

Final answers only, for *Review* and *Practice* questions that have a single correct answer.

Explanatory or descriptive answers may vary.

Chapter 1 Trigonometry

Activate Prior Knowledge

The Pythagorean Theorem, page 2

- About 257 km
 - About 15.39 m
- QR \doteq 9.5 m
- About 101 m

Metric and Imperial Unit Conversions, page 3

- 72 mm
 - 9.215 km
 - 9350 m
 - 8.32 m
 - 87 900 cm
 - 0.065 m
- 84 in.
 - 84 ft.
 - 42 240 ft.
 - 321 yd.
 - 281 in.
 - 4 ft.
- About 502 mm or about 0.50 m
 - 6 ft. or 2 yd.

1.1 Trigonometric Ratios in Right Triangles, page 8

- s or PR
 - k or LM
 - p or RS
 - m or KL
 - r or PS
 - l or KM
- $\sin A = \frac{BC}{AB}$
 - $\cos A = \frac{AC}{AB}$
 - $\cos B = \frac{BC}{AB}$
 - $\tan B = \frac{AC}{BC}$
- Sine
 - Tangent
 - Cosine
- $e \doteq$ 1.4 m
 - $q \doteq$ 24 ft.
 - $g \doteq$ 59 in.

- $\tan A \doteq$ 1.9230, $\angle A \doteq$ 63°
 - $\tan A = 1$, $\angle A = 45^\circ$
 - $\tan A \doteq$ 0.3801, $\angle A \doteq$ 21°
- $\angle A \doteq$ 32° , $\angle B \doteq$ 58° , $b \doteq$ 11.5 ft.
 - $\angle R \doteq$ 64° , $\angle P \doteq$ 26° , $r \doteq$ 27.9 cm
 - $\angle E \doteq$ 47° , $\angle D \doteq$ 43° , $f \doteq$ 45 in. or 3 ft. 9 in.
- About 3 ft.
 - About 9 ft.
- About 59°
- About 2 mi. (about 9471 ft.)
- About 5.2 m
- About 87.7 m
- Yes
 - About 326°
- AB \doteq 4.00 m
 - Angle of inclination; $\angle A \doteq$ 36°
- About 28°
 - About 123°
- About 3.2 km, about 2.0 km

1.2 Investigating the Sine, Cosine, and Tangent of Obtuse Angles, page 19

- Quadrant I
 - Quadrant II
 - Quadrant II
- Positive
 - Positive
 - Positive
- Negative
 - Positive
 - Negative
- Negative
 - Positive
 - Negative
- Positive
 - Negative
 - Negative
 - Positive
 - Negative
 - Positive
- Acute
 - Obtuse
 - Acute or obtuse

1.3 Sine, Cosine, and Tangent of Obtuse Angles, page 23

- $\sin 110^\circ \doteq$ 0.9397, $\cos 110^\circ \doteq$ -0.3420 ,
 $\tan 110^\circ \doteq$ -2.7475

- b) $\sin 154^\circ \doteq 0.4384$, $\cos 154^\circ \doteq -0.8988$,
 $\tan 154^\circ \doteq -0.4877$
- c) $\sin 102^\circ \doteq 0.9781$, $\cos 102^\circ \doteq -0.2079$,
 $\tan 102^\circ \doteq -4.7046$
2. a) Positive, about 0.5736
b) Negative, about -0.4877
c) Negative, about -0.6947
3. a) $\sin A = 0.6$
b) $\cos A \doteq 0.2425$
c) $\tan A = 0.5$
d) $\cos A \doteq -0.6402$
e) $\sin A \doteq 0.8682$
f) $\tan A \doteq -0.2857$
4. a) 167°
b) 101°
c) 145°
d) 175°
5. a) 132°
b) 56°
c) 103°
d) 104°
6. a) 25°
b) 122°
c) 145°
d) 123°
7. a) Acute
b) Obtuse
c) Acute or obtuse
8. a) Yes
b) No
c) Yes
d) Yes

9.

	Acute	Obtuse
Sine	Positive	Positive
Cosine	Positive	Negative
Tangent	Positive	Negative

10. a) 38° or 142°
b) 148°
c) 12°
d) 162°
e) 135°
f) 50° or 130°
11. Equations a and b will result in two different values for angle Y.

12. a) 27° or 153°
b) 117°
c) 24°
13. 0.8930
14. -0.3846
15. a) $\sin 90^\circ = 1$, $\cos 90^\circ = 1$

Chapter 1 Mid-Chapter Review, page 26

1. a) $c \doteq 44$ cm, $b \doteq 30$ cm, $\angle B = 43^\circ$
b) $CD \doteq 30$ yd., $\angle C = 26^\circ$, $\angle D = 64^\circ$
2. a) $\angle Y = 37^\circ$, $z \doteq 4.5$ cm, $y \doteq 2.7$ cm
b) $\angle X = 38^\circ$, $\angle Y = 52^\circ$, $y \doteq 32$ in., or 2 ft. 8 in.
3. About 41°
4. About 43.6 m
5. a) 6.5 mi.
b) About 157°
6. a) Positive, positive, positive
b) Positive, negative, negative
c) Positive, negative, negative
7. a) Acute
b) Obtuse
c) Acute or obtuse
d) Obtuse
8. a) About 167°
b) About 169°
c) About 122°
d) About 158°
9. a) About 32° or about 148°
b) About 115°
c) About 8°
d) About 3° or about 177°

1.4 The Sine Law, page 31

1. a) $\frac{\sin 52^\circ}{x} = \frac{\sin 55^\circ}{2.5}$
b) $\frac{\sin 105^\circ}{3} = \frac{\sin 23^\circ}{t}$
c) $\frac{\sin 33^\circ}{23} = \frac{\sin 19^\circ}{p}$
2. a) About 2.4 cm
b) About 1.2 ft.
c) About 14 m
3. a) About 16.6 m
b) About 505 in.
c) About 10.6 km

4. a) $\frac{\sin 21^\circ}{x} = \frac{\sin 21^\circ}{y} = \frac{\sin z}{5}$
 $\frac{\sin 11^\circ}{f} = \frac{\sin 120^\circ}{e} = \frac{\sin g}{2.4}$
 $\frac{\sin 69^\circ}{k} = \frac{\sin 76^\circ}{m} = \frac{\sin L}{2.2}$
- c) i) 138° , $XZ = ZY \doteq 3$ in.
 ii) 49° , $GE \doteq 0.6$ km, $GF \doteq 2.8$ km
 iii) 35° , $ML \doteq 3.6$ m, $KL \doteq 3.7$ m
5. a) 7° , $YZ \doteq 2.3$ m, $XZ \doteq 3.3$ m
 b) 30° , $YZ \doteq 23.3$ mi., $XZ \doteq 12.0$ mi.
 c) 20° , $YZ \doteq 33$ cm, $XZ \doteq 24$ cm
6. a) 41° , $YZ \doteq 5$ cm, $XZ \doteq 1$ cm
 b) 30° , $YZ \doteq 2$ ft., $XZ \doteq 1$ ft. 2 in.
 c) 20° , $YZ \doteq 157$ mm, $XZ \doteq 136$ mm
7. Use the Sine Law to solve the triangles.
8. a) Yes
 b) No
 c) Yes
9. a) About 8.4 cm
 c) About 20 m
10. a) 13°
 b) About 67 yd.
11. a) About 11.2 cm
12. a) $x \doteq 9.1$ cm, $z \doteq 17.7$ cm
13. a) $e \doteq 6.3$ in.
15. $\angle Q = 47^\circ$, $QR \doteq 0.6$ m, $PQ \doteq 0.2$ m
16. $\angle B = 45^\circ$, $BC \doteq 3.6$ km, $AB \doteq 1.6$ km
17. $LR \doteq 56$ ft., $LS \doteq 25$ ft.

1.5 The Cosine Law, page 38

1. a) $z^2 = 18^2 + 11^2 - 2 \times 11 \times 18 \times \cos 32^\circ$
 b) $v^2 = 9.7^2 + 3.0^2 - 2 \times 9.7 \times 3.0 \times \cos 22^\circ$
 c) $o^2 = 36^2 + 134^2 - 2 \times 36 \times 134 \times \cos 115^\circ$
2. a) About 10 ft. b) About 7.0 m
 c) About 153 in., or 12 ft. 9 in.
3. a) About 0.8 m
 b) About 5.3 ft.
 c) About 1.3 cm
4. a) About 18.8 cm
 b) About 18.9 cm
 c) About 5.8 in.
5. a) $4.3^2 = 5.0^2 + 3.2^2 - 2 \times 5.0 \times 3.2 \times \cos B$
 b) $145^2 = 111^2 + 35^2 - 2 \times 111 \times 35 \times \cos R$
 c) $6.23^2 = 4.11^2 + 2.78^2 - 2 \times 4.11 \times 2.78 \times \cos M$
6. a) 58° b) 164°
 c) 128°
7. a) 87° b) 23°
8. a) 117° b) 80°
 c) 55°
9. a) Cosine Law
 b) Sine Law
 c) Sine Law
10. a) The bearings are shown as angles measured from North, clockwise.
 b) About 9.6 mi.
11. About 3 ft. 4 in.
12. About 31°
13. About 19° , about 32°
14. 120° , about 22° , about 38°
15. a) 116°
17. a) About 40 ft.
 b) About 36°
18. a) About 48 m

1.6 Problem Solving with Oblique Triangles, page 47

1. a) Sine Law
 b) Sine Law
 c) Sine Law
2. a) About 20 mi.
 b) About 8 in.
 c) About 3.7 km
3. a) Sine Law; $t \doteq 7.9$ mi., $v \doteq 7.0$ mi.
 b) Cosine Law; about 3.9 km
 c) Cosine Law; about 21 in., or 1 ft. 9 in.
4. a) Cosine Law
 b) Both
 c) Both
5. a) About 112°
 b) About 160°
 c) About 34°
6. a) Cosine Law: about 10°
 b) Cosine Law: about 72°
 c) Cosine Law: about 111°
7. About 54 m
8. Yes
10. a) About 44°
 b) About 96°
11. a) About 102°
 b) About 39°
12. a) Meaford to Christian Island: about 34 mi.;
 Christian Island to Collingwood: about 31 mi.;
 about 85 mi. altogether
 b) About 30 mi.

13. About 112° , 40° , 28°
 14. **b)** About 94° ; answers may vary by as much as 8° ,
 depending on the method used.
 16. About 28 km

Chapter 1 Review, page 54

1. **a)** $a \doteq 0.8$ m, $b \doteq 1.5$ m
b) $\angle Y \doteq 34^\circ$ ($\angle Z \doteq 56^\circ$)
 2. About 1.2 m
 3. About 24°
 4. **a)** $\angle Y \doteq 52^\circ$, $\angle Z \doteq 38^\circ$
b) About 1370 ft.
 5. About 300°
 6. **a)** Positive
b) Negative
c) Positive
 7. **a)** Acute
b) Obtuse
c) Acute
d) Either
 8. **a)** $\cos(180^\circ - \angle A) = 0.94$
b) $\sin(180^\circ - \angle A) = 0.52$
c) $\tan(180^\circ - \angle A) = -0.37$
 9. **a)** About 112°
b) About 124°
 10. **a)** Obtuse
b) Either
 11. **a)** About 170°
b) About 21° or about 159°
 12. **a)** About 22°
b) About 47° or about 133°
 13. **a)** $x \doteq 30$ mm
b) $y \doteq 32$ mm
 14. **a)** $p \doteq 5$ ft., or 1 yd. 2 ft.,
 $q \doteq 12$ ft., or 4 yd.
 15. **a)** $n \doteq 36$ m, $m \doteq 28$ m, $\angle L = 27^\circ$
b) $i \doteq 306$ in., or about 25 ft. 6 in.; $j \doteq 262$ in.,
 or about 21 ft. 10 in.; $\angle I = 102^\circ$
 16. **a)** About 40°
b) About 80°
 17. About 2.1 m, about 3.5 m
 18. **c)** $q \doteq 3.0$ m
 19. About 10.8 km, $\angle D \doteq 18^\circ$, $\angle B \doteq 31^\circ$
 20. About 87°
 21. **b)** **i)** $\angle N \doteq 157^\circ$
ii) $\angle D \doteq 49$
 22. About 43° , about 76°

23. About 63° , about 72° , about 45°
 24. About 27 m
 25. About 5.8 m
 26. **b)** About 1622 m
 27. $t \doteq 5.9$ m, $s \doteq 1.7$ m

Chapter 1 Practice Test, page 57

1. B
 2. A
 3. $\angle A \doteq 28^\circ$, $\angle B \doteq 13^\circ$, $AC \doteq 2.9$ m
 5. About 114°
 6. **a)** About 326°
b) About 41 km

Chapter 2 Geometry

Activate Prior Knowledge

Metric and Imperial Units of Length, page 60

1. **a)** About 5.18 m
b) About 295 ft. and about 394 ft.
c) About 75 mi.
d) About 8.5 in.
 2. **a)** About 11.5 ft. by 13.8 ft.
b) About 6 in. and 10 in.

Perimeter and Area, page 62

1. **a)** $P = 21.6$ cm
 $A = 28.8$ cm²
b) $P = 30.0$ m
 $A \doteq 38.4$ m²
c) $P \doteq 28.3$ in.
 $A \doteq 63.6$ sq. in.
 2. $P = 344$ yd.
 $A = 6240$ sq. yd.
 3. $C \doteq 47.1$ ft.
 $A \doteq 176.7$ sq. ft.
 4. **a)** About 2.4 m
b) $P = 47.5$ m; $A \doteq 28.2$ m²
c) Perimeter

Metric and Imperial Units of Capacity, page 63

1. **a)** About 2.8 L
b) About 17.6 gal.
c) About 119.3 mL
d) About 181.8 L
e) About 14.0 fl. oz.

2. Canada; 21.2 U.S. gallons is about 80.2 L, which is less than the consumption in Canada.

Volumes of Prisms and Cylinders, page 64

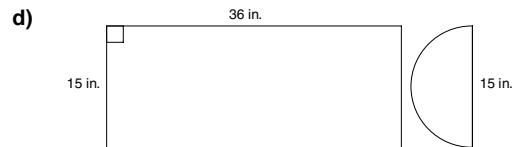
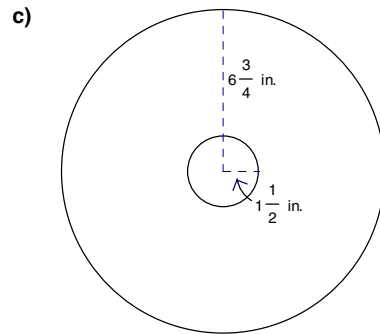
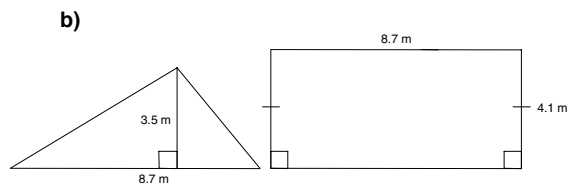
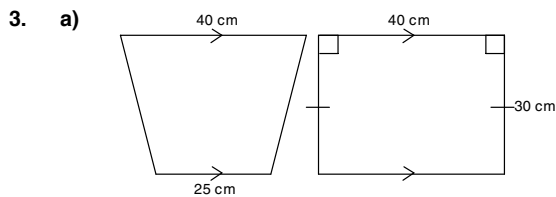
1. a) Base is a rectangle;
 $A = 51.75 \text{ sq. in.}$;
 $V = 77.625 \text{ cu. in.}$
- b) Base is a triangle;
 $A = 6 \text{ cm}^2$;
 $V = 36 \text{ cm}^3$
- c) Base is a circle;
 $A \doteq 15.9 \text{ m}^2$;
 $V \doteq 133.6 \text{ m}^3$
2. The base of a triangular prism is a triangle.

Surface Areas of Prisms and Cylinders, page 65

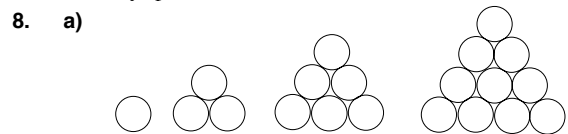
1. a) 151.5 sq. in.
 b) 84 cm^2
 c) About 150.6 m^2
2. A rectangular prism has 6 faces.
 A triangular prism has 5 faces.

2.1 Area Applications, page 71

1. a) A rectangle and a semicircle
 b) A square with a circle cut out
 c) A parallelogram and a right triangle
2. a) Add the area of the rectangle to the area of the semicircle.
 b) Subtract the area of the circle from the area of the square.
 c) Add the area of the parallelogram to the area of the triangle.



4. a) 2175 cm^2 b) About 50.9 m^2
 c) About 136.07 sq. in. d) About 451.6 sq. in.
5. Both of them are correct.
6. a) A semicircle with a smaller semicircle cut out;
 $A \doteq 18.85 \text{ sq. ft.}$
 b) A rectangle on top of a triangle; $A = 510 \text{ sq. in.}$
 c) A semicircle on top of a trapezoid;
 $A \doteq 207.2699 \text{ cm}^2$
7. a) The number of cans equals the square of the layer number.
 b) Square c) 100 cans
 d) About $15\,625 \text{ cm}^2$; the cans are stacked without any space in-between.

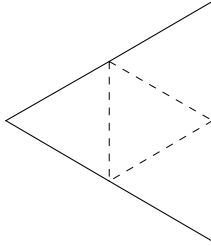


The number of cans in each layer starting at the top is: 1, 3, 6, 10...

- b) 55 cans
 c) About 6766 cm^2 ; the cans are stacked without any space in-between.
 d) Fewer cans
9. a) $A \doteq 7.955 \text{ m}^2$; $A \doteq 82.4 \text{ sq. ft.}$
 b) 2 cans
10. $A \doteq 4301.87 \text{ m}^2$
12. a) About 315 sq. ft.
 b) About 29 m^2
13. a) Split the composite figure into a rectangle and 2 congruent trapezoids. $A \doteq 1931 \text{ cm}^2$
14. a) $A \doteq 34.0 \text{ m}^2$ b) About 3.14 m^2

c) $A \doteq 237.7 \text{ m}^2$

16. a)



b) $A \doteq 259.3 \text{ cm}^2$

2.2 Working with Composite Objects, page 81

- A large cylinder with a smaller cylinder on top
 - A large rectangular prism with a smaller rectangular prism on top
- A rectangular prism with a half cylinder on top
 - A large rectangular prism with a smaller rectangular prism cut out
- A rectangular prism with a triangular prism on top
 - A rectangular prism with a half cylinder on top and a right triangular prism on the side
- $SA = 1600.5 \text{ cm}^2$
 - About 3400 cm^2
 - About 2000 mL
- About $15\,567 \text{ sq. in.}$
 - $V \doteq 10\,800 \text{ cu. in.}$
 - About 212.6 L
- Yes
- The volume of the quarter cylinder is $\frac{1}{4}$ of the volume of a cylinder with the same radius and height.
 - $V \doteq 1018 \text{ cu. in.}$
 - $SA \doteq 611.85 \text{ sq. in.}$

Face	Shape	Number	Area of each face (square inches)
Front and back	Quarter circle	2	$\frac{1}{4}(\pi \times 12^2) = 113.0973$
Bottom and side	Rectangle	2	$9 \times 12 = 108$
Curved surface	Unroll to form rectangle	1	$\frac{1}{4}(2\pi \times 12 \times 9) = 169.646$

d) The front and back are quarter circles, the side and bottom are rectangles, and the curved surface is a quarter of the curved surface of a cylinder.

- The volume of the base is about $11\,946 \text{ cm}^3$; the volume of the top layer is about 5309 cm^3 ; and the total volume is about $17\,255 \text{ cm}^3$.
 - About 4298.5 cm^2
 - About 3767.6 cm^2
- The volume of the base is 784 cubic inches. The volume of the top layer is 400 cubic inches. The total volume is 1184 cubic inches.
 - 680 sq. in.
 - 580 sq. in.
- The rectangular prism cake is a better deal. It has greater volume.
- $V \doteq 198.4 \text{ m}^3$
 - Yes
- The sheet metal mailbox has greater volume.
- The dimensions for the shipping crate should be slightly greater than the dimensions of the console. The smallest shipping crate is 31 in. by 16 in. by 33 in.
 - $16\,368 \text{ cu. in.}$
 - 5058.27 cu. in.
- About 4611.7 cm^3
- About 396.72 sq. in.
- About $16\,682 \text{ cm}^2$
- The wooden mailbox has a smaller surface area. The difference in surface areas is about 3008.3 cm^2 .
- Part a: $V \doteq 1512.5 \text{ cu. in.}$ or about $24\,785.4 \text{ cm}^3$
Part b: $V \doteq 378\,796.4 \text{ cm}^3$
 - Part b
 - Part a: $SA \doteq 783 \text{ sq. in.}$ or about 5052 cm^2
Part b: $SA \doteq 32\,166.4 \text{ cm}^2$
 - Part b
- $31\,104$ washers
 - About 513.22 sq. in.
 - $SA \doteq 53\,424 \text{ sq. in.}$

Chapter 2 Mid-Chapter Review, page 86

- Equilateral triangle cut out of a square; $A \doteq 14 \text{ sq. in.}$
 - Rectangle and right triangle; $A \doteq 723 \text{ cm}^2$
 - Semicircle cut out of a parallelogram; $A \doteq 6 \text{ m}^2$
- $A \doteq 347 \text{ sq. ft.}$

- b) The cover needs about 32 m^2 and it will cost about \$80.66.
3. $V \doteq 27.14 \text{ cm}^3$; $SA \doteq 54.29 \text{ cm}^2$
4. The simple objects that make up the object are a rectangular and triangular prism.
 $V \doteq 45\,000 \text{ cu. in.}$
 $SA \doteq 8186 \text{ sq. in.}$
5. No, the volume is about 2.2 m^3 .
6. $V \doteq 265.30 \text{ cm}^3$
 $SA \doteq 289.13 \text{ cm}^2$

2.3 Optimizing Areas and Perimeters, page 94

1. The rectangle with the maximum area is a square.
- Side length: 10 cm;
area: 100 cm^2
 - Side length: 27.5 ft.;
area: 756.25 sq. ft.
 - Side length: 6.25 m;
area: 39.0625 m^2
 - Side length: 21.75 in.;
area: 473.0625 sq. in.
2. The rectangle with the minimum perimeter is a square.
- Side length: 5 ft.; perimeter: 20 ft.
 - Side length: 9 m; perimeter: 36 m
 - Side length: 12 cm; perimeter: 48 cm
 - Side length: 13 in.; perimeter: 52 in.
3. The rectangle with the minimum perimeter is a square.
- Side length: about 5.5 ft.;
perimeter: about 21.9 ft.
 - Side length: about 8.1 m;
perimeter: about 32.3 m
 - Side length: about 11.1 cm;
perimeter: about 44.5 cm
 - Side length: about 15.8 in.;
perimeter: about 63.2 in.
4.
 - 2 m
 - 8 m
 - 4.5 m
5.
 - $A = 20 \text{ m}^2$
 - $A = 32 \text{ m}^2$
 - $A = 33.75 \text{ m}^2$
6. $A = 10\,000 \text{ sq. ft.}$
7.
 - 200 m
 - Maximum area: 2500 m^2
8. Greatest area: 1600 sq. in.
9.
 - Arrange the tiles to form a 10-tile by 10-tile square.
 - Minimum perimeter: 2000 cm;
 $A = 250\,000 \text{ cm}^2$
10.
 - Arrange the tiles to form a 8-tile by 10-tile rectangle.
 - Minimum perimeter: 1800 cm;
 $A = 200\,000 \text{ cm}^2$
11. Yes
12.
 - The minimum perimeter is 22 m.
The dimensions are 10 m by 6 m or 12 m by 5 m.
 - The minimum perimeter is about 21.91 m.
The dimensions are about 5.45 m by 11 m.
13.
 - Greatest area: 5000 m^2
The dimensions are 100 m by 50 m.
 - Greater
14. About 6.831 m^2
15. Circular design; about 19.42 m
16.
 - Maximum area: 253 sq. ft.
The dimensions are 22 ft. by 11.5 ft. or 23 ft. by 11 ft.
 - $d \doteq 28.65 \text{ ft.}$; $A \doteq 322.29 \text{ sq. ft.}$
 - The semicircle design has a greater area; about 69.2 sq. ft.
17. Rectangle
18. Maximum area: $67\,500 \text{ m}^2$
19. Regular dodecagon

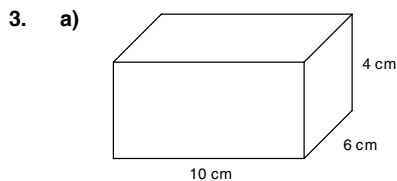
2.4 Optimizing Area and Perimeter Using a Spreadsheet, page 101

1.
 - Change the formula in cell B4 to “10 – A4”.
Change title to 20 m.
In column A, fill down from A5 to A22.
 - Change the value in A4 to 1 and change the formula in cell A5 to “A4 + 1”.
 - Change the formula in cell B4 to “19 – A4”.
Change title to 38 m.
In column A, fill down from A5 to A40.
 - Change the value in A4 to 0.25 and change the formula in cell A5 to “A4 + 0.25”.
2.
 - 7 m
 - 0.25-m increments
 - Maximum area is 3.06 m^2 . Change the value in A4 to 0.25, the formula in cell A5 to “A4 + 0.25”, and the formula in cell B4 to “3.50 – A4”.
3. Maximum area: 100 m^2
4. A square with side lengths 12 ft.
Change title to 144 sq. ft. and the formula in cell B4 to “144/A4”.

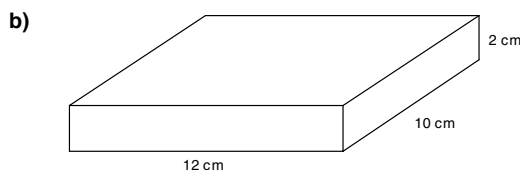
5. a) Minimum perimeter: 28 ft.
b) 48 is not a perfect square.
6. 20 ft. by 10 ft.
Change cell D4 to "A4 + 2*B4".
7. a) Maximum area: 9 m^2
b) Maximum area: 18 m^2
c) Maximum area: 36 m^2
8. a) Minimum length: 80 m
b) Minimum length: about 56.57 m
c) Minimum length: 40 m

2.6 Optimizing Volume and Surface Area, page 110

1. a) The rectangular prism is a cube with edge length 4 cm.
b) $V = 64 \text{ cm}^3$
2. a) The rectangular prism is a cube with edge length 9 in.
b) $SA = 486 \text{ sq. in.}$



$$SA = 248 \text{ cm}^2$$



$$SA = 328 \text{ cm}^2$$

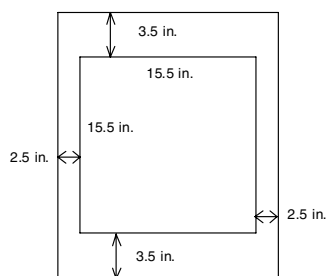
Prism a has the least surface area.

4. a) 10 in. by 10 in. by 10 in.
b) 15 cm by 15 cm by 15 cm
c) 20 in. by 20 in. by 20 in.
5. a) 1 m by 1 m by 1 m
b) 50 cm by 50 cm by 50 cm
c) 2 ft. by 2 ft. by 2 ft.
6. a) $V = 1728 \text{ cm}^3$
b) The rectangular prism has the shape of a cube with edge length 12 cm.
7. a) 1387.10 cu. in.
b) The minimum surface area is about 746 sq. in. and the container would be about 11.15 in. by 11.15 in.
8. a) A cube with edge length 65 cm

- b) $25\,350 \text{ cm}^2$
c) No
9. a) 160 sq. in. b) 10 in. by 10 in. by 4 in.
10. 4 cubes by 6 cubes by 6 cubes
12. a) The dimensions of the cylinder should be $r \doteq 4.9 \text{ cm}$ and $h \doteq 9.94 \text{ cm}$.
b) $SA \doteq 456.98 \text{ cm}^2$
13. About 819.3 sq. ft.
15. Cylinder
16. a) $s = b\sqrt{2}$
b) $V \doteq 184.9 \text{ cm}^3$
c) $b = 8.6 \text{ cm}$, $h = 5.0 \text{ cm}$
17. b) The side length of the base is 10 cm and $h \doteq 5.8 \text{ cm}$.
c) $SA \doteq 259.81 \text{ cm}^2$
d) The height of the prism decreases as the side length of the base increases.
18. a) The can with the least surface area has radius 3.8 cm and height about 7.8 cm.
b) The minimum amount of cardboard that can be used is about 1884.8 cm^2 for a case that has 3 layers of 2 rows by 2 cans each.
19. a) Rectangular prism with all sides measuring 14.7 in.; cylinder with radius 8.3 in. and height 16.55 in.; triangular prism with base length 22 in. and height 13.3 in.
b) The cylinder holds the most material.

Chapter 2 Review, page 120

1. a) $A = 34 \text{ sq. in.}$
b) $A \doteq 402.5 \text{ cm}^2$
c) $A = 2.04 \text{ m}^2$
2. a) $A \doteq 1834.61 \text{ sq. in.}$
b) 2 cans
3. a) 22.5 in. by 20.5 in.

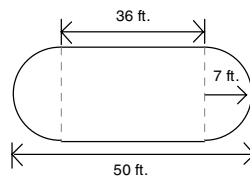


- b) $A = 461.25 \text{ sq. in.}$
4. a) $V \doteq 388\,065 \text{ L}$

- b) $SA \doteq 236.09 \text{ m}^2$
 c) 4 cans
5. a) $SA = 1456 \text{ sq. ft.}$
 b) $V \doteq 648 \text{ cu. ft.}$
6. a) $V = 2976 \text{ cu. in.}$
 b) About 6.4 cu. yd.
 c) $SA \doteq 1469 \text{ sq. in.}$; omit the bottom face.
 d) 2 cans
7. a) $V \doteq 3087.9 \text{ cm}^3$
 b) $SA \doteq 1783 \text{ cm}^2$
8. a) $V = 67.5 \text{ cu. ft.}$
 b) $SA = 22.5 \text{ sq. ft.}$
9. The rectangle with the maximum area is a square.
 a) Side length: 10 cm; area: 100 cm^2
 b) Side length: 27.5 ft.; area: 756.25 sq. ft.
 c) Side length: 6.25 m; area: 39.0625 m^2
 d) Side length: 21.75 in.; area: 473.0625 sq. in.
10. The rectangle with the minimum perimeter is a square.
 a) Side length: 5 ft.; perimeter: 20 ft.
 b) Side length: 9 m; perimeter: 36 m
 c) Side length: 12 cm; perimeter: 48 cm
 d) Side length: 13 in.; perimeter: 52 in.
11. $A = 0.5 \text{ km}^2$ or $500\,000 \text{ m}^2$
12. a) 5 ft. by 11 ft.
 b) 10 ft. by 11 ft.
13. a) Circle
 b) About 170.77 m^2
15. a) The prism is a cube with edge lengths 6 m.
 b) $SA = 216 \text{ m}^2$
16. a) The prism is a cube with edge lengths 5 cm.
 b) $V = 125 \text{ cm}^3$
17. a) $SA = 24 \text{ sq. in.}$
 b) 2 in. by 2 in. by 2 in.
 c) About 391 notes
18. a) $r \doteq 6 \text{ cm}$; $h \doteq 11.9 \text{ cm}$
 b) $V \doteq 1346.4 \text{ cm}^3$
19. a) Radius is about 4.2 cm.
 The height of the bottle is about 8.12 cm.
 The surface area is about 325 cm^2 .
 b) The base is an equilateral triangle with side lengths about 12 cm.
 The height is about 7 cm.
 The surface area is about 384 cm^2 .

Chapter 2 Practice Test, page 123

1. B
 2. B
 3. a) $V \doteq 184.3 \text{ cm}^3$;
 $SA \doteq 226.4 \text{ cm}^2$
 b) $V \doteq 942 \text{ cu. in.}$;
 $SA \doteq 696 \text{ sq. in.}$
4. 12 tiles by 5 tiles or 10 tiles by 6 tiles
5. a)



$$A \doteq 657.9 \text{ sq. ft.}$$

- b) 731 plants
 c) About 4.07 kg
6. a) About 22.5 cm by 22.5 cm by 22.5 cm;
 $SA \doteq 3040.2 \text{ cm}^2$
 b) $r \doteq 12.2 \text{ cm}$; $h \doteq 24.38 \text{ cm}$;
 $SA \doteq 2804.04 \text{ cm}^2$
 c) About 236 cm^2

Chapter 3 Two-Variable Data

Activate Prior Knowledge

Interpreting Data Graphs, page 126

1. a) 3 runners
 b) 160 to 169 bpm
 c) Minimum heart rate: 120 bpm;
 maximum heart rate: 180 bpm
2. a) The percent of students who travel to school by school bus.
 The light blue area represents less than half the graph.
3. a) Each point shows the price of a laptop computer relative to its mass.
 b) Four laptop computers have mass less than 4000 g. One costs less than \$1250.
 c) Five laptop computers have mass greater than 4000 g. All five cost less than \$1250.
4. a) The sum is 223.
 b) There were some students who picked more than one leisure activity.
 c) A histogram

Working with Slope and Line Graphs, page 128

1. a) $\frac{3}{4}$, or 0.75;
 $y = 0.75x + 5$
 b) $-\frac{1}{2}$, or -0.5;
 $y = -0.5x + 6$

3.1 One- and Two-Variable Data, page 133

1. a) i) One-variable data
 ii) One-variable data
 iii) One-variable data
 iv) Two-variable data
2. a) i) One-variable data
 ii) One-variable data
 iii) Two-variable data
3. a) Purchases made and reward points earned
 b) Brain mass and IQ
 c) Mosquito population and average rainfall
4. a) i) One-variable data
 ii) Two-variable data
 iii) One-variable data
5. a) Histogram
 b) Circle graph
 c) Scatter plot
6. a) A histogram would be best for showing the frequency of each sample size.
 b) A scatter plot would be best to display all the data in the table.
 c) Most concern: (50, 2); least concern: (200, 3)
7. a) Only one attribute (height) is measured.
 b) Compare mean/median/mode height among the students in English class and Math class.
8. a) *Study Time and Test Scores*
 b) *Study Time and Test Scores* provides information about a possible relationship. The variables involved are Study time and Mark on test.
10. a) One-variable statistics
 b) One-variable data; histogram
 c) Two-variable data; scatter plot

3.2 Using Scatter Plots to Identify Relationships, page 142

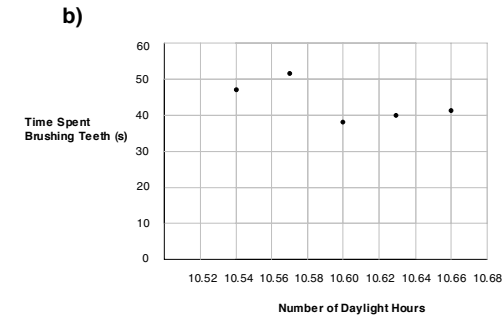
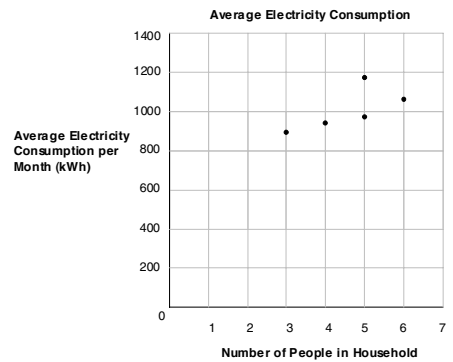
1. a) Shoe size of a child relative to her/his age
 b) Child A wears the smallest shoe size.
 Child D wears the biggest shoe size.
 c) Children C and D have the same age.

- d) Children C and F wear the same shoe size.
 2. Shoe size is the dependent variable.
 3. a) Company A
 b) Companies E and F use the largest trucks.
 c) Companies A and B use the smallest trucks.
 d) 3 different truck sizes
 e) Company A for a small load; company E for a very large load
 4. Moving cost is the dependent variable; the moving costs increase as truck size increases.

5.

Point	Building Number
A	5
B	6
C	1
D	3
E	2
F	4

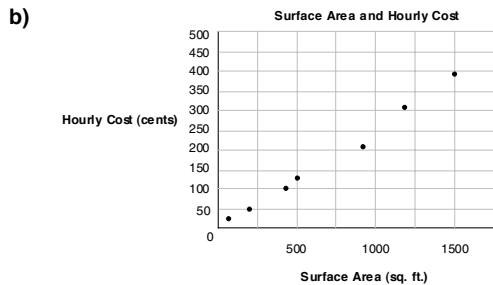
6. a) Positive correlation
 b) No correlation
 c) Negative correlation
 d) Positive correlation
 e) No correlation
7. a)



8. a) Positive correlation
 b) No correlation
 c) Negative correlation
 d) Negative correlation
9. a) Number of hours worked
 b) Size of backyard garden
 c) Time to travel to a specified destination
10. a) There are two sets of points plotted. Car A and car B are also labelled on the legend.
 b) 7 laps
 The two cars use the same track each time.
 c) Graph 3
 d) Car A has the greater average speed.
 e) Graph 1

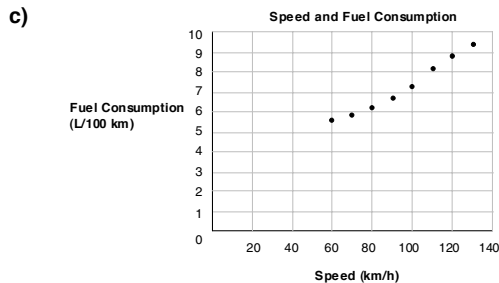
11. a) Car B b) Graph 2
 c) Graph 3 d) Graph 1

12. a) The hourly cost increases as the surface area increases. The points on the scatter plot should go up to the right. There should be a positive linear correlation.



- c) Yes, the scatter plot shows a positive correlation between the two variables.
 d) 4944 ¢ or \$49.44

13. a) Speed is the independent variable.
 b) The fuel consumption increases as the speed increases. The points on the scatter plot should go up to the right. There should be a positive correlation.

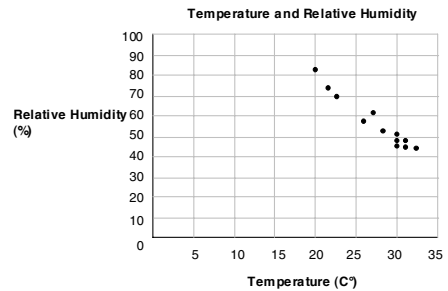


- d) There is a positive correlation between the two variables.

- e) About 6.7 L/100 km

15. a) Reasonable
 b) Not reasonable
 c) Not reasonable
 d) Reasonable

16. a) Temperature is the independent variable.
 b)

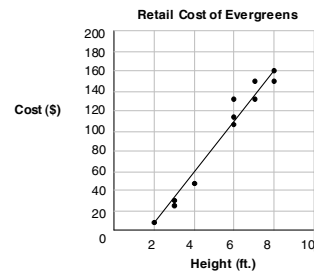


- c) There appears to be a correlation between the two variables. As the temperature increases, the relative humidity decreases.

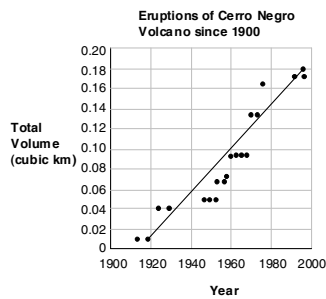
17. a) About 90%
 b) Yes, it is very likely to rain overnight.

3.3 Line of Best Fit, page 153

1. a) Graph B
 b) Graph D
2. Outlier A
3. a) Interpolation
 b) Extrapolation
 c) Extrapolation
 d) Interpolation
4. a) i)



ii)



b) i) $y = 26.271x - 47.364$

ii) $y = 0.0019x - 3.615$

5. a) The line of best fit is not in agreement with the trend of the points on the scatter plot.

b) The line of best fit would have a negative slope and lie close to the four points.

6. There is no clear pattern to these data.

If a weak correlation exists, it is difficult to determine whether it is positive or negative.

7. a) i) Fairly strong positive correlation
 ii) Strong positive correlation
 iii) Fairly strong negative correlation
 iv) Weak positive correlation followed by a fairly strong positive correlation, then a strong positive correlation

b) i) Positive linear

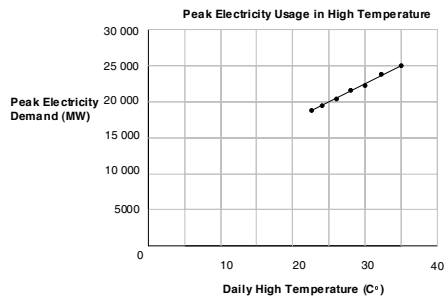
ii) Non-linear

iii) Negative linear

iv) Non-linear

8. a) i) About 29 games ii) About 11 games

9. a)



b) The equation for the line of best fit is:

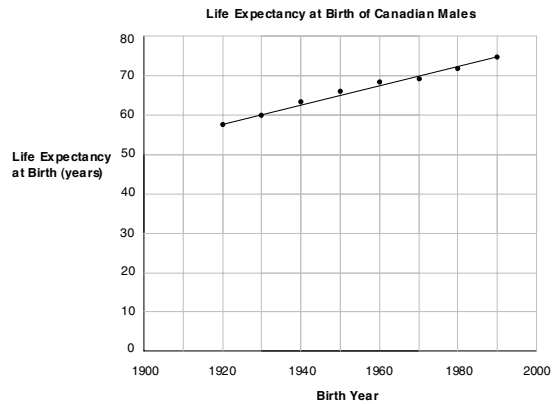
$$y = 538.32x + 6256.4$$

c) The peak electricity demand for a daily high temperature of 28°C is about 21 329 MW.

d) Unlikely; the peak electricity demand for a daily high temperature of 37°C is about 26 174 MW.

e) On days with temperatures below 20°C, the peak electricity demand would likely fall below 17 000 MW, so the power company can take one of the generators offline.

10. a)

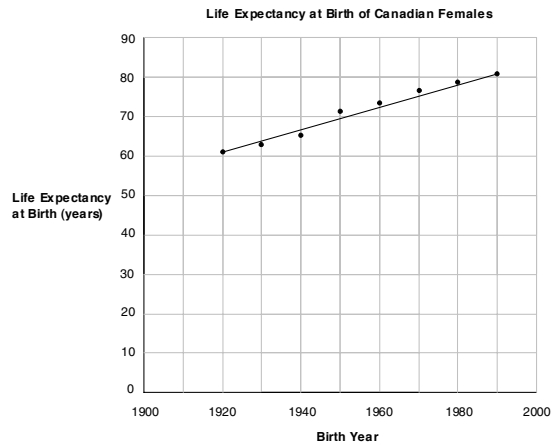


b) $y = 0.2286x - 380.36$

c) About 71 years d) About 77 years

e) Males born after 2013 will have a life expectancy of 80 years.

11. b)



$$y = 0.3071x - 529.21$$

The life expectancy of a female born in 1975 is about 77 years.

The life expectancy of a female born in 2000 is about 85 years.

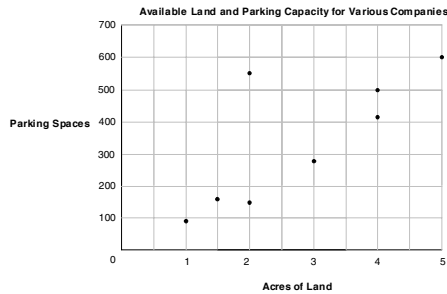
Females born after 1983 will have a life expectancy of 80 years.

13. There seems to be a strong positive relationship between the fuel consumption for city and highway

driving. The relationship does not appear to be linear.
A quadratic model for the data would provide a better fit.

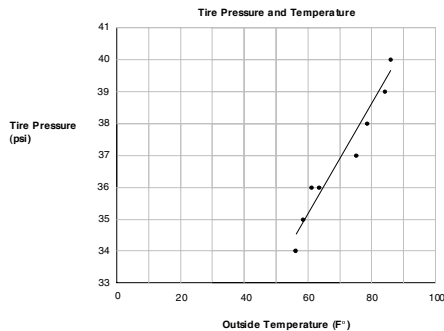
Chapter 3 Mid-Chapter Review, page 158

1. a) One-variable data
b) One-variable data
2. a) Negative correlation
b) No correlation
c) Positive correlation
d) No correlation
3. Graph A
4. a)



- b) The parking capacity increases as the available land increases. The data in the scatter plot show a fairly strong positive correlation. There appears to be an outlier at (2, 550).

5. a)



- b) There is a strong positive correlation between the outside temperature and the tire pressure.
- c) i) 37 psi
ii) 32 psi

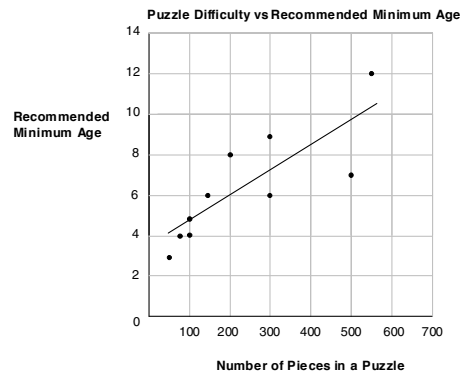
Chapter 3 Review, page 186

1. a) One-variable data
b) Two-variable data
c) One-variable data
2. a) Air pressure and height above Earth's surface
b) Rainfall and crop yield
c) Cooking time and mass of a turkey
3. a) Negative correlation
b) No correlation
c) Positive correlation
d) No correlation
e) Negative correlation
4. a) Independent variable: volume of aquarium;
dependent variable: cost
b) Independent variable: rain;
dependent variable: time people spend watering their lawns

- 5.

Cylinder number	Point
1	D
2	B
3	C
4	A
5	F
6	E

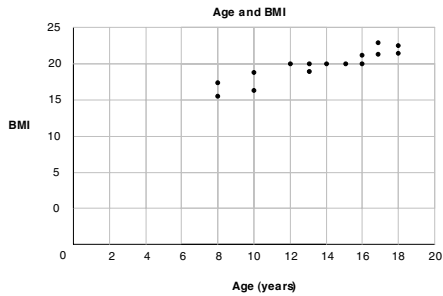
6. a)



7. The number of readings taken testing only one vehicle model is not sufficient to get conclusive data.

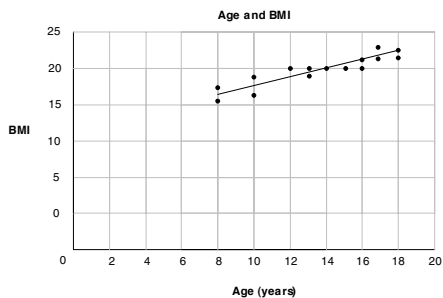
8. a) Weak negative correlation
 b) Strong positive correlation
 c) Strong negative correlation

9. a)



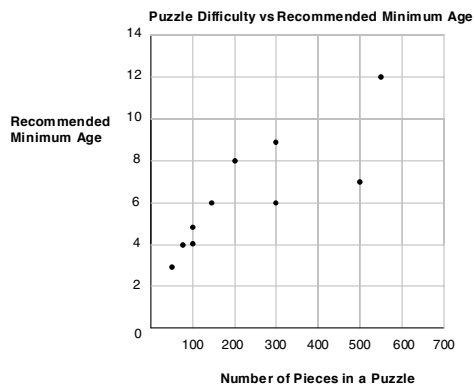
A few of the outliers are (12, 20), (10, 18).

b) $y = 0.6342x + 11.164$

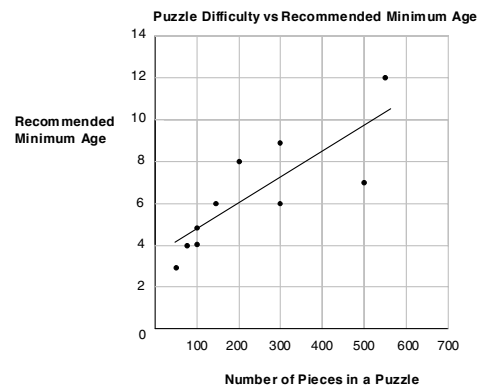


- c) Positive linear correlation
 d) 14 people; data are insufficient to draw a conclusion; the sample size is very small.

10. a)

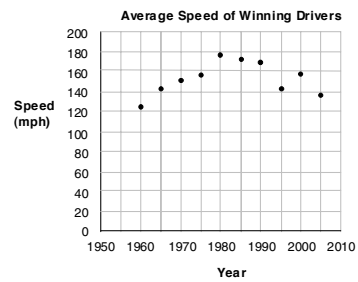


b)

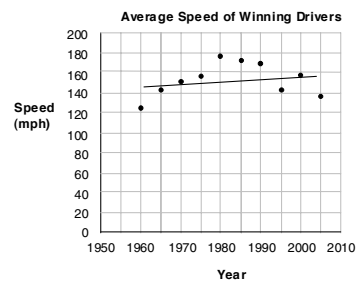


- c) 516 pieces
 d) 8 years

11. a)



b)

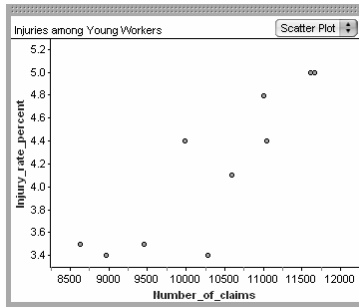


The speed of the winning driver in 2010 would be about 159 mph.

$$y = 0.2158x - 275$$

- c) The prediction is not very reliable. 2010 is not within the domain, so the answer is acquired through extrapolation.

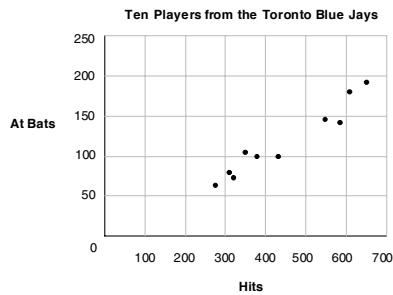
12. a)



- b) About 0.86
 c) The coefficient correlation suggests a strong positive correlation between the number of claims and the injury rate.

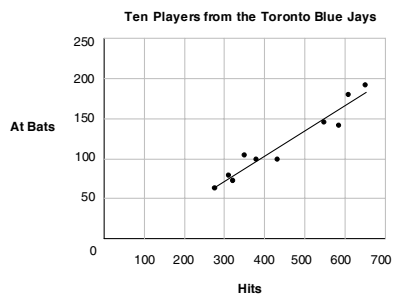
Chapter 3 Practice Test, page 189

1. C
 2. B
 3. a)



b) Yes, there is a strong positive linear correlation.

c)



A player might have about 10 hits after 100 times at bat. $y = 0.3149x - 21.586$

6. a) Strong positive correlation
 b) Yes
 c) (98, 15)

Chapter 4 Statistical Literacy

Activate Prior Knowledge

Ratios, page 192

- a) 20:30
 b) i) 4:6
 ii) About 67:100
- a) 400 girls and 300 boys
 b) 16 girls to 12 boys
- The number of people who liked the taste of cheese out of 100 people who tried it. Or: The percent of people who liked the taste of cheese out of the people who tried it.

Measures of Central Tendency, page 193

- a) Mean: about 19.5; median: about 19.4; no mode
 b) 6.5
- Since there are no outliers, either the mean or the median is appropriate.

Percent Increase and Decrease, page 194

- About 15.1%
- About 8.3%

4.1 Interpreting Statistics, page 201

- a) 8, 8, 9, 9, 10, 11, 11, 12, 12, 12, 14, 15
 b) 150, 154, 162, 163, 164, 165, 165, 168, 170, 172, 180
- a) In 2000, 2 in 5 students owing money had repaid their debt 5 years after graduations.
 b) In 2000, 56% of graduates had no debt.
 c) Almost half of the graduates who are still in debt have trouble paying off their loans. Only 1 in 5 graduates who had paid off their loans by 2005 had the same problem.
- Part ii
- a) Mean list price: \$334 466.67
 Median list price: \$324 500.00
 Mean sale price: \$326 666.67
 Median sale price: \$315 000.00
 List price range: \$79 100.00
 Sale price range: \$75 000.00
 b) Due to the small sample size, the presence of outliers cannot be determined easily. One should use either the median or mean.

8. a) i) 75th percentile
ii) 5th percentile
iii) 95th percentile
b) Between 50th and 75th percentile
9. a) Mean: 68.65; median: 69; modes: 65, 75
b) 1st quartile: 61.5; 3rd quartile: 76
c) 37% of the people that wrote the test received a mark below Vince's. Vince's mark is 65.
10. a) "Do you support the legislation that would ban smoking in cars and other private vehicles where a child or an adolescent under 16 of age is present?"/"Do you smoke?"
c) Poll results are not always accurate, but 19 times out of 20 (95%), the results are within 2.7% of the true public opinion.
11. a) Are you likely to/certain to/unlikely to/certain not to avoid toys made in China because of concerns about health or safety risks?
b) 55%
d) "Majority of Canadians Likely to Avoid Toys Made in China"
12. a) Part i
b) 15%
13. a) House 1 list price: \$284 500.00
House 1 sale price: \$275 000.00
House 2 list price: \$316 000.00
House 2 sale price: \$307 000.00
House 3 list price: \$276 900.00
House 3 sale price: \$272 000.00
b) Mean list price: \$292 500.00
Median list price: \$284 500.00
List price range: \$39 100.00
Mean sale price: \$285 000.00
Median sale price: \$275 000.00
Sale price range: \$35 000.00
14. a) 1st quartile: 70, 2nd quartile: 74.5, 3rd quartile: 77
b) 85 km/h

4.3 Surveys and Questionnaires, page 214

1. a) 20%
b) 90%
c) About 58%
2. a) 35 people
b) 93 people
c) 118 people
d) 1036 people
3. a) About 11%
b) About 7%
c) About 4%
4. a) Written form
b) Written form
c) Personal interview
d) Personal interview
e) Written form
Personal interviews were selected for parts c and d because people are likely to feel comfortable discussing their colour preference or shampoo.
5. a) Biased
b) Unbiased
c) Unbiased
d) Biased
6. i) Biased
ii) Unbiased
9. No. The sample only represents those who texted or e-mailed the radio station. The sample could be improved by surveying those directly affected by the proposed change, such as students, teachers, parents, etc.

Chapter 4 Mid-Chapter Review, page 222

1. Quartiles: 66, 72.5, 84.5
2. a) Half of the salaries at the firm are below \$85 000, and half are over \$85 000.
b) 95 out of every 100 people preferred the new cereal.
c) The local athlete was in the top 25% of all the athletes that took the fitness challenge.
d) On average, each person in Ontario used 11 996 kWh of electricity last year.
e) 1 quarter of Canadian adolescents are overweight.
4. a) Written form
b) Neither
c) Written form
d) Personal interview
5. a) The senior residents of the town
b) The assistant will be polling non-senior residents, too; the sample population should be seniors only.
6. a) Invalid due to bias; the reporter talked to dog-owners only.
b) The study should include opinions from individuals who do not own dogs.

4.5 The Use and Misuse of Statistics, page 229

- Part i
 - Part ii
- The data on the bar graph is difficult to read accurately.
 - The vertical scale makes changes in temperature look more dramatic than they really are.
- Part ii
 - Part i
- Part ii; an outside agency will have a more objective (unbiased) opinion. It will also have the expertise required in statistical surveys.
- Yes
 - Yes
 - No
 - No
- As the number of students increases, the number of teachers increases. Positive correlation, cause-and-effect relationship
 - The number of vacation days increases as the person works at a company longer. Positive correlation, cause-and-effect relationship
 - The population of a town does not affect the amount of precipitation.
 - Height does not affect a person's performance/marks in mathematics.
- Additional information about the person's credentials.
 - Additional information about the party who conducted the study, so that one can decide about its bias.
- Parts ii and iii
- Misleading report; the sample size is too small and the survey question is biased.
- Yes
- The error is assuming that a strong positive correlation means necessarily a cause-and-effect relationship. The high r -value means that the variables are strongly connected, but it could be in response to an increase in the population. It is unlikely that hockey is contributing to an increase in crime rate.
- Yes
- Survey only the few residents whose properties border the highway. Include a prefacing statement that will influence their decision.

4.6 Understanding Indices, page 237

- The change in the price of fruit from 1990 to 2006

- 1997
 - About \$84
 - About \$104
- 50%
 - 25%
 - 100%
 - 6%
- 26%
 - 50%
 - 7%
 - 80%
- Denmark and Switzerland, Austria and Iceland, The Bahamas, Finland, and Sweden, Bhutan, Brunei, and Canada
- 88.9%
 - 97.8%
 - CPI increased by 8.9% between January 1996 and January 2001.
 - 1.8%
- The FPPI for fruit increases with time.
 - The trend indicates that the same amount of money buys less fruit every year.
- Wood Buffalo National Park (B)
 - Cochrane District, Ontario (D)
 - Terra Nova National Park (E)
- 1986
 - 130
 - 140
 - 164
 - 30%
 - 7%
 - 17%
 - 1986 to 1992 had the greatest increase. 1992 to 1998 had the least increase.
- The overall change in EPI: about 62%
The average annual change: about 3.6%
 - About 187.2%
- Both graphs use 1986 as the base year.
 - The instructional supplies index change between 1986 and 2003: about 105%
The average annual rate of increase in price: about 6.2%
- Zurich, Oslo, Tokyo
It is more expensive to buy food in these cities than in New York.
 - It is about 12.1% more expensive to buy food at Oslo than New York. It will cost about 64.9% less to purchase food in Delhi than in New York.

13. a)

City	Food Price Index (Toronto = 100)
Zurich	143.1
Oslo	138.7
Dublin	107.2
New York	123.8
Copenhagen	123.1
Toronto	100.0
Tokyo	161.3
Rome	108.7
Hong Kong	107.2
Delhi	43.4

- b) Delhi; the cost of food in Delhi is about 43% the cost of food in Toronto.
 c) Tokyo has the highest food price index. If Tokyo was the base value, all other cities would be below 100.

Chapter 4 Review, page 251

- a) The average is the mean of a set of values. As the values of the set increase, the average increases as well.
- a) 0.167, 0.178, 0.204, 0.208, 0.216, 0.233, 0.236, 0.238, 0.238, 0.240, 0.242, 0.245, 0.251, 0.262, 0.277, 0.289, 0.291, 0.297
 b) 1st quartile: 0.21
 2nd quartile: 0.239
 3rd quartile: 0.262
 c) 0.277
- a) \$64 500; 25% of those surveyed had a salary below this value.
 b) \$96 000; 75% of those surveyed had a salary below this value.
- a) 62 students b) 124 students
 c) 186 students d) 372 students
- a) People who don't have Internet access or a cell phone cannot vote.
 b) Allow viewers to vote by phone.
- a) Only people that visit the community centre can vote. The sample is biased.
 b) Poll a wider variety of people using a variety of methods.
- a) False b) True

c) True d) False

- a) Part i b) Part i
- a) Costa Rica
 b) United States, Mexico, Belize, Guatemala, Honduras, El Salvador, Nicaragua, Panama
- a) Computer prices between 2002 and 2006
 b) 2001
 c) \$80.00
 The cost of computers is 20% lower than in 2001.
 d) Computer prices continue to drop throughout the years.
- a) January 2004
 b) Overall change: 65.1%; average annual decrease: 13.02%

Chapter 4 Practice Test, page 254

- D
 The 10th percentile indicates that 10% of the data is below this point.
- B
- a) 3 movies per capita (mpc)
 Enough people visited the movies in 1996 that each person in Canada could have gone to the movies 3 times that year.

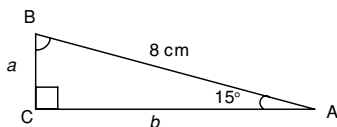
b)

Year	Movies per capita (mpc)
1996	3.0
1997	3.2
1998	3.6
1999	3.9
2000	3.8

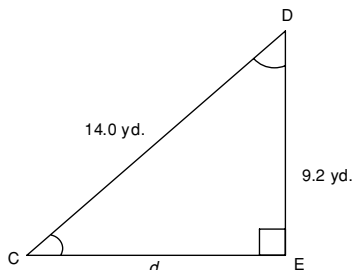
- c) Yes
 There was a lapse in 2000, when the number of movies per capita dropped. More data are required for an accurate conclusion.
- d) Per capita rate takes into account the changes in both variables.
- b) One must survey a significant portion of the student population. 10% or 100 students represent an appropriately-sized sample. It is important to ensure that the sample is representative. Survey 25 students from each grade.
- b) Between 2005 and 2006 c) About 14%

Cumulative Review Chapters 1–4, page 262

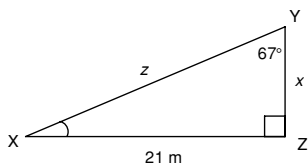
1. a) About 0.7 m
b) About 70°
2. a) $\angle A = 15^\circ$, $\angle B = 75^\circ$, $\angle C = 90^\circ$,
 $a \doteq 2$ cm, $b \doteq 8$ cm, $c = 8$ cm



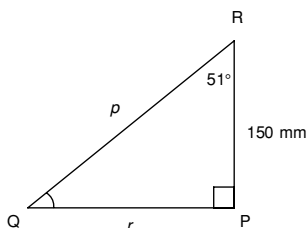
- b) $\angle C \doteq 41^\circ$, $\angle D \doteq 49^\circ$, $\angle E = 90^\circ$,
 $c = 9.2$ yd., $d \doteq 10.6$ yd., $e = 14.0$ yd.



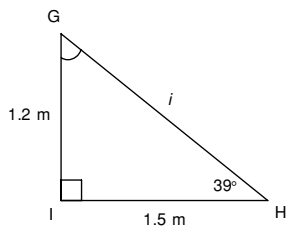
- c) $\angle X = 23^\circ$, $\angle Y = 67^\circ$, $\angle Z = 90^\circ$,
 $x \doteq 9$ m, $y = 21$ m, $z \doteq 23$ m



- d) $\angle P = 90^\circ$, $\angle Q = 39^\circ$, $\angle R = 51^\circ$,
 $p \doteq 238$ mm, $q = 150$ mm, $r \doteq 185$ mm



- e) $\angle G \doteq 51^\circ$, $\angle H \doteq 39^\circ$, $\angle I = 90^\circ$,
 $g = 1.5$ m, $h = 1.2$ m, $i \doteq 1.9$ m



3. a) $\angle D \doteq 153^\circ$
b) $\angle D \doteq 102^\circ$
c) $\angle D \doteq 157^\circ$
d) $\angle D \doteq 143^\circ$
e) $\angle D \doteq 172^\circ$
f) $\angle D \doteq 140^\circ$
4. a) Sine Law; $\angle R = 135^\circ$, $r \doteq 10.0$ km, $p \doteq 5.5$ km
b) Cosine Law; $\angle T = 32^\circ$, $\angle U \doteq 9^\circ$, $t \doteq 11$ in.
5. $z \doteq 1.7$ ft.
6. a) About 76 mi.
b) 177°
- 7 a) About 2.3 sq. in.
b) About 36.9 cm²; about 7.2 cm³
8. a) 7 m by 7 m; 49 m²
b) 11 in. by 11 in.; 121 sq. in.
c) 2.5 cm by 2.5 cm; 6.25 cm²
d) 23.5 ft. by 23.5 ft.; 552.25 sq. ft.
9. a) Rectangles: 2 in. by 8 in., or 4 in. by 6 in.
Triangles: 4 in., 8 in., 8 in., or 6 in., 6 in., 8 in.
b) A rectangle with dimensions closest to a square: 4 in. by 6 in.; maximum area: 24 sq. in.
10. a) 4 ft. by 4 ft. by 4 ft.; SA: 96 sq. ft.
b) 9 m by 9 m by 9 m; SA: 486 m²
c) About 6.1 cm by about 6.1 cm by about 6.1 cm; SA: about 222 cm²
d) About 14.4 in. by about 14.4 in. by about 14.4 in.; SA: about 1248 sq. in.
11. a) 1 in. by 1 in. by 66 in.,
2 in. by 2 in. by 32 in.,
4 in. by 4 in. by 14 in.,
5 in. by 5 in. by 10 in.,
8 in. by 8 in. by 3 in.
b) Maximum volume: 250 cu. in.
12. a) Vertical bar graph
b) No, Avery is incorrect. The graph is displaying one-variable data. Gender represents categories of data, not one of the variables being measured.
13. a) Positive correlation
b) Negative correlation
c) Negative correlation
d) Positive correlation
14. a) Price of gasoline
b) The remaining value of the car
c) Probability of developing lung cancer
15. Graph B has the best line of best fit. The line's path has shifted slightly downwards in response to the 3 outliers below the main data cluster.
16. a) i) There is a weak/moderate negative correlation.

- ii) There is a strong negative correlation; the data points are much closer, indicating a linear correlation.
 - b) i) One should not try to model a line of best fit for graph in part i. The linear model would not provide accurate predictions.
 - ii) A linear model would provide accurate predictions.
17. a) First quartile: 1.5
Second quartile: 5
Third quartile: 7.5
- b) First quartile: 104
Second quartile: 108
Third quartile: 110
18. a) 3 people
b) 18 people
c) 54 people
d) 1725 people
19. a) Only students in certain classes are surveyed. The sample is not representative of the entire school.
b) Ask every 5th person in the yearbook or out of a list of students provided by the administration.
c) Part b; every grade is represented equally. Part a, Carmelo's method, includes students from his class only.
d) The students may feel intimidated. Carmelo may ask the students to complete a written survey.
20. What does the vertical axis measure?
What does Taste Test Phase 1 and 2 indicate?
What happens between the 2 tests?
What breeds of dogs were tested?
What was the age distribution?
What does the horizontal axis measure?

Chapter 5 Graphical Models

Activate Prior Knowledge

Linear, Quadratic, and Exponential Graphs, page 267

1. a) 60
The distance travelled each hour is 60 km.
- b) -200
The value of a computer decreases by \$200 each year.
2. a) (150, 22 500)
Maximum revenue is generated when 150 tickets are sold.
- b) (2, 22)
A maximum height of 22 m is reached after 2 seconds.

3. The initial value appears as the vertical intercept in the graph. When the constant factor is greater than 1, the graph curves up. When the constant factor is between 0 and 1, the graph goes down and levels off.

5.1 Trends in Graphs, page 273

1. Part c
2. Part a
3. Part a
4. Part b

a)	i	Fallen dramatically
b)	iii	Fallen steadily
c)	ii	Remained constant
d)	i	Fluctuated

- 5.
6. a) The immigrant population: increased rapidly from 1901 to 1911; remained fairly constant from 1911 to 1931; decreased steadily from 1931 to 1951; remained fairly constant from 1951 to 1991; increased slightly from 1991 to 2001
- b) The number of births: decreased slowly from January to February; increased rapidly from February to March; remained fairly constant from March to September; decreased steadily from September to December
- c) The exchange rate: fluctuated slightly from January 1970 to 1977; decreased steadily from 1977 to 1985; increased from 1985 to 1992; decreased from 1992 to 2004; increased rapidly from 2004 to present
- d) Maximum safe heart rate during exercise decreased steadily with age.
7. a) Power increased very slowly for wind speeds of up to 5 m/s, then slowly, and then very rapidly.
- b) 0 kW
No power is generated when there is no wind.
- c) 100 kW
- d) No
8. a) The power capacity fluctuated with a slow increasing trend.
- c) Demand was constant Monday to Tuesday; increased steadily from Tuesday to Friday; decreased rapidly first, then slowly from Friday to Sunday.
- d) Demand exceeded capacity on Friday.
9. a) The area increases as the length of the third side increases, reaches a maximum at 100 m, and then decreases rapidly.
- b) i) 50 m or 130 m

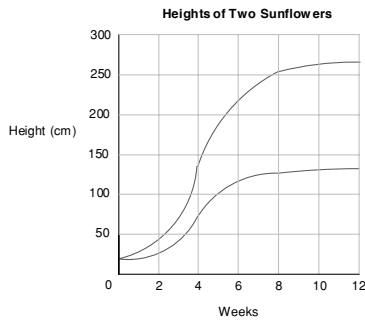
- ii) 100 m
10. a) i) Cost increased steadily as the number of T-shirts produced increased.
ii) As the number of T-shirts produced increased, the profit increased rapidly at first, then slowly, reached a maximum, then decreased slowly, and then rapidly.
11. a) The mortality rate was high for newborns; decreased rapidly for the first two years of life; remained fairly constant until mid-teenage years; increased steadily until age 20; remained constant until age 30; increased steadily to age 50.
b) (9, 10)
The mortality rate for 9-year-olds is about 10 deaths per 100 000.
c) The mortality increased rapidly from age 15 to age 20.
13. a) The fuel economy increased slowly as the speed increased from 40 km/h to 70 km/h, and then decreased steadily as the speed increased beyond 70 km/h.
b) Based on a fuel cost of \$1.30: about \$16
c) About 5.14 h
14. a) The global population increased very slowly from 1800 to 1880, then increased slowly from 1880 to 1930, and finally increased rapidly after 1930.

5.2 Rate of Change, page 284

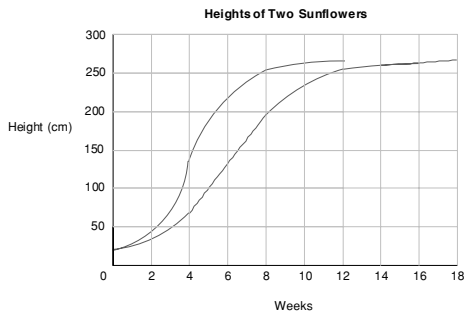
1. a) Independent variable: Hours worked
Dependent variable: Earnings
b) Independent variable: Pages printed
Dependent variable: Cost
c) Independent variable: Distance driven
Dependent variable: Fuel used
2. a) \$/hour; hourly wage
b) \$/page; per-page cost
c) L/km; fuel consumption rate
3. a) \$8/hr
b) \$0.0225/page
c) 0.6 L/km
4. a) Independent variable: Depth
Dependent variable: Temperature
b) Independent variable: Time
Dependent variable: Distance
c) Independent variable: Year
Dependent variable: Interest earned
5. a) °C/m; the change in temperature per metre of depth
b) m/s; distance travelled per second
c) \$/year; amount of interest earned per year

6. a) 10°C/m
b) 12 m/s
c) \$0/year
7. a) i) 0:00 to 6:00, 8:00 to 17:00, and 20:00 to 24:00
ii) 17:00 to 20:00
iii) 6:00 to 8:00
b) i) 0°C/h
ii) About -1.33°C/h
iii) 2°C/h
8. a) The attendance increased steadily from 1976 to 1983; remained constant from 1983 to 1989; then increased steadily from 1989 to 1998.
b) About 8000 students/year
c) The rate of change in attendance was 0 students/year.
9. a) Simple interest: \$40/year, \$40/year, \$40/year
Compound interest: \$47/year, \$68.8/year, \$101.4/year
b) The rate of change for simple interest was the same for each interval. The interest increased by equal amounts each interval.
The rate of change for compound interest was not the same for each interval. The interest increased by larger amounts during the later intervals.
c) Simple interest: straight line
Compound interest: exponential increase
10. a) i) 5 m/min, 392.6 m²/min
The rate of change measures how quickly the radius of the spill is growing.
ii) 5 m/min, 1962.6 m²/min
The rate of change measures how quickly the area of the spill is growing.
b) Constant increase
c) Exponential increase
11. a) First differences: 15, 29, 41, 60, 76, 75, 73, 57, 40, 34, 14
The first differences show how much more electric energy was generated in each 5-year period compared to the previous 5-year period.
b) From 1970 to 1975
c) The electricity generated increased at a constant rate.
d) The electric energy increased slowly initially, then rapidly, and then slowly again.
12. The sunflower increased steadily in the first 2 weeks, then increased rapidly from week 2 to week 5, and then increased slightly over the next 5 weeks.
13. a) From 30 to 36 months
b) About 75 words/month
c) About 41 words/month

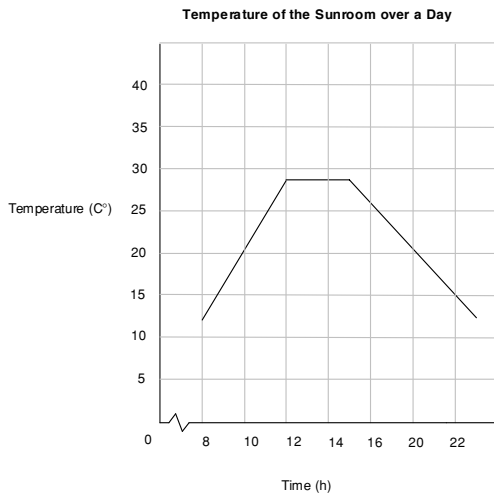
15. a)



b)



16.



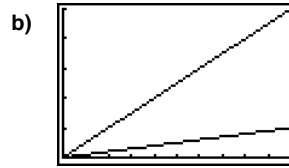
5.3 Linear Models, page 293

1. Part a; equal first differences
2. Parts a and c
Graph is a straight line.
3. Parts a and c
Relation is of form $y = mx + b$.
4. a) Part ii b) Part i
5. c) Part iii
6. a) 60 km/h
No, the rate of change is the same between any two points.
- b) The average distance travelled per hour, or speed

7. a) Temperature decreases at a constant rate as the distance from the inside increases.

b) $-2^\circ\text{C}/\text{cm}$ c) $T = 20 - 2d$

8. a) Both graphs would be straight lines with vertical intercept of 0, but different slopes.



c) Spring 1: 0.1 N/cm; Spring 2: 0.5 N/cm

d) Low spring constant

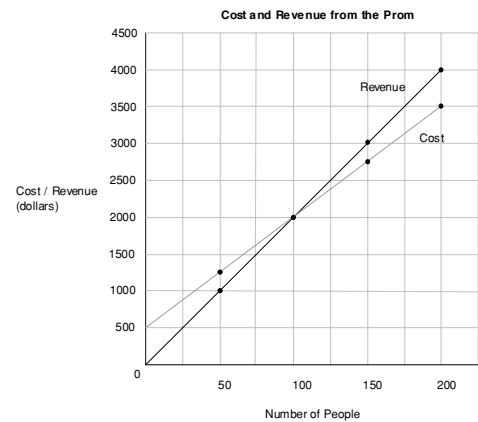
9. a) They start at the same initial position with the same speed of 2 m/s.

b) One friend stops walking after 10 seconds.

10. a) \$500; overhead costs of the prom if no tickets are sold

b) \$15/person; additional cost per person

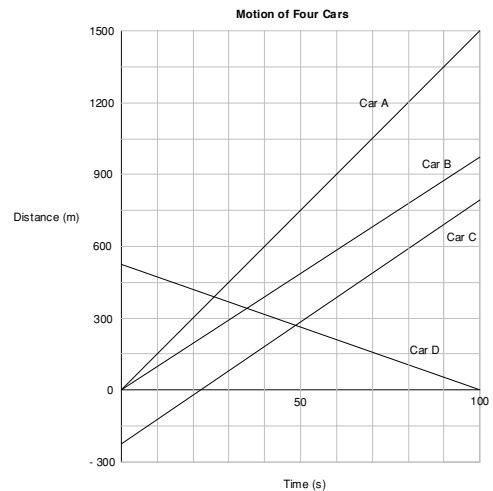
c)



d) 100 tickets

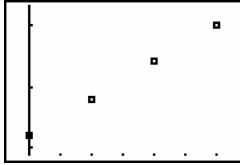
e) The graph would be steeper and the break-even point would be 50 tickets.

11. a)



- b) Car A = 15 m/s; Car B = 10 m/s;
Car C = 10 m/s; Car D = -5 m/s

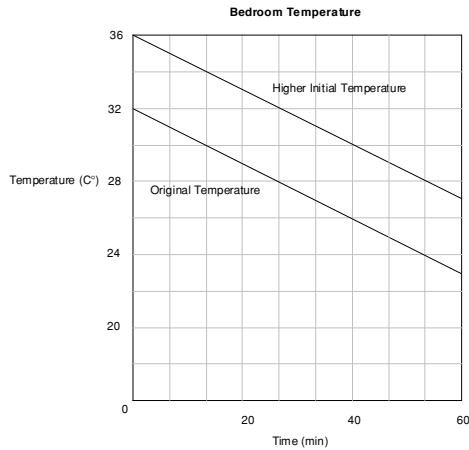
12. a)



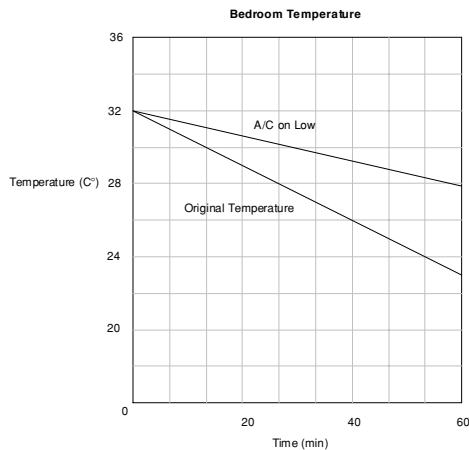
$$y = 0.6x + 332$$

- b) i) 341 m/s ii) 362 m/s
iii) 330.2 m/s
13. a) Yes b) Yanxia
- c) Alea: $y \doteq 15.2 + 0.3x$
Yanxia: $y = 20 + 0.5x$
- d) The line of best fit is perfect for Yanxia and a very good fit for Alea.
- e) Alea: about 0.3 lbs/month
Yanxia: about 0.5 lbs/month
14. a) $y \doteq 101.4x - 4.6$
- b) 401 km c) 2429 km
16. a) $-0.15^\circ\text{C}/\text{min}$

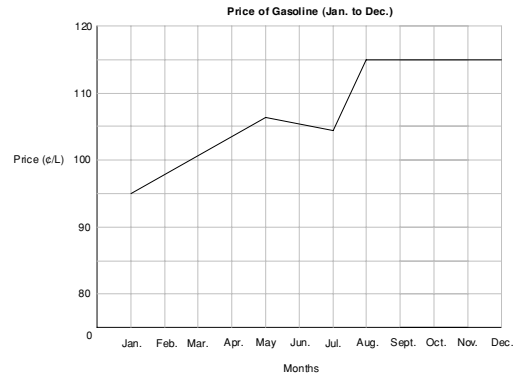
b)



c)

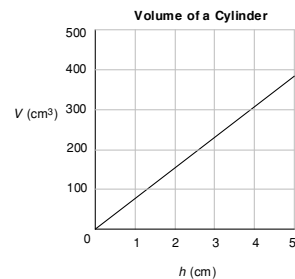


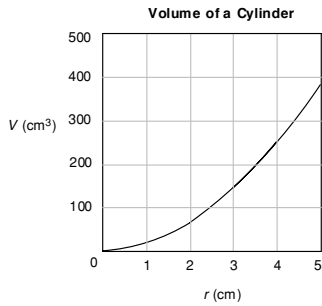
17.



5.4 Quadratic Models, page 303

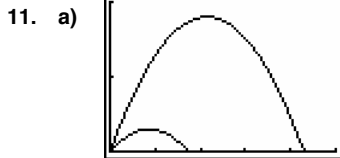
1. Part b
2. Parts a and c
3. Part b
4. a) vi
b) v
c) ii
d) iii
e) i
f) iv
5. a) True
b) False
c) False
d) True
e) False
6. a) The height increases from 0 s to 0.4 s and decreases from 0.4 s to 0.88 s.
b) The height changes rapidly from 0 s to 0.3 s and 0.6 s to 0.88 s and slowly from 0.3 s to 0.5 s.
7. a) The revenue increased rapidly and then more slowly from 0 to 1750 T-shirts; decreased slowly and then more rapidly from 1750 to 3500 T-shirts.
8. a) r
b) h
c)





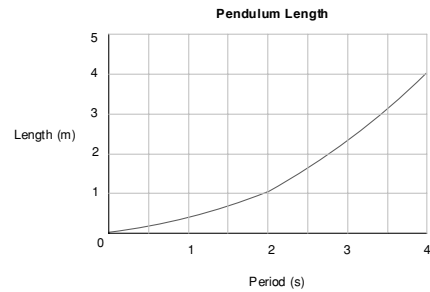
9. a) s
 b) h
10. a) The consumption of Car A is reasonably constant, with variations between 8 L/100 km and 10 L/100 km. The consumption of Car B is high at low speeds, drops dramatically to about 6 L/100 km at moderate speeds, and begins to rise at greater speeds.
 b) Fuel efficiency increases as fuel consumption decreases.
 Car A: The fuel consumption decreased rapidly between 24 km/h and 40 km/h, increased rapidly between 100 km/h and 120 km/h, and increased at a constant rate between 100 km/h and 120 km/h.
 Car B: The consumption decreased most rapidly between 10 km/h and 20 km/h, increased most rapidly between 80 km/h and 100 km/h, and increased at a constant rate between 100 km/h and 120 km/h.

- c) i) Car B
 ii) Car A



- b) Right hand: about 1.8 m;
 left hand: about 0.29 m
- c) Right hand: about 0.86 s;
 left hand: about 0.35 s
- d) Right hand
12. b) $y \doteq -90.5x^2 + 3109x - 6218$
 c) About \$20 475
 d) About \$5600
13. b) $y \doteq 1437x^2 - 5\,736\,296x + 5\,723\,797\,471$
 c) About 152 695 males; lowest number of males registered in the apprenticeship programs
 d) About 254 374 males
14. a) $y \doteq 0.0009x^2 - 3.6x + 3507.6$
 b) i) \$1.06
 ii) \$4.04

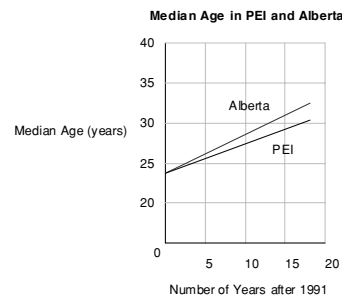
- c) The 1987 estimate; interpolation
16. a)



- b) The relationship between length and time is quadratic.
 c) The graph would remain quadratic but open up more slowly.
 d) There is a linear relationship between l and g .

Chapter 5 Mid-Chapter Review, page 308

1. a) Quadratic
 b) Linear
2. a) Discount increases with order size, first rapidly and then more slowly.
 b) Order size should be greater than 150 for a discount of 8%.
3. The hockey player's plus/minus score was constant from games 1 to 4, changed from games 4 to 15 and was zero in games 1-4, 8, 11 and 15.
4. a)



The graphs both start at a median age of 24 in 1991. The graph for Alberta rises more quickly.

- b) The graph would start at 30 instead of 24.
5. a) r
 b) h
6. b) $y \doteq -342.9x^2 + 1\,374\,637x - 1\,377\,338\,500$

5.5 Exponential Models, page 315

1. a) 1.03
 b) 1.05
 c) 1.12
2. a) Linear
 b) Exponential

b)

x	y	First Differences
0	10	$12.5 - 10 = 2.5$
1	12.5	$15 - 12.5 = 2.5$
2	15	$17.5 - 15 = 2.5$
3	17.5	

The relationship is linear.

b)

x	y	Decay Factors
10	54	$\frac{36}{54} \doteq 0.67$
15	36	$\frac{24}{36} \doteq 0.67$
20	24	$\frac{26}{24} \doteq 1.08$
25	26	

The relationship is not exponential.

2. a)

v	E	First Differences	Second Differences
0	0	$0.5 - 0 = 0.5$	
1	0.5	$2 - 0.5 = 1.5$	$1.5 - 0.5 = 1.0$
2	2	$4.5 - 2 = 2.5$	$2.5 - 1.5 = 1.0$
3	4.5	$8 - 4.5 = 3.5$	$3.5 - 2.5 = 1.0$
4	8	$12.5 - 8 = 4.5$	$4.5 - 3.5 = 1.0$
5	12.5		

The relationship is quadratic.

b)

x	y	First Differences	Second Differences
1	23	$55 - 23 = 32$	
3	55	$103 - 55 = 48$	$48 - 32 = 16$
5	103	$167 - 103 = 64$	$64 - 48 = 16$
7	167		

The relationship is quadratic.

3. a)

x	y	Growth Factors
0	0.3	$\frac{1.5}{0.3} = 5.0$
1	1.5	$\frac{7.5}{1.5} = 5.0$
2	7.5	$\frac{37.5}{7.5} = 5.0$
3	37.5	

The relationship is exponential.

4. a) Exponential
 b) Linear
 c) Quadratic
 d) Quadratic
 e) Linear
 f) Exponential

5. Exponential

6. a) Exponential
 b) Quadratic
 c) Linear
 d) Exponential

7. a) Quadratic
 b) Yes

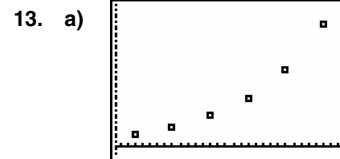
8. a) Exponential
 b) Yes

9. a) Linear
 b) Quadratic

10. a) Linear: $y \doteq 0.063x + 0.53$
 Quadratic: $y \doteq -0.0006x^2 + 0.153x - 2.49$
 Exponential: $y \doteq 1.92(1.013)^x$

b) Quadratic

12. a) Linear: $y \doteq 0.369x + 1.71$
 Quadratic: $y \doteq 0.01x^2 + 0.019x + 4.04$
 Exponential: $y \doteq 3.37(1.05)^x$

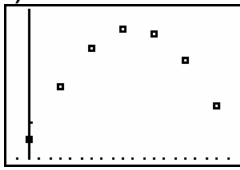


- b) Linear: $y \doteq 5.5x - 31.13$
 Quadratic: $y \doteq 0.24x^2 - 2.95x + 25.2$
 Exponential: $y \doteq 8.76(1.10)^x$
 c) Exponential

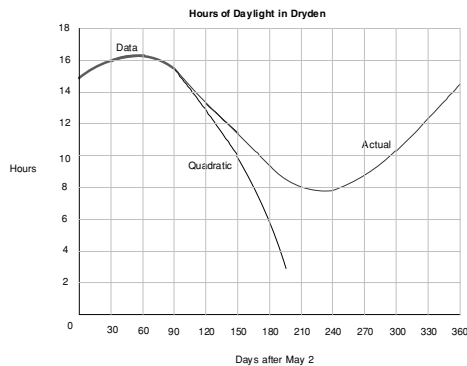
14. a) Linear: $y \doteq -5.9x + 20.8$
 Quadratic: $y \doteq 2.23x^2 - 14.83x + 25.23$
 Exponential: $y \doteq 25.2(0.442)^x$

- b) Exponential
 c) i) About 0.2°C
 ii) 0°C

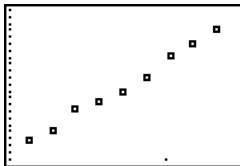
16. a)



- b) Quadratic: $y \doteq 0.00072x^2 + 0.07x + 14.8$
 c) The data showed an increase followed by a decrease, which models a quadratic relation.
 d) 14.1 h
 f)



17. a) The price increased steadily with length.



- b) Linear: $y \doteq 20.75x - 229.47$
 Quadratic: $y \doteq 0.76x^2 - 0.66x - 79.77$
 Exponential: $y \doteq 0.32(1.445)^x$

Chapter 5 Review, page 332

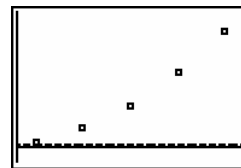
1. a) The population is constant with time.
 b) The population increased with time, rapidly at first, then more slowly.
 c) The population increased steadily with time.
 d) The population increased with time, slowly at first, then more rapidly.
2. a) Energy consumption was fairly constant from 1990 to 1992; decreased from 1992 and 1996; remained steady through 2000; decreased since, then appeared to have levelled off.

- b) 1992
 c) About 500 kWh/year

3. a) i) Part a
 ii) Part c
 iii) Parts b and d
 b) People/year
4. a) The rate of change is zero from 0 s to 3 s, then constant and positive from 3 s to 6 s, then constant and negative from 6 s to 8 s.
 b) The rate of change is negative at start; positive from November to January; negative from January to May; positive until September
5. a) \$1/year
 b) The increase in Zoltan's hourly wage with every year of experience with the company
 c) No
6. Part a
7. a) Lunch: 15
 Appetizers: 10
 b) The cost for each additional person attending the event
 c) The flat rate cost involved is \$100 for both events.
8. a) Consumption increased steadily.



- b) $y \doteq 0.96x + 22.3$,
 with $x = 0$ representing 1990
 c) About 41.5 g/day
9. Parts a and d
10. b) Linear
 d) Quadratic
11. a) Diameter increased slowly at first, and then more quickly.

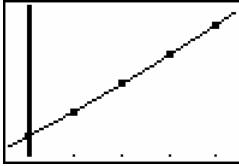


- b) $y \doteq 3.141x^2 + 0.026x - 0.40$
 c) About 46 757 cm^2
12. a) Both isotopes of Uranium start at 100%.
 b) U-238

13. a) The amount increased at a constant rate.



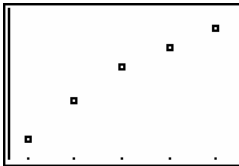
b) $y = 2500(1.06)^x$



- c) About \$4477.11

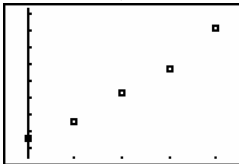
14. a) Linear
b) Exponential
c) Quadratic
d) Quadratic
e) Linear
f) Linear

15. a)



- b) Quadratic
c) $y = -9.7x^2 + 127.3x + 247.6$
d) 1995: about -\$631 000.00
2000: about \$248 000.00
2010: about \$549 000.00

16. a)



- b) Based on $x = 0$ representing 2000
Linear: $y = 8.2x + 41.2$
Quadratic: $y = 0.857x^2 + 4.771x + 42.914$
Exponential: $y = 42.2(1.153)^x$
c) Quadratic or exponential
d) Quadratic:
2010: About 176 million tonnes
2020: About 481 million tonnes
Exponential:
2010: About 177 million tonnes
2020: About 736 million tonnes

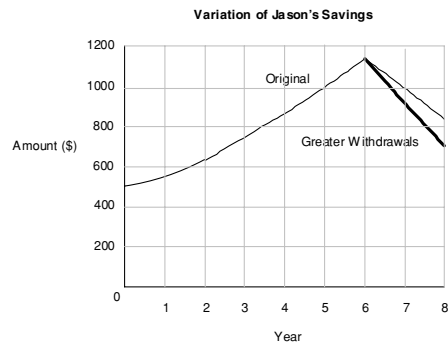
Chapter 5 Practice Test, page 335

1. C

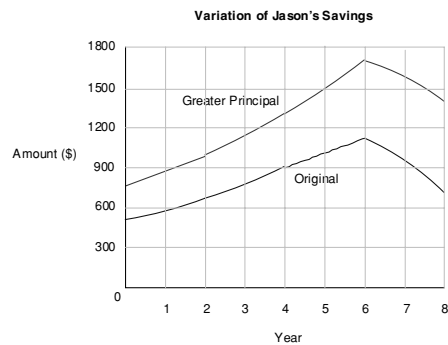
2. D
3. About 1.72 cm/month
4. i) The savings would grow more slowly.



- ii) The savings would fall more quickly after 6 years. The rate of change would be greater.



- iii) The initial value on the graph would be greater.



5. a) $y = 2.58x + 15.6$, where x is the number of years since 1990
b) About 60 000 t
6. a) Plan A: Weight decreased most rapidly in the first 2 months, then decreased more slowly, then increased slowly.
Plan B: Weight showed a rapid decrease in the first 2 months, then decreased more slowly, then increased slowly.
Plan C: Weight decreased in the first 2 months,

then increased slowly, then increased more rapidly.

Chapter 6 Algebraic Models

Activate Prior Knowledge

Square Roots, page 338

- 7
 - 8
 - About 3.16
 - 9
 - About 5.29
 - 3
 - 12
 - About 1.60
- $81 = 9^2$, $82 \div 9.06^2$
9.06 is not an integer.
 - 1, 1; 4, 2; 9, 3; 16, 4; 25, 5; 36, 6; 49, 7; 64, 8;
81, 9; 100, 10; 121, 11; 144, 12
- 0.9 s

Solving Linear Equations, page 339

- $x = 7$
 - $x = 18$
 - $x = 3$
 - $x = -7$
- $x = 2$
 - $x = 4$
 - $x = -2$
- 2 km

Evaluating Powers with Integer Exponents, page 340

- 8
 - 64
 - 25
 - $\frac{1}{9}$
 - 1
 - $\frac{1}{8}$
 - $-\frac{1}{7}$
 - $\frac{25}{9}$
- 0.70
 - 0.24
 - 243.33
 - 583.18
 - 0.09
 - 1.73

- $3^2 = 3 \times 3 = 9$; $2^3 = 2 \times 2 \times 2 = 8$
 - $4^3 = 4 \times 4 \times 4 = 64$;
 $(-4)^3 = (-4) \times (-4) \times (-4) = -64$
 - $5^2 = 5 \times 5 = 25$; $5^{-2} = \frac{1}{5 \times 5} = \frac{1}{25}$

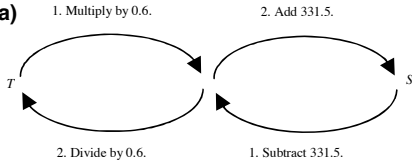
6.1 Using Formulas to Solve Problems, page 346

- 40 m^2
 - 48 cm^2
 - 39.9 m^2
 - 60.48 cm^2
- 20 g/cm^3
 - About 6.43 g/cm^3
 - 3 kg/L
 - About 1.85 kg/L
- 349.5 m/s
 - 322.5 m/s
 - 337.5 m/s
 - 316.5 m/s
- 25°C
 - 100°C
 - 10°C
 - -20°C
- About 222.22 kPa
 - About 2666.67 kPa
 - About 611.11 kPa
 - About 370.37 kPa
- About 99 cm^3
- 15 games
 - No
- $\$1700$
 - $\$2700$
- About 76.18 m^2
 - $\$209.94$
- About 0.77 m^2
 - About 15 mg
- 230 full cones
- 6300 t
- About 33.51 cm^3
 - No
 - Price proportional to volume: $\$5.00$
- 450 000 L
 - 2025 g
 - About $\$10.00$
- About 0.36 m^3
- $\frac{1}{3}$
The dose increases as age increases.
 - Yes
- 2
 - 2

c) 2
 $V + F - E = 2$

6.2 Rearranging Formulas, page 354

- a) $L = A - E$ b) $E = A - L$
- a) $R = P + C$ b) $C = R - P$
- a) $b = \frac{A}{h}$ b) $h = \frac{A}{b}$
- a) $M = DV$ b) $V = \frac{M}{D}$
- a) $s = 32$ b) $a = 63$
- a) 35 h b) 10.5 h
- a) 42 h
- a) \$15.50/h
- a)
 1. Multiply by 0.6.
 2. Add 331.5.



- b) $T = \frac{1}{0.6}(S - 331.5)$
- c) i) 20°C
 ii) 7.5°C
 iii) -5°C
- 9.5 in.
 - Up to 10 pots
 - a) 66 words/min b) 330 words
 - a) About 3.14 h, or 3 h 9 min
 - a) $t = 5$ cm b) $l = 4$ m
 - About 12.4 cm
 - About 12 m/s
 - a) $r = \sqrt{\frac{V}{\pi h}}$ b) About 2 m
 c) About 30 cm
 - a) About 93 km/h b) About 10 m
 - a) $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$
 b) About 78°

6.3 Laws of Exponents, page 362

- a) 2^7
 b) $\frac{1}{3^3}$
 c) $(1.05)^1$
 d) c^9
 e) $\frac{1}{2^8}$
 f) a^3
- a) 4^3
 b) $\frac{1}{5^4}$
 c) $(1.02)^3$

- d) d^4
 e) $(-3)^{11}$
 f) h^{10}

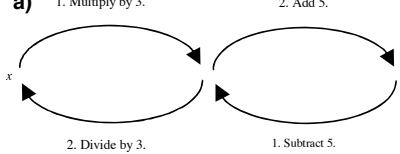
- a) 5^6 b) $\frac{1}{3^{10}}$
 c) $\frac{1}{(-2)^{12}}$ d) m^{20}
 e) r^{20} f) a^9
- a) 10 000 b) 1
 c) $\frac{1}{9}$ d) $\frac{1}{8}$
 e) $\frac{16}{81}$ f) 25
- a) 19 683 b) $\frac{1}{16}$
 c) $\frac{1}{16}$ d) -16
 e) 4 f) $\frac{8}{125}$
 g) About 3.73 h) -1
- a) d^3 b) $\frac{1}{x^{10}}$
 c) c^{14} d) z^{18}
 e) $\frac{1}{n^2}$ f) $\frac{1}{w^2}$
 g) s^{12} h) $\frac{1}{t^{26}}$
- a) 3200 b) 400
 c) 50
- a) 4500 transistors b) 1125 transistors
 c) 1 207 959 552 000 transistors
- a) $\frac{1}{16}$ b) $\frac{1}{125}$
 c) $\frac{1}{8}$ d) 9
- a) 8 b) $x^3 = 8$
- c) $(a \times b)^n = a^n b^n$
 d) i) $16f^4$ ii) $a^{12}b^4$
 iii) $s^{-15}v^{20}$ iv) $\frac{1}{25h^2}$
- a) 288 b) $\frac{500}{3}$
 c) -120 d) $-\frac{177\ 147}{10}$
- a) -15 360
- a) $V = 28\pi x^3$
 b) $V \doteq 10\ 996\ \text{cm}^3$; $V \doteq 152\ 003\ \text{cm}^3$
- b) About 81%
- a) $P = \frac{A}{(1+i)^n}$ b) $P = A(1+i)^{-n}$
 c) \$747.26

6.4 Patterns in Exponents, page 369

- a) 3 b) 7
 c) 8 d) 3
 e) -2 f) 10

3. a) i) 5 ii) 25
 iii) 125 iv) 625
 v) 3125
- b) The answers in part a are consecutive powers of 5.
- c) $25^{\frac{6}{2}} = 15\ 625$; $25^{\frac{7}{2}} = 78\ 125$; $25^{\frac{8}{2}} = 390\ 625$
4. b) $100^{\frac{3}{2}} = (100^{\frac{1}{2}})^3$; $100^{\frac{5}{2}} = (100^{\frac{1}{2}})^5$; $100^{\frac{7}{2}} = (100^{\frac{1}{2}})^7$
 c) 1000, 100 000, 10 000 000
5. a) $\sqrt[5]{32} = 2$ b) $\sqrt[4]{81} = 3$
 c) $\sqrt{16^3} = 64$ d) $\sqrt{9^5} = 243$
 e) $\sqrt{100^3} = 1000$ f) $\sqrt[4]{16^3} = 8$
 g) $\sqrt[3]{8^4} = 16$ h) $\sqrt[3]{27^3} = 27$
6. b) About 1.4
 c) $2^{\frac{3}{2}}$ is between 2 and 4.
 $2^{\frac{5}{2}}$ is between 4 and 8.
 $2^{\frac{7}{2}}$ is between 8 and 16.
 d) 2.8; 5.7; 11.3
7. a) About 93% b) About 81%
 c) About 91%

Chapter 6 Mid-Chapter Review, page 371

1. a) 6 m^2 b) 1598 cm^2
3. a) 66 m^2 b) $\$47.97$
4. $\$93\ 374.73$
5. a) 1. Multiply by 3. 2. Add 5.

 b) $x = \frac{y-5}{3}$
6. a) $d = 225\text{ m}$ b) $a = 8\text{ m/s}^2$
 c) $t = 64\text{ s}$
7. 5.25%
8. a) 9 b) -9
 c) $\frac{1}{9}$ d) $\frac{1}{9}$
9. a) p^2 b) $\frac{1}{p^5}$
 c) $\frac{1}{p^{10}}$
10. a) $\frac{59\ 049}{16}$ b) 291 600
 c) 2916
11. a) $4^{\frac{5}{2}}, 4^3, 4^{\frac{7}{2}}$
 b) 1, 2, 4, 8, 16, 32, 64, 128

12. a) 4 b) 4
 c) 125

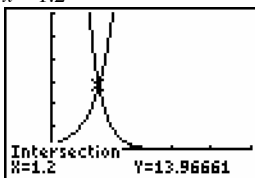
6.5 Rational Exponents, page 376

1. a) 6 b) 9
 c) 12 d) 0.5
2. a) 2 b) 4
 c) 0.3 d) -5
3. a) $64^{\frac{1}{2}}$ b) $1.21^{\frac{1}{2}}$
 c) $216^{\frac{1}{3}}$ d) $(-343)^{\frac{1}{3}}$
4. a) 8 b) 1.1
 c) 6 d) -7
5. a) 2 b) 0.4
 c) -3 d) 2
6. a) $\sqrt[5]{243} = 3$ b) $\sqrt{9^3} = 27$
 c) $\sqrt[3]{8^5} = 32$ d) $\sqrt[4]{81^3} = 27$
 e) $\sqrt[4]{0.0625} = 0.5$ f) $\sqrt[5]{(-32)^3} = -8$
 g) $\sqrt{0.01^3} = 0.001$ h) $\sqrt[3]{(-27)^4} = 81$
7. a) 64 b) 64
8. a) $D = 0.099\sqrt[10]{M^9}$
 b) i) About 2.43 L/day
 ii) About 27.54 L/day
 iii) About 0.003 963 L/day
9. Maria's
10. a) 49 b) 3
 c) 4 d) 4
 e) $\frac{3}{4}$ f) 125
11. About 10.41%
12. a) 1.5 ha
 b) 13.5 ha
13. About 9.85 cm
14. a) About 0.704 kg
 b) About 0.006 169 kg
 c) About 3.43 kg
16. a) $r = \sqrt{\frac{2P}{s^3}} = \left(\frac{2P}{s^3}\right)^{\frac{1}{2}}$
 b) $s = \sqrt[3]{\frac{2P}{r^2}} = \left(\frac{2P}{r^2}\right)^{\frac{1}{3}}$
17. a) About 4.4 m/s b) 20 cm

6.6 Exponential Equations, page 384

1. a) $x = 3$ b) $x = 2$
 c) $x = 7$ d) $x = \frac{3}{2}$
2. a) $x = 15$ b) $x = 2$
 c) $x = 2$ d) $x = -12$

3. a) $x = 5$ b) $x = 1$
 c) $x = 2$ d) $x = \frac{9}{2}$
4. a) 6^2 b) 2^4
 c) 5^3 d) 10^3
5. a) $3^x = 3^2; x = 2$ b) $3^x = 3^{-2}; x = -2$
 c) $3^{2x} = 3^4; x = 2$ d) $3^{x+5} = 3^3; x = -2$
6. a) $x = 4$ b) No
7. a) $x = 3$ b) $x = \frac{3}{2}$
 c) $x = 2$ d) $x = 3$
 e) $x = \frac{3}{2}$ f) $x = \frac{-1}{2}$
 g) $x = -3$ h) $x = -2$
9. a) i) 30 is between 2^4 and 2^5 ; 4 and 5
 ii) 100 is between 5^2 and 5^3 ; 2 and 3
 iii) 75 is between 3^3 and 3^4 ; 3 and 4
 iv) $\frac{1}{5}$ is between 2^{-2} and 2^{-3} ; -2 and -3
- b) i) $x = 4.91$ i) $x = 2.86$
 iii) $x = 3.93$ iv) $x = -2.32$
10. a) $x = 2$ b) $x = -5$
 c) $x = -2$ d) $x = 1$
 e) $x = \frac{-9}{5}$ f) $x = -7$
12. $x = 1.8$
13. a) $x = 2.40$ b) $x = 2.37$
 c) $x = 1.70$ d) $x = 5.17$
 e) $x = 2.60$ f) $x = 11.90$
14. a) Approximate b) About 1.68
15. a) $6400 = 100(2)^t$ b) $t = 6$
16. a) i) $x = 0$ ii) $x = 1.2$
 c) $x = 1.2$

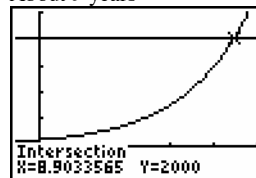


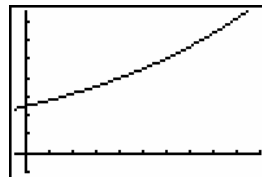
18. a) 2010
 19. a) 1 min, 9°C

6.7 Applications of Exponential Equations, page 391

1. a) $\frac{1}{2} = (0.84)^t$ b) $\frac{3}{4} = (0.84)^t$
 c) $\frac{3}{8} = (0.84)^t$ d) $\frac{7}{8} = (0.84)^t$
2. a) 4 years b) 2 years
 c) 6 years d) 1 year
3. a) $2.5 = 2.4(1.017)^t$ b) $2.7 = 2.4(1.017)^t$
 c) $3 = 2.4(1.017)^t$
4. a) About 1990 b) About 1994
 c) About 2001

5. a) Part ii b) Part iii
 c) Part i
6. a) i) $y = 1$ ii) $y = 8$
 b) i) $x = 3$ ii) $x = 1$
7. a) 100 bacteria b) 2 h
8. a) $600 = 500(1.08)^n$ b) $1000 = 500(1.08)^n$
 c) $1500 = 500(1.08)^n$
9. a) $50 = 100(0.98)^n$
 b) 34 washings
10. a) $2000 = 100(1.4)^t$
 b) About 9 years

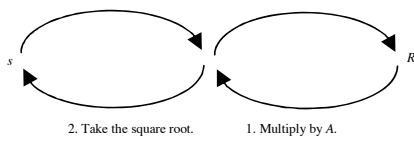


11. a) 
 b) i) About 3 years
 ii) About 12 years
 iii) About 15 years
12. a) Decreased
 b) 2010
 c) 2021
13. a) 8.7 min
 c) About 17 min
 d) Decrease
14. a) About 42.04 kPa
 b) About 8 km
 c) Part b
15. a) $A = 500(0.5)^{\frac{t}{12.3}}$
 b) About 82 years
16. About 1300 years old
17. About 3 h
19. a) About 56.24 years
 b) $P = 29.6(2)^{\frac{t}{56.24}}$
 c) 2020

Chapter 6 Review, page 400

1. \$3300
 2. \$334.32
 3. \$1.40
 4. a) 17 Wh
 b) About 233.33 Wh

- c) 13.7 h
5. a) $d = \frac{C}{\pi}$
- b) About 2.55 m
6. About 6.94 Ω
7. 1. Square. 2. Divide by A.



- a) $s = \sqrt{RA}$
- b) 9 ft.
8. a) $P = \frac{A}{1 + rt}$
- b) \$1702.13
9. a) -25
- b) $\frac{1}{25}$
- c) 25
10. a) $10^5 = 100\,000$
- b) $7^8 = 5\,764\,801$
- c) $1.12^6 \approx 1.97$
- d) $2^0 = 1$
11. a) kl
- b) a^2
- c) $\frac{1}{x^2 y^4}$
- d) $(\frac{s}{n})^7$
12. a) $\frac{1}{125}$
- b) -243
- c) $\frac{9}{25}$
- d) 729 000
13. a) 4
- b) -3
- c) 2
- d) 32
- e) 125
- f) 0.729
14. a) About 2.94 mg
- b) About 2.47 mg
- c) About 0.88 mg
15. a) 10
- b) 4
- c) 81
- d) 4
16. About 4.5%
17. a) $B = 0.4089(\sqrt[4]{M})^3$
- b) i) About 1.26 m³/day
- ii) About 1.95 m³/day

- c) About 11.8 kg
- d) No
18. a) $2^2, 2^4, 2^5$
- b) $5^{-1}, 5^2, 5^3$
- c) $3^2, 3^4, 3^5$
19. a) 3 b) 4
- c) $\frac{1}{2}$ d) 4
- e) 9 f) 8
21. a) 2.1
- b) 1.6
- c) -2.9
- d) 15.9
- e) 7.4
23. a) $1 = 300(0.8)^t$
- b) About 25.56 h
24. About 17 200 years old
25. a) $7549.74 = 36\,000(0.8)^n$
- b) About 7 years old

Chapter 6 Practice Test, page 403

1. B
2. D
3. a) i) $-\frac{1}{8}$
- ii) $\frac{5}{3}$
- iii) 27
- b) $\frac{25}{8}$
5. a) 32 000 represents the population in 1990. 1.09 represents an increase in the population by 9% each year.
- b) 2004
6. a) About 0.63 g
- b) About 99 kg
- c) Yes

Chapter 7 Annuities and Mortgages

Activate Prior Knowledge

Simple and Compound Interest, page 406

1. \$4584.38
2. \$11 596.93
3. a) Yes b) No
- c) No

Present Value, page 407

1. \$5365.95
2. \$2387.21

3. If the final amount is given and you need to find the amount invested then solve for the present value. If the initial value is given and you need to find the final value or earnings then solve for the amount.

7.1 The Amount of an Annuity, page 415

1. a)

Year	Starting balance	Interest earned	Deposit	Ending balance
1	\$0.00	\$0.00	\$1000.00	\$1000.00
2	\$1000.00	\$80.00	\$1000.00	\$2080.00
3	\$2080.00	\$166.40	\$1000.00	\$3246.40
4	\$3246.40	\$259.71	\$1000.00	\$4506.11

b)

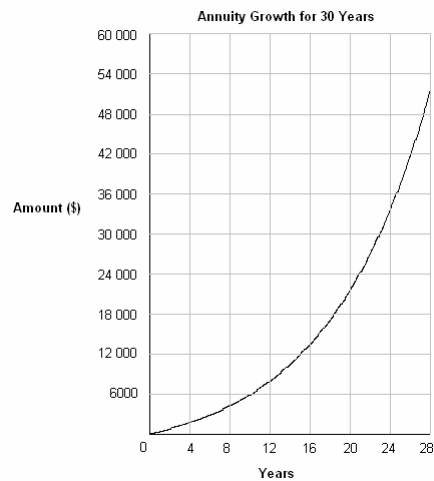
Month	Starting balance	Interest earned	Deposit	Ending balance
1	\$0.00	\$0.00	\$100.00	\$100.00
2	\$100.00	\$0.50	\$100.00	\$200.50
3	\$200.50	\$1.00	\$100.00	\$301.50
4	\$301.50	\$1.51	\$100.00	\$403.01

2. a) $i = 0.03; n = 7$ b) $i = 0.045; n = 24$
 c) $i = 0.006; n = 32$ d) $i = 0.015; n = 60$
3. a) \$630.50 b) \$8922.80
 c) \$9388.46
4. a) N: 7; I%: 3; P/Y: 1; C/Y: 1
 b) N: 24; I%: 9; P/Y: 2; C/Y: 2
 c) N: 32; I%: 2.4; P/Y: 4; C/Y: 4
 d) N: 60; I%: 18; P/Y: 12; C/Y: 12
5. a) \$300.00 b) Monthly
 c) 6 d) 8%
 e) Monthly f) \$1830.27
6. a) \$41 449.34 b) \$14 767.57
 c) \$69 362.25 d) \$32 302.36
7. a) \$11 449.34 b) \$4367.57
 c) \$17 162.25 d) \$5302.36
9. No, Shen Wei will have saved only \$9636.38.
10. a) \$37 086.78 b) \$15 486.78
 c) \$3712.06
11. a) \$3818.16
 b) i) Yes ii) No
 iii) No
 c) Part iii
 Part i gives an amount of \$7636.32, part ii gives \$4053.56, and part iii gives \$8122.26.
12. a) Both Jackson and Abina invested \$14 400, but Jackson's annuity has an amount of

\$40 180.60 and Abina's annuity has an amount of \$23 265.50.

- b) Jackson's: \$25 780.60
 Abina's: \$8865.50
- c) Financial planners recommend saving for retirement from an early age because more interest is earned that way, therefore less investment is required to save a given amount.
13. a) Annuity 1; deposit: \$6000; amount: \$6629.90
 Annuity 2; deposit: \$6000; amount: \$6605.70
 b) The deposits are made more frequently and interest is calculated more often.
14. a) Part iii
 b) i) Deposit: \$10 000; amount: \$10 724.93
 ii) Deposit: \$5000; amount: \$5750.74
 iii) Deposit: \$10 000; amount: \$11 731.39
 iv) Deposit: \$10 000; amount: \$10 825.40

16.



- b) Yes
17. a) Kishore will have a greater amount because he started investing sooner so his money had more time to collect interest.
 b) Kishore: investment: \$20 000;
 amount: \$895 760.96
 Giselle: investment: \$60 000;
 amount: \$328 988.05
 c) Yes;
 Kishore has saved far more money than Giselle, even though he invested less.

7.2 The Present Value of an Annuity, page 423

1. a) 851.13
 b) 25 669.07
 c) 26 681.04
 d) 471.93
2. a) \$544.65 b) \$5206.37

- c) \$7931.51
3. a) \$350 b) Monthly
c) 32 withdrawals d) \$10 678.37
4. a) \$6373.02 b) \$23 589.62
c) \$5936.30 d) \$13 081.15
6. a) \$468.87
b) \$4345.77
c) \$105 628.79
d) \$805.12
7. a) \$281.13
b) \$2854.23
c) \$106 871.21
d) \$94.88
8. \$11 495.78
9. \$205 218.51
10. Isabel should choose the plan that receives monthly payments because she will earn more money over the ten years.
11. a) \$13 419.22 b) Part ii
12. a) \$2499.92 b) \$206.80
13. No; Becky's annuity had more compounding periods, therefore it earned more interest and had a lower present value than Angela's annuity.
15. \$35 714.48
16. a) \$1356.45
b) \$720.34
c) \$49.70

7.3 The Regular Payment of an Annuity, page 430

1. a) $R = \frac{Ai}{[(1+i)^n - 1]}$
b) $R = \frac{PVi}{[1 - (1+i)^{-n}]}$
2. a) 456.51
b) 180.49
3. a) \$3500
b) 21%
c) \$131.86
d) 36
e) 3 years
4. a) \$299.48
b) \$1481.93
c) \$244.63
d) \$185.05
6. a) Present value
b) Amount
c) Amount
d) Present value
7. a) \$1535.13 b) \$92 107.80
c) \$17 107.80

8. a) \$419.36
b) i) Yes ii) No
 iii) No
9. a) \$2928.73
b) \$5712.70
10. a) 36-month loan: \$579.96;
 48-month loan: \$455.66
b) \$993.12
11. a) David's: \$638.79; Ulani's: \$669.07
b) \$1090.08
13. Lincoln should make monthly deposits into the account with 7.8% interest compounded monthly.
14. a) \$325.91
b) \$1035.91
c) \$18 040.90
16. \$1841.77

Chapter 7 Mid-Chapter Review, page 442

1. \$5237.09
2. a) i) \$39 087.32
 ii) \$136 842.87
 iii) \$992 763.04
b) i) \$14 087.32
 ii) \$86 842.87
 iii) \$892 763.04
3. \$476 931.87
5. \$197.12
6. a) 7 years: \$409.88; 10 years: \$324.86
b) \$4553.28
7. a) \$2076.26
b) i) \$415.25
 ii) \$15.55
8. a)

Payment number	Payment	Interest paid	Principle paid	Outstanding balance
0				\$8000
1	\$177.96	\$80.00	\$97.96	\$7902.04
2	\$177.96	\$79.02	\$98.94	\$7803.11
3	\$177.96	\$78.03	\$99.02	\$7703.18
:	:	:	:	:
58	\$177.96	\$5.23	\$172.72	\$350.64
59	\$177.96	\$3.51	\$174.45	\$176.19
60	\$177.96	\$1.76	\$176.19	\$0.00

- b) \$3780.38

7.6 What Is a Mortgage?, page 445

1. a) \$38 750 b) \$116 250

2. b) A greater down payment will decrease the amount of interest paid on the mortgage.
3. \$7362.50
4. a) \$4650
5. a) Kyle and Tea have borrowed \$139 500. They will pay it back over a 25-year period. Every 5 years, they will have to renew their mortgage based on current interest rates.
- c) Weekly, bi-weekly, semi-monthly, monthly

7.7 Amortizing a Mortgage, page 450

1. a) \$195 000
b) 5.8%
c) \$1224.54
d) 300 monthly payments
e) Nadia makes monthly payments and the interest is compounded semi-annually.
2. a) i) \$225 000 ii) 240 payments
 iii) \$347 596.80 iv) \$122 596.80
b) i) \$80 000 ii) 180 payments
 iii) \$132 553.80 iv) \$52 553.80
3. a) \$479.73 b) \$872.41
c) \$1517.34 d) \$1764.44
4. a) \$21 351.40 b) \$111 723.00
c) \$174 161.60 d) \$346 198.40
5. a) \$125 000 b) \$799.76
c) \$617.33 d) \$183.33
e) \$124 450.00
f) Total interest is about 3 times as large as the total principal paid in the first 3 payments.
6. a) Principal borrowed: \$120 000;
 monthly payment: \$1104.62
b) 15 years
c) Interest: \$738.54; principal: \$366.08
d) \$78 830.44
- The amount of interest paid is about $\frac{2}{3}$ of the principal originally borrowed.
- e) \$118 894.99
7. a) The amount of interest paid is much greater than the amount of principal paid.
b) The amount of interest paid is much less than the amount of principal paid.
c) Interest: about 67%; principal: about 33%
- Interest:
 $(738.54 + 736.29 + 734.02) \div (1104.62 \times 3)$
 ≈ 0.6665
- Principal:
 $(366.08 + 368.33 + 370.60) \div (1104.62 \times 3)$
 ≈ 0.3334

8. a) Down payment: \$26 250; principal: \$148 750
b) \$1134.77
c) \$204 258.60
- The total amount paid is about \$55 500 more than the principal originally borrowed.
10. a) $N = 300$
 $I\% = 6.00$
 $PV = 185\,000.00$
 $PMT = -1183.64$
 $FV = 0.00$
 $P/Y = 12$
 $C/Y = 2$
- b) Interest: \$906.91; principal: \$276.73
c) \$182 802.34 d) About 1.8%
11. a) No
b) 15-year amortization period: \$1802.05
30-year amortization period: \$1234.59

12. b)

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				\$200 000.00
1	\$1197.60	\$873.73	\$323.87	\$199 676.13
2	\$1197.60	\$872.32	\$325.28	\$199 350.85
3	\$1197.60	\$870.90	\$326.70	\$199 024.15
4	\$1197.60	\$869.47	\$328.13	\$198 696.02
5	\$1197.60	\$868.04	\$329.56	\$198 366.46
6	\$1197.60	\$866.60	\$331.00	\$198 035.46

13. c) \$2343.00

7.8 Using Technology to Generate an Amortization Table, page 459

1. a) \$800.91 b) \$1068.68
c) \$1974.69
2. a) \$843.33 b) 0.412%
c)

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				\$145 000.00
1	\$843.33	\$597.97	\$245.36	\$144 754.64
2	\$843.33	\$596.96	\$246.37	\$144 508.27
3	\$843.33	\$595.94	\$247.39	\$144 260.88
:	:	:	:	:
298	\$843.33	\$10.34	\$832.99	\$1674.70
299	\$843.33	\$6.91	\$836.42	\$838.28
300	\$841.74	\$3.46	\$838.28	(\$0.00)

- d) \$107 997.41
4. a) \$1339.65

b)

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				\$200 000.00
1	\$1339.65	\$1068.95	\$270.70	\$199 729.30
2	\$1339.65	\$1067.50	\$272.15	\$199 457.15
3	\$1339.65	\$1066.05	\$273.60	\$199 183.55
4	\$1339.65	\$1064.58	\$275.07	\$198 908.48
5	\$1339.65	\$1063.11	\$276.54	\$198 631.94
6	\$1339.65	\$1061.64	\$278.01	\$198 353.93

c) \$1646.07

d) \$6391.83

5. a) \$1419.24

b)

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				\$245 000.00
1	\$1419.24	\$1160.14	\$259.10	\$244 740.90
2	\$1419.24	\$1158.91	\$260.33	\$244 480.57
3	\$1419.24	\$1157.68	\$261.56	\$244 219.01
4	\$1419.24	\$1156.44	\$262.80	\$243 956.21
5	\$1419.24	\$1155.19	\$264.05	\$243 692.16
6	\$1419.24	\$1153.94	\$265.30	\$243 426.86

c) \$6942.30

6. a) \$1059.08

b)

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				\$168 000.00
1	\$1059.08	\$624.17	\$434.91	\$167 565.09
2	\$1059.08	\$622.56	\$436.52	\$167 128.57
3	\$1059.08	\$620.94	\$438.14	\$166 690.43
:	:	:	:	:
22	\$1059.08	\$588.95	\$470.13	\$158 049.39
23	\$1059.08	\$587.20	\$471.88	\$157 577.51
24	\$1059.08	\$585.45	\$473.63	\$157 103.88

c) i) Interest: \$14 521.80; principal: \$10 896.12

ii) \$157 103.88

iii) 6.49%

At this rate, it would take 30 years and 10 months to repay the mortgage. In reality it does not take this long because over time the percentage of the monthly payment contributing to paying off the principal increases.

7.9 Reducing the Interest Costs of a Mortgage, page 466

- \$1116.13
 - \$558.07
 - \$279.03
- The regular payment decreases and the total interest paid increases.
 - The regular payment decreases and the total interest paid decreases.
 - The regular payment decreases and the total interest paid decreases.
- Monthly payment: \$1145.25
Total interest: \$164 575.00
- Monthly payment: \$1274.82
Interest saved: \$37 618.20
 - Monthly payment: \$1118.79
Interest saved: \$7938.00
 - Weekly payment: \$263.79
Interest saved: \$648.00
 - Accelerated bi-weekly payment: \$572.63
Interest saved: \$30 460.92
- Part a

Chapter 7 Review, page 468

- \$23 970.46
 - \$13 177.77
 - \$62 246.69
- \$6120.46
 - \$2137.77
 - \$17 246.69
- b) Yvonne: \$8452.49; Teresa: \$8387.68
- Carlos: \$465 297.31; Renata: \$235 065.28
 - No
- \$19 195.82
 - \$51 821.34
- \$5304.18
 - \$33 978.66
- \$1470.49
 - \$257.51
- Annuity A: \$706.56
Annuity B: \$1413.13
Annuity C: \$1263.36
 - Part i
- \$2158.58
- First annuity payments are \$2478.12 quarterly for 6 years at 7.5% per year compounded quarterly and amount to \$74 250. Second annuity payments are \$4969.91 bi-yearly for 6 years at 7.8% per

year compounded semi-annually and amount to \$74 250.

- b) Tarak should choose the first annuity because he invests less money and ends up with the same future value.

11. a) \$90.34
 b) \$211.80
 12. a) \$57.33
 b) \$208.98
 c) 6 years and 3 months

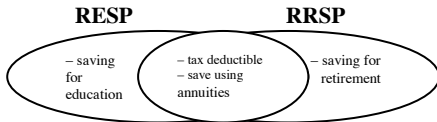
13. a)

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				\$8000
1	\$138.32	\$50.00	\$88.32	\$7911.68
2	\$138.32	\$49.45	\$88.87	\$7822.81
3	\$138.32	\$48.89	\$89.43	\$7733.38
:	:	:	:	:
70	\$138.32	\$2.56	\$135.76	\$274.07
71	\$138.32	\$1.71	\$136.61	\$137.46
72	\$138.32	\$0.86	\$137.46	\$0.00

- b) \$1959.10

This is about 25% of the amount originally borrowed.

14.



15. A closed mortgage with a 30-year amortization period means that it will take 30 years to repay the mortgage. Bi-weekly payments mean that payment will be made every other week. The interest rate is 6% and the compounding period is 6 months. The interest rate will be reevaluated every 5 years.

16. a) Monthly payment: \$536.87
 Total interest: \$64 061.00
 b) Monthly payment: \$820.83
 Total interest: \$51 999.20
 c) Monthly payment: \$2198.90
 Total interest: \$188 802.00
 d) Monthly payment: \$1686.08
 Total interest: \$307 988.80
 17. a) \$150 000.00
 b) \$959.71
 c) \$737.53
 d) \$149 340.00
 e) \$4428.43
 18. \$1077.84; \$296.61; \$779.94; \$178 231.91
 19. a) \$1521.73

b)

Payment number	Monthly payment	Interest paid	Principal paid	Outstanding balance
0				\$190 000.00
1	\$1521.73	\$822.30	\$699.43	\$189 300.57
2	\$1521.73	\$819.27	\$702.46	\$188 598.11
3	\$1521.73	\$816.23	\$705.50	\$187 892.61
:	:	:	:	:
10	\$1521.73	\$794.58	\$727.15	\$182 867.88
11	\$1521.73	\$791.43	\$730.30	\$182 137.58
12	\$1521.73	\$788.27	\$733.46	\$181 404.12

- c) Total amount: \$273 911.40

Interest paid: \$83 911.40

20. a) 24 payments
 b) 26 payments
 c) 52 payments
 d) 26 payments
 21. a) \$342 743.60
 b) Option IV

Chapter 7 Practice Test, page 471

1. B
 2. B
 3. \$2419.44
 4. a) \$80 000.00
 b) Principal: \$45.22; interest: \$589.05
 c) \$634.27; \$588.72; \$45.55
 d) \$148 337.20
 5. Option A

Chapter 8 Budgets

Activate Prior Knowledge

Fixed and Variable Costs, page 475

1. \$2788.78
 2. \$9152.18
 3. a) Fixed expenses: obedience training course (if one time only), annual vet visits and shots, buying the dog and dog licence
 Variable expenses: food, vet visits for illness
 b) Buying the dog and dog licence
 4. Fixed expenses: bicycle, bicycle shoes, helmet, running shoes, sunglasses, wet suit, swim goggles, membership in triathlon club, fitness training, and race entrance fees
 Variable expenses: bike maintenance and parts, biking and running clothes, and bathing suits

8.2 The Costs of Owning or Renting a Home, page 484

- \$15 000
 - \$25 364.56
 - \$656.28
 - \$395.40
- Fixed cost
 - Variable cost
 - Fixed cost
 - Variable cost
- \$738
 - \$1159
 - \$370
 - \$285
- Ashley is responsible for replacing the window.
- No;
Paul would have to give his tenants a 90-day written notice after they have rented the place for 12 months.
- Fixed expenses: mortgage payments, home insurance, property taxes, phone and TV
Variable expenses: water, sewer, electricity, and natural gas
- \$15 802.54
- \$20 271.28
- About \$58.01
 - About \$66.77
 - The plan provides stability in the monthly expenses.
- About \$391.54/month; about \$395.96/month if they include water heater
 - Yes, the rent they plan to charge is reasonable, maybe on the low side.
- Option 1: \$7620
Option 2: \$7800
 - Electricity
- Option 1: \$8988
Option 2: \$7548
 - Option 1: electricity
Option 2: electricity (includes heat) and transportation

Chapter 8 Mid-Chapter Review, page 492

- Electricity, gas, water, TV/cable, phone, internet
 - Property tax, home insurance, mortgage, maintenance
- Rent, cable, phone, internet, utilities
- \$18 032.56
 - \$359.40
 - \$9180
 - \$855.20
 - \$275.80
- No
Karim's landlord would have to give him a 90-day written notice after he has rented the place for 12 months.
- \$14 790
- \$4500
 - \$1320
 - Yes;
Melissa and Farideh would still save \$525.

8.4 Designing Monthly Budgets, page 501

- \$1615
 - Tuition, residence, and meals
 - No
- Expense
 - Expense
 - Income
 - Expense
 - Expense
 - Income
- About \$2708.33
 - Ingrid can save about \$308 monthly.
- About \$606.67/month
 - About \$4666.67/month
 - About \$137.50/month
 - About \$266.67/month
-

Income	Monthly amount (\$)
Student loan ($\$5000 \div 12$)	417.00
Part-time job ($\$260 \times 52 \div 12$)	1127.00
<i>Total income</i>	1544.00
Expenses	
Rent and utilities	550.00
Transportation	65.00
Food ($\$85 \times 52 \div 12$)	368.00
Cell phone service	25.00
Books and supplies ($\$1200 \div 12$)	100.00
Miscellaneous ($\$250 \times 26 \div 12$)	542.00
<i>Total expenses</i>	1650.00
<i>Balance (Total income – total expenses)</i>	-106.00

b) No

6.

Income	Monthly amount (\$)	
Income	5417.00	Fixed
Investments	75.00	Fixed
Expenses		
Mortgage payment and property tax	1463.00	Fixed
Home insurance	54.00	Fixed
Car insurance	88.00	Fixed
Utility costs	230.00	Variable
Phone/cable	75.00	Fixed
Vehicle lease	410.00	Fixed
Gasoline costs	175.00	Variable
Retirement savings plan	488.00	Fixed
Grocery costs	693.00	Variable
Clothing costs	250.00	Variable
Entertainment costs	520.00	Variable
Charitable donations	83.00	Fixed
Miscellaneous costs	325.00	Variable

7. a)

Income	Monthly amount (\$)		
	Fixed	Variable	Total
Salary	5417.00		5417.00
Investments	75.00		75.00
<i>Total income</i>	5492.00		5492.00
Expenses			
Housing			
Mortgage payment/ property tax	1463.00		1463.00
House insurance	54.00		54.00
Utilities		230.00	230.00
Phone/cable	75.00		75.00
<i>Subtotal</i>	1592.00	230.00	1822.00
Transportation			
Vehicle lease	410.00		410.00
Gas costs		175.00	175.00
Insurance	88.00		88.00
<i>Subtotal</i>	498.00	175.00	673.00
Food			
Groceries		693.00	693.00
<i>Subtotal</i>		693.00	693.00
Other			
Clothing		250.00	250.00
Entertainment		520.00	520.00
Charitable donations	83.00		83.00
Miscellaneous expenses		325.00	325.00
<i>Subtotal</i>	83.00	1095.00	1178.00
Savings	488.00		488.00
<i>Total Expenses</i>	2661.00	2193.00	4854.00
<i>Balance (Total income – total expenses)</i>			638.00

b) Yes

8. No

9. a)

Income	Monthly amount (\$)
Part-time job ($\$425 \times 52 \div 12$)	1842.00
<i>Total income</i>	1842.00
Expenses	
Rent and utilities	650.00
Transportation (bus pass)	80.00
Groceries ($\$95 \times 52 \div 12$)	412.00
Education (community college course)	100.00
Miscellaneous ($\$150 \times 26 \div 12$)	325.00
<i>Total expenses</i>	1567.00
<i>Balance (Total income – total expenses)</i>	275.00

b) Yes

c) Yes

10. a) Each month, Nihal will have \$299 left over, even with his savings for education built into the budget.

Income	Monthly amount (\$)
Part-time job ($\$350 \times 52 \div 12$)	1517.00
<i>Total income</i>	1517.00
Expenses	
Rent	450.00
Utilities	120.00
Transportation (bus pass)	60.00
Groceries	320.00
Clothing	30.00
Entertainment	40.00
Education (tuition and equipment) $900 \div 8$	113.00
Phone/Internet	60.00
Contact lenses	25.00
<i>Total expenses</i>	1218.00
<i>Balance (Total income – total expenses)</i>	299.00

b) He will need to use \$1105 of his savings.

Income	Monthly amount (\$)
Employment Insurance ($\$2310 \div 3$)	770.00
<i>Total income</i>	770.00
Expenses	
Rent	450.00
Utilities	120.00
Transportation (bus pass)	60.00
Groceries	320.00
Clothing	30.00
Entertainment	40.00
Phone/Internet	60.00
Contact lenses	25.00
<i>Total expenses</i>	1105.00
<i>Balance (Total income – total expenses)</i>	-335.00

c) Yes

8.5 Creating a Budget Using a Spreadsheet, page 508

1. B7 calculates the sum of all of the monthly income items.
B20 calculates the sum of all of the monthly expense items.
B22 calculate the monthly balance by subtracting total expenses from total income.

3.

Rebecca's Monthly Budget	
Description of income	Monthly amount (\$)
Employment income	2085.00
Total	2085.00
Description of expenses	Monthly amount (\$)
Rent and utilities	480.00
Food expenses	325.00
Entertainment	173.00
Transportation	65.00
Miscellaneous	433.00
Savings for education	175.00
Total	1652.00
Money left at end of month	433.00

- a) \$175
- b) \$1299

4. a)

Rebecca's Monthly Budget	
Description of income	Monthly amount (\$)
Employment insurance (EI)	1147.00
Total	1147.00
Description of expenses	Monthly amount (\$)
Rent and utilities	480.00
Food expenses	325.00
Entertainment	173.00
Transportation	65.00
Miscellaneous items	433.00
Total	1477.00
Money left at end of month	-330.00

5. a) \$176

Oliver's Monthly Budget	
Description of Income	Monthly amount (\$)
Employment income	596.00
Total	596.00
Description of Expenses	Monthly amount (\$)
Room and board	130.00
Cell phone expenses	30.00
Entertainment	108.00
Miscellaneous items	152.00
Total	420.00
Money left at end of month	176.00

b) No

8.6 Making Decisions about Buying or Renting, page 513

1. \$31 850
2. \$3475

Chapter 8 Review, page 520

1. a) One-bedroom condo downtown
b) Two-bedroom apartment/townhouse/house, city/suburbs
c) Three-bedroom home and double-car garage, suburbs
2. a) Mortgage payment, home insurance, utilities, property taxes, and regular repairs and upgrades
3. a) \$10 500
b) \$16 222.44
c) \$537.10
d) \$455.40
4. a) \$780
b) \$1040
c) \$350
d) \$380
5. \$15 468
6. Yes
10. a) The greatest expense is the mortgage: \$1200
The least expense is the insurance: \$100
b) \$800
11. a) Income; \$130
b) Expense; about \$333.33
c) Expense; \$97.50
d) Income; about \$67.92
12. a)

Income	Monthly amount (\$)
Take-home pay	2400.00
<i>Total income</i>	2400.00
Expenses	
Rent and utilities	975.00
Phone plan	50.00
Car payment	325.00
Gas ($\$50 \times 52 \div 12$)	217.00
Food ($\$120 \times 52 \div 12$)	520.00
Car and contents insurance ($\$30 \times 52 \div 12$)	130.00
Entertainment ($\$170 \times 26 \div 12$)	368.00
Miscellaneous	200.00
<i>Total expenses</i>	2785.00
<i>Balance (Total income - total expenses)</i>	-385.00

b) No

13. a)

Phillip and Teresa's Monthly Budget	
Description of income	Monthly amount (\$)
Employment income - Phillip	2752.00
Employment income - Teresa	3250.00
Total	6002.00
Description of expenses	Monthly amount (\$)
Mortgage payment	1380.00
Food and restaurants	943.00
Utilities and services	550.00
Transportation	700.00
Property tax	250.00
Vacation expenses	160.00
Entertainment	390.00
Miscellaneous	500.00
Insurance and RSPs	400.00
Total	5273.00
Money left at end of month	729.00

b) Yes

14. a)

Phillip and Teresa's Monthly Budget	
Description of income	Monthly amount (\$)
Employment income – Phillip	2752.00
Employment income – Teresa	3250.00
Total	6002.00
Description of Expenses	Monthly amount (\$)
Mortgage payment	1380.00
Food and restaurants	943.00
Utilities and services	550.00
Transportation	700.00
Property tax	250.00
Vacation expenses	160.00
Entertainment	390.00
Miscellaneous	500.00
Insurance and RSPs	400.00
Total	5273.00
Money left at end of month	729.00

Chapter 8 Practice Test, page 523

1. B
2. C
4. a) Option 1: \$4200
Option 2: \$5640
- b) Utilities

6. a)

Expenses	Monthly amount (\$)
Mortgage	1400.00
Condo fees	275.00
Utilities	350.00
Property tax	208.00
Condo Insurance	47.00
Food	867.00
Day care	975.00
Transportation	50.00
Vacations	125.00
Entertainment	650.00

b) \$53

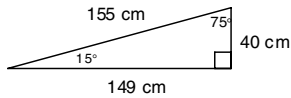
	Monthly amount (\$)
Income	
Income	5000.00
<i>Total income</i>	5000.00
Expenses	
Mortgage	1400.00
Condo fees	275.00
Utilities	350.00
Property tax	208.00
Condo insurance	47.00
Food	867.00
Day care	975.00
Transportation	50.00
Vacations	125.00
Entertainment	650.00
<i>Total expenses</i>	4947.00
<i>Balance (Total income – total expenses)</i>	53.00

c)

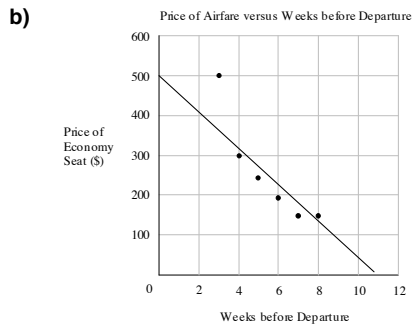
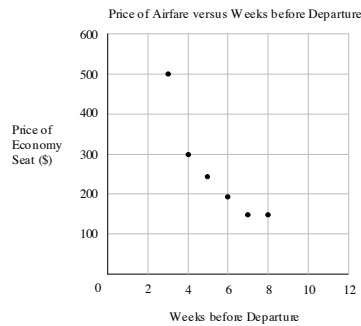
Expenses	Monthly amount (\$)
Income	
Income	4000.00
<i>Total income</i>	4000.00
Expenses	
Mortgage	1400.00
Condo fees	275.00
Utilities	350.00
Property tax	208.00
Condo Insurance	47.00
Food	867.00
Daycare	975.00
Transportation	50.00
Vacations	125.00
Entertainment	650.00
<i>Total expenses</i>	4947.00
<i>Balance (Total income – total expenses)</i>	-947.00

Cumulative Review Chapters 1–8, page 530

1. a) $\angle X \doteq 40^\circ$
b) $\angle L \doteq 41^\circ$
2. a) About 155 cm, about 149 cm

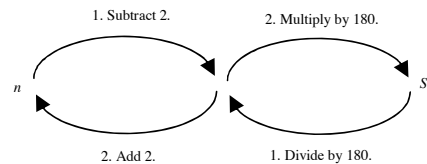


3. a) About 20° or about 160°
b) About 24° or about 156°
c) About 157°
d) About 139°
4. a) $l \doteq 2.57$ m, $k \doteq 0.71$ m; $\angle S = 54^\circ$
b) $\angle F \doteq 82^\circ$, $\angle G \doteq 49^\circ$, $\angle E = 49^\circ$
5. About 330 km
6. About 464.3 cm²
7. $SA \doteq 39$ sq. ft.
8. About 20 ft.
9. a) Cube with edge length 7 m
b) 343 m³
10. The cylinder has radius about 3.55 in. and height about 7.1 in.
11. a) One-variable data
b) Two-variable data
12. a)



- c) The cost is about \$26.
No, the price is not reasonable.
The cost would never reach zero after 10 weeks – it is not realistic.
- d) No, the line of best fit does not represent the data.
The data curve, but the line does not.
The correlation is non-linear, except for the middle range values (from weeks 4 to 7).

13. Part i
14. a) Zurich, Oslo, Dublin
b) Copenhagen, Toronto, Tokyo, Rome, Hong Kong, New Delhi
15. a) The population increases slowly at first, then rapidly, then slowly again before leveling off.
b) The population increases by about 16 fruit flies per day.
c) The rate of change in the fruit fly population is about 0 flies per day.
No calculation was required.
The graph is almost horizontal.
16. a) $A = 100(1.06)^n$ Exponential
b) $A = 100(1 + t)^2$ Quadratic
c) $A = P(1.08)^1$ Linear
17. a) About 0.0972 billion/year
The world's population is increasing by about 97 million people each year.
b) The scatter plot looks nearly linear.
A linear model should fit the data well.
c) $y = 0.098x + 4.925$
d) The population in 2007 (year 21) is about 6.988 billion.
18. About 35 buckets
19. a) $n = \frac{S}{180} + 2$



- b) 6 sides
20. a) $\frac{1}{9}$
b) $\frac{16}{81}$
c) 64
d) $\frac{25}{81}$
e) 12
f) 16

21. a) $\frac{1}{256}$
 b) 256
22. a) $x = 3$
 b) $x = 3$
 c) $x \doteq 2.322$
 d) $x = -\frac{1}{6}$
 e) $x = 16$
 f) $x \doteq 46.27$

To check if the solutions are correct, substitute the value of x into the left side of the equation. If the answer is correct, the value of the left should equate the right.

23. About 8%
24. a) In 10 years, the wolf population will be 98 wolves.
 b) The doubling time for the wolf population is about 35 years.
25. The amount of these deposits after 5 years is \$16 574.74.
26. a) $PV = \$143\,820.39$
 b) Yes, the value would double.
 PV (\$2000 monthly payments) = \$287 640.78
28. a) Regular quarterly payment: \$703.61
 b) No, it will take about 2 years to repay the loan.
29. a) Monthly payment: \$1279.61
 Total interest paid: \$183 885.31
 b) Interest saved: \$42 035.67
 c) It would take 21 years to repay the mortgage, and they would have saved \$34 035.35.

30.

Principal	\$200 000.00
Annual interest rate	6.00%
Equivalent monthly rate	0.49%
Amortization period in years	25
Number of payments	300
Monthly payments	\$1279.61

Payment number	Payment	Interest paid	Principle paid	Outstanding balance
0				\$200 000.00
1	\$1279.61	\$987.72	\$291.89	\$199 708.11
2	\$1279.61	\$986.28	\$293.33	\$199 414.78
3	\$1279.61	\$984.83	\$294.78	\$199 120.00
4	\$1279.61	\$983.38	\$296.23	\$198 823.77
5	\$1279.61	\$981.92	\$297.69	\$198 526.08
6	\$1279.61	\$980.45	\$299.16	\$198 226.92

- a) Interest: \$5904.58
 Principal: \$1773.08
- b) \$198 526.08

31.

Description	Total costs (\$)
Rent	9900.00
Content insurance	240.00
Cable/Internet/phone	1488.00
Utilities	1320.00

Total housing costs for one year: \$12 948

32. Yes
33. a) Personal expenses (monthly): \$100.00
 Laundry (monthly): \$22.00
 Entertainment (monthly): \$650.00
 Total expenses: \$772.00
 b) Jeremy will save \$728 each month.
 c) He will have saved \$8736 after 1 year.
 He will have \$5436 to cover his housing and living expenses (\$453/month).
 He will likely have to get a part-time job.
 It is unlikely he will be able to live on \$450/month.
34. Annual net income: \$2750/month
 Expenses: \$1400
 Housing expenses: \$1350
 Option 1 cost: \$1119 monthly (\$231 remaining)
 Option 2 is recommended.
 Maral's annual income is not enough for her to comfortably afford Option 1.