Lesson 7.1 • Secret Codes

Name ______________________________ Period ________ Date ____________

1. Use this table to code each word.

Input	A	B	C	D	E	F	G	H	I	J	K	L	M
Coded output	M	N	O	P	Q	R	S	T	U	V	W	X	Y
Input	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Coded output	Z	A	B	C	D	E	F	G	H	I	J	K	L

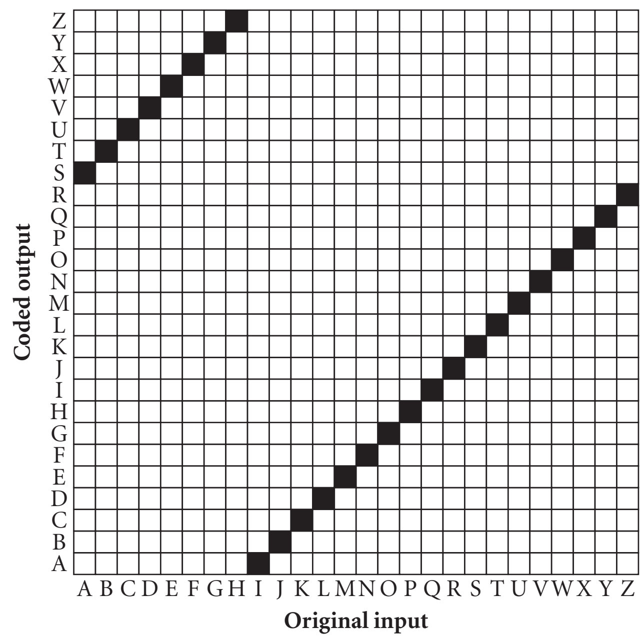
a. ALGEBRA **b.** EQUATION **c.** SOLVE

2. Use this coding grid to decode each word.

a. KGUUWJ

b. JSVAG

c. WAFKLWAF



3. Luisa used a letter-shift code to code her name as TCQAI.

a. Write the rule or create the coding grid for Luisa's code.

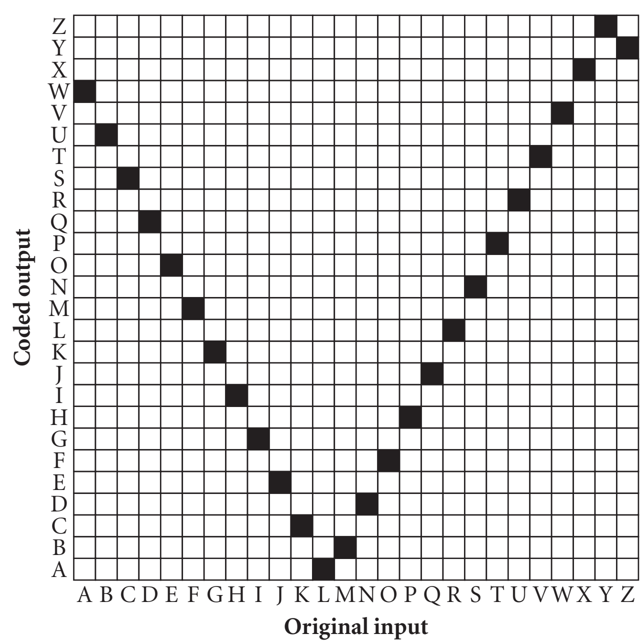
b. Use Luisa's code to decode BWX AMKZMB.

4. Use this coding grid to answer 4a–c.

a. What are the possible input values?

b. What are the possible output values?

c. Is this code a function? Explain why or why not.



Lesson 7.2 • Functions and Graphs

Name ______________________________ Period __________ Date ______________

1. Use the given equations to find the missing output values.

a. $y = 3 - x$

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

b. $y = -1.5 + 3x$

Input x	Output y
-2	
-1.5	
-1	
-0.5	
0	
0.5	
1	

c. $y = 6.8 + 0.5x$

Input x	Output y
-6	
-2.4	
1	
2.8	
-14	
3.1	
-17.5	

2. Use the given equations to find the missing domain and range values.

a. $y = -3x + 5$

Domain x	Range y
-4	
-2	
	5
3	
	-7

b. $2x - 3y = 6$

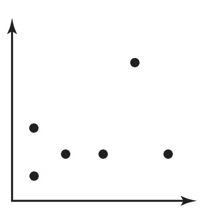
Domain x	Range y
	0
0	
	2
-6	
	5

c. $x^2 - 2y = 11$

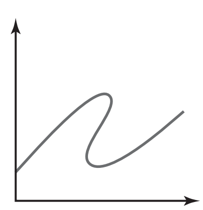
Domain x	Range y
-3	
0	
	7
1	
4	

3. Find whether each graph represents a function.

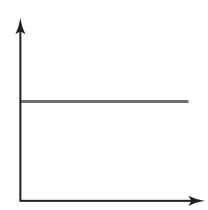
a.



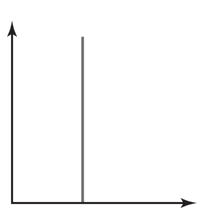
b.



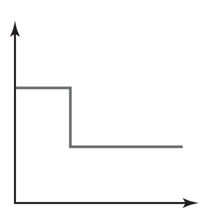
c.



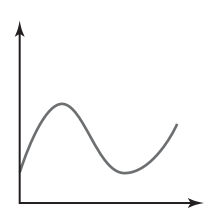
d.



e.



f.



Lesson 7.3 • Graphs of Real-World Situations

Name ______________________________ **Period** __________ **Date** ______________

1. For each relationship, identify the independent variable and the dependent variable. Then sketch a reasonable graph for each situation and label the axes. Write a few sentences explaining each graph. In your explanations, use terms such as *linear, nonlinear, continuous, discrete, increasing,* and *decreasing.*

a. The temperature of a carton of milk and the length of time it has been out of the refrigerator

b. The number of cars on the freeway and the level of exhaust fumes in the air

c. The temperature of a pot of water as it is heated

d. The relationship between the cooking time for a 2-pound roast and the temperature of the oven

e. The distance from a Ferris-wheel rider to the ground during two revolutions

2. Sketch a graph of a continuous function to fit each description.

a. Linear and increasing, then linear and decreasing

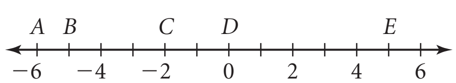
b. Neither increasing nor decreasing

c. Increasing with a slower and slower rate of change

d. Decreasing with a slower and slower rate of change, then increasing with a faster and faster rate of change

e. Increasing with a slower and slower rate of change, then increasing with a faster and faster rate of change

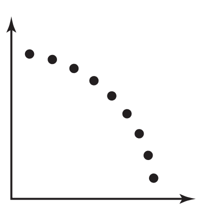
3. Write an inequality for each interval in 3a–f. Include the least point in each interval and exclude the greatest point in each interval.

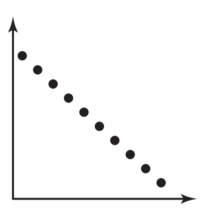


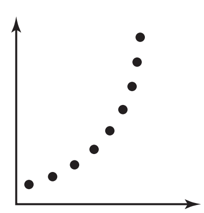
a. A to B **b.** B to D **c.** A to C

d. B to E **e.** C to E **f.** C to D

4. Describe each of these discrete function graphs using the words *increasing, decreasing, linear, nonlinear,* and *rate of change.*

a.


b.


c.


Lesson 7.4 • Function Notation

Name ________________________ **Period** __________ **Date** ____________

1. Find each unknown function value or x-value for $f(x) = 4x - 7$ and $g(x) = -3x + 5$ without using your calculator. Then enter the equation for $f(x)$ into Y1 and the equation for $g(x)$ into Y2. Use function notation on your calculator to check your answers.

a. $f(2)$ **b.** $f(0)$ **c.** $f(-3)$ **d.** x, when $f(x) = -3$

e. $g(6)$ **f.** $g(-7)$ **g.** $g(0.5)$ **h.** x, when $g(x) = 5$

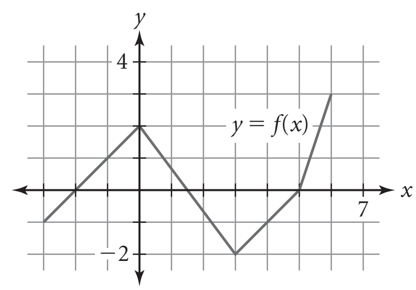
i. $f(3.25)$ **j.** $g\left(\frac{2}{3}\right)$ **k.** x, when $f(x) = -\frac{13}{3}$ **l.** x, when $g(x) = 11.9$

2. Find the y-coordinate corresponding to each x-coordinate or vice versa for the functions $f(x) = 2x^2 - 4x - 5$ and $g(x) = 40(1 - 0.2)^x$. Check your answers with your calculator.

a. $f(1)$ **b.** $f(-3)$ **c.** $f(0)$ **d.** $f(2)$

e. $f(-0.5)$ **f.** $g(1)$ **g.** $g(-1)$ **h.** x, when $g(x) = 40$

3. Use the graph of $y = f(x)$ to answer each question.



a. What is the value of $f(0)$?

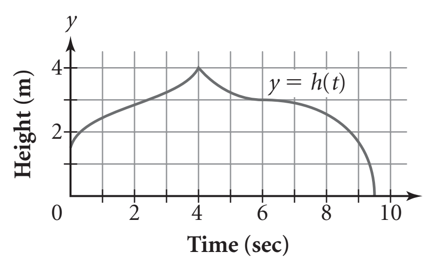
b. What is the value of $f(3)$?

c. For what x-value or x-values does $f(x)$ equal 3?

d. For what x-value or x-values does $f(x)$ equal 0?

e. What are the domain and range shown on the graph?

4. The graph of the function $y = h(t)$ shows the height of a paper airplane on its maiden voyage.



a. What are the dependent and independent variables?

b. What are the domain and range shown on the graph?

c. Use function notation to represent the plane's height after 6 seconds.

d. Use function notation to represent the time at which the plane was 4 meters high.

5. The function $f(x) = 2.5x + 1.5$ represents the distance of a motorized toy car from a motion sensor, where distance is measured in meters and time (x) is measured in seconds.

a. Find $f(3)$. Explain what this means.

b. How far is the car from the sensor at time 0? Express your answer using function notation.

c. When will the car be 12.5 meters from the sensor? Express your answer using function notation.

Lesson 7.5 • Defining the Absolute-Value Function

Name ______________________ Period __________ Date ______________

1. Find the value of each expression without using a calculator. Check your results with your calculator.

a. $|12|$ **b.** $|-9|$ **c.** $\left|-\frac{4}{3}\right|$

d. $-|7|$ **e.** $|-7|$ **f.** $|-11 + 6|$

g. $|-11| + |6|$ **h.** $|-4| - |3|$ **i.** $|-7| \cdot |5|$

j. $\frac{|-18|}{|6|}$ **k.** $-3|4 - 9|$ **l.** $|-3|^{-2}$

m. $4|-5|^{|-1|}$ **n.** $5|-3|^2$ **o.** $-3|(-4)(5)|$

2. Find the x-values that satisfy each equation.

a. $|x| = 6$ **b.** $|x| = 3.14$ **c.** $|x| = -4.5$

d. $|x + 3| = 11$ **e.** $|x| + 3 = 11$ **f.** $|x - 3| = 5$

g. $|x| \geq 8$ **h.** $|x| < 5.5$ **i.** $|x + 9| > 11$

3. Evaluate both sides of each statement to determine whether to replace the box with $=$, $<$, or $>$. Use your calculator to check your answers.

a. $|12 - 7| \square |7 - 12|$ **b.** $\frac{|30|}{|-5|} \square \left|\frac{30}{-5}\right|$

c. $-|-6| \square -(-6)$ **d.** $5^{-2} \square |5^{-2}|$

e. $(-3)^4 \square |-3|^4$ **f.** $(-5)^3 \square |-5|^3$

g. $|14 - (-6)| \square |14| - |-6|$ **h.** $|21 - 13| \square |21| - |13|$

i. $3|12 + 7| \square 3|12| + 3|7|$

4. Find each value if $f(x) = 2 - 3x$ and $g(x) = |2 - 3x|$.

a. $f(-4)$ **b.** $f(-1)$ **c.** $f(1)$ **d.** $f(2)$

e. $f(5)$ **f.** $f(8)$ **g.** $g(-4)$ **h.** $g(-1)$

i. $g(1)$ **j.** $g(2)$ **k.** $g(5)$ **l.** $g(8)$

m. x, when $f(x) = 22$ **n.** x, when $g(x) = 22$ **o.** x, when $f(x) = -7$ **p.** x, when $g(x) = -7$

Lesson 7.6 • Squares, Squaring, and Parabolas

Name ______________________ Period __________ Date ______________

1. The length of a rectangle is 2 cm greater than the width.

a. Complete the table by filling in the missing width, length, perimeter, and area of each rectangle.

b. Let x represent the width of the rectangle. Use function notation to write an equation for the perimeter.

c. Is the relationship between width and perimeter linear? Explain why or why not.

d. Let x represent the width of the rectangle. Use function notation to write an equation for the area.

e. Is the relationship between width and area linear? Explain why or why not.

Width (cm)	Length (cm)	Perimeter (cm)	Area (cm^2)
1			
2			
		16	
			24
9			
		52	
		68	288

2. Find the value of each expression without using a calculator. Check your results with your calculator.

a. 4^2 **b.** $(-3)^2$ **c.** 1.1^2 **d.** $(-0.5)^2$

e. $-(-8)^2$ **f.** $\sqrt{49}$ **g.** $\sqrt{0.81}$ **h.** $\sqrt{1.44}$

i. $3\sqrt{121}$ **j.** $-\sqrt{36}$ **k.** $(0.2)^3$ **l.** 2^{-2}

3. Solve each equation for x. Use a calculator graph or table to verify your answers.

a. $|x| = 6.13$ **b.** $|x| - 4 = 8$ **c.** $|2x| = 6$

d. $|x + 5| = 7$ **e.** $x^2 = 121$ **f.** $(x - 3)^2 = 625$

g. $x^2 = -2.56$ **h.** $x^2 + 1 = 8.29$ **i.** $x^2 = 5$

j. $|x - 2| + 9 = 3$ **k.** $|x + 4| - 12 = -5$ **l.** $\sqrt{x} = 2.5$

4. Sketch the graphs of $y = |x|$ and $y = x^2$ on the same set of axes. Describe the similarities and differences of the graphs.

2. a. = **b.** <

c. = **d.** <

3. a. -4 **b.** 4 **c.** -1

d. -7 **e.** 6 **f.** -8

4. a. $42{,}576(1 + 0.045)^0$

b. Her salary 7 years ago

c. $42{,}576(1 + 0.045)^{-15} \approx 22{,}000$. Fifteen years ago she earned \$22,000.

d. $\dfrac{42{,}576}{(1 + 0.045)^7}; \dfrac{42{,}576}{(1 + 0.045)^{15}}$

5. a. $\dfrac{1}{32}$ **b.** $\dfrac{1}{64}$ **c.** $\dfrac{1}{36}$

d. $-\dfrac{1}{8}$ **e.** 1 **f.** -5

6. a. 27,900 **b.** 0.006591 **c.** 4.48×10^{-5}

d. 9.69×10^8 **e.** 0.00000139 **f.** 950

LESSON 6.7 • Fitting Exponential Models to Data

1. a. $1 + 0.4$; rate of increase: 40%

b. $1 - 0.28$; rate of decrease: 28%

c. $1 - 0.91$; rate of decrease: 91%

d. $1 + 0.03$; rate of increase: 3%

e. $1 + 0.25$; rate of increase: 25%

f. $1 - 0.5$; rate of decrease: 50%

g. $1 - 0.01$; rate of decrease: 1%

h. $1 + 0.5$; rate of increase: 50%

i. $1 + 1.25$; rate of increase: 125%

2. a. Decreasing **b.** 3% rate of decrease

c. $y \approx 206.10$

3. a. Decreasing **b.** 35% rate of decrease

c. $y \approx 10.35$

4. a. Increasing **b.** 2% rate of decrease

c. $y \approx 1056.84$

5. $B = 500(1 + 0.035)^t$

6. $V = 26{,}400(1 - 0.08)^t$

7. a. $\dfrac{1}{m^2}$ **b.** $\dfrac{1}{4n^5}$ **c.** $-\dfrac{8}{y^3}$

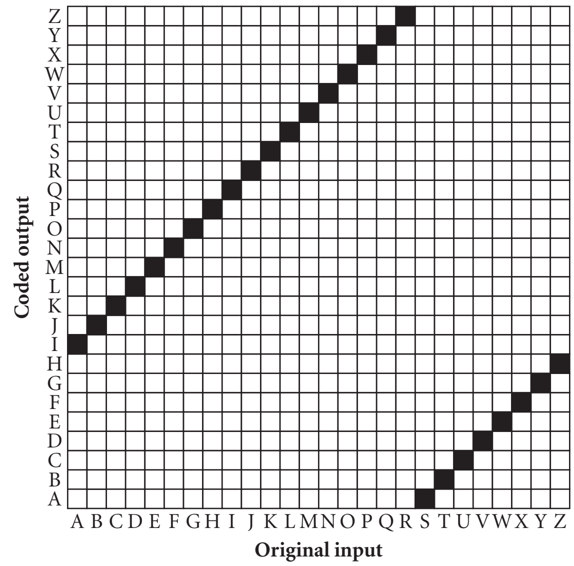
d. $\dfrac{5xz^5}{3y^2}$ **e.** $\dfrac{9n^2}{5m^2}$ **f.** $\dfrac{y^4}{2x^3z}$

LESSON 7.1 • Secret Codes

1. a. MXSQNDM **b.** QCGMFUAZ **c.** EAXHQ

2. a. SOCCER **b.** RADIO **c.** EINSTEIN

3. a. Shift each letter up (right) by 8 letters. Here is the coding grid.



b. TOP SECRET

4. a. All the letters of the alphabet

b. All the letters of the alphabet

c. Yes. Each input has a unique output.

LESSON 7.2 • Functions and Graphs

1. a.

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

b.

Input x	Output y
-2	-7.5
-1.5	-6
-1	-4.5
-0.5	-3
0	-1.5
0.5	0
1	1.5

c.

Input x	Output y
-6	3.8
-2.4	5.6
1	7.3
2.8	8.2
-14	-0.2
3.1	8.35
-17.5	-1.95

2. a.

Domain x	Range y
-4	17
-2	11
0	5
3	-4
4	-7

b.

Domain x	Range y
3	0
0	-2
6	2
-6	-6
10.5	5

c.

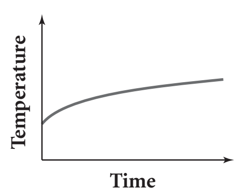
Domain x	Range y
-3	-1
0	-5.5
-5 or 5	7
1	-5
4	2.5

3. a. No **b.** No **c.** Yes
d. No **e.** No **f.** Yes

LESSON 7.3 • Graphs of Real-World Situations

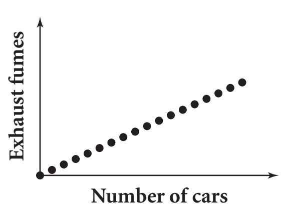
1. Graphs and explanations will vary.

a. Independent variable: time; dependent variable: temperature



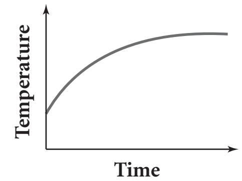
Sample explanation: Cold milk will start warming quickly. It will warm less quickly as it approaches the temperature of the air. The graph is nonlinear, continuous, and increasing. (After considerable time, the graph will stop increasing and become a horizontal line at room temperature.)

b. Independent variable: number of cars; dependent variable: level of exhaust fumes



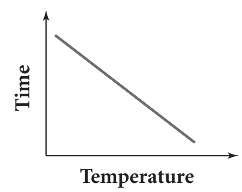
Sample explanation: As the number of cars increases, the level of fumes in the air increases. The level of exhaust fumes is directly related to the number of cars (a direct variation). The graph is a series of collinear points falling on a line through (0, 0) with positive slope. The graph is linear, discrete, and increasing.

c. Independent variable: time; dependent variable: temperature



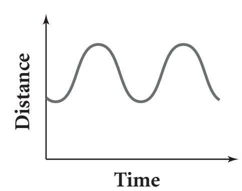
Sample explanation: The water increases in temperature over time. At first, it increases more quickly, and later, more slowly. If it continues to heat until boiling, it will maintain a constant temperature of about 100°C. Initially, the graph is nonlinear, increasing, and continuous. After the water reaches the boiling point, the graph stops increasing and becomes a horizontal line.

d. Independent variable: temperature; dependent variable: time



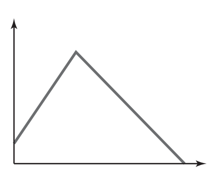
Sample explanation: The relationship between temperature and time (for temperatures associated with an oven) is a roughly decreasing, linear relationship. The lower the temperature, the longer the time. *Note:* This model does not apply when the temperature is very low or very high. In these regions of the graph, the relationship is not linear but is still decreasing.

e. Independent variable: time; dependent variable: distance from the rider to the ground

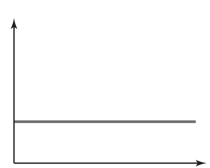


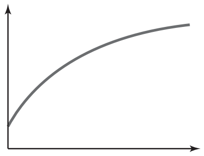
Sample explanation: The graph starts just before the lowest point of the Ferris wheel rotation. So the graph dips down, then rises to the top, and then goes back to the low point again. This cycle repeats for each rotation of the Ferris wheel. The graph is a smooth, continuous curve; no part of it is linear.

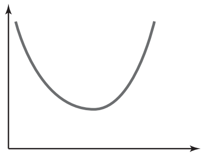
2. a.

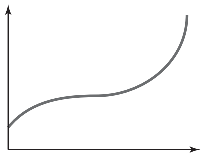


b.



c. 

d. 

e. 

3. a. $-6 \le x < -5$ **b.** $-5 \le x < 0$
c. $-6 \le x < -2$ **d.** $-5 \le x < 5$
e. $-2 \le x < 5$ **f.** $-2 \le x < 0$

4. a. Nonlinear and decreasing with a faster and faster rate of change
b. Linear and decreasing with a constant rate of change
c. Nonlinear and increasing with a faster and faster rate of change

LESSON 7.4 • Function Notation

1. a. 1 **b.** -7 **c.** -19 **d.** $x = 1$
e. -13 **f.** 26 **g.** 3.5 **h.** $x = 0$
i. 6 **j.** 3 **k.** $x = \frac{2}{3}$ **l.** $x = -2.3$

2. a. -7 **b.** 25 **c.** -5 **d.** -5
e. -2.5 **f.** 32 **g.** 50 **h.** $x = 0$

3. a. 2 **b.** -2 **c.** 6 **d.** $-2, 1.5, 5$
e. $-3 \le x \le 6$ and $-2 \le y \le 3$

4. a. Dependent variable: height; independent variable: time
b. Domain: $0 \le t \le 9.5$; range: $0 \le h \le 4$
c. $f(6) = 3$ **d.** $f(4) = 4$

5. a. $f(3) = 9$; At 3 s, the car is 9 m from the sensor.
b. $f(0) = 1.5$; The car is 1.5 m from the sensor at time 0 s.
c. $f(4.4) = 12.5$; At 4.4 s, the car is 12.5 m from the sensor.

LESSON 7.5 • Defining the Absolute-Value Function

1. a. 12 **b.** 9 **c.** $\frac{4}{3}$ **d.** -7
e. 7 **f.** 5 **g.** 17 **h.** 1
i. 35 **j.** 3 **k.** -15 **l.** $\frac{1}{9}$
m. 20 **n.** 45 **o.** -60

2. a. -6 and 6 **b.** -3.14 and 3.14
c. No values **d.** -14 and 8
e. -8 and 8 **f.** -2 and 8
g. $x \le -8$ or $x \ge 8$
h. $-5.5 < x < 5.5$ (x is between -5.5 and 5.5)
i. $x < -20$ or $x > 2$

3. a. $=$ **b.** $=$ **c.** $<$ **d.** $=$
e. $=$ **f.** $<$ **g.** $>$ **h.** $=$
i. $=$

4. a. 14 **b.** 5 **c.** -1
d. -4 **e.** -13 **f.** -22
g. 14 **h.** 5 **i.** 1
j. 4 **k.** 13 **l.** 22
m. $x = -\frac{20}{3}$ **n.** $x = -\frac{20}{3}$ or $x = 8$
o. $x = 3$ **p.** No solution

LESSON 7.6 • Squares, Squaring, and Parabolas

1. a.

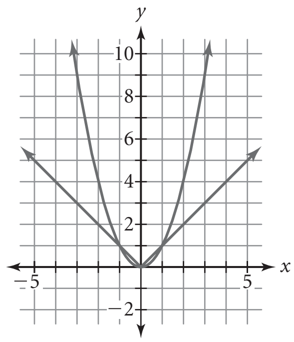
Width (cm)	Length (cm)	Perimeter (cm)	Area (cm^2)
1	3	8	3
2	4	12	8
3	5	16	15
4	6	20	24
9	11	40	99
12	14	52	168
16	18	68	288

b. $P(x) = 4x + 4$
c. Yes. Possible explanations: The equation is in slope-intercept form. The rate of change for the perimeter is constant.
d. $A(x) = x(x + 2)$ or $A(x) = x^2 + 2x$
e. No. Possible explanation: The rate of change for the area is not constant. As the width changes from 1 to 2 to 3 to 4, the area changes by 5, then 7, then 9.

2. a. 16 **b.** 9
c. 1.21 **d.** 0.25
e. -64 **f.** 7
g. 0.9 **h.** 1.2
i. 33 **j.** -6
k. 0.008 **l.** 0.25

3. a. $x = -6.13$ or $x = 6.13$ **b.** $x = -12$ or $x = 12$
c. $x = -3$ or $x = 3$ **d.** $x = -12$ or $x = 2$
e. $x = -11$ or $x = 11$ **f.** $x = -22$ or $x = 28$
g. No real solutions **h.** $x = -2.7$ or $x = 2.7$
i. $x = -\sqrt{5}$ or $x = \sqrt{5}$ **j.** No solution
k. $x = 3$ or $x = -11$ **l.** $x = 6.25$

4.

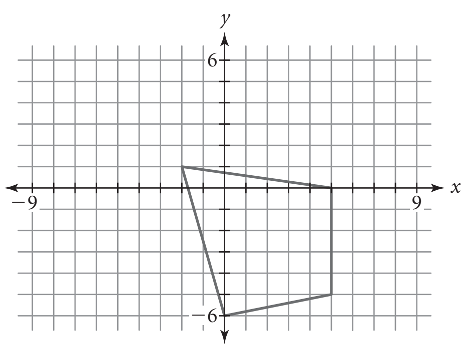


Descriptions will vary. The graph of $y = |x|$ has two linear parts, while $y = x^2$ is nonlinear. The parabola grows faster when $x > 1$ or $x < -1$. Both graphs have a vertex at (0, 0). Both graphs are symmetric about the y-axis (that is, they can be folded along the y-axis and the halves will match). For both functions, an input value and its opposite give the same output value.

LESSON 8.1 • Translating Points

1. a. (2, 3), (5, −2), (0, −1)
b. A translation left 6 units
c. The x-coordinates decrease by 6.
d. The y-coordinates are unchanged.

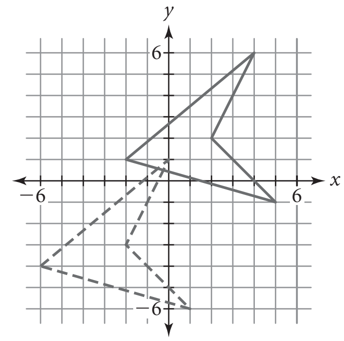
2. a. (−6, 3), (1, 2), (1, −3), (−4, −4)
b.



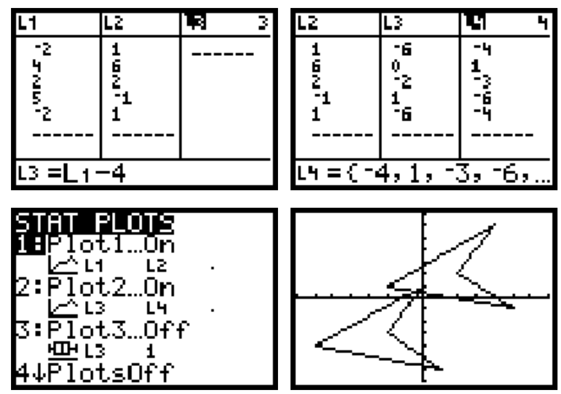
c. $(x + 4, y - 2)$

3. a. A translation left 8 units and up 5 units
b. $L_3 = L_1 - 8$, $L_4 = L_2 + 5$
c. Addition would change to subtraction and subtraction would change to addition: $L_3 = L_1 + 8$, $L_4 = L_2 - 5$.

4. a. Translate the polygon left 4 units and down 5 units.
b.



c.



LESSON 8.2 • Translating Graphs

1. a. −20 **b.** 10 **c.** −9
d. $10 - 3|2x|$, or $10 - 6|x|$, or $10 - |6x|$
e. 5 **f.** 70 **g.** −3
h. $(m - 4)^2 - 11$

2. a. (3, −1) **b.** (−3, 1)
c. (1, 5) **d.** (−4, −2)

3. a. A translation of the graph of $y = |x|$ left 4 units