ANSWERS

Chapter 1 Measurement Systems and Similar Triangles

Get Set

1. a) $\frac{1}{12}, \frac{1}{8}, \frac{1}{4}, \frac{1}{2}$ **b)** $1\frac{1}{2}, 1\frac{3}{4}, \frac{17}{8}, 2\frac{1}{4}, 2\frac{3}{8}$
c) $\frac{1}{6}, \frac{1}{5}, \frac{1}{3}, \frac{1}{2}$

2. a) $\frac{17}{12}$ **b)** $\frac{1}{4}$ **c)** 81 **d)** $4\frac{1}{4}$

3. a) 1:2 **b)** 3:1 **c)** 6:5 **d)** 2:11

4. a) $m = \frac{3}{2}$ **b)** $y = 1$ **c)** $t = 33$ **d)** $x = 21$

5. a) $a = 125°, b = 55°$ **b)** $a = 95°, b = 85°, c = 95°$
c) $a = 75°$

1.1: Imperial Measure

Warm-Up

1. a) length **b)** weight
c) length **d)** volume

2. a) 24 in. **b)** 60 in.

3. 9 ft^2

4. a) 15 ft **b)** 5 ft **c)** 2 ft

5. Answers may vary.

6. a) 6 **b)** 3

7. a) inches **b)** fluid ounces **c)** pounds

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

Practise

1. 16

2. No, a 1-gal jug can only hold 4 qt.

3. a) 36 in. **b)** 31 in. **c)** 102 in.

4. a) 5′11″ **b)** 5′6″ **c)** 18′

5. a) 5.5 lb **b)** 4200 lb **c)** 12 lb

6. a) 39 600 sq ft **b)** $237 600 **c)** $99 000

7. 48 quarts

8. 4 miles

9. 67 in.

10. 6 cups

11. a) 72 sq ft **b)** $360.00

1.2: Conversions Between Metric and Imperial Systems

Warm-Up

1. Length: millimetre, centimetre, metre, kilometre
Volume: millilitres, litres
Mass: milligrams, grams, kilograms

2. a) 4.2 cm **b)** 12 000 g **c)** 180 cm **d)** 2.4 km **e)** 0.98 g

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

4. a) 10 pt **b)** 48 in. **c)** 1.5 lbs **d)** 6 ft **e)** 12 qt

5. a) centimetres **b)** grams **c)** millilitres

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

7. a) 420 000 **b)** 5.6 **c)** 2.458 **d)** 6.5 **e)** 4.25

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

Practise

1. a) 74°F **b)** 136°F **c)** −18°F

2. a) 29°C **b)** −25°C **c)** 96°C

3. a) 4 tbsp **b)** 5.5 lb **c)** 30 cm **d)** 165 mL

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

5. 8 cups

6. a) 212°F **b)** 32°F

7. a) 1100 miles **b)** 1760 km
c) 3520 km **d)** 221.76 L

1.3 Similar Triangles

Warm-Up

1. $\angle d, \angle e, \angle h$

2. $\angle a$ and $\angle c$, $\angle b$ and $\angle d$

3. AB = DE = 6 cm
AC = DF = 7.5 cm
BC = EF = 4.5 cm

4. ∠TSU and ∠RSQ, ∠RST and ∠QSU

5. Answers may vary. Triangles will have equal sides and corresponding angles.

6. $\angle S = 20°, \angle X = 105°$

7. a) AB = 4 **b)** LM = 6

8. ∠MRS = ∠MUV = ∠MKL;
∠MSR = ∠MVU = ∠MLK

Practise

1. $x = 77°, y = 71°$

2. a) JK, KL, JL

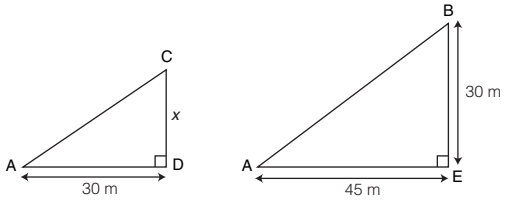
b) Since △RST ~ △JKL, then the lengths of the corresponding sides are proportional.

c) $\frac{RS}{JK} = \frac{ST}{KL}$
$\frac{RS}{16} = \frac{27}{18}$
$RS = \frac{16 \times 27}{18}$
$RS \doteq 24$

3. a) Answers may vary. Yes, the triangles are similar because they have equal corresponding angles.

b) $\frac{CE}{AB} = \frac{EF}{AF}$
$\frac{CE}{3.1} = \frac{2.9}{3.8}$
$CE = \frac{3.1 \times 2.9}{3.8}$
$CE \doteq 2.4$ cm

4. a)



b) Answers may vary. Yes triangles ABE and ACD are similar because they have equal corresponding angles.

c) $x = 20$ m

1.4 Solve Problems Using Similar Triangles

Warm-Up

1. DF and GF, DE and GH, EF and HF

2. **a)** all three pairs of sides **b)** all three pairs of angles

3. $AB = \frac{15 \times 5}{3}$

$AB = 25$

4. Answers may vary.

5. The side lengths of Triangle A are five times as long as the side lengths of Triangle B.

6. $\angle WXV$ and $\angle YXZ$, $\angle VWX$ and $\angle XYZ$, $\angle XVW$ and $\angle XZY$

7. **a)** $b = \frac{3}{2}$ **b)** $m = 12$

8. MN = 9 cm

Practise

1. **a)** Yes, $\triangle ABC$ and $\triangle DEF$ are similar because they have equal corresponding angles.

b) Since $\triangle ABC \sim \triangle DEF$, corresponding angles are equal.

Therefore, $\angle C = \angle F = 42°$

and $\angle D = \angle A = 34°$

$\frac{BC}{EF} = \frac{AB}{DE}$ $\frac{DF}{AC} = \frac{DE}{AB}$

$\frac{BC}{2.1} = \frac{4.0}{2.6}$ $\frac{DF}{5.1} = \frac{2.6}{4.0}$

$BC = \frac{2.1 \times 4.0}{2.6}$ $DF = \frac{5.1 \times 2.6}{4.0}$

$BC \doteq 3.2$ cm $DF \doteq 3.3$ cm

2. **a)** Triangle ADE and triangle ACB are similar because they have equal corresponding angles.

b) $\frac{CB}{DE} = \frac{AB}{AE}$

$\frac{CB}{40} = \frac{102}{32}$

$CB = \frac{40 \times 102}{32}$

$CB \doteq 127.5$ m

3. **a)** Yes, triangle ABC and triangle DEF are similar because they have equal corresponding angles.

b) DF = 294

c) $\frac{EF}{BC} = \frac{DF}{AC}$

$\frac{EF}{2} = \frac{294}{4}$

$EF = \frac{2 \times 294}{4}$

EF = 147 m

Chapter 1 Review

1. Answers may vary.

2. **a)** 17.6 lbs **b)** 480 fl oz **c)** 57.2°C **d)** 13.3 L **e)** 11.0 m **f)** 1545 ft

3. **a)** 63.6 kg **b)** 2035 mg

4. **a)** \$2.99 U.S./gal

b) Port Huron offers a better price for gas.

5. $x = 3.8$ cm, $y = 4.4$ cm

6. **a)** 450 m

b) $\triangle DRC$ and $\triangle ERB$ are similar because the corresponding angles are equal.

c) 40 m

7. 12.6 m

Chapter 2 Right Triangle Trigonometry

Get Set

Solving Proportions

1. **a)** $x = 7$ **b)** $y = 33$ **c)** $z = 36$ **d)** $x = 3$

2. **a)** $x = 3.143$ **b)** $y = 67.5$ **c)** $x = 7.125$ **d)** $t = 32.5$

3. **a)** 14° **b)** 11° **c)** 32 **d)** 83°

4. **a)** 22.4 **b)** 163.7 **c)** 2.4 **d)** 0.8

5. **a)** 0.148 3 **b)** 27.005 2 **c)** 45.760 3 **d)** 3.421 8 **e)** 15.763 2 **f)** 109.524 7

2.1 The Pythagorean Theorem

Warm-Up

1. **a)** 11.1 **b)** 8.2 **c)** 3.5 **d)** 17.3

2. isosceles

3. **a)** 15 **b)** 13

4. Answers may vary.

5. obtuse isosceles triangle

6. right, hypotenuse, legs

7. **a)** 3 **b)** 6

8. scalene right triangle

Practise: The Pythagorean Theorem

1. **a)** 5 **b)** 18.6 cm **c)** 26.2 **d)** 20.2 in.

2. **a)** 17.3 m **b)** 11.3 **c)** 17.2 ft **d)** 8.2

3. Simone is incorrect since the Pythagorean theorem can only be applied to right triangles and the triangle on the right is not.

4. Step 1: Find the difference between the square of the hypotenuse and square of the given leg.

Step 2: x is equal to the square root of answer found in Step 1.

5. 39.7 cm

6. **a)** **b)** 14.5 ft

2.2 Explore Ratio and Proportion in Right Triangles

Warm-Up

1. **a)** 0.4 **b)** 2.4 **c)** 0.875 **d)** 1.25

2. **a)** $\frac{4}{9}$ **b)** $\frac{1}{4}$ **c)** $\frac{1}{8}$ **d)** $\frac{2}{5}$

3. Answers may vary.

4. **a)** 3:2 **b)** 3:4 **c)** 1:4 **d)** 3:7

5. **a)** 11 **b)** 8 **c)** 10 **d)** 20

6. Answers may vary.

7. $x = 48°$

8. $x = 45°$; $y = 45°$

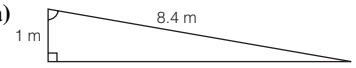
Practise: Explore Ratio and Proportion in Right Triangles

1. **a)** DE = adjacent side

b) DE would become the opposite side and EF would become the adjacent side.

2. **a)** 0.71 **b)** 0.54 **c)** 0.5

3. **a)**



b) 8.34 **c)** 0.120 **d)** the slope

4. **a)** 12 cm **b)** 0.92, 0.38

2.3 The Sine and Cosine Ratios

Warm-Up

1. adjacent = QR, hypotenuse = QS

2. 2:4.5; 0.44

3. An adjacent side is a leg of a right triangle adjacent to a given angle.

4. 7:7.6; 0.92

5. Answers may vary.

6. Answers may vary.

7. 7:5, 1.4

8. Adjacent = ZX, hypotenuse = ZY

Practise: The Sine and Cosine Ratios

1. **a)** 0.2588 **b)** 0.2079 **c)** 0.7986
d) 0.9903 **e)** 0.9135 **f)** 0.1564

2. **a)** 9° **b)** 70° **c)** 77°
d) 54° **e)** 27° **f)** 46°

3. **a)** 46 cm **b)** 27 cm **c)** 17 cm **d)** 181 cm

4. 21.3 m

5. **a)** 27.9 m b) 8.7 m

2.4 The Tangent Ratio

Warm-Up

1. opposite, hypotenuse

2. $\sin 25° = \frac{y}{12}$

$12 \sin 25° = y$

$y = 5.1$ cm

3. $\sin 42° = \frac{m}{47}$

4. adjacent; hypotenuse

5. sine

6. $\cos 30° = \frac{j}{19}$

$19 \cos 30° = j$

$j = 16.5$ cm

7. $r = 18.1$ cm

8. $\cos 32° = \frac{p}{51}$

Practise: The Tangent Ratio

1. **a)** 0.4122 **b)** 3.7321 **c)** 0.2126 **d)** 1.0000

2. **a)** 33° **b)** 70° **c)** 48° **d)** 19°

3. 20 cm, 21 cm, 20, 21, 44°

4. **a)** $\frac{8}{5}$ **b)** $\frac{17}{21}$ **c)** $\frac{6}{31}$

5. Jeremy forgot to check if triangle ABC is a right triangle. Since triangle ABC is not a right triangle, Jeremy cannot use the Pythagorean theorem.

6. **a)** 14° **b)** 14°

c) The measure of angle Z is the same for parts (a) and (b). This is because both ladders are placed with a 4:1 ratio.

2.5 Solve Problems Using Right Triangles

Warm-Up

1. $\tan 32° = \frac{u}{25}$

2. $e = 6.9$ cm

3. 47 cm

4. No, the tangent ratio does not involve the hypotenuse.

5. 15 m

6. Answers may vary.

7. $\tan 37° = \frac{12}{d}$

$d \tan 37° = 12$

$d = \frac{12}{\tan 37°}$

$d = 15.9$ cm

8. both

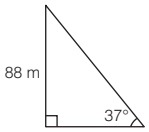
Practise: Solve Problems Using Right Triangles

1. **a)** 19.0 ft **b)** angle of depression

2.

Distance From Object (m)	Angle of Elevation (°)	Height From Transit to Top of Object (m)	Height of Object (m)
8.5	48.2	9.5	10.7
9.3	44.2	9.0	10.2
15.8	51.3	19.7	20.9
7.3	49.6	8.6	9.8

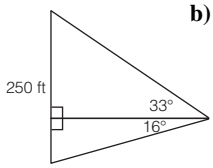
3. **a)**



b) 117 m

4. **a)** 172.8 ft **b)** 40°

5. **a)**



b) 267 ft

Chapter 2 Review

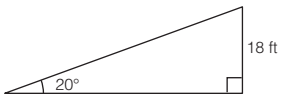
1. 17.0 cm

2. KM = hypotenuse, KL = adjacent side, LM = opposite side

a) $\frac{LM}{KL}$ **b)** $\frac{KL}{KM}$ **c)** $\frac{LM}{KM}$

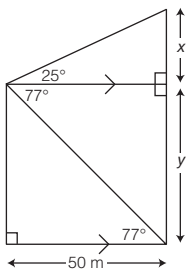
3. 38.7°

4. **a)**



b) 52.6 ft

5. **a)**



b) 239.9 m

Chapter 3 Linear Relations

Get Set

1. a) 4 **b)** 15 **c)** 11

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

3. a) -13 **b)** -5 **c)** $\frac{1}{16}$

4. $A(2, 3)$, $B(-6, 5)$, $C(-5, -2)$, $D(-6, 0)$, $E(5, -5)$

5. a) 3 **b)** 3 **c)** -4

6. a) -4 **b)** 11 **c)** -59

3.1 Slope as a Rate of Change

Warm-Up

1. a) $\frac{2}{3}$ **b)** $\frac{2}{5}$ **c)** $\frac{4}{7}$ **d)** $\frac{1}{2}$

2. a) 8 **b)** -13 **c)** -1 **d)** 2

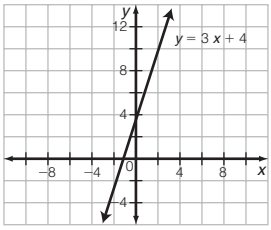
3.

x	y
0	5
1	7
2	9
3	11
4	13

4. \$63

5.

x	y
−2	−2
−1	1
0	4
1	7
2	10



6. Answers may vary.

Practise: Slope as a Rate of Change

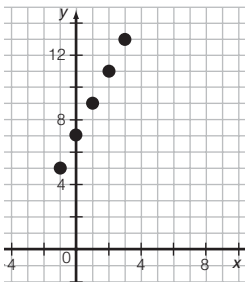
1. a) $y = -2x + 2$

x	y	Rate of Change
−2	6	
−1	4	−2
0	2	−2
1	0	−2
2	−2	−2

b) $y = 5x - 1$

x	y	Rate of Change
−2	−11	
−1	−6	5
0	−1	5
1	4	5
2	9	5

2. a)



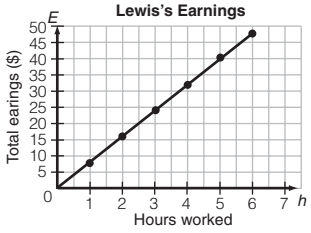
b) The rate of change is 2.

3. a)

Hours Worked	Total Earnings (\$)	Rate of Change
0	0	
1	8.25	8.25
2	16.50	8.25
3	24.75	8.25
4	33.00	8.25
5	41.25	8.25
6	49.50	8.25

b) \$8.25/h

c)



d) Answers may vary.

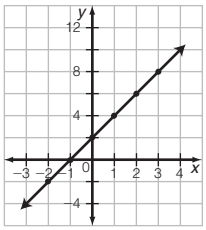
e) slope = 8.25

f) The rate of change is \$8.25/h. This represents the money Lewis earns per hour.

4. a)

x	y
−2	−2
−1	0
0	2
1	4
2	6
3	8

b)



c) Answers may vary.

d) slope = 2

5. a)

Hours Worked	Number of Dolls Packed	Rate of Change
0	0	
1	15	15
2	30	15
3	45	15
4	60	15
5	75	15
6	90	15

b) 15 dolls per hour

c) The rate of change represents the speed that Amy packs dolls.

3.2 Investigate Slope and *y*-Intercept Using Technology

Warm-Up

1. slope

2. a) -13 **b)** -8 **c)** 11 **d)** 3

3. a) $\frac{3}{-9} = -\frac{1}{3}$ **b)** $\frac{-4}{-12} = \frac{1}{3}$

4. \$6.50/h

5. $\frac{18 - 12}{4 - 1} = 2$

6. Change in price from changing in toppings.

Practise: Investigate Slope and *y*-Intercept Using Technology

1. a) slope: 2, *y*-intercept: 0

b) slope: 4, *y*-intercept: -5

c) slope: -1, *y*-intercept: 6

d) slope: $-\frac{1}{2}$, *y*-intercept: $\frac{5}{2}$

2. a) $y = \frac{7}{2}x + 9$ **b)** $y = -3x + 3$

c) $y = -3$ **d)** $y = 7x$

3. a) slope: –3, *y*-intercept: 8, equation: $y = -3x + 8$

b) slope: 2, *y*-intercept: -3, equation: $y = 2x - 3$

c) slope: 1, *y*-intercept: 2, equation: $y = x + 2$

4. a) Answers may vary.

b) Change the window settings.

c) slope **d)** *y*-intercept **e)** \$10 000

3.3 Properties of Slopes of Lines

Warm-Up

1. $p = \frac{\text{rise}}{\text{run}} = \frac{30}{40} = \frac{3}{4}$

2. $m = \frac{2}{5}$

3. Answers may vary.

4. a) -3 **b)** $\frac{4}{9}$ **c)** $-\frac{3}{2}$ **d)** 3

5. $f = \frac{\text{rise}}{\text{run}} = \frac{30}{70} = \frac{3}{7}$

6. $m = \frac{\text{rise}}{\text{run}} = \frac{8}{2} = 4$

Practise: Properties of Slopes of Lines

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

v) -1 **vi)** 0 **vii)** $\frac{1}{3}$

b)

Positive Slope	Negative Slope	Zero Slope
$y = 3x + 4$	$y = -\frac{1}{2}x + 5$	$y = 4$
$y = x - 2$	$y = -x - 5$	$y = -1$
$y = \frac{1}{3}x + 5$		

2. a) Answers may vary. The equation must have a slope of 4.

b) Answers may vary. The equation must have a slope less than -1.

c) Answers may vary. The equation must have a slope of less than 3.

d) Answers may vary. The equation must have a slope of $-\frac{1}{2}$.

3. a) $y = -2x - 4$ **b)** $y = x + 4$

c) $y = -\frac{4}{3}x - 6$ **d)** $y = -\frac{3}{2}x$

4. $s = \frac{\text{rise}}{\text{run}} = \frac{3}{7}$; The slope of the ramp is $\frac{3}{7}$.

5. $w = \frac{\text{rise}}{\text{run}} = \frac{481}{377} = \frac{37}{29}$; The slope of the ramp is $\frac{37}{29}$.

3.4 Determine the Equation of a Line

Warm-Up

1. $m = \frac{\text{rise}}{\text{run}} = -\frac{5}{4}$;
y-intercept: 8

2. $m = \frac{\text{rise}}{\text{run}} = \frac{4}{2} = 2$;
y-intercept: -1

3.

x	*y*	Rate of Change
0	5	
1	2	3
2	-1	3
3	-4	3
4	-7	3

4.

x	*y*	Rate of Change
0	-3	
1	$-\frac{5}{2}$	$\frac{1}{2}$
2	-2	$\frac{1}{2}$
3	$-\frac{3}{2}$	$\frac{1}{2}$
4	-1	$\frac{1}{2}$

5. The *y*-intercept for this relation is 4.

6. The line in question 3 has a negative slope.

Practise: Determine the Equation of a Line

1. a) slope: $\frac{1}{2}$, y-intercept: -9, equation: $y = \frac{1}{2}x - 9$

b) slope: 3, y-intercept: 5, equation: $y = 3x + 5$

c) slope: 0, y-intercept: 5, equation: $y = 5$

2. a) $y = -\frac{1}{3}x + 2$

b) $y = 4x - 3$

c) $y = 3x + 8$

d) $y = -3$

3. a) $y = -2x$

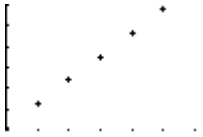
b) $y = \frac{1}{3}x - 4$

c) $y = -4x + 24$

d) $y = \frac{1}{2}x + 7$

4. $y = -3x + 15$

5. a)



b) $y = \frac{113}{50}x + 412$

c) 412. This represents the mass of the empty beaker.

d) $\frac{113}{50}$

3.5 Graph Linear Relations by Hand

Warm-Up

1. a) $y = 7$

b) $y = 2$

2. The steepest slope is part a) $y = -2x + 1$.

3. No;
$y = \frac{2}{3}(3) - 1 = 1 \neq -1$

4. slope: 2
y-intercept: 4

5. slope: 3
y-intercept: -1

6. Slope is the coefficient of the x term. The y-intercept can be determined by substituting in $x = 0$ to get the y-value.

Practise: Graph Linear Relations by Hand

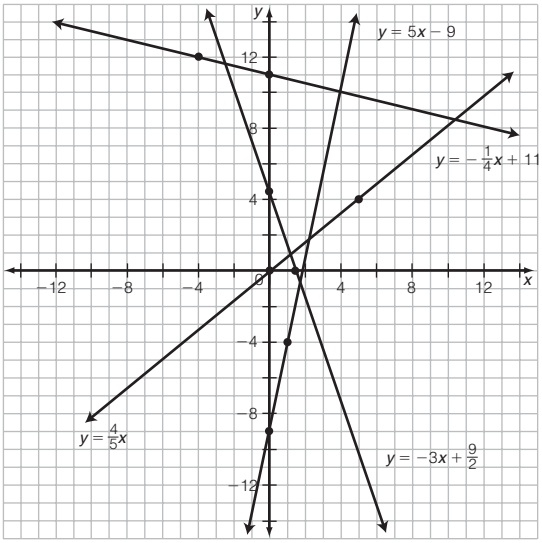
1. a) slope: $-\frac{1}{4}$; y-intercept: 11

b) slope: 5; y-intercept: -9

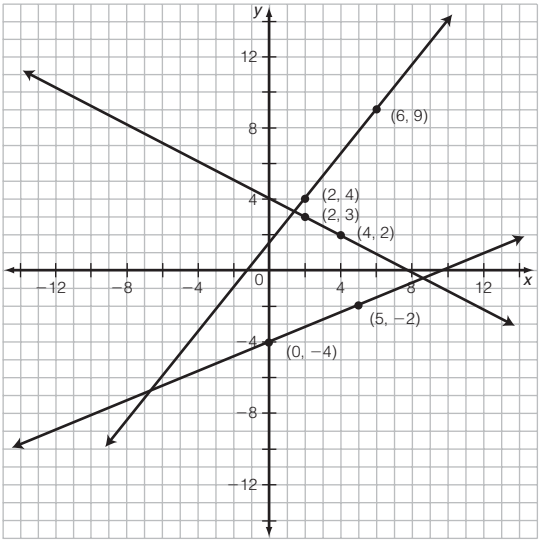
c) slope: $\frac{4}{5}$; y-intercept: 0

d) slope: -3; y-intercept: $\frac{9}{2}$

2.



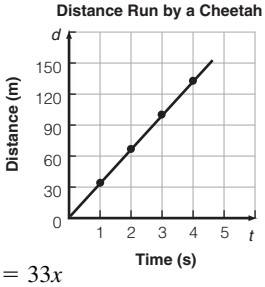
3.



4. a)

Time (s)	0	1	2	3	4
Distance (m)	0	33	66	99	132

b)

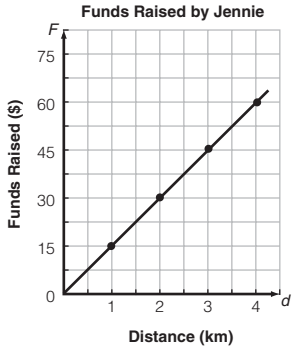


c) $y = 33x$

5. a)

Distance (km)	0	1	2	3	4
Funds Raised ($)	0	15	30	45	60

b)



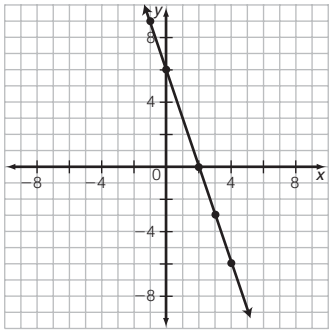
c) $y = 15x$

Chapter 3 Review

1. a)

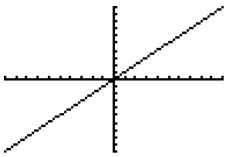
x	y	Rate of Change
−1	9	
0	6	−3
1	3	−3
2	0	−3
3	−3	−3
4	−6	−3

b)

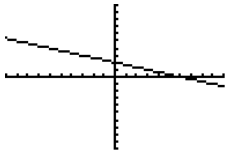


c) −3

2. a)



b)



3. a) Answers may vary. The equation must have a slope of 6.

b) Answers may vary. The equation must have a slope of −2.

c) Answers may vary. The equation must have a slope of $\frac{1}{2}$.

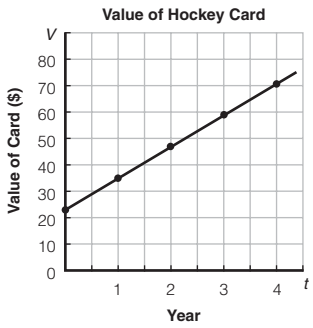
4. a) $y = 3x - 1$ **b)** $y = -2x + 3$
c) $y = 4$ **d)** $y = 2.5x - 1$

5. a) $y = -6x + 13$ **b)** $y = \frac{1}{2}x + 8$
c) $y = -\frac{1}{3}x$ **d)** $y = \frac{5}{8}x - 4$

6. a)

Year	0	1	2	3	4
Value of Card ($)	23	35	47	59	71

b)



c) $y = 12t + 23$ **d)** $71.00

Chapter 4 Linear Equations

Get Set

1. a) 60 **b)** 12 **c)** 16 **d)** 110
2. a) $\frac{7}{12}$ **b)** $\frac{1}{20}$ **c)** $\frac{1}{5}$ **d)** $\frac{8}{15}$
3. a) 2 **b)** 8 **c)** 2 **d)** 10
4. a) $4x$ **b)** $7x - 8y$ **c)** $3x - 5y + 3$ **d)** $4k$
5. a) $8y - 12$ **b)** $-2x + 14y$ **c)** $-4x + 32$ **d)** $2y + 2$
6. a) 12 **b)** 44 **c)** 36 **d)** 8

4.1 Solve One- and Two-Step Linear Equations

Warm-Up

1. $\frac{22}{15}$ or $1\frac{7}{15}$
2. x
3. 4
4. First, subtract the value of the y-coordinate of the first point from the value of the y-coordinate of the second point. Second, subtract the value of the x-coordinate of the first point from the value of the x-coordinate of the second point. Then, divide the difference between the y-coordinates by the difference between the x-coordinates. The quotient is the slope.
5. −2
6. $x = 8$
7. $x = 16$
8. $x = 5$

Practise: Solve One- and Two-Step Linear Equations

1. **a)** $x = -7$ **b)** $x = 2$ **c)** $x = 11$ **d)** $x = 12$

2. **a)** $x = 5$ **b)** $t = 4$ **c)** $y = 8$ **d)** $k = 8$

3. Answers will vary.

4. **a)** $k = 9$ **b)** $t = 15$ **c)** $y = 18$ **d)** $x = -10$

5. Answers will vary.

6. **a)** $x = 4$ **b)** $x = 2$ **c)** $x = 8$ **d)** $x = 25$

e) $x = -\frac{7}{3}$ or $-2\frac{1}{3}$

f) $x = 22$

7. Substitute $x = 3$; LS $= 4(3) - 7 = 5 =$ RS.

8. **a)** 72 cm^2 **b)** 48 in.

9. **a)** $C = 125n$ **b)** \$5 250 **c)** No

d) \$840 more is needed.

4.2 Solve Multi-Step Linear Equations

Warm-Up

1. $\frac{3}{10}$

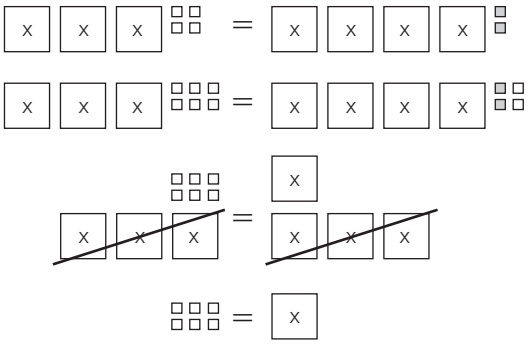
2. $m = 2$

3. $\frac{2}{3}$

4. Answers may vary. A "variable term" is one that can change where a "constant term" is one that cannot. For example, in an equation modeling the cost of riding a taxi, the flat rate would be the constant term where the duration of the ride would be the variable term.

5. 1

6.



7. $x = 3$

8. $x = -1$

Practise: Solve Multi-Step Linear Equations

1. **a)** Multiply by 5, add 2, divide by 6.

b) Divide by $\frac{2}{5}$, subtract 1.

c) Divide by 4, add 1, divide by 2.

d) Multiply by 3, subtract 1, divide by 22.

2. **a)** $x = 2$ **b)** $k = 4$

c) $a = \frac{5}{2}$ or $2\frac{1}{2}$ **d)** $t = 2$

3. **a)** $d = 8$ **b)** $x = -7$

c) $t = -3$ **d)** $p = 1$

4. Both are correct. The two equations are equivalent.

5. **a)** $k = 3$ **b)** $x = 13$

c) $y = -60$ **d)** $t = 1$

6. **a)** $x = 7$ **b)** $k = 5$

7. **a)** $\angle A = 30°$, $\angle B = 60°$, $\angle C = 90°$

b) $\triangle ABC$ is a scalene triangle.

8. **a)** Edge Sky Diving Services: $y = 130x + 200$

JerrMo: $y = 145x$

b) JerrMo

9. **a)** 8 weeks **b)** \$150 **c)** 3 weeks

4.3 Model With Formulas

Warm-Up

1. $\frac{11}{18}$

2. $x = 14$

3. $x = 3$

4. First, add 1 to 20. Then divide the sum by 3. The quotient is the solution.

5. $l = 14$

6. 59 km/h

7. 6 years

8. $h = \frac{SA - 2l^2}{4l}$

Practise: Model with Formulas

1. **a)** $t = \frac{I}{Pr}$ **b)** $V = \frac{nRT}{P}$

c) $a = \frac{2(d - vt)}{t^2}$ **d)** $m = \frac{(y - b)}{x}$

2. **a)** $b = \frac{2A - ah}{h}$ **b)** $b = 1$ cm

c) $28 = \frac{1}{2}(6 + b)8$

d) Answers may vary. The second method because he would not have to manipulate as many variables.

e) Answers may vary. The first method because she would only have to manipulate the formula once.

3. **a)** $v = \frac{d}{t}$ **b)** $t = \frac{d}{v}$

c)

distance (m)	time (s)	velocity (m/s)
4	3	**$\frac{4}{3}$**
6	**3**	2
75	5	15
28	**7**	4
121	11	11
85	5	**17**

4. **a)** $C = 11f + 18m + 14p + 200$

b) \$703

5. **a)** **i)** 60.8 km **ii)** 360 km **iii)** 1600 km

b) $M = \frac{K}{1.6}$

c) **i)** 15.625 mi **ii)** 283.125 mi **iii)** 62.5 mi

d) 88 km/h

6. **a)** 75 km/h

b) It would take about 7.33 h.

7. 6.25%

4.4 Convert Linear Equations From Standard Form

Warm-Up

1. 24

2. $x = 20$

3. $x = 5$

4. **a)** slope **b)** standard form

5. $y = -4x + 7$

6. $y = 3x + 4$

7. slope: $\frac{3}{4}$, y-intercept: -2

8. slope: $\frac{1}{3}$, y-intercept: -4

Practise: Convert Linear Equations From Standard Form

1. **a)** Subtract y, multiply by -1.
b) Add $4y$, divide by 4.
c) Subtract $5y$, divide by -5.
d) Add $2y$, divide by 2.

2. **a)** $y = -3x + 5$; slope: -3, y-intercept: 5
b) $y = x$; slope: 1, y-intercept: 0
c) $y = 4$; slope: 0, y-intercept: 4
d) $y = \frac{2}{5}x + 3$; slope: $\frac{2}{5}$, y-intercept: 3

4. $C = -37$

5. $A = 2$

6. $m = 4$

7. **a)** $C = 42n + 2000$ **b)** \$12 500

8. **a)** $C = 44n + 2500$ **b)** \$13 500
c) Chisholm Hall costs \$1000 more.

Chapter 4 Review

2. **a)** $x = 19$ **b)** $t = 7$ **c)** $h = 4$ **d)** $b = 6$

3. **a)** $x = 5$ **b)** $t = 12$ **c)** $k = -1$ **d)** $x = 20$

4. **a)** $t = 3$ **b)** $x = 7$ **c)** $x = 14$ **d)** $y = 10$
e) $x = -\frac{17}{14}$ or $-1\frac{3}{14}$ **f)** $k = 0$

5. **a)** $P = \frac{I}{rt}$ **b)** $r = \frac{I}{Pt}$ **c)** $t = \frac{I}{Pr}$

6.

interest (\$)	principal (\$)	rate (%)	time (years)
500	2000	**6.25%**	4
66	600	5.5%	2
120	1200	4%	**2.5**
450	**1000**	5%	9

7. **a)** $y = -\frac{1}{4}x + 4$; slope: $-\frac{1}{4}$, y-intercept: 4
b) $y = \frac{3}{2}x + 5$; slope: $\frac{3}{2}$, y-intercept: 5
c) $y = -\frac{8}{5}x + 3$; slope: $-\frac{8}{5}$, y-intercept: 3
d) $y = -3x$: slope: -3, y-intercept: 0

8. **a)** $b = -5$ **b)** $b = -22$ **c)** $b = -31$ **d)** $b = 15$

Chapter 5: Linear Systems

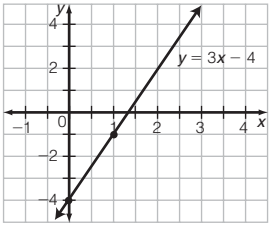
Get Set

1. **a)** $2c + 5$ **b)** $-3x - 9$ **c)** $-y + 10$

2. **a)** $x = 3y + 7$ **b)** $x = 3y + 4$
c) $x = -\frac{4}{3}y + 6$ **d)** $x = 2y - \frac{5}{2}$

3. **a)** $x = 14$ **b)** $x = 1$ **c)** $x = 3$

4. slope: 3, y-intercept: -4,



5. **a)** Answers may vary. Let l be Leah's age and j be Joan's age. $l + j = 29$
b) Let h be the number of hours the equipment was rented and C be the total cost including the flat fee. $C = 10h + 25$

5.1 Solve Linear Systems by Graphing

Warm-Up

1. **a)** $\frac{5}{2}$ **b)** -2 **c)** $-\frac{10}{2} + \frac{6}{2}$

2. **a)** $y = -2x + 7$ **b)** $y = -2x - 4$

3. **a)** Answers may vary, however, the graph should be a straight line.
b) It would represent the y-intercept.

4. **a)** $y = 5$ **b)** $y = -6$ **c)** $y = 3$

5. It will have travelled 132 m.

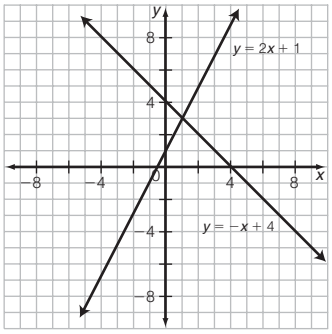
6. $y = 2x + 5$

Practise: Solve Linear Systems by Graphing

1. Answers may vary.

2. **a)** (1) $y = 2x + 1$. Slope: 2, y-intercept: 1
(2) $y = -x + 4$. Slope: -1, y-intercept: 4

b)



c) (1, 3)

d) Equation ①

LS $= -2x$ RS $= -y + 1$

$= -2(1)$ $= -3 + 1$

$= -2$ $= -2$

Equation ②

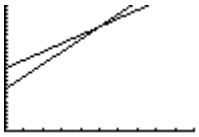
LS $= x$ RS $= -y + 4$

$= 1$ $= -3 + 4$

$= 1$

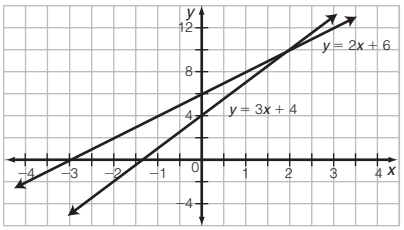
e) (1, 3)

3. a) Answers may vary.



b) (5, 250)

4. a)



b) (2, 10)

c) Equation ①

LS $= y$ RS $= 3x + 4$

$= 10$ $= 3(2) + 4$

$= 10$

Equation ②

LS $= y$ RS $= 2x + 6$

$= 10$ $= 2(2) + 6$

$= 10$

5. a) $y = 25x + 300$

b) $y = 20x + 400$

c) The point of intersection is (20, 800).
This means that if 20 rounds of golf are played, the cost of joining the women's league costs the same for both memberships. The cost is $800.

5.2 Solve Linear Systems by Substitution

Warm-Up

1. a) 0 **b)** -9

2. a) y because isolating y requires fewer steps.

b) x because isolating x requires fewer steps.

3. a) $y = -2x + 4$ **b)** -2 **c)** 4

4. Answers may vary. You can use a grid: mark the y-intercept at -3, rise 1 and run 4 to mark a next point at $(-2, 4)$ and so on, or you can use a graphing calculator.

5. Celia earns about $76.08.

6.

x	y
−2	7
−1	6
0	5
1	4
2	3

Practise: Solve Linear Systems by Substitution

1. The name is used because you are substituting one equation into the other to find a solution.

2. a) ② $2x + 1 = 3x - 13$

b) $2x - 3x = -13 - 1$

$-1x = -14$

$x = 14$

c) $y = 2(14) + 1$

$y = 28 + 1$

$y = 29$

d) LS $= y$ RS $= 3x - 13$

$= 29$ $= 3(14) - 13$

$= 42 - 13$

$= 29$

Yes.

The solution to this linear system is (14, 29).

3. a) $(-\frac{4}{3}, \frac{5}{3})$ **b)** (8, 3)

4. a) First hall: $y = 14x + 1000$

Second hall: $y = 16x + 800$

b) i) $x = 100$ **ii)** $y = 2400$ **iv)** (100, 2400)

c) The solution represents the number of people for which the cost of renting both halls will be the same.

d) Dianne should choose the first hall since it only costs $3100 where the second hall costs $3200.

5.3 Solve Linear Systems by Elimination

Warm-Up

1. a) 12

b) 22

2. a) $19x + 22$

b) $6x + 34$

3. Answers may vary. No, it is not a solution to the linear system, because (0, 2) does not satisfy the first equation.

4. When the *profit* is equal to the *revenue*.

5. a) $9

b) $1.20

6. $x = \frac{3}{5}y + 2$

Practise: Solve Linear Systems by Elimination

1. Answers may vary. It is because addition or subtraction of equations is used to eliminate one variable.

2. a) $4y = 8$

b) $y = 2$

c) $x = 3$

d) LS $= -2x + 3y$ RS $= 0$

$= -2(3) + 3(2)$

$= -6 + 6$

$= 0$

The solution to this system is (3, 2).

3. a) 2; x; subtracted; $8x + 34y = 50$

b) $45y = 45$

c) $y = 1$

d) $x = 2$

e) LS $= -4x + 17y$ RS $= 25$

$= -4(2) + 17(1)$

$= 8 + 17$

$= 25$

The solution to this system is (2, 1).

4. a) Multiply equation ① by two, then add the two equations.

b) Subtract equation ② from equation 1.

5.4 Solve Problems Involving Linear Systems

Warm-Up

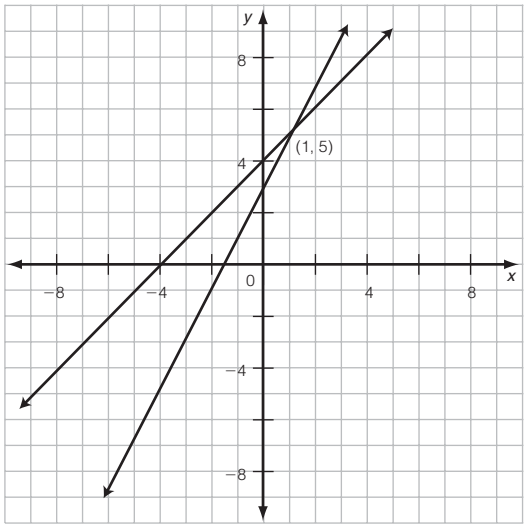
1. a) 21
b) 0.8
2. a) $4y = 14$
b) $5x = 29$
3. Answers may vary. No, since the first difference is not constant.
4. Answers may vary.
5. \$119 000
6. (1, 7)

Practise: Solve Problems Involving Linear Systems

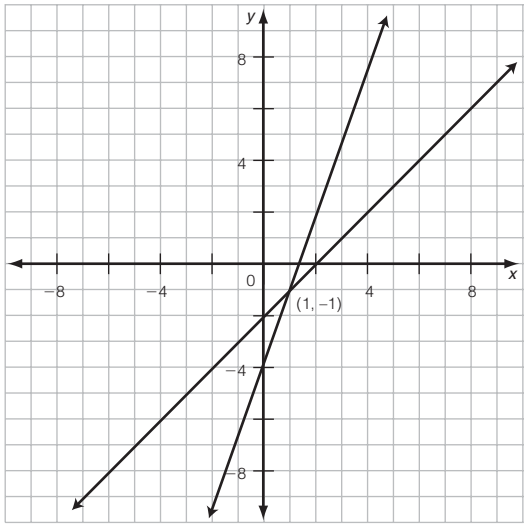
1. (1, −5)
2. a) $5x = 5$
b) $x = 1$
c) $y = -5$
d) LS $= 3x - y$ RS $= 8$
$= 3(1) - (-5)$
$= 3 + 5$
$= 8$
The solution to this linear equation is (1, −5)
3. a) $x + y = 19$
b) $2x + y = 34$
c) $x = 15$; $y = 4$
d) Answers may vary.
4. a) $C_{\text{Tony}} = 5w + 50$; $C_{\text{Mike}} = 10w$
b) (10, 100)
c) Answers may vary.
d) For a 10-week contract, both Mike and Tony charge the same amount, \$100.
5. $6d + 480k = 361.50$ ①; $2d + 300k = 173.00$ ②; (30.25, 0.375)

Chapter 5 Review

1. a) Yes, because it satisfies both equations.
b) No, because it does not satisfy the second equation.
2. a)



b)



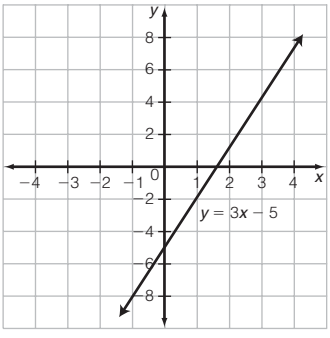
3. a) (13, −1)
b) (5, 40)
c) Answers may vary. When the solution is not an integer, it is difficult to find the exact solution by graphing by hand.
4. a) $y = x + 4$
b) $y = \dfrac{2x - 5}{3}$
c) $y = -3x + 5$
5. a) The total revenue from selling the sweatshirts
b) $C = 10x + 250$
c) $R = 20x$
d) $x = 25$; $C = R = 500$
e) (25, 500); 25 sweatshirts
6. a) Answers may vary. Subtract the second equation from the first equation.
b) Multiply the second equation by 2, then add the resulting equation ③ to equation ①.
7. (−2, −3); substitution, because equation ① already has the variable y isolated.

Chapter 6: Quadratic Relations

Get Set

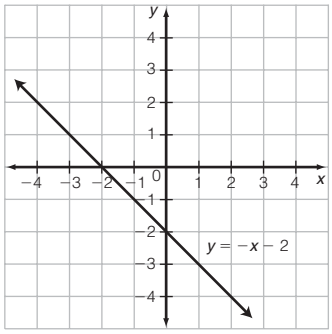
1. a) 20 **b)** 82
2. a)

x	$y = 3x - 5$
−3	−14
−2	−11
−1	−8
0	−5
1	−2
2	1
3	4



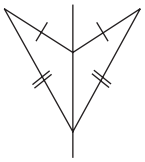
b)

x	$y = -x - 2$
−3	1
−2	0
−1	−1
0	−2
1	−3
2	−4
3	−5

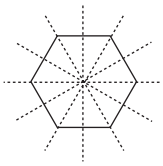


3. a) x-intercept: 4, y-intercept: 4
b) x-intercept: 6, y-intercept: −12

4. a) Number of lines of symmetry: 1



b) Number of lines of symmetry: 6



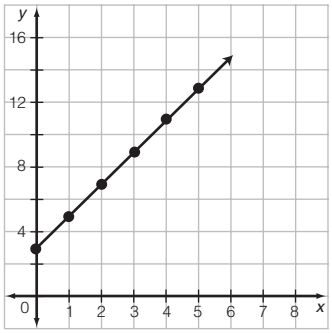
6.1 Explore Non-Linear Relations

Warm-Up

1. A parabola is a quadratic non-linear graph.
2. Linear relation — line of best fit
Non-linear relation — curve of best fit
3. a) 2 **b)** 18
4. Length: 5 cm, Width: 2 cm, Area $= 5 \times 2$
$= 10$ cm^2
5. Perimeter $= 2 \times (5 + 12)$
$= 34$ m
6. a) 48 **b)** 45
7. One type of non-linear relation is a quadratic.
8. A graph of a quadratic relation is called a parabola

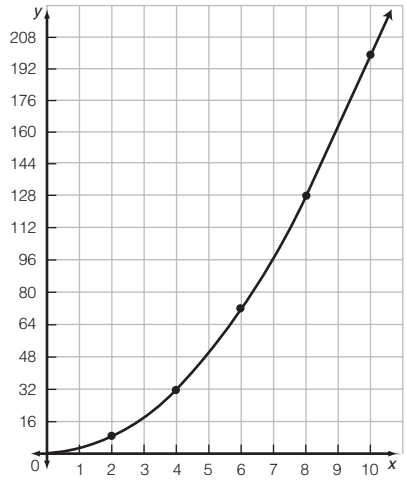
Practise

1. a)



The points lie in a line, so I drew a line of best fit.

b)

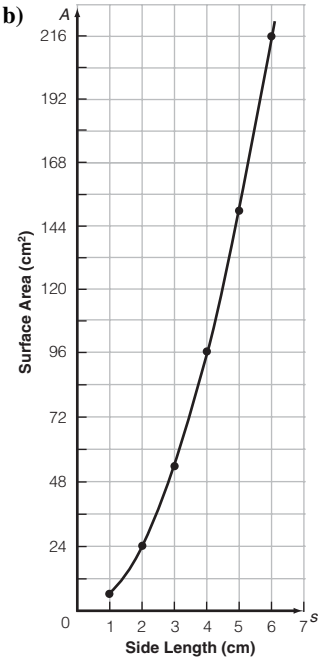


The points do not lie in a line, so I drew a curve of best fit.

2. a)

Side Length (cm)	Surface Area (cm^2)
1	6
2	24
3	54
4	96
5	150
6	216

b)

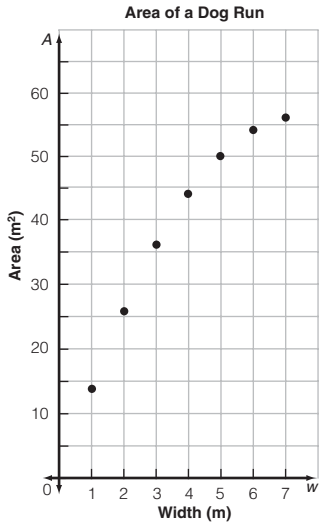


3. a) $P = 2(l + w)$, $A = l \times w$

b)

Length (m)	14	13	12	11	10	9	8
Width (m)	1	2	3	4	5	6	7
Area (m^2)	14	26	36	44	50	54	56

c)



d) The relation between width and area is non-linear because the points lie on a curve.

4.

Figure	Base	Height	Area
1	2	2	3
2	3	3	6
3	4	4	10
4	5	5	15
5	6	6	21
6	7	7	28

6.2 Model Quadratic Relations

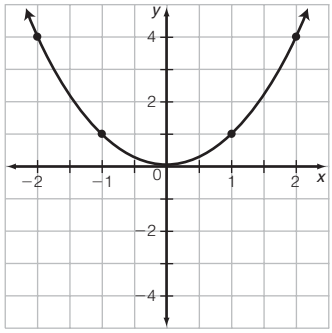
Warm-Up

1. A quadratic relation can be modelled by an equation in the form of $y = ax^2 + bx + c$. It can never be zero.

2. a, b, and c are all quadratic

3. They would form a curve of best fit.

4.



5. a) $y = 3x - 2$ **b)** $y = 4x + 5$

6. a) $y = 14$ **b)** $y = 8$

7. $y = 3$

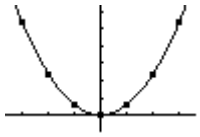
8. a) 102.6 **b)** 25.1 **c)** 4.2

Practise

1. An equation for a quadratic relation has an x^2-term.

2. It represents a quadratic relation because it has an x^2-term.

3. a)



b) A quadratic relation

4. a)

x	y
−5	20
−4	11
−3	4
−2	−1
−1	−4
0	−5
1	−4
2	−1
3	4
4	11
5	20

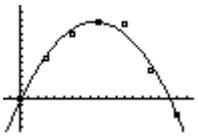
b) $y = x^2 - 5$

c) A quadratic relation fits the data.

5. b) The data appear on the graph in the shape of a parabola, therefore, the data form a quadratic relation.

c) The equation of the relation is $y = -4.9x^2 + 29.4x$.

6. a)



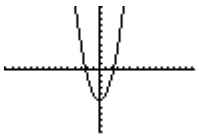
b) The equation of the quadratic relation is $y = -0.744x^2 + 12.846x - 2.002$.

6.3 Key Features of Quadratic Relations

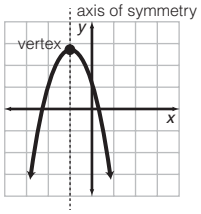
Warm-Up

1. $y = 4x^2 + 17$

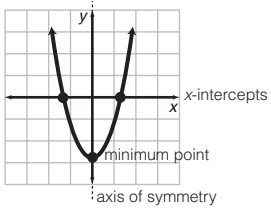
2.



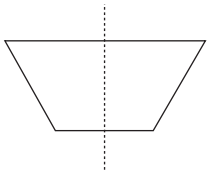
3.



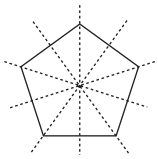
4.



5.



6.

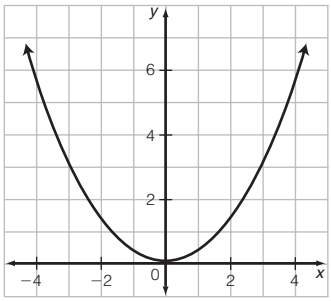


7. $y = 28$

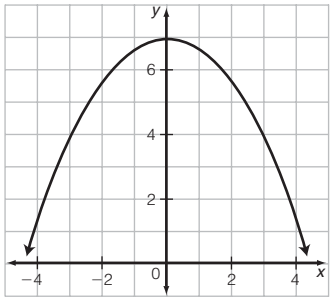
8. $y = -x^2 - \frac{2}{3}x + 2$. If $x = 3$, $y = -9$

Practise

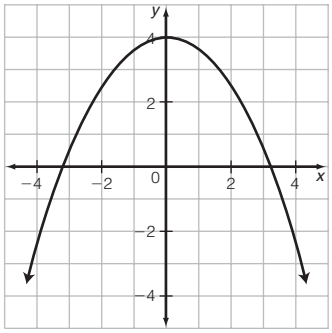
1. a)



b)



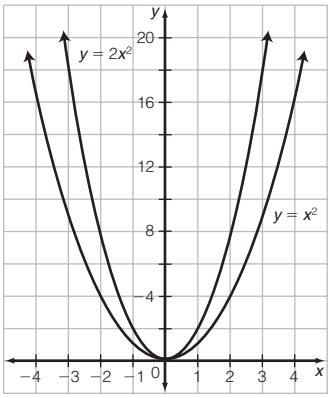
c)



2.

x	$y = x^2$
−3	9
−2	4
−1	1
0	0
1	1
2	4
3	9

x	$y = 2x^2$
−3	18
−2	8
−1	2
0	0
1	2
2	8
3	18



3. a) Similarities: same vertex, same axis of symmetry, both open upward
Differences: the parabola $y=2x^2$ is narrower than the parabola $y=x^2$

b) The reason for the difference is the coefficient of 2 for x^2.

c) Changing the sign of the coefficient of x^2 would cause the graphs to reflect and open downward.

4. a) The coordinates of the vertex are (0.75, 6.125) because the graph reaches a maximum of 6.125 when $x = 0.75$.

b) The equation of the axis of symmetry is $x = 0.75$ because the graph is symmetrical about this line.

c) The y-intercept is 5 because $y=5$ when $x=0$.

d) The x-intercepts are -1 and 2.5 because $x=-1$ and $x=2.5$ when $y=0$.

e) The graph has a maximum value of 6.125.

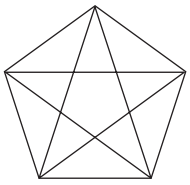
6.4 Rates of Change in Quadratic Relations

Warm-Up

1. $y = 25$

2. $y = 2x^2 - 4x + 6$ is quadratic

3. You can draw 5 diagonals.



4.

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

5. 5.3
6. 2
7. $y = 2x^2 - x + 8$; when $x=4$, $y=36$
8. $x = 14$

Practise

1. You can calculate the second differences for the data, and if they are constant then the data represent a quadratic relation.

2. Leon is incorrect because the first differences also have a constant value of 2, so the data must be linear.

3. a)

x	y	First Differences	Second Differences
−3	18		
−2	11	−7	
−1	6	−5	2
0	3	−3	2
1	2	−1	2
2	3	1	2
3	6	3	2

b) The relation is a quadratic relation because the second differences are constant.

c) The shape of the graph forms a parabola because the data form a quadratic relation.

4. a)

x	y	First Differences	Second Differences
−6	10		
−5	4	$4 - 10 = -6$	
−4	0	$0 - 4 = -4$	$-4 - (-6) = 2$
−3	−2	$-2 - 0 = -2$	$-2 - (-4) = 2$
−2	−2	$-2(-2) = 0$	$0 - (-2) = 2$
−1	0	$0(-2) = 2$	$2 - 0 = 2$
0	4	$4 - 0 = 4$	$4 - 2 = 2$
1	10	$10 - 4 = 6$	$6 - 4 = 2$

b) Yes, the relation is quadratic.
Yes, it makes sense that the relation is quadratic because it has an x^2-term.

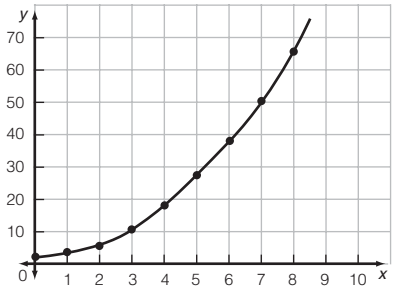
5. a)

time (s)	height (m)
0	0
1	100
3	250
5	450
6	500
8	600
10	650
13	700
15	675
20	500

b) $y = -4.14x^2 + 107.91x - 5.73$

Chapter 6 Review

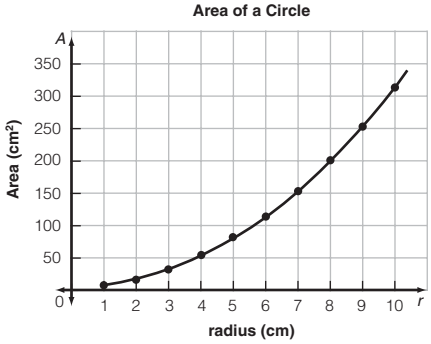
1.



I used a curve of best fit because the points do not form a straight line.

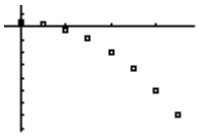
2. a)

r (cm)	A (cm²)
1	3.14
2	12.56
3	28.26
4	50.24
5	78.5
6	113.04
7	153.86
8	200.96
9	254.34
10	314



3. a) Quadratic because the relation has an x^2-term.
b) Linear because the relation has no x^2-term.
c) Quadratic because the relation has an x^2-term.

4.



I think the relation is quadratic because the data appears to form a parabola.

5. Coordinates of vertex: $(-2, 0)$
Axis of symmetry: $x = -2$
y-intercept: 4
Minimum value: 0
x-intercept: -2

6.

x	y	First Differences	Second Differences
-3	12		
-2	7	$7 - 12 = -5$	
-1	4	$4 - 7 = -3$	$-3 - (-5) = 2$
0	3	$3 - 4 = -1$	$-1 - (-3) = 2$
1	4	$4 - 3 = 1$	$1 - (-1) = 2$
2	7	$7 - 4 = 3$	$3 - 1 = 2$
3	12	$12 - 5 = 5$	$5 - 3 = 2$

The relation is quadratic because its second differences are constant.

Chapter 7 Quadratic Expressions

Get Set

1. a) monomial
b) trinomial
c) monomial
d) binomial
2. a) $12y$ **b)** $6t^2$ **c)** $-2x$ **d)** $5x$
3. a) $-2x + 3$
b) $x^2 + 3x + 4$
c) $9x^2 + 8x - 7$
4. a) $2x - 10$
b) $10x^2 + 30x$
c) $-12x^2 - 12x + 6$
d) $6x^3 + 10x^2$
5. a) 36 **b)** $16x^2$ **c)** $100y^2$ **d)** $25x^2$
6. 288 cm^2

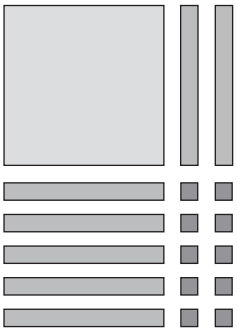
7.1 Multiply Two Binomials

Warm-Up

1. a) 24 **b)** 34
2. a) 8 **b)** 7
3. a) $12x^2 + 8x$
b) $10x^2 + 30x$
4. a) two
b) Answers may vary. For example: bicycle
5. 32 m
6. a) $9x + 20$
b) $3a + 2$

Practise

1. a) Answers may vary. For example: $x + 3$
b) Answers may vary.
2. a)



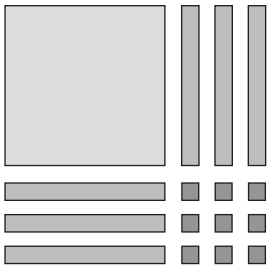
$x^2 + 7x + 10$

b)

$2a^2 + 9a + 4$

3. a) $x^2 + x(3) + 6(x) + (6)(3)$
$x^2 + 3x + 6x + 18 = x^2 + 9x + 18$
b) $2x^2 - 20x - 3x + 30 = 2x^2 - 23x + 30$
c) $7a^2 + 6a - 63a - 54 = 7a^2 - 57a - 54$

4. a)



$x^2 + 6x + 9$
b) Answers may vary. For example: $(x + 3)^2$
c) square
d) perfect square trinomial

5. a) Area $= (3x + 5)(x + 5)$
$= 3x^2 + 5x + 15x + 25$
$= 3x^2 + 20x + 25$
b) 112 ft^2

6. $(3x + 2)(x + 2)$
$= 3x^2 + 6x + 2x + 4$
$= 3x^2 + 8x + 4$

7. $4x^2 + 11x + 6$

7.2 Common Factoring

Warm-up

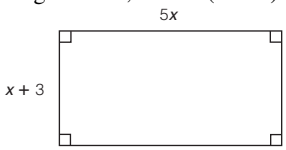
1. a) 15 **b)** 6
2. a) Answers may vary. For example: 2, 3, 5
b) Answers may vary. For example: 2, 3, 4
3. a) $12a - 4a^2 + 2ab$
b) $-7x + 28y - 42$
4. The opposite process is expanding. Explanations will vary.
5. a) \$5 **b)** \$0.01
6. a) $-16x - 2$
b) $5x^2 + 3x + 4$

Practise

1. a) 8 **b)** $2a$ **c)** $2x$
2. a) expanded; 3
b) factored; 5
c) expanded; 3
3. a) $3(p - 5)$ Check: $3p^2 - 15$
b) $3(7x^2 - 3x + 6)$ Check: $21x^2 - 9x + 18$
c) $6(y^2 + 3y + 10)$ Check: $6y^2 + 18y + 60$
4. Answers may vary. For example: $6n^2 - 3n = 3n(2n - 1)$

5. a) $5x(x + 3)$

b) length: $5x$ m; width: $(x + 3)$ m



c) 540 m^2

d) Perimeter $= 2(5x) + 2(x + 3)$; Area $= 5x(x + 3)$

e) 114 m

6. a) 6 **b)** 9

7.3 Factor a Difference of Squares

Warm-Up

1. a) 32 **b)** 8

2. a) 2, 4 **b)** 4

3. a) $4t^2 - 16$

b) yes

4. c

5. 122

6. a) $x^2 + 36$ **b)** 45

Practise

1. a) 8^2 **b)** 12^2 **c)** $(3x)^2$

2. a) yes; because first and second terms are perfect squares.

b) yes; because first and second terms are perfect squares.

c) no; because second term is not a perfect square

3. a) $(x + 3)(x - 3)$ Check: $x^2 - 9$

b) $(10 + x)(10 - x)$ Check: $100 - x^2$

c) $(a + 9)(a - 9)$ Check: $a^2 - 81$

4. a) Answers may vary. Draw a square with side length 6 cm.

b) $A = 6 \times 6 = 36$ cm^2

c) yes; 6^2 cm^2 $= 36$ cm^2

d) Answers may vary. $2 \times 2 = 4$ cm^2

e) $36 - 4 = 32$ cm^2

f) $6^2 - 2^2 = 36 - 4 = 32$ cm^2 or $6^2 - 2^2 = (6 + 2)(6 - 2)$
$= (8)(4)$
$= 32$ cm^2

5. a) $(x + 4)(x - 4)$

b) Measure a \$5 bill to get x; $x = 11$

c) Substitute $x = 11$ to find the area.
$(11 + 4)(11 - 4) = (15)(7)$
$= 105$ cm^2

d) $A = 11^2 - 16$
$= 121 - 16$
$= 105$ cm^2

7.4 Factoring Trinomials of the Form $x^2 + bx + c$

Warm Up

1. a) -2 **b)** 68

2. a) 3 **b)** $2x$

3. a) $7x^2 - 14x + 42$

b) $4b^2 - 28b$

4. Answers may vary.

5. b) 4 h

6. a) $6b^2 - 2b + 13$

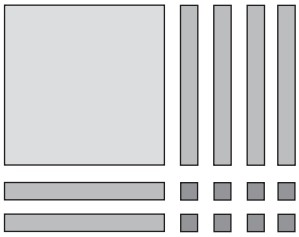
b) 33

Practise

1.

Pair of Integers	Product	Sum
2, 4	8	6
4, 9	36	13
-5, 4	-20	-1
-6, -4	24	-10

2. a)



b) length: $x + 4$, width: $x + 2$

c) The expressions for the length and width are the factors of the trinomial expression.

3. a) STEP 1: 3,1;
STEP 2: $(x + 3)(x + 1)$ Check: $x^2 + 4x + 3$

b) $(x + 7)(x + 4)$ Check: $x^2 + 11x + 28$

c) $(x + 5)(x + 4)$ Check: $x^2 + 9x + 20$

4. Answers may vary. While 4 and 2 multiply to give 8, they do not add up to -6. To fix this she should use -4 and -2, which add up to -6 and still multiply to equal 8.

5. a) $A = (x + 7)(x + 1)$

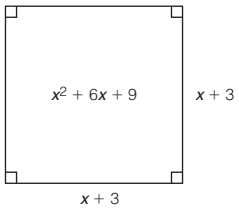
b) factoring

c) 160 cm^2

6. a) $(x + 3)(x + 3)$. The room is square.

b) 16 m^2

c)



Chapter 7 Review

1. a) $6x^2 + 5x - 4$

b) $2x^2 + 12x - 14$

c) $3x^2 - 8x - 3$

d) $x^2 - 2x + 1$

2. a) $x^2 - 9$

b) $x^2 + 6x + 9$

c) Answers may vary.

3. a) No. Completely factored form: $3x(x + 4)$

b) No. Completely factored form: $6x^2(3x + 1)$

4. a) GCF:2; $2(x^2 + 10)$

b) GCF:$4xy$; $4xy(x + 2)$

c) $(x + 12)(x - 12)$

d) $(x - 7)(x + 2)$

5. a) $25 = 5^2$ **b)** $49 = 7^2$ **c)** $81 = 9^2$

6. **a)** and **b)** are difference of squares

7. a) $(x + 3)(x - 3)$ Check: $x^2 - 9$

b) $(x + 4)(x - 4)$ Check: $x^2 - 16$

8. a) length: $x + 6$; width: $x + 1$

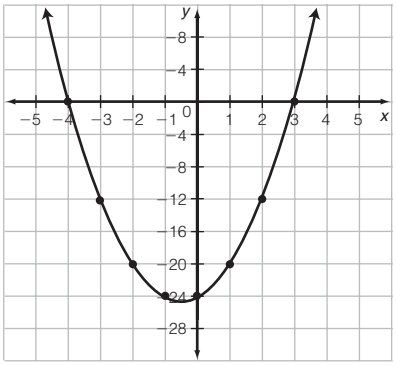
b) The countertop is a rectangle.

c) 14 ft^2

Chapter 8: Represent Quadratic Relations

Get Set

1.



The relation is quadratic.

2. Coordinates of vertex: $(0, -8)$
Equation of axis of symmetry: $x = 0$
x-intercepts: -4 and 4
y-intercepts: -8

3. **a)** $y = 2$ **b)** $y = 8$

4. **a)** $x^2 - 8x + 16$ **b)** $x^2 + 3x - 4$

5. **a)** $4(x^2 - 3)$ **b)** $(x - 5)(x - 2)$

8.1 Interpret Quadratic Relations

Warm-Up

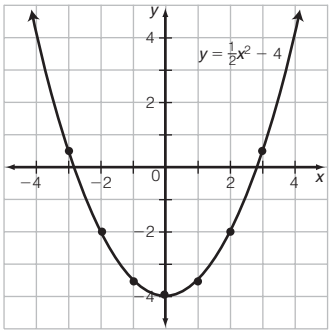
1. (3, 9)

2.

x	y	First Differences	Second Differences
−3	20		
−2	13	−7	
−1	8	−5	2
0	5	−3	2
1	4	−1	2
2	5	1	2
3	8	3	2

The relation is quadratic.

3.



4. **a)** $y = -x + 3$ **b)** $y = 2x + \frac{5}{2}$

5. Two lines are parallel if they have the same slope. For example, $y = x + 2$ and $y = x - 6$ are parallel. Two lines are perpendicular if their slopes are negative reciprocals of each other. For example, $y = 2x$ and $y = -\frac{1}{2}x$ are perpendicular.

6. $3a(a^2 - 5)$

7. $(x - 2)(x + 1)$

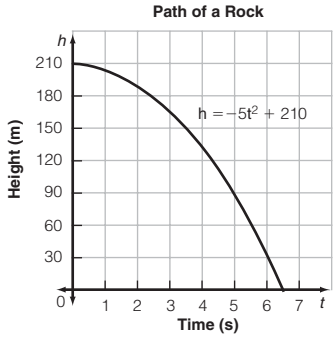
8. $y = 8$

Practise: Interpret Quadratic Relations

1. **a)** 10 m **b)** 20 m **c)** 40 m
d) Yes. **e)** 35 m

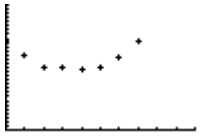
2. **a)**

time (s)	height (m)
0	210
1	205
2	190
3	165
4	130
5	85
6	30



b) 210 m **c)** 6.5 s **d)** 157.2 m

3. **a)**



b) $y = 0.0023x^2 - 0.08x + 2.13$

c) The lowest point is 1.4 m from the ground, this point occurs at a horizontal distance of 17.4 m.

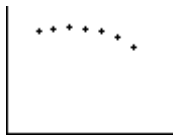
d) The person could stand 8.9 m from either end.

4. Answers may vary. You can determine if a relation is quadratic by graphing with a graphing calculator or by finding the second differences.

5. **a)**

Fare ($)	Riders	Total Revenue ($)
2.00	240 000	480 000
2.10	230 000	483 000
2.20	220 000	484 000
2.30	210 000	483 000
2.40	200 000	480 000
2.50	190 000	475 000
2.60	180 000	468 000

b)



c) $2.20
d) $484 000

8.2 Represent Quadratic Relations in Different Ways

Warm-Up

1. (3, −1)

2.

x	−3	−2	−1	0	1	2	3
y	30	12	0	−6	−6	0	12

3. (−5, −3)

4. Enter $y = (x - 2)(x + 1)$ as Y_1 and $y = x^2 - x - 2$ as Y_2 and graph them. Since the two equations are different forms of the same equation only one curve will appear in the window.

5. $(x - 8)(x - 1)$

6. The x-intercepts are −6 and 3.

7. No they are not. When $y = (x - 3)(x + 2)$ is expanded and simplified it is $y = x^2 - x - 6$.

8. The x-intercepts are −6 and −1. The y-intercept is 6.

Practise: Represent Quadratic Relations in Different Ways

1. a) −4 and 7 **b)** −5 and 3 **c)** −4 and 3

2. a) 2 **b)** −4 **c)** −6

3. If the coefficient of the x^2 term is positive, the quadratic relation will have a minimum. If the coefficient of the x^2-term is negative, the quadratic relation will have a maximum.

4. a) $A = x(8 - x)$

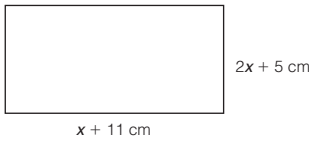
b)

x (cm)	0	1	2	3	4	5	6
A (cm^2)	0	7	12	15	16	15	12

$x = 4$ will generate the rectangle with the greatest area.

c) The greatest area is 16 cm^2.

5. a)



b) $A = (x + 11)(2x + 5) = 2x^2 + 27x + 55$

c) $x = 2$ will produce an area of 117 cm^2.

6. a) The population will be 50 514.

b) The population was 39 666.

c)

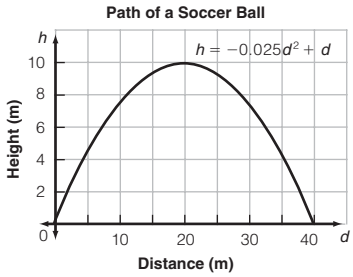
d) The population was least in 1971.

e) The least population was 29 993.

7. a) The d-intercepts are 0 and 40.

b)

distance (m)	0	5	10	15	20	25	30	35	40
height (m)	0	4.375	7.5	9.375	10	9.37	7.5	4.375	0



c) The maximum height of the ball is 10 m.

d) The ball traveled 20 m.

8.3 The Quadratic Relation $y = ax^2 + c$

Warm-Up

1. (2, 3)

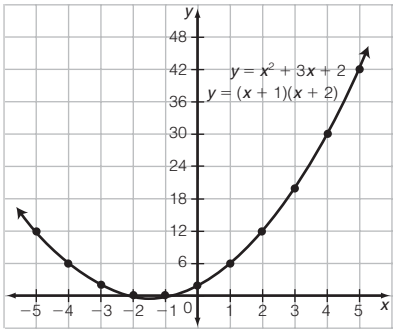
2.

x	−5	−4	−3	−2	−1	0	1	2	3	4	5
y	12	6	2	0	0	2	6	12	20	30	42

3.

x	−5	−4	−3	−2	−1	0	1	2	3	4	5
y	12	6	2	0	0	2	6	12	20	30	42

4.



5. Answers may vary. Both graphs lie on the same curve because the two equations are different forms of the same equation.

6. Equations b) and c) are parabolas that open downward because the coefficients of the x^2 terms are negative.

7. $c = 5$

8. $a = 3$

Practise: The Quadratic Relation $y = ax^2 + c$

1. a) iii, ii, i **b)** ii, iii, i

2.

Quadratic Relation	y-intercept	Maximum or Minimum
a) $y = x^2 + 5$	5	Minimum
b) $y = -\frac{1}{3}x^2 - 7$	−7	Maximum
c) $y = -3x^2 + 27$	27	Maximum
d) $y = \frac{1}{4}x^2 - 1$	−1	Minimum

3. a) none **b)** none

c) −3 and 3 **d)** −2 and 2

4. a)

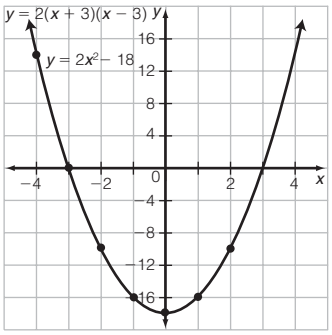
time (s)	depth (m)
0	35
1	31.5
2	21
3	3.5
$\sqrt{10}$	0

b) The tank is 35 m deep.
c) It takes about 3.2 s.

5. a)

x	y
−4	14
−3	0
−2	−10
−1	−16
0	−18
1	−16
2	−10
3	14

x	y
−4	14
−3	0
−2	−10
−1	−16
0	−18
1	−16
2	−10
3	14

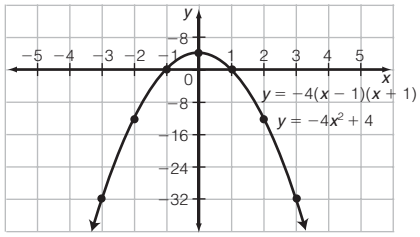


The two graphs lie on the same curve. Each curve opens upward with its vertex at (0, −18) and x-intercepts at −3 and 3.

b)

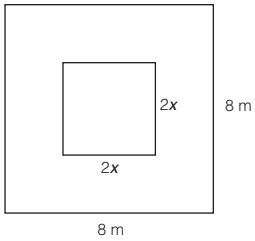
x	y
−3	−32
−2	−12
−1	0
0	4
1	0
2	−12
3	−32

x	y
−3	−32
−2	−12
−1	0
0	4
1	0
2	−12
3	−32



The two graphs lie on the same curve. Each curve opens downward with its vertex at (0, 4) and x-intercepts at −1 and 1.

6. a)



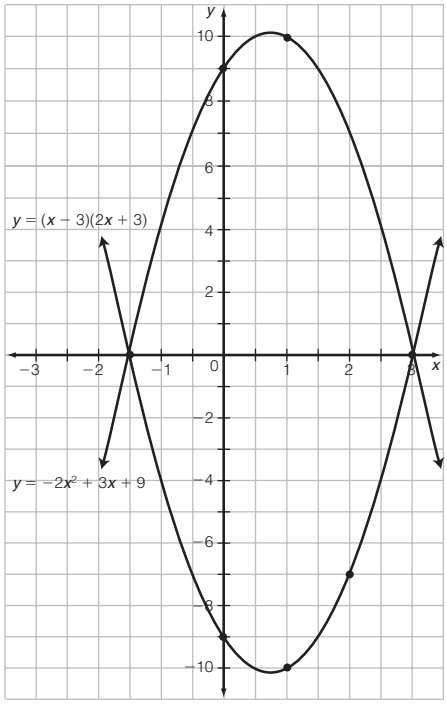
b) 64 m² **c)** $4x^2$ m²
d) $A = 64 - 4x^2$ m²

8.4 Solve Problems Involving Quadratic Relations

Warm-Up

1. $(x + 7)(x - 2)$

2.



3. $(2h - 9)(2h + 9)$
4. The maximum is 14 375.
5. Answers may vary. The value of x that gives the greatest value for R is the price that would maximize revenue.
6. −18
7. −4 and 4
8. a) 40 s **b)** 20 s

Practise: Solve Problems Involving Quadratic Relations

1. a)

distance (m)	height (m)
0	3
1	3.54
2	3.96
3	4.26
4	4.44
5	4.5
6	4.44
7	4.26
8	3.96
9	3.54
10	3

The maximum height of the ball was 4.5 m.

b) The horizontal distance travelled when it reaches this maximum height is 5 m.

2. a) 71.7 m **b)** 12.544 m **c)** 3.83 s

3. a) The zeros are at $t = 5.32$ and $t = -0.01$. The zeros represent the times when the ball is on the ground, but since negative time does not exist, the only time the ball is on the ground is at $t = 5.32$ s.

b) 2.65 s

c) 34.74 m

4. a)

time (s)	0	0.5	1	1.5	2	2.5	3
height (m)	1	4.75	6	4.75	1	−5.25	−14

b) 1 m **c)** 6 m; 1 s **d)** 2.1 s

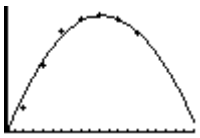
5. a) The cost for running a spring fair.

b) \$17

c) \$2993.00

Chapter 8 Review

1. a)



b) 102.1 ft **c)** 23.2 ft **d)** 51.6 ft

2. a)

Price (\$)	Number Sold	Revenue (\$)
3.50	300	1050.00
3.75	285	1068.75
4.00	270	1080.00
4.25	255	1083.75
4.50	240	1080.00
4.75	225	1068.75
5.00	210	1050.00
5.25	195	1023.75
5.50	180	990.00

b)

c) \$4.25 **d)** \$1083.75

3. a) $-3, -2$ **b)** $0, 8$

c) $-2, 6$ **d)** $0, \frac{5}{3}$

4. a) $N = 400 - 8x$

b) $P = 80 + 2x$

c) $R = (400 - 8x)(80 + 2x) = 32\,000 + 160x - 16x^2$

d) \$32 400

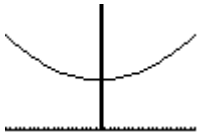
e) 360 cars, \$90 per car

5. Answers may vary. You can expand and simplify the second equation; if its coefficients are the same as the first equation, the quadratic relations are the same.

6. a)

Quadratic Relation	*y*-Intercept	Maximum or Minimum	*x*-Intercepts
a) $y = 2x^2 - 32$	−32	Minimum	−4, 4
b) $y = \frac{1}{3}x^2 - 3$	−3	Minimum	−3, 3
c) $y = x^2 + 9$	9	Minimum	None
d) $y = -\frac{3}{4}x^2 - 5$	−5	Maximum	None

7. a)



b) Minimum value: 4; vertex: (0, 4)

c) *y*-intercept: 4; *x*-intercepts: None

8. a) $P = -x^2 + 19x + 150$

b)

c) −6 and 25

d) 950 items should be produced.

e) \$240.25

9. a) Answers may vary. Let n be the number of \$2 increases.

$$R = (1200 - 60n)(20 + 2n)$$
$$= 24\,000 + 1200n - 120n^2$$

b)

Ticket Price (\$)	20	22	24	26	28	30	32	34	36
Tickets Sold (*n*)	1200	1140	1080	1020	960	900	840	780	720
Revenue (\$)	24 000	25 080	25 920	26 520	26 880	27 000	26 880	26 520	25 920

c) \$30

d) 900

e) \$27 000

Chapter 9 Volume and Surface Area

Get Set

1. 5, 2

$$(5)^2 + (2)^2 = x^2$$
$$25 + 4 = x^2$$
$$29 = x^2$$
$$\sqrt{29} = x$$
$$5.4 \doteq x$$

2. The net has a triangular base and three congruent triangular faces. It is a net of a triangular pyramid.

3. 71 ft; 84 mm; 6000 cm^2; 5875.2 in.^{2}

4. 15^2; 706.9 ft^2

9.1 Volume of Prisms and Pyramids

Warm-Up

1. 6 in.

2. $P = \frac{I}{rt}$

3. $t = \sqrt{\frac{d}{a}}$

4. Answers may vary. To find the volume of a cup to see how much liquid it can hold.
5. $y = 11$
6. $A = -46$

Practise

1. $A = 85 \times 12$
$= 1020 \text{ cm}^2$; 1020 cm^2
$V = 1020 \times 15$
$= 15\,300 \text{ cm}^3$; $15\,300 \text{ cm}^3$

2. $A = \frac{1}{2}(18)(22)$
$= 198 \text{ in.}^2$; 198 in.^2
$V = 198 \times 44$
$= 8712 \text{ in.}^3$; 8712 in.^3

3. $A = 39 \times 20$
$= 780 \text{ ft}^2$; 780 ft^2
$V = \frac{1}{3}(780)(70)$
$= 18\,200 \text{ ft}^3$; $18\,200 \text{ ft}^3$

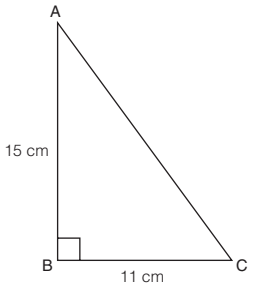
4. $0.6^2 + h^2 = 1.2^2$
$h^2 = 1.2^2 - 0.6^2$
$h^2 = 1.44 - 0.36$
$h^2 = 1.08^2$
$h^2 \doteq 1.04 \text{ m}^2$
$A = \frac{1}{2}(1.2)(1.04)$
$= 0.624 \text{ m}^2$; 0.624 m^2
$V = (0.624)(6.3)$
$= 3.931 \text{ m}^3$; 3.931 m^3

5. 400 cm^3

9.2 Surface Area of Prisms and Pyramids

Warm-Up

1. Answers may vary.



AC $\doteq 18.6$ cm

2. Answers may vary. To find the amount of wrapping paper needed to wrap a gift box.
To find the amount of cardboard needed to create a box.

3. **a)** $h = \frac{A}{b}$ **b)** $r = \frac{C}{2\pi}$

4. **a)** $x = 55$ **b)** $y = 36$

5. A cube

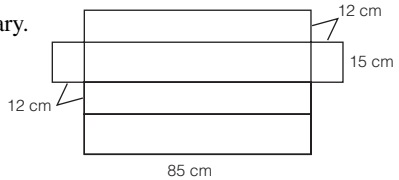
6. A square-based pyramid.

7. b)

8. Answers may vary. No, since the triangle is not a right triangle.

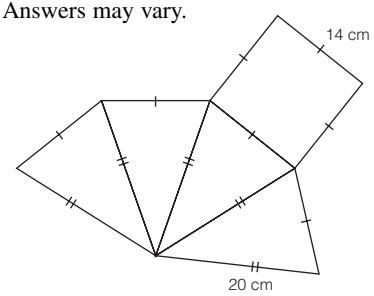
Practise

1. Answers may vary.



2. $A = 15 \times 12$
$= 180 \text{ cm}^2$
$A = 15 \times 85$
$= 1275 \text{ cm}^2$
$A = 85 \times 12$
$= 1020 \text{ cm}^2$
$A_{\text{Surface}} = 2(180) + 2(1275) + 2(1020)$
$= 4950 \text{ cm}^2$; 4950 cm^2

3. Answers may vary.



4. STEP 1:
$h^2 + 7^2 = 20^2$
$h^2 = 20^2 - 7^2$
$h^2 = \sqrt{20^2 - 7^2}$
$h \doteq 18.73$
STEP 2:
$A \doteq \frac{1}{2}(14)(18.73)$
$= 131.1 \text{ cm}^2$
STEP 3: SA of triangle faces
$A \doteq 4(131.1)$
$\doteq 524.4 \text{ cm}^2$
SA of base $= 14 \times 4$
$= 196 \text{ cm}^2$
Total SA is $524.4 + 196 = 720.4 \text{ cm}^2$

5. **a)** 90 m^2 **b)** \$1255.50

9.3 Surface Area and Volume of Cylinders

Warm-Up

1. Answers may vary. Canned food; cups

2. πr^2

3. c)

4. 3.14

5. **a)** 105 yd **b)** 185 mm **c)** 223 cm^2 **d)** 3 ft^3

6. **a)** $n = \frac{PV}{RT}$ **b)** $w = \frac{P - 2l}{2}$

7. 7920 m^3

8. 41 in.^2

Practise

1. $2\pi(20)^2 + 2\pi(20)(65) \doteq 2512 + 8168$
$\doteq 10\,676$; $10\,676 \text{ cm}^2$

2. 21; $2\pi(10.5)^2 + 2\pi(10.5) \doteq 758.3$; 758.3 cm^2

3. $\pi(6)^2(7.2) \doteq 813.9$; 813.9 m^3

4. 1.44; $\pi(0.72)^2(42) \doteq 68.4$; 68.4 m^3

5. **a)** $\pi(4)^2(18) \doteq 904.3$; 904.3 cm^3
b) $\pi(1.5)^2(18) \doteq 127.2$; 127.2 cm^3
c) 777.1 cm^3

6. Answers may vary. You would need more paint after it was hollowed out because the area of the inside surface is greater than the area of the circle openings.

9.4 Volume of Cones and Spheres

Warm-Up

1. No, it will be 8 times the volume.
2. Answers may vary. pylon; ice-cream cone
3. 46 cm
4. Answers may vary. orange; the Sun
5. a) 42 000 m
b) 3520 mm
c) 573 000 mm^3
d) 1250 ft^2
6. a) $I = \sqrt{\frac{P}{R}}$ **b)** $V = \frac{m}{D}$
7. a) 1727 $in.^3$ **b)** 7033.6 cm^2
8. 10.5

Practise

1. a) $\frac{1}{3}\pi(14)^2(22)$
$\doteq 4513.2$; 4513.2 cm^3
b) 24; $V = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3}\pi(5)^2(24)$
$= 628$; 628 $in.^3$
2. a) $\frac{4}{3}\pi(18)^3$
$\doteq 24\,416.6$; 24 416.6 m^3
b) diameter = 6 cm; radius = 3 cm
$V = \frac{4}{3}\pi r^2$
$= \frac{4}{3}\pi(3)^3$
$\doteq 113.0$; 113.0 cm^3
3. a) $\frac{1}{3}\pi(18)^2(100)$
$\doteq 33912$; 33912 $in.^3$
b) $r = \sqrt[3]{\frac{3V}{4\pi}}$
$r = \sqrt[3]{\frac{3 \times 16\,956}{4\pi}}$
$= \sqrt[3]{4050}$
$\doteq 15.9$ in.
c) 31.8 in.
4. a) 9 cm **b)** 3052.1 cm^3

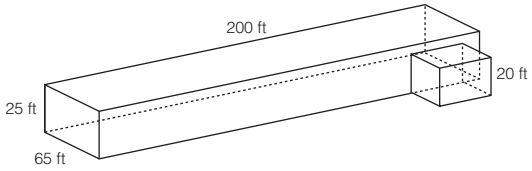
9.5 Solve Problems Involving Surface Area and Volume

Warm-Up

1. a) 93 ft **b)** 4.2 mm
c) 0.2276 m^2 **d)** 1674 ft^3
2. Answers may vary. Regina is correct, Seema is not. The area of the base does not change when the height is doubled.
3. 36 $in.^3$
4. 288 $in.^3$
5. a) $h = \frac{SA - 2\pi r^2}{2\pi r}$ **b)** $c = \sqrt{\frac{E}{m}}$
6. $x = 3$

Practise

1. a) cylinders: 175.8 cm^3;
rectangular prism: 2240 cm^3
b) Sphere A: 14 130 $in.^3$
Sphere B: 65 416.7 $in.^3$
Sphere C: 113 040 $in.^3$
2. Area of back rectangle $= 12 \times 8$
$= 96$
Area of front $= 12 \times 8 - \pi(1.5)^2$
$= 88.9$
Area of 2 sides $= 2 \times 8 \times 8$
$= 128$
Area of base $= 12 \times 8$
$= 96$
Area of front and back triangles $= \frac{1}{2} \times 12 \times 5$
$= 30$
Area of roof $= 2 \times 8 \times 7.8$
$= 124.8$
Total surface area to be painted = 453.7 $in.^2$
3. a) Answers may vary.



b) 333 000 ft^3

Chapter 9 Review

1. $V = l \times w \times h$
$= 60 \times 14 \times 22$
$= 18\,480$ cm^3
2. $V = \frac{1}{3}$ area of base $\times$ height
$= \frac{1}{3} \times 40 \times 20 \times 70$
$= 18\,666.7$ ft^3
3. 5,8; $A = 5 \times 8$
$= 40$
5,9; $A = 5 \times 9$
$= 45$
8,9; $A = 8 \times 9$
$= 72$
$A_{Surface} = 2(40) + 2(45) + 2(72)$
$= 314$; 314 yd^2
4. Circular top SA = 78.5 $in.^2$
Side SA = 439.6 in
Cylinder SA = 596.6 $in.^2$
Cylinder V = 1099 $in.^3$
5. a) 0.5 yd^3 **b)** 670 637.9 cm^3

9.4 Solve Problems Involving Surface Area and Volume, textbook pages 398-405

6. a) 2253 $in.^2$ **b)** 7173 $in.^3$