Answers

CHAPTER 1

Trigonometry, pages, pages 2–55

Prerequisite Skills, pages 4–5

1. a) $x = \pm 6$ **b)** $x = \pm 5$ **c)** $x = \pm 10$
   d) $x = \pm 13$ **e)** $x = \pm 24$
2. a) 10 cm   **b)** 12 mm   **c)** 19.2 m
3. 5.8 m
4. a) 1:2   **b)** 3:7   **c)** 2:5
5. $10.50
6. a) $x = 3$ **b)** $x = 3$ **c)** $x = 20, y = 4$
7. a) 1 unit of distance on the map represents 700 000 of the same unit of distance on the earth.
   b) 84 km
   c) 5.7 cm
8. a) 3.46   **b)** 19.83   **c)** 9015.98
9. a) 7.7   **b)** 26.9   **c)** 0.9
10. a) 24°   **b)** 69°   **c)** 36°

1.1 Revisit the Primary Trigonometric Ratios, pages 6–15

1. a) opposite: AC or b; adjacent: BC or a; hypotenuse: AB or c
   b) opposite: DE or f; adjacent: EF or d; hypotenuse: DF or e
   c) opposite: XY or z; adjacent: YZ or x; hypotenuse: XZ or y
2. a) 0.5000   **b)** 0.7071   **c)** 1.7321
3. a) $\angle A = 13.6°$ **b)** $\angle B = 28.8°$ **c)** $\angle C = 51.0°$
4. a) 23 m   **b)** 11 m   **c)** 65°
5. a) 16.1°   **b)** 73.9°   **c)** 35 cm
6. a) 13.5 m   **b)** 12.4 m
7. a) 12.9 cm   **b)** 37.8 cm
8. a) 45.4 m   **b)** 89.1 m
9. $\angle A = 25°, a = 7.2$ cm, $c = 17.1$ cm
10. 16.8 m
11. 15.5 m
12. 40.5 cm
13. 15 mm
14. 290 cm2

1.2 Solve Problems Using Trigonometric Ratios, pages 16–23

1. 4°
2. 67 m
3. 59°
4. 1°
5. 5 ft
6. Yes, the angle is 81°.
7. No, the angle is 68°.
8. 477 m
9. 5 km
10. Answers may vary.
11. Lina reversed the opposite and adjacent sides in the fraction; $d \doteq 2065$
12. 27 m
13. 24°
14. 3816 m
15. 121 m
16. 6.6 ft

1.3 The Sine Law, pages 24–33

1. a) 41.0 cm   **b)** 64.1 m   **c)** 71.6 cm
2. a) 20.9°   **b)** 38.2°
3. a) $\angle X = 76°, x = 22.0$ cm, $y = 21.5$ cm
   b) $\angle D = 60.4°, \angle E = 36.6°, d = 21.9$ cm
4. a) $\angle A = 62°, b = 17.1$ cm, $c = 26.6$ cm
   b) $\angle E = 22.7°, \angle F = 82.3°, f = 25.6$ m
5. 44 m
6. 8 km
7. The measure of an angle that is opposite one of the known sides.
8. 4 ft
9. from Twillingate: 11 nautical miles; from Fogo: 14 nautical miles
11. 55.8 m
12. Answers may vary.
13. 19.8 cm

1.4 The Cosine Law, pages 34–41

1. a) 18.9 cm   **b)** 58.1 mm   **c)** 3.1 m
2. a) 53.7°   **b)** 88.0°   **c)** 54.7°
3. $\angle B = 86°, \angle C = 62°, a = 13.5$ m
4. $\angle A = 67°, \angle B = 81°, \angle C = 32°$
5. 9.5 km
6. Either all three sides or two sides and the enclosed angle.
7. 19°
8. 827 m
9. 6.9 km
10. 14.7 m
11. 11.5 m
12. a) 86°, 63°, 31°   **b)** no
13. 41°

1.5 Make Decisions Using Trigonometry, pages 42–51
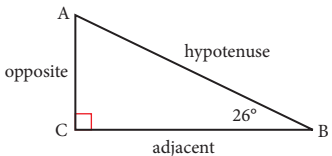
1. a) primary trigonometric ratios
   b) cosine law
   c) sine law
   d) primary trigonometric ratios
   e) cosine law
   f) sine law
2. a) 64°, 20.5 cm, 22.8 cm   **b)** 48.1°, 59.7°, 72.3°
   c) 30°, 12.2 m, 12.8 m   **d)** 30°, 60°, 22.5 mm
   e) 47.7°, 80.3°, 48.0 m   **f)** 30°, 8.9 cm, 16.7 cm
3. Yes; the green is less than 200 m away, the shot will make it if there is no wind or error.
4. Yes; the shot will clear the trees if there is no wind or error.
5. Answers may vary.
6. 4.2 km
7. 49.8°, 65.1°, 65.1°
8. 57.7 m
9. a) one angle   **b)** one angle   **c)** two sides
10. a) 4.4 km   **b)** 65.8°, 52.2°
12. No; the shot will go 0.5 m wide of the net.
13. 53°
14. a) 1353.6 m   **b)** 1985.8 m
   c) 1757.2 m   **d)** 12° north of east

Chapter 1 Review, pages 52–53

1. a) $\angle B = 70°, a = 11.3$ m, $c = 33.0$ m
   b) $\angle A = 57.1°, \angle B = 33.0°, a = 29.4$ cm
2. $\angle A = 65.0°, \angle B = 25.0°, c = 16.6$ cm
3. No; an additional side or angle is needed in order to solve the triangle.
4. 169.3 m

5. 50.2°

6. No; need to know the measure of at least one angle.

7. $\angle A = 60°$, $a = 13.8$ m, $c = 12.2$ m

8. 4.4 nautical miles

9. 15.5 cm

10. Either all three sides or two sides and the enclosed angle.

11. Answers may vary.

12. 118.3 km

13. $\angle M = 50.0°$, $\angle L = 50.0°$, $\angle K = 80.0°$

14. No; the rafter is too long; answers may vary.

15. 28.4°

16. 3.4 mm

17. cosine law; $\angle R = 43.7°$, $\angle P = 50.1°$, $\angle Q = 86.2°$

Chapter 1 Practice Test, pages 54–55

1.

2. $\angle A = 56.3°$, $\angle B = 33.7°$, $c = 6.9$ m

3. No; answers may vary.

4. 3.1°

5. $\angle C = 24°$, $a = 60.5$ m, $b = 59.6$ m

6. 39.2 m

7. $\angle B = 44°$, $\angle C = 68°$, $a = 20$ cm

8. 80.4°

9. $\angle A = 69.0°$, $\angle B = 57.6°$, $\angle C = 53.4°$

10. a) Since $\sin 90° = 1$, the sine law is the same as the primary trigonometric ratio for sine of a right angle; answers may vary.

b) Yes, since $\cos 90° = 0$, for some triangles it is the same as using the Pythagorean theorem; answers may vary.

CHAPTER 2

Probability, pages 56–97

Prerequisite Skills, pages 58–59

1. a) 0.97   **b)** 0.4   **c)** 0.15   **d)** 0.625

2. a) 0.425   **b)** 0.3077   **c)** 0.8333   **d)** 0.4444

3. a) $\dfrac{3}{4}$ **b)** $\dfrac{4}{25}$ **c)** $\dfrac{13}{20}$

   d) $\dfrac{1}{8}$ **e)** $\dfrac{1}{3}$ **f)** $\dfrac{1}{1000}$

4. a) $\dfrac{3}{10}$ **b)** $\dfrac{1}{4}$ **c)** $\dfrac{4}{5}$

   d) $\dfrac{9}{20}$ **e)** $\dfrac{2}{3}$ **f)** 1

5. a) $\dfrac{3}{4}$ **b)** $\dfrac{1}{3}$ **c)** 16   **d)** $\dfrac{1}{26}$

6. a) 0.75 or $\dfrac{3}{4}$ **b)** $0.\overline{3}$ or $\dfrac{1}{3}$

   c) 0.16 or $\dfrac{4}{25}$ **d)** 0.0385 or $\dfrac{1}{26}$

7. a) 18   **b)** $27.\overline{7}\%$ **c)** $\dfrac{5}{9}$ **d)** $\dfrac{2}{5}$

8. a) bar graph   **b)** 25   **c)** van

   d) $\dfrac{1}{5}$ **e)** 8%

9. a) 20   **b)** $\dfrac{2}{5}$ **c)** 70%

10. a) 20   **b)** 8   **c)** 35%   **d)** $\dfrac{17}{20}$

2.1 Probability Experiments, pages 60–67

1. a) $\dfrac{3}{10}$, 30%, 0.3   **b)** $\dfrac{7}{10}$; answers may vary.

2. $\dfrac{1}{5}$, 20%, 0.2

3. a) 12 times   **b)** 18 times

   c) $\dfrac{3}{5}$; answers may vary.

4. a) $\dfrac{9}{40}$ **b)** $\dfrac{19}{40}$ **c)** $\dfrac{3}{10}$

5. a) They should be the same height since heads and tails are equally likely; answers may vary.

   b) HT and TH   **c)** $\dfrac{19}{40}$ **d)** $\dfrac{21}{80}$

6. a) 90%

   b) No, heads and tails are equally likely; answers may vary.

7. a) No, $\dfrac{8}{240} = 3.\overline{3}\%$; answers may vary.

   b) Yes; answers may vary.

   c) Yes; answers may vary.

8. a) True; explanations may vary.

   b) True; explanations may vary.

9. a) 1000; answers may vary.

   b) Answers may vary.

10. a) Less than 50%; answers may vary.

   b) Answers may vary.

11. $\dfrac{4}{9}$; explanations may vary.

2.2 Theoretical Probability, pages 68–75

1. a) $\dfrac{1}{4}$ **b)** $\dfrac{3}{13}$ **c)** $\dfrac{10}{13}$

   d) $\dfrac{1}{26}$ **e)** 1   **f)** $\dfrac{3}{26}$

2. a) $\dfrac{1}{16}$ **b)** $\dfrac{3}{16}$

3. a) $\dfrac{1}{6}$ **b)** $\dfrac{1}{2}$ **c)** 0   **d)** $\dfrac{1}{2}$

4. a) $\dfrac{2}{5}$ **b)** $\dfrac{3}{25}$ **c)** $\dfrac{3}{5}$

5. a) $\dfrac{1}{36}$ **b)** $\dfrac{1}{18}$ **c)** $\dfrac{13}{18}$

   d) $\dfrac{1}{6}$ **e)** $\dfrac{5}{6}$

6. $\dfrac{1}{5}$

7. $\dfrac{1}{12}$; diagrams may vary.

8. a) 14 is impossible; answers may vary.

   b) All possible sums are between 2 and 12; answers may vary.

9. a) 6

   b) i) $\dfrac{1}{6}$ **ii)** $\dfrac{1}{3}$ **iii)** $\dfrac{1}{3}$ **iv)** $\dfrac{1}{3}$

10. a) $\frac{5}{6}$

b) P(second die will not match the first die) $= \frac{5}{6}$; answers may vary.

c) They are the only 2 possible outcomes; answers may vary.

11. a) $\frac{1}{4}$

b) The dart will not land outside the dartboard; answers may vary.

12. a) $\frac{1}{4}$ **b)** $\frac{3}{4}$; answers may vary. **c)** 0.625

13. a) $\frac{2}{3}$ **b)** $\frac{2}{3}$

c) Yes, if Ann is not between Bob and Cathy, then Bob and Cathy are standing beside each other.

14. $\frac{2}{3}$; answers may vary.

2.3 Compare Experimental and Theoretical Probabilities, pages 76–85

1. a) $\frac{1}{4}$ **b)** $\frac{13}{15}$

2. a) $\frac{4}{5}$ **b)** $\frac{1}{2}$

c) decrease; answers may vary.

3. a) 85% **b)** 70%

4. a) 1: $\frac{2}{15}$; 2: $\frac{1}{5}$; 3: $\frac{7}{30}$; 4: $\frac{1}{6}$; 5: $\frac{1}{5}$; 6: $\frac{1}{15}$

b) experimental; answers may vary.

5. a) i) $\frac{1}{3}$ **ii)** $\frac{2}{3}$ **iii)** 0

b) Too few trials were done to give an accurate experimental probability; answers may vary.

6. a) $\frac{1}{4}$ **b)** $\frac{1}{6}$

c) Yes; answers may vary. **d)** No; answers may vary.

7. a) Use the **rand** command six times, use a number less than 0.25 to represent rain, use a number greater than 0.25 to represent no rain; answers may vary.

b) Use **randInt(1,4,1)**.

8. a) 2 or 3, since there is a $\frac{1}{4}$ chance of being correct on each question and $\frac{1}{4}$ of 10 is 2.5.

b) Every time a 1 comes up, record it as a correct answer; answers may vary.

9. a) $\frac{1}{10}$ **b)** Answers may vary.

10. a) The average number of correct answers for each trial up to that one; answers may vary.

b) The scatter plot shows the average, on the whole, getting closer and closer to 2.5 as more trials are done. If more trials were done, the graph would likely continue getting closer to 2.5; answers may vary.

Average Number Correct
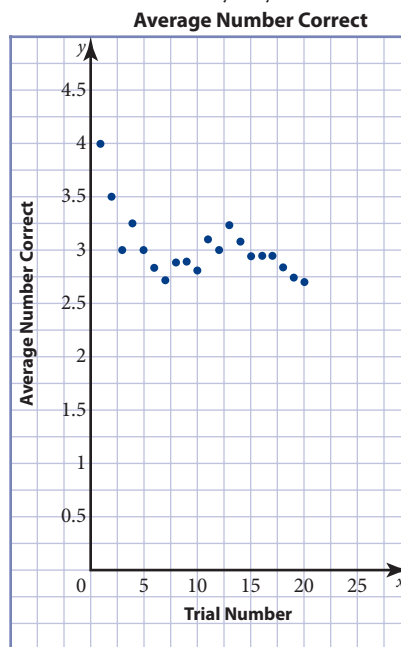
11. a) 0.4 **b)** It is larger.

c) More points are scored for red, so people will aim for it; answers may vary.

12. a) $\frac{3}{10}$ **b)** $\frac{3}{8}$

c) Some types of fish might be more difficult to catch than others; answers may vary.

14. lose; answers may vary.

15. a) It is fair; answers may vary.

b) Answers may vary.

c) Answers may vary.

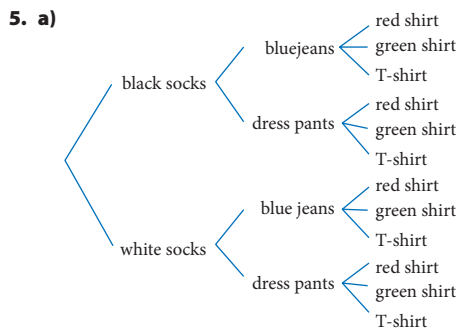**d)** Answers may vary.

16. Marucia; answers may vary.

2.4 Interpret Information Involving Probability, pages 86–93

1. a) 25% **b)** 65% **c)** 85%

2. a) 62.5% **b)** 19 **c)** Answers may vary.

3. a) 13 **b)** 89

4. a) 23 **b)** 35

5. a) hits divided by at-bats; answers may vary.

b) 12

c) Yes; explanations may vary.

6. a) $\frac{3}{4}$ **b)** 64% **c)** 16% **d)** 2 970 000

7. a) 65.5% **b)** 76%

c) $\frac{32}{19}$ is greater than $\frac{76}{65.5}$.

d) These numbers make the increase seem larger than the percents do; answers may vary.

8. a) about 23%

b) They have the largest populations in the world.

c) $\frac{5}{26}$

10. a) radio: 35%, television: 60% between 6:00 A.M. and 12:00 midnight, and 50% between 6:00 P.M. and 12:00 midnight

   b) No, the content must be broadcast between 6:00 A.M. and 6:00 P.M. on radio, and on television, 60% Canadian content must be broadcast between 6:00 A.M. and 12:00 midnight, and 50% Canadian content between 6:00 P.M. and 12:00 midnight.

   c) No, the TV show must meet certain requirements to be considered Canadian: the key producer must be Canadian, the key creative personnel are Canadian, and 75% of service costs and post-production lab costs are paid to Canadians.

   d) Answers may vary.

11. a) If the **rand** command produces a number less than 0.3, it rains, otherwise it does not rain; answers may vary.

   b) Answers may vary.

   c) 49%

Chapter 2 Review, pages 94–95

1. a) $\frac{3}{8}$ **b)** 37.5%   **c)** 0.375

2. a) No, 10 chips is not a large enough sample to determine if all the chips are working; answers may vary.

   b) Test chips regularly; answers may vary.

3. a) $\frac{13}{54}$ **b)** $\frac{1}{9}$ **c)** $\frac{2}{9}$ **d)** $\frac{5}{27}$

4. a) $\frac{1}{18}$ **b)** $\frac{17}{18}$ **c)** $\frac{1}{6}$

   d) $\frac{1}{3}$ **e)** 1   **f)** $\frac{11}{12}$

5. a)

   b) i) $\frac{1}{6}$ **ii)** $\frac{1}{2}$ **iii)** $\frac{1}{12}$ **iv)** $\frac{1}{3}$

6. a) 25%   **b)** No; answers may vary.

   c) 3; answers may vary.

7. a) $\frac{1}{2}$; answers may vary.   **b)** 0.8

   c) If there are extra points awarded for hitting red, then people will aim for it; answers may vary.

8. a) The calculator will generate 10 random integers between 1 and 5; answers may vary.

   b) 2; explanations may vary.

9. a) The calculator will generate a random number between 0 and 1; answers may vary.

   b) 10; explanations may vary.

10. a) 80%   **b)** 6

11. a) 16   **b)** $\frac{3}{13}$

Chapter 2 Practice Test, pages 96–97

1. C

2. A

3. D

4. false

5. a)
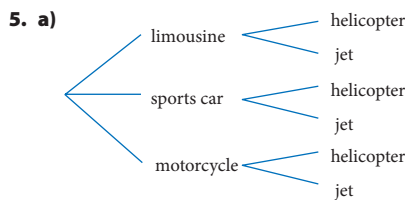
   b) i) $\frac{1}{6}$ **ii)** $\frac{2}{3}$ **iii)** $\frac{1}{3}$

6. a) 99 936   **b)** 71%

7. a) Divide a spinner into 3 areas, one with half the total area of the spinner, the other with one tenth the total area, and the other with the rest; answers may vary.

   b) Any number between 0 and 0.1 can be a loss of $30 000, any number greater than 0.5 can be a gain of $10 000, and any other number would be no loss or gain; answers may vary.

   c) Answers may vary.

8. a) red: 40°, blue: 80°, yellow: 240°

   b) i) $\frac{1}{9}$ **ii)** $\frac{8}{9}$

   c) A result of 1 indicates red, a result of 2 to 3 indicates blue, and a result of 4 to 9 indicates yellow; answers may vary.

   d) Answers may vary.

   e) $\frac{4}{9}$

CHAPTER 3

One Variable Statistics, pages 98–163

Prerequisite Skills, pages 100–101

1. a) 1, 4, 4, 5, 5, 7, 8, 9, 9, 11, 15, 19

   b) 1, 1, 2, 2, 3, 3, 3, 4, 5, 5, 6, 6, 7, 9, 11, 12

   c) −11, −5, −3, −3, 0, 1, 1, 4, 5, 5, 7, 8, 12

   d) $\frac{3}{16}, \frac{1}{4}, \frac{1}{2}, \frac{5}{8}$

2. a) 41.17   **b)** 10.5   **c)** 70.71   **d)** 59.6   **e)** 4.35

3. a) 11   **b)** 6.86   **c)** 5   **d)** 3.74

4. a) bar graph   **b)** hockey   **c)** curling

   d) No, two people like curling, so it is popular among some people; answers may vary.

5. a) entertainment   **b)** $207.40

6. a) scatter plot   **b)** about 18°C

   c) about 30°C; answers may vary.

   d) Whether the temperature continues to increase, decreases, or stays the same; answers may vary.

7. a) histogram   **b)** 34

3.1 Sampling Techniques, pages 102–109

1. convenience sampling

2. a) combined stratified random sampling and systematic sampling

   b) Probably; answers may vary.

   c) Choose random numbers to form the teams; answers may vary.

3. a) voluntary-response sampling; answers may vary.

   b) stratified random sampling; answers may vary.

   c) stratified random sampling; answers may vary.

   **d)** simple random sampling; answers may vary.

4. a) sample: teenagers at local library; population: all students at Zoe's school

b) sample: Enrica and her friends; population: "Canadian Idol" viewers

c) sample: surveyed stores; population: toothpaste sellers

d) sample: people pass Tony; population: all voters

e) sample: people at gym at that time; population: all member of Angelo's gym

f) sample: students in Maya's science class; population: all students in Maya's grade

5. a) Those who do not respond or those the government does not know about; answers may vary.

b) No sampling technique is used, since the government does not need to choose which Canadians to survey. The representative sample is the population. Because the representative sample is so large, it costs too much money and takes too much time to be carried out every year; answers may vary.

c) Yes, since the remaining 3% of the population would probably respond similarly to the 97% that were surveyed; answers may vary.

6. Probably not; it could be a coincidence; answers may vary.

7. a) Ontario high school graduates

b) It would be too expensive and time-consuming to survey them all; answers may vary.

c) Telephone high schools to obtain their graduates' contact information.

d) Cluster sampling; survey every graduate from a few randomly-selected schools; answers may vary.

8. a) simple random sampling

b) No; the number of defective bolts might be changing; answers may vary.

c) He could specify exactly how each bolt is defective; answers may vary.

9. a) Yes; about 10% of each grade is surveyed; answers may vary.

b) Yes; each grade gets a fair representation; answers may vary.

11. a) simple random sampling; the vehicles are chosen randomly.

b) Answers may vary.

c) Very unlikely; there are many possible times between 2 P.M. and midnight, and only a 1 in 20 chance that the same gate would be chosen; answers may vary.

12. a) sample: selected students at the two schools; population: all elementary school students in the school district

b) 20 in grade 4, 25 in grade 5, 30 in grade 6, and 25 in grade 7.

c) 20 in grade 4, 20 in grade 5, 30 in grade 6, and 30 in grade 7.

d) Use a random number generator; answers may vary.

3.2 Collect and Analyse Data, pages 110–117

1. a) Dharma's observations are primary data because she collected information for herself. The cafeteria staff's observations are secondary data because they collected the information for Dharma.

b) Both should be accurate; answers may vary.

2. a) combined voluntary-response sampling and systematic random sampling

b) No; those who returned the survey are probably like-minded people; answers may vary.

c) Answers may vary.

d) Maybe; since the 56% of people responded, it is likely that he will be able to gather reliable information from the survey; answers may vary.

3. a) response bias; only asking football fans and worrying them about relocation; change question to: *Should the provincial and federal governments help build a new stadium?* and ask people outside the game; answers may vary.

b) non-response bias; only the most opinionated people will call in; offer an entry in a contest for a calling as an incentive ; answers may vary.

c) non-response bias; only the most opinionated people will return the survey; offer some incentive for the less opinionated to return the survey, such as an entry in a contest; answers may vary.

d) response bias; the question is clearly biased against the development of the subdivision; change question to: *Are you for or against the decision made by a developer to close this mall in order to build a subdivision?*

4. a) measurement bias

b) Have the question in one type size and alphabetize the options.

5. How do you think the $2000 raised in the last fundraiser should be spent? Randomly selecting a representative sample from each grade; answers may vary.

6. Answers may vary.

7. a) Yes; more people in favour could have called in because they were losing and fewer people opposed could have called in because they were winning.

b) Call and ask others in favour to vote too.

8. Probably; since pilots have nothing to gain or lose by deliberately reporting negatively or positively about air traffic controllers; answers may vary.

9. a) Ask students at your school at random; ask each of your friends to ask ten people the question and then report their responses to you; answers may vary.

b) Primary data; since it is difficult to know whether your friends asked the question without any bias; answers may vary.

10. a) Get honest data; answers may vary.

b) No; Spyware reflects the sample accurately unless someone can block it; answers may vary.

c) telephone-tapping, intercepting e-mails, stealing mail, searching garbage, inappropriate use of medical or banking records

11. It is very vague and might draw a wide range of answers; answers may vary.

12. a) Terence: primary data; Linda: secondary data

b) Terence: the list is objective and comes from a very large sample; because radio listeners enjoyed certain songs does not mean that students at his school will enjoy the same playlist. Linda: the list reflects the music preferences of students in the school; responses might be rushed. Answers may vary.

c) Find a way to combine their data; answers may vary.

13. a) Yes, all four preferred Proteeth.

b) They knew that dentists would prefer a toothpaste that fights cavities, gingivitis, and plaque, so they would prefer Proteeth; answers may vary.

c) Give the dentists several brands of toothpaste that fight cavities, gingivitis, and plaque.

15. Answers may vary.
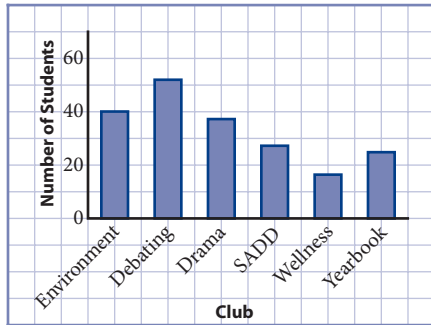
16. Answers may vary.

3.3 Display Data, pages 118–129

1. **a)** discrete
   b) continuous
   c) continuous
   d) discrete

2. **a)** Bar graph, since the data is discrete and values are wanted for comparison; answers may vary.
   b) Histogram, since the data is continuous; answers may vary.
   c) Circle graph, since the data is discrete and part of a total amount; answers may vary.
   d) Bar graph, since the data is discrete and values are wanted for comparison; answers may vary.
   e) Histogram, since the data is continuous; answers may vary.
   f) Circle graph, since the data is discrete and part of a total amount; answers may vary.

3. **a)** No, since the data is continuous; answers may vary.
   b) Yes, though the information about the cities would be gone. Instead, the histogram would display the frequency of each amount of snow in those five cities.

4. The line graph shows continuous data; the circle graph shows discrete data.

5. **a)**

Score Interval	Tally	Frequency
[30, 40)	||	2
[40, 50)	|	1
[50, 60)	|||	3
[60, 70)	⦀⦀	5
[70, 80)	⦀⦀ ||	7
[80, 90)	⦀⦀	5
[90, 100]	|	1

b)
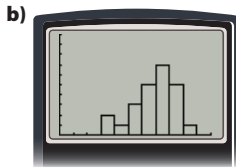
6.

Students in School Clubs

7. Tomas is correct, height is continuous, so a histogram should be used.

8. Answers may vary.

9. Favourite ice-cream flavours; life-spans of a group of salmon tagged in the wild; answers may vary.

10. Answers may vary.

11. **a)** Discrete; bar graph, since the data is discrete; answers may vary.
   **b)** Discrete; bar graph, since the data is discrete; answers may vary.
    c) Continuous; histogram, since the data is continuous; answers may vary.
    d) Discrete; bar graph, since the data is discrete; answers may vary.
    e) Discrete; bar graph, since the data is discrete; answers may vary.

13. Answers may vary.

14. **a)**

Weekly Closing Stock Price
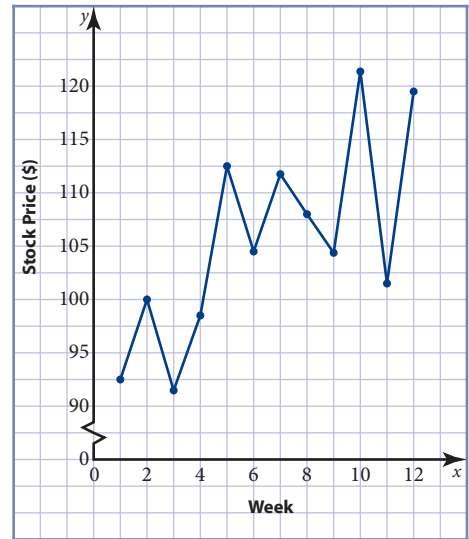
b) Yes, the price changes dramatically from week to week; answers may vary.

c)

Weekly Closing Stock Price
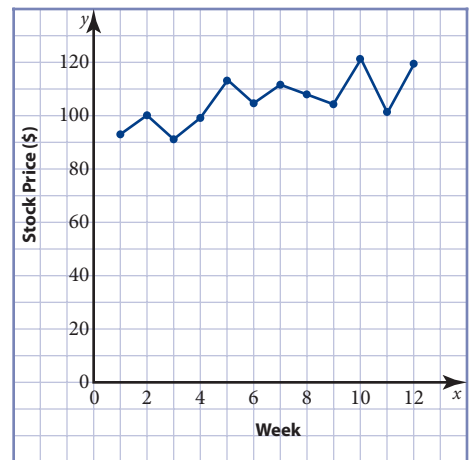
d) less volatile

e) The second graph so that the stock appears less volatile; the first graph because it makes the stock look unpredictable and unstable.

3.4 Measures of Central Tendency, pages 130–139

1. a) mean: 29.3; median: 29; mode: 21 and 38
   b) mean: 63.1; median: 64.5; mode: no mode
2. mean: $31.25; median: $10; mode: $10
3. a) mean: 382.2; median: 364; mode: no mode
   b) mean: 403.8; median: 437; mode: no mode
4. a) median: [170–175); mode: [165–170)
   b) The median; most values are within 10 cm of it.
5. Shoe size; answers may vary.
6. The mean can get distorted by outliers, but not the median; answers may vary.
7. a) mean: 7; median: 7; mode: 7
   b) The mode; because it is the highest bar.
   c) The mode describes the most common shoe size.
8. a) mean: 37 000; median: 38 000; mode: 41 000 and 43 000
   b) The median; it describes the average and there are no outliers; answers may vary.
   c) Weather, attractions, location, or the duration of the fair might vary from year to year; answers may vary.
9. a) Lionel: mean: 21.3; median: 22; mode: 22
   Jeffrey: mean: 20.9; median: 21; mode: 21
   b) The median best represents Lionel's performance, because he has several outliers; the mean best represents Jeffrey's performance because he was very consistent.
   c) Lionel; all three of his measures of central tendencies higher.
**10. a)**

Position	Hits	At-Bats	Batting Average
1st base	26	71	0.366
2nd base	38	84	0.452
3rd base	25	62	0.403
shortstop	31	67	0.463
catcher	28	70	0.400
pitcher	12	39	0.308
left field	41	88	0.466
centre field	52	88	0.591
right field	47	88	0.534

   b) 0.443   **c)** 0.457
   d) The team's batting average is higher than the mean batting average; not every player has the same number of at-bats; better batters generally have more at-bats.
   e) 0.530   **f)** 0.530
   g) All the fielders have the same number of at-bats; their means have the same denominator.
12. Answers may vary.
13. a) $x = 18$ **b)** $x > 13$ **c)** $x = 11$ or $x = 8$
14. 164

3.5 Measures of Spread, pages 140–147

1. a) 122
   b) first quartile: 108; third quartile: 139.5
   c) 31.5
2. a) 51   **b)** 30   **c)** 9   **d)** 46
3. 52
4. 102
5. a) 12.4 g   **b)** 6 m
   c) 8.9 cm   **d)** 4.2 L
6. a) 198.81 cm   **b)** 12.25 kg
   c) $484   **d)** 44.89 mL
7. a) variance: 108; standard deviation: 10.4
   b) variance: 7.3; standard deviation: 2.7
   c) variance: 5.1; standard deviation: 2.3
   d) variance: 10.9; standard deviation: 3.3

8. There is more variation in the heights of the players on Team Two.
9.
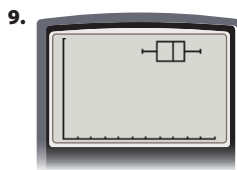
10. Ingrid; she is less likely to have a very low scoring game.
11. a) 0.071 cm   **b)** 0   **c)** 0%
   d) Probably not; the failure rate could be 2% or 3% and it likely would not be measured by testing just 10 pistons; answers may vary.
12. range: 21 000; variance: 37 420; standard deviation: 6117
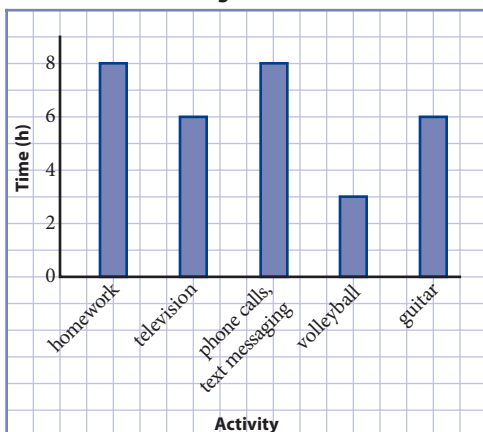**14.** Answers may vary.

3.6 Common Distributions, pages 148–155

1. a) skewed left
   b) bimodal
   c) normal
   d) skewed right
2. a) The lengths of hairs on a cat; answers may vary.
   b) The masses of pumpkins in a giant pumpkin contest; answers may vary.
   c) The times for male and female Olympic athletes in the 100 m dash; answers may vary.
3. a) bimodal
   b) Girls might be, on the average, better or more focused readers than boys at this age; answers may vary.
4. a) To make sure that the mean dress size is close to the mean dress size of its customers; answers may vary.
   b) Yes; to make sure the standard deviation of dresses is similar to the standard deviation of the sizes of customers; answers may vary.
5. a) Bimodal, there are many homeowners between 35 and 45 years old, and many between 55 and 65 years old.
   b) To direct campaigning and advertising towards 35 to 45 and 55 to 65 year olds.
   c) mean: about 50; median: about 50
6. a) Skewed to the right; lots of highly paid employees; answers may vary.
   b) The mode because it is the greatest measure of central tendency; answers may vary.
   c) The median, since it is less than the mode and the mean; answers may vary.
8. 1360
9. Answers may vary.

Chapter 3 Review, pages 156–157

1. a) convenience sampling
   b) voluntary-response sampling
   c) stratified random sampling
2. Survey 60 females and 40 males.
3. Number the people from 1 to 200, then generate 15 random numbers between 1 and 200.
4. *Do you think a carnival should be held for this year's Spirit Week?*
5. a) response bias
   b) non-response bias
   c) measurement bias
6. a) systematic random sampling
   b) Not everyone will return the survey.

7. a) circle graph, bar graph

b)

Le Hing's Activities

Le Hing's Activities

- ■ doing homework
- ■ watching television
- ■ making phone calls and text messaging
- ■ playing volleyball
- ■ practising guitar

8. a) 3   **b)** 12   **c)** It is continuous.

9. a) mean: 59.92; median: 59; mode: 21
  b) mean: 7.39; median: 6; mode: 6
  c) mean: 72.62; median: 73; mode: no mode

10. a) mean: $83.33; median: $25; mode: $25
  b) The mean, since the median and mode only represent one price; answers may vary.

11. a) range: 63; variance: $305.\overline{5}$; standard deviation: 17.48
  b) range: 23; variance: 48; standard deviation: 6.93

12. Answers may vary.

13. a) The mode is near the left or right side of the data; for example, the masses of body-builders; answers may vary.
  b) There are two modes in the data, or two peaks in the histogram; for example, the hair length of both men and women; answers may vary.
  c) The mode is in the middle, making a perfect normal curve; for example, the scores on a science test.

14. a)

Mark Interval	Tally	Frequency
[30-40)	|	1
[40-50)	||||	4
[50-60)	╫ |	6
[60-70)	╫ ╫	10
[70-80)	╫ ||	7
[80-90)	|||	3
[90-100]	|	1
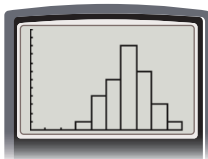
b) Yes, the median, mean, and mode are all at the centre, and the graph is almost symmetrically bell-shaped.

1. A
2. B
3. C
4. a) primary
  b) primary or secondary, depending on the information
  c) primary
  d) secondary
5. a) response bias, since it is clear that the question is trying to get a positive response; answers may vary.
  b) measurement bias, since only a few types of shows are shown, and people may not take the time to fill in the "Other" box, even if their favourite type of show is not sports, reality, or crime drama; answers may vary.
6. a) *Should we allow private-sector investment in our transit system?*
  b) *What is your favourite type of television show?*
7. a) 0.1 cm
  b) 1.3 cm to 1.7 cm
  c) 1.13 cm to 1.17 cm
  d) The manufacturing process for nuts may be more accurate and less prone to irregularity than that for washers, or it may be more important for nuts to have a lower standard deviation than for washers; answers may vary.
8. a) range: $31 900; mean: $46 150; median: $42 050; mode: $58 000
  b) decrease, since in the first week people go there because it is new. After that, they only go if they really enjoyed it; answers may vary.
9. range: 48 min; variance: $227.\overline{5}$ min; standard deviation: 15.08 min
10. a) bar graph   **b)** normal distribution

1. $\sin A = \frac{4}{5}$, $\cos A = \frac{3}{5}$, $\tan A = \frac{4}{3}$

2. 115 m

3. a) $b = 50.2$ cm, $c = 50.2$ cm, $\angle C = 86°$
  b) $e = 32.3$ cm, $\angle D = 84.7°$, $\angle F = 45.3°$

4. $e = 6.7$ m

5. $\frac{3}{4}$

6. a) $\frac{1}{50}$ **b)** $\frac{1}{10}$ **c)** $\frac{9}{10}$ **d)** $\frac{97}{100}$ **e)** $\frac{1}{10}$

7. a) Green: 60%; Purple: 40%; Red: 0%
  b) Green: 36.7%; Purple: 60%; Red: 3.3%

8. a) 20%   **b)** 12 hits
  c) The player may get injured, may get better at getting hits; answers may vary.

9. a) Sample: readers who return the form; population: all readers
 **b)** Sample: his neighbours; population: all people in the town

10. Answers may vary.
  a) Not everyone who uses the cafeteria was surveyed so there is a non-response bias; more people can be asked for their opinion so the population is better represented.
  b) Students may not volunteer the information resulting in response bias; ask students privately or ask students for proof or progress.
  c) The wording of the question will affect responses so there is response bias; ask a simpler question: *Should cell phones be banned from the hallways and cafeteria?*

11. a)

Grade 10 Election Results
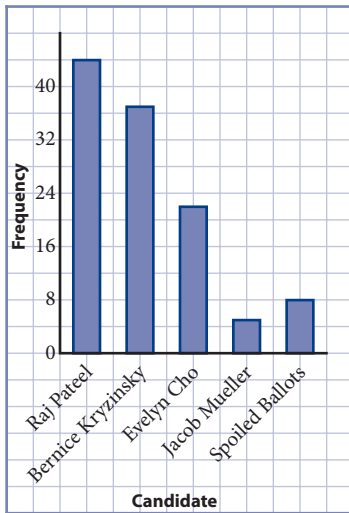
b) Raj Pateel won the vote, there were a total of 116 votes cast, 7% of the ballots were spoiled; answers may vary.
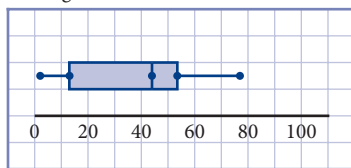
12. a) mean: 2.87, median: 2, mode: 2

  b) The mode because it occurs more than twice as often as any other frequency; answers may vary.

13. a) range: 75, variance: 562.76, standard deviation: 23.72

  b) range: 8, variance: 4.88, standard deviation: 2.21

14.

CHAPTER 4

Quadratic Relations I, pages 164–229

Prerequisite Skills, pages 166–167

1. a) 13.1 **b)** −1.7
  c) −7.7 **d)** −17.1
2. a) −6.5 **b)** 26.1
  c) −10.5 **d)** −6.7
3. a) 41.4 **b)** −25.2
  c) −130 **d)** 10.65
4. a) $-2x$ **b)** $7x^2 + 3x + 10$
  c) $8x^2 - 2x$ **d)** $-8x^2 + 2x + 2$
5. a) 0 **b)** 6
  c) 96 **d)** −202
6. a) −18 **b)** 47
  c) −100 **d)** 151
7. a) 192 **b)** −183
  c) −363 **d)** 2284

8. a)

x	y
−2	−10
−1	−7
0	−4
1	−1
2	2

b)

x	y
8	17
12	15
16	13
20	11
24	9

9. a)

b)
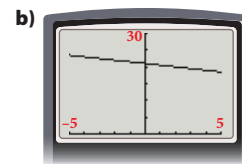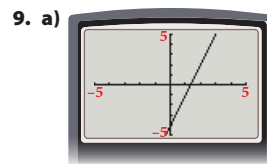
b) a) slope: 3; y-intercept: −4

  b) slope: −0.5; y-intercept: 21

10. a)

x	y	First Differences
3	8	
		7
4	15	
		8
5	23	
		8
6	31	
		8
7	39	

b)

x	y	First Differences
13	0	
		1
14	1	
		3
15	4	
		5
16	9	
		7
17	16	

c)

x	y	First Differences
−5	3	
		0
−4	3	
		0
−3	3	
		0
−2	3	
		0
−1	3	

11. a) slope: $-\dfrac{1}{2}$; y-intercept: 3

  b) slope: 5; y-intercept: 1

  c) slope: 2; y-intercept: −4

  d) slope: $\dfrac{2}{5}$; y-intercept: $-3\dfrac{4}{5}$

**12. a)** a translation of 4 units down

  b) a translation of 3 units up and 4 units right

 **c)** a reflection in the vertical line halfway between the pentagons

  d) a rotation about the point $(-1.5, 0)$

4.1 Introduction to Quadratic Relations, pages 168–179

1. a) quadratic **b)** linear
  c) neither **d)** quadratic
  e) neither **f)** neither

2. a) Not quadratic; the first difference is always 9.

  b) Not quadratic; the second difference is not constant.

  c) Quadratic; the second difference is always 16.

  d) Not quadratic; the second difference is not constant.

3. a) i) Quadratic; the highest power is x^2.

    ii) Not quadratic; there is no x^2 term.

    iii) Quadratic; the highest power is x^2.

    iv) Not quadratic; there is no x^2 term.

    v) Quadratic; the highest power is x^2.

    vi) Not quadratic; there is no x^2 term.

b) i)

ii)

iii)

iv)

v)

vi)
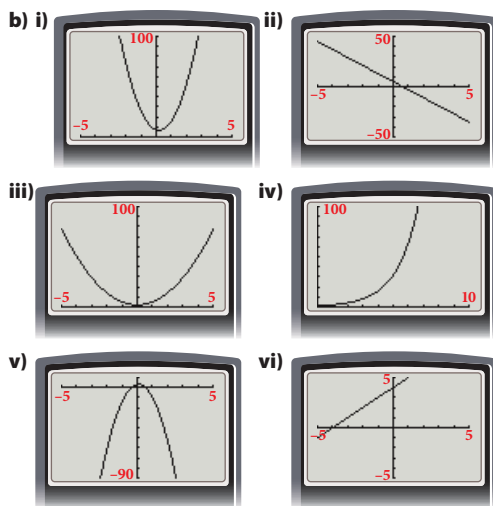
4. a) minimum: 4 m   **b)** maximum: 82 m

c) minimum: 0 m

5. a)
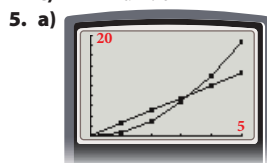
b) Carl's distance-time relationship is quadratic since his graph is a parabola.

6. a)

Time (s)	Height (m)
0	150.0
1	145.1
2	130.4
3	105.9
4	71.6
5	27.5

b) Yes, it is quadratic because of the t^2 term in the relation and because the second differences in the heights are constant, -9.8.

c)
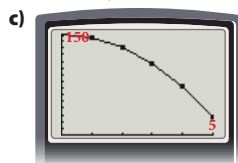
7. a) On Earth:

Time (s)	Height (m)
0	0
1	10.1
2	10.4
3	0.9

On the moon:

Time (s)	Height (m)
0	0
2	26.8
4	47.2
6	61.2
8	68.8
10	70.0
12	64.8
14	53.2
16	35.2
18	10.8

b) Curve A models the motion of the ball on the moon since the ball goes higher and takes longer to land; Curve B models the motion of the ball on Earth.

8. a) four

b) A quadratic relation has a squared variable, and a square has four sides; answers may vary.

9. a)

Length (m)	Width (m)	Perimeter (m)
40	10	2(40) + 2(10) = 100
35	15	2(35) + 2(15) = 100
30	20	2(30) + 2(20) = 100
25	25	2(25) + 2(25) = 100
20	30	2(20) + 2(30) = 100
15	35	2(15) + 2(35) = 100
10	40	2(10) + 2(40) = 100

b)

Length (m)	Width (m)	Perimeter (m)	Area (m²)
40	10	2(40) + 2(10) = 100	400
35	15	2(35) + 2(15) = 100	525
30	20	2(30) + 2(20) = 100	600
25	25	2(25) + 2(25) = 100	625
20	30	2(20) + 2(30) = 100	600
15	35	2(15) + 2(35) = 100	525
10	40	2(10) + 2(40) = 100	400

c)

d) 25 m by 25 m

10. a)
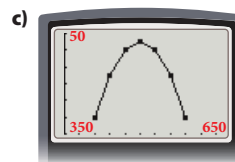
Horizontal Distance From Cliff (m)	Vertical Distance From the Base of Cliff (m)
0	11.25
1	11.20
2	11.05
3	10.80
4	10.45
5	10.00
6	9.45
7	8.80
8	8.05
9	7.20
10	6.25
11	5.20
12	4.05
13	2.80
14	1.45
15	0

b)
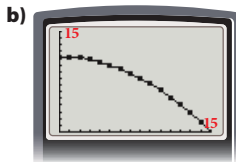
c) 15 m

12. 13.3 s; 266.7 m

13. Oliver

14. a) No; the second difference is not constant; answers may vary.
b) No; the second difference is not constant; answers may vary.

15. Answers may vary.

4.2 The Quadratic Relation $y = ax^2 + k$, pages 180–193

1. a) $0 < a < 1$ **b)** $a < -1$
   c) $0 > a > -1$ **d)** $a > 1$
2. a) positive **b)** negative
   c) positive **d)** negative
3. a) $k = 3$; vertex: $(0, 3)$ **b)** $k = -2$; vertex: $(0, -2)$
   c) $k = 5$; vertex: $(0, 5)$ **d)** $k = -7$; vertex: $(0, -7)$
4. a) stretched vertically by a factor of 3
   b) translated up by 3 units, has vertex $(0, 3)$
   c) reflected in the x-axis and compressed vertically
   d) translated down by 12 units, has vertex $(0, -12)$
   e) compressed vertically and translated up 13 units, has vertex $(0, 13)$
   f) reflected in the x-axis, stretched vertically and translated up 6 units, has vertex $(0, 6)$
   g) reflected in the x-axis, compressed vertically and translated down 5 units, has vertex $(0, -5)$
   h) stretched vertically and translated down 9 units, has vertex $(0, -9)$
5. a) $0 < a < 1, k > 0$ **b)** $a > 1, k < 0$
   c) $a < -1, k < 0$ **d)** $0 > a > -1, k > 0$
6. a) $y = 4x^2 - 6$
   b) $y = -0.04x^2 + 5$
   c) $y = \dfrac{5}{9}x^2 - 3$

7. a) widest: $y = 0.2x^2$ because $0.2 < 5$
   farthest from x-axis: $5x^2 + 6$ because $6 > 0$
   b) widest: $y = -0.4x^2 - 8$ because $0.4 < 3$
   farthest from x-axis: $y = 3x^2 + 9$ because $9 > 8$
   c) widest: $y = 2x^2 - 5$ because $2 < 5$
   farthest from x-axis: $y = 5x^2 + 7$ because $7 > 5$
   d) widest: $y = 0.1x^2$ because $0.1 < 0.25$
   farthest from x-axis: $y = 0.25x^2 + 11$ because $11 > 0$
   e) widest: $y = 0.03x^2 + 2$ because $0.03 < 0.2$
   farthest from x-axis: $y = 0.03x^2 + 2$ because $2 > 1$
   f) widest: $y = 0.9x^2 + 6$ because $0.9 < 1$
   farthest from x-axis: they are both the same distance from the x-axis since $6 = 6$
**8. a)** 1.79 m after 0.5 s, 1.15 m after 1 s
   b) 1.53 s
9. a)
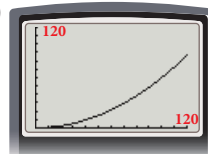
b) i) 15 m **ii)** 21.6 m **iii)** 60 m **iv)** 72.6 m
   c) in the city: 6.6 m; on the highway: 12.6 m. The stopping distance increases by about two times as much when going 10 km/h over the speed limit on the highway.
10. Answer may vary.
   a) $(0, 6)$ **b)** -0.06 **c)** $y = -0.06x + 6$
11. a) 19.6 m **b)** 4.0 s
12. 33.9 m

4.3 The Quadratic Relation $y = a(x - h)^2$, pages 194–203

1. a) $h = 5$; vertex is $(5, 0)$
   b) $h = -3$; vertex is $(-3, 0)$
   c) $h = -7$; vertex is $(-7, 0)$
   d) $h = 2$; vertex is $(2, 0)$
2. a) $a = 1$, so the graph is neither stretched nor compressed; $h = 7$, so the graph is translated 7 units to the right.
   b) $a = -1$, so the graph is neither stretched nor compressed, but it is reflected in the x-axis; $h = -3$, so the graph is translated 3 units to the left.
   c) $a = 1.5$, so the graph is vertically stretched; $h = -8$, so the graph is translated 8 units to the left.
   d) $a = -0.8$, so the graph is vertically compressed and reflected in the x-axis; $h = 2$, so the graph is translated 2 units to the right.
   e) $a = 0.1$, so the graph is vertically compressed; $h = 5$, so the graph is translated 5 units to the right.
   f) $a = 2$, so the graph is vertically stretched; $h = -1$, so the graph is translated 1 unit to the left.
   g) $a = -2$, so the graph is vertically stretched and reflected in the x-axis; $h = 8$, so the graph is translated 8 units to the right.
   h) $a = 0.3$, so the graph is vertically compressed; $h = -14$, so the graph is translated 14 units to the left.
3. a) The graph is vertically stretched and translated 7 units to the right, so $a > 1$ and $h = 7$.
   b) The graph is vertically compressed, reflected in the x-axis, and translated 5 units to the left, so $0 > a > -1$ and $h = -5$.
   c) The graph is neither vertically compressed nor stretched, but it is translated 8 units to the left, so $a = 1$ and $h = -8$.
   d) The graph is vertically stretched, reflected in the x-axis and translated 2 units to the right, so $a < -1$ and $h = 2$.

4. a) $y = -2(x - 4)^2$ **b)** $y = 0.5(x + 5)^2$

5. a) $y = 2(x + 3)^2$; because $3 > 1$
   b) $y = -0.2(x - 8)^2$; because $8 > 3$
   c) $y = 32(x - 10)^2$; because $10 > 3$
   d) $y = 0.85(x + 9)^2$; because $9 > 2$

6. So that a positive h means a translation to the right and a negative h means a translation to the left.

7. a)
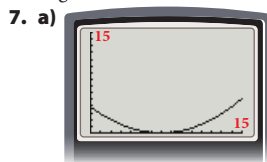
   b) 14.07 cm

8. a) -17.07
   b) Decrease; if the mountain biker has a greater speed when travelling horizontally, he will have to jump sooner so that he does not overshoot the ramp.
   c) -24.14

9. a) $(282, 0)$ **b)** 0.000 85
   c) $y = 0.000\ 85(x - 282)^2$ **d)** 67.60 m

10. a)

x	$y = (x - 3)^2$	$y = 3 + \sqrt{x}$	$y = 3 - \sqrt{x}$
0	9.00	3.00	3.00
1	4.00	4.00	2.00
2	1.00	4.41	1.59
3	0.00	4.73	1.27
4	1.00	5.00	1.00
5	4.00	5.24	0.76
6	9.00	5.45	0.55
7	16.00	5.65	0.35

   b)
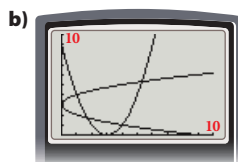
   c) They are similar in that they have the same shape, but they are different in that one is a reflection of the other through the line $y = 3$; answers may vary.

4.4 The Quadratic Relation $y = a(x - h)^2 + k$, pages 204–217

1. a) i) $(5, 1)$ **ii)** positive
   b) i) $(-2, -7)$ **ii)** positive
   c) i) $(-4, -2)$ **ii)** negative
   d) i) $(2, 6)$ **ii)** negative
   e) i) $(-8, 4)$ **ii)** positive
   f) i) $(6, -2)$ **ii)** negative
   g) i) $(2, -5)$ **ii)** positive
   h) i) $(-8, 1)$ **ii)** negative

2. a) i) $(3, 12)$ **ii)** upward   **iii)** stretched
   b) i) $(10, -1)$ **ii)** downward   **iii)** compressed
   c) i) $(-4, -8)$ **ii)** downward   **iii)** stretched
   d) i) $(-20, -5)$ **ii)** downward   **iii)** neither
   e) i) $(11, -3)$ **ii)** upward   **iii)** compressed
   f) i) $(-2, 9)$ **ii)** upward   **iii)** stretched
   g) i) $(-6, 7)$ **ii)** downward   **iii)** compressed
   h) i) $(8, 2)$ **ii)** upward   **iii)** stretched
   i) i) $(-2, -1)$ **ii)** upward   **iii)** stretched
   j) i) $(4, 6)$ **ii)** downward   **iii)** compressed

3. a)

   b)

   c)

   d)

   e)

   f)

   g)

   h)
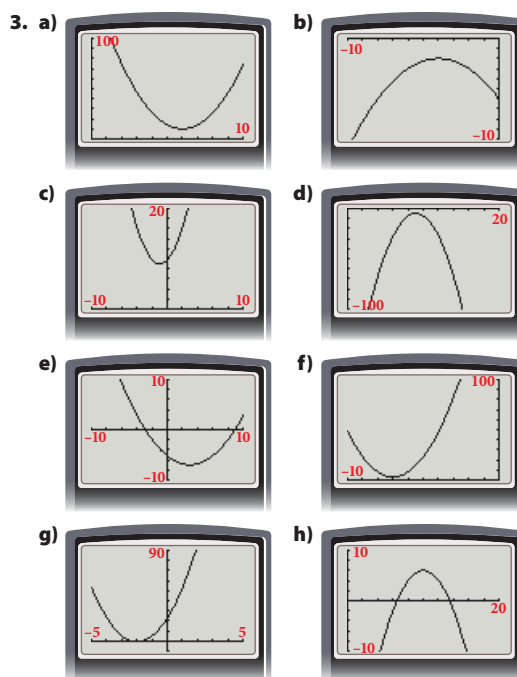
4. a) $(0, 0)$ $y = 3x^2$
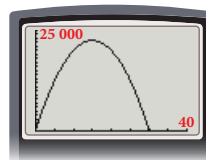   **b)** $(7, 3)$ $y = 0.375(x - 7)^2 + 3$
   c) $(-4, 8)$ $y = -6(x + 4)^2 + 8$
   d) $(-6, 1)$ $y = 0.5(x + 6)^2 + 1$

5. a) $y = 0.01(x + 2)^2 - 3$
   b) $y = -2(x - 8)^2 + 3$
   c) $y = 10(x - 5)^2 - 7$
   d) $y = -4(x + 3)^2 - 1$

6. a) $(8.7, 7.6)$ **b)** 0.031 m
   c)
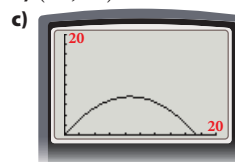
   d) the football's greatest height above ground

7. a)

Ticket Price, P ($)	Total Revenue, R ($)
0	0
5	12 500
10	20 000
15	22 500
20	20 000
25	12 500
30	0

   b) $(15, 22\ 500)$; y-coordinate is the greatest total revenue, x-coordinate is the amount that, when used as the ticket price, results in this total revenue.

8. a) $m = 83.3(s - 30) + 9800$
  b) 8133.3 m
9. a) 2.3 m
  b) (9.5, 5); when the biker is 9.5 m horizontally from the end of the ramp, the biker's height is 5 m.
  c)
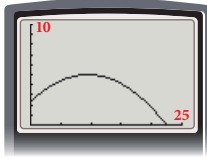
  d) 22.4 m from the ramp
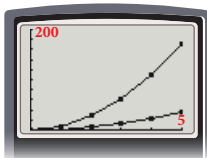**11.** Answers may vary.
12. Yes; explanations may vary.

4.5 Interpret Graphs of Quadratic Relations, pages 218–225
1. a) -7 **b)** 20   **c)** 2895   **d)** 3.375
  e) -3 **f)** 3.312   **g)** -1.8 **h)** -21
2. a) x-intercepts: -10, 2; y-intercept: -5; minimum: -9; vertex: $(-4, -9)$
  b) x-intercepts: -2, -6; y-intercept: -6; maximum: 2; vertex: $(-4, 2)$
  c) x-intercepts: 2, -20; y-intercept: 4; maximum: 12; vertex: $(-9, 12)$
  d) x-intercepts: -3, 1; y-intercept: -6; minimum: -8; vertex: $(-1, -8)$
  e) x-intercepts: none; y-intercept: 12; minimum: 3; vertex: $(6, 3)$
  f) x-intercepts: 2, -10; y-intercept: 10; maximum: 18; vertex: $(-4, 18)$
3. a) $-3(x - 3)^2 + 27$ **b)** $-0.5x^2 + 24.5$
  c) $-0.1(x - 10)^2 + 10$ **d)** $15x^2$
4. a) 2 s, 169.6 m   **b)** 125.5 m
5. a) Smart Car Fortwo

Time, t (s)	Distance, d (m)
0	0
1	1.4
2	5.6
3	12.6
4	22.4
5	35.0

Tesla Roadster

Time, t (s)	Distance, d (m)
0	0
1	6.9
2	27.6
3	62.1
4	110.4
5	172.5

  b) 137.5 m, the coefficients of t^2
  c) first second 1.4 m and 6.9 m; fourth second 9.8 m and 48.3 m; the speed is increasing for each time period.

6. Answers may vary.
7. a) $h = -5(t - 4.5)^2 + 101.25$
  b) 90.23 m; yes after 6 s, the first time is when the projectile is rising and the second time is when it is falling, explanations may vary.
8. a)
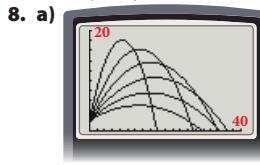
  b) 45°   **c)** 75°   **d)** the height of the ski ramp
9. 2.8 s
10. a) 1.9 m from the vertex   **b)** 2.8 cm from the vertex

Chapter 4 Review, pages 226–227
1. a) No; the greatest exponent is 1.
  b) Yes; the greatest exponent is 2.
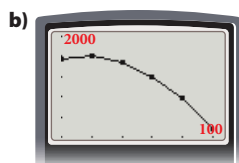 **c)** No; the second differences are not constant.
2. a)

Time (s)	Height (m)
0	0
0.5	8.3
1.0	12.1
1.5	13.5
2.0	12.4
2.5	8.9
3.0	2.9

  b) about 1.5 s   **c)** about 3.1 s
  d) The second differences are constant, when graphed the points in the table form a parabola, and there is a t^2 term.
3. a) no stretch, translated 3.4 units down
  b) reflected in the x-axis, vertically compressed, has not been translated
  c) vertically compressed, translated 15 units up
  d) vertically stretched, translated 3.4 units down
4. Sketches may vary slightly.
5. a) $y = 12x^2 - 100$ **b)** $y = -0.02x^2 + 20$
6. a) $y = 8(x - 10)^2$ **b)** $y = 0.15(x + 6)^2$
7. a) reflected in the x-axis, vertically compressed, translated 18 units to the right and 15 units up
  b) vertically stretched, translated 1 unit the left and 2 units down
  c) reflected in the x-axis, vertically stretched, translated 9 units to the left and 10.8 units up
  d) vertically compressed, translated 40 units right
8. Sketches may vary slightly.
9. a)

Hourly Rate ($)	Expected Number of Hours per Week	Weekly Revenue ($)
45	42	$1890
50	38	$1900
55	34	$1870
60	30	$1800
65	26	$1690
70	22	$1540

b)

c) $y = -0.4(x - 50)^2 + 1900$
d) \$50/h

10. a) $y = -0.25(x - 3)^2 - 5$
b) $y = -2.875(x + 4)^2 + 7$

11. Answers may vary.

12. a)

d	0	0.5	1.0	1.5	2.0	2.5	3.0
h	2.15	5.4	7.35	8	7.35	5.4	2.15

b) 2.15 m
c) $y = -2.6(x - 1.5)^2 + 8$

Chapter 4 Practice Test, pages 228–229

1. B
2. C
3. C
4. C
5. B
6. B
7. The first differences increase by a constant amount and the second differences are a constant.
8. a) vertically compressed, vertex has been translated 8 units to the left
b) reflected in the x-axis, vertically stretched, vertex has been translated 14 units down
c) reflected in the x-axis, vertically stretched, vertex has been translated 7 units to the right and 13 units down
d) vertically compressed, vertex has been translated 20 units to the right and 16 units down
9. a) $y = \dfrac{-1}{49}(x - 35)^2 + 25$ **b)** about 20 m
10. a)

Number of Layers	Total Number of Pennies
1	1
2	3
3	6
4	10
5	15
6	21
7	28
8	36
9	45
10	55

b) The number of layers squared plus the number of layers, all divided by 2; answers may vary.
c) 14
d) 1275 pennies
11. a) 3 m   **b)** 4.25 m, 2.5 m   **c)** no

Chapter 5

Quadratic Relations II, pages 230–291

Prerequisite Skills, pages 232–233

1. a) $18x$ **b)** $135x$
    c) $-88x$ **d)** $4.5x$
2. a) $13x^2 + 4x$ **b)** $-2x + 17$
    c) $10x^2 - 19x + 9$ **d)** $-2x^2 + x - 5$
3. a) $4x + 64$ **b)** $51x + 6x^2$
    c) $-84x^2 + 21x$ **d)** $40x^2 - 50x$
4. a) $8(x + 2) = 8x + 16$ **b)** $3x(x - 8) = 3x^2 - 24x$
5. a)   **b)**

c)   **d)**
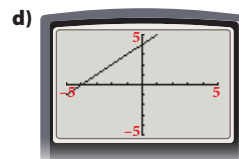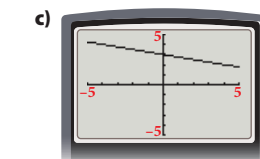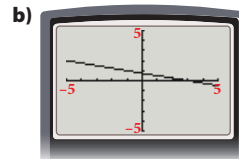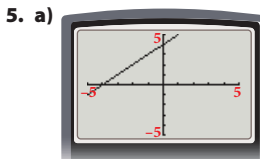
6. a) and d)
7. a) x-intercept: -1.5; y-intercept: 4
b) x-intercept: -1 and 5; y-intercept: -5
c) x-intercept: 0 and 6; y-intercept: 0
8. a)

b)

c)

d)

9. a) 40   **b)** 18   **c)** 26   **d)** 11
10. a) 1, 2, 3, 4, 6, 8, 12, 24
    b) 1, 3, 9, 27, 81
    c) 1, 2, 3, 5, 6, 10, 15, 30
    d) 1, 2, 3, 6, 9, 18, -1, -2, -3, -6, -9, -18
11. a) 3 and 7   **b)** 2 and 6   **c)** 2 and 10
    d) 2 and 16   **e)** 2 and 25   **f)** 5 and -4
    g) 8 and -8 **h)** -16 and 4
12. a) $x = 5$ **b)** $x = 13$ **c)** $x = 37$
    d) $x = -13$ **e)** $x = 7$ **f)** $x = 8$
    g) $x = -5$ **h)** $x = -2$
13. a) $3(x + 3)$ **b)** $5(x + 4)$ **c)** $7(x - 5)$
    d) $-8(x + 6)$ **e)** $x(x - 4)$ **f)** $4x(x + 6)$
    g) $-3x(5x - 9)$ **h)** $5(4x^2 - 11)$
14. a) $(x + 1)(x + 2)$ **b)** $(x + 3)(x - 2)$
    c) $(x - 2)(x - 6)$ **d)** $(x + 2)(x + 7)$
    e) $(x - 5)(x + 2)$ **f)** $(x - 1)^2$

5.1 Expand Binomials, pages 234–241

1. a) $2(x + 2)$ **b)** $(x + 1)(x + 2)$
   c) $(2x + 1)(x + 2)$ **d)** $(2x + 1)(3x + 4)$
2. a) $2x + 4$ **b)** $x^2 + 3x + 2$
   c) $2x^2 + 5x + 2$ **d)** $6x^2 + 11x + 4$
3. a) $x^2 + 8x$ **b)** $x^2 + 8x + 7$
   c) $x^2 + 7x + 12$ **d)** $2x^2 + 7x + 3$
   e) $24x^2 + 38x + 10$ **f)** $9x^2 + 12x + 4$
4. a) $12x^2 + 41x + 35$ **b)** $6x^2 + 13x - 44$
   c) $18x^2 + 78x - 60$ **d)** $35x^2 - 46x - 16$
   e) $9 - 64x^2$ **f)** $16x^2 + 72x + 81$
5. a) $2x^2 + 23x + 30$ **b)** $3x^2 + 25x + 50$
   c) $3x^2 - 25x - 132$ **d)** $-20x^2 - 140x + 75$
   e) $4x^2 - 69x + 135$ **f)** $256x^2 + 288x + 81$
6. a) $x^2 - 25$ **b)** $x^2 - 100$
   c) $9x^2 - 49$ **d)** $64x^2 - 25$
   e) $49x^2 - 49$ **f)** $144x^2 - 81$
7. a) $x^2 + 12x + 36$ **b)** $x^2 - 16x + 64$
   c) $16x^2 + 120x + 225$ **d)** $81x^2 - 36x + 4$
   e) $25x^2 - 30x + 9$ **f)** $36x^2 + 144x + 144$
8. Patterns: $(ax + b)(ax - b) = a^2x^2 - b^2$
   $(ax + b)(ax + b) = a^2x^2 + 2abx + b^2$
9. a) i) $6x^2 + 8x - 14$ **ii)** $5x^2 - 13x + 6$ **iii)** $12x^2 - 56x - 55$
   b) i) 946 cm^2 **ii)** 570 cm^2 **iii)** 1001 cm^2
10. a) $2s^2 + 7s - 30$ **b)** 240 m^2
11. $6x^2 + 31x + 23$
12. a) $6x^2 + 19x + 15$ **b)** 111 m^2
   c) smallest base: \$13 500; largest base: \$113 400
13. a) about 0.62
   b) Answers may vary.
14. $46x^2 + 28x + 5$
15. a) $64x + 240$ **b)** 432 cm^2; 560 cm^2; 880 cm^2
   c) 21.6¢; 28¢; 44¢
16. a) $3x^3 + 14x^2 + 35x + 18$ **b)** $14x^3 - 39x^2 + 26x - 40$
   c) $x^4 + 7x^3 - 18x^2 + 107x + 11$
17. a) $(x + 5)(x + 5)$ **b)** $(x - 9)(x - 9)$
   c) $(x + 12)(x + 12)$ **d)** $(x + 6)(x - 6)$
   e) $(x + 8)(x - 8)$ **f)** $(x + 11)(x - 11)$

5.2 Change Quadratic Relations From Vertex Form to Standard Form, pages 242–247

1. a) $y = x^2 + 12x + 36$ **b)** $y = x^2 - 8x + 16$
   c) $y = x^2 - 30x + 225$ **d)** $y = x^2 - 4x + 4$
   e) $y = x^2 + 18x + 81$ **f)** $y = x^2 - 2x + 1$
2. a) $y = 3x^2 + 54x + 243$ **b)** $y = -2x^2 - 28x - 98$
   c) $y = -8x^2 + 80x - 200$ **d)** $y = 0.5x^2 + 2x + 2$
   e) $y = -0.25x^2 - 4x - 16$
   f) $y = 9.8x^2 - 62.72x + 100.352$
3. a) $y = x^2 - 16x + 67$ **b)** $y = x^2 + 10x + 35$
   c) $y = x^2 + 2x - 12$ **d)** $y = x^2 - 6x + 10$
   e) $y = x^2 + 12x + 29$ **f)** $y = x^2 - 10x + 22$
4. a) $y = 5x^2 - 40x + 92$ **b)** $y = -6x^2 - 108x - 493$
   c) $y = -2x^2 - 28x - 108$ **d)** $y = -8x^2 + 80x - 194$
   e) $y = 2.4x^2 - 24.48x + 65.424$
   f) $y = -1.9x^2 - 10.26x - 18.951$
5. a)

b)

c)

d)

e)

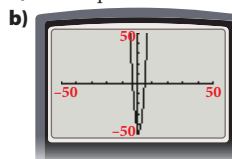
f)

g)

h)
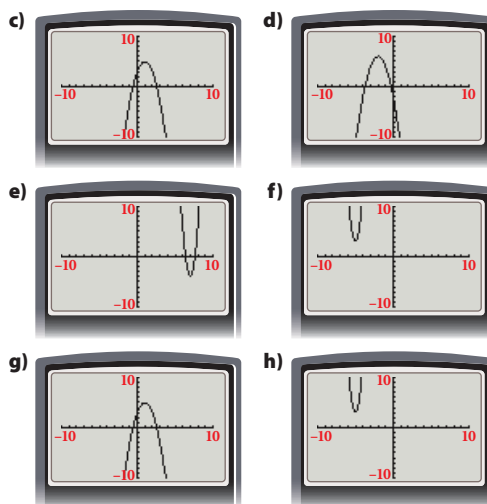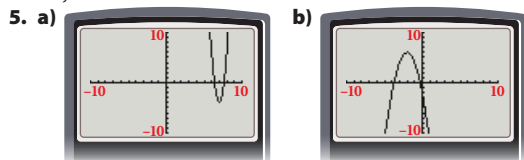
a) and e) are the same; b) and d) are the same; c) and g) are the same; f) and h) are the same.
6. a) $y = 5x^2 - 10x + 12$ **b)** $y = -3x^2 - 30x - 69$
   c) $y = -8x^2 + 160x - 783$ **d)** $y = 12x^2 + 24x + 15$
7. a) 447 **b)** 7 **c)** -181
   d) -20 **e)** -1 **f)** 15.04
8. a) 6; the speed of the racer when the maximum distance is reached.
   b) 50; the maximum distance
   c) $d = -2v^2 + 24v - 22$
   d)
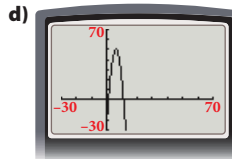
9. a) It shows the y-intercept; but it does not provide any information on the maximum or minimum value of the relation; answers may vary.
   b) It directly shows the vertex of the graph; but not the x- and y-intercepts; answers may vary.
10. a) $h = 0.000\ 549(x - 640)^2 + 227$
   b) $h = 0.000\ 549x^2 - 0.702\ 72x + 451.8704$
   c) 451.8704 m
   d)

11. a) $y = -4.9(t - 2)^2 + 20$ **b)** $y = -4.9t^2 + 19.6t + 0.4$
   c) 19.6 m/s **d)** 20 m
13. a) -1.625 **b)** $y = -1.625(x - 1.8)^2 + 8.0$
   c) 2.735 m
14. a) Both equal $3x^2 - 6x - 45$.
   b)

c) Answers may vary.

5.3 Factoring Trinomials of the Form $x^2 + bx + c$, pages 248–255

1. a) 5 and 5   **b)** 4 and 8
   c) −2 and −12   **d)** −2 and −18
   e) 6 and −5   **f)** 3 and −14
   g) 25 and −2   **h)** 8 and −8

2. a) $(x + 3)(x + 12)$ **b)** $(x + 4)(x + 4)$
   c) $(x + 2)(x + 10)$ **d)** $(x + 5)(x + 8)$

3. a) $(x − 2)(x − 11)$ **b)** $(x − 7)(x − 7)$
   c) $(x − 4)(x − 7)$ **d)** $(x − 10)(x − 10)$
   e) $(x − 2)(x + 16)$ **f)** $(x − 3)(x + 16)$
   g) $(x − 5)(x + 4)$ **h)** $(x − 21)(x + 3)$

4. a) $(x + 1)(x + 2)$ **b)** $(x + 1)(x + 6)$
   c) $(x + 2)(x + 6)$ **d)** $(x + 2)(x + 4)$

5. a) $x^2 + 6x + 8 = (x + 2)(x + 4)$
   b) $x^2 + 8x + 7 = (x + 1)(x + 7)$
   c) $x^2 + 8x + 15 = (x + 3)(x + 5)$
   d) $x^2 + 10x + 24 = (x + 6)(x + 4)$

6. a) $x(x + 5)$ **b)** $x(x + 22)$
   c) $x(x − 19)$ **d)** $x(x − 15)$
   e) $x(x − 9.8)$ **f)** $x(x + 33.5)$

7. a) $(x + 5)(x − 5)$ **b)** $(x + 10)(x − 10)$
   c) $(x + 11)(x − 11)$ **d)** $(x + 1)(x − 1)$
   e) $(x + 7)(x − 7)$ **f)** $(x + 12)(x − 12)$

8. a) $x(x + 25)$ **b)** $(x + 2)(x + 14)$
   c) $(x + 6)(x − 7)$ **d)** $(x + 8)(x − 8)$
   e) $(x + 4)(x + 9)$ **f)** $(x − 6)(x − 6)$
   g) $(x + 2)(x − 2)$ **h)** $x(x − 32)$

9. a) $(x + 1)(x + 3)$ **b)** not factorable
   c) not factorable   **d)** $(x + 1)(x + 2)$
   e) $(x − 1)(x − 3)$ **f)** $(x + 3)(x − 1)$

10. No two numbers with a product of c have a sum of b; could not model as a rectangle with algebra tiles; answers may vary.

11. a) $x^2 − 9$ **b)** $x^2 − 100$

12. a) πx^2 **b)** 25π
   c) $\pi x^2 − 25\pi$ **d)** $\pi(x − 5)(x + 5)$

13. a) $x^2 − 4$ **b)** \$4800

14. a) $(x + 2)(x + 5)$
   b) The length is 8 m and the width is 5 m.

15. a) $(x^2 − 1)(x^2 − 25) = (x + 1)(x − 1)(x + 5)(x − 5)$
   b) $(x^2 − 4)(x^2 − 49) = (x + 2)(x − 2)(x + 7)(x − 7)$
   c) $(x^2 − 36)(x^2 − 9) = (x + 6)(x − 6)(x + 3)(x − 3)$

5.4 Factoring Trinomials of the Form $ax^2 + bx + c$, pages 256–263

1. a) $2(x + 3)(x + 5)$ **b)** $4(x + 6)(x − 1)$
   c) $3(x + 1)(x + 5)$ **d)** $2(x + 4)(x − 3)$
   e) $5(x + 2)(x − 1)$ **f)** $3(x − 2)(x − 2)$

2. a) $7(x − 5)(x − 6)$ **b)** $6(x − 3)(x − 7)$
   c) $−3(x + 4)(x + 6)$ **d)** $10(x − 16)(x + 2)$
   e) $−5(x − 3)(x − 7)$ **f)** $−2(x − 8)(x + 6)$

3. a) $1.2(x − 10)(x + 3)$ **b)** $−2.5(x + 4)(x + 8)$
   c) $3.4(x − 7)(x − 4)$ **d)** $−4.6(x + 6)(x + 6)$

4. a) $5x(x + 4)$ **b)** $3x(x − 7)$
   c) $−7x(x − 7)$ **d)** $−15x(x + 5)$
   e) $8.2x(x + 8)$ **f)** $−4.9x(x − 9)$

5. a) $3(x + 3)(x − 3)$ **b)** $6(x + 4)(x − 4)$
   c) $−3(x + 4)(x − 4)$ **d)** $−8(x + 9)(x − 9)$
   e) $1.2(x + 5)(x − 5)$ **f)** $−4.5(x + 6)(x − 6)$

6. a) $6(x + 4)(x + 4)$ **b)** $5(x + 3)(x − 3)$
   c) $9x(x − 3)$ **d)** $10(x − 8)(x + 3)$
   e) $−4(x + 7)(x − 7)$ **f)** $−2x(x − 9)$
   g) $1.5(x + 6)(x − 3)$ **h)** $−6.2(x + 8)(x − 8)$

7. a)

8. a) S.A. $= \pi r(2h + r)$
   b) about 5184 cm^2
   c) S.A. $= 5\pi r^2$

9. a) S.A. $= \pi r(r + s)$
   b)

Slant Height (cm)	Surface Area (cm²)
40	$1200\pi \doteq 3770$
45	$1300\pi \doteq 4084$
50	$1400\pi \doteq 4398$
55	$1500\pi \doteq 4712$
60	$1600\pi \doteq 5027$

   c) S.A. $= 4\pi r^2$

10. a) $h = -4.9t\left(t − \dfrac{760}{49}\right)$
   b)

Time (s)	Height Increment (m)	Height (m)
0	0	0
1	71.1	71.1
2	61.3	132.4
3	51.5	183.9
4	41.7	225.6
5	31.9	257.5
6	22.1	279.6
7	12.3	291.9
8	2.5	294.4
9	−7.3	287.1
10	−17.1	270.0

The maximum height is about 295 m.
   c) yes

11. a) main fountain: $h = −4.9t^2 + 19.6t$
     smaller fountain: $h = −4.9t^2 + 14.7t$
   b) main fountain: $h = −4.9t(t − 4)$
     smaller fountain: $h = −4.9t(t − 3)$
   c) main fountain: 19.6 m; smaller fountain: 11.025 m

13. a) $9x^2 − 25$ **b)** $16x^2 − 49$ **c)** $25x^2 − 4$
   Pattern: $(ax + b)(ax − b) = a^2x^2 − b^2$

14. a) $(8x + 3)(8x − 3)$ **b)** $(7x + 6)(7x − 6)$
   c) $(10x + 3)(10x − 3)$

15. a) $(2x + 3)(x + 8)$ **b)** $(2x + 5)(5x + 1)$
   c) $(3x + 1)(4x + 3)$
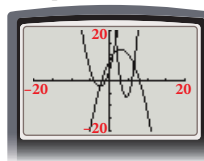
16. a) Group 1:   Group 2:
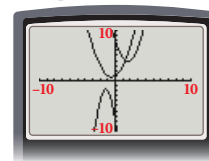
   b) They all have x-intercepts.
   c) None have x-intercepts.
   **d)** Only expressions that can be factored have x-intercepts.

5.5 The x-Intercepts of a Quadratic Relation, pages 264–275

1. a) 8 and −1   **b)** −3

2. a) $x = −4$ and $x = 6$ **b)** no zeros

3. a) $x = 5$ and $x = −3$ **b)** $x = 4$ and $x = 1$
   c) $x = 9$ **d)** $x = 7$ and $x = −6$
   e) $x = −8$ and $x = −2$ **f)** $x = 0$ and $x = −5$

4. a) $x = −2$ and $x = −8$ **b)** $x = 7$ and $x = −5$
   c) $x = 7$ and $x = −1$ **d)** $x = 5$ and $x = −5$
   e) $x = −4$ and $x = −9$ **f)** $x = 7$

5. a) $x = 0$ and $x = 4$ **b)** $x = 25$ and $x = 0$
c) $x = 9$ and $x = -8$ **d)** $x = -9$
e) $x = 0$ and $x = 5$ **f)** $x = -6$
6. b) and d) have more than one zero.
7. a) $y = x^2 + 10x + 21$; $y = (x + 3)(x + 7)$
b) $y = x^2 - 6x - 27$; $y = (x - 9)(x + 3)$
c) $y = -2x^2 - 16x - 24$; $y = -2(x + 2)(x + 6)$
d) $y = 6x^2 + 24x + 18$; $y = 6(x + 1)(x + 3)$
e) $y = 3x^2 - 24x$; $y = 3x(x - 8)$
f) $y = -4x^2 + 40x$; $y = -4x(x - 10)$
8. a) $h = -1.25d(d - 1.5)$
b) $d = 0$ and $d = 1.5$; yes
c)

Horizontal Distance (m)	Height (m)
0	0
0.25	0.39
0.50	0.63
0.75	0.70
1.00	0.63
1.25	0.39
1.50	0

d) The maximum height is about 0.70 m.
e)
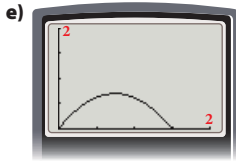
9. a) 1.6 m **b)** $d = 2$ and $d = -1$
c) when the skateboarder is 2 m from the ledge
d)
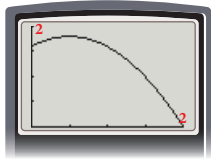
10. a) $d = 0$ and $d = 2.5$ **b)** 2.5 m
c) 1.0 m
11. a) $d = 9$ and $d = -4$ **b)** 9 m
c) No; the maximum height is about 4.2 m.
12. a) $x = -2$ and $x = -5$
b) $x = \dfrac{15}{4}$ and $x = -\dfrac{5}{4}$
c) $x = \dfrac{-5 + \sqrt{73}}{4}$ and $x = \dfrac{-5 - \sqrt{73}}{4}$
13. a) no zeros **b)** has zeros **c)** no zeros
14. 45°

5.6 Solve Problems Involving Quadratic Relations, pages 276–285

1. a) $x = 5$ and $x = -4$ **b)** $x = -9$ and $x = -15$
c) $x = -3$ and $x = -19$ **d)** $x = 8$ and $x = -10$
2. a) $y = (x + 3)(x + 4)$ **b)** $y = (x + 4)(x + 7)$
c) $y = 3(x + 5)(x + 8)$ **d)** $y = -2(x - 11)(x + 6)$
3. a) $x = -7$ and $x = 4$ **b)** $x = 4$ and $x = -4$
c) $x = -7$ and $x = 8$ **d)** $x = 7$ and $x = -14$
e) $x = \sqrt{56}$ and $x = -\sqrt{56}$ **f)** $x = 3$ and $x = -3$
g) $x = 10$ and $x = -5$ **h)** $x = 8$ and $x = -28$
4. a) $x = 6$ **b)** $x = -3$
c) $x = 0$ **d)** $x = -5$

5. a) $x = -8$ **b)** $x = 4$
c) $x = -2$ **d)** $x = -4$
e) $x = -5$ **f)** $x = 4$
6. a) $y = x^2 + 16x + 48$; $y = (x + 8)^2 - 16$
b) $y = x^2 - 8x + 7$; $y = (x - 4)^2 - 9$
c) $y = 8x^2 + 32x - 360$; $y = 8(x + 2)^2 - 392$
d) $y = -5x^2 - 40x + 240$; $y = -5(x + 4)^2 + 320$
e) $y = 6x^2 + 60x$; $y = 6(x + 5)^2 - 150$
f) $y = -3x^2 + 24x$; $y = -3(x - 4)^2 + 48$
7. a)
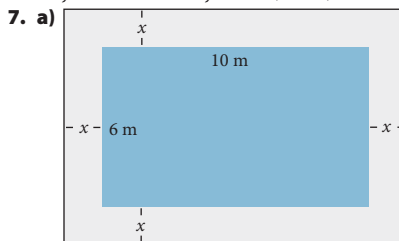
b) total length: $2x + 10$; total width: $2x + 6$
c) $4x^2 + 32x + 60$
d) 5 m
8. a) $10\,000 - 4x^2$ **b)** 30 cm
9. a) $16x^2 + 16x - 96$ **b)** 6 m
10. a) $y = x^2 + 4x - 5$; $y = 2x^2 + 8x - 10$; $y = 3x^2 + 12x - 15$; answers may vary.
b) Answers may vary.
c) $y = 2.5x^2 + 10x - 12.5$
11. a) 72 **b)** 10
12. a) 28 **b)** 15
c) No; there is no integer solution for $0.5L^2 + 0.5L = 160$.
13. a) at $t = 9$ **b)** 99.225 m
c) No, it takes longer than 2.5 s to hit the ground.
14. a) $x = 2$ and $x = 14$
b) $(8, 7.2)$; the longest time the engine will run.
c)

15. a) $h = -0.05d(d - 23)$
b) 23 m
c) 6.6125 m
16. a) 2 m **b)** 7 m
18. 45° and 30 m/s; answers may vary.

Chapter 5 Review, pages 286–287

1. a) $x^2 + 13x + 40$ **b)** $14x^2 + 43x - 90$
c) $x^2 + 26x + 169$ **d)** $x^2 - 49$
2. $16x^2 + 4x - 2$
3. a) $5x^2 + 100x + 507$ **b)** $-0.5x^2 - 8x - 28$
c) $9x^2 - 144x + 572$ **d)** $2x^2 + 4x - 4$
4. a) 507 **b)** -28
c) 572 **d)** -4
5. Initial velocity is 29.4 m/s and initial height is 0.9 m; answers may vary.
6. a) $x(x + 5)$ **b)** $(x + 5)(x + 8)$
c) $(x + 5)(x + 5)$ **d)** $(x + 9)(x - 9)$
e) $(x + 6)(x - 4)$ **f)** $(x - 5)(x - 7)$
g) $(x + 10)(x - 10)$ **h)** $(x - 12)(x + 1)$
7. a) $x^2 - 64$ **b)** 836 cm²

8. a) $4(x + 7)(x + 11)$ **b)** $12x(x + 8)$
    c) $3(x - 9)(x + 5)$ **d)** $-2(x + 6)(x + 6)$
    e) $-8(x + 5)(x - 5)$ **f)** $10(x + 2)(x - 10)$
9. a) $\pi(r + 3)(r - 3)$ **b)** about 679 mm^2
10. a) $x = 0$ and $x = 16$ **b)** $x = 4$ and $x = -4$
    c) $x = -8$ and $x = 4$
11. a) $y = 3x^2 - 6x - 144$; zeros are $x = 8$ and $x = -6$
    b) $y = -4x^2 - 48x - 108$; zeros are $x = -3$ and $x = -9$
12. a) $x = -1$ and $x = 6$
    b) $x = 6$ is the horizontal distance from the kick to landing;
      $x = -1$ does not have a meaning in this context.
13. a) zeros: -3 and -13; minimum: -25
    b) zeros: 12 and -2; minimum: -245
    c) zeros: -16 and 2; maximum: 162
    d) zeros: -7 and 1; minimum: -96
14. a) $4x^2 + 60x$ **b)** 3 m
15. a) 1.5 m   **b)** 5 m

Chapter 5 Practise Test, pages 288–289
1. D
2. B
3. C
4. B
5. A
6. D
7. C
8. a) $18x^2 - 36x - 80$ **b)** 190 cm^2
9. a) $13x^2 + 182x + 648$ **b)** $-4x^2 + 24x - 20$
    c) $5.6x^2 - 13.44x - 0.136$
10. a) $x = 7$ and $x = -5$ **b)** $x = 4$ and $x = -8$
    c) $x = -2$ and $x = -14$
11. a) 50 m   **b)** 25 m
12. a) 4.2 m   **b)** 3 m   **c)** 4.375 m

CHAPTER 6

Geometry in Design, pages 292–349

Prerequisite Skills, pages 294–295
1. a) rectangle   **b)** parallelogram
    c) circle   **d)** trapezoid
2. a) rectangular prism   **b)** triangular prism
    c) square-based pyramid   **d)** cylinder
3. a) triangle   **b)** square
    c) pentagon   **d)** hexagon
    e) octagon
4. $P = 440$ m; $A = 12\ 000 \text{ m}^2$
5. $P = 45$ cm; $A = 97.5 \text{ cm}^2$
6. $P = 75$ m; $A = 452 \text{ m}^2$
7. a) 118 m^2 **b)** 120 m^3
8. 0.7 m^2
9. area $= 534 \text{ m}^2$; volume $= 942 \text{ m}^3$
10. $S = 540°$; angle $= 108°$
11. 12 cm by 18 cm
12. 40 ft

6.1 Investigate Geometric Shapes and Figures, pages 296–305
1. D
2. No; the ratio of the two side lengths is about 1.78:1.
3. Answers may vary.

4. Answers may vary.
5. cone, cylinder, square-based pyramid, rectangular prism, triangular prism, triangle, rectangle, square, trapezoid
6. Answers may vary.
7. No; the ratio of the two side lengths is 2:1.
9. Answers may vary.
10. 1.2:1; answers may vary.
11. a) 90°
    b) A triangle with side lengths of 3 units, 4 units, and 5 units is a right triangle.
12. a) scalene, obtuse; answers may vary.
    b) Answers may vary.
13. Red rectangle; the ratio of the sides is 1.6:1.
15. a) 1.545 m   **b)** It is the golden ratio.
16. a) 1.4143:1   **b)** 1.4141:1
    c) 1.4143:1; it is the same ratio as in part a).
    d) It is 1.4142:1.
17. Answers may vary.

6.2 Perspective and Orthographic Drawings, pages 306–312
1. C
2. 1 cm represents 2 m; length: 24.5 cm, width: 17.5 cm, height: 28.0 cm; answers may vary.
3. B
4. length of 4 cubes, width of 2 cubes, height of 3 cubes
5. Answers may vary.
6. Answers may vary.
7. a)
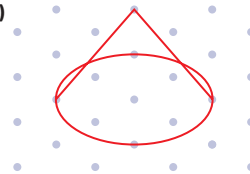
    b) Yes, but it is difficult to draw and the farthest left and right tips of the base will not be on dots; answers may vary.
8. a) Diagrams may vary.
    b) Diagrams may vary.
    c) They are congruent right triangles; answers may vary.
9. b)
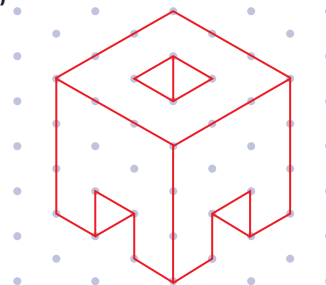
10. All four drawings are valid because you cannot see behind the cubes shown.
11. Answers may vary.
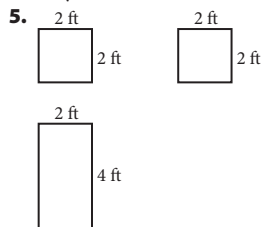**12.** Answers may vary.
13.
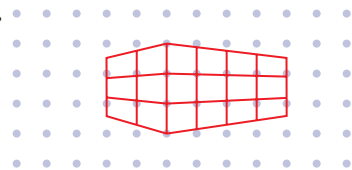
6.3 Create Nets, Plans, and Patterns, pages 313–326

1. A
2. Diagrams may vary.
3. Diagrams may vary.
4. A pattern because there are several pieces that need to be assembled to make a bookcase; answers may vary.
5. a) Answers may vary.
   b) Move the bottom square 1 unit to the left.
6. a) Diagrams may vary.   c) yes
7. a) Diagrams may vary.   c) yes
8. a) Diagrams may vary.   b) about 51.6 m^2
   c) about $335
9. Diagrams may vary.
10. Diagrams may vary.
11. a) Diagrams may vary.
12. The squares for the walls of the hole keep overlapping other faces.
13. Diagrams may vary.

6.4 Scale Models, pages 327–334

1. 5 in. by 6 in.
2. 85 ft 4 in.
3. Easier to visualize; answers may vary.
4. Half a tennis ball placed on a roll of thick paper; answers may vary.
5.

6. Diagrams may vary.
7.
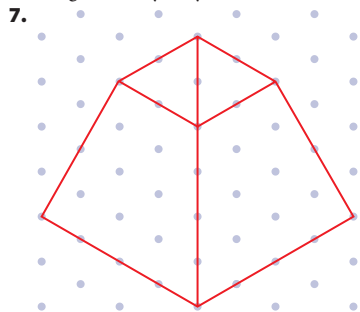
8. a) Diagrams may vary.   c) $40, $38, $32
9. a) 9 cm   b) Diagrams may vary.
10. a) Diagrams may vary.
    c) About 26 m^3; answers may vary.
    d) About $1949; answers may vary.
11. a) The roof of the net will now be made of 6 isosceles triangles.
    b) No change, base remains the same.
12. a) Diagrams may vary.
    c) $230 400
13. B
14. Diagrams may vary.

6.5 Solve Problems With Given Constraints, pages 335–345

1. 10 cm
2. 80 m
3. Less material used to make the box, takes up less space; answers may vary.
4. Minimum and maximum space requirements, price; answers may vary.
5. Diagrams may vary.
6. about 2242 m
7. Answers may vary.
8. Answers may vary.
9. a)
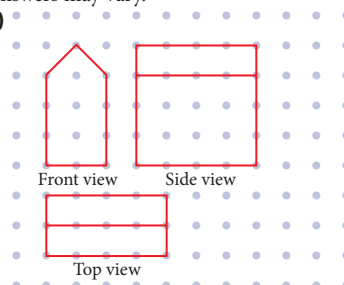
   b) Diagrams may vary.   c) about $740
10. a) diameter: 10 m, height: 8 m
    b) about 327 m^3 c) about $29 400
12. Diagrams may vary.
13. a) Diagrams may vary.
14. Diagrams may vary.

Chapter 6 Review, pages 346–347

1. To ensure the diagonals were equal; answers may vary.
2. The blanket is close to a golden rectangle but is not when folded in half.
3. b)
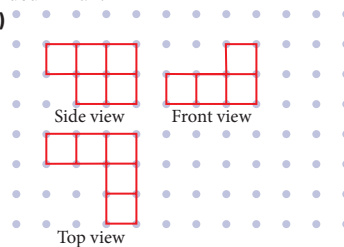
4.

5. Diagrams may vary.
6. Diagrams may vary.
7. Diagrams may vary.
8. wingspan: 84.6 cm; length: 102.6 cm
9. Diagrams may vary.
10. Diagrams may vary.
11. a) Side length of hexagon is about 5.55 m.
    b) about $9590

1. A

2. B

3. B

4.

Front view

Side view

Top view

5. Diagrams may vary.

6. Diagrams may vary.

7.

Front view   Side view

Top view
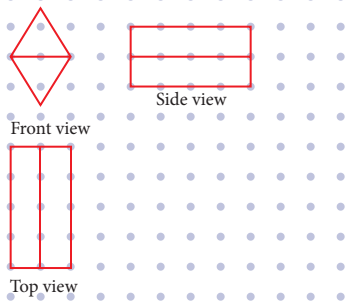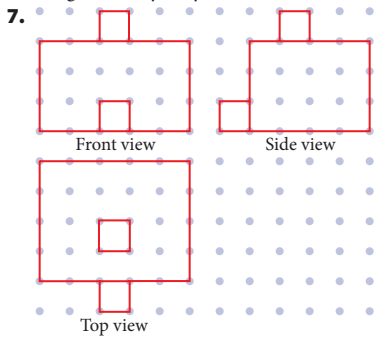
8. Diagrams may vary.

9. a) Diagrams may vary.

   b) about 2196 mL

Chapters 4 to 6 Review, pages 350–351

1. a) i) Not quadratic, the second differences are 0 and the graph is a straight line; answers may vary.

   ii) Quadratic, the second differences are a constant and the graph is a parabola; answers may vary.

   iii) Not quadratic, the graph is a straight line and there is no x^2 term; answers may vary.

   iv) Quadratic, the graph is a parabola and there is an x^2 term; answers may vary.

b) i)   **ii)**

iii)   **iv)**
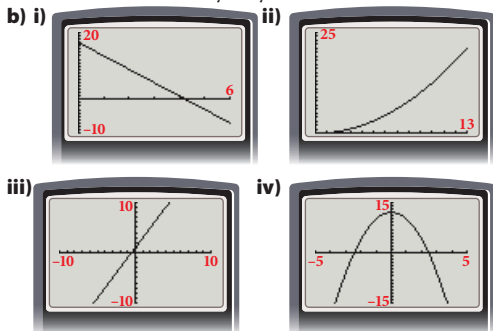
2. a) The parabola has not been stretched, it opens upward, and the vertex has been translated 4 units to the left of the y-axis.

   b) The parabola has not been stretched, it opens downward, and the vertex has been translated 1 unit to the right of the y-axis.

c) The parabola has been vertically compressed, it opens downward, and the vertex has been translated 7 units to the left of the y-axis.

d) The parabola is vertically stretched, it opens upward, and the vertex has been translated 9 units to the left of the y-axis.

e) The parabola is vertically compressed, it opens upward, and the vertex has been translated 32 units to the left of the y-axis.

f) The parabola is vertically stretched, it opens downward, and the vertex has been translated 18 units to the right of the y-axis.

3. a) i) $(1, 9)$ **ii)** upward   **iii)** not stretched

   iv)
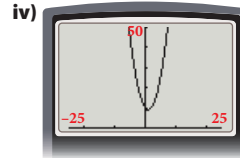
b) i) $(-8, -5)$ **ii)** downward

   iii) vertically stretched

   iv)
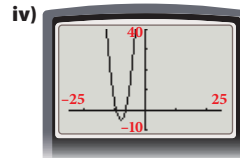
c) i) $(0, -1)$ **ii)** upward

   iii) vertically compressed

   iv)
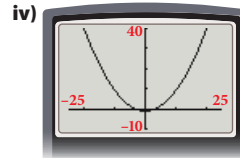
d) i) $(0, 0)$ **ii)** upward

   iii) vertically stretched

   iv)
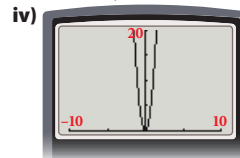
e) i) $(2, 2)$ **ii)** upward

   iii) vertically compressed

   iv)
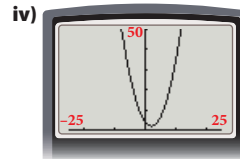
f) i) $(-1, 13)$ **ii)** upward

   iii) vertically stretched

   iv)
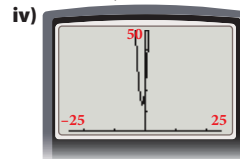
4. a) 6 s, 177.4 m   **b)** 172.5 m

c)
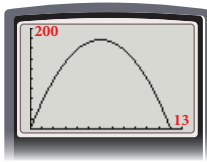
d) about 12 s

5. a) $30x^2 + 43x + 4$ **b)** $4x^2 + 7x - 30$
    c) $24x^2 - 10x - 4$ **d)** $-4x^2 + 36$

6. a) $4s^2 - 11s + 7$ **b)** 742 m^2

7. a) $y = x^2 - 8x + 16.5$ **b)** $y = x^2 + 20x + 97$
    c) $y = 8x^2 + 32x + 59$ **d)** $y = -3.2x^2 + 25.6x - 52$

8. -42

9. a) $(x + 8)(x + 3)$ **b)** $(x + 6)(x - 5)$
    c) $(x - 7)(x - 1)$ **d)** $(x + 4)(x + 4)$
    e) $3(x + 9)(x + 4)$ **f)** $-10(x + 10)(x + 1)$

10. a) Equivalent; explanations may vary.
    b) Not equivalent; explanations may vary.
    c) Equivalent; explanations may vary.

11. a) $5, -4$ **b)** $6, -6$
    c) $7, -5$ **d)** -3

12. a)
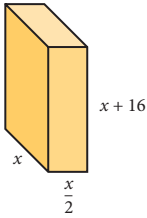
b) $4x^2 + 48x$ **c)** 880 cm^2

13. yes

14. b)

c)

Front   Side   Top

15. a)

Front   Side

Top
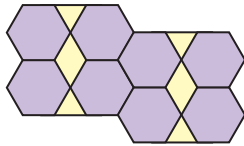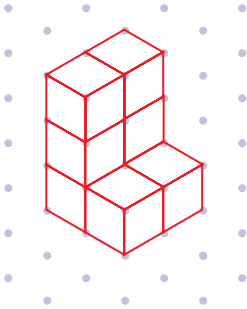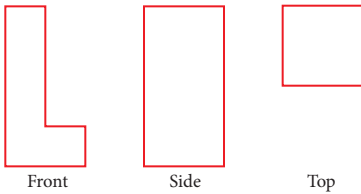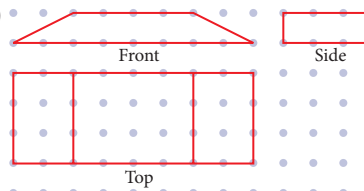
b) Diagrams may vary.
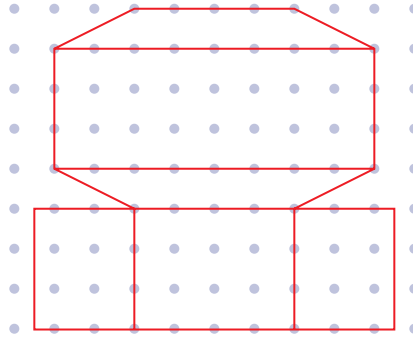
c) 48 m^2; $1920

CHAPTER 7

Exponents, pages 352–417

Prerequisite Skills, pages 354–355

1. a) 6^2 **b)** 7^4
    c) $(-2)^3$ **d)** 4^8
    e) $\left(\dfrac{1}{4}\right)^5$ **f)** $\left(-\dfrac{4}{5}\right)^2$

2. a) 25   **b)** 343   **c)** 100 000
    d) 9   **e)** -9 **f)** -144
    g) $\dfrac{1}{4}$ **h)** $\dfrac{1}{81}$ **i)** $-\dfrac{1}{125}$

3. a) 2, 5   **b)** 3, -1
    c) $-4, 3$ **d)** $-\dfrac{1}{2}, -\dfrac{2}{3}$

4. Graphs may vary.

5. For each call, the pay increases by $2; answers may vary.

6. a) $A = 78.5$ cm^2
    b) $I = \$24$
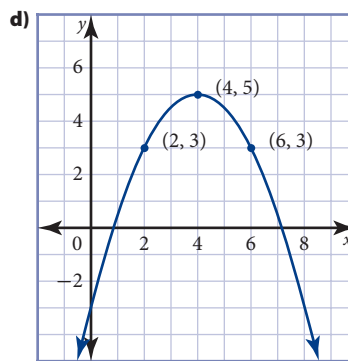   **c)** $V = 125$ m^3
    d) $P = 34$ cm

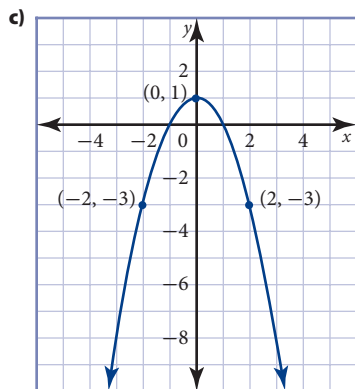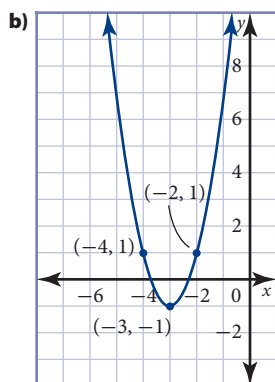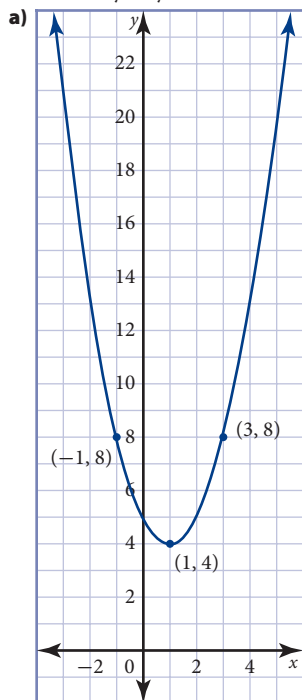**7.** Answers may vary.
    a) reflected in the x-axis
    b) right 1 unit, down 2 units
    c) left 3 units, up 2 units

8. Answers may vary.

a)

Points shown: $(-1, 8)$, $(3, 8)$, $(1, 4)$

b)

Points shown: $(-4, 1)$, $(-2, 1)$, $(-3, -1)$

c)

Points shown: $(0, 1)$, $(-2, -3)$, $(2, -3)$

d)

Points shown: $(4, 5)$, $(2, 3)$, $(6, 3)$

7.1 Exponent Rules, pages 356–363

1. a) $5^4 = 625$ **b)** $2^7 = 128$ **c)** $(-3)^6 = 729$

d) $(-4)^6 = 4096$ **e)** $\left(\dfrac{1}{4}\right)^5 = \dfrac{1}{1024}$ **f)** $\left(-\dfrac{1}{2}\right)^3 = -\dfrac{1}{8}$

2. a) $6^1 = 6$ **b)** $8^2 = 64$ **c)** $12^1 = 12$

d) $2^4 = 16$ **e)** $(-2)^3 = -8$ **f)** $(-3)^2 = 9$

3. a) $5^6 = 15\ 625$ **b)** $2^9 = 512$ **c)** $(-4)^6 = 4096$

d) $\left(\dfrac{1}{7}\right)^4 = \dfrac{1}{2401}$ **e)** $\left(\dfrac{1}{3}\right)^6 = \dfrac{1}{729}$

f) $\left(\dfrac{1}{10}\right)^8 = \dfrac{1}{100\ 000\ 000}$

4. a) $36 \times 216 = 7776,\ 6^5 = 7776$

b) $2401 \times 49 = 117\ 649,\ 7^6 = 117\ 649$

c) $59\ 049 \div 729 = 81,\ 9^2 = 81$

d) $\dfrac{2401}{-343} = -7,\ (-7)^1 = -7$

e) $(25)^3 = 15\ 625,\ 5^6 = 15\ 625$

f) $(100\ 000)^2 = 10\ 000\ 000\ 000,\ 10^{10} = 10\ 000\ 000\ 000$

g) $(-512)(-8) = 4096,\ (-8)^4 = 4096$

h) $(-1)^9 = -1,\ (-1)^{99} = -1$

5. a) $9^9 = 387\ 420\ 489$ **b)** $7^8 = 5\ 764\ 801$

c) $(-6)^6 = 46\ 656$ **d)** $24^1 = 24$

e) $9^2 = 81$ **f)** $\left(\dfrac{3}{4}\right)^7 = \dfrac{2187}{16\ 384}$

g) $4^{15} = 1\ 073\ 741\ 824$ **h)** $(-8)^3 = -512$

i) $\left(-\dfrac{5}{7}\right)^4 = \dfrac{625}{2401}$

6. 100

7. 100 000

8. the 4.2 earthquake, $10^{1.4}$ times

9. a) $3^1 \times 3^7$, $3^3 \times 3^5$, $3^4 \times 3^4$; answers may vary.

b) $\dfrac{2^5}{2^0}$, $\dfrac{2^6}{2^1}$, $\dfrac{2^7}{2^2}$; answers may vary.

c) $7^2 \times 7^{10}$, $7^3 \times 7^9$, $7^4 \times 3^8$; answers may vary.

10. a) yes **b)** 8^4; answers may vary.

11. a) $\dfrac{1}{36}$ **b)** $\dfrac{1}{216}$

12. a) $\dfrac{1}{4}$ in.² **b)** $\dfrac{1}{16}$ ft²

13. a) $\dfrac{1}{576}$ ft² **b)** 9 in.²

14.

Measurement to be Calculated	Formula	Dimensions Given	Calculated Measurement
Area of a Circle	$A = \pi r^2$	$r = \pi$ cm	31 cm^3
Volume of a Cube	$V = s^3$	$s = \frac{1}{2}$ in.	$\frac{1}{8}$ in.^{3}
Volume of a Sphere	$V = \frac{4}{3}\pi r^3$	$r = \frac{1}{8}$ in.	0.0082 in.^{3}
Volume of a Cylinder	$V = \pi r^2 h$	$r = h = 5$ cm	392.7 cm^3

15. 216 cm^3

16. a) $10^{7.3}$, 19 952 623.15   **b)** $10^{4.8}$, 63 095.73

   c) $2^{6.4}$, 84.45   **d)** $\left(\frac{1}{2}\right)^{8.7}$, 0.0021

17. a) $8x^7$ **b)** $-4a^3b^2$
   c) $m^{10}n^{15}$ **d)** k^9h^6

7.2 Zero and Negative Exponents, pages 364–371

1. a) 9^{-5} **b)** $\left(\frac{1}{6}\right)^{-3}$ **c)** $\left(\frac{1}{5}\right)^2$ **d)** 4

2. a) $25, \frac{1}{25}$ **b)** $2, \frac{1}{2}$ **c)** $256, \frac{1}{256}$ **d)** $1000, \frac{1}{1000}$

   e) 1, 1   **f)** $512, \frac{1}{512}$ **g)** $81, \frac{1}{81}$ **h)** $-8, -\frac{1}{8}$

3. a) 1   **b)** $\frac{1}{8}$ **c)** $\frac{1}{36}$ **d)** 1

   e) $\frac{1}{500}$ **f)** $\frac{1}{125}$ **g)** $\frac{1}{256}$ **h)** $-\frac{1}{1000}$

   i) 36   **j)** $\frac{1}{243}$ **k)** 27   **l)** -343

4. Keep dividing 4 from 4^3 to get to 4^{-3}: $4^3 = 64$, $4^2 = 16$,

   $4^1 = 4$, $4^0 = 1$, $4^{-1} = \frac{1}{4}$, $4^{-2} = \frac{1}{16}$, $4^{-3} = \frac{1}{64} = \frac{1}{4^{-3}}$;

   answers may vary.

5. Fractions are more exact, but whole numbers are easier to
   compare; answers may vary.
   a) 1   **b)** 0.125   **c)** 0.02778
   d) 1   **e)** 0.002   **f)** 0.008
   g) 0.0039   **h)** -0.001 **i)** 36
   j) 0.0041   **k)** 27   **l)** -343

6. a) 8^2 **b)** 5^{-5} **c)** 7^{-2}
   d) 12^{-3} **e)** $(-4)^{-1}$ **f)** $(-3)^{-5}$

7. a) 1   **b)** 1   **c)** 1
   d) 1   **e)** 1   **f)** 1

8. a) $8^2 = 64$ **b)** $4^3 = 64$

   c) $\left(\frac{1}{2}\right)^{12} = \frac{1}{4096}$ **d)** $(-3)^2 = 9$

   e) $10^{-6} = \frac{1}{1\,000\,000}$ **f)** $\left(\frac{1}{2}\right)^8 = \frac{1}{256}$

   g) $6^{-3} = \frac{1}{216}$ **h)** $5^{-3} = \frac{1}{125}$

   i) $4^{-6} = \frac{1}{4096}$ **j)** $\left(\frac{1}{3}\right)^{-3} = 27$

   k) $\left(\frac{1}{9}\right)^{-2} = 81$ **l)** $5^{-6} = \frac{1}{15\,625}$

9. a) 8 g   **b)** 0.5 g

10. a) 10^3 **b)** $\frac{1}{1000}, \left(\frac{1}{10}\right)^3, 10^{-3}$

   c) 10^{-6} **d)** 10^{-9}
   e) $10^{-3} : 10^{-9}, 10^6$

11. a) 1024   **b)** $\frac{1}{1024}$

   c) 1 048 576   **d)** $\frac{1}{1\,073\,741\,824}$

   e) $\frac{1}{8}$ **f)** $\frac{1}{8\,796\,093\,022\,208}$

12. a) 1 000 000
   b) 10 000
   c) $10^{0.5}$

13. a) $\frac{2^a}{2^b}$ **b)** 2^{a-b}
   c) 10, multiply the number of vacuums by 10 to double the
   loudness; answers may vary.

14. a) \$9.44   **b)** \$6168.94
   c) \$0.48   **d)** \$84 775.42

15. a) 0.05 g   **b)** 0.165 g

16. a) $\frac{2^7}{2^{10}} = 2^{-3}$ **b)** $\frac{3^5}{3^8} = 3^{-3}$

   c) $\frac{5^5}{5^4} = 5^1$ **d)** $\frac{7^2}{7^4} = 7^{-2}$

   e) $\frac{11^1}{11^3} = 11^{-2}$ **f)** $\frac{2^9}{2^6} = 2^3$

   g) $\frac{1}{2^3} \times \frac{1}{2^4} = 2^{-7}$ **h)** $\frac{1}{5^2} \times \frac{1}{5^3} = 5^{-5}$

17. a) 4^4 **b)** 4^{-1} **c)** 4^{-14}
   d) 4^4 **e)** 4^{-18} **f)** 4^4

7.3 Investigate Exponential Relationships, pages 372–381

1. The ratio between successive terms is 2, indicating a constant
   rate of change; answers may vary.
2. b) and d), a) is linear and c) is quadratic; answers may vary.
3. a)

Day	1	2	3	4	5	6	7
Number of Grains of Rice	1	2	4	8	16	32	64

   b) The ratio between successive terms is 2, indicating a
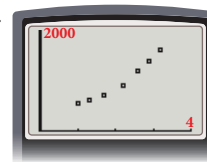   constant rate of change; answers may vary.
   c) 32 768
   d) The amount of rice would rise to more than 1 billion grains
   only halfway through the 64 days; answers may vary.
4. a) Answers may vary.

Distance (cm)	AM Radio Frequency (kHz)
1.0	540
1.3	600
1.7	700
2.2	900
2.6	1200
2.9	1400
3.2	1600

   b) Graphs may vary.

   c) Yes, it looks exponential; answers may vary.
5. a) $200 \div 100 \neq 300 \div 200$; answers may vary.
   b)

$62.50	$500	$4000	$32 000	$256 000
$125	$1000	$8000	$64 000	$512 000
$250	$2000	$16 000	$128 000	$1 024 000

   c) Answers may vary.

6. a) increasingly steep curve upward

b) about 5, extrapolation

c) about 35

d) positive exponential growth

7. a)

Time (h)	Number of Bacteria (1000s)
12	1000
24	2000
36	4000
48	8000
60	16 000
72	32 000
84	64 000
96	128 000
108	256 000
120	512 000
132	1 024 000
144	2 048 000
156	4 096 000
168	8 192 000

b)

c) 5.5 days

8. a) Decreasing curve then levelling off; answers may vary.

b) 16 min

c) 20°C

9. a) 81%

b) 7, 0.90^7 is the first power of 0.90 less than 0.5; answers may vary.

10. a) It looks very similar to an exponential curve; answers may vary.

b) $180 billion, $1.4 trillion; answers may vary.

c) Answers may vary.

12. a) At every new stage, the end of the branch is broken into two new branches, so the number of branch sections doubles at every stage

b) At every new stage, the white triangles are broken into three white triangles and a shaded triangle, so the number of white triangles triples at every stage

7.4 Exponential Relations, pages 382–394

1. a) exponential   **b)** linear

c) exponential   **d)** quadratic

e) linear

2. a) C   **b)** A   **c)** D   **d)** B

3. a) Graphs may vary.

i)

ii)

iii)

iv)
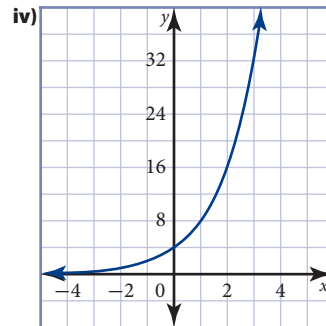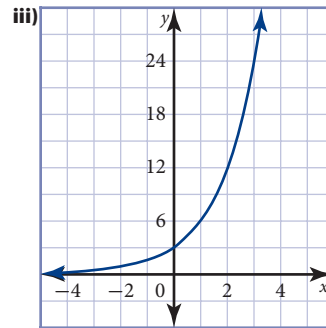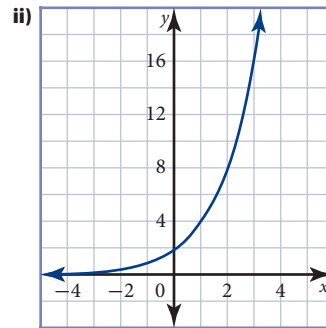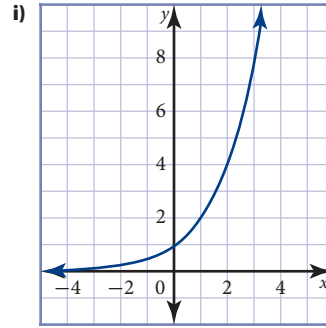
b) The greater the value of *a*, the faster the graph grows.

4. Answers may vary.

a)

x	−1	0	1	2	3
$y = 3^x$	$\frac{1}{3}$	1	3	9	27
$y = 2(3^x)$	$\frac{2}{3}$	2	6	18	54
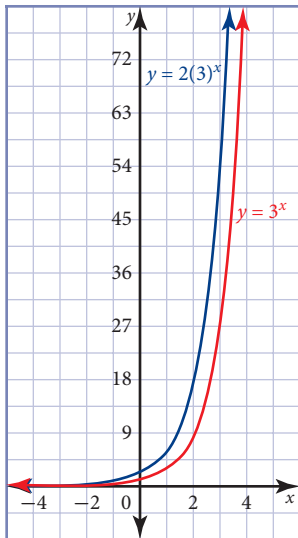
b)

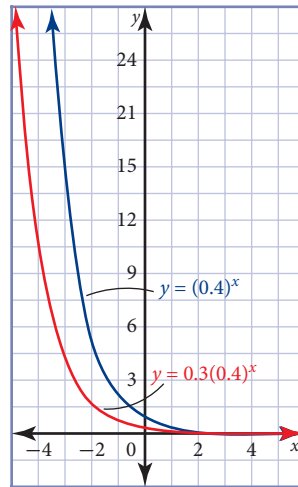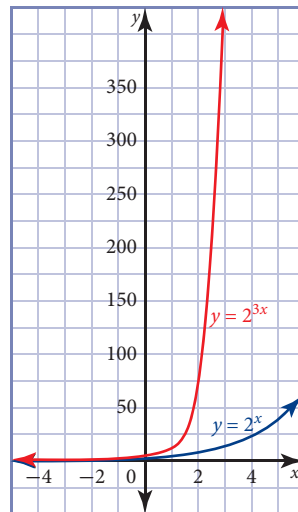| x	−1	0	1	2	3
$y = \left(\frac{1}{2}\right)^x$	2	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
$y = 2\left(\frac{1}{2}\right)^x$	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$
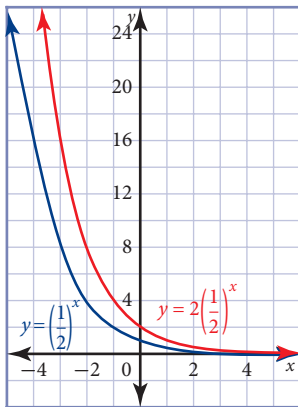
c)

x	−1	0	1	2	3
$y = (0.4)^x$	2.5	1	0.4	0.16	0.064
$y = 0.3(0.4)^x$	0.75	0.3	0.12	0.048	0.0192

5. Answers may vary.

a)

x	−1	0	1	2	3
$y = 2^x$	$\frac{1}{2}$	1	2	4	8
$y = 2^{3x}$	$\frac{1}{8}$	1	8	64	512

b)

x	−1	0	1	2	3
$y = 10^x$	$\frac{1}{10}$	1	10	100	1000
$y = 10^{\frac{x}{2}}$	0.316	1	3.16	10	31.6

c)
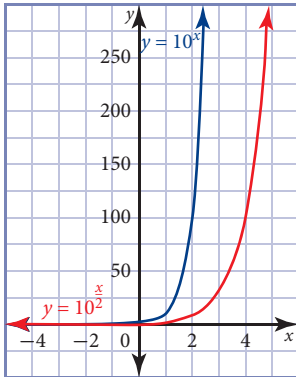
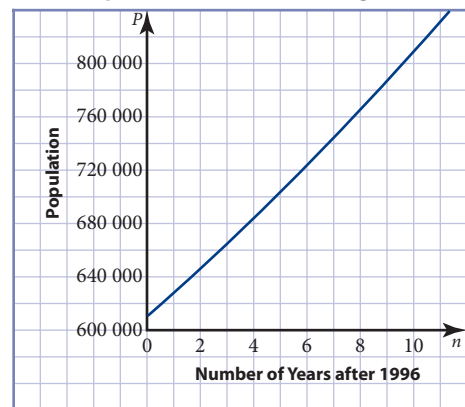| x	−1	0	1	2	3
$y = \left(\frac{1}{2}\right)^x$	2	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
$y = \left(\frac{1}{2}\right)^{\frac{x}{4}}$	1.19	1	0.84	0.707	0.59

d)
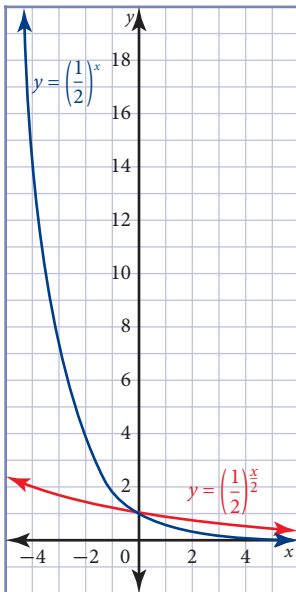
x	−1	0	1	2	3
$y = 2^x$	$\frac{1}{2}$	1	2	4	8
$y = (3)2^{\frac{x}{5}}$	2.61	3	3.45	3.96	4.55
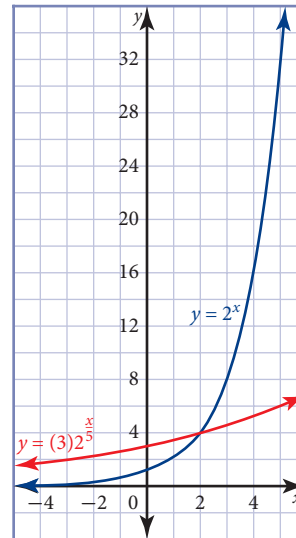
6. a)

Population Growth in York Region

b) 610 000, population in 1996
c) i) 1 050 079   **ii)** 1 659 082

7. a)   **Sound Intesity of a Bell**
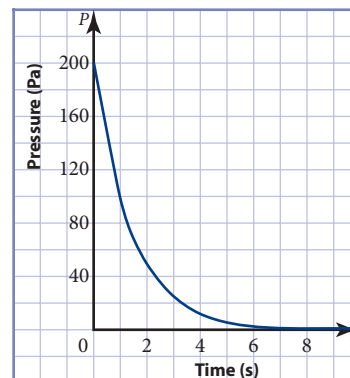
b) 200, pressure at 0 s
c) i) 100   **ii)** 50

8. a)

Number of years after 1996, n	Population of Toronto, P
1	2 473 966
2	2 488 315
3	2 502 747
4	2 517 263
5	2 531 863
6	2 546 548
7	2 561 318
8	2 576 174
9	2 591 116
10	2 606 144

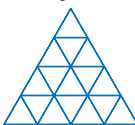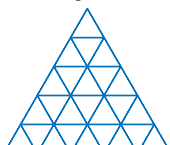| Number of years after 1996, n	Population of Peel, P
1	907 800
2	947 757
3	968 704
4	989 097
5	1 033 693
6	1 067 805
7	1 103 043
8	1 113 238
9	1 177 045
10	1 215 887
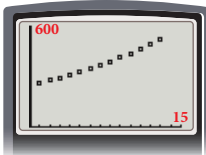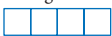
Population Growth in Toronto and Peel Region
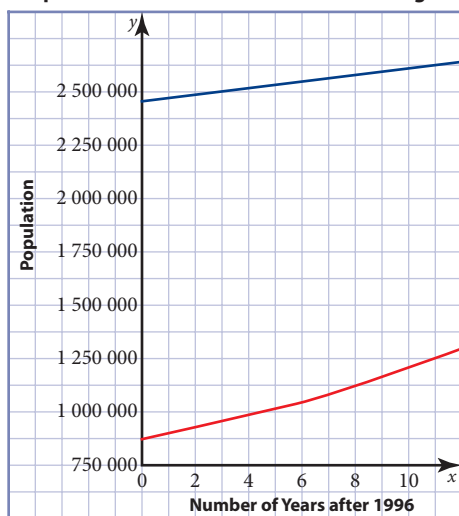
b) the population increases faster when the growth rate is greater

9. a) exponential, because it decreases by the same rate over equal time periods
b) quadratic, because gravity involves quadratics
c) linear, because it increases by the same amount over equal time periods
d) exponential, because it increases by the same rate over equal time periods
e) quadratic, because gravity involves quadratics
**f)** exponential, because it decreases by the same percent each bounce

10. a) Sound Intensity Compared to Sound Pressure

b) $P = 20\ 000$ and $P = 20\ 000\ 000$
c) $P = 2\ 000\ 000\ 000$

11. a) The ratio between successive keys is 1.06, indicating a constant rate of change; answers may vary.
b)

12. a) 1.01; answers may vary.
b) 1.03; answers may vary.
c) 1.01; answers may vary.
d) close to an exponential relationship, because the growth rate is almost the same over equal time periods; answers may vary.
e) 35 years
f) 2031; answers may vary.

13. a) Each new diagram, a square is added; linear

Diagram 4   Diagram 5

b) Each new diagram, two squares are added; linear

Diagram 4   Diagram 5

c) Each new diagram, a new row is added; quadratic

Diagram 4   Diagram 5

14. a) temperature decreases 9.84°C for every 1000 m, pressure decreases by 12% for every 1000 m

b) the decrease in temperature is linear, the decrease in pressure is exponential

c) there is less atmosphere above as altitude increases; answers may vary.

15. a) add the exponents when multiplying 0.5 by $(0.5)^{x-1}$; answers may vary.
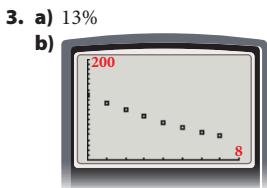
b) $y = 26 \times 0.5^{x-1}$

7.5 Modelling Exponential Growth and Decay, pages 395–405

1. a)
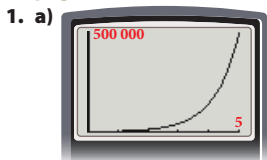
b) 1000   **c)** 3450   **d)** 488 760

2. a)

b) 240   **c)** 201

3. a) 13%

b)
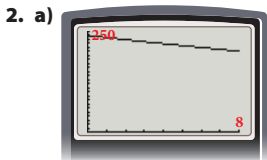
c) 19 h   **d)** 50 h; answers may vary.

4. a) i)

Time (h)	0	1	2	3	4	5	6	7
Mass of Caffeine (mg)	45.6	39.7	34.5	30.0	26.1	22.7	19.7	17.1

ii)

Time (h)	0	1	2	3	4	5	6	7
Mass of Caffeine (mg)	31.0	27.0	23.5	20.4	17.75	15.4	13.4	11.7

b) i)

ii)
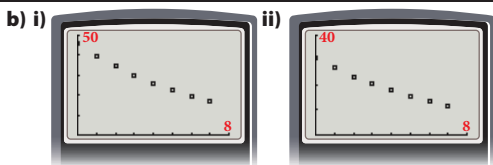
c) can of cola: 11 h; chocolate bar: 9 h

d) Answers may vary.

5. a) 1.25 min   **b)** almost 2 min

c) Yes; answers may vary.   **d)** Answers may vary.

6. a) Yes, because the growth rate is almost the same over equal time periods; answers may vary.

b) about 75%   **c)** 330 s

7. a) increasing

b) 1961 to 1962: 1.1 ppm, 0.34%; 1981 to 1982: 1.05 ppm, 0.31%; 2001 to 2002: 1.99 ppm, 0.53%

c) 1960s: 7.63 ppm, 2.4%; 1970s: 10.76 ppm, 3.3%; 1980s: 14.65 ppm, 4.3%; 1990s: 14.94 ppm, 4.2%
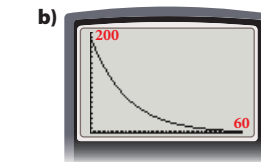
d) Answers may vary.

e) Answers may vary.

8. a)
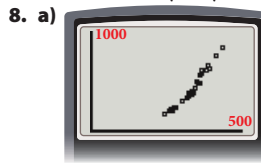
b) Yes, it looks exponential; answers may vary.

c) 100 g

d) Estimate the mass of a fish given its length; answers may vary.

9. Answers may vary.

11. 7.25 years

12. a) $P = 4\ 500\ 000\ 000(1.02)^t$; P is the population and t is the number of years after 1980

b) 9 000 000 000

c) 3 700 000 000; assuming same rate of increase

7.6 Solve Problems Involving Exponential Growth and Decay, pages 406–413

1. a) 20 min   **b)** 40 000   **c)** 4.7×10^{24}

2. a) 1200 W/cm^2 **b)** 960 W/cm^2

c) 614.4 W/cm^2 **d)** 393.2 W/cm^2

3. a) 19.5 mm^2 **b)** 9.2 mm^2

4. a) 0.25 ppt   **b)** 0.55 ppt   **c)** 0.05 ppt

5. 0.93 ppt

6. a) 10 h

b)

c) 31 h, 56 h

7. a) 4 h

b) i) 16.8 mg/mL   **ii)** 5.2 mg/mL

c) 25 h

8. a) Answers may vary.   **b)** Answers may vary.

9.

Sound Source	Intensity Level (dB)	Relative Intensity
Mosquito buzzing	40	$10^{-12} \times 10^{\frac{40}{10}} = 10^{-8}$ = 0.000 000 01
Rainfall	50	$10^{-12} \times 10^{\frac{50}{10}} = 10^{-7}$ = 0.000 000 1
Quiet alarm clock	65	$10^{-12} \times 10^{\frac{65}{10}} = 10^{-5.5}$ $\doteq$ 0.000 003
Loud alarm clock	80	$10^{-12} \times 10^{\frac{80}{10}} = 10^{-4}$ = 0.0001
Average factory	90	$10^{-12} \times 10^{\frac{90}{10}} = 10^{-3}$ = 0.001
Large orchestra	98	$10^{-12} \times 10^{\frac{98}{10}} = 10^{-2.2}$ $\doteq$ 0.006
Car stereo	125	$10^{-12} \times 10^{\frac{125}{10}} = 10^{0.5}$ $\doteq$ 3.16

10. a) the number of collisions divided by the number of millions of kilometres driven by all vehicles; answers may vary.
  b) i) 7.6 **ii)** 18.5
11. a) Answers may vary.
  b) Graphs may vary.
  c) Answers may vary.
12. a) Graphs may vary.
  b) Answers may vary.
  c) Answers may vary.
13. a) 286 Bq, 132 Bq **b)** 62 MBq
**14.** $P = 325(2)^{\frac{n}{15}}$, 1638

Chapter 7 Review, pages 414–415

1. a) $6^5 = 7776$ **b)** $(-2)^6 = 64$
  c) $5^3 = 125$ **d)** $\left(\frac{1}{3}\right)^6 = \frac{1}{729}$
  e) $10^8 = 100\ 000\ 000$ **f)** $(-7)^4 = 2401$
  g) $3^3 = 27$ **h)** $\left(-\frac{1}{2}\right)^5 = -\frac{1}{32}$

2. $\frac{9}{64}$ in.²

3. a) 1 **b)** $\frac{1}{5}$ **c)** $\frac{1}{512}$ **d)** 1
  e) $\frac{9}{4}$ **f)** 64 **g)** $\frac{1}{7}$ **h)** $\frac{1}{9}$
  i) 8 **j)** 5

4. a), b) is quadratic and **c)** is linear
5. a) 60 000
  b) 120 000
  c) 122 880 000
6. All graphs pass through (1, 3) and none of them have multiple y-values for the same x-value; $3x$ is the only one with negative values, and $3x^2$ has x-values that share the same y-values; answers may vary.
7. a) **Relation of Concentration of Hydrogen Ions to Acidity**
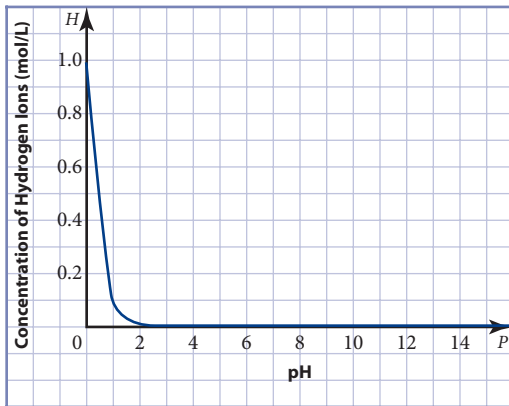
  b) $\dfrac{1}{10\ 000\ 000}$
  c) 0.000 000 025 to 0.000 000 1
  d) 0.000 0025 compared to 0.000 01
8. a)

  b) 1250 **c)** 1333

9. a)
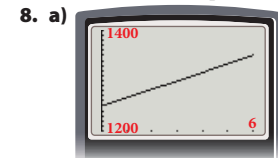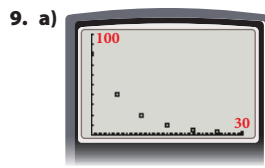
  b) Decay because every 10 s the amplitude is reduced by half; answers may vary.
  c) It has a half-life of 10 s.
  d) 90 s
10. a) 2 h
  b) 500 mg
  c) i) 250 mg **ii)** 62.5 mg
11. a) $50 814 **b)** $66 241 **c)** 4.1%

Chapter 7 Practice Test, pages 416–417

1. a) true **b)** false **c)** false **d)** true
2. a) 243 **b)** 81 **c)** 64 **d)** 1
  e) $\frac{1}{49}$ **f)** 125 **g)** 1 **h)** $\frac{1}{3}$
3. Graphs may vary.
  a) i)
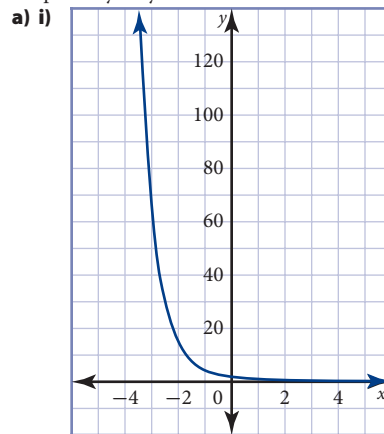
  ii) Exponential decay, because the relation divides by 4 for every x-value.
  b) i)
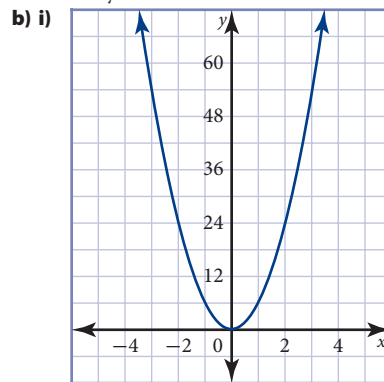
  ii) neither (quadratic)

c) i)
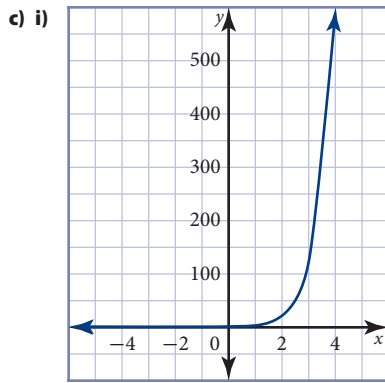
ii) Exponential growth, because the relation multiplies by 5 for every x-value.

d) i)
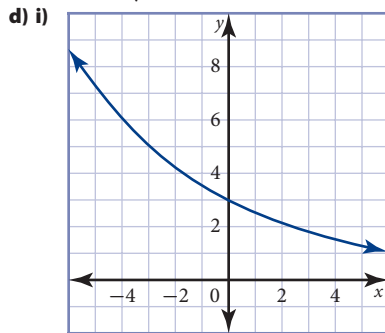
ii) Exponential decay, because the relation divides by 2 for every 4 x-values.

4. a) 3^3 **b)** 3^5 ft^3 **c)** 81

5. If b is positive, then any power of it will be positive; answers may vary.

6. a) Answers may vary.
b) exponential

7. a)

b) $101.3(0.883)^n$ **c)** 101.3 kPa
d) 1040 m **e)** 59.7 kPa

CHAPTER 8

Compound Interest, pages 418–457

Prerequisite Skills, pages 420–421

1. a) 5.16 **b)** 2.1 **c)** 280 **d)** 30.625
  e) 522.5 **f)** 972.1$\overline{6}$ **g)** 742.5 **h)** 1019
2. a) 0.02 **b)** 0.025 **c)** 0.032 **d)** 0.016
  e) 0.005 **f)** 0.021 25 **g)** 0.0025 **h)** 0.0475
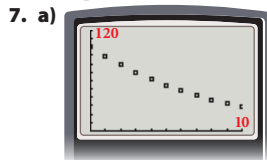**3. a)** 0.06 **b)** 0.04 **c)** 0.025 **d)** 0.18
  e) 0.185 **f)** 0.1225 **g)** 0.005 **h)** 0.0233
4. a) $20 **b)** $30 **c)** $110 **d)** $24.50
  e) $600 **f)** $112.50 **g)** $2245 **h)** $232.40
5. a) 0.03 **b)** 0.042 **c)** 0.007 75 **d)** 0.013
  e) 0.04 **f)** 0.018 **g)** 0.018 75 **h)** 0.002 75

6. Answers may vary.
  a) $40 **b)** $500 **c)** $8 **d)** $35
  e) $13 **f)** $12 500
7. a) 1.06 **b)** 1.59 **c)** 238.81 **d)** 6246.02
  e) 0.5 **f)** 0.04 **g)** 0.84 **h)** 0.94
8. a) $50 **b)** $48 **c)** $225 **d)** $1100
9. a) $180 **b)** $86.40 **c)** $49.71 **d)** $450

8.1 Simple and Compound Interest, pages 422–429

1. Simple Interest:

Year	Simple Interest ($)	Amount ($)
0		500.00
1	30	530.00
2	30	560.00
3	30	590.00
4	30	620.00
5	30	650.00
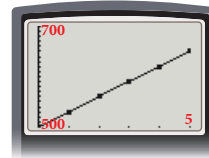
Compound Interest:

Year	$A = P(1.06)$	Amount ($)
0		500.00
1	500.00(1.06)	530.00
2	530.00(1.06)	561.80
3	561.80(1.06)	595.508
4	595.508(1.06)	631.23848
5	631.23848(1.06)	669.11279
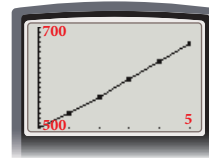
2. Simple Interest:

Year	Simple Interest ($)	Amount ($)
0		800.00
1	64	864.00
2	64	928.00
3	64	992.00
4	64	1056.00
5	64	1120.00
6	64	1184.00
7	64	1248.00
8	64	1312.00
9	64	1376.00
10	64	1440.00
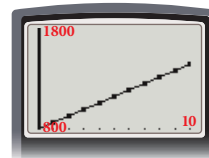
Compound Interest:

Year	A = P(1.08)	Amount ($)
0		800.00
1	800.00(1.08)	864.00
2	864.00(1.08)	933.12
3	933.12(1.08)	1007.7696
4	1007.7696(1.08)	1088.39117
5	1088.39117(1.08)	1175.46246
6	1175.46246(1.08)	1269.49946
7	1269.49946(1.08)	1371.05942
8	1371.05942(1.08)	1480.74417
9	1480.74417(1.08)	1599.20370
10	1599.20370(1.08)	1727.14000
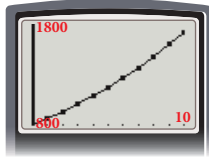
3. Shu Ying's investment after 5 years: $937.50
Shu Jin's investment after 5 years: $957.21
4. a) $1390.00   **b)** $1459.14
5. a) $2080; $2163.20; $2249.73
   b) $2100; $2205; $2315.25
   c) $2120; $2247.20; $2382.03
6. $17.81
Simple Interest:

Year	Simple Interest ($)	Amount ($)
0		2000.00
1	108	2108.00
2	108	2216.00
3	108	2324.00
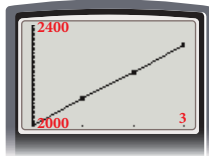
Compound Interest:

Year	A = P(1.054)	Amount ($)
0		2000.00
1	2000(1.054)	2108.00
2	2108(1.054)	2221.832
3	2221.832(1.054)	2341.810 93
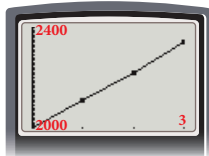
7. a) $7.60
   b) $7.60 in the first year, $7.89 in the second year, and $8.19 in the third year
   c) Simple interest, because it is the same every year.

8. a)

Year	A = P(1.04)	Amount ($)
0		20 000.00
1	20 000(1.04)	20 800.00
2	20 800(1.04)	21 632.00
3	21 632(1.04)	22 497.28
4	22 497.28(1.04)	23 397.1712
5	23 397.1712(1.04)	24 333.058
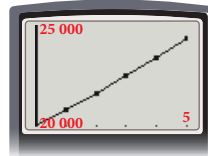
   b) It grows faster, they would earn $4000 using simple interest; answers may vary.
9. a) about $1125   **b)** about 11 years
   **c)** The graph would increase faster and curve more; answers may vary.
10. a)

Year	A = P(1.013)	Population
0		75 600.00
1	75 600(1.013)	76 582.80
2	76 582.8(1.013)	77 578.3764
3	77 578.3764(1.013)	78 586.8953
4	78 586.8953(1.013)	79 608.5249
5	79 608.5249(1.013)	80 643.4358
6	80 643.4358(1.013)	81 691.8004
7	81 691.8004(1.013)	82 753.7938
8	82 753.7938(1.013)	83 829.5931
9	83 829.5931(1.013)	84 919.3779
10	84 919.3779(1.013)	86 023.3298
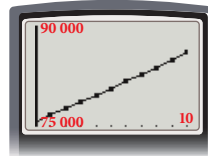
   b) The graph would increase faster and curve more; answers may vary.
11. 3.42% per year, compounded annually

8.2 Compound Interest, pages 430–435
1. a) 530.60   **b)** 245.97   **c)** 1262.48
   d) 3570.62   **e)** 2099.86   **f)** 15 281.42
2. a) $A = 2000(1 + 0.05)^3$
   b) $A = 1000(1 + 0.04)^4$
   c) $A = 50\ 000(1 + 0.03)^{20}$
   d) $A = 750(1 + 0.005)^{12}$
3. a) amount: $1216.65; interest: $216.65
   b) amount: $1265.32; interest: $265.32
   c) amount: $1137.64; interest: $137.64
   d) amount: $1154.64; interest: $154.64
4. a) $1013.84   **b)** $113.84
5. a) $6691.13   **b)** $6719.58   **c)** $6734.28
   d) $6744.25   **e)** $6749.13
6. a) $18 087.26   **b)** $24 325.35
7. $5546.98

8. a) after one year: $5203.02; after two years: $5414.28
   b) $211.26
   c) $290.47
   d) The value of the investment is greater in the ninth year than in the first year, so the interest earned in greater; answers may vary.
9. a) the $2500 investment
   b) $619.49
10. $132.77
11. Answers may vary.
12. He should take loan B, since it has less interest.
13. a) $4 915 849.32   **b)** $1 915 849.32
14. Markton; 11 452 people
15. $1295.85
17. $7743.48
18. a) 5%   **b)** 6%   **c)** 5%
19. a) $606.28   **b)** $1818.83

8.3 Present Value, pages 436–441

1. a) 1580.63 **b)** 706.43 **c)** 452.64 **d)** 7894.09
   e) 2141.68 **f)** 1126.97
2. a) $3960.47 **b)** $1847.69 **c)** $873.94 **d)** $6729.71
3. a) $1674.97 **b)** $4098.73 **c)** $68 809.18 **d)** $862.30
4. $2000
5. $923.48
6. $4806.37; $15 193.63
7. $26 673.51
8. $2396
9. $45 097.14
10. paying $2399.99 in now
11. $9005.01
12. $5060.59
13. a) $28 827.51   **b)** $1172.49
14. a) $3891.33   **b)** $136.09
15. a) $2299.66   **b)** $1210.84   **c)** $1114.14
   d) first situation: $3299.66; second situation: $3210.84; third situation: $3114.14
16. a) 3   **b)** 5   **c)** 4

8.4 The TVM Solver, pages 442–445

1. $2687.83
2. $1182.24
3. 3 years and 6 months
4. $4307.54
5. $3493.07
6. 9 years and 9 months
7. a) 12 years
   b) Yes, any amount would double in the same length of time; answers may vary.
8. a) 8.2%
   b) No, since it did not doubled the $2000 investment; answers may vary.
9. a) 24.5%   **b)** 18.1%   **c)** 14.35%
10. $3500 invested at 6.5% per year
11. money invested at 8% per year, compounded semi-annually
12. No, the investment will be worth only $364 331.82; 10.9%
13. $37 085.10; $25 053.37
14. a) $7651.34   **b)** $8419.73
15. Answers may vary.
16. 4.6%
**17.** semi-annually: 9.76%; quarterly: 9.65%; monthly: 9.57%

8.5 Effects of Changing the Conditions on Investments and Loans, pages 446–453

1. a) amount: $1843.88; total interest: $343.88
   b) amount: $1975.21; total interest: $475.21
   c) amount: $2115.90; total interest: $615.90
2. The graph of 5% interest increases faster and curves upwards more than the graph of 3% interest; 5% gives more interest than 3%; answers may vary.
3. a) The amount will increase from $798.94 to $942.99 and the interest will increase from $123.94 to $267.99.
   b) The amount will increase from $798.94 to $945.63 and the interest will increase from $123.94 to $270.63.
4. a) $2771.54
   b) $2717.85
5. The more frequent the compounding periods, the less she needs to invest; answers may vary.
6. a) $3.75   **b)** $5.67   **c)** $6.97
7. a) i) $15 730.86   **ii)** $15 750.44
   b) Compounded monthly because the compounding periods are more frequent; answers may vary.
8. Option A, since it makes the most interest.
   A: $11 360.00; B: $11 298.86; C: $11 236.00
9. a) Plan C; not necessarily the best option, since Jayeed can only use the money after four years; answers may vary.
   b) Plan A, since it earns more interest than plan B, and plan C is not cashable in two and a half years; answers may vary.
10. a) $1080   **b)** 282.1%
11. a) $602.22   **b)** Answers may vary.
12. a) i) $7413.72   **ii)** $7440.94
   b) The second investment has a greater principal because it has less frequent compounding periods.
13. Answers may vary.
15. $372.65
16. a) $1 777 232.88   **b)** $2 000 000
   c) Answers may vary.
17. a) 8.45%   **b)** 8.28%
   c) 8.19%   **d)** 8.14%
18. 21%

Chapter 8 Review, pages 454–455

1. Simple Interest:

Year	Simple Interest ($)	Amount ($)
0		2000
1	100	2100
2	100	2200
3	100	2300
4	100	2400
5	100	2500
6	100	2600
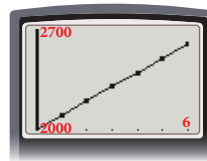
Compound Interest:

Year	A = P(1.05)	Amount ($)
0		2000.00
1	2000(1.05)	2100.00
2	2100(1.05)	2205.00
3	2205(1.05)	2315.25
4	2315.25(1.05)	2431.0125
5	2431.0125(1.05)	2552.56313
6	2552.56313(1.05)	2680.19128
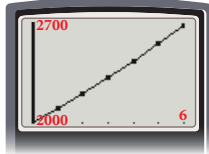
2. a)

Year	A = P(1.03)	Amount ($)
0		1500.00
1	1500(1.03)	1545.00
2	1545(1.03)	1591.35
3	1591.35(1.03)	1639.0905
4	1639.0905(1.03)	1688.26322
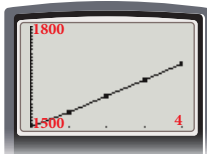
b)

Year	A = P(1.035)	Amount ($)
0		1500.00
1	1500(1.035)	1552.50
2	1552.5(1.035)	1606.8375
3	1606.8375(1.035)	1663.07681
4	1663.07681(1.035)	1721.28450
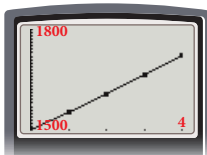
c)

Year	A = P(1.04)	Amount ($)
0		1500.00
1	1500(1.04)	1560.00
2	1560(1.04)	1622.40
3	1622.4(1.04)	1687.296
4	1687.296(1.04)	1754.78784
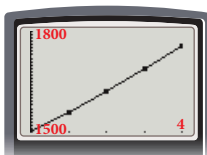
3. a) about $2700   **b)** about 12 years
  c) The graph would be less steep and would curve upwards more slowly because of the lower interest rate.

4. a) $A = 600(1 + 0.035)^6$ **b)** $A = 4000(1 + 0.0225)^{20}$
  c) $A = 6000(1 + 0.007)^{36}$ **d)** $A = 1200(1 + 0.0225)^4$
5. a) investment A earned him more money
  b) $1863.46
6. a) $3768.82   **b)** $1468.82
7. $3612.10
8. $5634.32
9. Plan C
10.

Present Value ($)	Future Value ($)	Term (years)	Compounding Period	Annual Interest Rate (%)
8000	12 000	5	monthly	8.14
6000	13 000	10	semi-annually	7.88
1340	2000	6.75	quarterly	6
100 000	1 000 000	29.5	semi-annually	8
4000	4376.21	3	monthly	3
16 149.25	25 000	8	quarterly	5.5

11. a) 17 years 6 months
  b) Yes, since doubling does not depend on the principal; answers may vary.
12. a) $3184.09   **b)** $3379.48   **c)** $3586.85
13. a) $289.80   **b)** $295.05   **c)** $297.76   **d)** $299.61
14. a) $28 405.65
  b) $20 000.00
  c) He should lease the car; $8405.65

Chapter 8 Practice Test, pages 456–457

1. B
2. C
3. A
4. A and D
5. Simple Interest:

Year	Simple Interest ($)	Amount ($)
0		1000.00
1	70	1070.00
2	70	1140.00
3	70	1210.00
4	70	1280.00
5	70	1350.00
6	70	1420.00
7	70	1490.00
8	70	1560.00
9	70	1630.00
10	70	1700.00
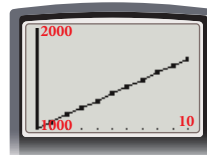
Compound Interest:

Year	$A = P(1.07)$	Amount ($)
0		1000.00
1	1000.00(1.07)	1070.00
2	1070.00(1.07)	1144.90
3	1144.90 (1.07)	1225.043
4	1225.043 (1.07)	1310.79601
5	1310.79601 (1.07)	1402.55173
6	1402.55173 (1.07)	1500.73035
7	1500.73035 (1.07)	1605.78148
8	1605.78148 (1.07)	1718.18618
9	1718.18618 (1.07)	1838.45921
10	1838.45921 (1.07)	1967.15136
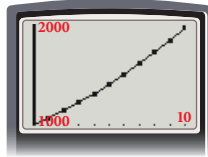
6. a) $780.27   **b)** $804.51
7. 8 years
8. Loan B
9. 7.05%
10. $8859.56
11. a) $1246.18   **b)** $1249.20
    c) $1250.75   **d)** $1251.80
12. a)

Annual Interest Rate (%)	Compounding Period	Scholarship Amount ($)
8.0	semi-annually	$4080.00
7.5	quarterly	$3856.79
5.5	semi-annually	$2787.81
7.0	semi-annually	$3561.25
9.0	annually	$4500.00

    b) 10%

CHAPTER 9

Personal Finance, pages 458–459

Prerequisite Skills, pages 460–461

1. a) 13.23   **b)** 21.285   **c)** 5400
    d) 65   **e)** 458.4375   **f)** 6986.25
2. a) 0.04   **b)** 0.013 75   **c)** 0.024
    d) 0.015   **e)** 0.0085   **f)** 0.0075
3. a) 0.16   **b)** 0.07   **c)** 0.049
    d) 0.009   **e)** −0.0285   **f)** 0.288
4. a) 60   **b)** 425   **c)** 209
    d) 43.2   **e)** 225   **f)** 250
5. a) 350   **b)** 175   **c)** 1.6
    d) 3.2   **e)** 2500   **f)** 250
6. a) 0.02   **b)** 0.032   **c)** 0.004
    d) 0.015   **e)** 0.015   **f)** 0.028
    g) 0.0875   **h)** 0.013 25
7. a) 16   **b)** 27   **c)** 1.44
    d) 1   **e)** 0.125   **f)** 0
8. a) 13.0321   **b)** 25.672 375   **c)** 1.5625

    d) 0.005 15   **e)** 0.166 375   **f)** 0.000 343
9. a) 0.0075   **b)** 0.0423   **c)** −0.0233
    d) 0.0045   **e)** 0.0004   **f)** 0.0008
10. a) 12   **b)** 60   **c)** 8
    d) 183   **e)** 730   **f)** 540
11. a) $2459.75   **b)** $1308.65
    c) $524.44   **d)** $304.97
12. a) $2459.75   **b)** $1308.65
    c) $524.44   **d)** $304.97

9.1 Saving Alternatives, pages 462–467

1. a) $2001.64   **b)** $3007.65   **c)** $1500.95
    d) $410.13   **e)** $500.02   **f)** $2500.48
2. a) $2001.64   **b)** $3007.65   **c)** $1500.95
    d) $410.13   **e)** $500.02   **f)** $2500.48
3. a) $8.45   **b)** $6.95   **c)** $13.70
    d) $0   **e)** $11.45   **f)** $17.45
4. a) $9.95   **b)** $9.95   **c)** $10.90
    d) $0   **e)** $9.95   **f)** $15.65
5. Answers may vary.
6. a) $1.60   **b)** $19.82
    c) The account is earning interest on previously earned interest each new month.
7. a) 11   **b)** Option 1
    c) Option 1: $11, $1; Option 2: $14.75, $1.34; Option 3: $24.95, $2.27
    d) Withdraw more cash so he makes fewer withdrawals; answers may vary.
8. a) Option 2   **b)** Option 1   **c)** 16   **d)** $17.25, $1.08
9. a) about 65   **b)** Option 3   **c)** about $0.38
    d) To make fewer bank transactions; answers may vary.
10. a) $31.27   **b)** $281.46   **c)** $0.04   **d)** $28.69
    e) $59.96   **f)** $0.08   **g)** about $800
11. A savings account is for money you are going to use soon; answers may vary.

9.2 Investment Alternatives, pages 468–475

1. a) 0.06   **b)** 0.08   **c)** 0.1
    d) 0.005   **e)** 0.0325   **f)** 0.049
    g) −0.026   **h)** 0.0595   **i)** 0.0506
2.

	r (%)	Compounding Frequency	i
a)	9.0	monthly	0.0075
b)	16.0	quarterly	0.0400
c)	−4.6	semi-annually	−0.0230
d)	1.8	quarterly	0.0045
e)	0.5	monthly	0.0004
f)	12.8	quarterly	0.0320

3. a) $1127.46   **b)** $7889.56   **c)** $2016.24
4. a) $1127.46   **b)** $7889.56   **c)** $2016.24
5. a) $127.46   **b)** $2889.56   **c)** $16.24
6. $2339.50
7. $11 221.64
8. a) $1988.40   **b)** $2114.27   **c)** $3196.27
9. a) Guaranteed Investment Certificate; A type of risk free investment that lasts a fixed amount of time; answers may vary.
    b) Low-risk
    c) Answers may vary.

10. a) $1041 **b)** $1083.68
c) $FV = 1000(1.041)^n$ **d)** $1324.81
e)
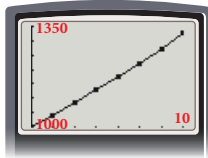
11. a) Answers may vary.
    i) low-risk   **ii)** medium-risk
    iii) high-risk   **iv)** low-risk
    v) medium-risk   **vi)** high-risk
    vii) medium-risk
b) Answers may vary.
12. a) $520 **b)** $10.32
c) $104 **d)** $634.32
13. a) $550 396.54 **b)** $63 700 **c)** $487 435.80
d) He expects to get higher paying jobs.
14. $902.72
16. Answers may vary.

9.3 Manage Credit Cards, pages 476–481
1. a) 0.049% **b)** 0.0789%
c) 0.0381% **d)** 0.0107%
2. a) $1541.00 **b)** $1566.50
c) $1531.74 **d)** $1508.84
3. a) $1541.00 **b)** $1566.50
c) $1531.74 **d)** $1508.84
4. 37 days
5. a) February 8 **b)** March 11
6. a) $10 **b)** $36.62
7. advantage: fewer bank transactions; disadvantage: she might buy more than she can afford; answers may vary.
8. a) 0.0518%, 0.000 518 **b)** 0.0353%, 0.000 353
9. a) $99.24 **b)** $10
c) August 17 **d)** Answers may vary.
e) 0.046%, 0.000 46 **f)** $0
10. a) $8380 **b)** $325.35
c) Bank 1: $29.03; Bank 2: $53.19; Gasoline Retailer: $3.55; Furniture Retailer: $31.32
d) Bank 2
e) It will take 36 monthly payments (3 years) of $272.37 to pay off his $8380 debt at 10.5% interest, compounded monthly.

9.4 Obtain a Vehicle, pages 482–488
1. a) $26 214.30 **b)** $41 325
c) $20 518.86 **d)** $14 814.30
2. a) $127.20 **b)** $209.51 **c)** $313.20
3. a) $4579.20 **b)** $10 056.48 **c)** $18 792
4. a) $579.20 **b)** $1556.48 **c)** $3792
5. a) $11 764 **b)** $19 152 **c)** $42 561
6. a) $200 **b)** $336 **c)** $24
7. different mileage, condition, or damage; answers may vary.
8. 5-speed, automatic, or best offer, power steering, $170 000, all-wheel drive, emission test, power brakes, certified, power windows, air conditioning, front-wheel drive, has all extra options, power (door) locks, year 2000 model
9. a) $26 200
b) $545.83
c) buy the car or lease a new car; answers may vary.
10. a) $7020 **b)** $65.35 **c)** $150
11. a) $38 360 **b)** $799.17
13. Answers may vary.

14. a) pre-delivery inspection **b)** $26 385.20
c) $453.76 **d)** $26 780.48
e) $11 578.10

9.5 Operate a Vehicle, pages 489–495
1. a) $80 **b)** $6 **c)** $0.16
2. Answers may vary.
3. Answers may vary.
4. a) 1000 km **b)** 508 km **c)** 705 km
d) 735 km **e)** 681 km
5. a) 3.7 gallons **b)** 7.9 gallons **c)** 14.5 gallons
d) 19.8 gallons **e)** 24.3 gallons
6. Answers may vary.
    a) fixed **b)** variable **c)** fixed
    d) variable **e)** variable **f)** fixed
    g) fixed **h)** fixed **i)** variable
    j) fixed
7. a) $2336 **b)** $9999 **c)** $4450
8. a) 16% **b)** 19% **c)** 24%
9. $1320
10. a) 13 km/L **b)** 12 km/L **c)** 20 km/L
11. a) $19 355 **b)** 6
12. Answers may vary.
14. a)

Date	Odometer Reading	Distance (km)	Fuel Use (US gallons)	Fuel Use (L)	Fuel Costs (US$)	Fuel Costs (CDN$)	Unit Fuel Cost (CDN$/L)	Fuel Efficiency (km/L)
Mar. 15	236 083	--------	------	-----	---------	--------	--------	--------
Mar. 16	236 948	865	12.7	48.1	41.00	48.38	1.01	18
Mar. 17	237 760	812	12.3	46.6	40.00	47.20	1.01	17
Mar. 22	237 897	137	2.6	9.8	8.50	10.03	1.02	14
Mar. 23	238 780	883	12.5	47.3	40.25	47.50	1.00	19
Mar. 24	239 541	761	----------	42.9	-------	42.85	1.00	18

b) 3458 km **c)** 17.8 km/L, 5.6 L/100 km
d) $195.96

Chapter 9 Review, pages 496–497
**1. a)** $20.25
b) Make fewer transactions and use a credit card; answers may vary.
2. a) $0.09 **b)** $0.09
3. $1.27
4. $4485.20
5. a) $FV = PV(1.0365)^n$ **b)** $2392.64
c) $2392.64
6. advantage: groups all purchases into one payment; disadvantage: has high interest rates; answers may vary.
7. $4.65
8. PST
9. a) $23 652 **b)** $492.75
10. a) $136.37 **b)** $211.74
11. a) $28 032.77 **b)** $57 340.09
12. a) Answers may vary. **b)** Answers may vary.
c) 4.2 L/100 km, 23.6 km/L
13. a) $8040 **b)** 12%
c) 34.9% **d)** 13.3%
e) $FV = 67 000(0.867)^n$ **f)** $16 079.25

Chapter 9 Practice Test, pages 498–499

1. A
2. C
3. B
4. C
5. a) \$58 800   **b)** \$357 333.44   **c)** \$298 533.44
6. \$23 632.60
7. a) \$18 772   **b)** \$391.08
8. a) The van requires 12.2 L of fuel to drive 100 km.
     b) 656 km
     c) 52 L
**9.** Answers may vary.

Chapters 7 to 9 Review , pages 504–513

1. a) $6^5 = 7776$ **b)** $10^4 = 10\ 000$
     c) $\left(\dfrac{1}{4}\right)^5 = \dfrac{1}{1024}$ **d)** $7^2 = 49$
     e) $2^{10} = 1024$ **f)** $(-1)^{24} = 1$
2. a) $\dfrac{1}{4}$ **b)** 1   **c)** $\dfrac{1}{125}$
     d) 1   **e)** $\dfrac{1}{1000}$ **f)** $\dfrac{1}{135}$
3. Every time the x value increases by 1, the y value is multiplied by 3.
4. a) negative exponential because every 5 s, the speed is divided by 2; B
     b) positive linear because every second, the speed increases by 10; A
     c) quadratic (parabola) because gravity involves a quadratic function; C
     d) positive exponential because every year, the population is multiplied by 1.02; D
5. a)
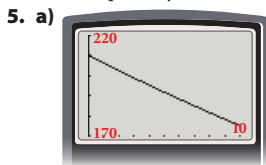
     b) 210   **c)** about 182
6. a) 996 mg   **b)** 819 mg   **c)** 18.6 mg

7.

Years	Simple Interest ($)	Compound Interest ($)
0	1500	1500.00
1	1590	1590.00
2	1680	1685.40
3	1770	1786.52
4	1860	1893.71
5	1950	2007.33
6	2040	2127.77
7	2130	2255.44
8	2220	2390.77
9	2310	2534.22
10	2400	2686.27
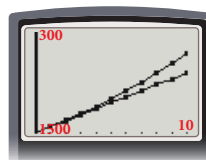
8. a) 26.92   **b)** 395.98
     c) 23.21   **d)** 227.28
9. a) \$3152.84; \$3313.46   **b)** \$186.44
10. a) \$3593.81   **b)** \$1847.69   **c)** \$7430.48
11. a) 9.2%   **b)** 7.35%   **c)** 5.5%
12. Both graphs start together, but as time increases, the investment at 6% increases faster than the other and increases the gap between them. The 6% investment has greater return than the 4.5% investment.
13. a) \$0   **b)** \$6.95   **c)** \$4.95
     d) \$9.95   **e)** \$8.45   **f)** \$11.95
14. \$848.05
15. \$659.59; \$660.31
16. a) \$14 214   **b)** \$23 952
17. a) 544 km   **b)** 75.875 L
18. a) \$2395   **b)** \$7299