Discovering Algebra

An Investigative Approach

More Practice Your Skills with Answers

DISCOVERING MATHEMATICS™

Key Curriculum Press
Innovators in Mathematics Education

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Introduction

The authors of *Discovering Algebra: An Investigative Approach* are aware of the importance of students developing algebra skills along with acquiring concepts through investigation. The student text includes many skill-based exercises. These *More Practice Your Skills* worksheets provide problems similar to the Practice Your Skills exercises in *Discovering Algebra.* Like the Practice Your Skills exercises, these worksheets allow students to practice and reinforce the important procedures and skills developed in the lessons. Some of these problems provide non-contextual skills practice. Others give students an opportunity to apply skills in fairly simple, straightforward contexts. Some are more complex problems that are broken down into small steps. And some have several parts, each giving practice with the same skill.

You may choose to assign the *More Practice Your Skills* worksheet for every lesson, or only for those lessons your students find particularly difficult. Or you may wish to assign the worksheets on an individual basis, only to those students who need extra help. To save you the time and expense of copying pages, you can give students the inexpensive *More Practice Your Skills Student Workbook,* which does not have answers. Though the copyright allows you to copy pages from *More Practice Your Skills with Answers* for use with your students, the consumable *More Practice Your Skills Student Workbook* should not be copied.

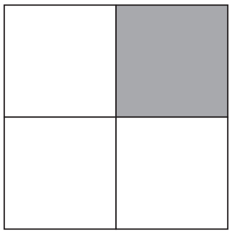
Students who need further practice can use the *TestCheck*™*: Test Generator and Worksheet Builder*™ CD to generate additional practice sheets. This CD is part of the *Discovering Algebra Teaching Resources.*

Lesson 0.1 • The Same yet Smaller

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

1. Write an expression and find the total shaded area in each square. In each case, assume that the area of the largest square is 1.

a.



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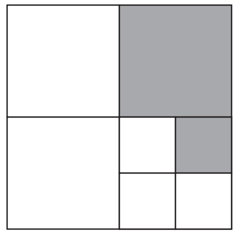

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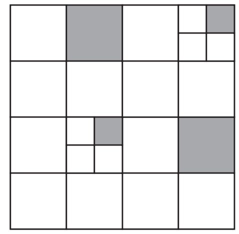

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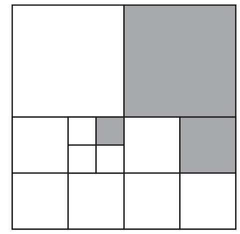
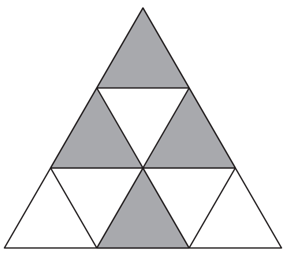


2. Write an expression and find the total shaded area in each triangle. In each case, assume that the area of the largest triangle is 81.

a.



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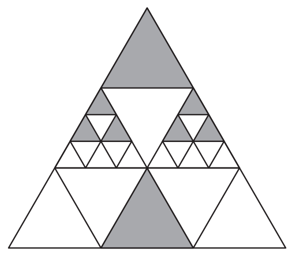

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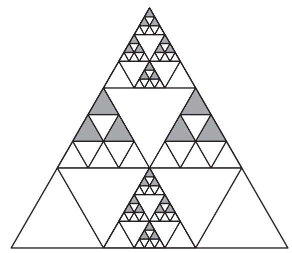
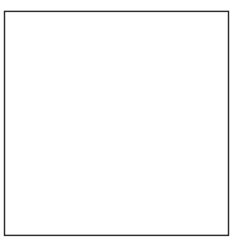
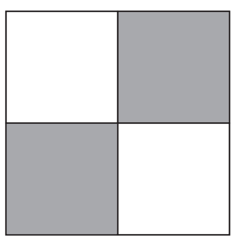


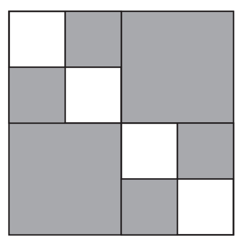
3. Use this fractal pattern to answer the questions. Assume that the area of the Stage 0 square is 1.



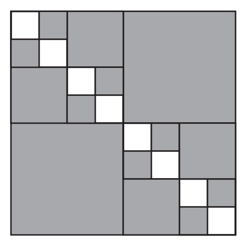
Stage 0



Stage 1



Stage 2



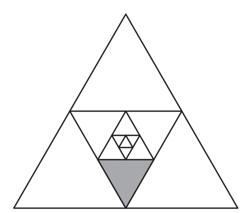
Stage 3

a. Draw Stage 4 of the pattern.

b. What is the area of the smallest square at Stage 4?

c. What is the total area of the unshaded squares at Stage 2? At Stage 3?

4. Suppose the largest triangle in this figure has an area of 1.



a. Write an expression for the shaded area.

b. Write an expression for the unshaded area.

c. Write an expression for the smallest triangle at the center.

Lesson 0.1 • Adding and Multiplying Fractions

Name ______________________________ Period ____________ Date ______________

1. Find each sum.

a. $\frac{1}{4}+\frac{1}{4}$ **b.** $\frac{3}{4}+\frac{1}{4}$ **c.** $\frac{3}{8}+\frac{2}{8}$

d. $\frac{1}{8}+\frac{1}{64}$ **e.** $\frac{1}{5}+\frac{3}{10}$ **f.** $\frac{1}{7}+\frac{2}{21}$

g. $\frac{2}{5}+\frac{2}{15}$ **h.** $\frac{1}{8}+\frac{3}{16}+\frac{5}{64}$ **i.** $\frac{1}{9}+\frac{1}{27}+\frac{1}{81}$

j. $\frac{3}{7}+\frac{8}{21}$ **k.** $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}$ **l.** $\frac{1}{3}+\frac{4}{9}+\frac{6}{27}$

2. Find each difference.

a. $1-\frac{1}{4}$ **b.** $1-\frac{3}{16}$ **c.** $1-\frac{1}{4}-\frac{3}{8}$

d. $1-\frac{1}{2}-\frac{1}{4}-\frac{1}{8}$ **e.** $1-\left(\frac{1}{2}+\frac{1}{4}+\frac{1}{8}\right)$ **f.** $1-\frac{3}{8}-\frac{7}{16}$

g. $1-\frac{3}{4}-\frac{1}{8}-\frac{1}{16}$ **h.** $1-\left(\frac{3}{4}+\frac{1}{8}+\frac{1}{16}\right)$ **i.** $1-\frac{1}{4}-\frac{3}{8}-\frac{5}{16}$

3. Find each product.

a. $\frac{1}{4}\times\frac{1}{4}$ **b.** $\frac{1}{5}\times\frac{3}{5}$ **c.** $\frac{1}{3}\times\frac{1}{9}$

d. $\frac{2}{3}\times\frac{5}{8}$ **e.** $2\times\frac{1}{5}$ **f.** $3\times\frac{1}{6}$

g. $6\times\frac{2}{9}$ **h.** $3\times\frac{1}{4}\times\frac{7}{16}$ **i.** $9\times\frac{1}{3}\times\frac{2}{27}$

4. Find each product.

a. $\frac{1}{2}\times 32$ **b.** $\frac{1}{4}\times 32$ **c.** $\frac{3}{4}\times 32$

d. $\frac{1}{2}\times\frac{3}{4}\times 32$ **e.** $\frac{1}{4}\times\frac{3}{4}\times 32$ **f.** $\frac{3}{4}\times\frac{3}{4}\times 32$

g. $\frac{1}{4}\times\frac{1}{8}\times 32$ **h.** $\frac{1}{8}\times\frac{1}{8}\times 32$ **i.** $\frac{3}{8}\times\frac{3}{4}\times 32$

Lesson 0.2 • More and More

Name ______________________ Period ________ Date ____________

1. Write each multiplication expression in exponent form.
Example: $2 \cdot 2 \cdot 2 = 2^3$

a. $3 \cdot 3 \cdot 3 \cdot 3$ **b.** $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$ **c.** $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

d. $10 \cdot 10 \cdot 10$ **e.** $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$ **f.** $\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3}$

2. Rewrite each expression as a repeated multiplication and find the value.

a. 4^3 **b.** 2^6 **c.** 6^3

d. 10^6 **e.** $\left(\frac{1}{3}\right)^3$ **f.** $\left(\frac{2}{3}\right)^2$

3. Write each number in exponent form. Example: $25 = 5^2$

a. 32 **b.** 27 **c.** 64

d. 81 **e.** 289 **f.** 1331

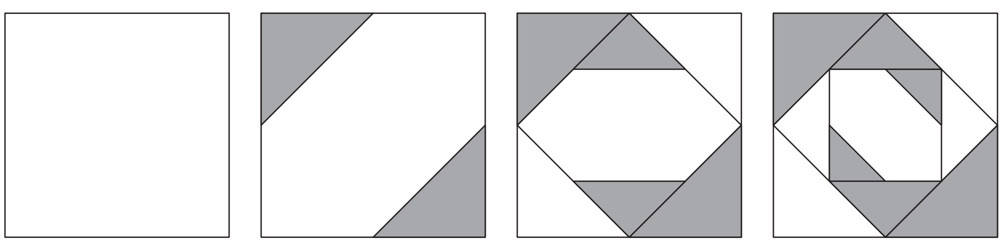
4. Do each calculation. Check your results with a calculator.

a. $\frac{1}{4} + \frac{2}{3}$ **b.** $\frac{3}{8} \cdot 16$ **c.** $\frac{5}{6} - \frac{1}{4}$

d. $9 - \frac{3}{8}$ **e.** $\frac{1}{7} \cdot \frac{3}{5} \cdot 4$ **f.** $\frac{7}{64} + \frac{5}{16} + \frac{3}{8}$

g. $\frac{15}{16} - \frac{7}{8} + \frac{3}{4}$ **h.** $\frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{4} \cdot 24$ **i.** $\frac{3}{4} + \frac{2}{3} - \frac{1}{2}$

5. Four stages of a fractal spiral are shown. The area of Stage 0 is 12. Draw Stage 4 and copy and complete the table for Stages 0 to 4.



Stage 0 Stage 1 Stage 2 Stage 3

Stage	Total shaded area in multiplication and addition form	Total shaded area in fraction form	Total shaded area in decimal form
0	0	0	0
1	$\left(2 \cdot \frac{1}{8}\right) \cdot 12$	3	3
2	$\left[\left(2 \cdot \frac{1}{8}\right) + \left(2 \cdot \frac{1}{8} \cdot \frac{1}{2}\right)\right] \cdot 12$		
3			

Lesson 0.3 • Shorter yet Longer

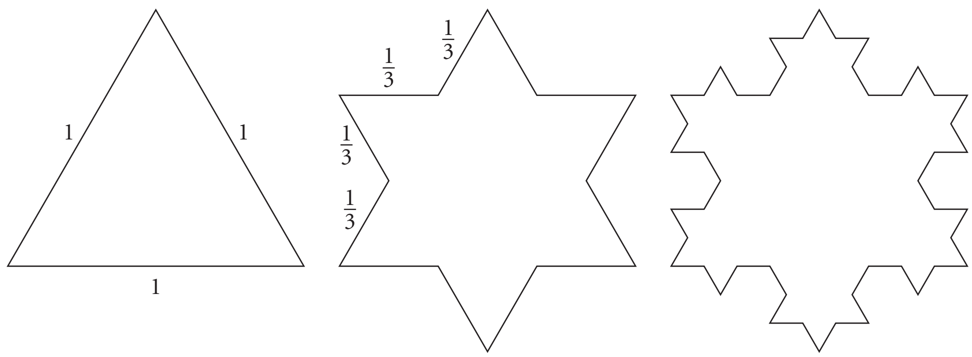
Name ______________________ Period ________ Date __________

1. Evaluate each expression. Write your answer as a fraction and as a decimal rounded to the nearest hundredth.

a. $\left(\frac{3}{4}\right)^3$ **b.** $\frac{3^3}{4^3}$ **c.** $\frac{6^2}{5^2}$

d. $\left(\frac{5}{7}\right)^2$ **e.** $\left(\frac{8}{10}\right)^4$ **f.** $\frac{12^2}{5^3}$

2. This fractal is a relative of the Koch curve called the snowflake curve.



Stage 0 Stage 1 Stage 2

a. Complete the table by calculating the length of the figure at Stages 2 and 3. Round decimal answers to the nearest hundredth.

b. How much longer is the figure at Stage 4 than at Stage 3? Express your answer as a fraction and as a decimal rounded to the nearest hundredth.

	Total length		
Stage number	**Multiplication form**	**Exponent form**	**Decimal form**
0	$3 \cdot 1 = 3$	$3 \cdot \left(\frac{4}{3}\right)^0$	3.00
1	$3 \cdot 4 \cdot \frac{1}{3} = 4$	$3 \cdot \left(\frac{4}{3}\right)^1$	4.00
2	$3 \cdot 4 \cdot 4 \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{16}{3}$		
3			

3. At what stage does the figure in Exercise 2 first exceed a length of 15? How many segments are there at that stage?

4. Evaluate each expression, and check your results with a calculator.

a. $\frac{5}{8} + \frac{5}{3}$ **b.** $3^2 + 2^3$ **c.** $5^3 - \frac{7}{12}$

d. $\left(\frac{5}{6}\right)^2 \cdot \left(\frac{2}{3}\right)^2$ **e.** $\frac{1^2}{2^2} - \left(\frac{1}{2}\right)^3$ **f.** $4^3 + \left(\frac{3}{4}\right)^2$

g. $2^4 - \left(\frac{3}{2}\right)^2 + \frac{1}{2}$ **h.** $\left(\frac{3}{4}\right)^2 + \left(\frac{3}{2}\right)^3 - 3$ **i.** $\left(\frac{7}{2}\right)^2 - \frac{7}{3} + \frac{5^2}{6}$

Lesson 0.4 • Going Somewhere?

Name ______________________ Period __________ Date ____________

1. Do each calculation. Check your results on your calculator. Use a number line to illustrate your answer for 1d–f.

a. $12 - 5$ **b.** $5 - 12$ **c.** $15 + -6$

d. $15 - (-6)$ **e.** $-3 + -7$ **f.** $-3 - (-7)$

2. Do the indicated multiplication or division. Check your results on your calculator.

a. $4 \cdot -2$ **b.** $-2 \cdot 4$ **c.** $-4 \cdot -7$

d. $-24 \div 3$ **e.** $32 \div -16$ **f.** $-64 \div -16$

g. $100 \div -4 \cdot 3$ **h.** $-3 \cdot 16 \div -8$ **i.** $12 \div -3 \div -2$

3. Do the following calculations. Remember, if there are no parentheses, you must do multiplication or division before addition or subtraction. Check your results by entering the expression exactly as it is shown on your calculator.

a. $9 - 4 \cdot 2 + 3$ **b.** $9 - 4 + 12 \cdot 3$

c. $-3 \cdot 6 + 4 \cdot -5$ **d.** $-18 + -6 \cdot -2 + 5$

e. $2 \cdot (9 - 18) - (-10)$ **f.** $-(5 - 9) \cdot -3 + -6 \cdot -2$

4. Do the following calculations. Check your results on your calculator.

a. $3 + -7 \cdot 2 - 5$ **b.** $(3 + -7) \cdot 2 - 5$ **c.** $(3 + -7) \cdot (2 - 5)$

d. $3 + -7 \cdot (2 - 5)$ **e.** $3 + (-7 \cdot 2 - 5)$ **f.** $(3 + -7 \cdot 2) - 5$

5. Start with this expression:

$0.5 \cdot (\square - 1)$

a. Recursively evaluate the expression three times, starting with 2. Round your answers to the nearest thousandth.

b. Do three more recursions starting with the last value you found in 5a.

c. Now do five recursions, starting with -2.

d. Do you think this expression has an attractor value? Explain your reasoning.

Lesson 0.5 • Out of Chaos

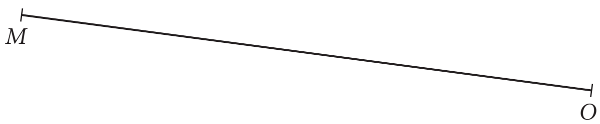
Name ________________________________ Period ____________ Date ______________

1. Estimate the length of each segment in centimeters. Then measure and record the length to the nearest tenth of a centimeter.

a. 

b. 

c. 

d. 

2. Draw a segment to fit each description.

a. one-fourth of a segment 16.4 cm long

b. two-thirds of a segment 12 cm long

c. three-fifths of a segment 15.5 cm long

d. five-eighths of a segment 16 cm long

3. Draw a line segment and label the endpoints *A* and *B*.

a. Mark and label point *C* midway between *A* and *B*.

b. Mark and label point *D* two-thirds of the distance from *B* to *A*.

c. Mark and label point *E* three-fourths of the distance from *A* to *B*.

d. Which two points are closest together? If the segment is 12 cm long, how far apart are they?

4. Do each calculation. Check your results with a calculator.

a. $\frac{1}{4} \cdot (12)^2$

b. $\frac{2}{3} - \left(\frac{3}{2}\right)^2$

c. $3^2 - \left(-4^3\right) - \frac{3}{8}$

d. $46 - \frac{3^2}{7}$

e. $-3 - \frac{3}{4} + \left(\frac{7}{2}\right)^2$

f. $-\left(2^4\right) \cdot \frac{5}{6} - 17$

g. $16 + \left(-2^4\right)$

h. $\frac{6^2}{7} + 21 + (-2)^4$

i. $-\left(\frac{5}{7}\right) + \left(8^2\right) - 36$

j. $-3\frac{1}{4} + 2\frac{2}{3}$

k. $4\frac{3}{4} - 2\frac{1}{2} + 1\frac{3}{10}$

l. $-1\frac{3}{4} + -1\frac{1}{2}$

Lesson 1.1 • Bar Graphs and Dot Plots

Name ______________________ **Period** __________ **Date** ______________

1. This table shows the heights of the ten tallest mountains in the world.

Mountain Heights

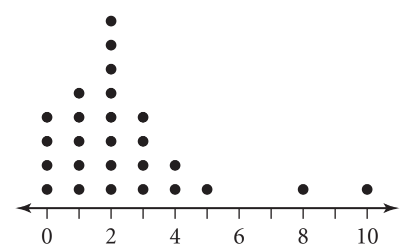
ID	Mountain, location	Height (ft)	ID	Mountain, location	Height (ft)
1	Everest, Nepal/Tibet	29,035	6	Lhotse II, Nepal/Tibet	27,560
2	K2, Kashmir	28,250	7	Dhaulagiri I, Nepal	26,810
3	Kanchenjunga, India/Nepal	28,208	8	Manaslu I, Nepal	26,760
4	Lhotse I, Nepal/Tibet	27,923	9	Cho Oyu, Nepal/Tibet	26,750
5	Makalu I, Nepal/Tibet	27,824	10	Nanga Parbat, Kashmir	26,660

(*The World Almanac and Book of Facts 2004,* p. 488)

a. Find the minimum, maximum, and range of the data.

b. Construct a bar graph for this data set. Use the ID numbers to identify the mountains.

2. The students in one social studies class were asked how many brothers and sisters (siblings) they each have. The dot plot here shows the results.



a. How many of the students have six siblings?

b. How many of the students have no siblings?

c. How many of the students have three or more siblings?

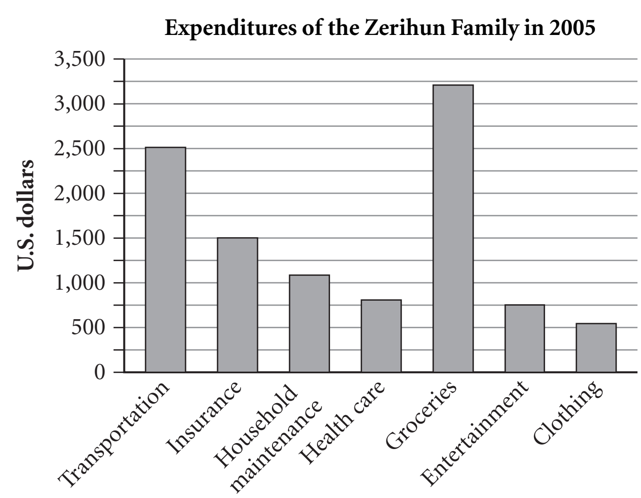
3. This table shows approximately how long it took members of Abdul's math class to complete a cross-number puzzle.

Time (min)	2	3	5	6	8	10
Number of students	1	2	6	8	3	1

a. Show this data on a dot plot.

b. What is the range of the data?

4. The bar graph shows how much money the Zerihun family spent on various goods and services during 2005.



a. On what did the Zerihun family spend the least amount of money?

b. About how much did they spend on insurance?

c. About how much more did they spend for groceries than for transportation?

Lesson 1.2 • Summarizing Data with Measures of Center

Name ________________________ Period __________ Date ____________

1. Find the mean, median, mode, and range of each data set.

a. {10, 54, 72, 43, 25, 29, 36, 10, 68}

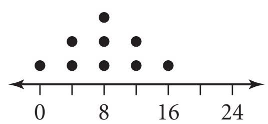
b. {16, 11, 31, 19, 12, 17, 13, 14}

c. {12, 26, 21, 36, 25, 20, 21}

d. {25, 25, 30, 30, 35, 35}

2. Find the mean, median, and mode of each dot plot.

a.



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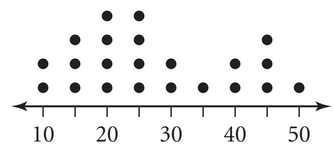


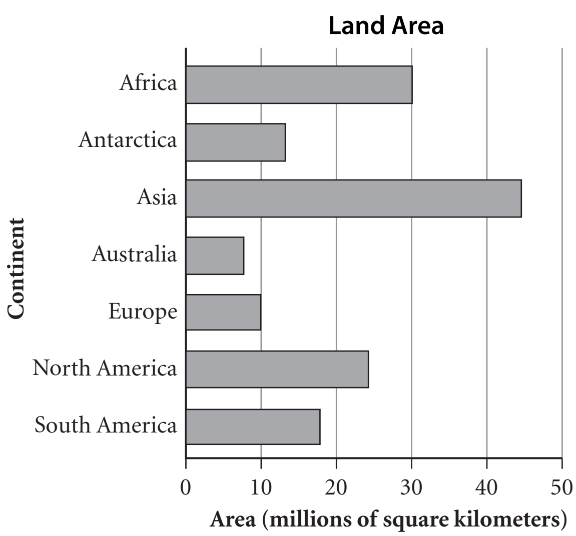
3. Create a data set that fits each description.

a. The median age of Shauna and her six siblings is 14. The range of their ages is 12 years and the mode is 10.

b. Jorge took six math tests during the current marking period. His mean mark is 83 and his median mark is 85.

c. Laurel took a survey of the number of coins eight students had in their pockets. The minimum was 7, the mode was 11, the median was 10, and the range was 9.

4. This bar graph shows the approximate land area of the seven continents.



a. Find the approximate mean and median of this data set.

b. What is the approximate range of this data set?

Lesson 1.3 • Five-Number Summaries and Box Plots

Name ________________________ **Period** ________ **Date** ____________

1. Find the five-number summary for each data set.

a. {37, 44, 5, 8, 20, 11, 14}

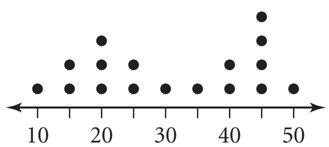
b. {10, 1, 3, 4, 30, 4, 20, 22, 10, 25, 30}

c. {25, 27, 33, 14, 31, 16, 22, 24, 43, 25, 37, 39, 42}

d. {35, 17, 2, 32, 47, 13, 22, 7, 21, 55, 5, 52, 34, 41, 25, 8}

2. Circle the points that represent the five-number summary values in the dot plots below. If two data points are needed to calculate the median, first quartile, or third quartile, draw a circle around both points. List the five-number summary values for each plot.

a.



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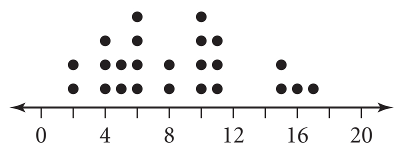
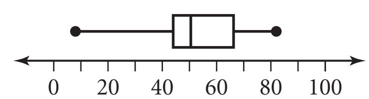


3. Which data set matches this box plot? (More than one answer may be correct.)



a. {70.2, 52, 24.5, 61, 77, 26, 9, 51, 64, 28, 54, 28}

b. {59, 47, 79, 8, 65, 42, 23, 70, 82, 62, 48, 42, 52, 67.5, 49, 46}

c. {82, 36, 42, 8, 61, 50}

4. Create a data set with the five-number summary 6, 10, 12, 15, 20 that contains each number of values.

a. 11

b. 12

5. This table shows the number of bachelor's degrees earned in various fields at a private university for 1994 and 2004.

Bachelor's Degrees Awarded

Degree field	1994	2004
Architecture	76	78
Biological sciences	158	172
Business and management	410	422
Computer science	132	205
Cultural studies	25	46
Education	247	261
Engineering	351	370

Degree field	1994	2004
English literature	129	143
Law	18	29
Mathematics	62	65
Philosophy	43	52
Physical sciences	107	110
Visual and performing arts	154	141

a. Give the five-number summaries and the mean for each data set.

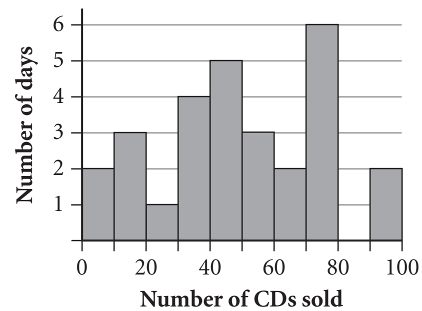
b. Create a box plot for each data set on the same number line.

Lesson 1.4 • Histograms and Stem-and-Leaf Plots

Name ______________________________ **Period** __________ **Date** ____________

1. The owner of an independent record shop monitored CD sales over a period of days. This histogram shows the results.

CD Sales



a. Find the total number of days included in this data set.

b. For how many days were fewer than 20 CDs sold?

c. For how many days were at least 50 but fewer than 80 CDs sold?

d. Explain the empty 80–90 interval.

e. Construct another histogram for this data set using intervals of 20 rather than 10.

2. The table shows the results of a study that found the distance each of 191 buses traveled before its first major engine failure.

a. Construct a histogram for this data.

b. How many buses traveled at least 100,000 mi before major engine failure?

c. If an engine warranty covered the cost of repair only for less than 80,000 mi, how many of the buses would have been repaired under the warranty?

d. What is a reasonable median value of the data?

Distance before Major Engine Failure

Distance traveled (thousands of miles)	Number of buses
0–19	6
20–39	11
40–59	16
60–79	25
80–99	34
100–119	46
120–139	33
140–159	16
160–179	2
180–199	2

(*Technometrics*, Nov. 1980, p. 588)

3. Add a reasonable box plot to your histogram for Exercise 2.

4. Dori did a survey of how many states the members of her class had visited. The results were

10 15 23 2 20 31 14 10 8 19 8 42 15 22 6 34 19 3 24 17 11

a. Find the minimum, maximum, and range of this data.

b. Create a stem plot of the data set.

Lesson 1.6 • Two-Variable Data

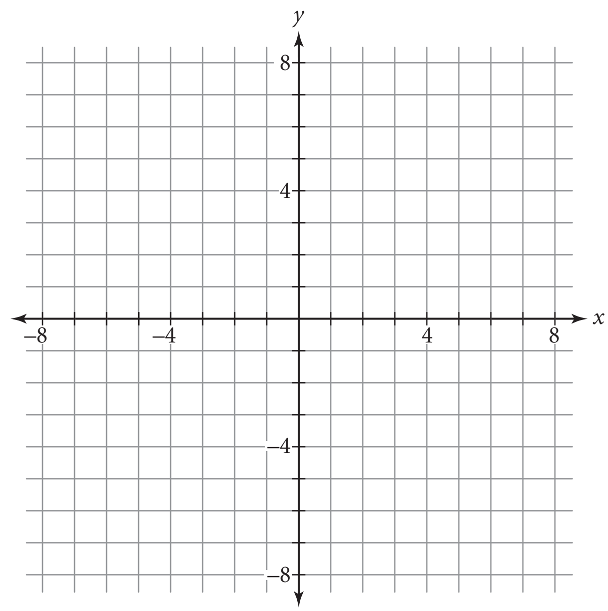
Name ______________________________ Period ____________ Date ______________

1. Identify the location (axis or quadrant) of each point listed.
Example: $(2, -2)$ is in Quadrant IV; $(2, 0)$ is on the x-axis.

$A(4, -3)$ $B(2.5, 4)$ $C(-3, 0)$ $D(-6.5, -5)$ $E(-2, -3)$

$F(-4, 6)$ $G(5, 4)$ $H(0, -7)$ $I(1, -4)$

2. Plot each point in Exercise 1 on this coordinate plane. Label each point with its corresponding letter name.

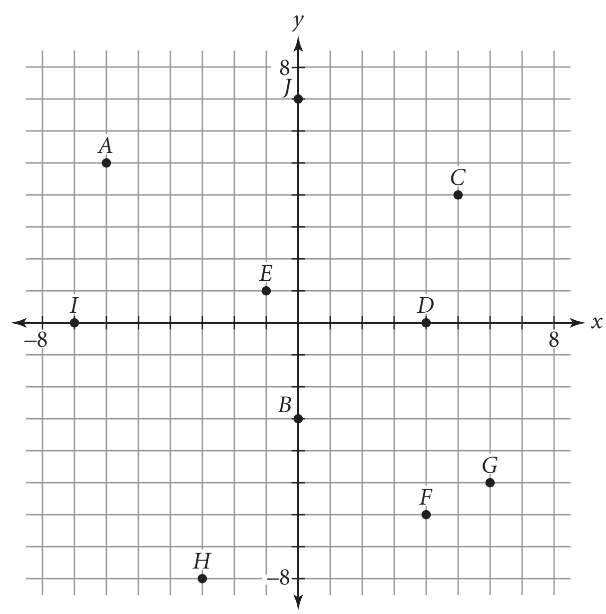


3. Use this scatter plot to answer the questions.

a. Give the coordinates of each point on the scatter plot.

b. How many points are in Quadrant IV?

c. Name the points in Quadrant II.



Lesson 1.7 • Estimating

Name ______________________________ Period __________ Date ____________

1. The table below shows the cost of various phone calls. Graph the scatter plot (*length of call, cost of call*) of this data set.

Phone Call Costs

Length of call (min)	3	5	12	19	23	30
Cost of call ($)	1.50	2.40	5.55	8.70	10.50	15.00

2. The table below shows partial results of a chemical reaction.

Chemical Reaction

Elapsed time (h)	0	1	2	3	4	5	6	7	8
Amount of new substance formed (mL)	0	1.0	2.0	3.0	4.5	6.8	9.0	10.0	11.0

a. Graph the scatter plot (*elapsed time, amount of new substance formed*) of this data set.

b. Graph the line $y = x$.

c. Describe any pattern you see in the data.

3. This table shows the *Forbes* ranking of the top ten places in the United States for business in 2004 compared with their ranking in 2003.

a. Graph the scatter plot (*rank in 2004, rank in 2003*) of this data set. Label each point with an appropriate abbreviation.

b. Graph the line $y = x$. Which places are on the line? What does this mean?

c. Which places are below the $y = x$ line? What does this mean?

d. Which places are above the $y = x$ line? What does this mean?

e. According to *Forbes*, which place showed the greatest improvement in its business climate between 2003 and 2004? How can you tell?

Ten Best Places for Business in the United States

Place	**Rank in 2004**	**Rank in 2003**
Madison, WI	1	5
Raleigh-Durham, NC	2	3
Austin, TX	3	1
Washington, D.C.-Northern VA	4	10
Atlanta, GA	5	4
Provo, UT	6	6
Boise, ID	7	2
Huntsville, AL	8	11
Lexington, KY	9	14
Richmond, VA	10	12

(*www.forbes.com/lists*)

Lesson 1.8 • Using Matrices to Organize and Combine Data

Name ______________________ **Period** __________ **Date** ______________

Use these matrices to answer each part of Exercises 1–3.

$$[A] = \begin{bmatrix} 2 & 5 \\ 6 & 3 \end{bmatrix} \qquad [B] = \begin{bmatrix} -2 & 4 & 3 \\ 8 & -1 & 5 \end{bmatrix}$$

$$[C] = \begin{bmatrix} -2 & 4 \\ 7 & -5 \end{bmatrix} \qquad [D] = \begin{bmatrix} -1 & -5 \\ 3 & -5 \\ -2 & 6 \end{bmatrix}$$

$$[L] = \begin{bmatrix} 3 & -5 \\ 4 & 2 \\ 6 & -3 \end{bmatrix} \qquad [M] = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$$

$$[N] = \begin{bmatrix} 4 & 2 \\ 5 & 3 \\ 2 & 7 \end{bmatrix} \qquad [P] = \begin{bmatrix} 3 & -2 & 4 \\ -1 & 5 & -3 \end{bmatrix}$$

1. What are the dimensions of each matrix?

a. $[A]$ **b.** $[B]$ **c.** $[C]$ **d.** $[D]$

e. $[L]$ **f.** $[M]$ **g.** $[N]$ **h.** $[P]$

2. Which matrices can you add together?

3. Do each calculation or explain why it is not possible.

a. $[A] + [C]$ **b.** $[D] + [P]$ **c.** $-3 \cdot [N]$

d. $[L] - [N]$ **e.** $4 \cdot [C] - [M]$ **f.** $[B] + [P]$

4. Matrix $[A]$ represents the price of 5 lb bags of three types of apples from two wholesalers. The rows show the types of apples: Macintosh, Red Delicious, and Granny Smith. The columns show the wholesalers: Pete's Fruits and Sal's Produce. Matrix $[B]$ represents the number of 5 lb bags of each type of apple that Juanita needs today for her corner fruit boutique. She can place an order with only one wholesaler.

$$[A] = \begin{bmatrix} 3.79 & 4.49 \\ 3.19 & 2.99 \\ 5.59 & 5.29 \end{bmatrix} \qquad [B] = \begin{bmatrix} 8 & 10 & 5 \end{bmatrix}$$

Perform a matrix operation to help Juanita make the better choice. Explain the meaning of your answer and how it will help Juanita.

Lesson 2.1 • Proportions

Name ______________________________ Period __________ Date ____________

1. Estimate the decimal number equivalent for each fraction. Then use your calculator to find the exact value.

a. $\frac{15}{4}$ **b.** $\frac{8}{5}$ **c.** $\frac{17}{100}$

d. $\frac{11}{16}$ **e.** $\frac{5}{45}$ **f.** $\frac{5}{6}$

g. $\frac{6}{11}$ **h.** $\frac{5}{33}$ **i.** $\frac{7}{111}$

2. This table shows the number of endangered animal species in various categories in the United States in 2004. Write each ratio as a fraction.

Type	Species
Mammals	69
Birds	77
Reptiles	14
Amphibians	11
Fish	71

Type	Species
Snails	21
Clams	62
Crustaceans	18
Insects	35
Arachnids	12

(*ecos.fws.gov/tess_public/TESSBoxscore*)

a. endangered arachnids to endangered crustaceans

b. endangered reptiles to endangered insects

c. endangered birds to endangered amphibians

d. endangered mammals to all endangered species in the list

3. Write each ratio as a fraction. Be sure to include units in both the numerator and the denominator.

a. Jeremy's car will go 400 miles on 12 gallons of gas.

b. In 1988, Florence Griffith-Joyner ran 100 meters in 10.49 seconds.

c. In Monaco in 2000, 32,231 people lived in 1.95 square kilometers.

d. Light travels 186,282 miles in 1 second.

4. Find the value of the unknown number in each proportion.

a. $\frac{m}{2} = \frac{3}{4}$ **b.** $\frac{n}{14} = \frac{4.5}{7}$ **c.** $\frac{3}{4} = \frac{h}{14}$

d. $\frac{8}{7} = \frac{x}{22.4}$ **e.** $\frac{9}{14} = \frac{15.3}{b}$ **f.** $\frac{27}{18} = \frac{6}{y}$

Lesson 2.2 • Capture-Recapture

Name ______________________ **Period** __________ **Date** ____________

1. The proportion $\frac{36}{45} = \frac{x}{100}$ asks, "36 is what percent of 45?" Write each proportion as a percent question.

a. $\dfrac{180}{100} = \dfrac{n}{36}$

b. $\dfrac{a}{100} = \dfrac{27}{4}$

c. $\dfrac{386}{p} = \dfrac{712}{100}$

d. $\dfrac{11}{111} = \dfrac{t}{100}$

2. Write each question as a proportion, and find the unknown number.

a. 75% of 68 is what number?

b. 120% of 37 is what number?

c. 270 is what percent of 90?

d. What percent of 18 is 0.2?

3. Diana had a large stack of playing cards. She knew that 17 of them were kings. She took a sample of 30 cards and found 4 kings. Approximately how many playing cards did Diana have?

4. Write and solve a proportion for each situation.

a. A candy maker put prizes in 600 bags of candy. He then took a random sample of 125 bags of candy and counted 8 bags with prizes in them. Approximately how many bags of candy did the candy maker have?

b. A candy maker estimated that she had 2500 bags of candy. She had put prizes in 92 of them. She collected a sample in which there were 7 bags of candy with prizes. Approximately how many bags of candy were in the sample the candy maker collected?

Lesson 2.3 • Proportions and Measurement Systems

Name ______________________________ Period __________ Date ______________

1. Find the value of n in each proportion.

a. $\frac{2.54 \text{ centimeters}}{1 \text{ inch}} = \frac{n \text{ centimeters}}{12 \text{ inches}}$

b. $\frac{1 \text{ kilometer}}{0.621 \text{ mile}} = \frac{n \text{ kilometers}}{200 \text{ miles}}$

c. $\frac{1 \text{ yard}}{0.914 \text{ meter}} = \frac{140 \text{ yards}}{n \text{ meters}}$

d. $\frac{0.305 \text{ meter}}{1 \text{ foot}} = \frac{200 \text{ meters}}{n \text{ feet}}$

2. Use the conversion factors in the table to make each conversion.

a. 10 inches to centimeters

b. 355.6 centimeters to inches

c. 7392 feet to miles

d. 1 mile to inches

e. 4 miles to meters

f. 100 yards to meters

1 inch = 2.54 centimeters
1 foot ≈ 0.305 meter
1 foot = 12 inches
5,280 feet = 1 mile
1 yard = 3 feet

3. Write a proportion and answer each question below using the conversion factor 1 kilogram ≈ 2.2 pounds.

a. $20 buys 2.5 kilograms of steak. How many pounds of steak will $20 buy?

b. Mr. Ruan weighs 170 pounds. What is his mass in kilograms?

c. Which is heavier, 51 kilograms or 110 pounds?

d. Professional middleweight boxers have a weight of at most 160 pounds, which is a mass of at most ______________ kilograms.

4. Olympic track and field records are kept in metric units. Use the conversion factors for Exercises 2 and 3 to answer each question below. (*Encyclopedia Britannica Almanac 2005,* pp. 919–923.)

a. In 2004, Veronica Campbell of Jamaica won the 200-meter run in 22.05 seconds. Her average speed was ______________ meters per second, or ______________ feet per second. Round answers to the nearest hundredth.

b. In 2004, Christian Olsson of Sweden won the triple jump with a distance of 17.79 meters. How many inches was his jump? Give the answer to the nearest inch.

c. In 2004, Yuriy Bilonog of Ukraine won the 16-pound shot put with a distance of 21.16 meters. How far is this in yards? What was the mass of the shot in kilograms? Round answers to the nearest hundredth.

d. In 2004, Huina Xing of China won the women's 10-kilometer run in a time of 30 minutes 24.36 seconds. How far, to the nearest hundredth, did she run in miles? Note: 1 kilometer = 1000 meters.

e. In 2004, Stefano Baldini of Italy won the marathon (26 miles 385 yards) in 2 hours 10 minutes 55.0 seconds. How far is the marathon in meters? What was his average speed in meters per minute? Round answers to the nearest tenth.

Lesson 2.4 • Direct Variation

Name ______________________ **Period** __________ **Date** ____________

1. If x represents distance in feet and y represents distance in meters, then $y = 0.3048x$. Enter this equation into the Y= menu on your calculator. Trace on the graph to find each missing quantity. Round each answer to the nearest tenth.

a. 25 feet $= y$ meters

b. x feet $= 4$ meters

c. 12.4 feet $= y$ meters

d. x feet $= 7$ meters

2. If x represents distance in inches and y represents distance in centimeters, then $y = 2.54x$. Enter this equation into your calculator. Trace on the graph of the equation or use the calculator table to find each missing quantity. Round each answer to the nearest tenth.

a. 36 inches $= y$ centimeters

b. x inches $= 40$ centimeters

c. x inches $= 15$ centimeters

d. 0.8 inch $= y$ centimeters

3. Describe how to solve each equation for x. Then solve.

a. $18 = 3.2x$

b. $5x = 12\frac{1}{2}\left(3\frac{5}{6}\right)$

c. $\frac{7.4}{x} = \frac{1}{0.3}$

d. $\frac{x}{29} = 8.610$

4. Substitute each given value into the equation $y = 4.2x$ to find the missing value.

a. Find y if $x = 5$.

b. Find y if $x = 8$.

c. Find x if $y = 16.8$.

d. Find x if $y = 1.05$.

e. Find y if $x = \frac{3}{4}$.

f. Find x if $y = \frac{3}{4}$.

5. The equation $d = 27.8t$ shows the direct-variation relationship between the time and maximum legal distance traveled on most two-lane highways in Canada. The variable t represents the time in seconds, and d represents the distance in meters. Use the equation to answer the questions.

a. What distance can a car legally cover in 30 seconds? In 1 hour?

b. What is the shortest amount of time in which a person can legally drive 15 kilometers? (1 km $=$ 1000 m)

c. What is the legal speed limit on most two-lane Canadian highways in meters per second? In kilometers per hour? In miles per hour? (1 mi $\approx$ 1.6 km)

Lesson 2.5 • Inverse Variation

Name ______________________________ Period __________ Date ______________

1. Substitute the given value into the equation $y = \frac{12}{x}$ to find the missing value.

a. Find y if $x = 3$. **b.** Find y if $x = 48$. **c.** Find y if $x = 1.5$.

d. Find x if $y = 2$. **e.** Find x if $y = 36$. **f.** Find x if $y = 600$.

2. Two quantities, x and y, are inversely proportional. When $x = 8$, $y = 4$. Find the missing coordinate for each point.

a. $(16, y)$ **b.** $(x, 40)$

c. $(0.2, y)$ **d.** $(x, 12.8)$

3. Find five points that satisfy the equation $y = \frac{18}{x}$. Graph these points and the equation to verify that your points are on the graph.

4. The amount of time it takes to travel a given distance is inversely proportional to how fast you travel.

a. Sound travels at about 330 m/s in air. How long would it take sound to travel 80 m?

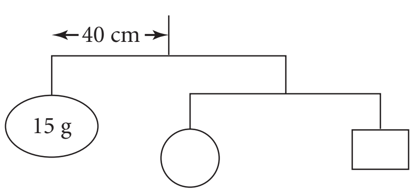
b. How long would it take sound to travel 1 mi, or 1609 m?

c. Sound travels faster through solid matter. How fast does sound travel in ice-cold water if it takes 3 s to travel 4515 m?

5. The mass needed to balance a mobile varies inversely with its distance from the point of suspension. A mass of 15 g balances the mobile when it is hung 40 cm from the suspension string.

a. What mass would be needed if the distance were 30 cm?

b. At what distance could you balance a 10 g mass?



Lesson 2.7 • Evaluating Expressions

Name ________________________________ Period __________ Date ______________

1. Use the rules for order of operations to evaluate each expression.

a. $5 + 3 \cdot 2$ **b.** $4 \div 2 - 5$ **c.** $-3 \cdot 4 + 7$ **d.** $6 \cdot (-5) - 8$

e. $-8 + 16 \div 2 + 7$ **f.** $8 \cdot 3 - 12 \div 4$ **g.** $\frac{17 - 5}{3} - 2$ **h.** $\frac{24 + 8}{-2} + 3 \cdot 5$

2. Insert parentheses to make each statement true.

Example: $5 - 2 + 6 = -3$ becomes $5 - (2 + 6) = -3$.

a. $-8 + 3 - 2 + 7 = -2$ **b.** $-8 + 3 - 2 + 7 = -16$

c. $2 - 3 - 4 + 1 = 4$ **d.** $2 - 3 - 4 + 1 = -6$

e. $4 - 5 + 2 - 6 - 11 = 6$ **f.** $4 - 5 + 2 - 6 - 11 = 2$

3. Insert parentheses, operation signs, and exponents to make each statement true.

Example: $-\ 2 \quad 1 \quad = -9$ becomes $-(2^3 + 1) = -9$.

a. $-\ 2 \qquad 9 \quad = 1$ **b.** $-\ 6 \qquad 3 \quad = 3$

c. $4 \qquad 2 \qquad 5 \quad = 19$ **d.** $-\ 2 \qquad 8 \qquad 3 \quad = -8$

e. $12 \qquad 3 \qquad 1 \quad = -4$ **f.** $3 \qquad -2 \qquad 7 \quad = 4$

4. Add 6 to a starting number, then multiply by 4, then subtract 7, and finally divide by 3.

a. What is the result when you start with 1? With -7? With $8\frac{1}{2}$?

b. Write an algebraic expression that fits the statement. Use x as the starting number.

c. Use your calculator to find the values of the expression with the starting numbers from 4a.

5. Consider the expression $\frac{4x + 6}{2} - 2x + 14$.

a. Write in words the meaning of the expression.

b. What is the value of the expression if the starting number is 9?

c. Is this expression a number trick? Explain how you know, and if it is, explain why it works.

Lesson 2.8 • Undoing Operations

Name ________________________________ Period __________ Date ____________

1. Evaluate each expression without a calculator. Then check your result with your calculator.

a. $12 - 5$

b. $5 - 12$

c. $-4 + (-6)$

d. $(-6)(-5)$

e. $4(-5) + (-36)\left(-\frac{1}{3}\right)$

f. $\frac{-18}{6} + 5$

g. $\frac{11 - 6(3 - 7)}{-7}$

h. $\frac{-3[10 + (-4)]}{9} - 8.2$

i. $\frac{-6(3 \cdot 4 - 7) - 3}{-11} + 6\left(\frac{2}{3}\right)$

2. Evaluate each expression if $x = 4$.

a. $9 - 2x + 3$

b. $-30 \div 6 + x \cdot -5$

c. $9x \div (9 - 18) - (-10)$

d. $-(5 - 17) \div 3 + -16\left(\frac{1}{x}\right)$

3. For each equation, identify the order of operations. Then work backward through the order of operations to find x.

a. $\frac{x}{5} - 8 = 12$

b. $6x - 7 = 11$

c. $\frac{x - 4}{9} = -1$

d. $-18(x + 0.5) = 27$

4. The Kelvin temperature scale is often used when working with the science of heat. To convert from a Fahrenheit temperature to a Kelvin temperature, subtract 32, then divide by 1.8, and then add 273. The Kelvin scale does not use the word or symbol for degree.

a. Write an equation showing the conversion from degrees Fahrenheit (°F) to Kelvin (K).

b. What is the Kelvin equivalent to normal body temperature, 98.6°F?

c. *Absolute zero,* the complete absence of heat, is 0 K. Use your equation from 4a and the undo procedure to find the Fahrenheit equivalent to absolute zero. Show your steps.

5. For each equation, create an undo table and solve by undoing the order of operations.

a. $\frac{2(x + 1.5)}{5} - 8.2 = -9.1$

b. $9\frac{1}{2} - 5(x - 3) = 18\frac{1}{4}$

Lesson 3.1 • Recursive Sequences

Name ______________________ Period __________ Date ____________

1. Evaluate the expression $\frac{2(3x+1)}{-4}$ for each value of x.

a. $x = 9$ **b.** $x = 2$ **c.** $x = -1$ **d.** $x = 14$

2. Consider the sequence of figures made from triangles.

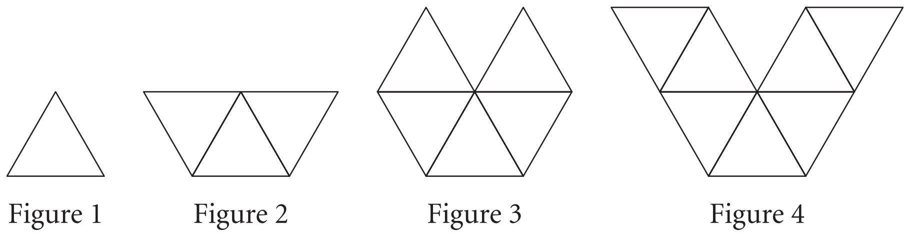


Figure #	Perimeter
1	3
2	5
3	
4	
5	

a. Complete the table for five figures.

b. Write a recursive routine to find the perimeter of each figure.

c. Find the perimeter of Figure 10.

d. Which figure has a perimeter of 51?

3. List the first six values generated by the following recursive routine:

-27.4 ENTER

Ans $+ 9.2$ ENTER, ENTER, . . .

4. Write a recursive routine to generate each sequence. Then use your routine to find the 10th term of your sequence.

a. 7.8, 3.6, -0.6, -4.8, . . .

b. -9.2, -6.5, -3.8, -1.1, . . .

c. 1, 3, 9, 27, . . .

d. 36, 12, 4, $1.\overline{3}$, . . .

5. Ben's school is $\frac{3}{4}$ mile, or 3960 feet, away from his house. At 3:00, Ben walks straight home at 330 feet per minute.

a. On your calculator, enter a recursive routine that calculates how far Ben is from home each minute after 3:00.

b. How far is he from home at 3:05?

c. At what time does Ben arrive home?

Lesson 3.2 • Linear Plots

Name ____________________ **Period** __________ **Date** ______________

1. Solve each equation.

a. $8(x - 3) - 9 = -25$

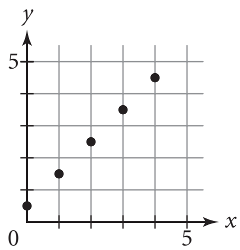
b. $16 - 5(x - 4) = 46$

c. $\dfrac{37 - 2(x + 8)}{4} = 4$

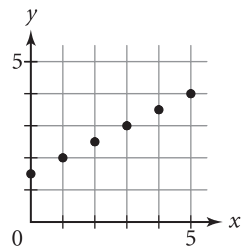
d. $\dfrac{-3(x - 9) + 4}{-4} = -10$

2. List the terms of each number sequence of y-coordinates for the points shown on each graph. Then write a recursive routine for each sequence.

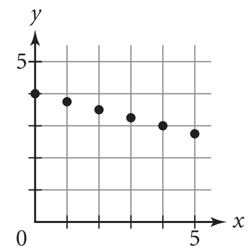
a.



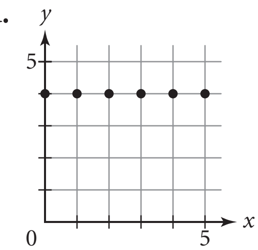
b.



c.



d.



3. Plot the first five points represented by each recursive routine on separate graphs.

a. $\{0, 4\}$ $\boxed{\text{ENTER}}$
$\{\text{Ans}(1) + 1, \text{Ans}(2) + 3\}$ $\boxed{\text{ENTER}}$, $\boxed{\text{ENTER}}$, . . .

b. $\{2, 6\}$ $\boxed{\text{ENTER}}$
$\{\text{Ans}(1) + 1, \text{Ans}(2) - 0.25\}$ $\boxed{\text{ENTER}}$, $\boxed{\text{ENTER}}$, . . .

c. $\{4, -1\}$ $\boxed{\text{ENTER}}$
$\{\text{Ans}(1) + 1, \text{Ans}(2) - 2\}$ $\boxed{\text{ENTER}}$, $\boxed{\text{ENTER}}$, . . .

4. Consider the following expression:

$$\frac{4(x - 5) - 8}{-3}$$

a. Use the order of operations to find the value of the expression if $x = 1$ and if $x = 8$.

b. Set the expression equal to 12. Create an undoing table and solve by undoing the order of operations you used in 4a.

5. One hundred metersticks are used to outline a rectangle. Write a recursive routine that generates a sequence of ordered pairs (l, w) that lists all possible rectangles.

Lesson 3.3 • Time-Distance Relationships

Name ______________________________ Period __________ Date ______________

1. Consider the following tables:

a.

Time (s)	Distance (m)
0	1.2
1	1.7
2	2.2
3	2.7
4	3.2
5	3.7

b.

Time (s)	Distance (m)
0	8
1	6.8
2	5.6
3	4.4
4	3.2
5	2.0

i. Describe the walk shown in each table. Include where the walker started and how quickly and in what direction the walker moved.

ii. Write a recursive routine for each table.

2. Walker A starts at the 0.5 m mark and walks away from the sensor at a constant rate of 1.7 m/s for 6 s. Walker B starts at the 4 m mark and walks toward the sensor at a constant rate of 0.3 m/s for 6 s.

a. Make a table of values for each walker.

b. Write a recursive calculator routine for each walk and use it to check your table entries.

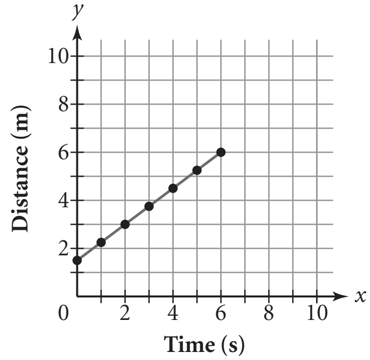
3. Look at the tables in 1a and b. Assume that both walkers start at the same time and are walking along the same route.

a. Make one graph showing both walks.

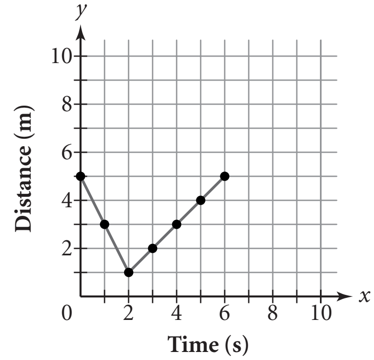
b. What do you notice about the two lines? Explain the significance of your observation.

4. Describe the walk shown in each graph. Include where the walker started, how quickly and in what direction the walker moved, and how long the walk lasted. The units for x are seconds and for y are meters.

a.



b.



Lesson 3.4 • Linear Equations and the Intercept Form

Name ________________________ Period __________ Date ____________

1. Match the answer routine in the first column with the equation in the second column.

a. 2 $\boxed{\text{ENTER}}$ Ans $-$ 0.75 $\boxed{\text{ENTER}}$, $\boxed{\text{ENTER}}$, . . .	**i.** $y = -2 + 0.75x$
b. 0.75 $\boxed{\text{ENTER}}$ Ans $+$ 2 $\boxed{\text{ENTER}}$, $\boxed{\text{ENTER}}$, . . .	**ii.** $y = 2 - 0.75x$
c. -0.75 $\boxed{\text{ENTER}}$ Ans $-$ 2 $\boxed{\text{ENTER}}$, $\boxed{\text{ENTER}}$, . . .	**iii.** $y = -0.75 - 2x$
d. -2 $\boxed{\text{ENTER}}$ Ans $+$ 0.75 $\boxed{\text{ENTER}}$, $\boxed{\text{ENTER}}$, . . .	**iv.** $y = 0.75 + 2x$

2. A store could use the equation $P = 6.75 + 1.20w$ to calculate the price P it charges to mail merchandise that weighs w lb. (1 lb $=$ 16 oz)

a. Find the price of mailing a 3 lb package.

b. Find the cost of mailing a 9 lb 8 oz package.

c. What is the real-world meaning of 6.75?

d. What is the real-world meaning of 1.20?

e. A customer sent \$20.00 to the store to cover the cost of mailing. He received the merchandise plus \$6.65 change. How much did his parcel weigh?

3. You can use the equation $d = -10 + 3t$ to model a walk in which the distance d is measured in miles and the time t is measured in hours. Graph the equation and use the trace function to find the approximate distance for each time value given in 3a and b.

a. $t = 2.2$ h

b. $t = 4$ h

c. What is the real-world meaning of -10?

d. What is the real-world meaning of 3?

4. Undo the order of operations to find the x-value in each equation.

a. $9 - 0.75(x + 8) - 5 = -2$

b. $\dfrac{15 - 8(x - 6)}{4} = -2.25$

5. The equation $y = 115 + 60x$ gives the distance in miles that a trucker is from Flint after x hours.

a. How far is the trucker from Flint after 2 hours and 15 minutes?

b. How long will it take until the trucker is 410 miles from Flint? Give the answer in hours and minutes.

Lesson 3.5 • Linear Equations and Rate of Change

Name ________________________________ Period __________ Date ______________

1. Complete the table of output values for each equation.

a. $y = 24 - 3x$

Input x	2	11	-1	7.5	9.4
Output y					

b. $\text{L}2 = 8 - 0.75 \cdot \text{L}1$

Input list L1	4	12	0.8	$-0.\overline{3}$	36
Output list L2					

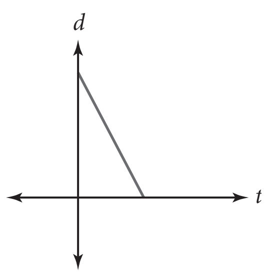
2. Use the equation $d = 1032 - 210t$ to approximate the distance in miles and time in hours of a pilot from her destination.

a. Find the distance d for $t = 4.8$ h.

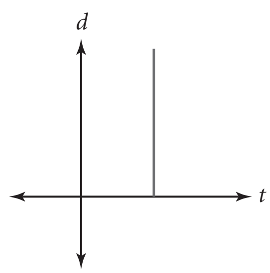
b. Find the time t for a distance of 770 mi.

3. Tell whether each graph is a possible model for a person's distance from a tree. If it is a possible model, describe the rate of change shown in the graph. If it is not a possible model, explain why not.

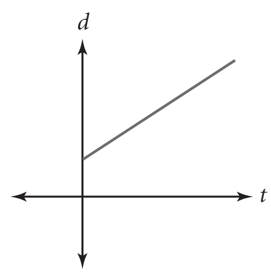
a.



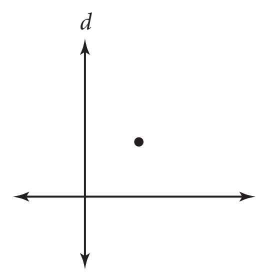
b.



c.



d.



4. Each table shows a different input-output relationship.

i.

Input	Output
2	7
3	9
4	11
5	13
6	15

ii.

Input	Output
-5	22
-2	10
1	-2
4	-14
7	-26

iii.

Input	Output
-8	4
-3	-1
2	-6
7	-11
12	-16

a. Find the rate of change, or slope, for each table.

b. For each table, find the output value that corresponds to an input value of 0. What is this output value called?

c. Use your results from 4a and b to write an equation in slope–intercept form for each table.

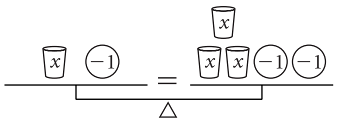
d. Use calculator lists to verify that your equations actually produce the table values.

Lesson 3.6 • Solving Equations Using the Balancing Method

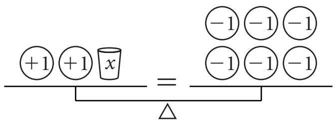
Name ________________________ Period __________ Date ____________

1. Give the equation that each picture models and solve for x.

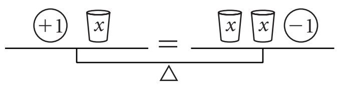
a.



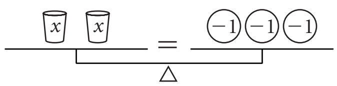
b.



c.



d.



2. Write each equation in intercept form, $y = a + bx$.

a. $y - 4 = 2x + 1$ **b.** $y + 9 = 4x + 2$ **c.** $\frac{3}{4}x - 6 = 11 - y$

3. Solve each equation using the balancing method. Give the action taken for each step.

a. $5 = 2a + 1$ **b.** $5b - 4 = -20$ **c.** $6 + c = 3c - 10$

4. Give the multiplicative inverse of each number.

a. 7 **b.** 0.25 **c.** $-\frac{5}{8}$ **d.** -36

5. Give the additive inverse of each number.

a. 0.25 **b.** $-\frac{5}{8}$ **c.** -36 **d.** $2z$

6. Solve each equation using the method of your choice. Then use another method to verify your answer.

a. $-12 = 9w - 30$ **b.** $8 - 3v = -1$

c. $\frac{3}{4}m = -9$ **d.** $-\frac{5}{2}n = -4$

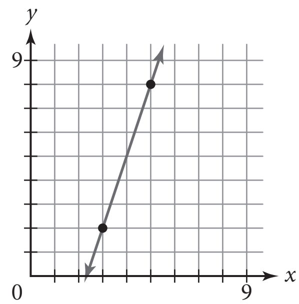
e. $4(x + 3.2) + 2.1 = 16$ **f.** $\dfrac{-4 + 2(3 - y)}{5} - 8.4 = 0$

Lesson 4.1 • A Formula for Slope

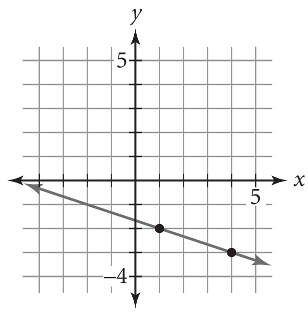
Name ____ Period _____________ Date __________________

1. Find the slope of each line using a slope triangle or the slope formula.

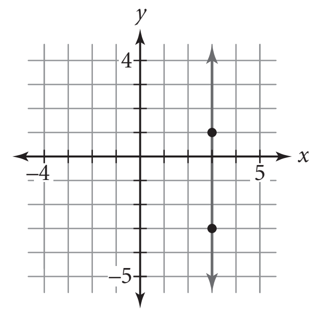
a.



b.



c.



2. Find the slope of the line through each pair of points.

a. $(0, 4); (5, 8)$

b. $(-4.1, 3.8); (2.7, -1.4)$

c. $\left(\frac{7}{4}, \frac{1}{2}\right); \left(\frac{1}{4}, 5\right)$

d. $(-8, 2); (-8, -5)$

3. Given one point on a line and the slope of the line, name *two* other points on the line. Then use the slope formula to check that the slope between each of the two new points and the given point is the same as the given slope.

a. $(3, 1)$; slope $\frac{2}{3}$

b. $(4, 2)$; slope 1

c. $(5, 3)$; slope -1.25

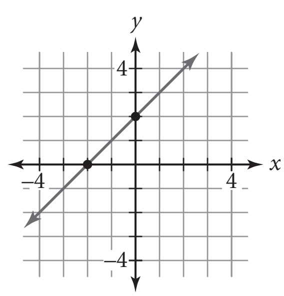
d. $(-1, 6)$; slope 0

e. $(-4, -7)$; slope -2

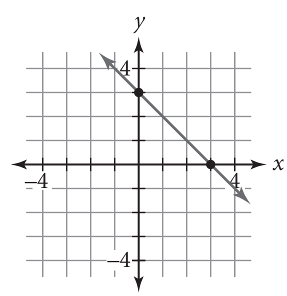
f. $(8, -5)$; slope $\frac{3}{7}$

4. Write the equation of each line in intercept form.

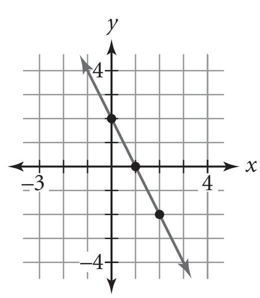
a.



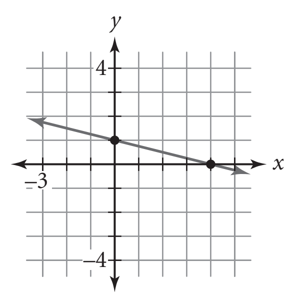
b.



c.



d.

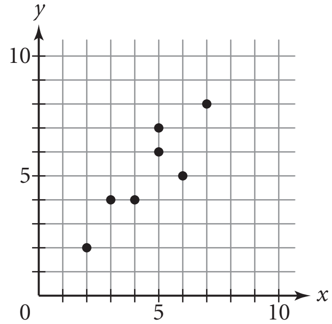


Lesson 4.2 • Writing a Linear Equation to Fit Data

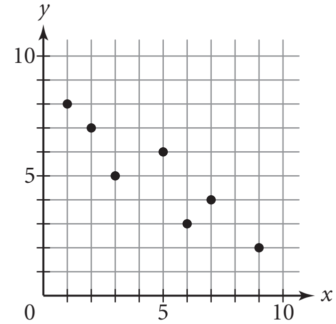
Name ______________________ **Period** __________ **Date** ____________

1. For each graph, draw a line that you think best approximates the linear data pattern. Write a few sentences explaining why you think your line is a good fit.

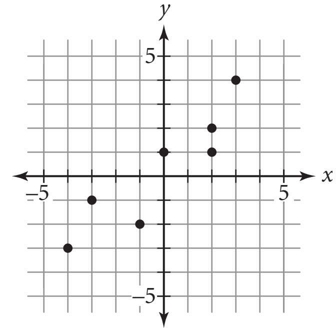
a.



b.

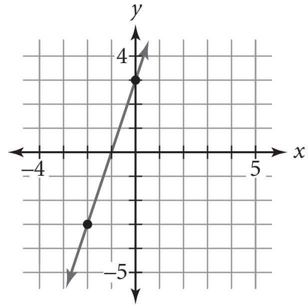


c.

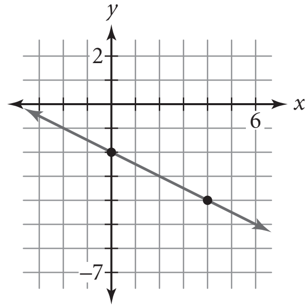


2. Write the equation of the line in each graph in intercept form.

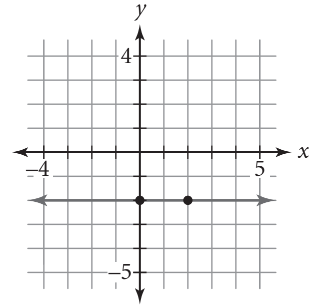
a.



b.



c.



3. Find the slope and the units for the slope for each table or graph.

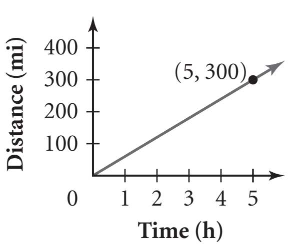
a.

Time (s)	Distance (m)
5	11
10	22

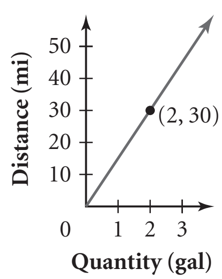
b.

Time (wk)	Money ($)
4	1,800
50	22,500

c.



d.



4. Solve each equation.

a. $3(x + 8) = 18$

b. $-4(x + 5) = 48$

c. $2x + 7 = 15$

d. $-6x - 3 = 39$

e. $4 - 3x = -23$

f. $4(3x - 1) = -40$

g. $-3(5x - 4) = -21$

h. $5(4 - 2x) = 35$

i. $-2(7 - 4x) = -14$

Lesson 4.3 • Point-Slope Form of a Linear Equation

Name ______________________________ Period __________ Date ______________

1. Name the slope and one point on the line that each point-slope equation represents.

a. $y = 3 + 2(x - 1)$ **b.** $y = -7.4 - \frac{3}{4}(x + 1)$

c. $y = \frac{6}{7}(x + 5) - 4.1$ **d.** $y = -(x - 2)$

2. Write an equation in point-slope form for a line, given its slope and one point that it passes through.

a. Slope 2; (4, 3) **b.** Slope $-\frac{2}{3}$; $(-6, 7)$ **c.** Slope 0; $(-4, 4)$

3. Refer to the information in the table to complete the following steps.

x	y
−4	−10
−3	−8.5
−1	−5.5
1	−2.5
4	2

a. Find the slope of the line through $(-4, -10)$ and $(-3, -8.5)$. Then find the slope of the lines through three other pairs of points from the table. What can you conclude from your results?

b. Write an equation in point-slope form using the slope you found in 3a and the first point in the table.

c. Write an equation in point-slope form using the third point in the table.

d. Verify that the equations you found in 3b and c are equivalent. Enter one equation into Y_1 and the other into Y_2 on your calculator, and compare their graphs and tables.

4. The heat index measures the apparent temperature for a given relative humidity. This table shows the heat index for three temperatures at a relative humidity of 90%.

Heat Index for 90% Relative Humidity

Air temperature x (°F)	Apparent temperature y (°F)
74	72
76	76
78	80

(*heat_index.tripod.com*)

a. Find the rate of change of the data (the slope of the line).

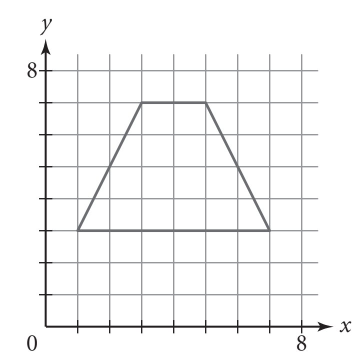
b. Choose one point and write an equation in point-slope form to model the data.

c. Choose another point and write another equation in point-slope form to model the data.

d. Verify that the two equations in 4b and c are equivalent. Enter one equation into Y_1 and the other into Y_2 on your calculator, and compare their graphs and tables.

e. When the air temperature is 88°F, the apparent temperature is 113°F, and when the air temperature is 91°F, the apparent temperature is 126°F. Are these points on your line? Do you think the heat index is really a linear relationship?

5. For each segment shown in the figure, write an equation in point-slope form for the line that contains the segment.



Lesson 4.4 • Equivalent Algebraic Equations

Name ____________________ Period ________ Date __________

1. Determine whether or not the expressions in each pair are equivalent. If they are not, change the second expression so that they are equivalent.

a. $2(x + 3) - 1; 2x + 5$

b. $-3(x + 4) + 6; -3x + 6$

c. $5 - 4(x - 1); 4x + 1$

d. $-8 + 6(x - 2); 6x - 20$

2. Rewrite each equation in intercept form. Show your steps. Check your answer by using a calculator graph or table.

a. $y = 5 + 3(x - 4)$

b. $y = -2 + (x + 1)$

c. $y = -0.5(x + 2) - 1$

d. $3y - x = 3$

3. Solve each equation by balancing and tell which property you used for each step. Use the distributive property in two of your solutions.

a. $3(4x - 2) + 5 = 11$

b. $-4(5 + 2x) - 8 = -12$

c. $6 - 5(3x - 2) = -44$

d. $-12 + 3(4 - 5x) = 12$

4. Solve each equation for x. Substitute your value into the original equation to check.

a. $-8(11 - 4x) + 9 = -23$

b. $7 - (8 - x) = 9$

c. $\frac{3}{4}(2x + 4) + 5 = 2$

d. $-8 - \frac{2}{5}(5x + 15) = 4$

5. An equation of a line is $y = -20 - (x + 3.6)$.

a. Name the point used to write the point-slope equation.

b. Find x when y is 0.2.

6. Factor each expression so that the coefficient of x is 1. Use the distributive property to check your work.

a. $4x + 8$

b. $-3x - 27$

c. $-6x + 72$

d. $10x - 250$

7. Solve each equation for the indicated variable.

a. $p = 7(q - 2) + 3$ Solve for q.

b. $3a - 2b = 9$ Solve for b.

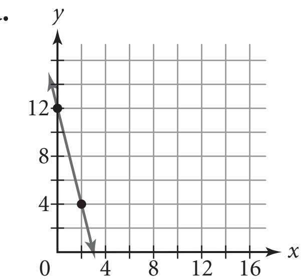
c. $\frac{y + 4}{x - 2} = 14$ Solve for x.

Lesson 4.5 • Writing Point-Slope Equations to Fit Data

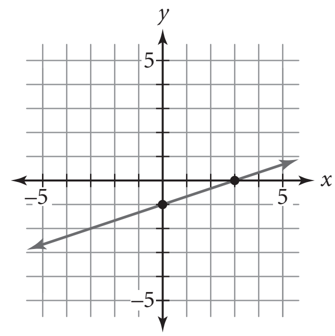
Name ____________________________ Period __________ Date ______________

1. Write the point-slope form of the equation for each line.

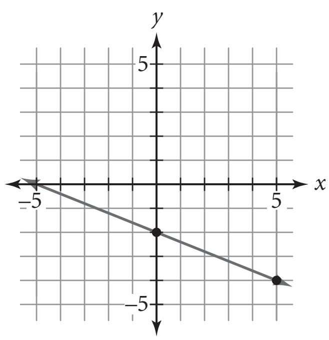
a.



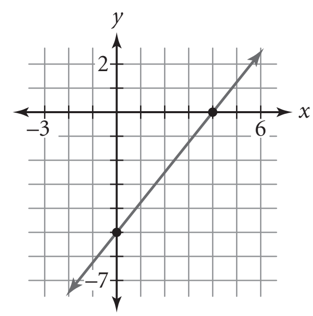
b.



c.

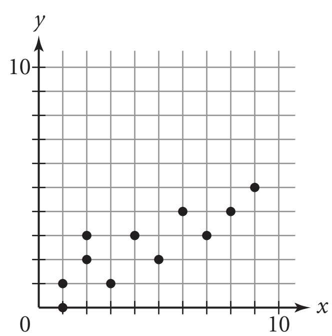


d.

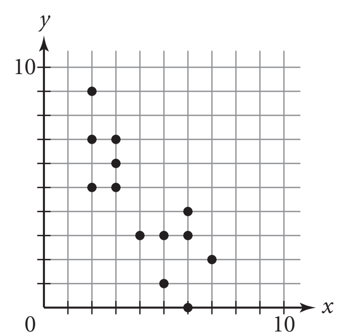


2. Choose two points on each graph so that a line through them closely represents the pattern of all the points on the graph. Use the two points to calculate the slope, and write the equation in point-slope form. Draw the line on your graph.

a.



b.



3. Name the x-intercept of each equation.

a. $y = 24 - 6x$

b. $y = -56 - 7x$

c. $y = 5x - 45$

d. $y = 8 + \frac{2}{3}x$

Lesson 4.6 • More on Modeling

Name ___________________________ Period ____________ Date ______________

1. This table shows travel times and fares between some stops on the Bay Area Rapid Transit (BART) system in and around San Francisco, California.

BART Travel Times and Fares

From	To	Travel time (min)	Fare ($)
Dublin/Pleasanton	Powell	47	4.70
Civic Center	Balboa Park	9	1.30
Embarcadero	San Leandro	22	3.45
Castro Valley	Daly City	51	4.20
Fremont	16th Street/Mission	52	4.75
Concord	MacArthur	26	3.05
West Oakland	Ashby	9	1.25
Walnut Creek	Union City	55	4.10
Coliseum	Montgomery	21	3.15
El Cerrito Plaza	Hayward	40	2.90
19th Street/Oakland	MacArthur	3	1.25

(*www.bart.gov*)

a. Give the five-number summaries of the travel times and of the fares.

b. Plot the data points in the form (*travel time, fare*).

c. Use the five-number summary values to draw a rectangle on the graph of the data. Name the two Q-points you should use for your line of fit.

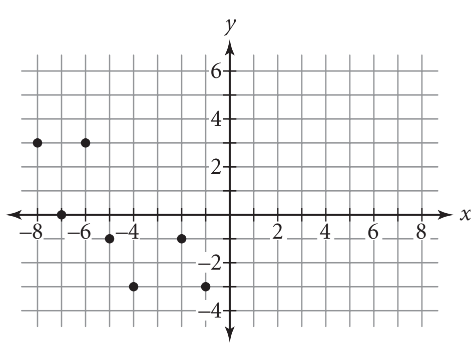
d. Find the equation of the line, and graph the line with your data points.

e. The travel time from Lake Merritt to Richmond is 27 minutes. Predict the fare from Lake Merritt to Richmond.

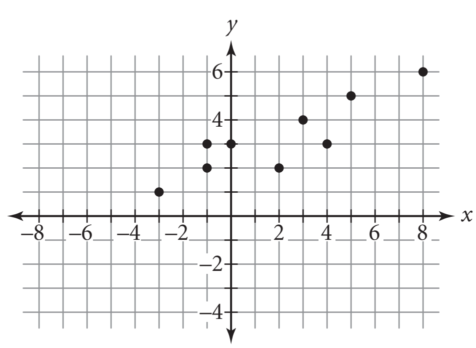
f. The fare from Powell to South San Francisco is $2.95. Predict the travel time from Powell to South San Francisco.

2. Give the coordinates of the Q-points for the data sets.

a.



b.



Lesson 4.7 • Applications of Modeling

Name ______________________________ Period __________ Date ______________

1. Use the Q-points of each data set to determine a line of fit. Write the equation in point-slope form, then write each equation in slope-intercept form.

   a.

x	-14	-10	-6	-2	6	8	10
y	16	14	18	12	15	8	10

   b.

x	-8.2	-4	0	8	10	12	20	28
y	-23.1	-8	-20	0.5	8.3	16	28	32

2. Let x represent time in hours and y represent distance in miles. You can use the equation $y = 38 - 41.5x$ to model someone driving home on a crowded freeway. Use this model to predict

   a. the number of miles the person will have gone in 20 minutes.

   b. how long it will take the person to get home.

3. Solve each equation symbolically for x. Use another method to verify your solution.

   a. $14 - 5(3x - 7) = -26$

   b. $2(8 - x) - 15 = 7$

   c. $\dfrac{-3(4x - 1)}{5} = -6$

   d. $\dfrac{4(8 - 2x)}{x + 3} = 6$

4. Solve each equation for y.

   a. $9x - y = 14$

   b. $4x + 2y = 12$

   c. $-3x + 7y = -14$

   d. $x - 3y = -24$

5. The table shows the average price for unleaded regular gasoline in the United States from 1990 to 2003.

   a. Find the Q-points and the slope of the Q-line. What is the real-world meaning of the slope?

   b. Find the equation of the Q-line.

   c. The average price for the first 6 months of 2004 was \$1.82. Does your model seem to be a good predictor of the 2004 average price? Explain.

Average Price per Gallon of Gasoline

Year	Price (\$)	Year	Price (\$)
1990	1.16	1997	1.23
1991	1.14	1998	1.06
1992	1.13	1999	1.17
1993	1.11	2000	1.51
1994	1.11	2001	1.46
1995	1.15	2002	1.36
1996	1.23	2003	1.59

(Energy Information Administration, *World Almanac and Book of Facts 2005*, p. 170)

Lesson 5.1 • Solving Systems of Equations

Name ______________________ Period __________ Date ______________

1. Verify whether or not the given ordered pair is a solution to the system. If it is not a solution, explain why not.

a. $(4, 3)$
$\begin{cases} y = 0.5x + 1 \\ y = 0.6x + 0.6 \end{cases}$

b. $(-4, 0)$
$\begin{cases} y = 0.5x + 2 \\ y = -\frac{4}{3}x + 2 \end{cases}$

c. $(5, -3)$
$\begin{cases} y = -0.75x + 0.75 \\ y = -\frac{2}{3}x + \frac{1}{3} \end{cases}$

d. $(3, -2)$
$\begin{cases} y = -5x + 13 \\ y = \frac{7}{3}x - 9 \end{cases}$

e. $(-3.5, -1.5)$
$\begin{cases} y = 2.5x + 7.25 \\ y = -2.5x - 10.25 \end{cases}$

f. $\left(\frac{1}{2}, -\frac{2}{3}\right)$
$\begin{cases} y = 4x - 2\frac{2}{3} \\ y = 6x - \frac{5}{3} \end{cases}$

2. Graph each system using the window $[-9.4, 9.4, 1, -6.2, 6.2, 1]$. Use the trace function to find the point of intersection.

a. $\begin{cases} y = 3x - 3 \\ y = -3x + 9 \end{cases}$

b. $\begin{cases} y = -x + 4 \\ y = -\frac{2}{3}x + 3 \end{cases}$

c. $\begin{cases} y = -2x + 2 \\ y = -1.5x + 2.5 \end{cases}$

d. $\begin{cases} y = \frac{1}{2}x - 3.5 \\ y = 3x - 11 \end{cases}$

e. $\begin{cases} y = \frac{3}{4}x - 4 \\ y = x - 5 \end{cases}$

f. $\begin{cases} y = 2x - 5 \\ y = -3x + 15 \end{cases}$

g. $\begin{cases} y = 2.5x + 4 \\ y = 5x + 9 \end{cases}$

h. $\begin{cases} y = \frac{3}{2}x + 3 \\ y = -3x - 15 \end{cases}$

i. $\begin{cases} y = -6x + 5 \\ y = 4x - 5 \end{cases}$

3. Use the calculator table function to find the solution to each system of equations. (You'll need to solve some of the equations for y first.)

a. $\begin{cases} y = -4x + 5 \\ y = 3x - 9 \end{cases}$

b. $\begin{cases} y = x + 6 \\ y = -2x \end{cases}$

c. $\begin{cases} 3x - 2y = 4 \\ 2x + y = 5 \end{cases}$

d. $\begin{cases} y = \frac{2}{3}x - 6 \\ y = -3x + 16 \end{cases}$

e. $\begin{cases} y = 3x + 8 \\ 2x + 3y = 2 \end{cases}$

f. $\begin{cases} y = -3x - 6 \\ y = 4x + 8 \end{cases}$

Lesson 5.2 • Solving Systems of Equations Using Substitution

Name ______________________ Period __________ Date ______________

1. Verify whether or not the given ordered pair is a solution to the system. If it is not a solution, explain why not.

a. $(4, 8)$

$$\begin{cases} y = 2x \\ y = -4x + 12 \end{cases}$$

b. $(2, -6)$

$$\begin{cases} 3.5x + 2.5y = -8 \\ 1.5x - 3.5y = 22 \end{cases}$$

c. $(2, -1)$

$$\begin{cases} y = -0.75x + 0.5 \\ y = -1.5x + 5 \end{cases}$$

d. $(-3, -2)$

$$\begin{cases} 2x - 5y = 4 \\ x - 3y = 3 \end{cases}$$

2. Solve each equation by symbolic manipulation.

a. $7 - 5x = 28 + 2x$

b. $3x - 9 = x - 1$

c. $5 - 2y = -3y - 2$

3. Substitute $2 + 5x$ for y to rewrite each expression in terms of one variable. Combine like terms.

a. $3x - y$

b. $2y - 10x$

c. $-4x + 3y$

4. Solve each system of equations using the substitution method, and check your solutions.

a. $\begin{cases} y = -2x + 3 \\ y = 1.5x - 0.5 \end{cases}$

b. $\begin{cases} 3x - 11y = 2 \\ x - 5y = 2 \end{cases}$

c. $\begin{cases} y = 6x - 3 \\ y = -3x + 6 \end{cases}$

d. $\begin{cases} x + 2y = 7 \\ 2x - 3y = -21 \end{cases}$

e. $\begin{cases} y = 4x - 3 \\ y = -2x + 9 \end{cases}$

f. $\begin{cases} 4x - 3y = 1 \\ y + 2x = 3 \end{cases}$

g. $\begin{cases} x + y = 6 \\ x - y = 12 \end{cases}$

h. $\begin{cases} 3x - y = 1 \\ 2x - 5y = 18 \end{cases}$

i. $\begin{cases} y = 7x + 1 \\ 7x + 3y = 3 \end{cases}$

5. Frank's Specialty Coffees makes a house blend from two types of coffee beans, one selling for \$9.05 per pound, and the other selling for \$6.25 per pound. His house blend sells for \$7.37 per pound. If he is using 9 lb of the \$6.25/lb beans, how many pounds of the \$9.05/lb beans does he need to make his house blend?

Lesson 5.3 • Solving Systems of Equations Using Elimination

Name ________________________ Period __________ Date ____________

1. Use the equation $6x - 4y = 8$ to find the missing coordinate of each point.

a. $(6, y)$ **b.** $(-3, y)$ **c.** $(x, -2)$ **d.** $(x, -12.5)$

2. Use the equation $-2x + 3y = 0$ to find the missing coordinate of each point.

a. $(5, y)$ **b.** $(-5, y)$ **c.** $(x, -3)$ **d.** $\left(x, 5\frac{1}{3}\right)$

3. Solve each system of equations by elimination. Show your work.

a. $\begin{cases} x + y = -2 \\ x - y = 0 \end{cases}$ **b.** $\begin{cases} 5x - 4y = 14 \\ 3y + 3x = 3 \end{cases}$ **c.** $\begin{cases} x - 2y = 4 \\ 2x - 3y = 5 \end{cases}$

d. $\begin{cases} 2x - 5y = -1 \\ 4x - 5y = -7 \end{cases}$ **e.** $\begin{cases} 2x - 6y = 16 \\ 3x + 18y = -30 \end{cases}$ **f.** $\begin{cases} 2x = 10 - y \\ y - x = -2 \end{cases}$

g. $\begin{cases} 3x - 3y = -18 \\ 2y - x = 10 \end{cases}$ **h.** $\begin{cases} 3x - 4y = -2 \\ 3y - 2x = 1 \end{cases}$ **i.** $\begin{cases} 2x + 6y = -1 \\ 4x - 3y = 3 \end{cases}$

j. $\begin{cases} 3x - 2y = 2 \\ 7x + 2y = 18 \end{cases}$ **k.** $\begin{cases} 2x - 7y = 3 \\ 5x - 4y = -6 \end{cases}$ **l.** $\begin{cases} 5x + 3y = 4 \\ 4x = 3y + 14 \end{cases}$

m. $\begin{cases} 3x + 3y = -6 \\ 2x - 4y = 14 \end{cases}$ **n.** $\begin{cases} 2y - 3x = -6 \\ 2x - 2y = 4 \end{cases}$ **o.** $\begin{cases} 3x - 5y = 11 \\ 5x - 3y = -3 \end{cases}$

4. Given the system

$$\begin{cases} 4x - 6y - 10 = 0 \\ 15y = 10x - 25 \end{cases}$$

a. Solve the system by elimination.

b. Explain your answer to 4a.

5. Given the system

$$\begin{cases} 3x + 2y = 9 \\ -9x - 6y = 12 \end{cases}$$

a. Solve the system by elimination.

b. Explain your answer to 5a.

Lesson 5.4 • Solving Systems of Equations Using Matrices

Name ______________________________ Period __________ Date ______________

1. Write a system of equations whose matrix is

a. $\begin{bmatrix} 2.5 & -7 & 3 \\ 4 & -3.25 & 17 \end{bmatrix}$

b. $\begin{bmatrix} 4 & 2 & 0 \\ -3 & 5 & 11 \end{bmatrix}$

c. $\begin{bmatrix} \frac{3}{5} & -2 & \frac{7}{5} \\ \frac{1}{5} & \frac{4}{5} & -3 \end{bmatrix}$

2. Write the matrix for each system.

a. $\begin{cases} x - 2y = 11 \\ 3x - y = 7 \end{cases}$

b. $\begin{cases} 0.9x + 1.2y = 2.4 \\ -1.5x + 2.4y = 1.8 \end{cases}$

c. $\begin{cases} -x + y = 4 \\ x + y = 1 \end{cases}$

3. Write each solution matrix as an ordered pair.

a. $\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 1 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 0 & 13.5 \\ 0 & 1 & 9.25 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & -\frac{12}{19} \\ 0 & 1 & -\frac{21}{38} \end{bmatrix}$

4. Use row operations to transform the matrix $\begin{bmatrix} 1 & 3 & -2 \\ -1 & 7 & 6 \end{bmatrix}$ into the form $\begin{bmatrix} 1 & 0 & a \\ 0 & 1 & b \end{bmatrix}$. Write the solution as an ordered pair.

5. Consider the system

$$\begin{cases} y = -5 + 3(x + 1) \\ y = 6 - 5x \end{cases}$$

a. Convert each equation to the standard form $ax + by = c$.

b. Write a matrix for the system.

c. Find the solution matrix using matrix row operations. Show the steps.

d. Write the solution as an ordered pair.

Lesson 5.5 • Inequalities in One Variable

Name ______________________________ **Period** __________ **Date** ____________

1. Tell what operation on the first inequality gives the second inequality, and give the answer using the correct inequality symbol.

a. $4 < 8$
$4 + 3 \;\square\; 8 + 3$

b. $-3 < -2$
$-3 - 5 \;\square\; -2 - 5$

c. $5 > -9$
$5(-2) \;\square\; (-9)(-2)$

d. $-4 > -7$
$5(-4) \;\square\; 5(-7)$

e. $m \leq 6$
$-2m \;\square\; 6(-2)$

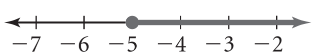
f. $w > -1$
$w - 8 \;\square\; -1 - 8$

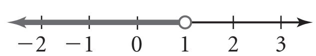
2. Find three values of the variable that satisfy each inequality.

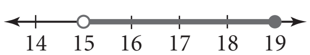
a. $x - 2 > -5$ **b.** $x + 4 \leq 11$ **c.** $x + 5 \geq -2.7$

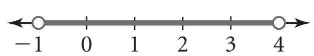
d. $7 - x < 6$ **e.** $9 - x \geq 6.2$ **f.** $-x - 3 > 2$

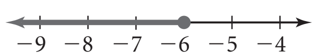
3. Give the inequality graphed on each number line.

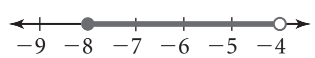
a. 

b. 

c. 

d. 

e. 

f. 

4. Translate each phrase into symbols.

a. x is no more than 11

b. y is at least -3

c. t is at most 27

d. m is not less than 6

5. Solve each inequality and graph the solution on a number line.

a. $10x + 3.3 \leq -1$

b. $17.2 - 2.6x > 3$

c. $6 + 3(x - 5) > 18$

d. $8(5 - x) + 12.5 < 16$

e. $6x - (4 - 3x) < 9x - 8$

f. $-3.4(x - 1) + 1.2 \geq 4.8x + 0.5$

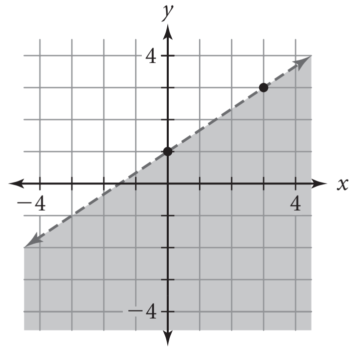
Lesson 5.6 • Graphing Inequalities in Two Variables

Name ______________________________ Period ____________ Date ______________

1. Match each inequality with its graph.

a. $y < \frac{2}{3}x + 1$ **b.** $y \geq -\frac{5}{2}x + \frac{1}{2}$ **c.** $y \leq -\frac{3}{2}x - 2$ **d.** $y < \frac{3}{4}x - \frac{9}{4}$

i.



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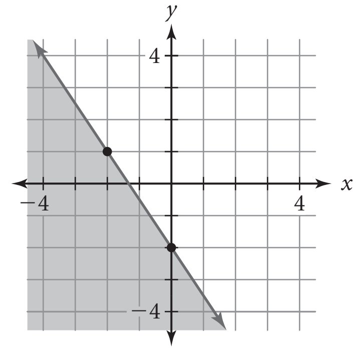

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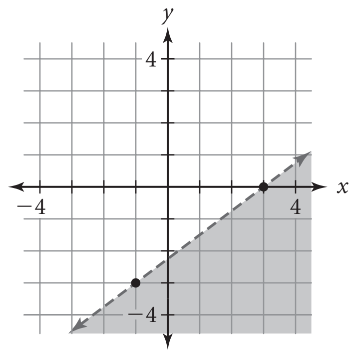

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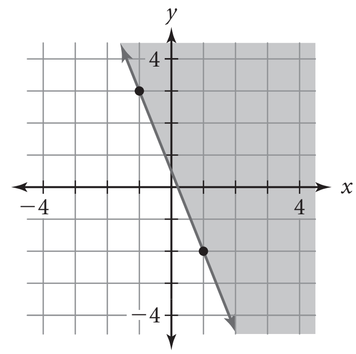


2. Solve each inequality for y.

a. $-2x + 3y > 9$ **b.** $1.5x - y \geq -4$ **c.** $-3x + 4y < 0$

3. Consider the inequality $y > 1.5x - 2$.

a. Graph the boundary line for the inequality on axes with scales from -6 to 6.

b. Determine whether each given point satisfies the inequality. Plot each point on the graph you drew in 3a. Label the point T (true) if it is part of the solution region or F (false) if it is not part of the solution region.

i. $(0, 0)$ **ii.** $(2, 1)$ **iii.** $(-3, -1)$

iv. $(4, -4)$ **v.** $(1, 0.5)$

c. Use your results from 3b to shade the half-plane that represents the inequality.

4. Sketch each inequality.

a. $y \geq 3 - 2.5x$ **b.** $-4x - 3y > 12$

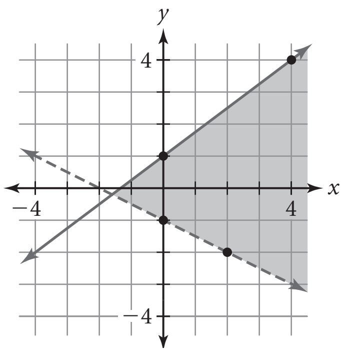
Lesson 5.7 • Systems of Inequalities

Name ____________________________________ Period ___________ Date ______________

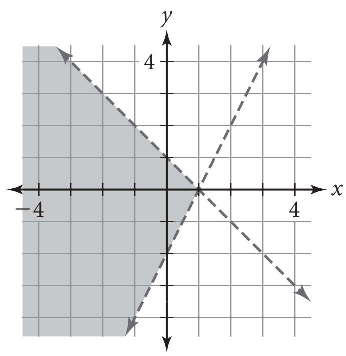
1. Match each system of inequalities with its graph.

a. $\begin{cases} y \geq -1.5x - 2 \\ y \leq -1.5x + 3 \end{cases}$ **b.** $\begin{cases} y > -0.5x - 1 \\ y \leq 0.75x + 1 \end{cases}$ **c.** $\begin{cases} y < -x + 1 \\ y > 2x - 2 \end{cases}$

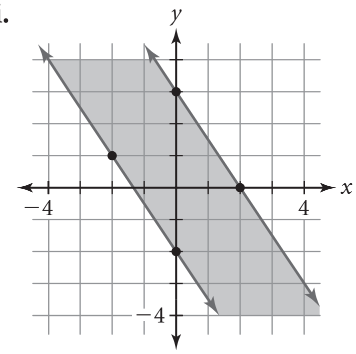
i.



ii.



iii.



2. Tell whether each point is a solution to the system $\begin{cases} y - 3x < 1 \\ 2y - x \geq 3 \end{cases}$

a. $(1, 0)$ **b.** $(-3, -3)$ **c.** $(4, 4)$

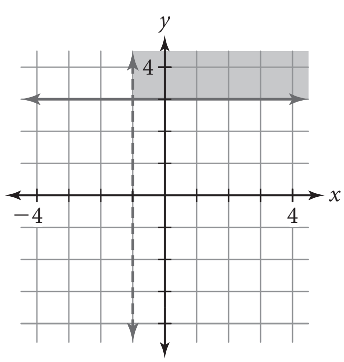
d. $(0, -0.5)$ **e.** $(2, 5)$ **f.** $(1, 1)$

3. Sketch a graph showing the solution to each system.

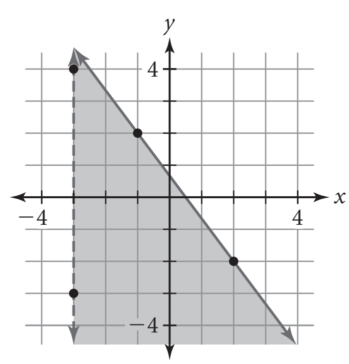
a. $\begin{cases} y < \frac{2}{5}x - 1 \\ y < -\frac{4}{5}x \end{cases}$ **b.** $\begin{cases} y \geq \frac{1}{2}x + 3 \\ y < 3x + 1 \end{cases}$ **c.** $\begin{cases} x + y \leq 3 \\ 2x - 3y < 6 \end{cases}$

4. Write a system of inequalities for the solution shown on each graph.

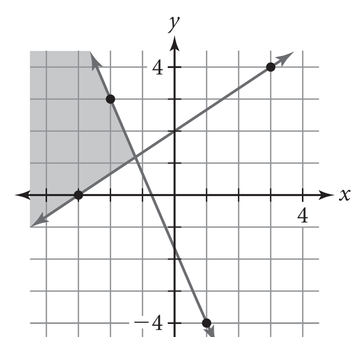
a.



b.



c.



Lesson 5.7 • Mixture, Rate, and Work Problems

Name ________________________ **Period** ____________ **Date** ________________

For each problem below, define the variable(s), write an equation or system of equations, and solve.

1. Claudia and Helen meet in San Jose, California for a class reunion. At 10:00 P.M., they both leave the reunion and head home. Claudia drives south at 65 mi/h. Helen drives north; due to heavy traffic, she averages only 35 mi/h. After how many hours will the two friends be 325 mi apart?

2. Frank works at a bookstore. Some days he works in the store as a salesperson and is paid $9.25/h. Other days he works in the warehouse doing inventory and is paid $11.50/h. This week he worked a total of 36 hours and was paid $378.00. How many hours did he work as a salesperson, and how many hours did he do inventory?

3. A steamboat cruise down the Mississippi River takes 1 hour and 30 minutes (1.5 h). The cruise back up the river takes 1 hour and 48 minutes (1.8 h) because the boat goes 6 mi/h slower against the current. The distance on either trip is the same. At what speed does the boat travel in each direction?

4. Ning mixes snack mix with mixed nuts to make trail mix for her hike. The snack mix is 10% peanuts. The mixed nuts are 35% peanuts. How many ounces of each should she combine to make 8 ounces of trail mix that is 20% peanuts?

5. Jennifer Aroulis receives an income tax refund of $1,272.00. She decides to invest the money in the stock market. Idea Software stock costs $2.32 per share. Good Foods stock costs $1.36 per share. Jennifer buys twice as many shares of Idea Software as Good Foods and spends all of her refund. How many shares of each stock does she buy?

6. Mr. Moss can tile a kitchen floor in 8 h. Ms. Senglin can tile the same floor in 6 h. If they work together, how long will it take to tile the floor?

7. Chenani and Matthew work in a donut shop. When Chenani works alone overnight, she makes all of the donuts for the next day in 6 h. When Matthew works alone overnight, he makes all of the donuts in 5 h. On Friday night, Chenani starts making the donuts by herself. After 2 h, Matthew arrives and they begin making donuts together. From the time that Chenani started, how long will it take to finish all of the donuts for the next day?

Lesson 6.1 • Recursive Routines

Name ______________________________ Period __________ Date ____________

1. Give the starting value and constant multiplier for each sequence. Then find the fifth term.

a. 4800, 1200, 300, . . .

b. $-21, 44.1, -92.61, \ldots$

c. $100, -90, 81, \ldots$

d. 100, 101, 102.01, . . .

e. $-5, 1.5, -0.45, \ldots$

f. 3.5, 0.35, 0.035, . . .

2. Use a recursive routine to find the first five terms of the sequence with the given starting value and constant multiplier.

a. Starting value: 12; multiplier: 1.5

b. Starting value: 360; multiplier: 0.8

c. Starting value: -45; multiplier: $-\frac{3}{5}$

d. Starting value: -9; multiplier: 2.2

e. Starting value: -1.5; multiplier: $\frac{1}{2}$

3. Use a recursive routine to find the first five terms of the sequence with the given starting value and percent increase or decrease.

a. Starting value: 16; increases by 50% with each term

b. Starting value: 24,000; decreases by 80% with each term

c. Starting value: 7; increases by 100% with each term

d. Starting value: 40; increases by 120% with each term

e. Starting value: 100,000; decreases by 35% with each term

4. Use the distributive property to rewrite each expression in an equivalent form. For example, you can write $500(1 + 0.05)$ as $500 + 500(0.05)$.

a. $40 + 40(0.8)$

b. $550 - 550(0.03)$

c. $W + Ws$

d. $25(1 - 0.04)$

e. $35 - 35(0.95)$

f. $10(1 + 0.25)$

g. $15 + 15(0.12)$

h. $0.02(1 - 0.15)$

i. $10{,}000(1 + 0.01)$

5. Burke's Discount Clothing has a "Must Go" rack. The price of each item on the rack is decreased by 10% each day until the item is sold. On February 2, a leather jacket on the rack is priced at $45.00.

a. Write a recursive routine to show the price of the jacket on subsequent days.

b. What will the jacket cost on February 6?

c. When will the jacket be priced less than $20.00?

Lesson 6.2 • Exponential Equations

Name ______________________________ Period __________ Date ______________

1. Rewrite each expression with exponents.

a. (2.5)(2.5)(2.5)(2.5)(2.5)

b. (8)(8)(8)(9)(9)(9)(9)(9)(9)

c. $(1 + 0.07)(1 + 0.07)(1 + 0.07)$

d. $6 \cdot 6 \cdot 7 \cdot 7 \cdot 8 \cdot 8$

2. An investment of $700 increases by 0.3% each month.

a. What is the value of the investment after 5 months?

b. What is the value after 1 year?

3. A population of 25,000 increases by 1.2% each year.

a. What is the population after 4 years?

b. What is the population after 84 months?

4. Match each equation with a table of values.

a. $y = 3(0.09)^x$

b. $y = 4(1.03)^x$

c. $y = 5(0.7)^x$

i.

x	y
1	3.5
2	2.45
3	1.715

ii.

x	y
1	0.27
2	0.0243
3	0.0022

iii.

x	y
1	4.12
2	4.2436
3	4.3709

5. Match each recursive routine with the equation that gives the same value.

a. 1.25 $\boxed{\text{ENTER}}$, Ans $\cdot$ 0.75 $\boxed{\text{ENTER}}$

b. 0.75 $\boxed{\text{ENTER}}$, Ans $\cdot$ $(1 + 0.25)$ $\boxed{\text{ENTER}}$

c. 1.25 $\boxed{\text{ENTER}}$, Ans + Ans $\cdot$ 0.25 $\boxed{\text{ENTER}}$

d. 0.75 $\boxed{\text{ENTER}}$, Ans $\cdot$ $(1 - 0.25)$ $\boxed{\text{ENTER}}$

i. $y = 1.25(1.25)^x$

ii. $y = 0.75(0.75)^x$

iii. $y = 0.75(1.25)^x$

iv. $y = 1.25(1 - 0.25)^x$

6. The equation $y = 25{,}000(1 + 0.04)^x$ models the salary of an employee who receives an annual raise. Give the meaning of each number and variable in this equation.

7. For each table, find the value of the constants a and b such that $y = a \cdot b^x$.

a.

x	y
0	5
2	20
4	80
5	160

b.

x	y
0	300
2	48
3	19.2
4	7.68

c.

x	y
0	100
1	110
2	121
3	133.1

Lesson 6.3 • Multiplication and Exponents

Name ______________________ Period ________ Date ____________

1. Use the properties of exponents to rewrite each expression. Use your calculator to check that your expression is equivalent to the original expression.

a. $(-7)(w)(w)(w)(w)$ **b.** $(3)(a)(a)(a)(b)(b)(b)(b)(b)$

c. $(5)(p)(p)(p)(-3)(q)(q)$ **d.** $4x^2 \cdot 3x^4$

e. $(6c)(-2c^3)(3d^2)$ **f.** $(-4m^3)(2m + m^2)$

2. Write each expression in expanded form. Then rewrite the product in exponential form.

a. $4^3 \cdot 4^4$ **b.** $(-3)^5 \cdot (-3)^2$ **c.** $(-2)^8(-2)^7$

d. $(8^6)(8^3)$ **e.** $x^9 \cdot x^4$ **f.** $n \cdot n^9$

3. Rewrite each expression with a single exponent.

a. $(4^5)^5$ **b.** $(8^2)^7$ **c.** $(x^9)^4$

d. $(y^3)^{10}$ **e.** $(5^3)^7$ **f.** $[(-3)^3]^2$

g. $(z^8)^2$ **h.** $(10^9)^3$ **i.** $(0.5^2)^5$

j. $(100^3)^8$ **k.** $[(-6)^5]^4$ **l.** $(t^7)^2$

4. Use the properties of exponents to rewrite each expression.

a. $4x \cdot 3x$ **b.** $(6m)(2m^2)$ **c.** $(-5n^2)(4n^4)$

d. $xy^2 \cdot x^2y^4$ **e.** $(2x^4)^6$ **f.** $(-4m^5)^2$

g. $(-3m^4n^7)^3$ **h.** $(5x^2yz^5)^4$ **i.** $(-3x^4y^3)^3$

5. Evaluate each expression for the given value of the variables.

a. $2x^3$ for $x = -5$ **b.** $5y^4$ for $y = -3$

c. $x^2 - 3x + 2$ for $x = 4$ **d.** $-5x^3y^2$ for $x = -2$ and $y = -1$

6. Match expressions from this list that are equivalent but written in different forms. There can be multiple matches.

a. $(2x^2)^3$ **b.** $8x^5$

c. $(-4x^3)(-2x^3)$ **d.** $(6x^2)(2x^3)$

e. $(12)(x)(x)(x)(x)(x)$ **f.** $(4x)(2x^5)$

Lesson 6.4 • Scientific Notation for Large Numbers

Name ______________________ Period ________ Date __________

1. Write each number in scientific notation.

a. 200	**b.** 5	**c.** -75
d. 48,900	**e.** $-9{,}043{,}000$	**f.** 6,703.1
g. $-3{,}500$	**h.** 12,500	**i.** -380
j. 320,000,000	**k.** 70,000,000,000	**l.** 8,097

2. Write each number in standard notation.

a. 3.14×10^3	**b.** 5.2×10^6	**c.** -7.08×10^1
d. 6.59×10^7	**e.** -1.8×10^5	**f.** 6.5×10^3
g. 3.25×10^5	**h.** 4.3×10^4	**i.** -5×10^6
j. 1.8×10^{10}	**k.** -4.5×10^8	**l.** 2.007×10^2

3. Use the properties of exponents to rewrite each expression.

a. $2x^3(5x)$	**b.** $(-4m^2)^3$	**c.** $-3y^2(4y^5 - 2y^3)$
d. $5w(3w^8 - w^6)$	**e.** $3x^3(-2x^5)$	**f.** $(-5z^6)^2$
g. $-6r^3(r^4 - 3r^2)$	**h.** $x^3(2x^2 + 3x - 4)$	**i.** $(3x^2y^4)^2$
j. $(4s^2t^3u^4)^3$	**k.** $(m^2n)(m^9n^3)$	**l.** $x^{12} \cdot y^3 \cdot x$

4. Write each number in scientific notation.

a. 425×10^3	**b.** 71.3×10^5	**c.** $-2{,}014 \times 10^1$
d. $800{,}000 \times 10^4$	**e.** -350.3×10^6	**f.** $15{,}000 \times 10^3$
g. $3{,}250 \times 10^2$	**h.** $425{,}000 \times 10^4$	**i.** -36.5×10^6
j. 10×10^{10}	**k.** -45.07×10^3	**l.** $89{,}060 \times 10^5$

5. Find each product and write it in scientific notation without using your calculator. Then set your calculator to scientific notation and check your answers.

a. $(2 \times 10^4)(4 \times 10^3)$

b. $(-6.0 \times 10^5)(1.2 \times 10^7)$

c. $(1.5 \times 10^3)(2.0 \times 10^2)(3.2 \times 10^4)$

d. $(-4.5 \times 10^3)(-4.0 \times 10^6)$

6. A human heart beats about 65 times per minute. By the time you are 25 years old, approximately how many times will your heart have beaten? Express your answer in scientific notation.

Lesson 6.5 • Looking Back with Exponents

Name ______________________ Period __________ Date ____________

1. Eliminate factors equivalent to 1 and rewrite the right side of this equation.

$$\frac{p^3q^5r^2}{pq^3r^2} = \frac{p \cdot p \cdot p \cdot q \cdot q \cdot q \cdot q \cdot q \cdot r \cdot r}{p \cdot q \cdot q \cdot q \cdot r \cdot r}$$

2. Use the properties of exponents to rewrite each expression.

a. $\dfrac{m^{10}}{m^4}$ **b.** $\dfrac{n^8}{n}$ **c.** $\dfrac{24x^9}{8x^5}$

d. $\dfrac{36x^5y^6}{4xy^3}$ **e.** $\dfrac{45m^7n^4}{-9m^4n^2}$ **f.** $\dfrac{-50x^{12}y^8}{-2x^{11}y^6}$

g. $\dfrac{42x^{10}y^5}{6x^3y}$ **h.** $\dfrac{-12m^5n^7}{-3m^4n^2}$ **i.** $\dfrac{-15\,r^{12}s^5}{5r^4s^2}$

3. Lana bought a car 8 years ago. Since she purchased it, the value of the car has decreased by 12% each year. The car is now worth about \$5900.

a. Which letter in the equation $y = A(1 - r)^x$ could represent the value of the car 8 years ago when Lana bought it?

b. Substitute the other given information into the equation $y = A(1 - r)^x$.

c. Solve your equation in 3b to find the value of Lana's car when she bought it.

4. Use the properties of exponents to rewrite each expression.

a. $(-3x)^2(2x^2)^4$ **b.** $\dfrac{(-4y^2)^6}{(-4y^2)^5}$

c. $\dfrac{(4z^2)^3}{(2z)^2}$ **d.** $(3a^2b)^2(-2ab)^3$

e. $\dfrac{4.2 \times 10^9}{1.2 \times 10^5}$ **f.** $\dfrac{(5r^3s^6)(4rs^2)^2}{20r^4s^8}$

5. a. In 2004 Canada had a population of about 3.25×10^7 people. Canada has an area of approximately 3.51×10^6 square miles. Find the population density of Canada (the number of people per square mile).

b. In 2004 the United States had a population of about 2.93×10^8 people. The United States has an area of approximately 3.54×10^6 square miles. Find the population density of the United States.

c. How did the population densities of Canada and the United States in 2004 compare?

(*The World Almanac and Book of Facts 2005*, p. 848)

Lesson 6.6 • Zero and Negative Exponents

Name ______________________ Period __________ Date ____________

1. Rewrite each expression using only positive exponents.

a. 4^{-3} **b.** $(-7)^{-2}$ **c.** x^{-5}

d. $12x^{-4}$ **e.** $\dfrac{m^{-1}}{n}$ **f.** $-5m^{6}n^{-9}$

g. $\dfrac{3s^{-7}w^{8}}{4}$ **h.** $\dfrac{6xy^{-1}z^{2}}{7m}$ **i.** $\dfrac{x^{-3}yz^{-2}}{m}$

2. Insert the appropriate symbol ($<$, $=$, or $>$) between each pair of numbers.

a. $5.25 \times 10^{3} \square 52.5 \times 10^{2}$ **b.** $3.5 \times 10^{-5} \square 350 \times 10^{-6}$

c. $0.0024 \times 10^{-3} \square 2.4 \times 10^{-6}$ **d.** $0.75 \times 10^{6} \square 75 \times 10^{5}$

3. Find the exponent of 10 that you need to write each number in scientific notation.

a. $0.00076 = 7.6 \times 10^{\square}$ **b.** $76{,}000 = 7.6 \times 10^{\square}$

c. $0.923 = 9.23 \times 10^{\square}$ **d.** $-0.00000045 = -4.5 \times 10^{\square}$

e. $6{,}090{,}000 = 6.09 \times 10^{\square}$ **f.** $0.000000017 = 1.7 \times 10^{\square}$

4. Ms. Frankel has been working for the same company for 15 years. She has received a 4.5% raise each year since she started. Her current salary is $42,576.

a. Write an expression of the form $42{,}576(1 + 0.045)^{x}$ for Ms. Frankel's current salary.

b. What does the expression $42{,}576(1 + 0.045)^{-7}$ represent in this situation?

c. Write and evaluate an expression for her salary 15 years ago.

d. Write expressions without negative exponents that are equivalent to the exponential expressions from 4b and c.

5. Evaluate each expression without using a calculator. Then check your answers with your calculator.

a. 2^{-5} **b.** $\left(4^{-3}\right)\left(9^{0}\right)$ **c.** $(-6)^{-2}$

d. $x^{0}(-2)^{-3}$ **e.** $27\left(3^{-3}\right)$ **f.** $-45\left(3^{-2}\right)$

6. Convert each number to standard notation from scientific notation, or vice versa.

a. 2.79×10^{4} **b.** 6.591×10^{-3} **c.** 0.0000448

d. 969,000,000 **e.** 1.39×10^{-6} **f.** 9.5×10^{2}

Lesson 6.7 • Fitting Exponential Models to Data

Name ______________________ Period __________ Date ____________

1. Rewrite each value as either $1 + r$ or $1 - r$. Then give the rate of increase or decrease as a percent.

a. 1.4 **b.** 0.72 **c.** 0.09

d. 1.03 **e.** 1.25 **f.** 0.5

g. 0.99 **h.** 1.5 **i.** 2.25

2. Use the equation $y = 240(1 - 0.03)^x$ to answer each question.

a. Does this equation model an increasing or decreasing pattern?

b. What is the rate of increase or decrease?

c. What is the y-value when x is 5?

3. Use the equation $y = 58(1 - 0.35)^x$ to answer each question.

a. Does this equation model an increasing or decreasing pattern?

b. What is the rate of increase or decrease?

c. What is the y-value when x is 4?

4. Use the equation $y = 902(1 + 0.02)^x$ to answer each question.

a. Does this equation model an increasing or decreasing pattern?

b. What is the rate of increase or decrease?

c. What is the y-value when x is 8?

5. Write an equation to model the growth of an initial deposit of $500 in a savings account that pays 3.5% annual interest. Let B represent the balance in the account, and let t represent the number of years the money has been in the account.

6. Write an equation to model the decrease in value of a truck purchased for $26,400 that depreciates by 8% per year. Let V represent the value of the truck, and let t represent the number of years since the truck was purchased.

7. Use the properties of exponents to rewrite each expression with only positive exponents.

a. $\dfrac{m^6}{m^8}$ **b.** $\dfrac{5n^7}{20n^{12}}$ **c.** $\dfrac{-48x^5y}{6x^5y^4}$

d. $\dfrac{15x^2yz^9}{9xy^3z^4}$ **e.** $\dfrac{45m^4n^{12}}{\left(-5m^3n^5\right)^2}$ **f.** $\dfrac{\left(-2xy^2z^0\right)^4}{\left(8x^5y\right)\left(4x^2y^3z\right)}$

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

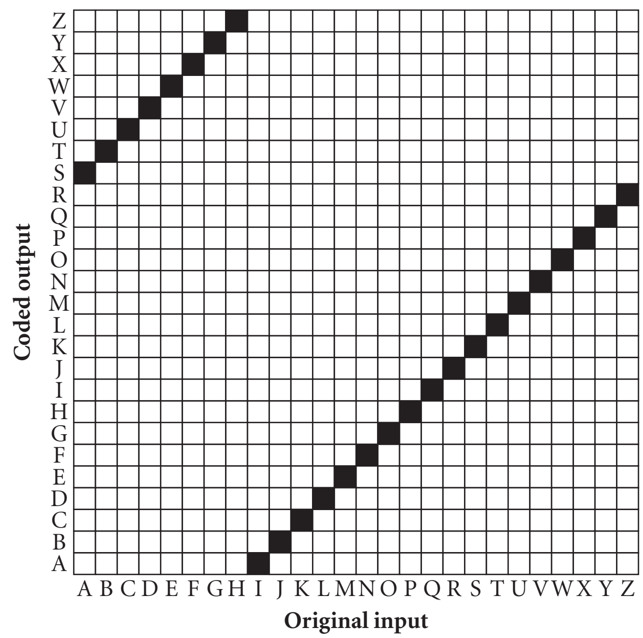
a. ALGEBRA **b.** EQUATION **c.** SOLVE

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.

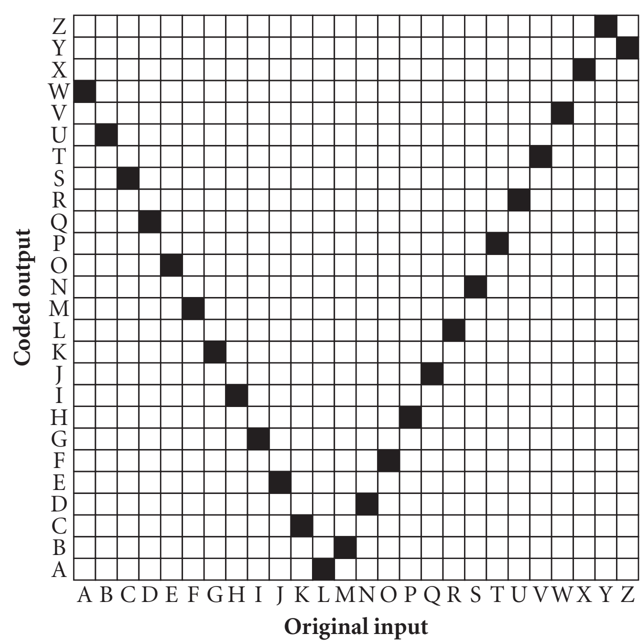
b. Use Luisa's code to decode BWX AMKZMB.

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. $2x - 3y = 6$

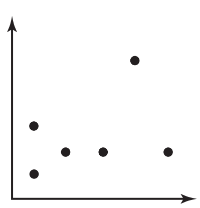
Domain x	Range y
	0
0	
	2
-6	
	5

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

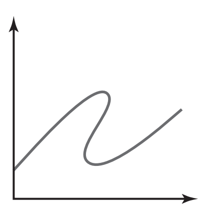
Domain x	Range y
-3	
0	
	7
1	
4	

3. Find whether each graph represents a function.

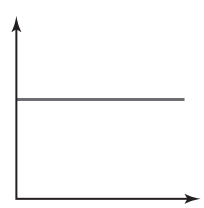
a.



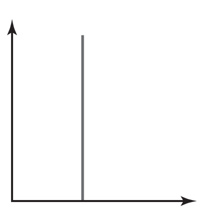
b.



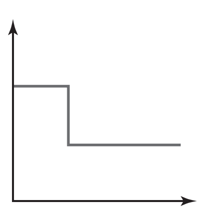
c.



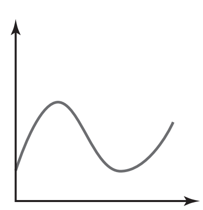
d.



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

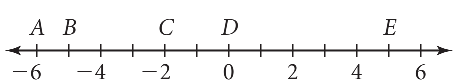
b. Neither increasing nor decreasing

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.

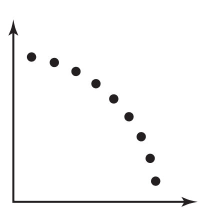


a. *A* to *B* **b.** *B* to *D* **c.** *A* to *C*

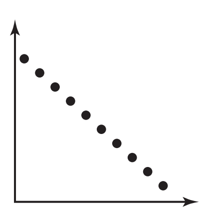
d. *B* to *E* **e.** *C* to *E* **f.** *C* to *D*

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

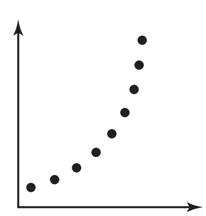
a.



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 $g(x) = 5$

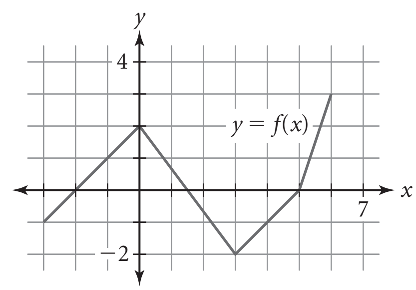
i. $f(3.25)$ **j.** $g\left(\frac{2}{3}\right)$ **k.** x, when $f(x) = -\frac{13}{3}$ **l.** x, when $g(x) = 11.9$

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 $f(0)$?

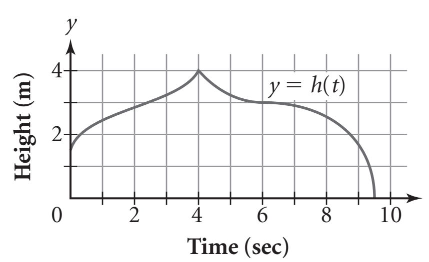
b. What is the value of $f(3)$?

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.** $x^2 = 5$

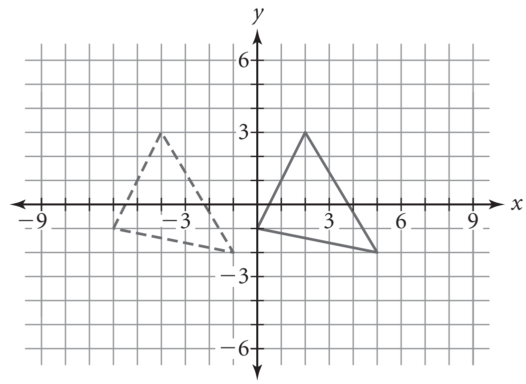
j. $|x - 2| + 9 = 3$ **k.** $|x + 4| - 12 = -5$ **l.** $\sqrt{x} = 2.5$

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.

Lesson 8.1 • Translating Points

Name ________________________________ **Period** __________ **Date** ______________

1. The dashed triangle is the image of the solid triangle after a transformation.



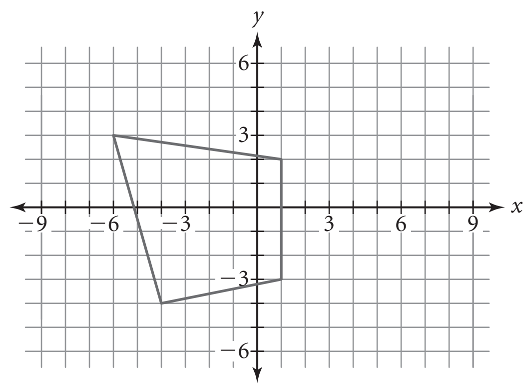
a. Name the coordinates of the vertices of the solid triangle.

b. Describe the transformation.

c. Tell how the x-coordinate of each point changes between the original figure and the image.

d. Tell how the y-coordinates change.

2. Consider this quadrilateral.

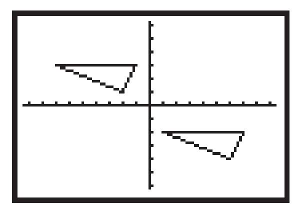


a. Name the coordinates of the vertices of the quadrilateral.

b. Sketch the image of the figure after a translation right 4 units and down 2 units.

c. Define the coordinates of the image using (x, y) as the coordinate of any point in the original figure.

3. The triangle in the lower right has its x-coordinates in list L1 and its y-coordinates in list L2.



$[-9, 9, 1, -6, 6, 1]$

a. Describe the transformation to its image in the upper left.

b. Write definitions for list L3 and list L4 in terms of list L1 and list L2.

c. How would your answer to 3b change if the triangle in the upper left was the original figure and the figure in the lower right was the image?

4. The coordinates of a polygon are $(-2, 1)$, $(4, 6)$, $(2, 2)$, and $(5, -1)$. A transformation of the polygon is defined by the rule $(x - 4, y - 5)$.

a. Describe the transformation.

b. Sketch the original polygon and its image on the same coordinate plane.

c. Use calculator lists and a graph to check your sketch for 4b.

Lesson 8.2 • Translating Graphs

Name ____ Period ____________ Date ________________

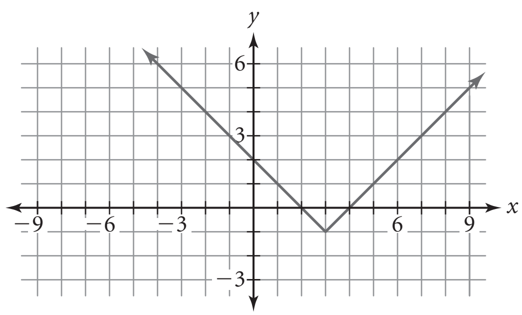
1. Use $f(x) = 10 - 3|2x - 4|$ and $g(x) = (x - 4)^2 - 11$ to find

a. $f(-3)$ **b.** $f(2)$ **c.** $f(0) - 7$ **d.** $f(x + 2)$

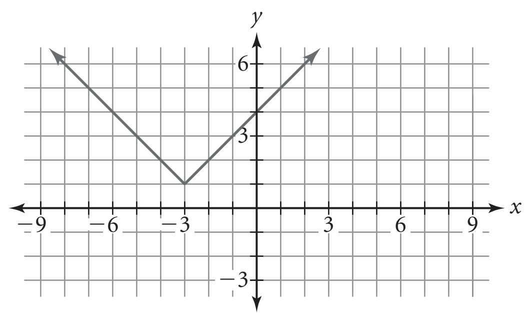
e. $g(0)$ **f.** $g(-5)$ **g.** $g(5) + 7$ **h.** $g(m)$

2. Give the coordinates of the vertex for each graph.

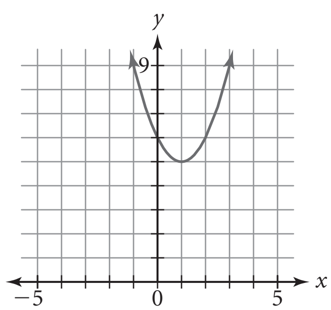
a.



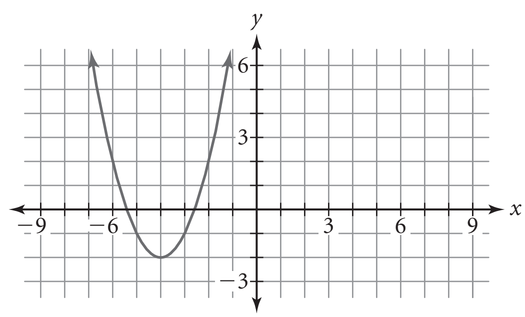
b.



c.



d.



3. Graph each equation and describe the graph as a transformation of $y = |x|$, $y = x^2$, or $y = 3^x$.

a. $y = |x + 4|$ **b.** $y + 3 = (x - 2)^2$ **c.** $y - 1 = |x - 1|$

d. $y - 3 = 3^{x-2}$ **e.** $y - 2 = x^2$ **f.** $y + 3 = |x - 3|$

4. Write an equation for each of these transformations.

a. Translate the graph of $y = x^2$ right 3 units.

b. Translate the graph of $y = |x|$ left 5 units.

c. Translate the graph of $y = 2^x$ right 2 units.

d. Translate the graph of $y = x^2$ up 3 units.

e. Translate the graph of $y = |x|$ down 4 units.

f. Translate the graph of $y = x^2$ left 2 units and up 3 units.

5. Describe each graph in Exercise 2 as a transformation of $y = |x|$ or $y = x^2$. Then write its equation.

Lesson 8.3 • Reflecting Points and Graphs

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

1. Use $f(x) = 2(x + 1)^2 - 4$ and $g(x) = -|x - 4| + 1$ to find

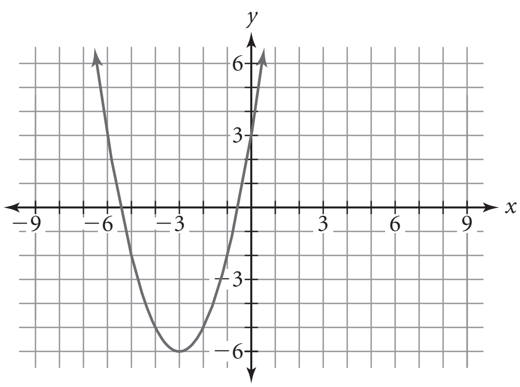
a. $f(-3)$ **b.** $-3 \cdot f(2)$ **c.** $f(-x)$

d. $-f(x)$ **e.** $g(-3)$ **f.** $-3 \cdot g(2)$

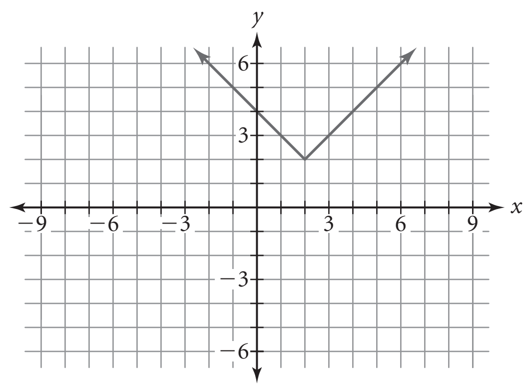
g. $g(-x)$ **h.** $-g(x)$

2. Describe each graph as a transformation of $y = |x|$ or $y = x^2$. Then write its equation.

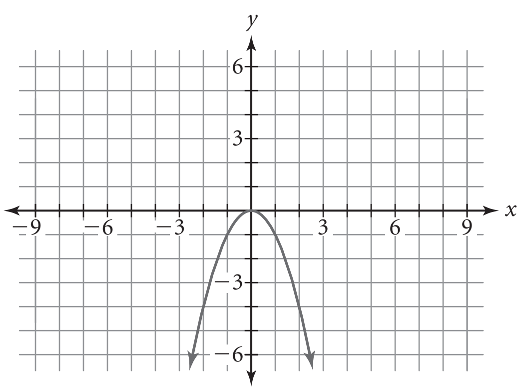
a.



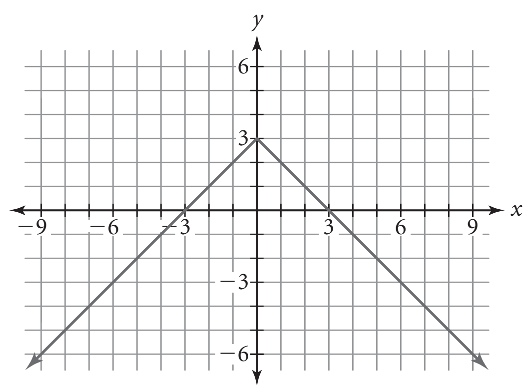
b.



c.



d.



3. Enter the function $f(x) = 5 - 2x$ into Y_1 on your calculator.

a. Predict what the graph of $y = f(-x)$ will look like. Check your answer by entering $y = f(-x)$ into Y_2 and graphing both Y_1 and Y_2.

b. Predict what the graph of $y = -f(x)$ will look like. Check your answer by entering $y = -f(x)$ into Y_2 and graphing both Y_1 and Y_2.

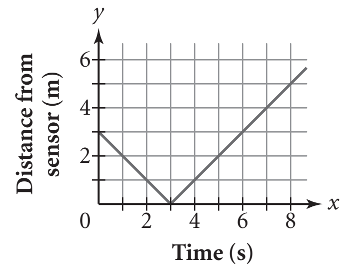
4. Describe each equation as a transformation of the parent function $y = |x|$. Check your answers by graphing on your calculator.

a. $y = -|x| - 4$ **b.** $y = |-x| - 4$ **c.** $y = -|x - 4|$ **d.** $y = |-x - 4|$

Lesson 8.4 • Stretching and Shrinking Graphs

Name ______________________ Period __________ Date ____________

1. Greta and Tom are using a motion sensor for a "walker" investigation. They find that this graph models the data for Greta's walk.



a. Write an equation for this graph.

b. Describe Greta's walk.

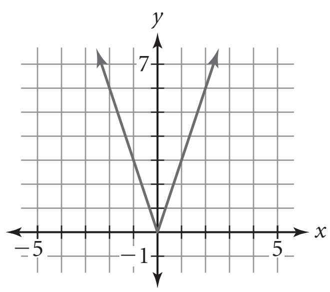
2. Tom walks so that his distance from the sensor is always half Greta's distance from the sensor.

a. Sketch a graph that models Tom's walk.

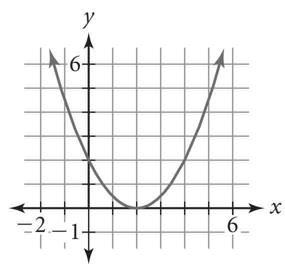
b. Write an equation for the graph in 2a.

3. Write an equation for each graph.

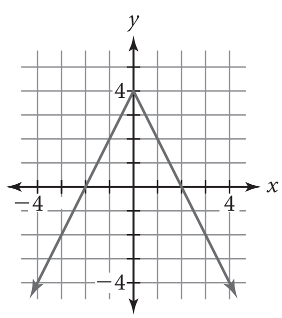
a.



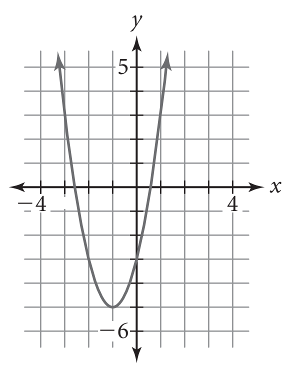
b.



c.



d.



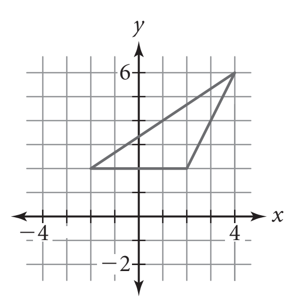
4. Graph each function on your calculator. Then describe how each graph relates to its parent function.

a. $y = 0.25|x - 4| - 3$

b. $y = -0.5(x + 3)^2 + 2$

c. $y = 3(x + 5) - 4$

5. Draw this triangle on graph paper or on your calculator. Then draw the image defined by each of the definitions in 5a–c. Describe how each image relates to the original figure.



a. $(2x, 2y)$

b. $(x, 2y)$

c. $(0.5x, 0.5y)$

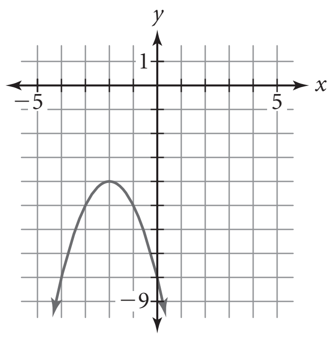
d. $(3x, y)$

Lesson 8.6 • Introduction to Rational Functions

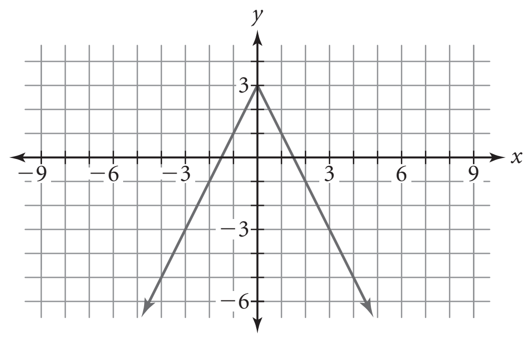
Name ____________________ Period __________ Date ______________

1. Describe each graph as a transformation of the parent function $y = |x|$ or $y = x^2$. Then write its equation.

a.



b.



2. Write an equation that generates this table of values.

x	-4	-3	-2	-1	0	1	2	3	4
y	$-\frac{1}{3}$	$-\frac{1}{2}$	-1	undefined	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$

3. Describe each function as a transformation of the graph of the parent function $y = \frac{1}{x}$. Then sketch the graph of each function and list values that are not part of the domain.

a. $y = -\dfrac{1}{x}$ **b.** $y = \dfrac{1}{-x}$ **c.** $y = \dfrac{3}{x}$ **d.** $y = \dfrac{1}{2x}$

e. $y = \dfrac{1}{x-4}$ **f.** $y = \dfrac{1}{x} - 2$ **g.** $y = \dfrac{2}{x-3}$ **h.** $y = \dfrac{1}{x+2} + 3$

4. Reduce each rational expression to lowest terms. State any restrictions on the variable.

a. $\dfrac{21x}{35}$ **b.** $\dfrac{15x^2}{10x}$ **c.** $\dfrac{6(x+3)}{(x+3)(x-1)}$ **d.** $\dfrac{8+4x}{2x}$

5. Perform each indicated operation and reduce the result to lowest terms. State any restrictions on the variable.

a. $\dfrac{2x}{3} + \dfrac{5x}{6}$ **b.** $\dfrac{2x}{3} - \dfrac{x}{4}$ **c.** $\dfrac{4x}{5} \cdot \dfrac{10}{3x^2}$ **d.** $\dfrac{3}{4x} \div \dfrac{1}{12x^3}$

Lesson 8.7 • Transformations with Matrices

Name ________________________________ Period ____________ Date ______________

1. The matrix $\begin{bmatrix} -1 & 4 & 1 & -4 \\ 1 & 1 & -2 & -2 \end{bmatrix}$ represents a quadrilateral.

a. Name the coordinates and draw the quadrilateral.

b. What matrix would you add to translate the quadrilateral right 4 units?

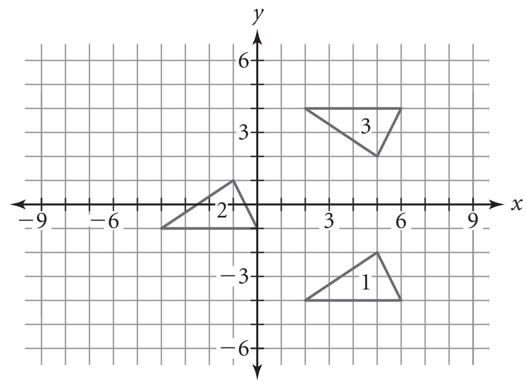
c. Calculate the matrix representing the image if you translate the quadrilateral right 4 units.

2. Refer to these triangles.

a. Write a matrix to represent triangle 1.

b. Write the matrix equation to transform triangle 1 into triangle 2.

c. Write the matrix equation to transform triangle 1 into triangle 3.

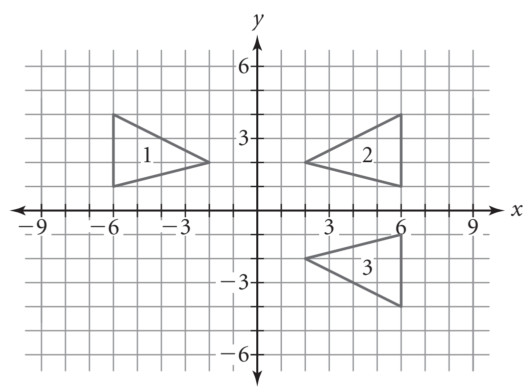


3. Refer to these triangles.

a. Write a matrix to represent triangle 1.

b. Write the matrix equation to transform triangle 1 into triangle 2.

c. Write the matrix equation to transform triangle 1 into triangle 3.



4. Add or multiply each pair of matrices.

a. $\begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix} + \begin{bmatrix} -5 & -5 \\ 2 & 2 \end{bmatrix}$

b. $\begin{bmatrix} -3 & 1.5 \end{bmatrix} \cdot \begin{bmatrix} 5 & -2 \\ -6 & 2 \end{bmatrix}$

c. $\begin{bmatrix} 3 \\ 7 \end{bmatrix} + \begin{bmatrix} -7 \\ -3 \end{bmatrix}$

d. $\begin{bmatrix} 1 & -2.5 \end{bmatrix} \cdot \begin{bmatrix} 5 & 0 & -1 \\ 2 & -5 & -4 \end{bmatrix}$

Lesson 9.1 • Solving Quadratic Equations

Name ______________________________ Period __________ Date ______________

1. Sketch the graph of a quadratic equation with

a. One x-intercept and all nonnegative y-values.

b. The vertex in the third quadrant and no x-intercepts.

c. The vertex in the third quadrant and two x-intercepts.

d. The vertex on the y-axis and two x-intercepts, opening upward.

2. Use a graph and table to approximate solutions for each equation to the nearest hundredth.

a. $4(x + 3)^2 + 5 = 10$

b. $-4(x + 3)^2 + 5 = -8$

c. $(x + 5)^2 = -4$

d. $3(x - 1)^2 + 1 = 15$

e. $x^2 - 8x + 16 = 25$

f. $x^2 - 4x + 2 = 5$

g. $-3x^2 - 6x + 11 = 14$

h. $2x^2 - 9x = -2$

3. Use a symbolic method to find exact solutions for each equation. Express each answer as a rational or a radical expression.

a. $x^2 = 21$

b. $x^2 - 50 = -1$

c. $(x + 1)^2 + 7 = 19$

d. $3(x - 5)^2 + 2 = 17$

e. $2(x + 7)^2 - 9 = -4$

f. $-4(x - 3)^2 = -9$

4. Classify each number by specifying all the number sets of which it is a member. Consider the sets: real, irrational, rational, integer, whole, and natural numbers.

a. $\frac{3}{8}$

b. $\sqrt{5}$

c. 0

d. $-\sqrt{4}$

e. $6 - \sqrt{2}$

f. -3.14

5. Given the two functions $f(x) = x^2 - 4x + 5$ and $g(x) = 3x^2 + 2x - 1$, find each answer without a calculator.

a. $f(2)$

b. $f(3)$

c. $f\left(\frac{1}{2}\right)$

d. $f\left(-\frac{1}{2}\right)$

e. $g(-2)$

f. $g(0)$

g. $g(2)$

h. $g\left(\frac{1}{2}\right)$

6. The equation $h(t) = -4.9t^2 + 40t$ gives the height in meters at t seconds of a projectile shot vertically into the air.

a. What is the height at 2 seconds?

b. Use a graph or table to find the time(s) when the height is 75 meters. Give answers to the nearest hundredth of a second.

c. At what time(s) is the height 0 meters? Give answers to the nearest hundredth of a second.

d. What is a realistic domain for t?

Lesson 9.2 • Finding the Roots and the Vertex

Name ______________________ **Period** __________ **Date** ____________

1. Find the equation of the axis of symmetry and the coordinates of the vertex for the parabola given by each function.

a. $y = x^2 + 4x - 5$, with x-intercepts -5 and 1

b. $y = x^2 + 7x - 30$, with x-intercepts -10 and 3

c. $y = 2x^2 - 11x + 12$, with x-intercepts $\frac{3}{2}$ and 4

2. Consider the equation $(x - 2.5)^2 - 15.5 = 0$.

a. Solve the equation symbolically. Show each step and give the exact answer.

b. Solve the equation using a graph or table. Give the answer to the nearest thousandth.

c. Compare your solutions in 2a and 2b.

3. Find the roots of each equation, to the nearest hundredth, by looking at a graph, zooming in on a calculator table, or both.

a. $y = x^2 + 6x + 5$

b. $y = x^2 + 6x + 7$

c. $y = -3(x + 1)^2 + 2$

d. $y = -2x^2 + x + 3$

e. $y = x^2 - x - 12$

f. $y = 6(x - 2)^2$

4. Solve each equation symbolically and check your answer.

a. $2(x - 1)^2 = 16$

b. $4(x - 4)^2 = 2$

c. $\frac{1}{3}(x + 5)^2 + 4 = 12$

d. $(x + 5)^2 + 13 = 4$

5. The equation of a parabola is $y = x^2 - 7x + 4$.

a. Use a graph or table to find the x-intercepts.

b. Write the equation of the axis of symmetry.

c. Find the coordinates (h, k) of the vertex.

d. Write the equation in vertex form, $y = a(x - h)^2 + k$.

Lesson 9.3 • From Vertex to General Form

Name ______________________ Period __________ Date ______________

1. Is each algebraic expression a polynomial? If so, how many terms does it have? If not, give a reason why it is not a polynomial.

a. $x^2 + 4x - 1$

b. $12\left(x^5 - 6\right)$

c. $\dfrac{2}{x} - 3$

d. $9x^{40}$

e. $6x^3 - 4$

f. $3x^2 - 2x + 1$

g. $4x^2 - 3x + 2x^{-2}$

h. $5 + \frac{1}{2}x - \sqrt{3}x^2 + x^3$

i. $3^{-1}x^2 + 5x - 1$

2. Expand each expression.

a. $(x + 1)^2$

b. $(x - 3)^2$

c. $(x + 4)^2$

d. $\left(x - \dfrac{1}{2}\right)^2$

e. $3(x - 5)^2$

f. $\frac{1}{2}(x - 2)^2$

3. List the first 15 perfect square whole numbers.

4. Fill in the missing values on each rectangular diagram. Then write a squared binomial and an equivalent trinomial for each diagram.

a.

	?	3
x	?	$3x$
?	?	?

b.

	?	13
?	x^2	?
?	?	169

c.

	x	?
?	?	x
1	?	?

d.

	x	-9
x	?	?
-9	?	?

e.

	?	0.5
?	x^2	?
?	?	0.25

f.

	?	-4
x	?	?
?	$-4x$	?

5. Convert each equation to general form. Check your answer by entering both equations into the Y= screen on your calculator and comparing their graphs.

a. $y = (x + 4)^2 + 1$

b. $y = (x - 5)^2 - 6$

c. $y = (x + 1)^2 - 1$

d. $y = 2(x - 4)^2 + 3$

e. $y = -4(x + 1)^2 - 2$

f. $y = (x - 3)^2 + 5$

Lesson 9.4 • Factored Form

Name ____________________ Period __________ Date __________

1. Use the zero product property to solve each equation.

a. $(x - 3)(x - 2) = 0$

b. $(x + 7)(x + 1) = 0$

c. $2(x - 2)(x + 2) = 0$

d. $-\frac{1}{2}(x + 3)(x - 4) = 0$

e. $x(x + 5) = 0$

f. $(x - 1)(x - 2)(x - 3) = 0$

g. $(4x + 3)(3x - 4) = 0$

h. $(3x - 6)(2x + 3) = 0$

2. Graph each equation and then rewrite it in factored form.

a. $y = x^2 + 4x - 5$

b. $y = x^2 + 6x + 8$

c. $y = x^2 - 2x - 15$

d. $y = 2x^2 - 12x + 10$

e. $y = -x^2 + 3x + 4$

f. $y = x^2 - 3x - 10$

3. Name the x-intercepts of the parabola described by each quadratic equation. Check your answers by graphing the equations.

a. $y = (x - 7)(x + 1)$

b. $y = (x + 2)(x - 6)$

c. $y = (x + 8)(x - 8)$

d. $y = 3(x - 5)(x - 4)$

e. $y = (x - 5)^2$

f. $y = (x + 0.5)(x - 3.5)$

4. Write an equation of a quadratic function that corresponds to each pair of x-intercepts. Assume there is no vertical shrink or stretch. Write each equation in factored form and in general form.

a. 3 and -1

b. 1 and 5

c. $-\frac{1}{2}$ and $\frac{1}{2}$

d. -4 and -4

e. $\frac{1}{3}$ and $\frac{4}{3}$

f. 0.2 and 0.8

5. Consider the equation $y = 3(x - 2)(x + 2)$.

a. How many x-intercepts does the parabola have?

b. Find the vertex of this parabola.

c. Write the equation in vertex form. Describe the transformations of the parent function, $y = x^2$.

6. Reduce each rational expression by dividing out common factors from the numerator and denominator. State any restrictions on the variable.

a. $\dfrac{(x - 3)(x + 2)}{(x + 1)(x - 3)}$

b. $\dfrac{x^2 + 6x + 8}{x^2 + 3x - 4}$

c. $\dfrac{x^2 + 10x + 25}{x^2 - 25}$

Lesson 9.6 • Completing the Square

Name ______________________________ Period __________ Date ______________

1. Solve each quadratic equation.

a. $x^2 - 121 = 0$

b. $x^2 - 96 = 0$

c. $(x - 3)^2 - 1 = 0$

d. $2(x + 6)^2 - 8 = 0$

e. $\frac{1}{2}(x - 5)^2 - 3 = 0$

f. $-3(x + 4)^2 - 20 = 0$

g. $\frac{2}{3}(x - 6)^2 + 3 = 5$

h. $5(x + 6)^2 - 8 = 0$

i. $-1.5(x + 5)^2 + 7 = 2.5$

2. Solve each equation.

a. $(x - 4)(x + 3) = 0$

b. $(x + 9)(x - 9) = 0$

c. $(x + 7)(x + 1) = 0$

d. $(3x + 1)(3x - 1) = 0$

e. $(3x + 5)(2x - 5) = 0$

f. $(x - 4)(2x + 1)(3x - 2) = 0$

3. Decide what number you must add to each expression to make a perfect-square trinomial. Then rewrite the expression as a squared binomial.

a. $x^2 + 6x$

b. $x^2 - 20x$

c. $x^2 - 2x$

d. $x^2 + 7x$

e. $x^2 - 11x$

f. $x^2 + 10x$

g. $x^2 + 24x$

h. $x^2 + \frac{5}{2}x$

i. $x^2 + (2\sqrt{7})x$

4. Solve each quadratic equation by completing the square. Leave your answer in radical form.

a. $x^2 - 6x - 16 = 0$

b. $x^2 + 6x - 2 = 0$

c. $x^2 - 16x + 50 = 0$

d. $x^2 - 4x = 0$

e. $x^2 + 11x = 0$

f. $x^2 + 5x + 1 = 0$

g. $2x^2 - 12x - 7 = 0$

h. $-x^2 + 14x - 24 = 0$

i. $x^2 + 2x = -7$

5. Rewrite each equation in vertex form. Use a graph or table to check your answers.

a. $y = x^2 - 8x + 6$

b. $y = x^2 + 11x$

c. $y = 2x^2 - 24x + 8$

d. $y = 2(x + 1)(x - 5)$

Lesson 9.7 • The Quadratic Formula

Name ______________________________ Period __________ Date ______________

1. Rewrite each equation in general form. Identify the values of a, b, and c.

a. $x^2 + 8x = -6$

b. $x^2 = 4x - 4$

c. $3x = x^2$

d. $(x + 1)(x - 1) = 0$

e. $(x - 4)^2 = -3$

f. $(2x + 1)(2x - 3) = 4$

2. Without using a calculator, use the discriminant, $b^2 - 4ac$, to determine the number of real roots for each equation in Exercise 1.

3. Use the quadratic formula to solve each equation. Give your answers in radical form and as decimals rounded to the nearest thousandth.

a. $x^2 + x - 6 = 0$

b. $x^2 - 8x + 12 = 0$

c. $2x^2 - 5x - 3 = 0$

d. $x^2 + 7x - 2 = 0$

e. $x^2 - 14x + 8 = 0$

f. $3x^2 + 2x - 1 = 0$

g. $3x^2 + 2x + 1 = 0$

h. $-2x^2 + 3x + 4 = 0$

i. $4x^2 + 12x + 9 = 0$

j. $2x^2 - 6x + 5 = 0$

4. Which equations from Exercise 3 could be solved by factoring? Explain how you know.

5. Solve each quadratic equation. Give your answers in radical form and as decimals rounded to the nearest hundredth.

a. $x^2 - 169 = 0$

b. $x^2 - 82 = 0$

c. $(x - 5)^2 - 3 = 0$

d. $2(x + 5)^2 - 9 = 0$

e. $\frac{1}{2}(x - 4)^2 - 2 = 0$

f. $-3(x + 5)^2 - 15 = 0$

g. $\frac{2}{3}(x - 8)^2 + 8 = 3$

h. $5(x + 5)^2 - 9 = 0$

6. Consider the parabola described by the equation $f(x) = -3x^2 + 6x + 8$.

a. Find the x-intercepts. Give the answers in radical form and as decimals rounded to the nearest hundredth.

b. Find the equation of the axis of symmetry.

c. Write the coordinates of the vertex.

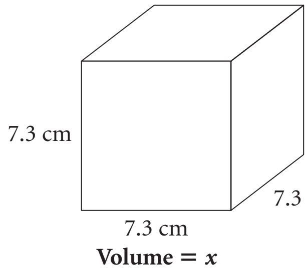
d. If $f(x) = 5$, find x. Give the answers in radical form and as decimals rounded to the nearest hundredth.

Lesson 9.8 • Cubic Functions

Name ______________________________ Period __________ Date ______________

1. Write and solve an equation to find the value of x in each figure.

a.



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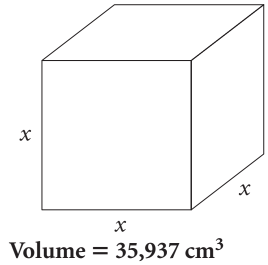

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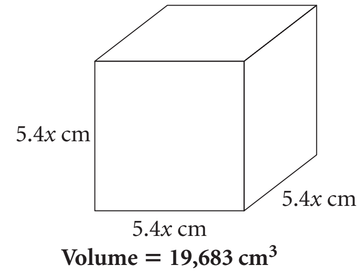


2. Write the equation of the image of $y = x^3$ after the transformations.

a. A translation right 2 units

b. A translation up 3 units

c. A translation right 2 units and up 3 units

d. A vertical shrink of 0.5

3. Factor each expression by removing the largest possible common monomial factor.

a. $15x^2 - 9x + 3$

b. $4x^2 + 5x$

c. $6x^3 - 3x^2 + 12x$

d. $8x^3 + 12x^2$

e. $2x^4 + 6x^3 - 10x^2 + 2x$

f. $5x^3 + 15x^2 - 25x$

4. Factor each expression completely.

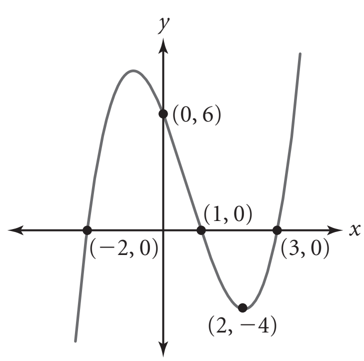
a. $x^3 + 3x^2 + 2x$

b. $x^3 - 9x$

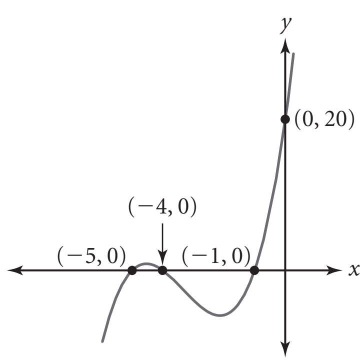
c. $3x^3 + 6x^2 + 3x$

5. Name the x-intercepts of each function and write the equation in factored form.

a.



b.



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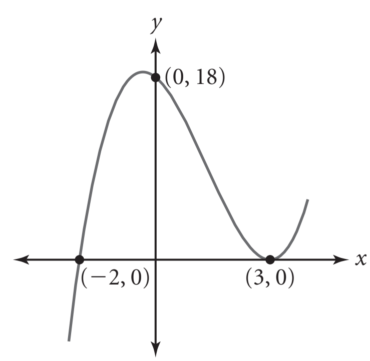


6. Use a rectangle diagram to find each missing expression.

a. $(5x + 2)\left(2x^2 + 3x\right) = (?)$

b. $(2x - 1)(?) = 2x^3 + 5x^2 - 11x + 4$

c. $(3x - 2)(?) = 9x^3 - 6x^2 - 12x + 8$

Lesson 9.8 • Rational Expressions

Name ____________________ Period __________ Date ____________

1. Reduce each rational expression to lowest terms. State any restrictions on the variable.

a. $\frac{20x^4}{4x^3}$

b. $\frac{\left(5x^3\right)\left(16x^2\right)}{80x^3}$

c. $\frac{28(x-5)}{7(x-5)^2}$

d. $\frac{3x^2}{15x^3}$

e. $\frac{4+20x}{20x}$

f. $\frac{15-5x^4}{5x}$

g. $\frac{(x-1)(x+2)}{(x+2)(x+1)}$

h. $\frac{x^2+3x+2}{(x-4)(x+2)}$

i. $\frac{x^2+2x-15}{x^2+6x+5}$

j. $\frac{x^2+5x+4}{x^2-16}$

k. $\frac{x^2-1}{3x^2-3}$

l. $\frac{x^2+12x+36}{x^2-36}$

2. Multiply or divide. State any restrictions on the variables.

a. $\frac{5}{n^2} \div \frac{10}{n}$

b. $\frac{4x^3}{24x^6} \cdot \frac{12x^4}{15x}$

c. $\frac{4xy^3}{(2x)^3} \div \frac{2y^2}{1}$

d. $\frac{3(x-6)}{18} \cdot \frac{4(x+6)}{8(x-6)}$

e. $\frac{3c-6}{8} \div \frac{5c-10}{6}$

f. $\frac{y+4}{5y} \cdot \frac{20}{y^2+6y+8}$

g. $\frac{a^2-9}{a+4} \div \frac{a-3}{a+4}$

h. $\frac{x^2+3x-10}{5x} \cdot \frac{x^2-3x}{x^2-5x+6}$

i. $\frac{x^2-5x-6}{x^2+4x+3} \div \frac{x^2-4x-12}{x^2+5x+6}$

3. Add or subtract. State any restrictions on the variable.

a. $\frac{2x}{3} + \frac{5}{2}$

b. $\frac{7}{3x} - \frac{5}{9}$

c. $\frac{x-2}{12x+8} + \frac{3}{4}$

d. $\frac{x+3}{14x+28} - \frac{2}{7}$

e. $\frac{x+3}{x+7} - \frac{1}{7}$

f. $\frac{x+3}{x+2} + \frac{x-1}{x+4}$

g. $\frac{1}{x^2-16} + \frac{1}{4}$

h. $\frac{1}{x} - \frac{10}{x^2(x+3)}$

i. $\frac{3}{x+3} + \frac{1}{x^2+6x+9}$

j. $\frac{x-9}{x^2-81} + \frac{1}{x+9}$

Lesson 10.1 • Relative Frequency Graphs

Name ______________________________ Period __________ Date ______________

1. This table shows the typical distribution of ticket sales by type of movie at a movie theater.

Ticket Sales by Movie Type

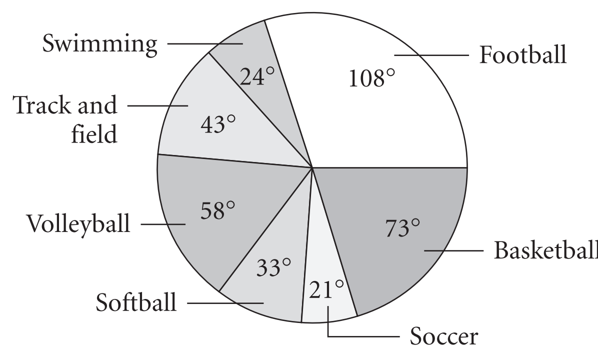
Comedy	Romance	Action	Drama	Science fiction	Horror
25%	10%	35%	15%	10%	5%

a. Create a circle graph to represent the information in the table. Include the angle measure of each sector.

b. If the manager of the theater expects to sell 620 tickets on Friday, how many of each type of ticket does he anticipate selling?

2. This graph shows the distribution of students who participate in each sport, among all the students who are involved in sports.

Distribution of Students in Sports



a. Create a relative frequency circle graph showing the information in the table.

b. If 53 students take football, how many students are involved in sports?

c. How many students participate in swimming? Track and field?

d. Construct a relative frequency bar graph of the data.

3. This table shows the number of pages in a newspaper one day.

Newspaper Pages by Section

Editorial	Classified	Sports	Business	National and world news	Entertainment	Local news
4	3	7	4	11	5	8

a. Construct a relative frequency bar graph of the data.

b. What percent of the newspaper does not cover national and world news?

c. During the Olympics, the newspaper puts three extra pages in the sports section. What percent of the paper covers sports then?

Lesson 10.2 • Probability Outcomes and Trials

Name ______________________ **Period** __________ **Date** ____________

1. The table shows the number of each type of book in a box at a garage sale. Without looking into the box, a person reaches in and pulls out a book.

Science fiction	Poetry	Current events	Drama	Fantasy	Comedy	Biography
5	4	9	4	11	7	10

Find each probability. Give your answer as a fraction and as a decimal number.

a. P(Poetry)

b. P(Biography)

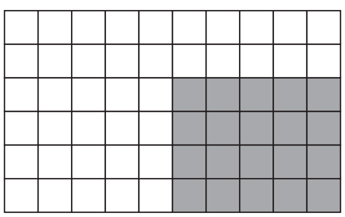
c. P(Drama or Comedy)

d. P(Science Fiction or Fantasy or Poetry)

e. P(not Biography)

2. Find the theoretical probability that a random point picked within each figure is in the shaded region of that figure.

a.



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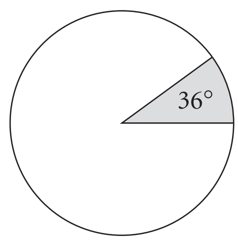
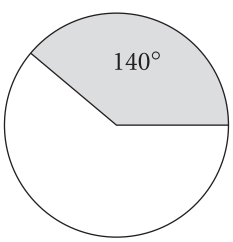
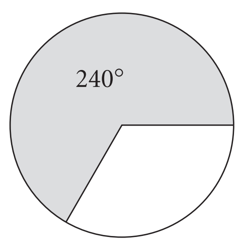


c.



d.

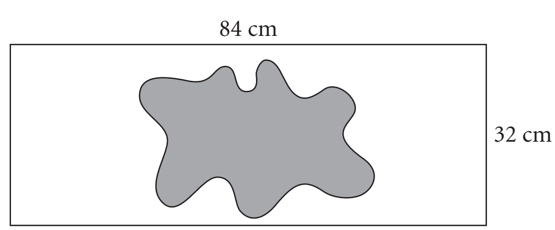


3. In some games, 8- or 12-sided dice are used.

a. If you roll two 8-sided dice together, what is the probability that the sum will be 9?

b. A *prime number* is a number greater than 1 that is divisible only by 1 and itself. If you roll a 12-sided die, what is the probability of rolling a prime number?

4. When 250 points are randomly dropped on the rectangle shown at right, 89 points fall within the blob. Estimate the area of the blob.



Lesson 10.3 • Random Outcomes

Name ____________________ Period __________ Date ______________

1. A park ranger estimated that her park contained 800 squirrels. Over a week, the park ranger caught and tagged 150 of them. Then, after allowing two weeks for random mixing, she caught 150 more squirrels and found that 32 of them had tags.

a. What is the park ranger's original estimated probability of catching a tagged squirrel?

b. What assumptions must you make to answer 1a?

c. Based on the number of squirrels she caught two weeks later, what is the park ranger's experimental probability of catching a tagged squirrel?

2. Suppose 9500 people try to buy tickets for a concert, but only 2200 tickets are available.

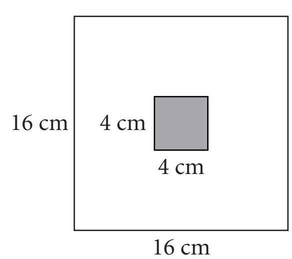
a. What fraction of the people will get a ticket?

b. What fraction of the people will not get a ticket?

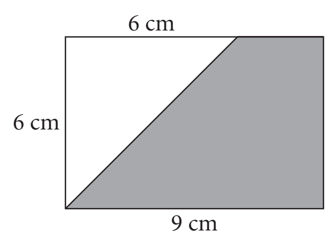
c. Assuming each person has the same chance of buying a ticket, what is the probability that a randomly selected person will get a ticket to the concert?

3. Use the figures to find the answers to 3a–3c.

i.



ii.



a. In each figure, what is the probability that a randomly selected point is in the shaded region of that figure?

b. If 100 points were randomly plotted on each figure, about how many points would you expect to find in each shaded region?

c. An unknown number of points are plotted on each figure. If 40 points are within the unshaded region of each figure, about how many points were plotted?

4. A paper cup is thrown into the air 75 times. It lands on its side 57 times, on its top 12 times, and on its bottom 6 times.

a. What is the experimental probability that it will land on its side on the next throw?

b. If it is thrown 19 more times, about how many times would you expect it to land on its top?

Lesson 10.4 • Counting Techniques

Name ____ Period ____________ Date _________________

1. Identify each situation as a permutation, a combination, or neither.

a. The number of three-person committees that can be selected from a class of 15 students

b. The number of different four-digit numbers that can be made from the digits 2, 6, 7, and 9

c. The number of paths, moving only right or down along side segments, for getting from the upper-left corner of a checker board to the bottom-right corner

d. The number of different outcomes of selecting five balls from a bag containing six red balls and seven white balls

2. Evaluate each number of permutations or combinations without using your calculator. Show your calculations.

a. ${}_6P_3$ **b.** ${}_6C_3$ **c.** ${}_6P_1$ **d.** ${}_6C_1$

3. The San Benito Boys and Girls Club basketball coach has seven players dressed for a game.

a. In how many ways can they be arranged to sit on the bench?

b. Five players are assigned to specific positions for the game. How many different teams can the coach put on the floor?

c. If there is a tie after regulation time, four players each take five free throws and the team with the highest total wins. How many possibilities does the coach have for selecting who will break a tie?

4. Ricardo has six books written by five different authors. In how many ways can he arrange them on a shelf so that the two books by the same author are next to each other?

5. In the Boys and Girls Club Basketball Fundraising Lottery, participants buy a ticket containing four different numbers from 0 to 9. Each week, a winner is determined by drawing four numbers from a hat containing the ten one-digit choices. Any person who has a ticket with three of the four correct digits is a winner.

a. How many different tickets is it possible to buy?

b. How many winning possibilities are there each week?

c. If you buy one ticket, what is your probability of winning?

Lesson 10.5 • Multiple-Stage Experiments

Name ______________________ Period __________ Date ______________

1. Selene flips a coin and then rolls a die.

a. Create a tree diagram showing the possible outcomes and the probabilities.

b. What is the probability of getting a head and then a 3? A tail and then an odd number?

c. Explain what $P(< 3 \mid \text{H})$ means. Evaluate the probability.

2. Amanda has a coin, a die, and a spinner with four equal sectors lettered A, B, C, and D. First she flips a coin. If she gets a head, she throws the die. If she gets a tail, she spins the spinner. Finally, she flips the coin again.

a. Create a tree diagram showing the possible outcomes.

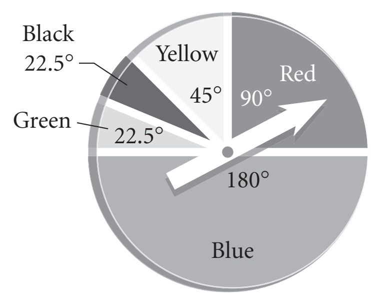
b. What is the probability that she will spin the spinner?

c. What is the probability that she will get an even number on the die followed by a tail?

d. Let H_1 represent a head on the first die roll, and H_2 represent a head on the second die roll. Calculate each probability.

i. $P(\text{H}_1 \text{ and } 2 \text{ and } \text{H}_2)$ **ii.** $P(\text{H}_2 \mid \text{H}_1 \text{ and } 2)$ **iii.** $P(2 \mid \text{T}_1)$

3. The spinner shown at right is spun twice. Evaluate each probability.



a. $P(\text{blue})$

b. $P(\text{red and then blue})$

c. $P(\text{green} \mid \text{green})$

d. $P(\text{black and then black})$

4. The Central High Cobras have a 7-3 win-loss record against the Bay High Cheetahs and a 4-6 win-loss record against the San Pablo Bulldogs. The three teams are about to start a tournament.

a. Based on its record, what is the probability that Central High will beat both of the other teams?

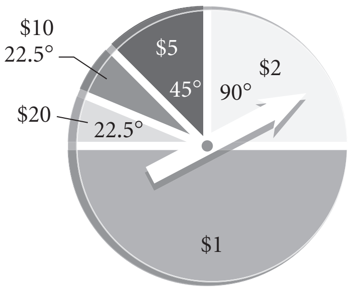
b. Create a tree diagram with probabilities to show the possible results of a two-out-of-three game match between the Cobras and the Cheetahs. On the diagram, mark the winner of each branch with its corresponding probability. What is the probability that the Cobras will win?

c. Create a tree diagram with probabilities to show the possible results of a two-out-of-three game match between the Cobras and the Bulldogs. On the diagram, mark the winner of each branch with its corresponding probability. What is the probability that the Cobras will win?

Lesson 10.6 • Expected Value

Name ____________________ Period __________ Date ____________

1. What is the expected value of one spin of the spinner game shown?



2. The table shows the ages in years of the students in an algebra class.

Age	13	14	15	16
Number	4	10	15	6

a. What is the probability that a randomly selected student is 13 years old? 14 years old? 15 years old? 16 years old?

b. What is the expected age of a randomly selected student?

c. What is the mean age of the class?

3. Therese plays a game in which she rolls two dice and moves the number of places equal to the sum of the numbers on the face-down sides. One die is a regular six-sided die with sides numbered 1 to 6; the other is a four-sided die (a regular tetrahedron) with sides numbered 1 to 4.

a. Complete a table like this showing the possible sums of the two dice.

Four-sided die

4						
3						
2						
1						
Roll	**1**	**2**	**3**	**4**	**5**	**6**

Six-sided die

b. What is the probability of Therese moving eight places on her next turn?

c. Calculate the expected number of places Therese will move on her next turn.

d. A variation of Therese's game is to multiply the numbers on the face-down sides instead of adding them. In this variation, what is the expected number of places Therese will move on a turn?

Lesson 11.1 • Parallel and Perpendicular

Name ______________________ Period ________ Date ____________

1. Find the slope of each line.

a. $y = -4x + 7$

b. $y - 2x + 7 = 0$

c. $3x - y = -4$

d. $2x + 3y = 11$

e. $y = \frac{4}{3}(x + 1) - 5$

f. $\frac{1}{3}x + \frac{3}{4}y + \frac{1}{2} = 0$

g. $1.2x - 4.8y = 7.3$

h. $y = -x$

i. $y = \frac{x}{2}$

2. Plot each set of points on graph paper and connect them to form a polygon. Classify each polygon using the most specific term that describes it. Justify your answers by finding the slopes of the sides of the polygon.

a. $A(1, 10)$, $B(-6, 3)$, $C(4, -17)$, $D(9, -12)$

b. $P(2, 4)$, $Q(10, 6)$, $R(14, -10)$, $S(6, -12)$

c. $W(-5, 4)$, $X(7, 7)$, $Y(15, -5)$, $Z(3, -8)$

3. Write an equation of a line parallel to each line.

a. $y = \frac{2}{3}x - 4$

b. $3x + 5y = 7$

c. $-\frac{1}{3}x + \frac{1}{2}y - \frac{2}{3} = 0$

d. $0.2x - 0.5y = 4$

e. $y = 2.8x$

f. $3y - 5x = 10$

4. Write an equation of a line perpendicular to each line.

a. $y = \frac{2}{3}x - 4$

b. $3x + 5y = 7$

c. $-\frac{1}{3}x + \frac{1}{2}y - \frac{2}{3} = 0$

d. $0.2x - 0.5y = 4$

e. $y = 2.8x$

f. $3y - 5x = 10$

5. Write the equation of the line through the point $(-4, 2)$ and

a. Parallel to the line with equation $2x - 5y = -9$

b. Perpendicular to the line with equation $2x - 5y = -9$

Lesson 11.2 • Finding the Midpoint

Name ______________________________ Period __________ Date ____________

1. Find the midpoint of the segment between each pair of points.

a. $(6, 9)$ and $(-2, 1)$

b. $(-7, 10)$ and $(-12, -4)$

c. $(11, -2)$ and $(5, 3)$

d. $(4.5, -2)$ and $(-3, 6.6)$

e. $(0, 5)$ and $(7, 2)$

f. $(13.5, 12)$ and $(-10.5, 8)$

2. Find the equation of the line that satisfies each set of conditions. Write each equation in slope-intercept form.

a. Slope -2 and y-intercept $(0, 5)$

b. Slope $\frac{2}{3}$ going through the origin

c. Slope 4 going through the point $(1, 7)$

d. x-intercept $(-3, 0)$ and y-intercept $(0, -1)$

e. Goes through the points $(-6, 1)$ and $(3, 7)$

f. Goes through the points $(5, -5)$ and $(-4, 4)$

3. Write the equation of the perpendicular bisector of the line segment that goes through each pair of points. Write the equation in point-slope form if possible.

a. $(3, 2)$ and $(-1, 4)$

b. $(17, 8)$ and $(-2, -5)$

c. $(-5, 2)$ and $(-1, -5)$

d. $(0, 4)$ and $(0, -6)$

4. Given triangle ABC with $A(1, -6)$, $B(-6, 4)$, and $C(10, 10)$, write the equation of each of the following lines in point-slope form:

a. The line containing the median through A

b. The line that is the perpendicular bisector of $\overline{AB}$

c. The line that passes through the midpoints of $\overline{BC}$ and $\overline{AC}$

5. Quadrilateral $ABCD$ has vertices $A(-4, -5)$, $B(8, 9)$, $C(13, -1)$, and $D(0, -14)$.

a. Find the most specific term to describe quadrilateral $ABCD$. Justify your answer.

b. Find the midpoint of each diagonal.

c. Make an observation based on your answer to 5b.

Lesson 11.3 • Squares, Right Triangles, and Areas

Name ______________________________ Period __________ Date ______________

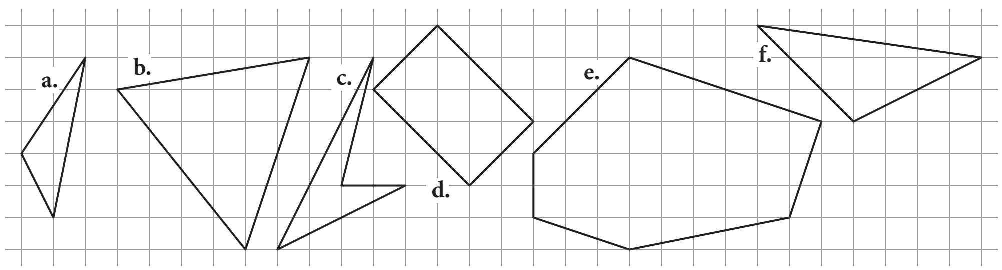
1. Find an exact solution for each quadratic equation.

a. $x^2 = 18$ **b.** $x^2 - 30 = 0$ **c.** $(x - 5)^2 = 14$

d. $(x + 1)^2 + 3 = 7$ **e.** $(x + 1)^2 + 3 = 8$ **f.** $(x - 2)^2 + 4 = 1$

2. Calculate decimal approximations for your solutions to Exercise 1. Round your answers to the nearest ten-thousandth. Check each answer by substituting it into the original equation.

3. Find the area of each figure.



4. Find the exact length of each side of these figures from Exercise 3.

a. Figure c **b.** Figure d **c.** Figure f

5. On grid paper, construct a square with each area, using only a straightedge.

a. 1 square unit **b.** 2 square units **c.** 4 square units **d.** 5 square units

Lesson 11.4 • The Pythagorean Theorem

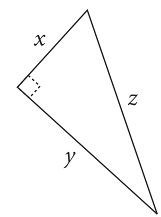
Name ______________________________ Period __________ Date ____________

1. Find the exact solutions of each equation.

a. $5^2 + 12^2 = a^2$ **b.** $4^2 + b^2 = 5^2$ **c.** $2^2 + 5^2 = c^2$

d. $6^2 = d^2 + 5^2$ **e.** $(2\sqrt{5})^2 + 6^2 = e^2$ **f.** $(\sqrt{37})^2 + f^2 = (6\sqrt{11})^2$

2. Find the value of each missing side, given the lengths of the other two sides. Give your answers in exact form and rounded to the nearest tenth.

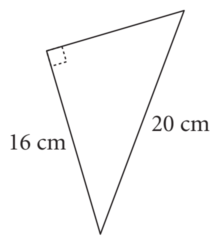


a. $x = 7, y = 8$ **b.** $y = 24, z = 25$ **c.** $x = 13, z = 19$

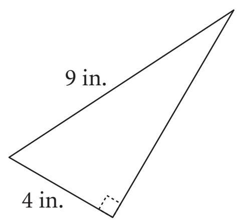
d. $x = 7.8, y = 13.1$ **e.** $y = 31, z = 50$ **f.** $x = 10, y = 10$

3. Find the exact area of each triangle. Then give the approximate area rounded to the nearest tenth.

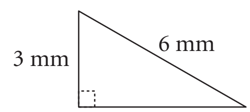
a.



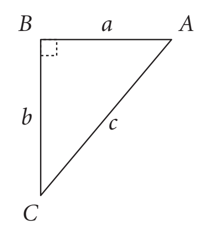
b.



c.



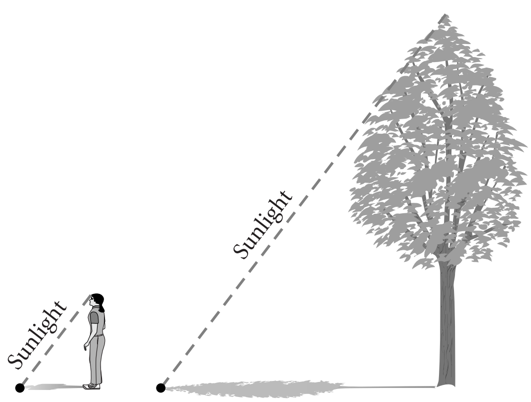
4. Determine whether $\triangle ABC$ is a right triangle for each set of side lengths. Show your work. Measurements are in centimeters.



a. $a = 7, b = 8, c = 11$ **b.** $a = 15, b = 36, c = 39$

c. $a = \sqrt{14}, b = \sqrt{21}, c = \sqrt{35}$ **d.** $a = 2\sqrt{13}, b = \sqrt{29}, c = 9$

5. Claudine wants to find the height of a tree at school. She measures the shadow, and finds it to be 11 m long. When Claudine measures her own shadow, it is 90 cm long. Claudine is 150 cm tall. How tall is the tree?



Lesson 11.5 • Operations with Roots

Name ______________________ **Period** __________ **Date** ______________

1. Rewrite each expression with as few square root symbols as possible and no parentheses.

a. $\sqrt{3} + \sqrt{3} + \sqrt{3}$ **b.** $(3\sqrt{5})(2\sqrt{2})$ **c.** $3\sqrt{2} + 4\sqrt{3} - \sqrt{2} + 2\sqrt{3}$

d. $(3\sqrt{2})^2$ **e.** $\sqrt{3}(2\sqrt{3} - 1)$ **f.** $\dfrac{\sqrt{20}}{\sqrt{5}}$

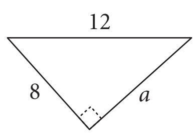
g. $\dfrac{6\sqrt{15}}{\sqrt{3}}$ **h.** $\sqrt{5}(1 - 3\sqrt{5})$ **i.** $7\sqrt{5} + (\sqrt{2})(\sqrt{3}) - \sqrt{5}$

2. Evaluate each expression.

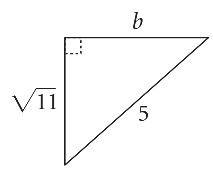
a. $(\sqrt{19})^2$ **b.** $(2\sqrt{3})^2$ **c.** $(\sqrt{29})^2 + 4^2$ **d.** $(2\sqrt{7})^2 - (\sqrt{11})^2$

3. Find the exact length of the third side of each right triangle. All measurements are in centimeters.

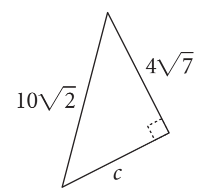
a.



b.



c.



4. Write the equation for each parabola in general form. Use your calculator to check that both forms give the same graph or table.

a. $y = (x + \sqrt{2})(x - \sqrt{2})$ **b.** $y = (x + 2\sqrt{5})^2$

5. Name the x-intercepts for each parabola in Exercise 4. Give both the exact value and a decimal approximation to the nearest thousandth for each x-intercept.

6. Name the vertex for each parabola in Exercise 4. Give both the exact values and decimal approximations to the nearest thousandth for the coordinates of each vertex.

7. Rewrite each radical expression without a coefficient.

a. $5\sqrt{3}$ **b.** $2\sqrt{2}$ **c.** $3\sqrt{15}$ **d.** $6\sqrt{10}$

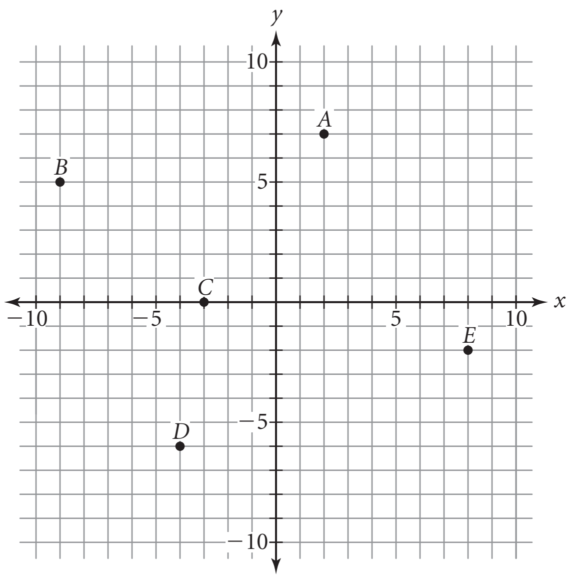
8. Rewrite each radical expression so that the value under the radical does not contain perfect-square factors.

a. $\sqrt{12}$ **b.** $\sqrt{48}$ **c.** $\sqrt{96}$ **d.** $\sqrt{500}$

Lesson 11.6 • A Distance Formula

Name ______________________________ Period __________ Date ____________

1. Find the exact distances and lengths.



a. A to B **b.** B to C **c.** $\overline{CD}$

d. $\overline{DE}$ **e.** E to the origin

2. Quadrilateral $MNOP$ has vertices $M(0, -5)$, $N(5, -3)$, $O(7, -8)$, and $P(2, -10)$.

a. Find the slope of each side.

b. Find the length of each side.

c. What kind of polygon is $MNOP$?

3. Triangle DEF has vertices $D(-4, 10)$, $E(2, 6)$, and $F(6, 12)$.

a. Find the slope of each side.

b. Find the length of each side.

c. What kind of triangle is DEF?

4. Solve each equation. Check each solution.

a. $\sqrt{30 + x} = x$ **b.** $x = \sqrt{x - \frac{1}{4}}$ **c.** $\sqrt{3x + 18} = x$

d. $2x = \sqrt{8x + 5}$ **e.** $x = \sqrt{-4x + 3}$ **f.** $\sqrt{2x + 3} = -x$

Lesson 11.7 • Similar Triangles and Trigonometric Functions

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

1. Solve each equation for x.

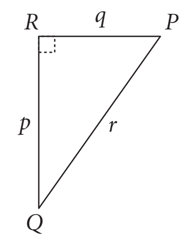
a. $\dfrac{9}{14} = \dfrac{27}{x}$ **b.** $\dfrac{\sqrt{6}}{x} = \dfrac{3}{\sqrt{6}}$ **c.** $\dfrac{2}{x} = \dfrac{x}{32}$ **d.** $\dfrac{16}{\sqrt{2}} = \dfrac{\sqrt{32}}{x}$

2. On a map, 2 cm represents 0.5 km.

a. What is the actual distance between two cities that are 7.25 cm apart on the map?

b. What is the map distance between two cities that are actually 7.7 km apart?

3. Refer to the triangle at right to answer the questions.



a. Name the hypotenuse.

b. With respect to angle P, name the opposite side and the adjacent side.

c. With respect to angle Q, name the opposite side and the adjacent side.

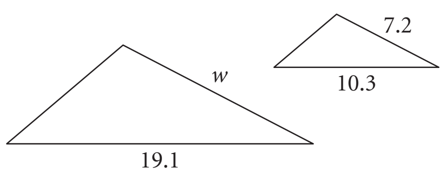
d. What trigonometric function of angle P is the same as $\frac{p}{r}$?

e. What trigonometric function of angle Q is the same as $\frac{q}{p}$?

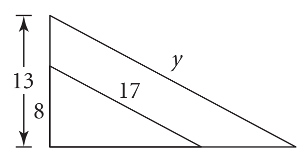
f. What ratio is the same as sin Q?

4. Write a proportion and find the value of the variable for each pair of similar triangles.

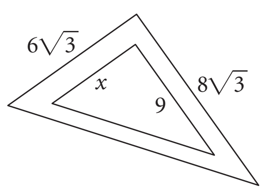
a.



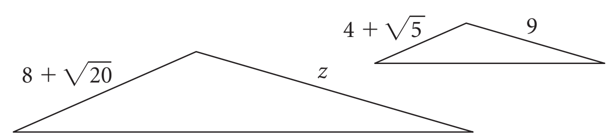
b.



c.



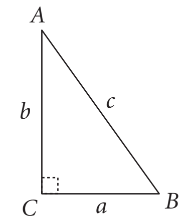
d.



Lesson 11.8 • Trigonometry

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

1. Use the triangle at right for Exercise 1a–f. Fill in the correct angle or ratio to make each statement true.

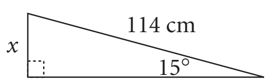


a. $\sin A = \square$ **b.** $\cos \square = \frac{a}{c}$ **c.** $\tan^{-1} \square = A$

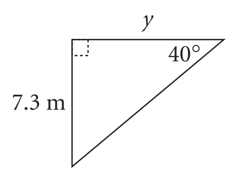
d. $\cos^{-1} \frac{a}{c} = \square$ **e.** $\cos A = \sin \square$ **f.** $\tan \square = \frac{a}{b}$

2. Write a trigonometric equation and solve for the indicated side length or angle measure.

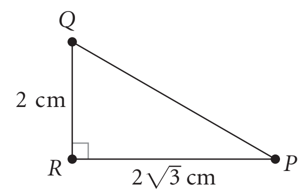
a. Find x.



b. Find y.



c. Find angle P.

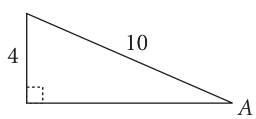


3. Find the measure of each angle. Round your answer to the nearest tenth of a degree.

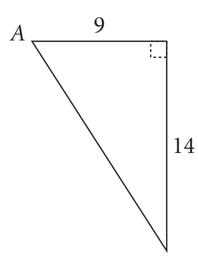
a. $\sin A = \frac{3}{4}$ **b.** $\cos B = \frac{\sqrt{2}}{2}$ **c.** $\tan C = \sqrt{3}$ **d.** $\sin E = \frac{2\sqrt{3}}{9}$

4. Find the measure of angle A for each figure. Round your answer to the nearest tenth of a degree.

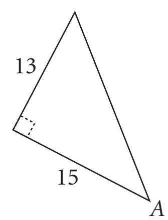
a.



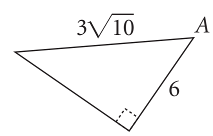
b.



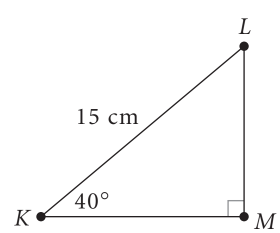
c.



d.



5. Find the area of triangle KLM to the nearest 0.1 cm^2. Show your work including any trigonometric equations you use.



LESSON 0.1a • The Same yet Smaller

The form of an answer may vary in Exercises 1–4. The following answers give one possible form.

1. a. $\frac{1}{4}$ **b.** $\frac{1}{4} + \frac{1}{16} = \frac{5}{16}$

c. $\frac{1}{16} + \frac{1}{16} + \frac{1}{64} + \frac{1}{64} = \frac{10}{64} = \frac{5}{32}$

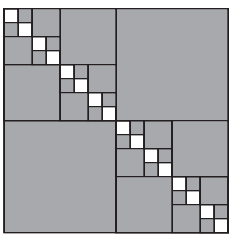
d. $\frac{1}{4} + \frac{1}{16} + \frac{1}{64} = \frac{21}{64}$

2. a. $81 \times \left(\frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9}\right) = 36$

b. $81 \times \left(\frac{1}{9} + \frac{1}{9} + \frac{1}{81} + \frac{1}{81} + \frac{1}{81} + \frac{1}{81} + \frac{1}{81} + \frac{1}{81}\right)$ $= 24$

c. $81 \times \left(6 \times \frac{1}{81} + 24 \times \frac{1}{729}\right) = \frac{26}{3}$

3. a.



Stage 4

b. $\frac{1}{256}$ **c.** $4 \times \frac{1}{16} = \frac{1}{4}; 8 \times \frac{1}{64} = \frac{1}{8}$

4. a. $\frac{1}{4} \times \frac{1}{4}$ **b.** $1 - \frac{1}{4} \times \frac{1}{4}$ **c.** $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4}$

LESSON 0.1b • Adding and Multiplying Fractions

1. a. $\frac{1}{2}$ **b.** 1 **c.** $\frac{5}{8}$ **d.** $\frac{9}{64}$

e. $\frac{1}{2}$ **f.** $\frac{5}{21}$ **g.** $\frac{8}{15}$ **h.** $\frac{25}{64}$

i. $\frac{13}{81}$ **j.** $\frac{17}{21}$ **k.** $\frac{7}{8}$ **l.** 1

2. a. $\frac{3}{4}$ **b.** $\frac{13}{16}$ **c.** $\frac{3}{8}$ **d.** $\frac{1}{8}$

e. $\frac{1}{8}$ **f.** $\frac{3}{16}$ **g.** $\frac{1}{16}$ **h.** $\frac{1}{16}$

i. $\frac{1}{16}$

3. a. $\frac{1}{16}$ **b.** $\frac{3}{25}$ **c.** $\frac{1}{27}$ **d.** $\frac{5}{12}$

e. $\frac{2}{5}$ **f.** $\frac{1}{2}$ **g.** $\frac{4}{3}$, or $1\frac{1}{3}$ **h.** $\frac{21}{64}$

i. $\frac{2}{9}$

4. a. 16 **b.** 8 **c.** 24 **d.** 12

e. 6 **f.** 18 **g.** 1 **h.** $\frac{1}{2}$

i. 9

LESSON 0.2 • More and More

1. a. 3^4 **b.** 4^6 **c.** 2^5

d. 10^3 **e.** $\left(\frac{1}{2}\right)^4$ **f.** $\left(\frac{1}{3}\right)^4$

2. a. $4 \cdot 4 \cdot 4 = 64$

b. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$

c. $6 \cdot 6 \cdot 6 = 216$

d. $10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 1{,}000{,}000$

e. $\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{27}$ **f.** $\frac{2}{3} \cdot \frac{2}{3} = \frac{4}{9}$

3. a. 2^5 **b.** 3^3 **c.** 2^6 or 4^3 or 8^2

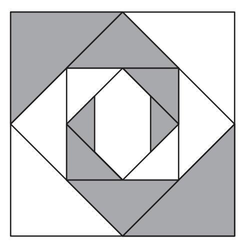
d. 3^4 or 9^2 **e.** 17^2 **f.** 11^3

4. a. $\frac{11}{12}$ **b.** 6 **c.** $\frac{7}{12}$

d. $\frac{69}{8}$, or $8\frac{5}{8}$ **e.** $\frac{12}{35}$ **f.** $\frac{51}{64}$

g. $\frac{13}{16}$ **h.** 6 **i.** $\frac{11}{12}$

5.



Stage 4

Stage	Total shaded area in multiplication and addition form	Total shaded area in fraction form	Total shaded area in decimal form
0	0	0	0
1	$\left(2\cdot\frac{1}{8}\right)\cdot 12$	3	3
2	$\left[\left(2\cdot\frac{1}{8}\right)+\left(2\cdot\frac{1}{8}\cdot\frac{1}{2}\right)\right]\cdot 12$	$\frac{9}{2}$	4.5
3	$\left[\left(2\cdot\frac{1}{8}\right)+\left(2\cdot\frac{1}{8}\cdot\frac{1}{2}\right)+\left(2\cdot\frac{1}{8}\cdot\frac{1}{2}\cdot\frac{1}{2}\right)\right]\cdot 12$	$\frac{21}{4}$	5.25
4	$\left[\left(2\cdot\frac{1}{8}\right)+\left(2\cdot\frac{1}{8}\cdot\frac{1}{2}\right)+\left(2\cdot\frac{1}{8}\cdot\frac{1}{2}\cdot\frac{1}{2}\right)+\left(2\cdot\frac{1}{8}\cdot\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{1}{2}\right)\right]\cdot 12$	$\frac{45}{8}$	5.625

Note: The multiplication and addition form may vary. For example, Stage 3 could be written $\left(\frac{1}{8}+\frac{1}{8}+\frac{1}{16}+\frac{1}{16}+\frac{1}{32}+\frac{1}{32}\right)\cdot 12$, or $\left(\frac{1}{4}+\frac{1}{8}+\frac{1}{16}\right)\cdot 12$.

LESSON 0.3 • Shorter yet Longer

1. a. $\frac{27}{64}\approx 0.42$ **b.** $\frac{27}{64}\approx 0.42$
c. $\frac{36}{25}=1.44$ **d.** $\frac{25}{49}\approx 0.51$
e. $\frac{4{,}096}{10{,}000}\approx 0.41$ **f.** $\frac{144}{125}\approx 1.15$

2. a.

Stage number	Total length: Multiplication form	Exponent form	Decimal form
0	$3\cdot 1=3$	$3\cdot\left(\frac{4}{3}\right)^0$	3.00
1	$3\cdot 4\cdot\frac{1}{3}=4$	$3\cdot\left(\frac{4}{3}\right)^1$	4.00
2	$3\cdot 4\cdot 4\cdot\frac{1}{3}\cdot\frac{1}{3}=\frac{16}{3}$	$3\cdot\left(\frac{4}{3}\right)^2$	5.33
3	$3\cdot 4\cdot 4\cdot 4\cdot\frac{1}{3}\cdot\frac{1}{3}\cdot\frac{1}{3}=\frac{64}{9}$	$3\cdot\left(\frac{4}{3}\right)^3$	7.11

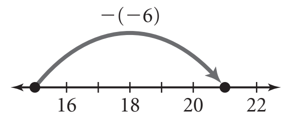
b. $3\cdot\left(\frac{4}{3}\right)^4-3\cdot\left(\frac{4}{3}\right)^3=\frac{256}{27}-\frac{64}{9}=\frac{64}{27}\approx 2.37$

3. Stage 6; 12,288 segments

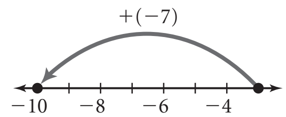
4. a. $\frac{55}{24}$, or $2\frac{7}{24}$ **b.** 17 **c.** $\frac{1493}{12}$, or $124\frac{5}{12}$
d. $\frac{25}{81}$ **e.** $\frac{1}{8}$ **f.** $\frac{1033}{16}$, or $64\frac{9}{16}$
g. $\frac{57}{4}$, or $14\frac{1}{4}$ **h.** $\frac{15}{16}$ **i.** $\frac{169}{12}$, or $14\frac{1}{12}$

LESSON 0.4 • Going Somewhere?

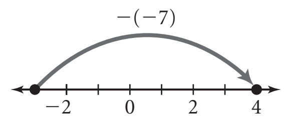
1. a. 7 **b.** −7 **c.** 9
d. 21



e. −10



f. 4



2. a. −8 **b.** −8 **c.** 28
d. −8 **e.** −2 **f.** 4
g. −75 **h.** 6 **i.** 2

3. a. 4 **b.** 41 **c.** −38
d. −1 **e.** −8 **f.** 0

4. a. −16 **b.** −13 **c.** 12
d. 24 **e.** −16 **f.** −16

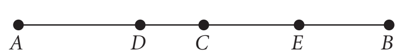
5. a. 0.5, −0.25, −0.625
b. −0.813, −0.906, −0.953
c. −1.5, −1.25, −1.125, −1.063, −1.031
d. Yes, both recursive sequences approach −1, but neither one reaches it.

LESSON 0.5 • Out of Chaos

1. Estimates may vary.
a. 6.7 cm **b.** 10.3 cm **c.** 2.5 cm **d.** 7.6 cm

2. a. Segment should be 4.1 cm in length.
b. Segment should be 8 cm in length.
c. Segment should be 9.3 cm in length.
d. Segment should be 10 cm in length.

3. a–c.



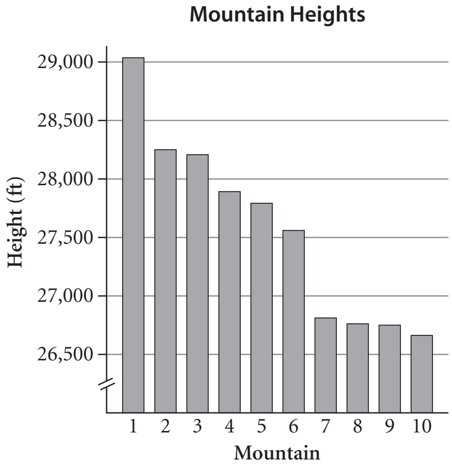
d. *D* and *C*; 2 cm

4. a. 36 **b.** $-\frac{19}{12}$, or $-1\frac{7}{12}$ **c.** $72\frac{5}{8}$, or $\frac{581}{8}$
d. $44\frac{5}{7}$, or $\frac{313}{7}$ **e.** $\frac{17}{2}$, or $8\frac{1}{2}$ **f.** $-\frac{91}{3}$, or $-30\frac{1}{3}$
g. 0 **h.** $\frac{295}{7}$, or $42\frac{1}{7}$ **i.** $27\frac{2}{7}$, or $\frac{191}{7}$
j. $-\frac{7}{12}$ **k.** $\frac{71}{20}$, or $3\frac{11}{20}$ **l.** $-3\frac{1}{4}$, or $-\frac{13}{4}$

LESSON 1.1 • Bar Graphs and Dot Plots

1. a. Minimum: 26,660 ft; maximum: 29,035 ft; range: 2,375 ft

b.

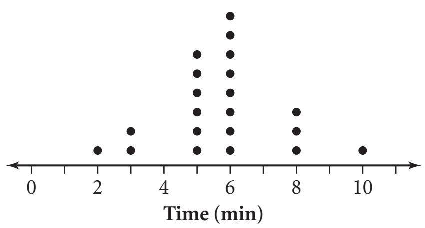


2. a. No student has six siblings.

b. Four students have no siblings.

c. Nine students each have three or more siblings.

3. a.



b. 8 min

4. a. clothing **b.** about $1,500 **c.** about $700

LESSON 1.2 • Summarizing Data with Measures of Center

1. a. Mean: $38.\overline{5}$; median: 36; mode: 10; range: 62

b. Mean: 16.625; median: 15; no mode; range: 20

c. Mean: 23; median: 21; mode: 21; range: 24

d. Mean: 30; median: 30; no mode; range: 10

2. a. The mean, median, and mode are 8.

b. Mean: 27.5; median: 25; modes: 20 and 25

3. Answers will vary. Possible answers:

a. {8, 10, 10, 14, 17, 19, 20}

b. {73, 76, 84, 86, 88, 91}

c. {7, 7, 8, 9, 11, 11, 11, 16}

4. a. Mean: $\approx$ 21 million km^2; median: $\approx$ 18 million km^2

b. Range: $\approx$ 36 million km^2

LESSON 1.3 • Five-Number Summaries and Box Plots

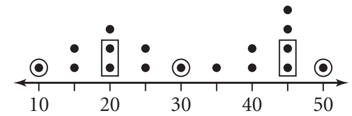
1. a. 5, 8, 14, 37, 44

b. 1, 4, 10, 25, 30

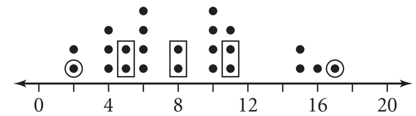
c. 14, 23, 27, 38, 43

d. 2, 10.5, 23.5, 38, 55

2. a. Summary values: 10, 20, 30, 45, 50



b. Summary values: 2, 5, 8, 11, 17



3. The closest or most accurate answer is b.

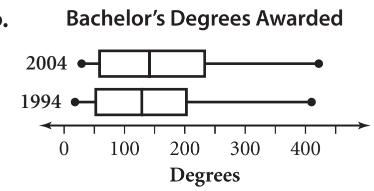
4. Answers will vary. Possible answers:

a. {6, 7, 10, 10, 11, 12, 13, 13, 15, 19, 20}

b. {6, 9, 10, 10, 10, 10, 14, 14, 14, 16, 17, 20}

5. a. For the 1994 data: 18, 52.5, 129, 202.5, 410; for the 2004 data: 29, 58.5, 141, 233, 422; mean for 1994: $\approx$ 147; mean for 2004: $\approx$ 161

b.

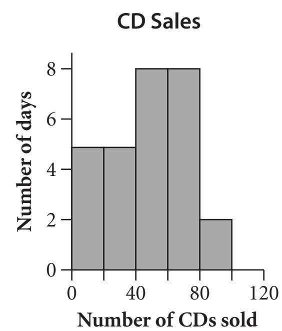


LESSON 1.4 • Histograms and Stem-and-Leaf Plots

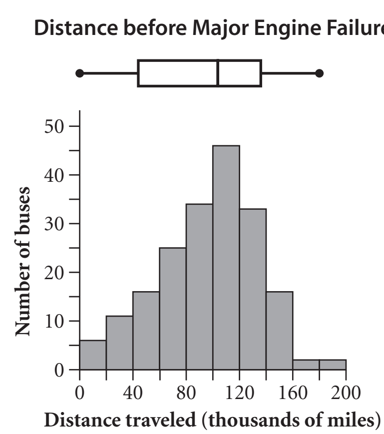
1. a. 28 days **b.** 5 days **c.** 11 days

d. There weren't any days during which the number of CDs sold was at least 80 but fewer than 90.

e.



2. a. Note: box plot added in Exercise 3



b. 99 buses **c.** 58 buses

d. Answers will vary, but should be near 102,000 mi (between 100,000 mi and 120,000 mi).

3. See Exercise 2a for answer. Answers will vary, but should look approximately as shown.

4. a. Minimum: 2; maximum: 42; range: 40

b. States Visited

0	2 3 6 8 8
1	0 0 1 4 5 5 7 9 9
2	0 2 3 4
3	1 4
4	2

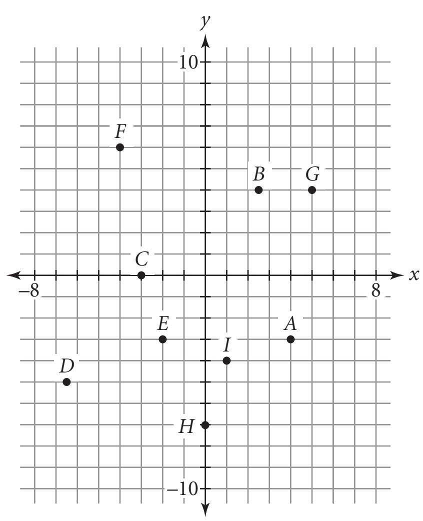
Key

2 | 3 means 23 states

LESSON 1.6 • Two-Variable Data

1. *A*: Quadrant IV *B*: Quadrant I *C*: *x*-axis
D: Quadrant III *E*: Quadrant III *F*: Quadrant II
G: Quadrant I *H*: *y*-axis *I*: Quadrant IV

2.



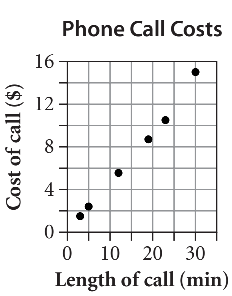
3. a. *A:* $(-6, 5)$, *B:* $(0, -3)$, *C:* $(5, 4)$, *D:* $(4, 0)$, *E:* $(-1, 1)$, *F:* $(4, -6)$, *G:* $(6, -5)$, *H:* $(-3, -8)$, *I:* $(-7, 0)$, *J:* $(0, 7)$

b. 2 points

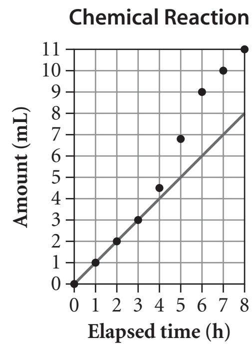
c. *A*, *E*

LESSON 1.7 • Estimating

1.

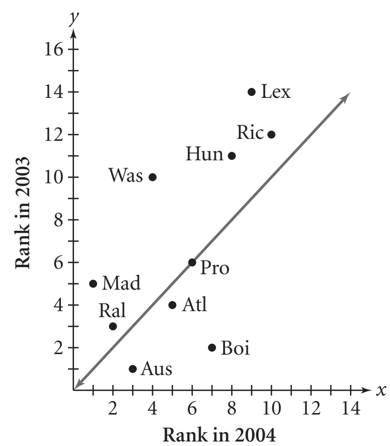


2. a–b.



c. The data starts out linear, then increases faster, then flattens out. Also, all points are on or above the line $y = x$.

3. a.



b. Provo is on the line. Provo maintained the same rank for both years.

c. Austin, Atlanta, and Boise are below the line. According to *Forbes,* these cities dropped in their relative business attractiveness when compared to other places. Note: In this data set, a lower numerical rank is better than a higher one.

d. Madison, Raleigh-Durham, Washington D.C.-Northern Virginia, Huntsville, Lexington, and Richmond are above the line. According to *Forbes,* these places improved their business climates relative to other places between 2003 and 2004.

e. Washington D.C.-Northern Virginia showed the biggest business climate improvement when compared to other places in the top ten. Washington D.C.-Northern Virginia is above the $y = x$ line, and its vertical distance from the line is the greatest.

LESSON 1.8 • Using Matrices to Organize and Combine Data

1. a. 2×2 **b.** 2×3 **c.** 2×2 **d.** 3×2
e. 3×2 **f.** 2×2 **g.** 3×2 **h.** 2×3

2. $[A]$, $[C]$, and $[M]$; $[B]$ and $[P]$; $[D]$, $[L]$, and $[N]$

3. a. $\begin{bmatrix} 0 & 9 \\ 13 & -2 \end{bmatrix}$

b. Not possible: The numbers of rows and columns are different.

c. $\begin{bmatrix} -12 & -6 \\ -15 & -9 \\ -6 & -21 \end{bmatrix}$ **d.** $\begin{bmatrix} -1 & -7 \\ -1 & -1 \\ 4 & -10 \end{bmatrix}$

e. $\begin{bmatrix} -12 & 13 \\ 27 & -22 \end{bmatrix}$ **f.** $\begin{bmatrix} 1 & 2 & 7 \\ 7 & 4 & 2 \end{bmatrix}$

4. $[B] \cdot [A] = [90.17 \quad 92.27]$

It would cost Juanita $90.17 to buy apples from Pete's Fruits and $92.27 to buy them from Sal's Produce. Juanita should order her apples from Pete's Fruits. She will save $2.10.

LESSON 2.1 • Proportions

1. a. 3.75 **b.** 1.6 **c.** 0.17
d. 0.6875 **e.** $0.\overline{1}$ **f.** $0.8\overline{3}$
g. $0.\overline{54}$ **h.** $0.\overline{15}$ **i.** $0.\overline{063}$

2. a. $\frac{12}{18}$, or $\frac{2}{3}$ **b.** $\frac{14}{35}$, or $\frac{2}{5}$
c. $\frac{77}{11}$, or $\frac{7}{1}$ **d.** $\frac{69}{390}$, or $\frac{23}{130}$

3. a. $\frac{400 \text{ mi}}{12 \text{ gal}}$ **b.** $\frac{100 \text{ m}}{10.49 \text{ s}}$
c. $\frac{32{,}231 \text{ people}}{1.95 \text{ km}^2}$ **d.** $\frac{186{,}282 \text{ mi}}{1 \text{ s}}$

4. a. 1.5 **b.** 9 **c.** 10.5
d. 25.6 **e.** 23.8 **f.** 4

LESSON 2.2 • Capture-Recapture

1. a. What is 180% of 36?
b. 27 is what percent of 4?
c. 712% of what number is 386?
d. 11 is what percent of 111?

2. a. $\frac{x}{68} = \frac{75}{100}$; $x = 51$ **b.** $\frac{x}{37} = \frac{120}{100}$; $x = 44.4$
c. $\frac{x}{100} = \frac{270}{90}$; $x = 300\%$ **d.** $\frac{x}{100} = \frac{0.2}{18}$; $x = 1.\overline{1}\%$

3. 128 cards

4. a. $\frac{8}{125} = \frac{600}{p}$; $p = 9375$ **b.** $\frac{92}{2500} = \frac{7}{b}$; $b = 190$

LESSON 2.3 • Proportions and Measurement Systems

1. a. $n = 30.48$ **b.** $n = 322.06$
c. $n = 127.96$ **d.** $n = 655.74$

2. a. 25.4 cm **b.** 140 in.
c. 1.4 mi **d.** 63,360 in.
e. 6441.6 m **f.** 91.5 m

3. a. $\frac{1 \text{ kg}}{2.2 \text{ lb}} = \frac{2.5 \text{ kg}}{x \text{ lb}}$; $x = 5.5$
b. $\frac{1 \text{ kg}}{2.2 \text{ lb}} = \frac{x \text{ kg}}{170 \text{ lb}}$; $x \approx 77.3$
c. $\frac{1 \text{ kg}}{2.2 \text{ lb}} = \frac{51 \text{ kg}}{x \text{ lb}}$; $x \approx 112.2$. So 51 kg is heavier.
d. $\frac{1 \text{ kg}}{2.2 \text{ lb}} = \frac{x \text{ kg}}{160 \text{ lb}}$; $x \approx 72.7$

4. a. 9.07 m/s; 29.74 ft/s **b.** 700 in.
c. 23.13 yd; 7.27 kg **d.** 6.21 mi
e. 42,222.7 m; 322.5 m/min

LESSON 2.4 • Direct Variation

1. a. $y = 7.6$ **b.** $x = 13.1$ **c.** $y = 3.8$ **d.** $x = 23.0$

2. a. $y = 91.4$ **b.** $x = 15.7$ **c.** $x = 5.9$ **d.** $y = 2.0$

3. a. Divide by 3.2 to undo the multiplication; $x = 5.625$.
b. Divide by 5 to undo the multiplication; $x = 9\frac{7}{12} \approx 9.58$.
c. Change the proportion to $\frac{x}{7.4} = \frac{0.3}{1}$, then multiply by 7.4 to undo the division; $x = 2.22$.
d. Multiply by 29 to undo the division; $x = 249.69$.

4. a. $y = 21$ **b.** $y = 33.6$ **c.** $x = 4$
d. $x = 0.25$ **e.** $y = 3.15$ **f.** $x = \frac{5}{28}$

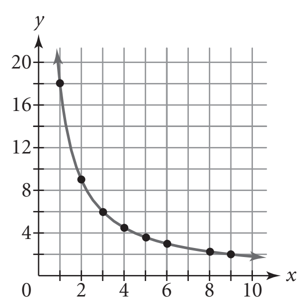
5. a. 834 m; 100,080 m (about 100 km)
b. about 540 s (about 9 min)
c. 27.8 m/s; about 100 km/h; about 62.6 mi/h

LESSON 2.5 • Inverse Variation

1. a. $y = 4$ **b.** $y = 0.25$ **c.** $y = 8$
d. $x = 6$ **e.** $x = 0.\overline{3}$ **f.** $x = 0.02$

2. a. $y = 2$ **b.** $x = 0.8$ **c.** $y = 160$ **d.** $x = 2.5$

3. Possible points: (1, 18), (2, 9), (3, 6), (4, 4.5), (5, 3.6), (6, 3), (8, 2.25), (9, 2)



4. a. about 0.24 s **b.** about 4.88 s **c.** 1505 m/s

5. a. 20 g **b.** 60 cm

LESSON 2.7 • Evaluating Expressions

1. a. 11 **b.** -3 **c.** -5 **d.** -38
e. 7 **f.** 21 **g.** 2 **h.** -1

2. a. $-(8 + 3 - 2) + 7 = -2$
b. $-(8 + 3 - 2 + 7) = -16$
c. $2 - (3 - 4) + 1 = 4$

d. $2 - 3 - (4 + 1) = -6$

e. $4 - 5 + 2 - (6 - 11) = 6$

f. $4 - (5 + 2) - (6 - 11) = 2$

3. Some answers may vary; sample answers are given.

a. $-(2^3 - 9) = 1$ b. $-(6 - 3^2) = 3$

c. $4^2 - (2 - 5) = 19$ d. $-(2^5 - 8 \cdot 3) = -8$

e. $12 - (3 + 1)^2 = -4$ f. $3^2 - (-2 + 7) = 4$

4. a. $7, -\frac{11}{3}, 17$ b. $\frac{4(x + 6) - 7}{3}$

c. Calculator technique may vary. A sample answer is:

```
{1, -7, 8.5}→L1
         {1 -7 8.5}
(4(L1+6)-7)/3
{7 -3.666666667…
Ans▸Frac
     {7 -11/3 17}
█
```

5. a. Multiply a starting number by 4 and add 6, then divide by 2, then subtract twice the starting number, and finally add 14.

b. 17

c. Yes, it is a number trick. If you pick other starting numbers, the value of the expression is always 17. The trick works because when 4 times the starting number plus 6 is divided by 2, the result is 2 times the starting number plus 3. Subtracting twice the starting number and adding 14 leaves just 3 + 14. It may help to draw a diagram showing the steps.

LESSON 2.8 • Undoing Operations

1. a. 7 b. -7 c. -10 d. 30

e. -8 f. 2 g. -5 h. -10.2

i. 7

2. a. 4 b. -25 c. 6 d. 0

3. a.

$x = 100$

/ (5)	· (5)	20
− (8)	+ (8)	12

b.

$x = 3$

· (6)	/ (6)	18
− (7)	+ (7)	11

c.

$x = -5$

− (4)	+ (4)	−9
/ (9)	· (9)	−1

d.

$x = -2$

+ (0.5)	− (0.5)	−1.5
· (−18)	/ (−18)	27

4. a. $K = \frac{(F - 32)}{1.8} + 273$ b. 310 K

c. $0 = \frac{(F - 32)}{1.8} + 273$

$-273 = \frac{(F - 32)}{1.8}$

$-491.4 = F - 32$

$-459.4 = F$

Absolute zero is −459.4°F.

5. a. Equation: $\frac{2(x + 1.5)}{5} - 8.2 = -9.1$

Description	Undo	Result
Pick x.		− 3.75
+ (1.5)	− (1.5)	− 2.25
· (2)	/ (2)	− 4.5
/ (5)	· (5)	− 0.9
− (8.2)	+ (8.2)	− 9.1

$x = -3.75$

b. Equation: $9\frac{1}{2} - 5(x - 3) = 18\frac{1}{4}$ or $9\frac{1}{2} + (-5)(x - 3) = 18\frac{1}{4}$

Description	Undo	Result
Pick x.		$1\frac{1}{4}$
− (3)	+ (3)	$-1\frac{3}{4}$
· (−5)	/ (−5)	$8\frac{3}{4}$
$+\left(9\frac{1}{2}\right)$	$-\left(9\frac{1}{2}\right)$	$18\frac{1}{4}$

$x = 1\frac{1}{4}$

LESSON 3.1 • Recursive Sequences

1. a. -14

b. -3.5

c. 1

d. -21.5

2. a.

Figure #	Perimeter
1	3
2	5
3	7
4	9
5	11

b. 3 ENTER

Ans + 2 ENTER, ENTER, . . .

c. 21 d. Figure 25

3. {−27.4, −18.2, −9, 0.2, 9.4, 18.6}

4. a. Start with 7.8, then apply the rule Ans − 4.2; −30.

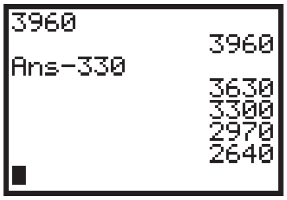
b. Start with −9.2, then apply the rule Ans + 2.7; 15.1.

c. Start with 1, then apply the rule Ans · 3; 19,683.

d. Start with 36, then apply the rule Ans ÷ 3; $\frac{4}{2187} \approx 0.001829$.

5.

a.



b. 2310 ft

c. at 3:12

LESSON 3.2 • Linear Plots

1. a. $x = 1$ **b.** $x = -2$ **c.** $x = 2.5$ **d.** $x = -3$

2. a. 0.5, 1.5, 2.5, 3.5, 4.5
0.5 ENTER; Ans + 1 ENTER, ENTER, . . .

b. 1.5, 2, 2.5, 3, 3.5, 4
1.5 ENTER; Ans + 0.5 ENTER, ENTER, . . .

c. 4, 3.75, 3.5, 3.25, 3, 2.75
4 ENTER; Ans − 0.25 ENTER, ENTER, . . .

d. 4, 4, 4, 4, 4, 4
4 ENTER; Ans + 0 ENTER, ENTER, . . .

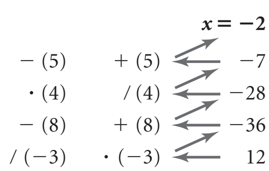
3. a. Graph should include (0, 4), (1, 7), (2, 10), (3, 13), and (4, 16).

b. Graph should include (2, 6), (3, 5.75), (4, 5.50), (5, 5.25), and (6, 5).

c. Graph should include (4, −1), (5, −3), (6, −5), (7, −7), and (8, −9).

4. a. 8; $-\frac{4}{3}$

b.

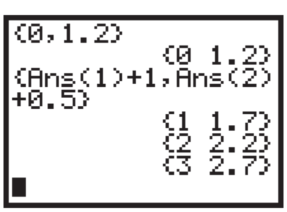


5. {49, 1} ENTER
{Ans(1) − 1, Ans(2) + 1} ENTER; ENTER, . . .

LESSON 3.3 • Time-Distance Relationships

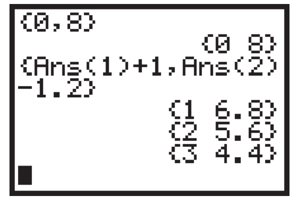
1. a. i. The walker started 1.2 m from the sensor and walked away from the sensor at 0.5 m/s.

a. ii.



b. i. The walker started 8 m from the sensor and walked toward the sensor at 1.2 m/s.

b. ii.



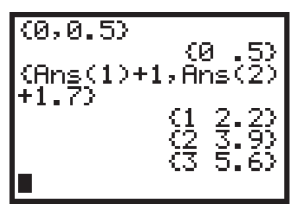
2. a. Walker A

Time (s)	Distance (m)
0	0.5
1	2.2
2	3.9
3	5.6
4	7.3
5	9.0
6	10.7

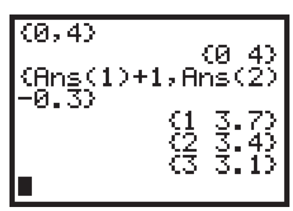
Walker B

Time (s)	Distance (m)
0	4.0
1	3.7
2	3.4
3	3.1
4	2.8
5	2.5
6	2.2

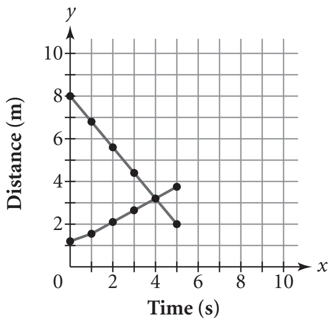
b. Walker A



Walker B



3.



The two lines intersect at (4, 3.2). This means that at 4 s, when they are both 3.2 m from the sensor, the two walkers will pass each other going in opposite directions.

4. a. The walker started 1.5 m from the sensor and walked at a constant rate of 0.75 m/s away from the sensor for 6 s.

b. The walker started 5 m from the sensor and walked at a constant rate of 2 m/s toward the sensor for 2 s. Then the walker walked at a constant rate of 1 m/s away from the sensor for 4 s.

LESSON 3.4 • Linear Equations and the Intercept Form

1. a. ii **b.** iv **c.** iii **d.** i

2. a. \$10.35

b. \$18.15

c. The basic handling charge for any package.

d. The cost per pound for a package.

e. 5.5 lb, or 5 lb 8 oz

3. a. -3.4 mi **b.** 2 mi

c. -10 means that the walker started 10 mi away from her destination, if the destination is considered 0.

d. 3 means that the walker walks at a speed of 3 mi/h.

4. a. $x = 0$

b. $x = 9$

5. a. 250 mi

b. 4 h 55 min

LESSON 3.5 • Linear Equations and Rate of Change

1. a. The output values are respectively 18, -9, 27, 1.5, and -4.2.

b. The output values are respectively 5, -1, 7.4, 8.25, and -19.

2. a. 24 mi **b.** about 1.25 h

3. a. Possible; the rate is negative, so the person is walking toward the tree.

b. Not possible; the rate is undefined.

c. Possible; the rate is positive, so the person started at a given distance from the tree and is walking farther away from it.

d. Not possible; there is only one point, so there is no rate.

4. a. i. slope $= 2$ **ii.** slope $= -4$ **iii.** slope $= -1$

b. i. 3 **ii.** 2

iii. -4; y-intercept

c. i. $y = 3 + 2x$ **ii.** $y = 2 - 4x$

iii. $y = -4 - x$

d. Lists should match tables.

LESSON 3.6 • Solving Equations Using the Balancing Method

1. a. $x - 1 = 3x - 2$; $x = \frac{1}{2}$

b. $x + 2 = -6$; $x = -8$

c. $1 + x = 2x - 1$; $x = 2$

d. $2x = -3$; $x = -1.5$

2. a. $y = 5 + 2x$, or $y = 2x + 5$

b. $y = -7 + 4x$, or $y = 4x - 7$

c. $y = 17 - \frac{3}{4}x$, or $y = -\frac{3}{4}x + 17$

3. a.

$5 = 2a + 1$	Original equation.
$5 - 1 = 2a + 1 - 1$	Subtract 1 from both sides.
$4 = 2a$	Evaluate and remove the 0.
$\frac{4}{2} = \frac{2a}{2}$	Divide both sides by 2.
$2 = a$, or $a = 2$	Reduce.

b.

$5b - 4 = -20$	Original equation.
$5b - 4 + 4 = -20 + 4$	Add 4 to both sides.
$5b = -16$	Evaluate and remove the 0.
$\frac{5b}{5} = \frac{-16}{5}$	Divide both sides by 5.
$b = \frac{-16}{5}$, or -3.2	Reduce.

c.

$6 + c = 3c - 10$	Original equation.
$6 + c - c = 3c - 10 - c$	Subtract c from both sides.
$6 = 2c - 10$	Simplify and remove the 0.
$6 + 10 = 2c - 10 + 10$	Add 10 to both sides.
$16 = 2c$	Evaluate and remove the 0.
$\frac{16}{2} = \frac{2c}{2}$	Divide both sides by 2.
$8 = c$, or $c = 8$	Reduce.

4. a. $\frac{1}{7}$ **b.** 4 **c.** $-\frac{8}{5}$ **d.** $-\frac{1}{36}$

5. a. -0.25 **b.** $\frac{5}{8}$ **c.** 36 **d.** $-2z$

6. a. $w = 2$ **b.** $v = 3$ **c.** $m = -12$
d. $n = 1.6$ **e.** $x = 0.275$ **f.** $y = -20$

LESSON 4.1 • A Formula for Slope

1. a. 3 **b.** $-\frac{1}{3}$, or $-0.\overline{3}$ **c.** Undefined

2. a. $\frac{4}{5}$, or 0.8 **b.** $-\frac{5.2}{6.8} = -\frac{13}{17} \approx -0.76$
c. -3 **d.** Undefined

3. Answers will vary; some possible answers:

a. $(0, -1), (6, 3)$ **b.** $(3, 1), (5, 3)$
c. $(1, 8), (9, -2)$ **d.** $(1, 6), (2, 6)$
e. $(-5, -5), (-3, -9)$ **f.** $(1, -8), (15, -2)$

4. a. $y = 2 + 1x$, or $y = 1x + 2$
b. $y = 3 - 1x$, or $y = -1x + 3$
c. $y = 2 - 2x$, or $y = -2x + 2$
d. $y = 1 - \frac{1}{4}x$, or $y = -\frac{1}{4}x + 1$

LESSON 4.2 • Writing a Linear Equation to Fit Data

1. Answers will vary.

2. a. $y = 3 + 3x$, or $y = 3x + 3$
b. $y = -2 - \frac{1}{2}x$, or $y = -\frac{1}{2}x - 2$
c. $y = -2$

3. a. $\frac{11}{5}$ m/s **b.** \$450/wk
c. 60 mi/h **d.** 15 mi/gal

4. a. $x = -2$ **b.** $x = -17$ **c.** $x = 4$
d. $x = -7$ **e.** $x = 9$ **f.** $x = -3$
g. $x = 2.2$ **h.** $x = -1.5$ **i.** $x = 0$

LESSON 4.3 • Point-Slope Form of a Linear Equation

1. Point answers may vary; a possible point is given.

a. Slope 2; $(1, 3)$ **b.** Slope $-\frac{3}{4}$; $(-1, -7.4)$
c. Slope $\frac{6}{7}$; $(-5, -4.1)$ **d.** Slope -1; $(2, 0)$

2. a. $y = 3 + 2(x - 4)$ **b.** $y = 7 - \frac{2}{3}(x + 6)$
c. $y = 4$

3. a. The slope is 1.5 for each pair of points. The points lie on the same line, or are collinear.
b. $y = -10 + 1.5(x + 4)$
c. $y = -5.5 + 1.5(x + 1)$

4. a. 2
b–c. The possible equations are $y = 72 + 2(x - 74)$, $y = 76 + 2(x - 76)$, and $y = 80 + 2(x - 78)$.
e. No; no

5. Answers will vary; some possible answers:

$y = 3 + 2(x - 1)$, or $y = 7 + 2(x - 3)$

$y = 7 + 0(x - 3)$, or $y = 7 + 0(x - 5)$, or $y = 7$

$y = 7 - 2(x - 5)$, or $y = 3 - 2(x - 7)$

$y = 3 + 0(x - 1)$, or $y = 3 + 0(x - 7)$, or $y = 3$

LESSON 4.4 • Equivalent Algebraic Equations

1. a. Equivalent
b. Not equivalent; $-3x - 6$
c. Not equivalent; $-4x + 9$
d. Equivalent

2. a. $y = -7 + 3x$
b. $y = x - 1$
c. $y = -2 - 0.5x$
d. $y = 1 + \frac{1}{3}x$

3. The properties and solutions may vary. Sample answers are:

a. $3(4x - 2) + 5 = 11$	Original equation.
$12x - 6 + 5 = 11$	Distributive property.
$12x - 1 = 11$	Add $-6 + 5$.
$12x = 12$	Addition property (add 1 to both sides).
$x = 1$	Division property (divide both sides by 12).
b. $-4(5 + 2x) - 8 = -12$	Original equation.
$-4(5 + 2x) = -4$	Addition property (add 8 to both sides).
$5 + 2x = 1$	Division property (divide both sides by -4).
$2x = -4$	Subtraction property (subtract 5 from both sides).
$x = -2$	Division property (divide both sides by 2).
c. $6 - 5(3x - 2) = -44$	Original equation.
$6 - 15x + 10 = -44$	Distributive property.
$-15x + 16 = -44$	Add $6 + 10$.
$-15x = -60$	Subtraction property (subtract 16 from both sides).
$x = 4$	Division property (divide both sides by -15).
d. $-12 + 3(4 - 5x) = 12$	Original equation.
$3(4 - 5x) = 24$	Addition property (add 12 to both sides).
$4 - 5x = 8$	Division property (divide both sides by 3).
$-5x = 4$	Subtraction property (subtract 4 from both sides).
$x = -\frac{4}{5}$, or -0.8	Division property (divide both sides by -5).

4. a. $x = 1.75$ **b.** $x = 10$

c. $x = -4$ **d.** $x = -9$

5. a. $(-3.6, -20)$ **b.** $x = -23.8$

6. a. $4(x + 2)$ **b.** $-3(x + 9)$

c. $-6(x - 12)$ **d.** $10(x - 25)$

7. a. $q = \frac{p - 3}{7} + 2$

b. $b = \frac{9 - 3a}{-2}$, or $b = \frac{3a - 9}{2}$

c. $x = \frac{y + 4}{14} + 2$, or $x = \frac{y + 32}{14}$

LESSON 4.5 • Writing Point-Slope Equations to Fit Data

1. Answers may vary. Possible answers:

a. $y = 12 - 4x$, or $y = 4 - 4(x - 2)$

b. $y = \frac{1}{3}(x - 3)$, or $y = -1 + \frac{1}{3}x$

c. $y = -2 - 0.4x$, or $y = -4 - 0.4(x - 5)$

d. $y = \frac{5}{4}(x - 4)$, or $y = \frac{5}{4}x - 5$

2. Answers will vary.

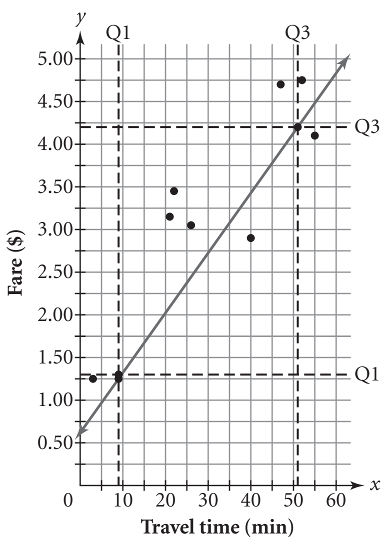
3. a. 4 **b.** -8

c. 9 **d.** -12

LESSON 4.6 • More on Modeling

1. a. Travel times: 3, 9, 26, 51, 55;
fares: 1.25, 1.30, 3.15, 4.20, 4.75

b–e.



c. (9, 1.30), (51, 4.20)

d. $y = 1.30 + 0.069(x - 9)$ or
$y = 4.20 + 0.069(x - 51)$

e. \$2.54

f. 33 min

2. a. $(-7, 3)$ and $(-2, -3)$

b. $(-1, 2)$ and $(4.5, 4.5)$

LESSON 4.7 • Applications of Modeling

1. a. $y = 16 - 0.\overline{3}(x + 10)$, or $y = 10 - 0.\overline{3}(x - 8)$;
$y = -0.\overline{3}x + 12.\overline{6}$

b. $y = -14 + 2(x + 2)$, or $y = 22 + 2(x - 16)$;
$y = 2x - 10$

2. a. 24.2 mi **b.** 0.92 h, or 55 min

3. a. $x = 5$ **b.** $x = -3$ **c.** $x = 2.75$ **d.** $x = 1$

4. a. $y = 9x - 14$ **b.** $y = -2x + 6$

c. $y = \frac{3}{7}x - 2$ **d.** $y = \frac{1}{3}x + 8$

5. a. Q-points are (1993, 1.13) and (2000, 1.36). The Q-line slope is about 0.033. The slope means that the price of gas increased on average about 3.3 ¢/yr during that time period.

b. The equation of the Q-line is
$y = 0.033(x - 1993) + 1.13$, or
$y = 0.033(x - 2000) + 1.36$.

c. The Q-line model predicts that the average price for 2004 should be about \$1.49. For the model to be correct, the average for the second half of the year would have to be \$1.16. This is highly unlikely.

LESSON 5.1 • Solving Systems of Equations

1. a. Yes **b.** No; $0 \neq -\frac{4}{3}(-4) + 2$

c. Yes **d.** Yes

e. Yes **f.** No; $-\frac{2}{3} \neq 6\left(\frac{1}{2}\right) - \frac{5}{3}$

2. a. (2, 3) **b.** (3, 1) **c.** $(-1, 4)$

d. $(3, -2)$ **e.** $(4, -1)$ **f.** (4, 3)

g. $(-2, -1)$ **h.** $(-4, -3)$ **i.** $(1, -1)$

3. a. $(2, -3)$ **b.** $(-2, 4)$ **c.** (2, 1)

d. $(6, -2)$ **e.** $(-2, 2)$ **f.** $(-2, 0)$

LESSON 5.2 • Solving Systems of Equations Using Substitution

1. a. No; $8 \neq -4(4) + 12$

b. No; $22 \neq 1.5(2) - 3.5(-6)$

c. No; $-1 \neq -1.5(2) + 5$ **d.** Yes

2. a. -3 **b.** 4 **c.** -7

3. a. $-2x - 2$ **b.** 4 **c.** $11x + 6$

4. a. (1, 1) **b.** $(-3, -1)$ **c.** (1, 3)

d. $(-3, 5)$ **e.** (2, 5) **f.** (1, 1)

g. $(9, -3)$ **h.** $(-1, -4)$ **i.** (0, 1)

5. The problem can be solved using the equation $9.05x + 9(6.25) = 7.37(x + 9)$. He needs 6 lb of the \$9.05/lb coffee.

LESSON 5.3 • Solving Systems of Equations Using Elimination

1. a. $y = 7$ **b.** $y = -6.5$ **c.** $x = 0$ **d.** $x = -7$

2. a. $y = 3\frac{1}{3}$ **b.** $y = -3\frac{1}{3}$ **c.** $x = -4.5$ **d.** $x = 8$

3. a. $(-1, -1)$ **b.** $(2, -1)$ **c.** $(-2, -3)$ **d.** $(-3, -1)$ **e.** $(2, -2)$ **f.** $(4, 2)$ **g.** $(-2, 4)$ **h.** $(-2, -1)$ **i.** $(0.5, -0.\overline{3})$ **j.** $(2, 2)$ **k.** $(-2, -1)$ **l.** $(2, -2)$ **m.** $(1, -3)$ **n.** $(2, 0)$ **o.** $(-3, -4)$

4. a. $0 = 0$; This is always true. There are an infinite number of solutions.

b. Explanations will vary. Sample explanation: The two equations are equations for the same line. Their intersection is the entire line. Every ordered pair that satisfies one equation also satisfies the other.

5. a. $0 = 4$ (or some other false statement); This is never true. There is no solution.

b. The explanations may vary. Sample explanation: The equations are equations of parallel lines. They never intersect. There is no ordered pair that satisfies both equations.

LESSON 5.4 • Solving Systems of Equations Using Matrices

1. a. $\begin{cases} 2.5x - 7y = 3 \\ 4x - 3.25y = 17 \end{cases}$ **b.** $\begin{cases} 4x + 2y = 0 \\ -3x + 5y = 11 \end{cases}$

c. $\begin{cases} \frac{3}{5}x - 2y = \frac{7}{5} \\ \frac{1}{5}x + \frac{4}{5}y = -3 \end{cases}$

2. a. $\begin{bmatrix} 1 & -2 & 11 \\ 3 & -1 & 7 \end{bmatrix}$ **b.** $\begin{bmatrix} 0.9 & 1.2 & 2.4 \\ -1.5 & 2.4 & 1.8 \end{bmatrix}$

c. $\begin{bmatrix} -1 & 1 & 4 \\ 1 & 1 & 1 \end{bmatrix}$

3. a. $(-1, 1)$ **b.** $(13.5, 9.25)$ **c.** $\left(-\frac{12}{19}, -\frac{21}{38}\right)$

4. $\begin{bmatrix} 1 & 0 & -3.2 \\ 0 & 1 & 0.4 \end{bmatrix}$; $(-3.2, 0.4)$

5. a. $3x - y = 2, 5x + y = 6$ **b.** $\begin{bmatrix} 3 & -1 & 2 \\ 5 & 1 & 6 \end{bmatrix}$

c. $\begin{bmatrix} 3 & -1 & 2 \\ 5 & 1 & 6 \end{bmatrix}$ Original matrix.

$\begin{bmatrix} 8 & 0 & 8 \\ 5 & 1 & 6 \end{bmatrix}$ Add row 2 to row 1.

$\begin{bmatrix} 1 & 0 & 1 \\ 5 & 1 & 6 \end{bmatrix}$ Divide row 1 by 8.

$\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$ Multiply row 1 by -5 and add it to row 2.

d. $(1, 1)$

LESSON 5.5 • Inequalities in One Variable

1. a. Add 3; $7 < 11$

b. Subtract 5; $-8 < -7$

c. Multiply by -2; $-10 < 18$

d. Multiply by 5; $-20 > -35$

e. Multiply by -2; $-2m \geq -12$

f. Subtract 8; $w - 8 > -9$

2. a. Answers will vary, but the values must be > -3.

b. Answers will vary, but the values must be ≤ 7.

c. Answers will vary, but the values must be ≥ -7.7.

d. Answers will vary, but the values must be > 1.

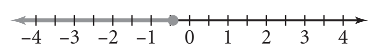
e. Answers will vary, but the values must be ≤ 2.8.

f. Answers will vary, but the values must be < -5.

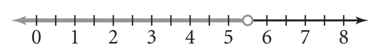
3. a. $x \geq -5$ **b.** $x < 1$ **c.** $15 < x \leq 19$ **d.** $-1 < x < 4$ **e.** $x \leq -6$ **f.** $-8 \leq x < -4$

4. a. $x \leq 11$ **b.** $y \geq -3$ **c.** $t \leq 27$ **d.** $m \geq 6$

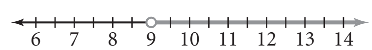
5. a. $x \leq -0.43$



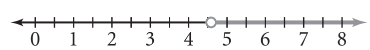
b. $x < 5.5$



c. $x > 9$

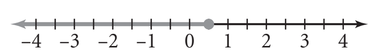


d. $x > 4.6$



e. No solution

f. $x \leq 0.5$

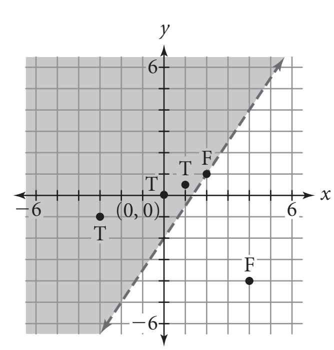


LESSON 5.6 • Graphing Inequalities in Two Variables

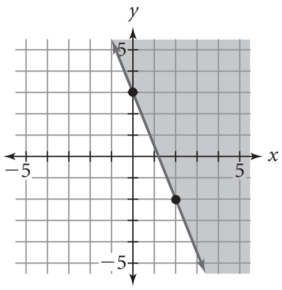
1. a. i **b.** iv **c.** ii **d.** iii

2. a. $y > 3 + \frac{2}{3}x$ **b.** $y \leq 1.5x + 4$ **c.** $y < \frac{3}{4}x$

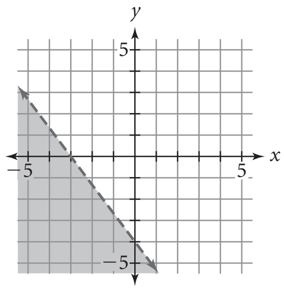
3. a–c.



4. a.



b.

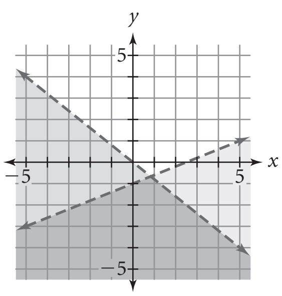


LESSON 5.7a • Systems of Inequalities

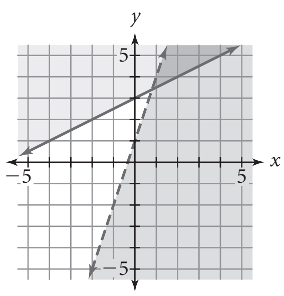
1. a. iii **b.** i **c.** ii

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

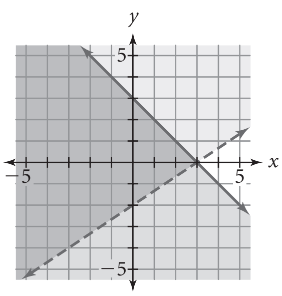
3. a.



b.



c.



4. a. $\begin{cases} y \geq 3 \\ x > -1 \end{cases}$ **b.** $\begin{cases} x > -3 \\ y \leq -\frac{4}{3}x + \frac{2}{3} \end{cases}$

c. $\begin{cases} y \geq \frac{2}{3}x + 2 \\ y \leq -\frac{7}{3}x - \frac{5}{3} \end{cases}$

LESSON 5.7b • Mixture, Rate, and Work Problems

1. t represents time driving; $65t + 35t = 325$; $t = 3.25$, or 3 h 15 min

2. x represents hours worked in sales; y represents hours doing inventory

$\begin{cases} x + y = 36 \\ 9.25x + 11.50y = 378 \end{cases}$

$x = 16$, $y = 20$; Frank worked 16 h doing sales and 20 h doing inventory.

3. r represents speed in miles per hour; $1.5r = 1.8(r - 6)$; $r = 36$; 36 mi/h down the river and 30 mi/h up the river

4. n represents ounces of mixed nuts, s represents ounces of snack mix

$\begin{cases} n + s = 8 \\ 0.35n + 0.10s = 0.20(8) \end{cases}$

$n = 3.2$, $s = 4.8$; 3.2 oz of mixed nuts and 4.8 oz of snack mix

5. x represents shares of Idea Software stock; y represents shares of Good Foods stock;

$\begin{cases} 2.32x + 1.36y = 1272 \\ x = 2y \end{cases}$

$x = 424$, $y = 212$; 424 shares of Idea Software and 212 shares of Good Foods

6. t represents time working together in hours; $\frac{1}{8}t + \frac{1}{6}t = 1$; $t = 3\frac{3}{7} \approx 3.4$; it will take them about 3 h 26 min to tile the floor together.

7. t represents time working together in hours; $\frac{1}{6}(2) + \frac{1}{6}t + \frac{1}{5}t = 1$; $t = 1\frac{9}{11} \approx 1.8$, plus the 2 h that Chenani worked alone; it took $3\frac{9}{11}$ h, or about 3 h 49 min, to finish all of the donuts.

LESSON 6.1 • Recursive Routines

1. a. Starting value: 4800; multiplier: 0.25; fifth term: 18.75

b. Starting value: -21; multiplier: -2.1; fifth term: -408.4101

c. Starting value: 100; multiplier: -0.9; fifth term: 65.61

d. Starting value: 100; multiplier: 1.01; fifth term: 104.060401

e. Starting value: -5; multiplier: -0.3; fifth term: -0.0405

f. Starting value: 3.5; multiplier: 0.1; fifth term: 0.00035

2. a. 12, 18, 27, 40.5, 60.75

b. 360, 288, 230.4, 184.32, 147.456

c. -45, 27, -16.2, 9.72, -5.832

d. -9, -19.8, -43.56, -95.832, -210.8304

e. -1.5, -0.75, -0.375, -0.1875, -0.09375

3. a. 16, 24, 36, 54, 81

b. 24,000, 4,800, 960, 192, 38.4

c. 7, 14, 28, 56, 112

d. 40, 88, 193.6, 425.92, 937.024

e. 100,000, 65,000, 42,250, 27,462.5, 17,858.625

4. a. $40(1 + 0.8)$ **b.** $550(1 - 0.03)$
c. $W(1 + s)$ **d.** $25 - 25(0.04)$
e. $35(1 - 0.95)$ **f.** $10 + 10(0.25)$
g. $15(1 + 0.12)$ **h.** $0.02 - 0.02(0.15)$
i. $10{,}000 + 10{,}000(0.01)$

5. a. Start with 45, then apply the rule Ans $\cdot$ $(1 - 0.10)$.
b. $29.52
c. February 10

LESSON 6.2 • Exponential Equations

1. a. $(2.5)^5$ **b.** $8^3 9^6$
c. $(1 + 0.07)^3$ **d.** $6^2 7^2 8^2$

2. a. $\approx$ $710.56 **b.** $\approx$ $725.62

3. a. $\approx 26{,}222$ **b.** $\approx 27{,}177$

4. a. ii **b.** iii **c.** i

5. a. iv **b.** iii **c.** i **d.** ii

6. y represents the employee's salary, 25,000 represents the employee's starting salary, x represents the number of years after the employee was hired, 1 represents 100% of the previous year's salary, and 0.04 represents an annual 4% raise.

7. a. $y = 5(2)^x$ **b.** $y = 300(0.4)^x$ **c.** $y = 100(1.1)^x$

LESSON 6.3 • Multiplication and Exponents

1. a. $-7w^4$ **b.** $3a^3b^5$ **c.** $-15p^3q^2$
d. $12x^6$ **e.** $-36c^4d^2$ **f.** $-8m^4 - 4m^5$

2. a. $(4)(4)(4)(4)(4)(4)(4)$; 4^7
b. $(-3)(-3)(-3)(-3)(-3)(-3)(-3)$; $(-3)^7$
c. $(-2)(-2)(-2)(-2)(-2)(-2)(-2)(-2)(-2)$ $(-2)(-2)(-2)(-2)(-2)(-2)$; $(-2)^{15}$
d. $(8)(8)(8)(8)(8)(8)(8)(8)(8)$; 8^9
e. $(x)(x)(x)(x)(x)(x)(x)(x)(x)(x)(x)(x)(x)$; x^{13}
f. $(n)(n)(n)(n)(n)(n)(n)(n)(n)(n)$; n^{10}

3. a. 4^{25} **b.** 8^{14} **c.** x^{36} **d.** y^{30}
e. 5^{21} **f.** $(-3)^6$ **g.** z^{16} **h.** 10^{27}
i. 0.5^{10} **j.** 100^{24} **k.** $(-6)^{20}$ **l.** t^{14}

4. a. $12x^2$ **b.** $12m^3$ **c.** $-20n^6$
d. x^3y^6 **e.** $64x^{24}$ **f.** $16m^{10}$
g. $-27m^{12}n^{21}$ **h.** $625x^8y^4z^{20}$ **i.** $-27x^{12}y^9$

5. a. -250 **b.** 405 **c.** 6 **d.** 40

6. a, c, and f are equivalent. d and e are equivalent.

LESSON 6.4 • Scientific Notation for Large Numbers

1. a. 2.0×10^2 **b.** 5.0×10^0 **c.** -7.5×10^1
d. 4.89×10^4 **e.** -9.043×10^6 **f.** 6.7031×10^3
g. -3.5×10^3 **h.** 1.25×10^4 **i.** -3.8×10^2
j. 3.2×10^8 **k.** 7.0×10^{10} **l.** 8.097×10^3

2. a. 3,140 **b.** 5,200,000 **c.** -70.8
d. 65,900,000 **e.** $-180{,}000$ **f.** 6,500
g. 325,000 **h.** 43,000 **i.** $-5{,}000{,}000$
j. 18,000,000,000 **k.** $-450{,}000{,}000$
l. 200.7

3. a. $10x^4$ **b.** $-64m^6$ **c.** $-12y^7 + 6y^5$
d. $15w^9 - 5w^7$ **e.** $-6x^8$ **f.** $25z^{12}$
g. $-6r^7 + 18r^5$ **h.** $2x^5 + 3x^4 - 4x^3$
i. $9x^4y^8$ **j.** $64s^6t^9u^{12}$
k. $m^{11}n^4$ **l.** $x^{13}y^3$

4. a. 4.25×10^5 **b.** 7.13×10^6 **c.** -2.014×10^4
d. 8.0×10^9 **e.** -3.503×10^8 **f.** 1.5×10^7
g. 3.25×10^5 **h.** 4.25×10^9 **i.** -3.65×10^7
j. 1.0×10^{11} **k.** -4.507×10^4 **l.** 8.906×10^9

5. a. 8×10^7 **b.** -7.2×10^{12} **c.** 9.6×10^9
d. 1.8×10^{10}

6. About 8.541×10^8 times

LESSON 6.5 • Looking Back with Exponents

1. p^2q^2

2. a. m^6 **b.** n^7 **c.** $3x^4$
d. $9x^4y^3$ **e.** $-5m^3n^2$ **f.** $25xy^2$
g. $7x^7y^4$ **h.** $4mn^5$ **i.** $-3r^8s^3$

3. a. A **b.** $5900 = A(1 - 0.12)^8$
c. About $16,400

4. a. $144x^{10}$ **b.** $-4y^2$ **c.** $16z^4$
d. $-72a^7b^5$ **e.** 3.5×10^4 **f.** $4rs^2$

5. a. About 9.26 people per square mile
b. About 82.77 people per square mile
c. In 2004, there were about 9 times as many people in the United States per square mile as there were in Canada.

LESSON 6.6 • Zero and Negative Exponents

1. a. $\frac{1}{4^3}$ **b.** $\frac{1}{(-7)^2}$ **c.** $\frac{1}{x^5}$
d. $\frac{12}{x^4}$ **e.** $\frac{1}{mn}$ **f.** $\frac{-5m^6}{n^9}$
g. $\frac{3w^8}{4s^7}$ **h.** $\frac{6xz^2}{7my}$ **i.** $\frac{y}{mx^3z^2}$

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. $\frac{1}{32}$ **b.** $\frac{1}{64}$ **c.** $\frac{1}{36}$

d. $-\frac{1}{8}$ **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. $\frac{1}{m^2}$ **b.** $\frac{1}{4n^5}$ **c.** $-\frac{8}{y^3}$

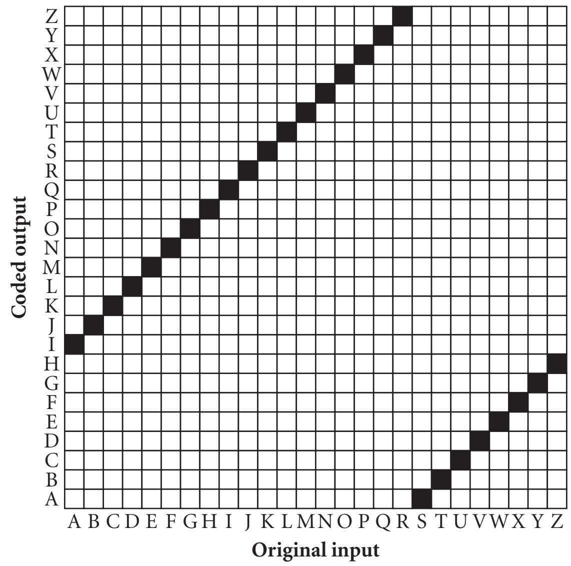
d. $\frac{5xz^5}{3y^2}$ **e.** $\frac{9n^2}{5m^2}$ **f.** $\frac{y^4}{2x^3z}$

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.

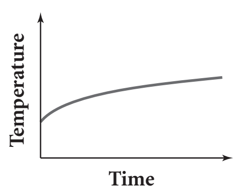
Domain x	Range y
-3	-1
0	-5.5
-5 or 5	7
1	-5
4	2.5

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

LESSON 7.3 • Graphs of Real-World Situations

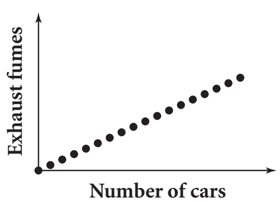
1. Graphs and explanations will vary.

a. Independent variable: time; dependent variable: temperature



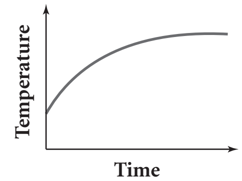
Sample explanation: Cold milk will start warming quickly. It will warm less quickly as it approaches the temperature of the air. The graph is nonlinear, continuous, and increasing. (After considerable time, the graph will stop increasing and become a horizontal line at room temperature.)

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



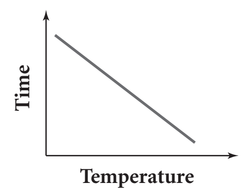
Sample explanation: As the number of cars increases, the level of fumes in the air increases. The level of exhaust fumes is directly related to the number of cars (a direct variation). The graph is a series of collinear points falling on a line through (0, 0) with positive slope. The graph is linear,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

c. Independent variable: time; dependent variable: temperature



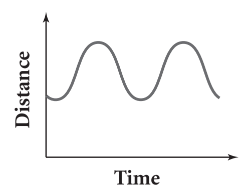
Sample explanation: The water increases in temperature over time. At first, it increases more quickly, and later, more slowly. If it continues to heat until boiling, it will maintain a constant temperature of about 100°C. Initially, the graph is nonlinear, increasing, and continuous. After the water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

d. Independent variable: temperature; dependent variable: time



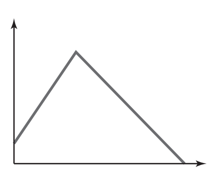
Sample explanation: The relationship between temperature and time (for temperatures associated with an oven) is a roughly decreasing, linear relationship. The lower the temperature, the longer the time. *Note:* This model does not apply when the temperature is very low or very high. In these regions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

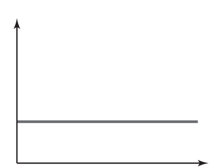


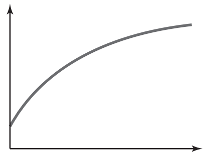
Sample explanation: The graph starts just before the lowest point of the Ferris wheel rotation. So the graph dips down, then rises to the top, and then goes back to the low point again. This cycle repeats for each rotation of the Ferris wheel. The graph is a smooth, continuous curve; no part of it is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

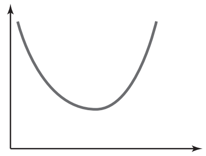
2. a.

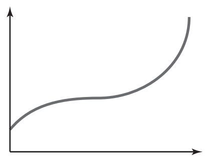


b.



c.


d.


e.


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

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. $-3 \leq x \leq 6$ and $-2 \leq y \leq 3$

4. a. Dependent variable: height; independent variable: time
b. Domain: $0 \leq t \leq 9.5$; range: $0 \leq h \leq 4$
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. $x \leq -8$ or $x \geq 8$
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 $x = 2$

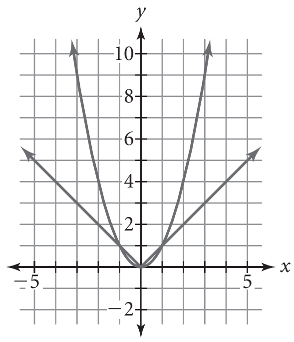
e. $x = -11$ or $x = 11$ **f.** $x = -22$ or $x = 28$

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)

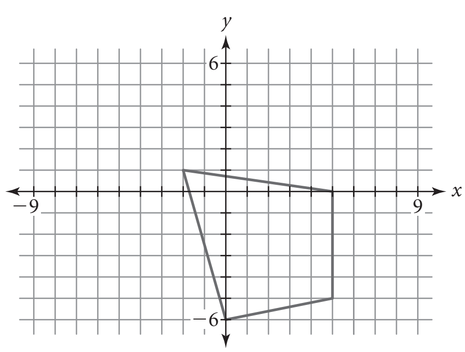
b. A translation left 6 units

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

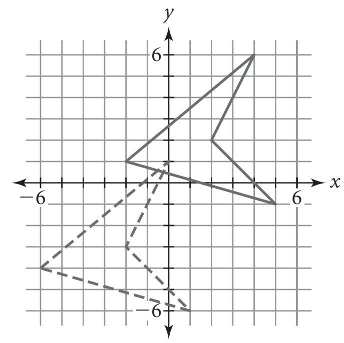
3. a. A translation left 8 units and up 5 units

b. $L_3 = L_1 - 8$, $L_4 = L_2 + 5$

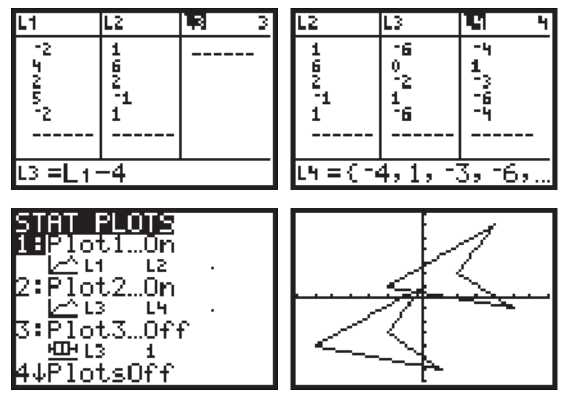
c. Addition would change to subtraction and subtraction would change to addition: $L_3 = L_1 + 8$, $L_4 = L_2 - 5$.

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 $10 - |6x|$

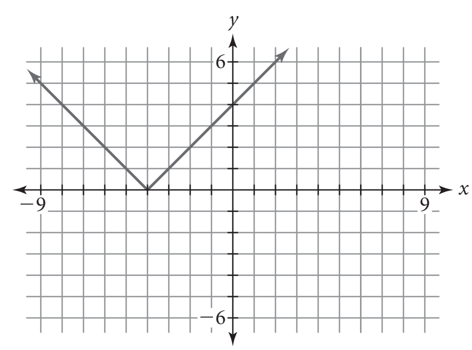
e. 5 **f.** 70 **g.** −3

h. $(m - 4)^2 - 11$

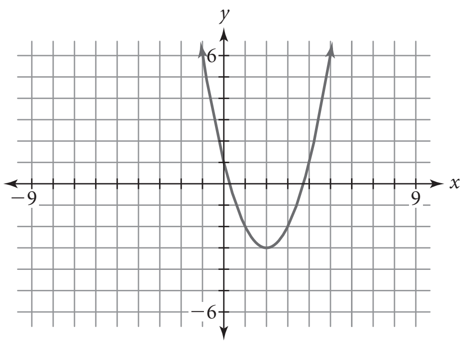
2. a. (3, −1) **b.** (−3, 1)

c. (1, 5) **d.** (−4, −2)

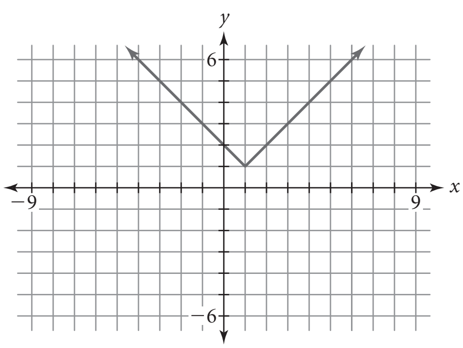
3. a. A translation of the graph of $y = |x|$ left 4 units



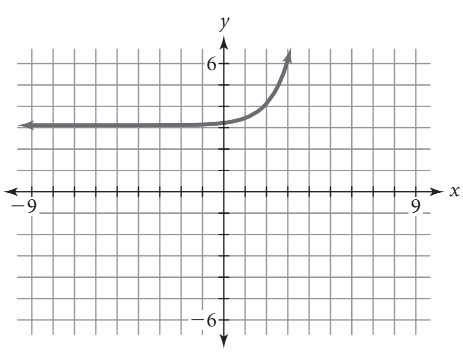
b. A translation of the graph of $y = x^2$ right 2 units and down 3 units



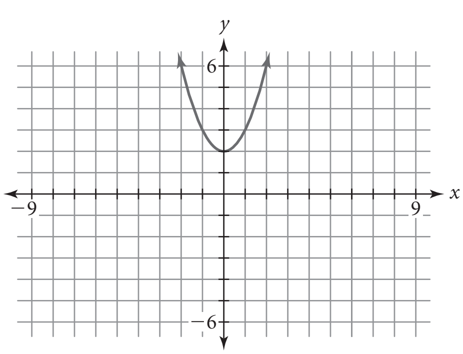
c. A translation of the graph of $y = |x|$ right 1 unit and up 1 unit



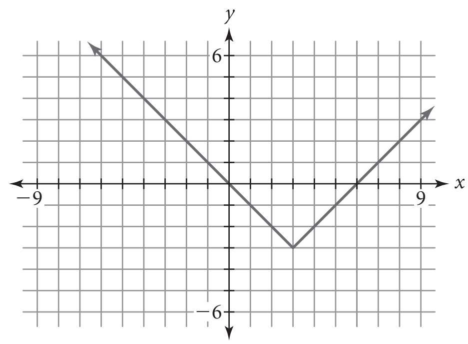
d. A translation of the graph of $y = 3^x$ right 2 units and up 3 units



e. A translation of the graph of $y = x^2$ up 2 units



f. A translation of the graph of $y = |x|$ right 3 units and down 3 units



4. a. $y = (x - 3)^2$

b. $y = |x + 5|$

c. $y = 2^{x-2}$

d. $y = x^2 + 3$, or $y - 3 = x^2$

e. $y = |x| - 4$, or $y + 4 = x^2$

f. $y = (x + 2)^2 + 3$, or $y - 3 = (x + 2)^2$

5. a. Translate $y = |x|$ right 3 units and down 1 unit; $y + 1 = |x - 3|$ or $y = |x - 3| - 1$

b. Translate $y = |x|$ left 3 units and up 1 unit; $y - 1 = |x + 3|$ or $y = |x + 3| + 1$

c. Translate $y = x^2$ right 1 unit and up 5 units; $y - 5 = (x - 1)^2$ or $y = (x - 1)^2 + 5$

d. Translate $y = x^2$ left 4 units and down 2 units; $y + 2 = (x + 4)^2$ or $y = (x + 4)^2 - 2$

LESSON 8.3 • Reflecting Points and Graphs

1. a. 4

b. -42

c. $2(-x + 1)^2 - 4$

d. $-2(x + 1)^2 + 4$

e. -6

f. 3

g. $-|-x - 4| + 1$

h. $|x - 4| - 1$

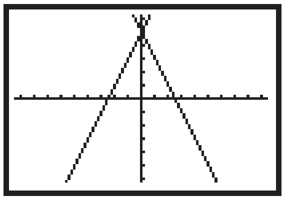
2. a. A translation of the graph of $y = x^2$ left 3 units and down 6 units; $y = (x + 3)^2 - 6$

b. A translation of the graph of $y = |x|$ right 2 units and up 2 units; $y = |x - 2| + 2$

c. A reflection of the graph of $y = x^2$ across the x-axis; $y = -x^2$

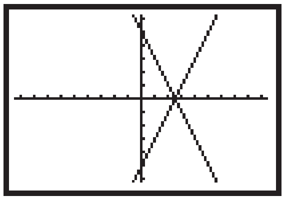
d. A reflection of the graph of $y = |x|$ across the x-axis followed by a translation up 3 units; $y = -|x| + 3$

3. a. Predictions will vary. The graph is a reflection of the original line across the y-axis.



$[-9.4, 9.4, 1, -6.2, 6.2, 1]$

b. Predictions will vary. The graph is a reflection of the original line across the x-axis.



$[-9.4, 9.4, 1, -6.2, 6.2, 1]$

4. a. A reflection across the x-axis followed by a translation down 4 units

b. A reflection across the y-axis followed by a translation down 4 units (or, because the graph is symmetric across the y-axis, just a translation down 4 units)

c. A translation right 4 units and a reflection across the x-axis

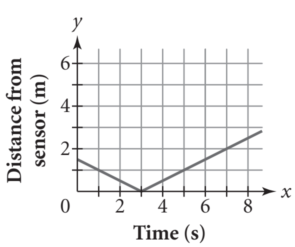
d. A reflection across the y-axis followed by a translation left 4 units (or, because the graph is symmetric across the y-axis, just a translation left 4 units). Note that $|-x - 4| = |-(x + 4)| = |x + 4|$.

LESSON 8.4 • Stretching and Shrinking Graphs

1. a. $y = |x - 3|$

b. Greta starts 3 m from the sensor and walks toward the sensor at 1 m/s. At 3 s, she is at the sensor. Then she walks away from the sensor at the same rate for another 5 s.

2. a.



b. $y = 0.5|x - 3|$

3. a. $y = 3|x|$

b. $y = 0.5(x - 2)^2$

c. $y = -2|x| + 4$ or $y - 4 = -2|x|$

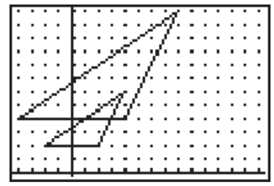
d. $y = 2(x + 1)^2 - 5$ or $y + 5 = 2(x + 1)^2$

4. a. Shrink the function $y = |x|$ vertically by a factor of 0.25 and then translate it right 4 units and down 3 units.

b. Reflect the function $y = x^2$ over the x-axis, shrink it vertically by a factor of 0.5, and then translate it left 3 units and up 2 units.

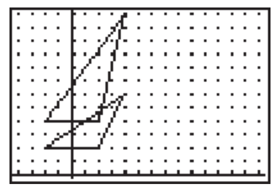
c. Stretch the function $y = x$ vertically by a factor of 3 and then translate it left 5 units and down 4 units.

5. a. A horizontal and vertical stretch by a factor of 2



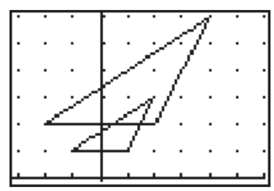
$[-4.4, 14.4, 1, -0.2, 12.2, 1]$

b. A vertical stretch by a factor of 2



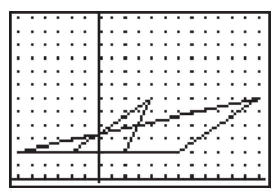
$[-4.4, 14.4, 1, -0.2, 12.2, 1]$

c. A horizontal and vertical shrink by a factor of 0.5



$[-3.2, 5.2, 1, -0.1, 6.1, 1]$

d. A horizontal stretch by a factor of 3



$[-6.4, 12.4, 1, -0.2, 12.2, 1]$

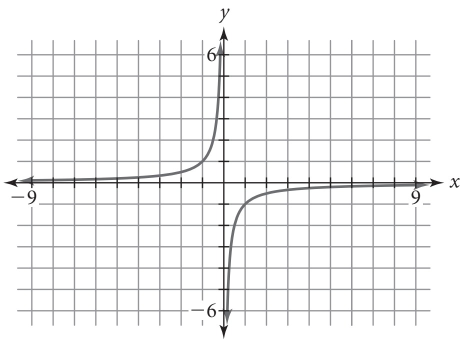
LESSON 8.6 • Introduction to Rational Functions

1. a. A reflection of the graph of $y = x^2$ over the x-axis and a translation left 2 units and down 4 units (the vertical translation must come after the vertical reflection); $y = -(x + 2)^2 - 4$

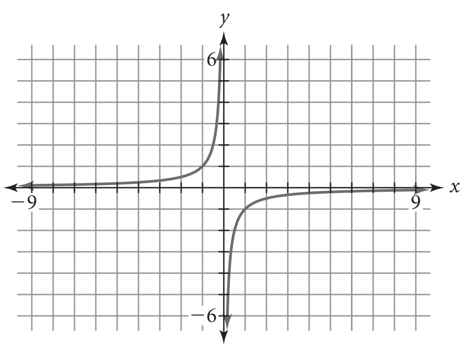
b. A reflection of the graph of $y = |x|$ over the x-axis, a vertical stretch by a factor of 2, and a translation up 3 units (the vertical translation must come after the vertical reflection and the vertical stretch); $y = -2|x| + 3$

2. $y = \dfrac{1}{x + 1}$

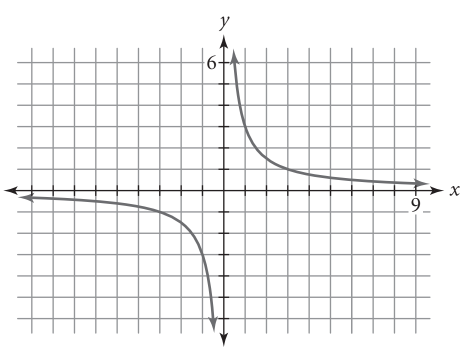
3. a. Reflection across the x-axis (or reflection across the y-axis); $x \neq 0$



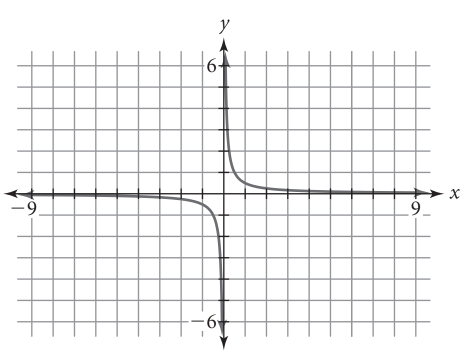
b. Reflection across the y-axis (or reflection across the x-axis); $x \neq 0$



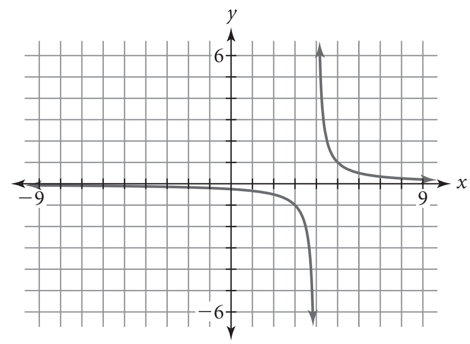
c. Vertical stretch by a factor of 3; $x \neq 0$



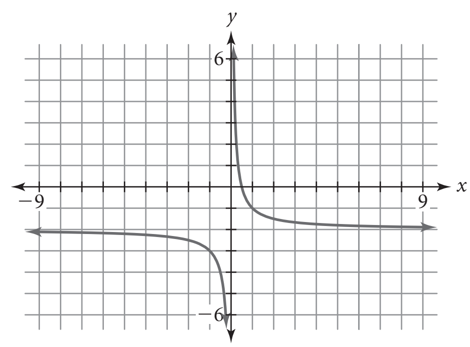
d. Vertical shrink by a factor of $\frac{1}{2}$; $x \neq 0$



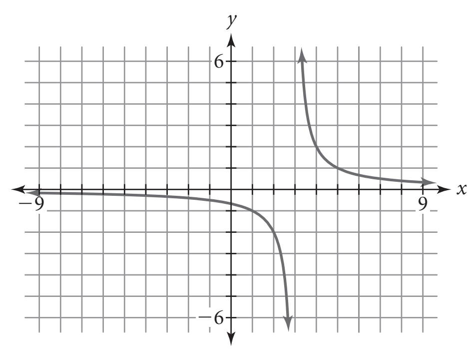
e. Translation right 4 units; $x \neq 4$



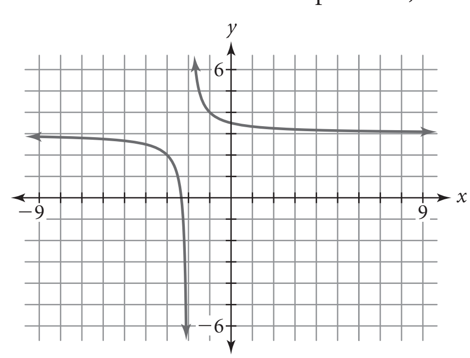
f. Translation down 2 units; $x \neq 0$



g. Vertical stretch by a factor of 2 and translation right 3 units; $x \neq 3$



h. Translation left 2 units and up 3 units; $x \neq -2$



4. a. $\dfrac{3x}{5}$ **b.** $\dfrac{3x}{2}$; $x \neq 0$

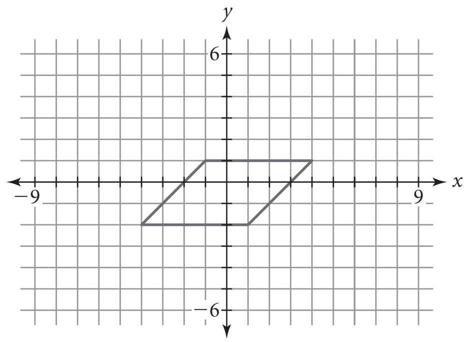
c. $\dfrac{6}{x-1}$; $x \neq -3$ and $x \neq 1$ **d.** $\dfrac{4+2x}{x}$; $x \neq 0$

5. a. $\dfrac{3x}{2}$ **b.** $\dfrac{5x}{12}$ **c.** $\dfrac{8}{3x}$; $x \neq 0$

d. $\dfrac{9x^2}{1}$ or $9x^2$; $x \neq 0$

LESSON 8.7 • Transformations with Matrices

1. a. $(-1, 1), (4, 1), (1, -2), (-4, -2)$



b. $\begin{bmatrix} 4 & 4 & 4 & 4 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ **c.** $\begin{bmatrix} 3 & 8 & 5 & 0 \\ 1 & 1 & -2 & 2 \end{bmatrix}$

2. a. Column order may vary.

$\begin{bmatrix} 2 & 5 & 6 \\ -4 & -2 & -4 \end{bmatrix}$

b. $\begin{bmatrix} 2 & 5 & 6 \\ -4 & -2 & -4 \end{bmatrix} + \begin{bmatrix} -6 & -6 & -6 \\ 3 & 3 & 3 \end{bmatrix}$

$= \begin{bmatrix} -4 & -1 & 0 \\ -1 & 1 & -1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} 2 & 5 & 6 \\ -4 & -2 & -4 \end{bmatrix} = \begin{bmatrix} 2 & 5 & 6 \\ 4 & 2 & 4 \end{bmatrix}$

3. a. Column order may vary.

$\begin{bmatrix} -6 & -6 & -2 \\ 1 & 4 & 2 \end{bmatrix}$

b. $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} -6 & -6 & -2 \\ 1 & 4 & 2 \end{bmatrix} = \begin{bmatrix} 6 & 6 & 2 \\ 1 & 4 & 2 \end{bmatrix}$

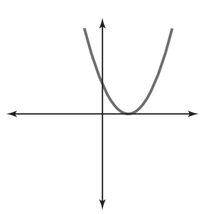
c. $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} -6 & -6 & -2 \\ 1 & 4 & 2 \end{bmatrix} = \begin{bmatrix} 6 & 6 & 2 \\ -1 & -4 & -2 \end{bmatrix}$

4. a. $\begin{bmatrix} -3 & 0 \\ -1 & 3 \end{bmatrix}$ **b.** $[-24 \quad 9]$ **c.** $\begin{bmatrix} -4 \\ 4 \end{bmatrix}$ **d.** $[0 \quad 12.5 \quad 9]$

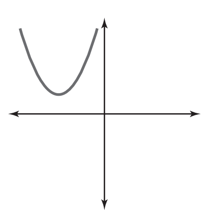
LESSON 9.1 • Solving Quadratic Equations

1. Sample answers:

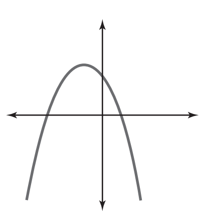
a.



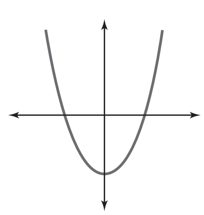
b.



c.



d.



2. a. $x = -1.88$ or $x = -4.12$

b. $x = -1.20$ or $x = -4.80$

c. No real solutions

d. $x = 3.16$ or $x = -1.16$

e. $x = -1$ or $x = 9$

f. $x = -0.65$ or $x = 4.65$

g. $x = -1$ **h.** $x = 0.23$ or $x = 4.27$

3. a. $x = \pm\sqrt{21}$ **b.** $x = -7$ or $x = 7$

c. $x = -1 \pm \sqrt{12}$ **d.** $x = 5 \pm \sqrt{5}$

e. $x = -7 \pm \sqrt{2.5}$ **f.** $x = \frac{3}{2}$ or $x = \frac{9}{2}$

4. a. Real, rational

b. Real, irrational

c. Real, rational, integer, whole

d. Real, rational, integer

e. Real, irrational

f. Real, rational

5. a. 1 **b.** 2 **c.** $\frac{13}{4}$ **d.** $\frac{29}{4}$

e. 7 **f.** -1 **g.** 15 **h.** $\frac{3}{4}$

6. a. 60.4 m **b.** 2.92 s and 5.25 s

c. 0 s and 8.16 s **d.** $0 \le t \le 8.16$

LESSON 9.2 • Finding the Roots and the Vertex

1. a. $x = -2; (-2, -9)$

b. $x = -3.5; (-3.5, -42.25)$

c. $x = 2.75; (2.75, -3.125)$

2. a.

$(x - 2.5)^2 - 15.5 = 0$	Original equation.
$(x - 2.5)^2 = 15.5$	Add 15.5.
$\sqrt{(x - 2.5)^2} = \sqrt{15.5}$	Take the square root to undo the squaring.
$\lvert x - 2.5 \rvert = \sqrt{15.5}$	Definition of absolute value.
$x - 2.5 = \pm\sqrt{15.5}$	Use definition of absolute value to undo the absolute value.
$x = 2.5 \pm \sqrt{15.5}$	Add 2.5.

b. $x = -1.437$ or $x = 6.437$

c. They are the same: $2.5 - \sqrt{15.5} \approx -1.437$ and $2.5 + \sqrt{15.5} \approx 6.437$.

3. a. $x = -1$ and $x = -5$

b. $x \approx -4.41$ and $x = -1.59$

c. $x = -1.82$ and $x = -0.18$

d. $x = -1$ and $x = 1.5$

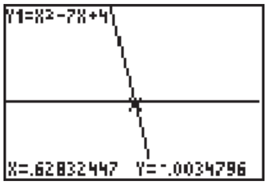
e. $x = 4$ and $x = -3$ **f.** $x = 2$

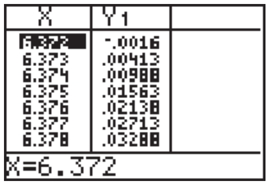
4. a. $x = 1 \pm \sqrt{8}$ **b.** $x = 4 \pm \sqrt{0.5}$

c. $x = -5 \pm \sqrt{24}$ **d.** No real solutions

5. a. Approximate x-intercepts: 0.628 and 6.372

Two possible calculator screens to use are:





b. Equation of axis of symmetry: $x = 3.5$

c. Vertex: $(3.5, -8.25)$

d. $y = (x - 3.5)^2 - 8.25$

LESSON 9.3 • From Vertex to General Form

1. a. Yes; 3 **b.** Yes; 2 **c.** No; negative power of x

d. Yes; 1 **e.** Yes; 2 **f.** Yes; 3

g. No; negative power of x

h. Yes; 4 **i.** Yes; 3

2. a. $x^2 + 2x + 1$ **b.** $x^2 - 6x + 9$

c. $x^2 + 8x + 16$ **d.** $x^2 - x + \frac{1}{4}$

e. $3x^2 - 30x + 75$ **f.** $\frac{1}{2}x^2 - 2x + 2$

3. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225

4. a. $(x + 3)^2$; $x^2 + 6x + 9$

	x	3
x	x^2	$3x$
3	$3x$	9

b. $(x + 13)^2$; $x^2 + 26x + 169$

	x	13
x	x^2	$13x$
13	$13x$	169

c. $(x + 1)^2$; $x^2 + 2x + 1$

	x	1
x	x^2	x
1	x	1

d. $(x - 9)^2$; $x^2 - 18x + 81$

	x	-9
x	x^2	$-9x$
-9	$-9x$	81

e. $(x + 0.5)^2$; $x^2 + x + 0.25$

	x	0.5
x	x^2	$0.5x$
0.5	$0.5x$	0.25

f. $(x - 4)^2$; $x^2 - 8x + 16$

	x	-4
x	x^2	$-4x$
-4	$-4x$	16

5. a. $y = x^2 + 8x + 17$ **b.** $y = x^2 - 10x + 19$

c. $y = x^2 + 2x$ **d.** $y = 2x^2 - 16x + 35$

e. $y = -4x^2 - 8x - 6$ **f.** $y = x^2 - 6x + 14$

LESSON 9.4 • Factored Form

1. a. $x = 3$ or $x = 2$ **b.** $x = -7$ or $x = -1$

c. $x = \pm 2$ **d.** $x = -3$ or $x = 4$

e. $x = 0$ or $x = -5$ **f.** $x = 1$, $x = 2$, or $x = 3$

g. $x = -\frac{3}{4}$ or $x = \frac{4}{3}$ **h.** $x = 2$ or $x = -\frac{3}{2}$

2. a. $y = (x + 5)(x - 1)$ **b.** $y = (x + 2)(x + 4)$

c. $y = (x - 5)(x + 3)$ **d.** $y = 2(x - 1)(x - 5)$

e. $y = -(x - 4)(x + 1)$ **f.** $y = (x - 5)(x + 2)$

3. a. -1 and 7 **b.** 6 and -2

c. ± 8 **d.** 4 and 5

e. 5 **f.** -0.5 and 3.5

4. Answers will vary but should have the basic form given here.

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

b. $(x - 5)(x - 1) = y$; $x^2 - 6x + 5 = y$

c. $\left(x - \frac{1}{2}\right)\left(x + \frac{1}{2}\right) = y$; $x^2 - \frac{1}{4} = y$

d. $(x + 4)^2 = y$; $x^2 + 8x + 16 = y$

e. $\left(x - \frac{1}{3}\right)\left(x - \frac{4}{3}\right) = y$; $x^2 - \frac{5}{3}x + \frac{4}{9} = y$

f. $(x - 0.2)(x - 0.8) = y$; $x^2 - x + 0.16 = y$

5. a. 2 **b.** $(0, -12)$

c. $y = 3x^2 - 12$. The function was stretched vertically by a factor of 3 and moved down 12 units.

6. a. $\frac{x + 2}{x + 1}$; $x \neq -1$ and $x \neq 3$

b. $\frac{x + 2}{x - 1}$; $x \neq -4$ and $x \neq 1$

c. $\frac{x + 5}{x - 5}$; $x \neq -5$ and $x \neq 5$

LESSON 9.6 • Completing the Square

1. **a.** $x = \pm 11$ **b.** $x = \pm\sqrt{96} = \pm 4\sqrt{6}$
c. $x = 4$ or $x = 2$ **d.** $x = -4$ or $x = -8$
e. $x = 5 \pm \sqrt{6}$ **f.** No real solutions
g. $x = 6 \pm \sqrt{3}$ **h.** $x = -6 \pm \sqrt{1.6}$
i. $x = -5 \pm \sqrt{3}$

2. **a.** $x = 4$ or $x = -3$ **b.** $x = \pm 9$
c. $x = -7$ or $x = -1$ **d.** $x = \pm\frac{1}{3}$
e. $x = -\frac{5}{3}$ or $x = \frac{5}{2}$ **f.** $x = 4, x = -\frac{1}{2}$, or $x = \frac{2}{3}$

3. **a.** $x^2 + 6x + 9 = (x+3)^2$
b. $x^2 - 20x + 100 = (x-10)^2$
c. $x^2 - 2x + 1 = (x-1)^2$
d. $x^2 + 7x + \frac{49}{4} = \left(x + \frac{7}{2}\right)^2$
e. $x^2 - 11x + \frac{121}{4} = \left(x - \frac{11}{2}\right)^2$
f. $x^2 + 10x + 25 = (x+5)^2$
g. $x^2 + 24x + 144 = (x+12)^2$
h. $x^2 + \frac{5}{2}x + \frac{25}{16} = \left(x + \frac{5}{4}\right)^2$
i. $x^2 + (2\sqrt{7})x + 7 = (x + \sqrt{7})^2$

4. **a.** $x = -2$ or $x = 8$ **b.** $x = -3 \pm \sqrt{11}$
c. $x = 8 \pm \sqrt{14}$ **d.** $x = 0$ or $x = 4$
e. $x = 0$ or $x = -11$ **f.** $x = \frac{-5}{2} \pm \frac{\sqrt{21}}{2}$
g. $x = 3 \pm \sqrt{12.5}$ **h.** $x = 2$ or $x = 12$
i. No real solutions

5. **a.** $y = (x-4)^2 - 10$ **b.** $y = (x+5.5)^2 - 30.25$
c. $y = 2(x-6)^2 - 64$ **d.** $y = 2(x-2)^2 - 18$

LESSON 9.7 • The Quadratic Formula

1. **a.** $x^2 + 8x + 6 = 0$; $a = 1, b = 8, c = 6$
b. $x^2 - 4x + 4 = 0$; $a = 1, b = -4, c = 4$
c. $x^2 - 3x = 0$; $a = 1, b = -3, c = 0$
d. $x^2 - 1 = 0$; $a = 1, b = 0, c = -1$
e. $x^2 - 8x + 19 = 0$; $a = 1, b = -8, c = 19$
f. $4x^2 - 4x - 7 = 0$; $a = 4, b = -4, c = -7$

2. **a.** $b^2 - 4ac = 40$; two real roots
b. $b^2 - 4ac = 0$; one real root
c. $b^2 - 4ac = 9$; two real roots
d. $b^2 - 4ac = 4$; two real roots
e. $b^2 - 4ac = -12$; no real roots
f. $b^2 - 4ac = 128$; two real roots

3. **a.** $x = -3$ or $x = 2$ **b.** $x = 2$ or $x = 6$
c. $x = -\frac{1}{2}$ or $x = 3$
d. $x = \frac{-7 \pm \sqrt{57}}{2} \approx 0.275$ or -7.275
e. $x = \frac{14 \pm \sqrt{164}}{2} \approx 0.597$ or 13.403
f. $x = -1$ or $x = \frac{1}{3}$
g. No real solutions
h. $x = \frac{-3 \pm \sqrt{41}}{-4} \approx -0.851$ or 2.351
i. $x = -\frac{3}{2}$
j. No real solutions

4. 3a, 3b, 3c, 3f, and 3i can be solved by factoring, because the roots are rational. (Students might say that the roots are integers and fractions.)

5. **a.** $x = \pm 13$ **b.** $x = \pm\sqrt{82} \approx \pm 9.06$
c. $x = 5 \pm \sqrt{3}$; $x \approx 6.73$ or $x = 3.27$
d. $x = -5 \pm \sqrt{4.5}$; $x \approx -7.12$ or $x = -2.88$
e. $x = 6$ or $x = 2$
f. No real solutions
g. No real solutions
h. $x = -5 \pm \sqrt{1.8}$; $x \approx -3.66$ or $x = -6.34$

6. **a.** $\frac{6 + \sqrt{132}}{6}$ and $\frac{6 - \sqrt{132}}{6}$; 2.91 and -0.91
b. $x = 1$
c. (1, 11)
d. $\frac{2 + \sqrt{8}}{2}$ and $\frac{2 - \sqrt{8}}{2}$; 2.41 and -0.41

LESSON 9.8a • Cubic Functions

1. **a.** $x = (7.3)^3$; $x = 389.017\ \text{cm}^3$
b. $x^3 = 35{,}937$; $x = 33$ cm
c. $(5.4x)^3 = 19{,}683$; $x = 5$

2. **a.** $y = (x-2)^3$ **b.** $y = x^3 + 3$
c. $y = (x-2)^3 + 3$ **d.** $y = 0.5x^3$

3. **a.** $3(5x^2 - 3x + 1)$ **b.** $x(4x + 5)$
c. $3x(2x^2 - x + 4)$ **d.** $4x^2(2x + 3)$
e. $2x(x^3 + 3x^2 - 5x + 1)$
f. $5x(x^2 + 3x - 5)$

4. **a.** $x(x+1)(x+2)$ **b.** $x(x+3)(x-3)$
c. $3x(x+1)^2$

5. **a.** $x = -2, 1, 3$; $y = (x+2)(x-1)(x-3)$
b. $x = -5, -4, -1$; $y = (x+5)(x+4)(x+1)$
c. $x = -2, 3$; $y = (x+2)(x-3)^2$

6. **a.** $10x^3 + 19x^2 + 6x$ **b.** $x^2 + 3x - 4$
c. $3x^2 - 4$

LESSON 9.8b • Rational Expressions

1. **a.** $5x; x \neq 0$ **b.** $x^2; x \neq 0$

c. $\frac{4}{x-5}; x \neq 5$ **d.** $\frac{1}{5x}; x \neq 0$

e. $\frac{1+5x}{5x}; x \neq 0$ **f.** $\frac{3-x^4}{5x}; x \neq 0$

g. $\frac{x-1}{x+1}; x \neq -1$ and $x \neq -2$

h. $\frac{x+1}{x-4}; x \neq 4$ and $x \neq -2$

i. $\frac{x-3}{x+1}; x \neq -1$ and $x \neq -5$

j. $\frac{x+1}{x-4}; x \neq 4$ and $x \neq -4$

k. $\frac{1}{3}; x \neq 1$ and $x \neq -1$

l. $\frac{x+6}{x-6}; x \neq 6$ and $x \neq -6$

2. **a.** $\frac{1}{2n}; n \neq 0$ **b.** $\frac{2}{15}; x \neq 0$

c. $\frac{y}{4x^2}; x \neq 0$ and $y \neq 0$ **d.** $\frac{x+6}{12}; x \neq 6$

e. $\frac{9}{20}; c \neq 2$

f. $\frac{4}{y(y+2)}; y \neq 0, y \neq -2$, and $y \neq -4$

g. $a + 3; a \neq -4$ and $a \neq 3$

h. $\frac{x+5}{5}; x \neq 0, x \neq 3$, and $x \neq 2$

i. $1; x \neq -1, x \neq 6, x \neq -3$, and $x \neq -2$

3. **a.** $\frac{4x+15}{6}$ **b.** $\frac{21-5x}{9x}; x \neq 0$

c. $\frac{10x+4}{12x+8}$, or $\frac{5x+2}{2(3x+2)}; x \neq -1.5$

d. $\frac{-3x-5}{14(x+2)}; x \neq -2$

e. $\frac{2(3x+7)}{7(x+7)}; x \neq -7$

f. $\frac{2(x^2+4x+5)}{(x+2)(x+4)}; x \neq -2$ and $x \neq -4$

g. $\frac{x^2-12}{4(x+4)(x-4)}; x \neq -4$ and $x \neq 4$

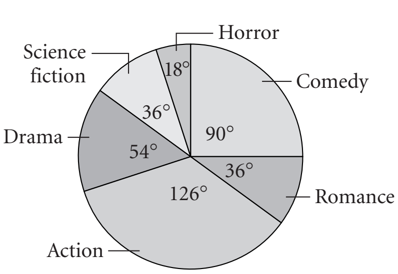
h. $\frac{(x+5)(x-2)}{x^2(x+3)}; x \neq 0$ and $x \neq -3$

i. $\frac{3x+10}{(x+3)(x+3)}; x \neq -3$

j. $\frac{2}{x+9}; x \neq -9$ and $x \neq 9$

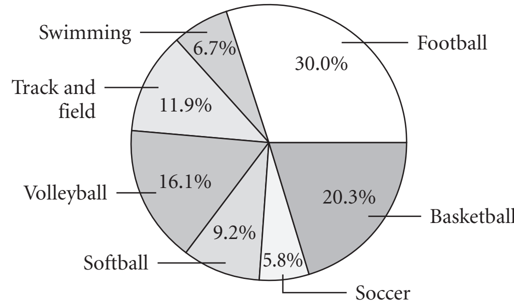
LESSON 10.1 • Relative Frequency Graphs

1. **a.** Ticket Sales Circle Graph



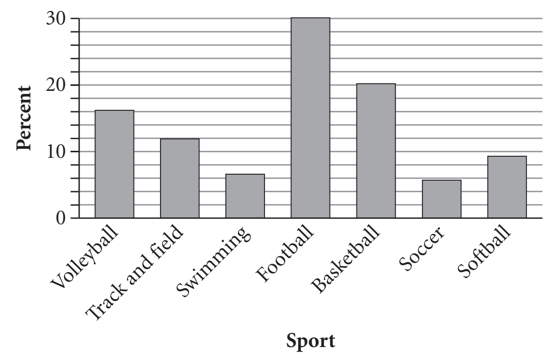
b. Comedy: 155; Romance: 62; Action: 217; Drama: 93; Science fiction: 62; Horror: 31

2. **a.** Distribution of Students in Sports

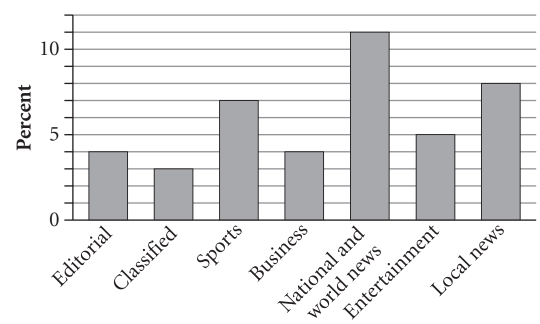


b. About 177 students **c.** 12 students; 21 students

d. Distribution of Students by Sport



3. **a.** Distribution of Pages in Newspaper



b. 74% **c.** 22%

LESSON 10.2 • Probability Outcomes and Trials

1. **a.** $\frac{2}{25}$; 0.08 **b.** $\frac{1}{5}$; 0.2

c. $\frac{11}{50}$; 0.22 **d.** $\frac{2}{5}$; 0.4

e. $\frac{4}{5}$; 0.8

2. **a.** $\frac{20}{60}$, or $0.3\overline{3}$ **b.** $\frac{36}{360}$, or 0.10

c. $\frac{140}{360}$, or $0.3\overline{8}$ **d.** $\frac{240}{360}$, or $0.6\overline{6}$

3. **a.** $\frac{1}{8}$, or 0.125 **b.** $\frac{5}{12}$, or $0.41\overline{6}$

4. $\frac{x}{84.32} = \frac{89}{250}$; $x = 957 \text{ cm}^2$

LESSON 10.3 • Random Outcomes

1. a. $\frac{150}{800}$, or about 0.18

b. You have to assume that the population is 800, it remains stable, and the squirrels are well-mixed.

c. $\frac{32}{150}$, or about 0.21

2. a. $\frac{2200}{9500} \approx 0.23$ **b.** $\frac{7300}{9500} \approx 0.77$ **c.** 0.23

3. a. i. $\frac{16}{256}$, or 0.0625 **ii.** $\frac{36}{54}$, or $0.6\overline{6}$

b. i. 6 **ii.** 67

c. i. 43 **ii.** 120

4. a. 0.76 **b.** 3

LESSON 10.4 • Counting Techniques

1. a. Combination

b. Permutation

c. Permutation

d. Neither

2. a. $6 \cdot 5 \cdot 4 = 120$ **b.** $\frac{6 \cdot 5 \cdot 4}{3 \cdot 2 \cdot 1} = 20$

c. $\frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 6$ **d.** $\frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot 1} = 6$

3. a. 5040 **b.** ${}_7P_5 = 2520$ **c.** ${}_7C_4 = 35$

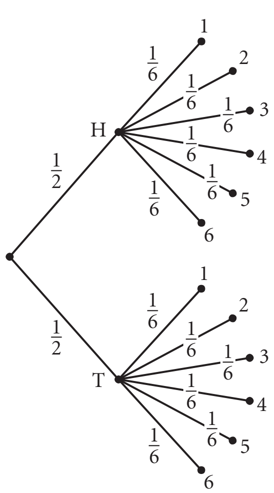
4. $(5 \cdot 4 \cdot 3 \cdot 2 \cdot 1) \cdot 2 = 240$. Reasoning: Think of the two books by the same author as being stuck together so that there are 5 things to arrange. This makes 120 possibilities. For each of the 120 arrangements, the two books by the same author can be in 2 arrangements, giving $120 \cdot 2$, or 240.

5. a. ${}_{10}C_4 = 210$ **b.** ${}_4C_3 = 4$

c. $\frac{{}_4C_3}{{}_{10}C_4} = \frac{4}{210} = \frac{2}{105} \approx 0.019$, or about 2%

LESSON 10.5 • Multiple-Stage Experiments

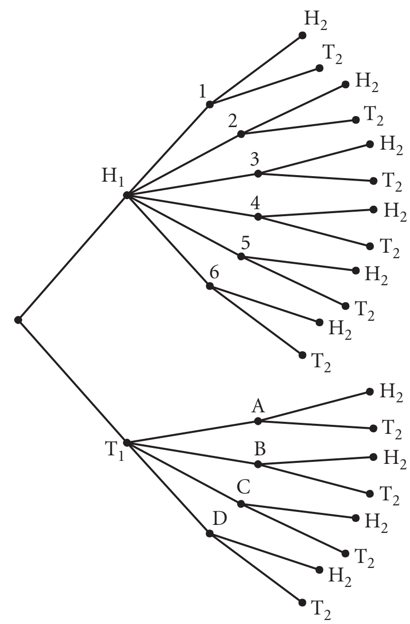
1. a.



b. $\frac{1}{12}$; $\frac{1}{4}$

c. $P(<3|\text{H})$ means the probability of throwing a 1 or a 2 with the die after having gotten a head with the coin flip. $P(<3|\text{H}) = \frac{1}{3}$

2. a.



b. $\frac{1}{2}$

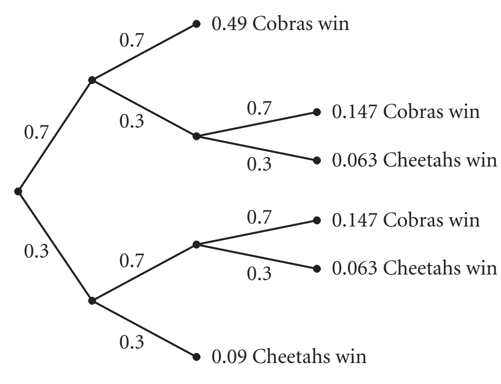
c. $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$

d. i. $\frac{1}{2} \cdot \frac{1}{6} \cdot \frac{1}{2} = \frac{1}{24}$ **ii.** $\frac{1}{2}$ **iii.** 0

3. a. $\frac{1}{2}$ **b.** $\frac{1}{8}$ **c.** $\frac{1}{16}$ **d.** $\frac{1}{256}$

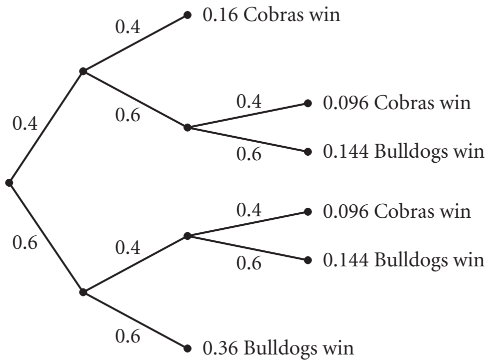
4. a. $\frac{7}{10} \cdot \frac{4}{10} = \frac{28}{100}$, or 0.28, or 28%

b.



$P(\text{Cobras win the match}) = 0.49 + 0.147 + 0.147 = 0.784$, or about 78%

c.



P(Cobras win the match) $= 0.16 + 0.096 + 0.096 = 0.352$, or about 35%

LESSON 10.6 • Expected Value

1. \$3.50

2. a. $P(13) = \frac{4}{35} \approx 0.114$; $P(14) = \frac{10}{35} \approx 0.286$;
$P(15) = \frac{15}{35} \approx 0.429$; $P(16) = \frac{6}{35} \approx 0.171$

b. $\frac{4}{35} \cdot 13 + \frac{10}{35} \cdot 14 + \frac{15}{35} \cdot 15 + \frac{6}{35} \cdot 16 \approx 14.657$, or about 14.7 years old

c. 14.657, or about 14.7 years old

3. a.

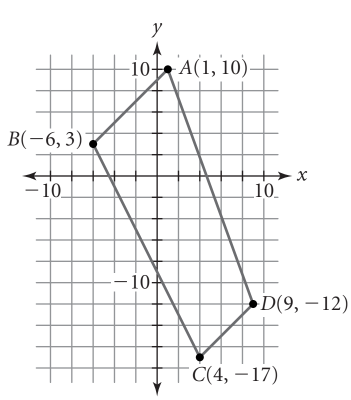
4	5	6	7	8	9	10
3	4	5	6	7	8	9
2	3	4	5	6	7	8
1	2	3	4	5	6	7
ROLL	**1**	**2**	**3**	**4**	**5**	**6**

b. $\frac{1}{8}$ **c.** 6 **d.** $8\frac{3}{4}$

LESSON 11.1 • Parallel and Perpendicular

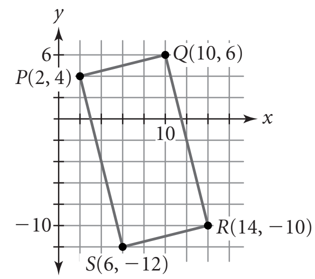
1. a. -4 **b.** 2 **c.** 3 **d.** $-\frac{2}{3}$
e. $\frac{4}{3}$ **f.** $-\frac{4}{9}$ **g.** $\frac{1}{4}$ **h.** -1
i. $\frac{1}{2}$

2. a.



Slope of $\overline{AB}$ is 1; slope of $\overline{BC}$ is -2; slope of $\overline{CD}$ is 1; slope of $\overline{AD}$ is $-\frac{11}{4}$. One pair of opposite sides have the same slope and are therefore parallel. Quadrilateral $ABCD$ is a trapezoid.

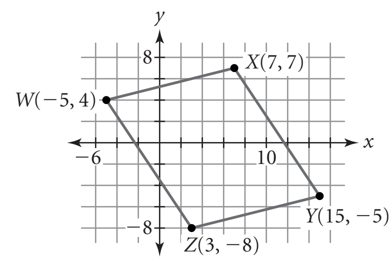
b.



Slope of $\overline{PQ}$ is $\frac{1}{4}$; slope of $\overline{QR}$ is -4; slope of $\overline{RS}$ is $\frac{1}{4}$; slope of $\overline{PS}$ is -4.

Both pairs of opposite sides have the same slope, so opposite sides are parallel. Also, the product of the slopes of each pair of adjacent sides equals -1, so adjacent sides are perpendicular. Quadrilateral $PQRS$ is a rectangle.

c.



Slope of $\overline{WX}$ is $\frac{1}{4}$; slope of $\overline{XY}$ is $-\frac{3}{2}$; slope of $\overline{YZ}$ is $\frac{1}{4}$; slope of $\overline{WZ}$ is $-\frac{3}{2}$.

Both pairs of opposite sides have the same slope, so opposite sides are parallel. Quadrilateral $WXYZ$ is a parallelogram.

3. Answers will vary. Possible answers:

a. $y = \frac{2}{3}x + 1$ **b.** $3x + 5y = 8$
c. $-\frac{1}{3}x + \frac{1}{2}y + 1 = 0$ **d.** $0.2x - 0.5y = 5$
e. $y = 2.8x + 1$ **f.** $3y - 5x = -10$

4. Answers will vary. Possible answers:

a. $y = -\frac{3}{2}x + 1$ **b.** $5x - 3y = 7$
c. $\frac{1}{2}x + \frac{1}{3}y + 1 = 0$ **d.** $0.5x + 0.2y = 4$
e. $-2.8y = x$ **f.** $5y + 3x = 10$

5. a. $2x - 5y = -18$ **b.** $5x + 2y = -16$

LESSON 11.2 • Finding the Midpoint

1. a. $(2, 5)$ **b.** $\left(-\frac{19}{2}, 3\right)$ **c.** $\left(8, \frac{1}{2}\right)$
d. $(0.75, 2.3)$ **e.** $(3.5, 3.5)$ **f.** $(1.5, 10)$

2. a. $y = -2x + 5$ b. $y = \frac{2}{3}x$

c. $y = 4x + 3$ d. $y = -\frac{1}{3}x + 1$

e. $y = \frac{2}{3}x + 5$ f. $y = -x$

3. a. $y = 3 + 2(x - 1)$ b. $y = \frac{3}{2} - \frac{19}{13}\left(x - \frac{15}{2}\right)$

c. $y = -\frac{3}{2} + \frac{4}{7}(x + 3)$ d. $y = -1$

4. a. $y = 13(x - 1) - 6$ or $y = 13(x - 2) + 7$

b. $y = 0.7(x + 2.5) - 1$

c. $y = -\frac{10}{7}(x - 2) + 7$ or $y = -\frac{10}{7}(x - 5.5) + 2$

5. a. Quadrilateral $ABCD$ is a parallelogram. The slope of both $\overline{AB}$ and $\overline{DC}$ is 1. The slope of both $\overline{BC}$ and $\overline{AD}$ is -2. Because opposite sides have the same slope, they are parallel. Therefore quadrilateral $ABCD$ is a parallelogram.

b. The midpoint of $\overline{AC}$ is $\left(\frac{-5 + 13}{2}, \frac{-4 + -1}{2}\right) = (4, -2.5)$. The midpoint of $\overline{BD}$ is $\left(\frac{0 + 8}{2}, \frac{-14 + 9}{2}\right) = (4, -2.5)$.

c. Both diagonals have the same midpoint. In other words, the diagonals bisect each other.

LESSON 11.3 • Squares, Right Triangles, and Areas

1. a. $x = \pm\sqrt{18}$, or $\pm 3\sqrt{2}$ b. $x = \pm\sqrt{30}$

c. $x = 5 \pm \sqrt{14}$ d. $x = -3$ or $x = 1$

e. $x = -1 \pm \sqrt{5}$ f. No real solutions

2. a. $x = \pm 4.2426$ b. $x = \pm 5.4772$

c. $x = 1.2583$ or $x = 8.7417$

d. $x = -3$ or $x = 1$

e. $x = -3.2361$ or $x = 1.2361$

f. No real solutions

3. a. $3\frac{1}{2}$ square units b. 19 square units

c. 5 square units d. 12 square units

e. 37 square units f. 9 square units

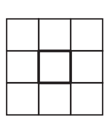
4. a. $\sqrt{45} = 3\sqrt{5}, \sqrt{17}, 2, \sqrt{20} = 2\sqrt{5}$

b. $\sqrt{18} = 3\sqrt{2}, 2, \sqrt{10}, \sqrt{26}, \sqrt{10}, \sqrt{40} = 2\sqrt{10}$

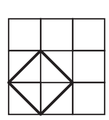
c. $\sqrt{8} = 2\sqrt{2}, \sqrt{18} = 3\sqrt{2}, \sqrt{8} = 2\sqrt{2}, \sqrt{18} = 3\sqrt{2}$

5. Answers will vary. Possible answers are given.

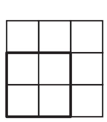
a.



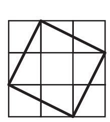
b.



c.



d.



LESSON 11.4 • The Pythagorean Theorem

1. a. $a = \pm 13$ b. $b = \pm 3$

c. $c = \pm\sqrt{29}$ d. $d = \pm\sqrt{11}$

e. $e = \pm\sqrt{56} = \pm 2\sqrt{14}$

f. $f = \pm\sqrt{359}$

2. a. $z = \sqrt{113} \approx 10.6$ b. $x = 7$

c. $y = \sqrt{192} = 8\sqrt{3} \approx 13.9$

d. $z = \sqrt{232.45} \approx 15.2$

e. $x = \sqrt{1539} = 9\sqrt{19} \approx 39.2$

f. $z = \sqrt{200} = 10\sqrt{2} \approx 14.1$

3. a. 96 cm^2

b. $2\sqrt{65}$ in.$^2 \approx 16.1$ in.^{2}

c. $\frac{9}{2}\sqrt{3}$ mm$^2 \approx 7.8$ mm^2

4. a. $7^2 + 8^2 \stackrel{?}{=} 11^2$

$113 \neq 121$

No, $\triangle ABC$ is not a right triangle.

b. $15^2 + 36^2 \stackrel{?}{=} 39^2$

$1521 = 1521$

Yes, $\triangle ABC$ is a right triangle.

c. $(\sqrt{14})^2 + (\sqrt{21})^2 \stackrel{?}{=} (\sqrt{35})^2$

$14 + 21 = 35$

$35 = 35$

Yes, $\triangle ABC$ is a right triangle.

d. $(2\sqrt{13})^2 + (\sqrt{29})^2 \stackrel{?}{=} 9^2$

$52 + 29 = 81$

$81 = 81$

Yes, $\triangle ABC$ is a right triangle.

5. The tree is about 18.3 m tall.

LESSON 11.5 • Operations with Roots

1. a. $3\sqrt{3}$ b. $6\sqrt{10}$ c. $2\sqrt{2} + 6\sqrt{3}$

d. 18 e. $6 - \sqrt{3}$ f. 2

g. $6\sqrt{5}$ h. $\sqrt{5} - 15$ i. $6\sqrt{5} + \sqrt{6}$

2. a. 19 b. 12 c. 45 d. 17

3. a. $a = \sqrt{80} = 4\sqrt{5}$ cm b. $b = \sqrt{14}$ cm

c. $c = \sqrt{88} = 2\sqrt{22}$ cm

4. a. $y = x^2 - 2$ b. $y = x^2 + (4\sqrt{5})x + 20$

5. a. $x = \pm\sqrt{2} \approx \pm 1.414$ b. $x = -2\sqrt{5} \approx -4.472$

6. a. $(0, -2)$ b. $(-2\sqrt{5}, 0) \approx (-4.472, 0)$

7. a. $\sqrt{75}$ b. $\sqrt{8}$ c. $\sqrt{135}$

d. $\sqrt{360}$

8. a. $2\sqrt{3}$ b. $4\sqrt{3}$ c. $4\sqrt{6}$ d. $10\sqrt{5}$

LESSON 11.6 • A Distance Formula

1. a. $\sqrt{11^2 + 2^2} = \sqrt{125} = 5\sqrt{5}$ units

b. $\sqrt{6^2 + 5^2} = \sqrt{61}$ units

c. $\sqrt{1^2 + 6^2} = \sqrt{37}$ units

d. $\sqrt{12^2 + 4^2} = \sqrt{160} = 4\sqrt{10}$ units

e. $\sqrt{8^2 + 2^2} = \sqrt{68} = 2\sqrt{17}$ units

2. a. Slope of $\overline{MN}$ is $\frac{2}{5}$; slope of $\overline{NO}$ is $-\frac{5}{2}$; slope of $\overline{OP}$ is $\frac{2}{5}$; slope of $\overline{MP}$ is $-\frac{5}{2}$.

b. Length of $\overline{MN}$ is $\sqrt{29}$ units; length of $\overline{NO}$ is $\sqrt{29}$ units; length of $\overline{OP}$ is $\sqrt{29}$ units; length of $\overline{MP}$ is $\sqrt{29}$ units.

c. Quadrilateral *MNOP* has four congruent sides and each pair of adjacent sides is perpendicular, so it is a square.

3. a. Slope of $\overline{DE}$ is $-\frac{2}{3}$; slope of $\overline{EF}$ is $\frac{3}{2}$; slope of $\overline{DF}$ is $\frac{1}{5}$.

b. Length of $\overline{DE}$ is $\sqrt{52}$ units; length of $\overline{EF}$ is $\sqrt{52}$ units; length of $\overline{DF}$ is $\sqrt{104}$ units.

c. Triangle *DEF* is an isosceles right triangle.

4. a. $x = 6$ **b.** $x = \frac{1}{2}$ **c.** $x = 6$ **d.** $x = \frac{5}{2}$

e. $x = -2 + \sqrt{7} \approx 0.65$ **f.** $x = -1$

LESSON 11.7 • Similar Triangles and Trigonometric Functions

1. a. $x = 42$ **b.** $x = 2$ **c.** $x = \pm 8$ **d.** $x = \frac{1}{2}$

2. a. $\frac{2}{0.5} = \frac{7.25}{x}$; $x = 1.8125$ km

b. $\frac{2}{0.5} = \frac{y}{7.7}$; $y = 30.8$ cm

3. a. r

b. The opposite side is p; the adjacent side is q.

c. The opposite side is q; the adjacent side is p.

d. $\sin P$

e. $\tan Q$

f. $\frac{q}{r}$

4. Proportions will vary.

a. $\frac{w}{7.2} = \frac{19.1}{10.3}$; $w \approx 13.4$

b. $\frac{8}{13} = \frac{17}{y}$; $y = 27\frac{5}{8}$

c. $\frac{6\sqrt{3}}{x} = \frac{8\sqrt{3}}{9}$; $x = 6.75$

d. $\frac{8 + \sqrt{20}}{4 + \sqrt{5}} = \frac{z}{9}$; $z = 18$

LESSON 11.8 • Trigonometry

1. a. $\frac{a}{c}$ **b.** B **c.** $\frac{a}{b}$ **d.** B

e. B **f.** A

2. a. $\sin 15° = \frac{x}{114}$; $x \approx 29.5$ cm

b. $\tan 40° = \frac{7.3}{y}$; $y \approx 8.7$ m

c. $\tan^{-1} \frac{2}{2\sqrt{3}} = P$, or $\tan P = \frac{2}{2\sqrt{3}}$; 30°

3. a. $A \approx 48.6°$ **b.** $B = 45°$

c. $C = 60°$ **d.** $E \approx 22.6°$

4. a. $A \approx 23.6°$ **b.** $A \approx 57.3°$

c. $A \approx 40.9°$ **d.** $A \approx 50.8°$

5. Solutions may vary. One solution is:

$\sin 40 = \frac{LM}{15}$; $LM = 15 \cdot \sin 40 \approx 9.64$

$\cos 40 = \frac{KM}{15}$; $KM = 15 \cdot \cos 40 \approx 11.49$

area $\triangle KLM \approx \frac{1}{2}(11.49)(9.64) \approx 55.4\text{ cm}^2$

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