

Lesson Activity 1

1. certain
2. impossible
3. as likely as not
4. unlikely
5. See student work.
6. See student work.
7. .320
8.
 - a. 3.2%
 - b. 96 pistons
 - c. \$26,640
9. See student work.
10. See student work.

- e. $\frac{9}{25}$, 36%; $\frac{6}{25}$, 24%; $\frac{2}{5}$, 40%
- f. C; Sample: The letter C has the greatest probability of occurring.
- g. .360
- h. See student work.

Investigation Practice 1

- a. as likely as not
- b. likely
- c. unlikely
- d. likely

Lesson Activity 2

1.

Interval	Description
0 to 10 minutes	no change
10 to 18 minutes	increasing
18 to 38 minutes	no change
38 to 40 minutes	decreasing
40 to 50 minutes	no change

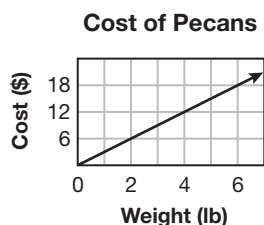
Sample: The speed of the horse increases more slowly than it decreases. The line showing the increase in speed is not as steep as the line showing the decrease in speed.

2. no; Sample: A negative number of pounds does not make sense.

3. Accept reasonable answers.

4. \$3.00; \$13.50

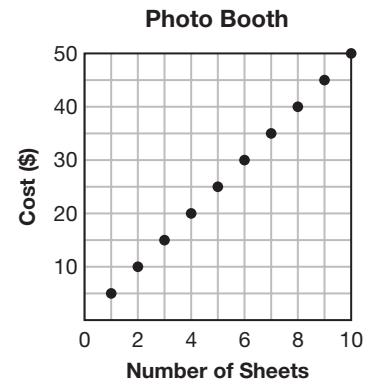
5.



6. Sample: Disconnected points that lie along a line.

7. 1 sheet; 10 sheets

8.

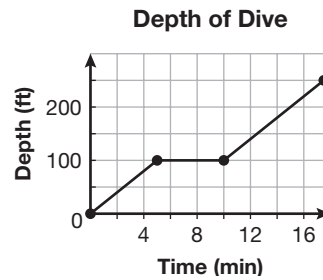


9. Sample: Maura walks along a flat trail for some time with no change in her elevation. Then her elevation increases as she walks up a hill. There is no change in her elevation as she walks along the top of the hill. Her elevation decreases when she walks down the hill to the base of the hill.

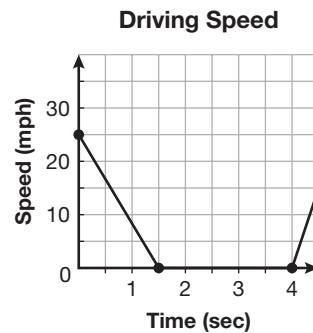
10. Sample: the hiker's distance from the starting point

- 11. Sample: Since the plane begins and ends its journey at ground level, its altitude will be 0 miles at the beginning and end of the flight.
- 12. Sample: Within the first and last hour of the trip, the altitude of the plane quickly increases and decreases, respectively.
- 13. Sample: For the middle part of the trip, there is no change in altitude.

- b. continuous, increasing, no change, increasing, no change

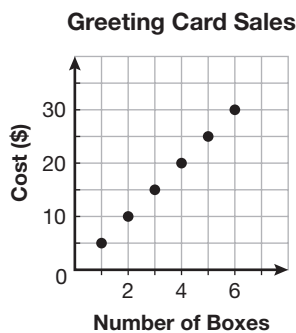


- c. continuous, decreasing, no change, increasing



Investigation Practice 2

- a. discrete, increasing



- d. A
- e. Sample: The graph is an upside-down U.
- f. Sample: The graph is a line that decreases from left to right.
- g. Sample: The graph is a series of points that fall in a line that increases from left to right.

Lesson Activity 3

1. Sample: Customers who ordered the cheese sauce probably like cheese.
2. Sample: Most science teachers' favorite subject is science.
3. Sample: Families without children have no chance to respond.
4. Sample: Randomly survey visitors leaving the zoo.
5. Sample: Survey every fifth visitor leaving the zoo.
6. Sample: Yes; People visiting with children might only visit the zoo because they have children.
7. Sample: Bias: Didn't you like the special tonight? Unbiased: How was the special?

8. Sample: Bias: Do you prefer listening to noisy, ear-splitting rock music or quiet, relaxing classical music?
Unbiased: What type of music do you prefer to listen to?

Investigation Practice 3

- a. People who visit the complex
- b. Every fifth person who signs a lease
- c. B
- d. Sample: People who visit the complex but do not sign a lease will not be included.
- e. See student's work.

Lesson Activity 4

1. inductive reasoning;
Sample: The conclusion is based on the student's previous performance on tests.
2. deductive reasoning;
Sample: Since the measures of a rectangle's angles are all the same, the fourth angle must also measure 90° .
3. inductive reasoning;
Sample: The conclusion is based on the pattern established by the first five terms in the sequence.
4. Sample: If you stay in the sun too long, then you will get a sunburn.
5. Sample: If a student has a temperature higher than 101 degrees, then the student should stay home from school.

6. Sample: If a number is divisible by 5, then it is prime.
7. Sample: The sum of 10 and -5 is 5.
8. Sample: A 15-year-old is a teenager but is not 14 years old.

Investigation Practice 4

- a. inductive, based on an observed pattern
- b. deductive, based on a rule
- c. Sample: If it rains today, then the game will be postponed.
- d. Sample: If $x = 2$, then x is negative.
- e. Sample: Cats are animals, but not all cats are Siamese.
- f. Sample: Some female cats are not Siamese.

Lesson Activity 5

1. If a number is a multiple of 5, then it ends in 5.; false; Sample: 10 is a multiple of 5 but does not end in 5.
2. If two lines meet, then they are not parallel.; true
3. If it is not Monday, then I will not go to school.; false; Sample: If it is Tuesday, I will go to school.
4. If a number is not even, then it is not divisible by two.; true

5.

Original	True or False	Contrapositive	True or False
If a figure is a square, then it is a rectangle.	true	If a figure is not a rectangle, then it is not a square.	true
If a number is odd, then it is divisible by 2.	false	If a number is not divisible by 2, then it is not odd.	false

6. Sample: They have the same truth values.

7.

		True or False
Converse	If a figure is a rectangle, then it is a square.	false
Inverse	If a figure is not a square, then it is not a rectangle.	false

		True or False
Converse	If an object is a bicycle, then it has wheels.	true
Inverse	If an object does not have wheels, then it is not a bicycle.	true

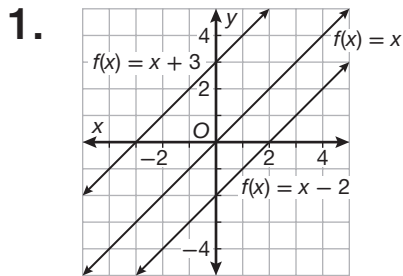
8. Sample: They have the same truth values.

- g. inverse; The original statement is true, but the inverse is false.

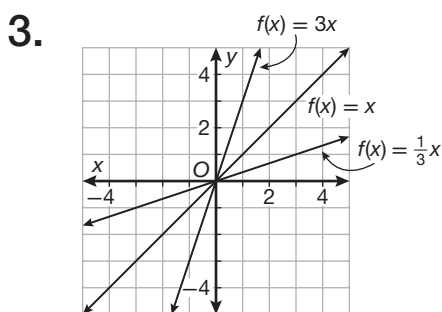
Investigation Practice 5

- If it is not cloudy, then it is not raining.
- If it is cloudy, then it is raining.
- If it is not raining, then it is not cloudy.
- true
- false
- contrapositive; The original statement and the contrapositive are true.

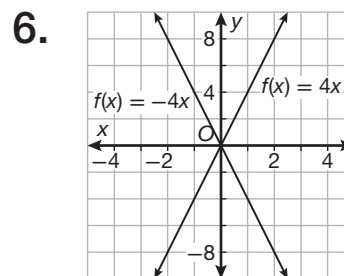
Lesson Activity 6



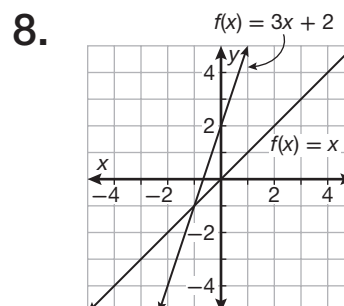
2. Sample: The graph of $f(x) = x + 3$ shifts up 3 units from the graph of $f(x) = x$. The y -intercept shifts from $(0, 0)$ to $(0, 3)$; The graph of $f(x) = x - 2$ shifts down 2 units from the graph of $f(x) = x$; The y -intercept shifts from $(0, 0)$ to $(0, -2)$.



4. Sample: When a positive slope increases, the line is steeper than the original line. When a positive slope decreases and stays positive, the line is not as steep as the original line.
5. no; The slope of $\frac{2}{3}$ is less than the slope of 1 for the parent function.

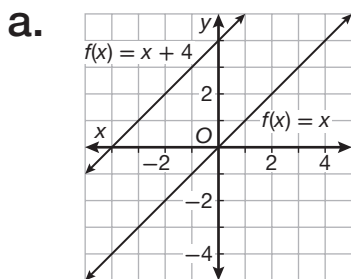


7. Graphing the original line with the opposite slope results in a reflection of the line over the y -axis.

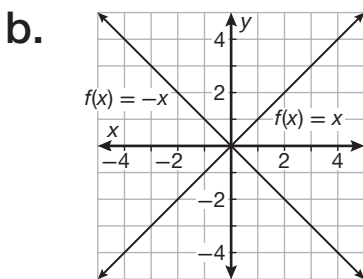


9. The graph of the line $y = 3x + 2$ is steeper than the graph of the line $y = x$ and is shifted up from the graph of the line $y = x$.

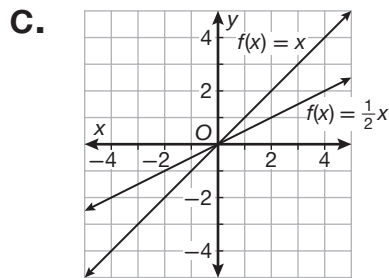
Investigation Practice 6



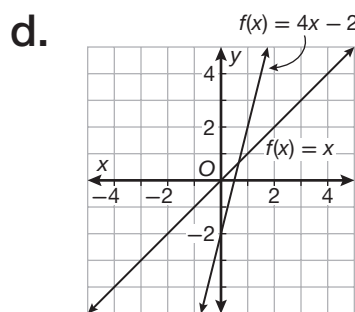
Sample: The graph of $f(x) = x$ is shifted up 4 units.



Sample: The graph of $f(x) = x$ is reflected over the y -axis.



Sample: The graph of $f(x) = \frac{1}{2}x$ is not as steep as the graph of $f(x) = x$.

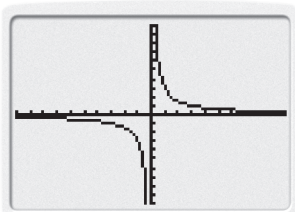
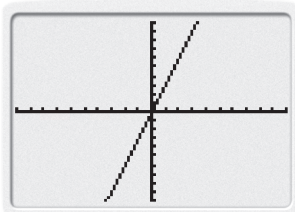


Sample: The graph is 4 times as steep as $f(x) = x$ and is shifted down 2 units.

Lesson Activity 7

1. $k = 5; y = 5x$
2. $k = \frac{1}{2}; y = \frac{1}{2}x$
3. Rate is the constant of variation.; $k = 3$
4. $d = 3t; \frac{d}{t} = 3$
5. $k = 3; xy = 3$
6. $k = 2; xy = 2$
7. Distance is the constant of variation.; $k = 4$
8. $r = \frac{4}{t}$ or $r \cdot t = 4$

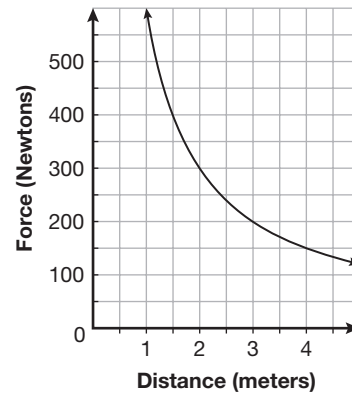
9–10.



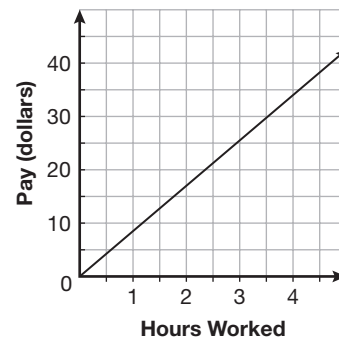
	Direct or Inverse Variation	Linear or Not Linear	x-Intercept
$y = 3x$	Direct	Linear	(0, 0)
$y = \frac{4}{x}$	Inverse	Not Linear	None

11. Sample: A direct-variation graph is linear and contains the origin. An inverse-variation graph is not linear and never intersects the x-axis.

12. inverse variation;
 $F = \frac{600}{d};$



13. direct variation;
 $p = 8.5h;$

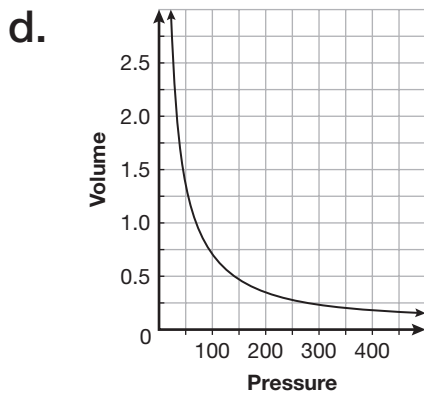


Investigation Practice 7

a. $k = 7; y = 7x$

b. $k = -24; w = \frac{-24}{z}$

c. $s = 3t; 15$ servings



inverse variation; $P = \frac{70}{V}$

Lesson Activity 8

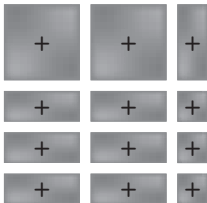
1. 2
2. doubling
3. directly; c
4. a ; c ; b
5. $20 = k \cdot 5 \cdot 2$
6. $k = 2$
7. $y = 2xz$
8. $y = 48$
9. $R = 0.08206$
10. 9.9 moles
11. 34.9 atm
12. $P = \frac{0.08206nT}{V}$
13. Sample: The absolute pressure is jointly proportional to the number of moles of the gas and the temperature, and inversely proportional to the volume of the vessel.

14. $P = \frac{kWD^2}{L}$
15. The load the beam can safely support is halved.
16. The load the beam can safely support is divided by 8.

Investigation Practice 8

- a. $s = 4rt$
- b. $m = \frac{1}{3} n\sqrt{p}$
- c. $y = \frac{kwx}{z}$
- d. $k = 5$
- e. $y = 32$
- f. 243.7 moles
- g. $V = \frac{0.08206nT}{P}$; inverse; joint
- h. $V = kr^2h$
- i. $k = 1.05$
- j. 66.15 cubic units

Lesson Activity 9

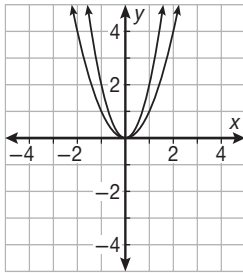
1. $x \cdot x \cdot x \cdot y + 2 \cdot x \cdot y \cdot y$
2. xy
3. $xy(x^2) + xy(2y)$
4. $xy(x^2 + 2y)$
5. no
6. yes
7. $a = x; b = 2$
8. $(x + 2)(x - 2)$
9. no
10. no
11. three
12. yes; $x, 8$
13. $a = x; b = 8$
14. $(x + 8)^2$
15. no; Sample: The value of a is x , but 32 is not a perfect square.
16. no
17. no; Sample: 15 is not a perfect square.
18. yes; $j = 3$ and $k = 5$
or $j = 5$ and $k = 3$
19. $(x + 3)(x + 5)$
20. no
21. four
22. $(x^3 + 7x^2) + (2x + 14)$
23. $x^2(x + 7)$
24. $2(x + 7)$
25. $x^2(x + 7) + 2(x + 7)$
26. $(x + 7)$
27. $(x + 7)(x^2 + 2)$
28. 
29. Sample: $2x + 1; x + 3$
30. Multiply the length times the width.
31. $(2x + 1)(x + 3)$
32. $(2x + 1)(x + 3)$

Investigation Practice 9

- a. $(x + 1)^2$
- b. $(3x + y)(x - 4)$
- c. $(3y^2 - 1)(3y^2 + 1)$
- d. GCF; $5x^2(x + 1)(x - 1)$;
difference of squares
- e. perfect-square
trinomial; $(3x + 5)^2$
- f. difference of squares;
 $(x + 3)(x - 3)$
- g. $(3x + 1)(x + 4)$
- h. $(x + 4)(x + 5)$
- i. $(2x + 2)(x + 3)$

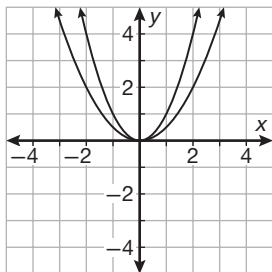
Lesson Activity 10

1.



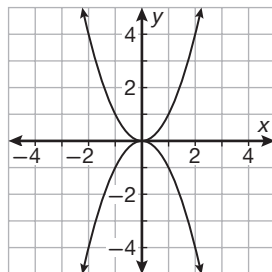
Sample: The graph of $y = 2x^2$ is narrower than the parent function.

2.



Sample: The graph of $y = \frac{1}{2}x^2$ is wider than the parent function.

3.



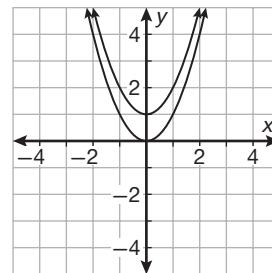
Sample: The graph of $y = -x^2$ opens in the opposite direction. (downward) of the parent function.

4. Sample: It makes the graph wider or narrower and changes the direction in which the parabola opens.

5. Sample: It's wider than the parent function.

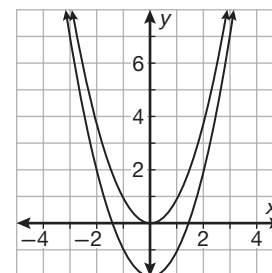
6. Sample: It's narrower than the parent function and opens downward.

7.



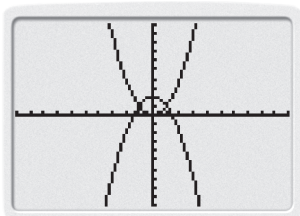
Sample: The new function moved up 1 unit from the parent function.

8.

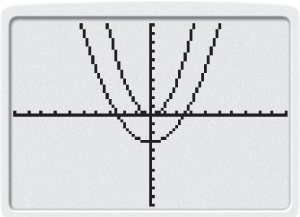


Sample: The new function shifts down 2 units from the parent function.

9. Sample: The new function moved up 7 units from the parent function.
10. moved up 2 units and opens downward;

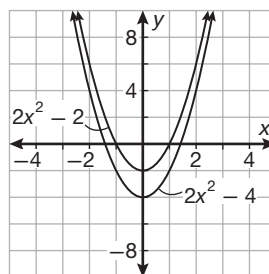


11. moved down 3 units and is wider;

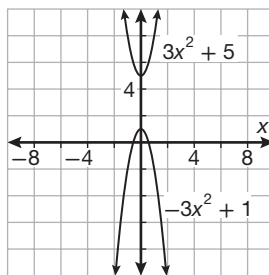


- d. The graph opens downward, is wider, and moved 1 unit down.

e. $f(x) = 2x^2 - 2$;



f. $f(x) = -3x^2 + 1$;

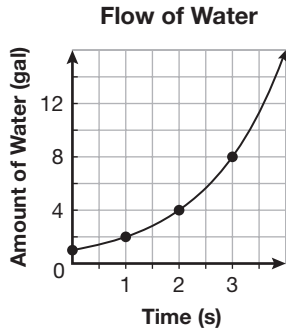


Investigation Practice 10

- a. The graph is narrower and moved 1 unit up.
- b. The graph is narrower, opens downward, and moved 2 units down.
- c. The graph is wider and moved 2 units up.

Lesson Activity 11

1.

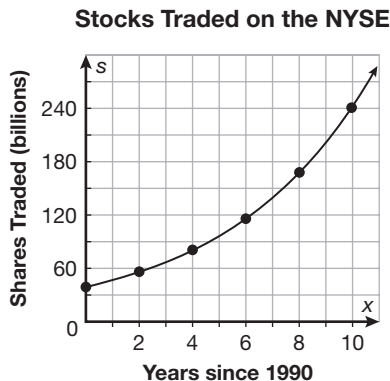


2. 16 gallons

3.

x	S
0	39
2	56
4	81
6	116
8	168
10	241

4.

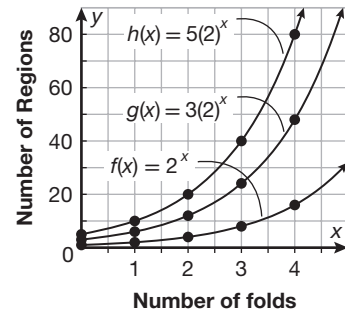


5. about 140 billion shares

6. 139.74 billion shares

7.

Exponential Growth



8. (0, 1); (0, 3); (0, 5);
(0, k)

9. Sample: The y-intercept is k. Each graph has the same shape, but larger values of k cause the graph to curve upward more sharply.

10. Sample: Every time the paper is folded in half, the number of regions doubles; $2; y = k(2)^x$

11. k represents the initial amount present.

12. 22,920 years

13.

Number of Half-Lives	Number of Years	Amount of Carbon-14 Remaining (mg)
0	0	100
1	5730	50
2	11,460	25
3	17,190	12.5
4	22,920	6.25

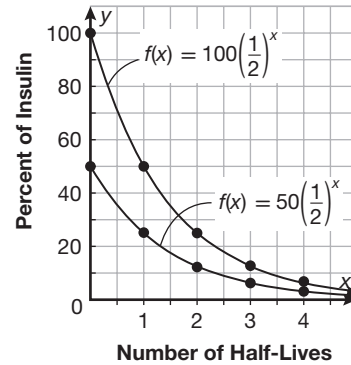
14. 6.25 mg

15. 0.39%

16. Sample: In each interval x , the amount of y remaining decreases by half.

17. Sample: The k value and the y -intercept are the same. The exponential decay graphs have y -intercept $(0, k)$. The y -intercept of f is $(0, 100)$. The y -intercept of g is $(0, 50)$. The graphs have the same shape, but a larger value of k causes the graph to curve downward more sharply.

Exponential Decay



18. Graph B; The y -intercept is 2 because $k = 2$. The value of b is 0.5, which is greater than zero and less than one, so the equation is exponential decay-as x increases, y decreases.

19. Graph C; The y -intercept is 2 because $k = 2$. The value of b is 3 and is greater than one, so the equation is exponential growth-as x increases, y increases.

20. Graph A; The y -intercept is 1 because $k = 1$. The value of b is 0.25 which is greater than zero and less than one, so the equation is exponential decay—as x increases, y decreases.
21. Graph D; The y -intercept is 0.25 because $k = 0.25$. The value of b is 2 and is greater than one so the equation is exponential growth—as x increases, y increases.
- Investigation Practice 11**
- a. 4 times; $y = 500(2)^x$; \$8000
- b. 14.4 half-lives;
 $y = 100\left(\frac{1}{2}\right)^x$; about 0.0046 mg
- c. decay; The value of b is 0.5, which is between 0 and 1.
- d. Both graphs have y -intercept (0, 1) and neither crosses the x -axis and both graphs show exponential decay. The graph of $y = \left(\frac{1}{3}\right)^x$ curves downward more sharply than the graph of $y = \left(\frac{1}{2}\right)^x$.
- e. Both graphs have y -intercept (0, 1) and neither crosses the x -axis. The graph of $f(x) = \left(\frac{1}{2}\right)^x$ represents exponential decay. The graph of $h(x) = 2^x$ represents exponential growth. The graphs are mirror images of each other reflected over the y -axis.
- f. Graph C; The y -intercept is 3 because $k = 3$. The value of b is 0.5 which is greater than zero and less than one, so the equation is exponential decay—as x increases, y decreases.

- g. Graph A; The y -intercept is 3 because $k = 3$. The value of b is 2 and is greater than one, so the equation is exponential growth—as x increases, y increases.
- h. Graph B; The y -intercept is 1 because $k = 1$. The value of b is 4 and is greater than one, so the equation is exponential growth—as x increases, y increases.
- i. Graph D; The y -intercept is 2 because $k = 2$. The value of b is 0.25 which is greater than zero and less than one, so the equation is exponential decay—as x increases, y decreases.

Lesson Activity 12

1.
$$\begin{bmatrix} 10 & 7 \\ 3 & 2 \\ 4 & 9 \end{bmatrix}$$

2. Sample: Add the numbers in the third row.; 13 sweatshirts

3. 3, 2

4. 3×2

5. 9

6. The matrix would have five rows and four columns.

7. Sample: Add the number of large hats sold on the first day, 2, to the number of large hats sold on the second day, which is 5.

8. Put the data from each table into a matrix and then find the sum of the values in the second row and second column of each matrix.

9.
$$\begin{bmatrix} 10 & 7 \\ 3 & 2 \\ 4 & 9 \end{bmatrix} + \begin{bmatrix} 8 & 3 \\ 1 & 5 \\ 4 & 7 \end{bmatrix} = \begin{bmatrix} 18 & 10 \\ 4 & 7 \\ 8 & 16 \end{bmatrix}$$

10. 2 hats

$$\begin{bmatrix} 10 & 7 \\ 3 & 2 \\ 4 & 9 \end{bmatrix} - \begin{bmatrix} 8 & 3 \\ 1 & 5 \\ 4 & 7 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 2 & -3 \\ 0 & 2 \end{bmatrix}$$

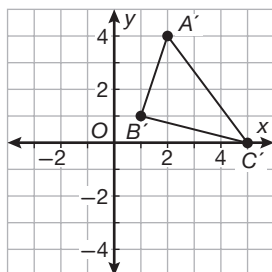
11.

	Point A	Point B	Point C
x-coordinate	-1	-2	2
y-coordinate	2	-1	-2

$$12. A = \begin{bmatrix} -1 & -2 & 2 \\ 2 & -1 & -2 \end{bmatrix}$$

$$13. A + B = \begin{bmatrix} 2 & 1 & 5 \\ 4 & 1 & 0 \end{bmatrix}$$

14.



15. Sample: The matrix addition $A + B$ translates $\triangle ABC$ three units to the right and two units up.

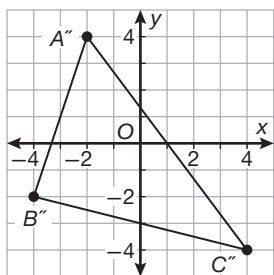
$$16. \begin{bmatrix} -1 & -1 & -1 \\ -3 & -3 & -3 \end{bmatrix}$$

$$17. \begin{bmatrix} 5 & 5 & 5 \\ 2 & 2 & 2 \end{bmatrix}$$

18. Sample: The coordinates of the vertices would double so the transformed triangle would be four times as big as $\triangle ABC$.

$$19. 2A = \begin{bmatrix} -2 & -4 & 4 \\ 4 & -2 & -4 \end{bmatrix}$$

20.



21. Sample: Scalar multiplication $2A$ quadrupled the size of $\triangle ABC$.

$$22. \frac{1}{2}A = \begin{bmatrix} -\frac{1}{2} & -1 & 1 \\ 1 & -\frac{1}{2} & -1 \end{bmatrix}$$

23. Sample: $\triangle ABC$ was transformed by scalar multiplication using scalar 3.

Investigation Practice 12

a. Put the data in each table above into a matrix. Label the first table matrix A and the second matrix B . Subtract the data in matrix A from matrix B .

b. \$25

$$\begin{bmatrix} 25 & 60 & 10 \\ 85 & 20 & 35 \\ 30 & 60 & 40 \end{bmatrix} - \begin{bmatrix} 15 & 55 & 0 \\ 75 & 10 & 30 \\ 20 & 40 & 35 \end{bmatrix} = \begin{bmatrix} 10 & 5 & 10 \\ 10 & 10 & 5 \\ 10 & 20 & 5 \end{bmatrix}$$

$$c. \frac{1}{2}A = \begin{bmatrix} -1 & -2 & 2 & 1.5 \\ 1.5 & -0.5 & -1 & 1.5 \end{bmatrix}$$