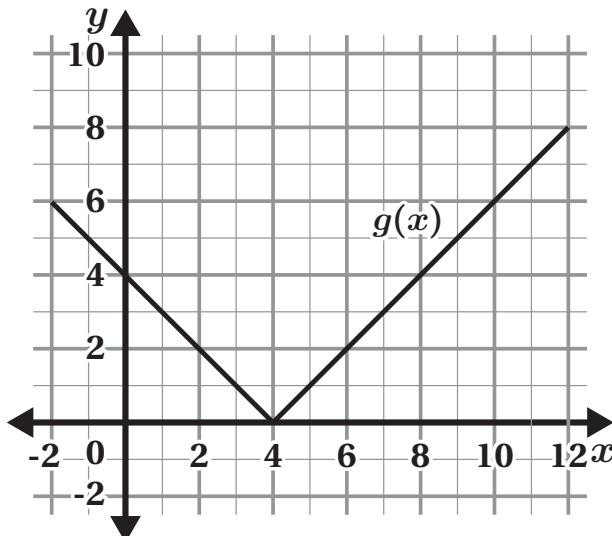
4. Which equation represents the graph of  $g(x)$ ? Circle your choice.

A.  $g(x) = |x - 4|$

B.  $g(x) = |x + 4|$

C.  $g(x) = |x| - 4$

D.  $g(x) = |x| + 4$

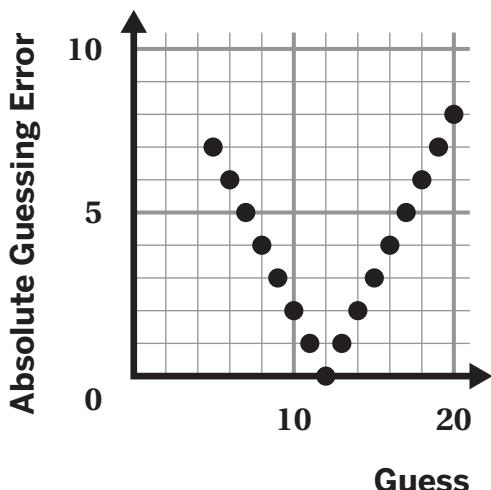


5. A group of 8 friends played a number guessing game. They were asked to select a number between 1 and 15.

The graph shows the guesses made by each of the 8 friends.

The actual number was 11.

Which is the greatest absolute guessing error?



**Problems 6–8:** A group of 10 friends played a number guessing game. They were asked to select a number between 1 and 20. The person closest to the target number wins. The table below shows the guesses made by each of the 10 friends.

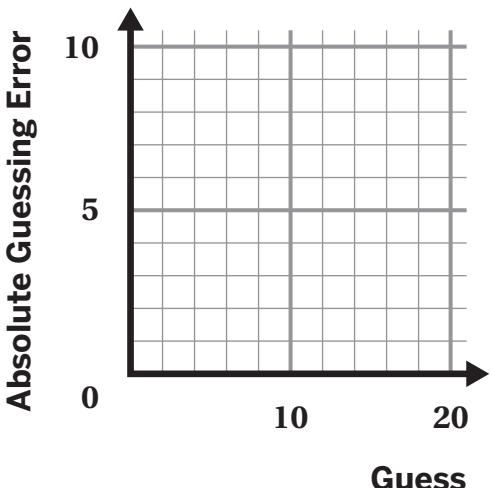
6. The actual number was 8. Complete the table with the absolute guessing errors.

Guess	15	3	10	14	16	12	1	7	6	11
Absolute Guessing Error										

7. Graph each guess,  $x$ , and its corresponding absolute guessing error,  $g(x)$  on the coordinate plane.

8. Nadine writes  $g(20) = 12$ .

What does her equation mean?



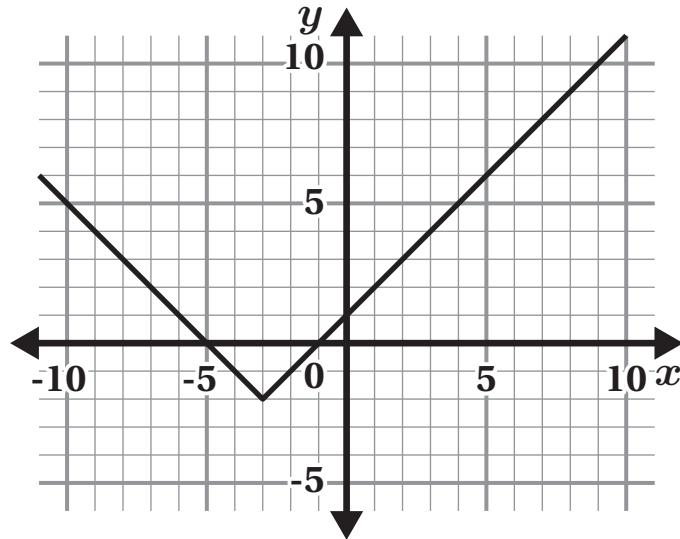
**Additional Practice****4.16**

**Problems 1–3:** Write each expression as a single integer.

1.  $|-5|$  .....      2.  $|12| - 4$  .....      3.  $|-6| + 3$  .....

4. Graph  $f(x) = |x + 3| - 2$ . Use the table if it helps your thinking.

$x$	$f(x)$
-5	
-3	
0	

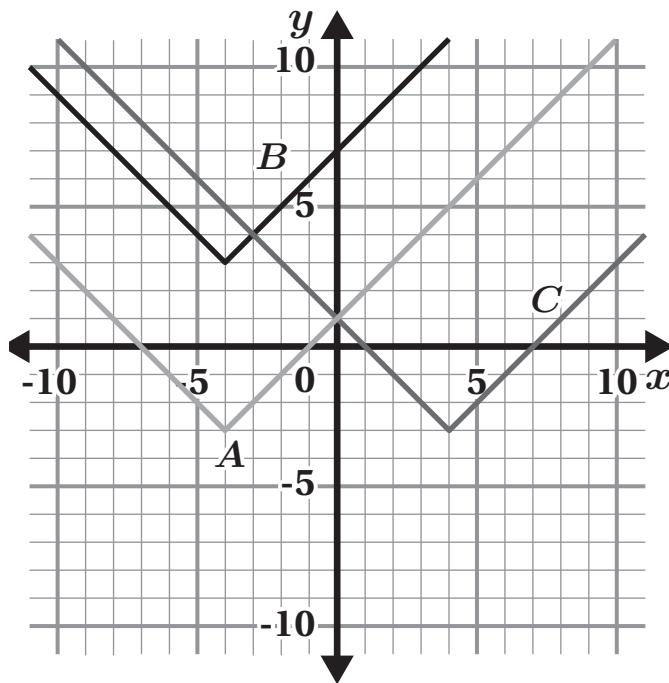


5. Match each function with its graph.

$f(x) = |x - 4| - 3$  .....

$f(x) = |x + 4| + 3$  .....

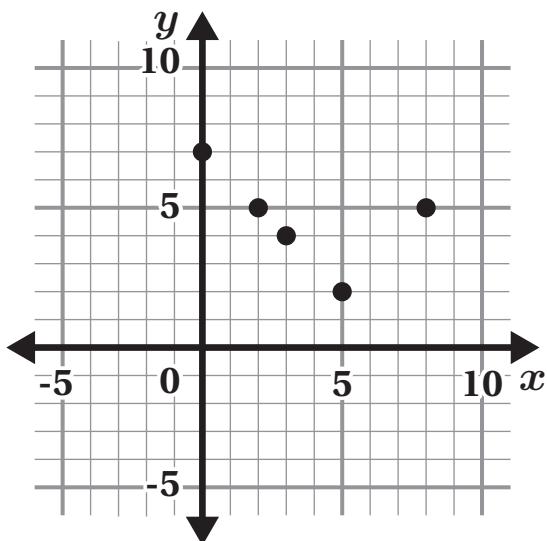
$f(x) = |x + 4| - 3$  .....



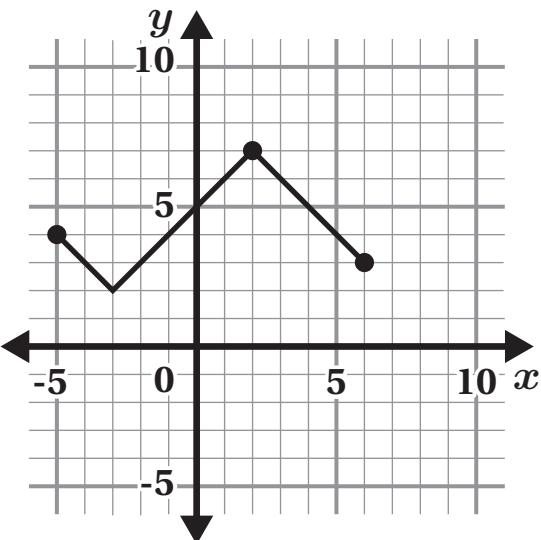
6. Here are some points on the graph of  $g(x) = |x - 5| + 2$ .

- Sketch a graph of  $g(x)$ .
- Describe the graph using some of these terms:

positive	maximum	increasing	domain
negative	minimum	decreasing	range
symmetry	piecewise-defined function		

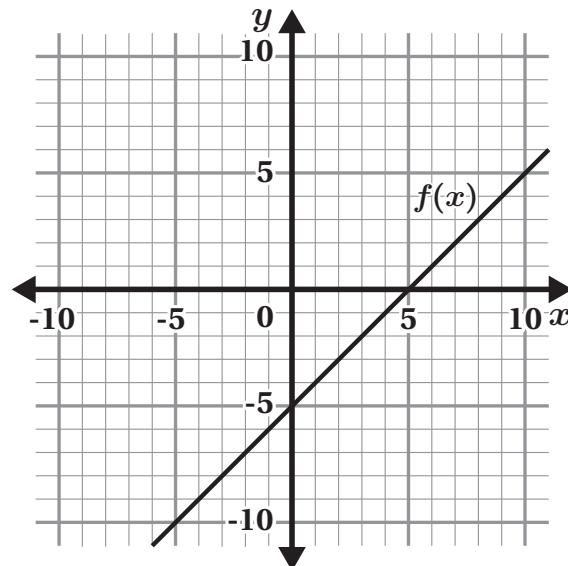


7. Determine two different piecewise-defined functions that could represent this graph.

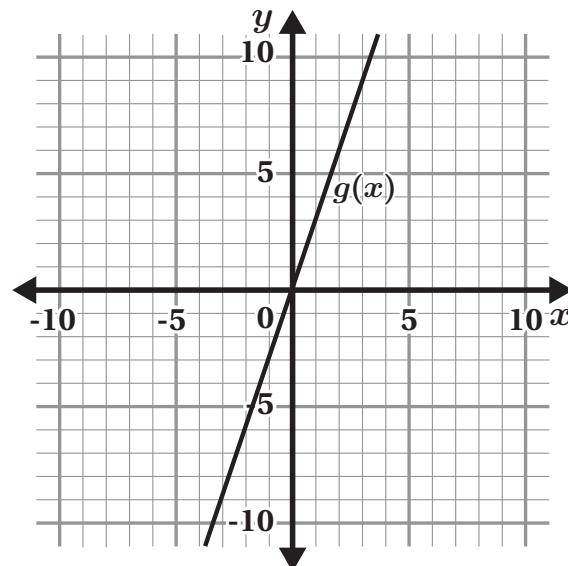


**Additional Practice****4.18**

- 1.** The graph of function  $k(x)$  passes through the point at  $(-9, 4)$ . The graph of the inverse of  $k(x)$  must pass through which of the following points?
- $(-9, 4)$
  - $(9, -4)$
  - $(4, -9)$
  - $(-4, 9)$
- 2.** Use the graph of  $f(x) = x - 5$  to determine the equation for the inverse function.
- $a(x) = -5x$
  - $b(x) = x + 5$
  - $c(x) = -x + 5$
  - $d(x) = 5 - x$

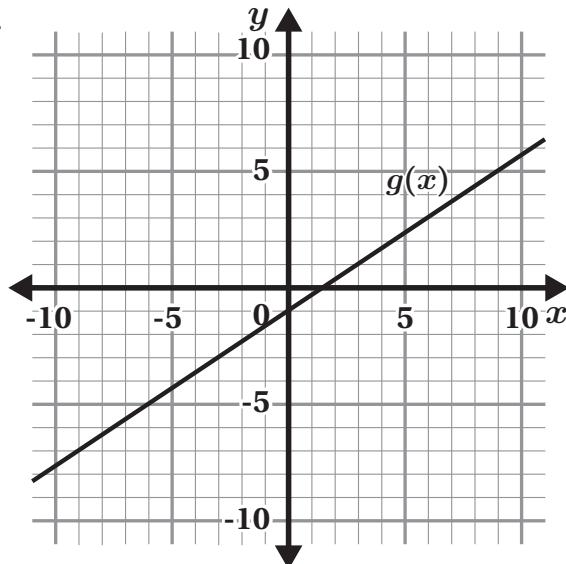


- 3.** Use the graph of  $g(x) = 3x$  to determine the equation for the inverse function.
- $a(x) = -3x$
  - $b(x) = x - 3$
  - $c(x) = -x + 3$
  - $d(x) = \frac{1}{3}x$



**Problems 4–6:** Here is the graph of  $g(x) = \frac{2}{3}x - 1$ .

4. List two points that the inverse function  $n(x)$  will pass through.



5. Write an equation for the inverse function  $n(x)$ .

6. Which of the functions will pass through point  $(-3, -3)$ ? Circle your choice.

$g(x)$

$n(x)$

Both

Neither

Explain your reasoning.

7. Kendra attempts to determine the inverse of the function  $h(x) = -4x + 12$ . She graphs the inverse of  $h(x)$  and determines the graph of the inverse is a line with a slope of 4 and a vertical intercept of -12, because the inverse is found by reversing the operations of the original function. Do you agree? Explain your thinking.