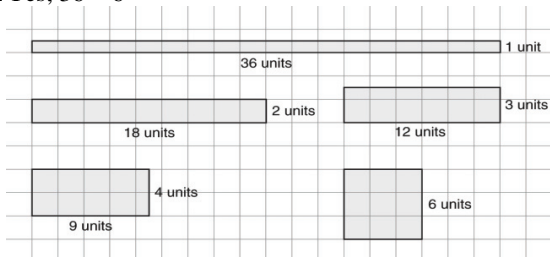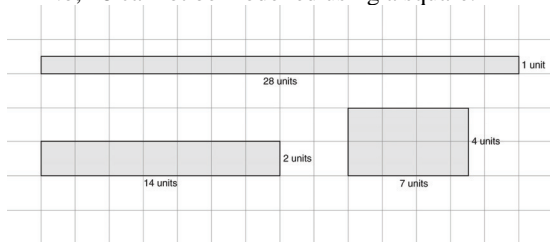# Unit 1 Square Roots and the Pythagorean Theorem, page 4

1.1 Square Numbers and Area Models, page 8

4.a) ii)   **b)** i)   **c)** iii)

5.a) 64 square units   **b)** 100 square units
   c) 9 square units

6. Yes; $36 = 6^2$

7. No; 28 cannot be modelled using a square.

8. $25 = 5^2$

9. 12 cannot be modelled using a square.

10.a)   **b)**

c)   **d)**
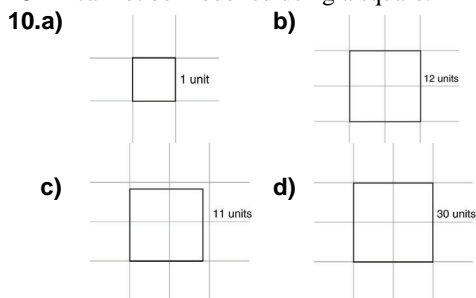
11.a) 10 m   **b)** 8 cm   **c)** 9 m   **d)** 20 cm

12.c) $81 = 9^2$

13. Answers may vary. For example:

Base (cm)	Height (cm)	Perimeter (cm)
64	1	130
32	2	68
16	4	40
8	8	32

A square with side length 8 cm has the smallest perimeter.

14. Answers may vary.
For example: 9, 36, 81, 144, 225, 324

15.a) 9 and 16   **b)** 36 and 49
   c) 64 and 81   **d)** 196 and 225

16.a) 12 m   **b)** 48 m
   c) 20 pieces; Assumptions may vary. For example: You must buy whole pieces.

17. 5 m

18. $64 = 8^2$, $81 = 9^2$, $100 = 10^2$, $121 = 11^2$, $144 = 12^2$, $169 = 13^2$, $196 = 14^2$

19.b) 49 m^2 **c)** 7 m   **d)** 28 m
   e) $280; Assumptions may vary. For example: There is no tax on fencing.

20.a) 30 cm   **b)** 2 cuts

21.a) 1, 4, 9, 7, 7, 9, 4, 1, 9, 1, 4, 9, 7, 7, 9
   b) The digital root of a square number is either 1, 4, 7, or 9.
   c) 2809, 4225, 625

1.2 Squares and Square Roots, page 15

5.a) 16   **b)** 36   **c)** 4   **d)** 81

6.a) 64   **b)** 9   **c)** 1   **d)** 49

7.a) 5   **b)** 9   **c)** 8   **d)** 13

8.a) i) 1   **ii)** 100   **iii)** 10 000   **iv)** 1 000 000
   b) i) 100 000 000   **ii)** 1 000 000 000 000

9.a)

i) Number = 50	ii) Number = 100	iii) Number = 144	iv) Number = 85
1, 50	1, 100	1, 100	1, 85
2, 25	2, 50	2, 72	5, 17
5, 10	4, 25	3, 48	
	5, 20	4, 36	
	10, 10	6, 24	
		8, 18	
		9, 16	
		12, 12	

$100 = 10^2$, $144 = 12^2$
   b) ii) 10   **iii)** 12

10.a) 1, 2, 4, 8, 16, 32, 64, 128, 256; 16
   b) 1, 5, 25, 125, 625; 25
   c) 1, 11, 121; 11

11. 225 and 324; Each has an odd number of factors.

12.a) i) 1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 96
   ii) 1, 2, 4, 11, 22, 44, 121, 242, 484
   iii) 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 30, 40, 48, 60, 80, 120, 240
   iv) 1, 2, 4, 8, 19, 38, 76, 152
   v) 1, 3, 7, 9, 21, 49, 63, 147, 441
   vi) 1, 2, 3, 6, 9, 18, 27, 54
   b) 484 and 441; Each has an odd number of factors.

13.a) 1   **b)** 7   **c)** 12   **d)** 3

e) 4   **f)** 10   **g)** 25   **h)** 15

14.a) 3   **b)** 6   **c)** 10   **d)** 117

15.a) 4   **b)** 121   **c)** 225   **d)** 676

16.a) 13   **b)** 6   **c)** 14

17. 529

18. If I square a number then take the square root, I end up with the original number.

$3^2 = 9$ and $\sqrt{9} = 3$

19.a) $\sqrt{9}, 4, \sqrt{36}, 36$ **b)** $\sqrt{100}, 15, 19, \sqrt{400}$

c) $\sqrt{81}, \sqrt{100}, 11, 81$ **d)** $\sqrt{36}, \sqrt{49}, \sqrt{64}, 9$

20. $1^2 = 1, 2^2 = 4, 3^2 = 9, 4^2 = 16, 5^2 = 25, 6^2 = 36,$
$7^2 = 49, 8^2 = 64, 9^2 = 81, 10^2 = 100, 11^2 = 121,$
$12^2 = 144, 13^2 = 169, 14^2 = 196, 15^2 = 225,$
$16^2 = 256, 17^2 = 289, 18^2 = 324, 19^2 = 361,$
$20^2 = 400$

21.a) i) 11   **ii)** 111   **iii)** 1111   **iv)** 11 111

b) $\sqrt{12\,345\,654\,321} = 111\,111$

$\sqrt{1\,234\,567\,654\,321} = 1\,111\,111$

$\sqrt{123\,456\,787\,654\,321} = 11\,111\,111$

$\sqrt{12\,345\,678\,987\,654\,321} = 111\,111\,111$

22.a) i) 4   **ii)** 9   **iii)** 16   **iv)** 25

b) i) 13   **ii)** 25   **iii)** 20   **iv)** 34

c) $3^2 + 4^2$ is a square number. The sum of two square numbers may or may not be a square number.

1.3 Measuring Line Segments, page 20

3.a) 9   **b)** 16   **c)** 49   **d)** 100   **e)** 36   **f)** 144

4.a) 1   **b)** 8   **c)** 12   **d)** 13   **e)** 11   **f)** 25

5.a) 6 cm   **b)** 7 m   **c)** $\sqrt{95}$ cm   **d)** $\sqrt{108}$ m

6.a) 64 cm²   **b)** 44 cm²   **c)** 7 m²   **d)** 169 m²

7.a) $A = 18$ square units, $s = \sqrt{18}$ units

b) $A = 53$ square units, $s = \sqrt{53}$ units

c) $A = 34$ square units, $s = \sqrt{34}$ units

8.a) Square A

b) Squares C and D have the same area.

9. $d < b < a < c$

a) $A = 37$ square units, $s = \sqrt{37}$ units

b) $A = 32$ square units, $s = \sqrt{32}$ units

c) $A = 41$ square units, $s = \sqrt{41}$ units

d) $A = 20$ square units, $s = \sqrt{20}$ units

10.a) $A = 25$ square units, $s = 5$ units

b) $A = 13$ square units, $s = \sqrt{13}$ units

c) $A = 26$ square units, $s = \sqrt{26}$ units
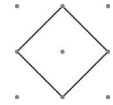
d) $A = 29$ square units, $s = \sqrt{29}$ units

11. Line segment b is shorter.
If you draw a square on each segment, the area of the square in part b is smaller, so its side length is also smaller.

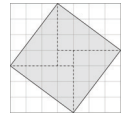**12.a)** $\sqrt{20}$ units   **b)** $\sqrt{41}$ units

c) $\sqrt{10}$ units   **d)** $\sqrt{8}$ units

13. Divide the square into 4 congruent triangles. The area of each triangle is $\frac{1}{2}$ square units. So, the area of the square is 2 square units.

14. The area must be 25 cm². Draw 4 triangles each with area 6 cm² and place a small square with area 1 cm² in middle.

1.4 Estimating Square Roots, page 25

4.a) 15   **b)** 3   **c)** 22   **d)** 1

5.a) 2 and 3   **b)** 3 and 4   **c)** 7 and 8

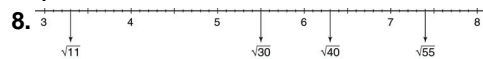**d)** 6 and 7   **e)** 13 and 14   **f)** 10 and 11

6. 2.6

7.a) $\sqrt{30}$; 30 is about halfway between 25 and 36.

$\sqrt{64}$; 64 is exactly 8.

$\sqrt{72}$; 72 is about halfway between 64 and 81.

b) $\sqrt{23}$ is about 4.8. $\sqrt{50}$ is about 7.1.

8.

9.a) Greater than   **b)** Greater than

c) Equal to   **d)** Less than

10.a) 8   **b)** 8   **c)** 9   **d)** 12

11.a) False   **b)** False   **c)** True

12.a) 4.80   **b)** 3.61   **c)** 8.83

d) 11.62   **e)** 7.87   **f)** 6.71

13.a) 9.6 cm   **b)** 20.7 m   **c)** 12.2 cm   **d)** 5.4 m

14.a) Bad estimate   **b)** Good estimate

c) Good estimate   **d)** Good estimate

15.a) 2.24 m by 2.24 m

b) 10 m since perimeter is about 8.96 m

16.a) 12.33 m by 12.33 m   **b)** 49.32 m

17. 7.35

18. Answers will vary. For example:
My classroom is 10 m by 7 m. The area is 70 m².
If my classroom were a square: $s = 8.37$ m

19.a) 6.93 m by 6.93 m   **b)** 16 m²

20. Always a perfect square

21. Since 7.67 is closer to 8 than 7, the whole number is closer to 64.

22. $9^2 = 81$ and $10^2 = 100$
Any number between 81 and 100 has a square root between 9 and 10.

23.a) 13   **b)** 9.85   **c)** 5   **d)** 9.22   **e)** 3.61

Unit 1 Technology: Investigating Square Roots with a Calculator, page 29

1.a) 21   **b)** 4.36; Approximation
 **c)** 7.94; Approximation   **d)** 23

Unit 1 Mid-Unit Review, page 30

1. 100
2.a) 4   **b)** 7   **c)** 14   **d)** 20
3.a) 121   **b)** 8   **c)** 13   **d)** 15
4.a) i) $A = 16$ cm^2 **ii)** $s = \sqrt{16}$ cm
  b) i) $A = 36$ cm^2 **ii)** $s = \sqrt{36}$ cm
5.a) 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 27, 36, 54, 72, 108, 216; Not a square number since even number of factors.
  b) 1, 2, 4, 7, 13, 14, 26, 28, 52, 91, 182, 364; Not a square number since even number of factors
  c) 1, 3, 9, 27, 81, 243, 729; Square number since odd number of factors; $\sqrt{729} = 27$
6. Let the square number represent the area of a square, then its square root is the side length.
7.a) $\sqrt{24}$; 24 is not a square number.
  b) 81 cm^2
8.a) 72 cm^2 **b)** $\sqrt{72}$ cm   **c)** 8.5 cm
9.a) 12   **b)** 34
10.a) 1 and 2   **b)** 8 and 9
  c) 8 and 9   **d)** 7 and 8
11.a) 4.12   **b)** 10.39   **c)** 5.74   **d)** 8.89

1.5 The Pythagorean Theorem, page 34

3.a) 50 cm^2 **b)** 52 cm^2
4.a) 64 cm^2 **b)** 28 cm^2
5.a) 10 cm   **b)** 13 cm   **c)** 4.5 cm   **d)** 5.8 cm
6.a) 9 cm   **b)** 24 cm   **c)** 9.8 cm   **d)** 6.7 cm
7.a) 7.6 cm   **b)** 20 cm   **c)** 20 cm
8.a) 8.06 cm   **b)** 11.66 cm   **c)** 25 cm
9.a) 5 cm   **b)** 10 cm   **c)** 15 cm
  Compared to rectangle a, the lengths are two times greater in rectangle b and three times greater in rectangle c. The next rectangle has dimensions 12 cm by 16 cm and diagonal 20 cm.
10. The longest side is the hypotenuse.
11. The two right triangles formed by the diagonals both have legs 12 cm and 16 cm. So the diagonals must be the same length.
12. 1 and $\sqrt{17}$, $\sqrt{2}$ and 4, $\sqrt{3}$ and $\sqrt{15}$, 2 and $\sqrt{14}$, $\sqrt{5}$ and $\sqrt{13}$, $\sqrt{6}$ and $\sqrt{12}$, $\sqrt{7}$ and $\sqrt{11}$, $\sqrt{8}$ and $\sqrt{10}$, 3 and 3
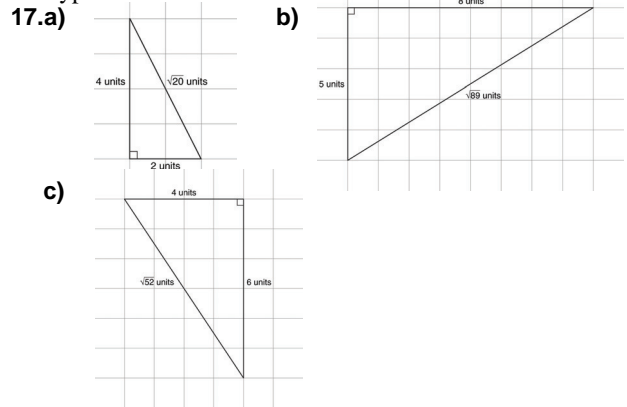 For each answer, the sum of the squares is 18.
13.a) 6 units   **b)** 8 units   **c)** 4 units
14.a)   **b)**

c)

d)
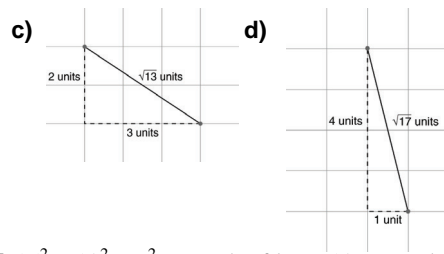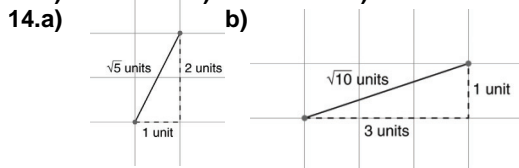
15. $15^2 = 12^2 + 9^2$; Length of legs: 12 cm and 9 cm
16. 3.535 cm^2, 6.283 cm^2, 9.817 cm^2
  The sum of the areas of the semicircles on the legs is equal to the area of the semicircle on the hypotenuse.
17.a)   **b)**

c)

18.a) $\sqrt{2}$ cm, $\sqrt{3}$ cm, $\sqrt{4}$ cm, $\sqrt{5}$ cm, $\sqrt{6}$ cm, $\sqrt{7}$ cm
  b) 1.4, 1.7, 2.0, 2.2, 2.4, 2.6
  c) 1.4 cm, 1.7 cm, 2.0 cm, 2.2 cm, 2.4 cm, 2.6 cm
  d) The lengths of the hypotenuses are the square roots of consecutive whole numbers.

1.6 Exploring the Pythagorean Theorem, page 43

3.a) Yes; $38 + 25 = 63$ **b)** No; $38 + 25 \neq 60$
4.a) No; $10^2 + 1^2 \neq 13^2$ **b)** No; $7^2 + 5^2 \neq 8^2$
  c) Yes; $15^2 + 8^2 = 17^2$
5. No, since it is not a right triangle
6.a) Yes   **b)** No   **c)** Yes   **d)** Yes
  e) No   **f)** No   **g)** No   **h)** Yes
7. a, c, d, f
8. Yes, it is a right angle since $9^2 + 12^2 = 15^2$.
9. Yes, the triangle is a right triangle;
$$7^2 = 6^2 + \left(\sqrt{13}\right)^2$$
  No, the side lengths do not form a Pythagorean triple since $\sqrt{13}$ is not a whole number.
10. $3^2 + 5^2 \neq 7^2$; Not a right triangle
11.a) Legs: 3, 4; 6, 8; 9, 12; 12, 16; 15, 20
    Hypotenuse: 5; 10; 15; 20; 25
  b) All triples are multiples of first triple 3, 4, 5.
  c) 10, 24, 26; 15, 36, 39; 20, 48, 52; 25, 60, 65
12.a) 50, since $14^2 + 48^2 = 50^2$

b) 40, since $32^2 + 24^2 = 40^2$

c) 35, since $12^2 + 35^2 = 37^2$

d) 99, since $20^2 + 99^2 = 101^2$

13. Hold the 1st, 4th, and 8th knots to form a right triangle with side lengths 3 units, 4 units, and 5 units.

14. Yes; Since $48^2 + 55^2 = 73^2$; all angles are right angles.

15. 40 m and 9 m, since $9 + 40 + 41 = 90$ and $9^2 + 40^2 = 41^2$

16.a) For obtuse triangles, the area of the square on the longest side is greater than the sum of the areas of the squares on the two smaller sides.

b) For acute triangles, the area of the square on the largest side is less than the sum of the areas of the squares on the two smaller sides.

c) In question 6,
   • the acute triangle is: b
   • the right triangles are: a, c, d, h
   • the obtuse triangles are: e, f, g

17. Answers will vary. For example:
Lesser number: 8; Greater number: 14
Triple: 224, 132, 260

1.7 Applying the Pythagorean Theorem, page 49

4.a) 29 cm   **b)** 12.2 cm   **c)** 15.8 cm

5.a) 24 cm   **b)** 15 cm   **c)** 5.7 cm

6. 4 m

7.a) 26 cm or 21.8 cm

b) The unknown side could be a leg or the hypotenuse of the right triangle.

8.a) 6.7 units   **b)** 7.8 units

9. 65 cm

10. 91 m

11. 38.18 m

12.a) The area of the square on the hypotenuse is equal to the sum of the areas of the squares on the legs.

b) The square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.

13. 57.4 cm

14. F; I drew two right triangles with hypotenuses AB and AF. The legs of both triangles were 4 units and 3 units.

15. 5.8 units   **16.** 216.9 m

17. Yes; $650^2 + 720^2 = 970^2$

18. 403.1 km   **19.** 7.6 cm   **20.** 17 cm

21. 37.3 m   **22.** 291.2 km

Unit 1 Unit Review, page 54

1. Rectangles: 1 unit by 24 units, 2 units by 12 units, 3 units by 8 units, 4 units by 6 units
Not a perfect square since 24 cannot be modelled by a square

2. 25

3. Answers may vary. For example: 16, 25, 1024, 1600, 2401, 2500

4.a) 25   **b)** 49   **c)** 81   **d)** 169

5.a) 7   **b)** 17   **c)** 20

6.a) i) 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 108
   ii) 1, 19, 361
   iii) 1, 2, 3, 5, 6, 10, 15, 25, 30, 50, 75, 150
   iv) 1, 2, 11, 13, 22, 26, 143, 286
   v) 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 81, 108, 162, 324
   vi) 1, 2, 4, 7, 8, 14, 28, 56

b) 361 and 324; Both have an odd number of factors.

7. 44 cm

8. $A = 17$ square units; $s = \sqrt{17}$ units

9.a) $\sqrt{75}$ cm   **b)** $\sqrt{96}$ cm   **c)** 9 cm

10. b; I drew a square on each line segment and found the area. Square b has a greater area.

11.a) 26   **b)** 5   **c)** 50   **d)** 13

12.a) 6 and 7   **b)** 9 and 10
   c) 10 and 11   **d)** 34 and 35

13.a) 2   **b)** 3   **c)** 5   **d)** 6   **e)** 8   **f)** 9

14.a) 7.4   **b)** 8.7   **c)** 9.7   **d)** 10.2   **e)** 6.8   **f)** 10.7

15. 8.49, since $8.48^2 = 71.9104$ and $8.49^2 = 72.0801$

16. 130 cm

17.a) False   **b)** True   **c)** True

18.a) 34 cm   **b)** 28 cm   **c)** 16.2 cm

19.a) 8.5 cm   **b)** 7.8 cm

20. Yes, since $24 + 57 = 81$

21. No; $7^2 + 12^2 \neq 15^2$
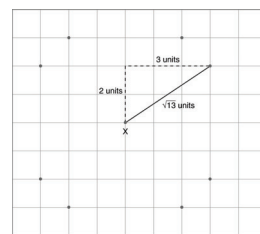
22. a and c

23. 21; One solution, because in a Pythagorean triple all three numbers must be whole numbers

24. 40 km

25. 42 cm

26. The distance from each possible position to x is the hypotenuse of a right triangle with legs lengths 2 units and 3 units.

27. 31.2 km

Unit 1 Practice Test, page 58

1.a) 11   **b)** 196   **c)** 6.32   **d)** 81

2. $\sqrt{1} = \sqrt{1 \times 1} = 1$

3. $s = 8$ cm, $A = 64$ cm^2

4.a) 25 square units   **b)** 5 units

5.a) Yes; $15 + 9 = 24$ **b)** No; $11 + 7 \neq 20$

6.a) 14.2 cm   **b)** 16 cm

7.a) No; $20^2 + 48^2 \neq 54^2$ **b)** Yes; $18^2 + 24^2 = 30^2$

8.a) 16.2 m   **b)** 81 m

9.a) 3.6 cm, 2.2 cm, 2.0 cm

b) The line segments could form a triangle because $2.0 + 2.2 > 3.6$.
They could not form a right triangle because $2.0^2 + 2.2^2 \neq 3.6^2$.

10. 19 times

Unit 1 Unit Problem: The Locker Problem, page 61

2. 1, 4, 9, 16, and 25; All numbers are perfect squares.

3. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100

4. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400

5. Open lockers have perfect squares as numbers. The number of students that change the locker corresponds to the number of factors for that locker number. All perfect squares have an odd number of factors, so those lockers are open.

6. The numbers in the third column are the consecutive odd numbers beginning at 3.

7.a) Every odd square number will appear in the third column if you continue the table far enough.
b) No, the difference between 2 consecutive odd numbers is always an odd number.
c) 25   **d)** 12, 13, 5 and 24, 25, 7
e) 9, 40, 41

Unit 2 Integers, page 62

2.1 Using Models to Multiply Integers, page 68

5.a) $(+3) \times (-1) = -3$ **b)** $(+5) \times (-2) = -10$
c) $(+4) \times (+11) = +44$

6.a) $(-4) + (-4) + (-4) + (-4) + (-4) + (-4) + (-4) = -28$
b) $(+3) + (+3) + (+3) + (+3) + (+3) + (+3) = +18$
c) $(+6) + (+6) + (+6) + (+6) = +24$
d) $(-6) + (-6) + (-6) + (-6) + (-6) = -30$

7.a) $(+3) \times (+3) = +9$ **b)** $(+4) \times (-2) = -8$

8.a) –6   **b)** +27   **c)** +12   **d)** –20

9.a) $(+5) \times (-2) = -10$ **b)** $(+5) \times (+2) = +10$
c) $(-7) \times (-3) = +21$ **d)** $(-9) \times (+4) = -36$
e) $(+11) \times (+3) = +33$ **f)** $(-10) \times (-5) = +50$

10.a) +5   **b)** +24 **c)** –14 **d)** –24 **e)** –30 **f)** +32

11.a) +8   **b)** +8   **c)** +16 **d)** –30 **e)** –24 **f)** +21

12. $(+2) \times (+9) = +18$; The temperature rose 18°C.

13. $(-3) \times (+11) = -33$; The water level dropped 33 cm.

14.a) Answers will vary. For example:
Olinga withdraws $6 from his bank account every day for 8 days. $(+8) \times (-6) = -48$

15. Use tiles: withdraw 7 sets of 8 red tiles.
Use a number line: Face the negative end and take 7 steps backward each of size 8.
$(-7) \times (-8) = +56$

16. $(-4) \times (+4) = -16$

17.a) $(+8) \times (-5) = -40$; He will have $40 less.
b) $(-2) \times (-5) = +10$; He had $10 more.

18.a) –40 or 40 cm to the left
b) +12 or 12 cm to the right
c) $(-4) \times (+10) = -40$
$(-3) \times (-4) = +12$

19. Answers may vary. For example:
Hugh threw out 7 cartons each with half a dozen eggs. How many eggs did he throw out?
$(-7) \times (+6) = -42$

20.a) –24   **b)** +15   **c)** –30   **d)** +36

2.2 Developing Rules to Multiply Integers, page 73

3.a) Negative   **b)** Positive
c) Negative   **d)** Positive

4.a) –24 **b)** +20 **c)** –27 **d)** –42 **e)** –30
f) +42 **g)** 0   **h)** –10 **i)** +56 **j)** –81

5.a) i) –21, –21   **ii)** +32, +32
iii) +45, +45   **iv)** –60, –60
b) No

6.a) +300 **b)** +780 **c)** –1600 **d)** –840
e) –780 **f)** –2640 **g)** +3290 **h)** +4680

7.a) –300 **b)** –945 **c)** +544 **d)** –666
e) +221 **f)** –3024 **g)** +1275 **h)** +667

8.a) +4   **b)** –3   **c)** +6   **d)** –6
e) –4   **f)** –12   **g)** –30   **h)** –6

9.a) +16, +32, +64; Multiply by +2 each time.
b) +1296, –7776, +46 656; Multiply by –6 each time.
c) –81, +243, –729; Multiply by –3 each time.
d) –4, +4, –4; Multiply by –1 each time.

10. $(+17) \times (-26) = -442$; Gaston withdrew $442.

11.a) –8 and –5   **b)** +9 and –8

12.a) i) +6   **ii)** –24   **iii)** +120
iv) –720   **v)** +5040   **vi)** –40 320
vii) +362 880   **viii)** –3 628 800
b) i) Positive **ii)** Negative
c) Yes

13.a) $(+60) \times (-20) = -1200$; Amelie wrote +1200 instead of –1200.
b) –1080

14. Answers will vary. For example:
Gavin ate 15 handfuls of 8 jelly beans. How many jelly beans did he eat?
$(+15) \times (-8) = -120$; Gavin ate 120 jelly beans.

15. When you multiply an integer by itself, you multiply two integers with the same sign. This always gives a positive product.

16. Answers may vary. For example:
Bridget's van uses 12 L of gas every day. How much gas does Bridget use in 7 days?
$(-12) \times (+7) = -84$; Bridget uses 84 L of gas.

17. For example:
Two factors: $(+2) \times (-18)$; $(-2) \times (+18)$
Three factors: $(-2) \times (-2) \times (-9)$;
$(-2) \times (+2) \times (+9)$
Four factors: $(-2) \times (-2) \times (-3) \times (+3)$

18. +9 and −16

19. No; The product of the positive integer and a negative integer is always less than or equal to each of the integers.

20.a) −5   **b)** −9

21. Multiply the integers from left to right.
The product is positive when there is an even number of negative factors.
The product is negative when there is an odd number of negative factors.
For example: $(-1) \times (+2) \times (-4)$ has 2 negative factors, so the answer is +8.

2.3 Using Models to Divide Integers, page 80

3.a) $(+5) \times (+5) = +25$ **b)** $(-12) \times (-2) = +24$
   c) $(+2) \times (-7) = -14$ **d)** $(-3) \times (+6) = -18$

4.a) $(-20) \div (-4) = +5$ **b)** $(+21) \div (+3) = +7$
   c) $(-26) \div (-13) = +2$

5. $(-24) \div (+4) = -6$

6.a) +8   **b)** +3   **c)** −2   **d)** +3   **e)** −5   **f)** −10

7.a) i) 2   **ii)** 5
   b) i) 4   **ii)** 3

8.a) +3   **b)** −2   **c)** +4   **d)** −3   **e)** −3   **f)** +2

9.a) +2   **b)** +2   **c)** −2   **d)** −2

10.a) +3   **b)** +4   **c)** −4   **d)** −5   **e)** −7   **f)** −2

11. $(+12) \div (+3) = +4$; 4 hours

12. $(-20) \div (-4) = +5$; 5 hours

13. $(-148) \div (+4) = -37$; 37 m

14. Answers will vary. For example:
Heather returned 5 towels to a store and received $45. How much had each towel cost?
$(+45) \div (-5) = -9$; Each towel cost $9.

15. Answers will vary. For example:
A scuba diver descends a total of 12 m over the course of 6 equal descents. How far did he descend each time?
$(-12) \div (+6) = -2$; 2 m

16.a) $(-36) \div (-6) = +6$; After 6 minutes
   b) $(+18) \div (-6) = -3$; 3 minutes ago

17.a) −4°C   **b)** +3°C

18.a) 6 weeks   **b)** $8

Unit 2 Mid-Unit Review, page 83

1.a) −36   **b)** +35   **c)** +32   **d)** −15

2. $(-2) \times (+7) = -14$; 14 m

3. $(+4) \times (+5) = +20$; 20°C

4.a) Negative   **b)** Positive
   c) Negative   **d)** Positive

5.a) −40   **b)** +15   **c)** −48   **d)** +72

6.a) −280   **b)** +456   **c)** +1080   **d)** −403

7. $(-35) \times (+30) = -1050$; 1050 L

8.a) −8   **b)** −9   **c)** +7   **d)** −12

9.a) $(+9) \times (+3) = +27$; $(+3) \times (+9) = +27$
   b) $(-2) \times (-7) = +14$; $(-7) \times (-2) = +14$
   c) $(+7) \times (-3) = -21$; $(-3) \times (+7) = -21$
   d) $(-13) \times (+2) = -26$; $(+2) \times (-13) = -26$

10.a) +5   **b)** +4   **c)** −4   **d)** −9

11. $(-30) \div (-5) = +6$; 6 hours

12. Answers will vary. For example:
A stock dropped 18 points steadily over 3 days. How much did it drop each day?
$(-18) \div (+3) = -6$; 6 points

13. To go from 0 to +64 take steps backwards of size 8. It will take 8 steps and you will face the negative direction. $(+64) \div (-8) = -8$

2.4 Developing Rule to Divide Integers, page 87

4.a) Negative   **b)** Positive
   c) Negative   **d)** Positive

5.a) +3   **b)** +5   **c)** −2   **d)** −9   **e)** −9
   f) +8   **g)** −14   **h)** −9   **i)** +9   **j)** +8

6.a) $(0) \div (+3) = 0$; $(+3) \div (+3) = +1$;
$(+6) \div (+3) = +2$; $(+9) \div (+3) = +3$
The quotient of two integers with opposite signs is negative.
The quotient of two integers with the same signs is positive.
   b) $(-15) \div (+3) = -5$; $(-25) \div (+5) = -5$;
$(-35) \div (+7) = -5$; $(-45) \div (+9) = -5$
The quotient of two integers with opposite signs is negative.
   c) $(0) \div (+2) = 0$; $(-2) \div (+2) = -1$;
$(-4) \div (+2) = -2$; $(-6) \div (+2) = -3$
The quotient of two integers with opposite signs is negative.
The quotient of two integers with the same signs is positive.
   d) $(-2) \div (-1) = +2$; $(-6) \div (-3) = +2$;
$(-10) \div (-5) = +2$; $(-14) \div (-7) = +2$
The quotient of two integers with the same signs is positive.
   e) $(+2) \div (-1) = -2$; $(+6) \div (-3) = -2$;
$(+10) \div (-5) = -2$; $(+14) \div (-7) = -2$
The quotient of two integers with opposite signs is negative.
   f) $(+10) \div (-5) = -2$; $(+15) \div (-5) = -3$;
$(+20) \div (-5) = -4$; $(+25) \div (-5) = -5$
The quotient of two integers with opposite signs is negative.
The quotient of two integers with the same signs is positive.

7.a) i) +8　　**ii)** –5　　**iii)** –7
　b) i) $(+24) \div (+8) = +3$ **ii)** $(+45) \div (-5) = -9$
　　iii) $(-28) \div (-7) = +4$
8.a) $(-30) \div (-6) = +5$ and $(-30) \div (+5) = -6$
　b) $(+42) \div (+7) = +6$ and $(+42) \div (+6) = +7$
　c) $(-36) \div (+9) = -4$ and $(-36) \div (-4) = +9$
　d) $(+32) \div (-4) = -8$ and $(+32) \div (-8) = -4$
9.a) +4　　**b)** –3　　**c)** –9　　**d)** 0
10.a) +5　　**b)** –90　　**c)** +9　　**d)** –21
　e) –60　　**f)** +49　　**g)** –48　　**h)** +44
11.a) $(-56) \div (-7)$　　**b)** +8; 8 days
12.a) $(-15) \div (+5)$ **b)** –3; Dropped 3°C per day
13. $11
14.a) $(-24) \div (-6)$　　**b)** +4; 4 performances
15.a) +81, –243, +729; Multiply by –3.
　b) +30, –36, +42; Add +6 and multiply by –1.
　c) –40, –160, +80; Alternately multiply by +4,
　　divide by –2.
　d) +8, –4, +2; Divide by –2.
　e) –100, +10, –1; Divide by –10.
16.a) When the dividend is positive and the divisor is
　　greater than the quotient; $(+8) \div (+4) = +2$
　b) When the dividend and divisor are negative;
　　$(-8) \div (-4) = +2$
　c) When the dividend is positive and the divisor is
　　less than the quotient; $(+8) \div (+2) = +4$
　d) When the dividend and divisor are equal and
　　non-zero; $(+8) \div (+8) = +1$
　e) When the dividend and divisor are opposite
　　integers; $(+8) \div (-8) = -1$
　f) When the dividend is 0 and the divisor is
　　non-zero; $0 \div (-4) = 0$
17. $(-32) \div (-1) = +32$; $(-32) \div (+1) = -32$
　$(-32) \div (-2) = +16$; $(-32) \div (+2) = -16$
　$(-32) \div (-4) = +8$; $(-32) \div (+4) = -8$
　$(-32) \div (-8) = +4$; $(-32) \div (+8) = -4$
　$(-32) \div (-16) = +2$; $(-32) \div (+16) = -2$
　$(-32) \div (-32) = +1$; $(-32) \div (+32) = -1$
18.a) –5　　**b)** +6 **c)** –7　　**d)** +4 **e)** +4　　**f)** –5
19. +$9
20. Answers may vary. For example:
　A squirrel had 78 acorns and ate 13 each week.
　How many weeks ago did the squirrel have 78
　acorns? $(+78) \div (-13) = -6$; 6 weeks ago
21.a) 2°C/hour
　b) The temperature must have been less than
　　–20°C.
22. –2, +2, +4; –6, +6, +4; –8, +8, +4; –4, +2, +6;
　–6, +2, +8
23. $(-36) \div (+1) = -36$; $(-36) \div (-1) = +36$
　$(-36) \div (+2) = -18$; $(-36) \div (-2) = +18$
　$(-36) \div (+3) = -12$; $(-36) \div (-3) = +12$
　$(-36) \div (+4) = -9$; $(-36) \div (-4) = +9$
　$(-36) \div (+6) = -6$; $(-36) \div (-6) = +6$
　$(-36) \div (+9) = -4$; $(-36) \div (-9) = +4$
　$(-36) \div (+12) = -3$; $(-36) \div (-12) = +3$

$(-36) \div (+18) = -2$; $(-36) \div (-18) = +2$
$(-36) \div (+36) = -1$; $(-36) \div (-36) = +1$
–36 is not a square number; Each pair of factors
has opposite signs.
24. Represent the mean with the division equation:
　$(-140) \div (+7) = -20$
　Find 7 numbers whose sum is –140. Use guess
　and check.

2.5 Order of Operations with Integers, page 92

3.a) Multiply　　**b)** Divide　　**c)** Add
　d) Add　　**e)** Multiply　　**f)** Divide
4.a) 10 **b)** 7 **c)** 4　　**d)** –4 **e)** –12 **f)** 9
5. No; Elijah added before subtracting
　Correct answer: –24
6.a) i) 0　　　　　　**ii)** 6
　b) The brackets are in different positions.
7.a) Multiply; 23　　**b)** Add; –18
　c) Multiply; 25　　**d)** Multiply; –14
　e) Divide numbers in brackets; –3
　f) Divide; –54
8.a) –15 **b)** 10 **c)** 2　　**d)** 14 **e)** 10　　**f)** 14
9.a) –5　　**b)** 1　　**c)** –2　　**d)** –1
10.a) 8　　**b)** 2　　**c)** –4　　**d)** –2
11.a) Robert
　b) Christian calculated $(-8) \div 2$ to be +4 instead of
　　–4. Brenna subtracted $(-40) - 2$ first.
12.a) –8; $-20 \div [2 - (-2)]$
　b) –19; $[(-21) + 6] \div 3$
　c) 9; $10 + 3 \times [2 - 7]$
13. $405 + 4(-45)$; $225
14. Answers may vary. For example:
　a) $(-4) + (-4) + (-4)$　　**b)** $(-4) - (-4) + (-4)$
　c) $(-4)[(-4) - (-4)]$　　**d)** $(-4) \div (-4) + (-4)$
　e) $(-4) \div (-4) - (-4)$　　**f)** $\dfrac{(-4) + (-4)}{-4}$
15. –5°C
16.a) $[(-24) + 4] \div (-5) = 4$
　b) $[(-4) + 10] \times (-2) = -12$
　c) $[(-10) - 4] \div (-2) = 7$
17.a) $(-10) \times (-2) + 1 = 21$
　b) $(-5) - (-2) + 4 = 1$ **c)** $6 \times (-7) - 2 = -44$
　d) $(-2)(-2) - 8 = -4$

Unit 2 Strategies for Success: Understanding the Problem, page 95

1. Answers may vary. For example:
　$1 - 5 = -4$; $2 - 6 = -4$; $3 - 7 = -4$; $4 - 8 = -4$
2. $(-5) + [(+4) - (-2) \div (-1)] \times (-3) = -11$
3. 10°C

Unit 2 Unit Review, page 97

1.a) $(-1) + (-1) = -2$　　**b)** $(+9) + (+9) = +18$
　c) $(-3) + (-3) + (-3) = -9$
　d) $(+7) + (+7) + (+7) = +21$

2.a) +35 **b)** –60 **c)** –16 **d)** +48
3. –10°C
4.a) Negative **b)** Positive
  c) Negative **d)** Positive
5.a) –63 **b)** +28 **c)** –143
  d) +880 **e)** –17 **f)** 0
6.a) –6 **b)** +10 **c)** 0 **d)** +15
7. $(-55) \times 6 = -330$; 330 mL
8. Answers will vary. For example:
  Jari spends \$7 on lunch at school. How much
  does it cost him to buy lunch for 5 school days?
  $(+5) \times (-7) = -35$; \$35
9.a) +5 **b)** –4 **c)** –3 **d)** +9
10.a) –6 **b)** +7 **c)** –7 **d)** +5
11.a) 13 weeks **b)** $(-65) \div (-5) = +13$
  c) Tyler has \$65 to withdraw.
12.a) Negative **b)** Positive
  c) Negative **d)** Positive
13.a) +8 **b)** –8 **c)** –11 **d)** +14
14.a) +9 **b)** –4 **c)** –3 **d)** 0
15.a) –2 **b)** –3 **c)** +5 **d)** +9
16.a) $(-63) \div (-3)$ **b)** +21; 21 days
  c) She does not return any of the candies to the
    jar.
17. Answers may vary. For example:
  Renira returned 9 glasses to a store. She received
  \$72 in store credit. What was the average cost of
  a glass? $(+72) \div (-9) = -8$; \$8
18. $(-21) \div (-1) = +21$; $(-21) \div (+1) = -21$
  $(-21) \div (-3) = +7$; $(-21) \div (+3) = -7$
  $(-21) \div (-7) = +3$; $(-21) \div (+7) = -3$
  $(-21) \div (-21) = +1$; $(-21) \div (+21) = -1$
19.a) Multiply **b)** Divide
  c) Subtract **d)** Multiply
20.a) 16 **b)** –1 **c)** 2 **d)** 12
21.a) –16 **b)** –1 **c)** 12 **d)** –18
22.a) 3 **b)** –3 **c)** –4
23.a) +1 **b)** +2 **c)** +6
24.a) Corey: +1; Suzanne: –2 **b)** Corey

Unit 2 Practice Test, page 99

1.a) +90 **b)** –66 **c)** –6 **d)** +13
  e) –48 **f)** –4 **g)** +11 **h)** +5
2.a) +98 **b)** –3 **c)** –4 **d)** +21
3. –20°C
4.a) Receive \$90 **b)** Spend \$105
  c) Receive \$63
5.a) Answers may vary. For example:
    –2 and +1, +2 and –1
  b) +3 and +4 **c)** –2 and –1 **d)** +4 and –1
  e) Answers may vary. For example: Find all pairs
    of integers with a difference of –2.
    +2 and +4, 0 and +2, –2 and 0, +1 and +3,
    –1 and +1

Unit 2 Unit Problem: Charity Golf Tournament, page 100

1.a) $3(0) + 2(+1) + (-1) + 2(-2) + (+2)$
  b) –1 or 1 under par
2.a) 4, 4, 4, 2, 3 **b)** 31 **c)** –1 or 1 under par
3.a) Kyle: 35 **b)** Delaney: 28
  c) Hamid: 26
4.a) Hamid, Hanna, Delaney, Chai Kim, Kyle,
    Weng Kwong
  b) Hamid; –6
  c) Hanna and Delaney; –5 and –4

Unit 3 Operations with Fractions, page 102

3.1 Using Models to Multiply Fractions and Whole Numbers, page 108

5.a) $\frac{5}{9} \times 45$; $45 \times \frac{5}{9}$ **b)** $\frac{3}{8} \times 32$; $32 \times \frac{3}{8}$
  c) $\frac{1}{12} \times 36$; $36 \times \frac{1}{12}$ **d)** $\frac{4}{5} \times 25$; $25 \times \frac{4}{5}$
6.a) $3 \times \frac{1}{4}$; $\frac{1}{4} \times 3$ **b)** $7 \times \frac{2}{5}$; $\frac{2}{5} \times 7$
  c) $4 \times \frac{3}{10}$; $\frac{3}{10} \times 4$
7.a) $\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3}$ **b)** 4
  c)
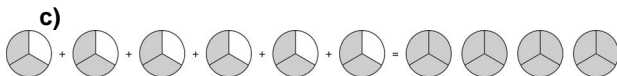
  d) $\frac{2}{3} \times 6 = 4$
8.a) $4 \times \frac{4}{5} = 3\frac{1}{5}$ **b)** $9 \times \frac{1}{2} = 4\frac{1}{2}$
  c) $3 \times \frac{5}{6} = 2\frac{1}{2}$
9.a) $5 \times \frac{1}{2} = \frac{5}{2}$ **b)** $4 \times \frac{3}{4} = 3$
10.a) $4 \times \frac{1}{2} = 2$ **b)** $5 \times \frac{2}{3} = 3\frac{1}{3}$
11.a) $5 \times \frac{1}{8} = \frac{5}{8}$
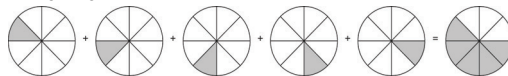
  b) $\frac{2}{5} \times 3 = 1\frac{1}{5}$

  c) $4 \times \frac{5}{12} = 1\frac{2}{3}$
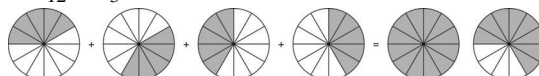
12.a) 12 **b)** 8 **c)** 6 **d)** 4 **e)** 3 **f)** 2
13.a) 24 **b)** 16 **c)** 18 **d)** 20 **e)** 9 **f)** 10

14.a) $1\dfrac{5}{7}$
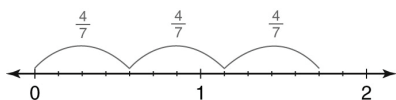
b) $1\dfrac{1}{3}$
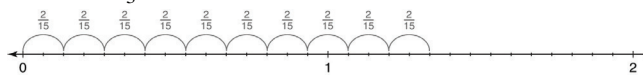
c) 9
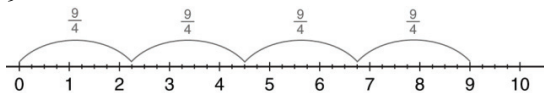
d) $2\dfrac{4}{5}$
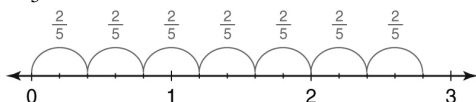
15.a) 4

b) 3
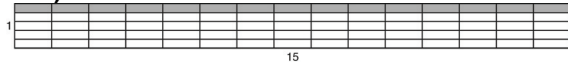
c) 9
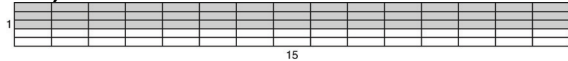
d) 6
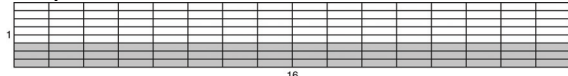
16.a) $2\dfrac{2}{5}$ **b)** $3\dfrac{8}{9}$ **c)** 10 **d)** $2\dfrac{1}{2}$ **e)** $10\dfrac{1}{2}$ **f)** $4\dfrac{1}{2}$
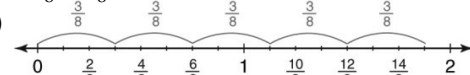
17. $24\times\dfrac{2}{3}=16$; 16 hours

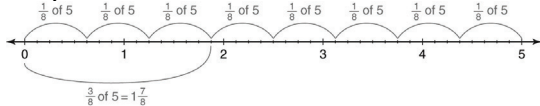**18.a)** For example: Jerry ordered 5 pizzas for his birthday party. $\dfrac{3}{8}$ of each pizza is left over. How much pizza is left over in total?

$5\times\dfrac{3}{8}=1\dfrac{7}{8}$

b)

c)

19. For example: Parri only likes black jelly beans. At Halloween she receives 16 packets of jelly beans, each containing 3 black jelly beans and 5 jelly beans of other colours. How many packets of jelly beans will she eat? $\dfrac{3}{8}\times16=6$

20. $\dfrac{4}{7}\times28=16$; She spent $16 on rides.

21.a) i) 1   **ii)** 1   **iii)** 1   **iv)** 1

b) The product of a number and its reciprocal is 1.

c) For example: $6\times\dfrac{1}{6}=1; 37\times\dfrac{1}{37}=1$

22. $4\dfrac{1}{2}$ hours

3.2 Using Models to Multiply Fractions, page 113

5.a) 1   **b)** 3   **c)** 20   **d)** 3   **e)** $\dfrac{3}{20}$

6.a) $\dfrac{3}{8}$ **b)** $\dfrac{1}{2}$ **c)** $\dfrac{1}{5}$ **d)** $\dfrac{5}{12}$ **e)** $\dfrac{21}{40}$ **f)** $\dfrac{3}{5}$

7.a) $\dfrac{3}{5}$ **b)** $\dfrac{4}{9}$ **c)** $\dfrac{1}{6}$ **d)** $\dfrac{2}{9}$ **e)** $\dfrac{5}{12}$ **f)** $\dfrac{1}{2}$

8.a) $\dfrac{15}{32}$ **b)** $\dfrac{8}{45}$ **c)** $\dfrac{1}{6}$ **d)** $\dfrac{4}{7}$ **e)** $\dfrac{2}{9}$ **f)** $\dfrac{16}{25}$

9. For example:

$\dfrac{1}{7}\times\dfrac{2}{5}=\dfrac{2}{35}$; $\dfrac{3}{4}\times\dfrac{7}{8}=\dfrac{21}{32}$; $\dfrac{2}{7}\times\dfrac{8}{11}=\dfrac{16}{77}$

10.a) $\dfrac{3}{5}\times\dfrac{1}{2}=\dfrac{3}{10}$ **b)** $\dfrac{6}{8}\times\dfrac{1}{3}=\dfrac{1}{4}$

   c) $\dfrac{1}{3}\times\dfrac{3}{4}=\dfrac{1}{4}$ **d)** $\dfrac{4}{5}\times\dfrac{2}{3}=\dfrac{8}{15}$

11. $\dfrac{1}{4}$

12.a) i) $\dfrac{3}{10}$ **ii)** $\dfrac{3}{10}$ **iii)** $\dfrac{3}{32}$

   iv) $\dfrac{3}{32}$ **v)** $\dfrac{2}{5}$ **vi)** $\dfrac{2}{5}$

b) Switching the numerators of 2 fractions does not change the product.

c) For example: $\dfrac{1}{7}\times\dfrac{5}{8}=\dfrac{5}{56}, \dfrac{5}{7}\times\dfrac{1}{8}=\dfrac{5}{56}$;

$\dfrac{3}{11}\times\dfrac{1}{2}=\dfrac{3}{22}, \dfrac{3}{2}\times\dfrac{1}{11}=\dfrac{3}{22}$

13.a) $\dfrac{1}{6}$ **b)** $\dfrac{1}{2};\dfrac{1}{6}$ **c)** $\dfrac{1}{10};\dfrac{3}{10}$

14. For example: Gwen conducted an experiment involving $\dfrac{4}{9}$ of the lab rats at her school. Of the rats she used, $\dfrac{1}{5}$ were female. What fraction of the rats used were female? $\dfrac{4}{9}\times\dfrac{1}{5}=\dfrac{4}{45}$

15. $\dfrac{2}{7}\times\dfrac{7}{8}=\dfrac{1}{4}$

16. $\dfrac{5}{8}\times\dfrac{3}{12}=\dfrac{5}{32}$ $\dfrac{3}{8}\times\dfrac{5}{12}=\dfrac{5}{32}$
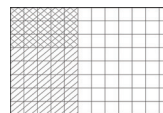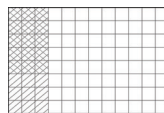
17.a) 3 of 5 parts making up the whole are shaded.

b) To show $\frac{5}{3}$ of $\frac{3}{5}$ you need to shade $\frac{5}{3}$ of the $\frac{3}{5}$ already shaded. Since $\frac{5}{3}$ is all 5 parts of the whole, one whole is $\frac{5}{3}$ of $\frac{3}{5}$.

3.3 Multiplying Fractions, page 118

4.a) 2, 4 **b)** 7 **c)** 2, 4, 8
d) 3 **e)** 5 **f)** 2, 3, 6

5.a) $\frac{1}{8}$

b) $\frac{5}{6}$ is about 1, $\frac{3}{20}$ is about 0; so $\frac{5}{6} \times \frac{3}{20}$ is close to 0.

c) Yes; $\frac{1}{8}$ is close to 0.

6. $\frac{3}{16}$

7.a) $\frac{6}{5}$ **b)** $\frac{3}{10}$ **c)** 1 **d)** $\frac{1}{3}$ **e)** $\frac{5}{6}$ **f)** $\frac{3}{2}$

8.a) $\frac{2}{5}$ **b)** $\frac{1}{4}$ **c)** $\frac{1}{24}$ **d)** $\frac{39}{16}$ **e)** $\frac{11}{8}$ **f)** $\frac{49}{24}$

9.a) $\frac{3}{32}$ **b)** $\frac{1}{6}$

10. For example: Amanda ate $\frac{1}{8}$ of a pizza. Her clumsy friend Cody dropped $\frac{1}{2}$ of the remaining pizza on the floor. How much pizza is left?
$\frac{7}{8} \times \frac{1}{2} = \frac{7}{16}$

11. $\frac{3}{8}$

12.a) i) 1 **ii)** 1 **iii)** 1 **iv)** 1
b) For example: $\frac{3}{8} \times \frac{8}{3} = 1$, $\frac{8}{9} \times \frac{9}{8} = 1$, $\frac{13}{6} \times \frac{6}{13} = 1$
The product of a fraction and its reciprocal is 1.

13. Answers may vary. For example:
a) i) $\frac{3}{2} \times \frac{4}{3} = 2$ **ii)** $\frac{12}{5} \times \frac{5}{4} = 3$
iii) $\frac{5}{4} \times \frac{16}{5} = 4$ **iv)** $\frac{15}{2} \times \frac{2}{3} = 5$
b) $\frac{7}{20} \times \frac{20}{7} = 1$
i) $\frac{7}{10} \times \frac{20}{7} = 2$ **ii)** $\frac{7}{20} \times \frac{60}{7} = 3$
iii) $\frac{7}{5} \times \frac{20}{7} = 4$ **iv)** $\frac{35}{20} \times \frac{20}{7} = 5$

14. $\frac{1}{3}$ and $\frac{1}{4}$

15.a) $\frac{9}{40}$ **b)** $\frac{6}{13}$ **c)** $\frac{3}{8}$ **d)** $\frac{4}{13}$

16.a) i) $\frac{24}{25} \times \frac{85}{86} = \frac{1 \times 17}{5 \times 4} = \frac{17}{20}$

ii) $\frac{24}{25} \times \frac{85}{96} = \frac{2040}{2400} = \frac{17}{20}$

17. For example: $\frac{1}{2} \times \frac{3}{2}$ **18.** $\frac{1}{6}$ **19.** $\frac{10}{9}$

20. b; $\frac{4}{7} \times \frac{3}{5} = \frac{12}{35}$

21.a) $\frac{2}{3}$ **b)** $\frac{4}{5}$ **c)** $\frac{2}{3}$ **d)** $\frac{7}{13}$

3.4 Multiplying Mixed Numbers, page 125

4.a) $3\frac{1}{2}; \frac{7}{2}$ **b)** $2\frac{1}{5}; \frac{11}{5}$ **c)** $1\frac{6}{7}; \frac{13}{7}$

5.a) $\frac{23}{10}$ **b)** $\frac{33}{8}$ **c)** $\frac{23}{6}$ **d)** $\frac{5}{3}$ **e)** $\frac{17}{5}$
f) $\frac{11}{2}$ **g)** $\frac{18}{7}$ **h)** $\frac{32}{9}$ **i)** $\frac{20}{3}$

6.a) $3\frac{2}{3}$ **b)** $3\frac{3}{4}$ **c)** $4\frac{1}{5}$ **d)** $1\frac{3}{8}$ **e)** $3\frac{1}{6}$
f) $4\frac{3}{7}$ **g)** $5\frac{1}{2}$ **h)** $4\frac{3}{10}$ **i)** $4\frac{5}{8}$

7.a) 8 **b)** 8 **c)** 21 **d)** 15

8.a) 8 **b)** $\frac{18}{5} \times \frac{20}{9}$ **c)** 8
d) Yes; Estimate and answer are the same.

9. a) $6\frac{3}{4}$ **b)** $8\frac{1}{2}$ **c)** $3\frac{1}{3}$ **d)** $9\frac{3}{5}$

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

11.a) 5 **b)** $14\frac{1}{6}$ **c)** $3\frac{7}{9}$ **d)** 8 **e)** 6 **f)** $4\frac{1}{5}$

12.a) $4\frac{3}{8}$ **b)** $8\frac{1}{15}$ **c)** $5\frac{15}{32}$
d) $14\frac{1}{16}$ **e)** $3\frac{11}{25}$ **f)** $2\frac{11}{40}$

13.a) $35\frac{1}{4}$ **b)** \$35.25

14. $6\frac{5}{12}$ h or 6 h 25 min

15. For example: Josh spends $3\frac{1}{2}$ hours on his phone every week. Mark spends $2\frac{1}{8}$ as much time on the phone as Josh. How much time does Mark spend on the phone in a week? $7\frac{7}{16}$ hours

16. 7 innings

17.a) Layton: 5; Meghan and Josh: $12\frac{1}{2}$
b) $5\frac{5}{12}$ **c)** $13\frac{1}{3}$ **d)** $21\frac{1}{4}$ **e)** 255
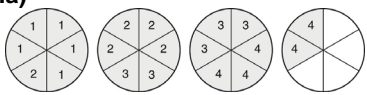
18. Least product: a; Greatest product: d

19.a) $16\frac{8}{27}$ **b)** $12\frac{3}{8}$ **c)** $11\frac{13}{16}$

1.a) $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}=\frac{1}{2}$

  b) $\frac{3}{5}+\frac{3}{5}+\frac{3}{5}+\frac{3}{5}+\frac{3}{5}+\frac{3}{5}+\frac{3}{5}=4\frac{1}{5}$

  c) $\frac{5}{6}+\frac{5}{6}+\frac{5}{6}=2\frac{1}{2}$

  d) $\frac{2}{9}+\frac{2}{9}+\frac{2}{9}+\frac{2}{9}+\frac{2}{9}+\frac{2}{9}=1\frac{1}{3}$

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

3.a) 14 **b)** 2 **c)** $\frac{1}{8}$

4.a) $\frac{5}{16}$ **b)** $\frac{1}{2}$ **c)** $\frac{2}{5}$ **d)** $\frac{1}{4}$

5.a) $\frac{2}{9}$ **b)** $\frac{4}{15}$ **c)** $\frac{6}{11}$ **d)** $\frac{1}{3}$

6.a) $\frac{1}{3}$ **b)** $\frac{1}{5}$ **c)** $\frac{9}{32}$ **d)** $\frac{10}{27}$

7. $\frac{2}{15}$

8.a) 5 **b)** $8\frac{1}{3}$ **c)** $1\frac{25}{32}$ **d)** $8\frac{1}{4}$

9.a) $8\frac{1}{8}$ **b)** $1\frac{1}{10}$ **c)** $2\frac{4}{5}$ **d)** $14\frac{7}{16}$

11. $4\frac{1}{2}$ h

3.5 Dividing Whole Numbers with Fractions, page 132

3.a) $4\div\frac{1}{3}=12$ **b)** $3\div\frac{1}{6}=18$

  c) $4\div\frac{2}{3}=6$ **d)** $3\div\frac{3}{5}=5$

4.a)

  b) $4;\ \frac{4}{6}$ **c)** $\frac{4}{5}$ **d)** $4\div\frac{5}{6}=4\frac{4}{5}$

5. 5 subjects

6.a) 4 **b)** 9 **c)** 16 **d)** 12 **e)** 6 **f)** 8

7. Answers may vary. For example:

  a) $3\div\frac{1}{4}=12;\ 3\div\frac{3}{4}=4;\ 3\div1\frac{1}{2}=2$

  b) $2\div\frac{1}{5}=10;\ 2\div\frac{2}{5}=5;\ 2\div\frac{10}{5}=1$

  c) $4\div\frac{1}{6}=24;\ 4\div\frac{1}{3}=12;\ 4\div\frac{4}{3}=3$

8.a) i) 6 **ii)** 3

  b) i) 12 **ii)** 6 **iii)** 4

  c) i) $\frac{1}{4}$ **ii)** $\frac{1}{8}$ **iii)** $\frac{1}{16}$

9.a) $7\frac{1}{2}$ **b)** $5\frac{1}{3}$ **c)** $\frac{1}{10}$ **d)** $\frac{5}{16}$

10.a) 20 **b)** 9 **c)** 15

11.a) $\frac{3}{20}$ **b)** 12 **c)** $\frac{11}{60}$

12.a) $2\div\frac{4}{6}=3;\ 2\div\frac{6}{4}=1\frac{1}{3}$

  $4\div\frac{2}{6}=12;\ 4\div\frac{6}{2}=1\frac{1}{3}$

  $6\div\frac{2}{4}=12;\ 6\div\frac{4}{2}=3$

  b) $4\div\frac{2}{6}$ and $6\div\frac{2}{4}$ both have the greatest quotient of 12. $2\div\frac{6}{4}$ and $4\div\frac{6}{2}$ both have the least quotient of $1\frac{1}{3}$.

13. No

  $\frac{2}{3}\div4=\frac{1}{6}$

  $4\div\frac{2}{3}=6$
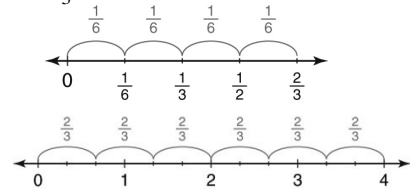
14.a) 24 **b)** $\frac{1}{24}$

  c) The quotients are reciprocals.

15. $\frac{25}{4}-5=\frac{25}{4}\div5=1\frac{1}{4}$

  $\frac{49}{6}-7=\frac{49}{6}\div7=1\frac{1}{6}$

  The numerator is the square of the whole number. The denominator is one less than the whole number.

3.6 Dividing Fractions, page 139

4.a) $\frac{9}{5}$ **b)** $\frac{7}{3}$ **c)** $\frac{8}{7}$ **d)** $\frac{15}{14}$

5.a) 2
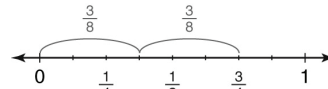
  b) 4
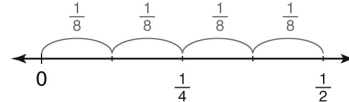
  c) 2
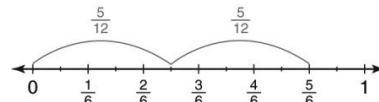
6.a) $\frac{10}{9}$ **b)** $\frac{3}{5}\times\frac{10}{9}=\frac{1\times2}{1\times3}=\frac{2}{3}$ **c)** 1

  d) Yes; $\frac{2}{3}$ is close to 1.

7.a) $2\frac{1}{2}$

  b) $2\frac{1}{4}$

c) $2\frac{1}{3}$

one $\frac{1}{3}$ one $\frac{1}{3}$ $\frac{1}{3}$ of $\frac{1}{3}$

0       $\frac{7}{9}$ 1

d) $2\frac{1}{2}$

one $\frac{1}{4}$ one $\frac{1}{4}$ $\frac{1}{2}$ of $\frac{1}{4}$

0       $\frac{5}{8}$ 1
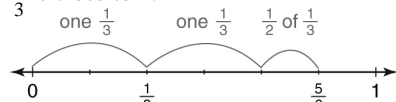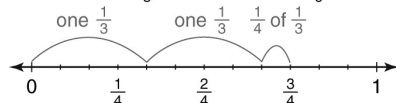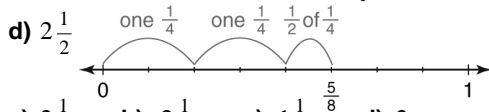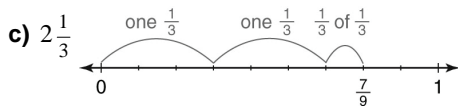
8.a) $2\frac{1}{3}$ **b)** $2\frac{1}{2}$ **c)** $1\frac{1}{2}$ **d)** 2

9.a) $2\frac{2}{15}$ **b)** $\frac{27}{50}$ **c)** $2\frac{5}{8}$ **d)** $\frac{3}{7}$

10.a) $2\frac{1}{3}$ **b)** $\frac{6}{11}$ **c)** $7\frac{1}{2}$ **d)** $\frac{20}{27}$

11.a) $2\frac{7}{9}$ **b)** 1 **c)** $\frac{1}{15}$

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

13.a) i) $\frac{6}{5}$ **ii)** $\frac{5}{6}$ **iii)** $\frac{35}{24}$

iv) $\frac{24}{35}$ **v)** $\frac{25}{12}$ **vi)** $\frac{12}{25}$

b) When you switch the divisor with the dividend, the quotient is the reciprocal of the original quotient.

$\frac{6}{5} \div \frac{2}{3} = \frac{9}{5}; \frac{2}{3} \div \frac{6}{5} = \frac{5}{9}$

$\frac{4}{7} \div \frac{1}{3} = \frac{12}{7}; \frac{1}{3} \div \frac{4}{7} = \frac{7}{12}$

14. 8

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

16. 12

17.a) $\frac{2}{3} \div \frac{4}{5} = \frac{5}{6}; \frac{3}{2} \div \frac{4}{5} = 1\frac{7}{8}; \frac{2}{3} \div \frac{5}{4} = \frac{8}{15}; \frac{3}{2} \div \frac{5}{4} = 1\frac{1}{5}$

$\frac{2}{5} \div \frac{3}{4} = \frac{8}{15}; \frac{5}{2} \div \frac{3}{4} = 3\frac{1}{3}; \frac{2}{5} \div \frac{4}{3} = \frac{3}{10}; \frac{5}{2} \div \frac{4}{3} = 1\frac{7}{8}$

$\frac{2}{4} \div \frac{3}{5} = \frac{5}{6}; \frac{4}{2} \div \frac{3}{5} = 3\frac{1}{3}; \frac{2}{4} \div \frac{5}{3} = \frac{3}{10}; \frac{4}{2} \div \frac{5}{3} = 1\frac{1}{5}$

$\frac{4}{5} \div \frac{2}{3} = 1\frac{1}{5}; \frac{4}{5} \div \frac{3}{2} = \frac{8}{15}; \frac{5}{4} \div \frac{2}{3} = 1\frac{7}{8}; \frac{5}{4} \div \frac{3}{2} = \frac{5}{6}$

$\frac{3}{4} \div \frac{2}{5} = 1\frac{7}{8}; \frac{3}{4} \div \frac{5}{2} = \frac{3}{10}; \frac{4}{3} \div \frac{2}{5} = 3\frac{1}{3}; \frac{4}{3} \div \frac{5}{2} = \frac{8}{15}$

$\frac{3}{5} \div \frac{2}{4} = 1\frac{1}{5}; \frac{3}{5} \div \frac{4}{2} = \frac{3}{10}; \frac{5}{3} \div \frac{2}{4} = 3\frac{1}{3}; \frac{5}{3} \div \frac{4}{2} = \frac{5}{6}$

b) $\frac{5}{2} \div \frac{3}{4}, \frac{4}{2} \div \frac{3}{5}, \frac{4}{3} \div \frac{2}{5}$, and $\frac{5}{3} \div \frac{2}{4}$ all have the greatest quotient of $3\frac{1}{3}$.

$\frac{2}{4} \div \frac{5}{3}, \frac{3}{5} \div \frac{4}{2}, \frac{2}{5} \div \frac{4}{3}$, and $\frac{3}{4} \div \frac{5}{2}$ all have the least quotient of $\frac{3}{10}$.

18. For example: Tahoe has $\frac{7}{8}$ of a bag of chips he wants to share with his friends. Each serving of chips should be $\frac{1}{4}$ of a bag. How many servings are there? $3\frac{1}{2}$

19.a) $\frac{3}{4}$ **b)** $\frac{5}{4}$ **c)** $\frac{5}{9}$ **d)** $\frac{9}{7}$

20. Answers will vary. For example:

$\frac{3}{5} \div \frac{4}{5}; \frac{6}{11} \div \frac{5}{9}; \frac{1}{2} \div \frac{3}{4}$

3.7 Dividing Mixed Numbers, page 145

4.a) $\frac{35}{8}$ **b)** $\frac{23}{7}$ **c)** $\frac{37}{6}$ **d)** $\frac{9}{4}$

e) $\frac{17}{10}$ **f)** $\frac{23}{3}$ **g)** $\frac{23}{9}$ **h)** $\frac{27}{5}$

5.a) $1\frac{5}{9}$ **b)** $2\frac{2}{7}$ **c)** $4\frac{4}{5}$ **d)** $2\frac{1}{10}$

e) $2\frac{1}{2}$ **f)** $3\frac{2}{7}$ **g)** $5\frac{2}{3}$ **h)** $2\frac{1}{12}$

6.a) 2 **b)** 4 **c)** 1 **d)** 5

7.a) $\frac{2}{3}$ **b)** $\frac{9}{5} \div \frac{27}{10}$ **c)** $\frac{2}{3}$

d) Yes; The quotient and estimate are both $\frac{2}{3}$.

8.a) $3\frac{1}{3}$ **b)** $\frac{7}{26}$ **c)** 1 **d)** $\frac{3}{5}$

9.a) $1\frac{2}{5}$

one $1\frac{2}{3}$ $\frac{2}{5}$ of $1\frac{2}{3}$

0   1   2 $2\frac{1}{3}$ 3

b) $1\frac{1}{2}$

one $\frac{3}{4}$ $\frac{1}{2}$ of $\frac{3}{4}$

0   1 $1\frac{1}{8}$ 2
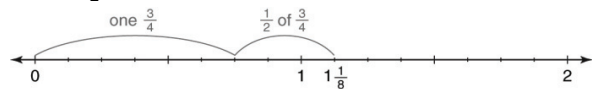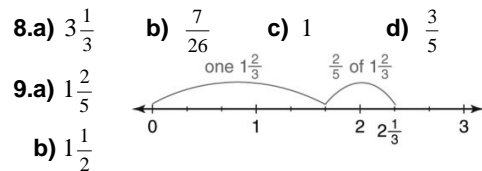
10.a) $\frac{44}{63}$ **b)** $3\frac{1}{3}$ **c)** $\frac{13}{36}$ **d)** 1

11.a) $\frac{57}{80}$ **b)** $1\frac{5}{28}$ **c)** $\frac{18}{35}$ **d)** 1

12. 10

13. $3\frac{1}{2}$ min

14.a) 7 **c)** $10\frac{5}{8} \div 1\frac{1}{2} = 7\frac{1}{12}$

d) Amelia can fill 7 planters and $\frac{1}{12}$ of another planter.

15. For example: Sharon has $4\frac{2}{3}$ pounds of cherries with which to make cherry tarts. Each tart requires $\frac{3}{5}$ of a pound of cherries. How many tarts can she make? $7\frac{7}{9}$ tarts

16. Greatest quotient: c; Least quotient: d

17.a) $4\frac{3}{8} \div 3\frac{2}{5}$ is a mixed number since the divisor is smaller than the dividend.

b) $\frac{175}{136}$; $\frac{136}{175}$ The quotients are reciprocals.

18. Parts a, b, and d have values less than $3\frac{1}{5}$. Parts c, e, and f have values greater than $3\frac{1}{5}$. Part f has a greater value than part e since $\frac{3}{2} > \frac{2}{3}$.

Calculate c and f:

c) $4\frac{4}{5}$ **f)** $4\frac{7}{10}$

So, c has the greatest value.

19.a) Instead of multiplying, divide by the reciprocal of the second fraction.

b) Answers may vary. For example: No, since drawing number lines to divide takes too long

3.8 Solving Problems with Fractions, page 151

3.a) Addition   **b)** Multiplication
c) Subtraction   **d)** Multiplication

4. $\frac{11}{12}$ cans; Addition

5. 40 goals; Division

6.a) $\frac{1}{2}$; Subtraction   **b)** 15; Multiplication

7. $\frac{7}{12}$ h; Subtraction

8. $960; Multiplication

9. 72 cm; Division

10. $\frac{5}{24}$; Subtraction

11.a) $\frac{1}{2}$ cup; Subtraction   **b)** $1\frac{1}{8}$ cups; Multiplication

c) $1\frac{23}{24}$ cups; Addition   **d)** $\frac{13}{24}$ cup; Subtraction

12. $\frac{1}{12}$; Multiplication

13. $\frac{3}{5}$; Subtraction, then multiplication

14. $\frac{17}{24}$; Division

15. The official was puzzled because the sum of $\frac{3}{8}, \frac{3}{5}$, and $\frac{1}{20}$ is greater than 1.

3.9 Order of Operations with Fractions, page 155

4.a) Subtraction   **b)** Multiplication
c) Division   **d)** Addition

5. Raj; Rena added before she multiplied.

6.a) $\frac{11}{20}$; Multiplication **b)** $2\frac{1}{3}$; Division

c) $1\frac{10}{21}$; Division   **d)** $\frac{1}{48}$; Subtraction

e) $1\frac{1}{3}$; Division   **f)** $\frac{8}{9}$; Addition

7.a) $\frac{3}{16}$ **b)** $1\frac{5}{8}$ **c)** $1\frac{2}{3}$ **d)** $1\frac{3}{8}$

8. No; In the first equation you divide first, and in the second equation you multiply first.

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

10.a) 4   **b)** $\frac{1}{18}$

11.a) Myra

b) Robert solved $\left(\frac{3}{4} - \frac{1}{2}\right) + \frac{13}{6} \times \frac{1}{2}$ then multiplied by 4. Joe solved $\left(\frac{3}{4} - \frac{1}{2}\right) + \frac{13}{6}$ before multiplying.

12.a) $2\frac{7}{8}$ **b)** $1\frac{5}{8}$ **c)** $5\frac{11}{15}$

Unit 3 Strategies for Success: Checking and Reflecting, page 157

1.a) 3   **b)** $\frac{2}{5}$ **c)** $2\frac{11}{12}$ **d)** $\frac{3}{4}$

2. 12 glasses

3. $\frac{5}{6}$ h

Unit 3 Unit Review, page 159

1.a) $6 \times \frac{2}{5} = 2\frac{2}{5}$ **b)** $3 \times \frac{6}{7} = 2\frac{4}{7}$

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

3.a) 18   **b)** 4   **c)** 50   **d)** $1\frac{1}{2}$

4.a) $\frac{1}{4}$ **b)** $\frac{6}{25}$ **c)** $\frac{21}{40}$ **d)** $\frac{1}{7}$

5. $\frac{3}{20}$

6.a) $\frac{3}{20}$ **b)** $\frac{3}{40}$ **c)** $\frac{7}{20}$ **d)** $\frac{4}{21}$

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

8. For example: $\frac{5}{7}$ of a litter of mice are grey with white patches. The other $\frac{2}{7}$ are black. Of the grey and white mice, $\frac{3}{8}$ are female. What fraction of the litter is grey, white, and female? $\frac{15}{56}$

9.a) $\frac{15}{2}$ **b)** $\frac{23}{8}$ **c)** $\frac{107}{10}$

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

11.a) $3\frac{1}{6}$ **b)** $2\frac{13}{16}$ **c)** $3\frac{3}{20}$ **d)** $8\frac{2}{3}$

12. $4\frac{1}{12}$ h assuming that he mows at the same rate

13.a) $\frac{1}{10}$ **b)** 12

14.a) $3\frac{3}{4}$ **b)** $4\frac{4}{5}$ **c)** $\frac{3}{20}$ **d)** $\frac{7}{8}$

15. 16 glasses

16. $13\frac{1}{2}$ loads

17. For example: $\frac{3}{4} \div 5 = \frac{3}{20} < 1$

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

19.a) 2 **b)** $\frac{2}{7}$ **c)** $1\frac{1}{4}$ **d)** $\frac{5}{6}$

20. $5\frac{1}{4}$

21. For example: $\frac{3}{5} \div \frac{5}{3} = \frac{9}{25} < 1$

22.a) $\frac{40}{11}$ **b)** $\frac{31}{6}$ **c)** $\frac{44}{9}$ **d)** $\frac{29}{12}$

23.a) $\frac{14}{17}$ **b)** $1\frac{49}{66}$ **c)** $2\frac{6}{11}$ **d)** $\frac{1}{2}$

24. $4\frac{3}{5}$

25. $\frac{1}{8}$

26. 882 tickets

27.a) $\frac{3}{10}$ **b)** 9 students

28.a) $\frac{3}{5}$; Multiplication **b)** $2\frac{2}{11}$; Subtraction

c) $2\frac{2}{5}$; Multiplication **d)** $\frac{3}{5}$; Division

29.a) $\frac{3}{4}$ **b)** $1\frac{3}{4}$ **c)** $\frac{1}{2}$ **d)** $\frac{5}{36}$

30. Carlton should have written $\frac{14}{5} \div \frac{9}{12} = \frac{14}{5} \times \frac{12}{9}$.

Correct answer: $3\frac{11}{15}$

Unit 3 Practice Test, page 162

1. 6 **2.** $\frac{5}{12}$

3.a) 7 **b)** $\frac{3}{16}$ **c)** $\frac{5}{12}$ **d)** $\frac{3}{10}$

4.a) $2\frac{1}{32}$ **b)** 7 **c)** $2\frac{4}{7}$ **d)** $\frac{14}{15}$

5.a) $\frac{1}{5}$

b) 30 since $\frac{3}{5}$ of 30 is 18 and $\frac{1}{3}$ of 30 is 10, which are both whole numbers

6.a) $1\frac{3}{4}$ **b)** $1\frac{7}{12}$ **c)** $3\frac{1}{9}$ **d)** $3\frac{1}{12}$

7. The product of a fraction and its reciprocal is 1.

For example: $\frac{7}{8} \times \frac{8}{7} = \frac{56}{56} = 1$

8.a) $\frac{2}{5}$ **b)** $2\frac{1}{8}$

9.a) About $4\frac{1}{2}$

b)
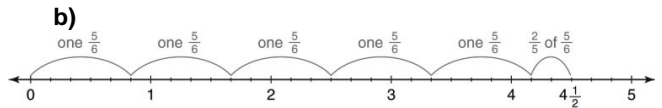
c) About 5
d) Each poodle takes the same amount of time to groom.

10.a) $\frac{7}{15}$ **b)** $\frac{1}{4}$

c) i) Yes **ii)** No; $\frac{1}{6}$ cups

11.a) No **b)** No **c)** Yes

Cumulative Review Units 1–3, page 167

1.a) i) 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84
ii) 1, 3, 7, 9, 21, 49, 63, 147, 441
iii) 1, 2, 4, 59, 118, 236
iv) 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 25, 30, 36, 45, 50, 60, 75, 90, 100, 150, 180, 225, 300, 450, 900

b) 441 and 900; Both have an odd number of factors.

2.a) 7.2 **b)** 7.9 **c)** 9.5 **d)** 8.7
3.a) 32.5 cm **b)** 27.5 cm
4.a) No; $16 + 8 \neq 30$ **b)** Yes; $16 + 8 = 24$
5.a) No; $2^2 + 5^2 \neq 6^2$ **b)** Yes; $6^2 + 8^2 = 10^2$
c) No; $9^2 + 7^2 \neq 12^2$ **d)** Yes; $18^2 + 24^2 = 30^2$
6. 5 cm
7. 31.1 m
8.a) -72 **b)** $+112$ **c)** $+18$ **d)** -126
9.a) $(+4) \times (-5)$ **b)** -20
10. For example: Paul withdraws \$5 from his account for 8 days. How much has he withdrawn in total? $(+8) \times (-5) = -40$; \$40
11.a) -11 **b)** $+21$ **c)** $+30$ **d)** -4 **e)** -17 **f)** 0
12.a) -7 **b)** $+5$ **c)** -6 **d)** $+7$
13.a) $(-52) \div (+4)$ **b)** -13; \$13
14. Answers will vary. For example:
a) i) $(-10) + (+2) = -8$ **ii)** $(+2) - (+10) = -8$
iii) $(-4) \times (+2) = -8$ **iv)** $(-16) \div (+2) = -8$
b) i) $(-4) + (+2) = -2$ **ii)** $(+1) - (+3) = -2$

iii) $(-1) \times (+2) = -2$ **iv)** $(-4) \div (+2) = -2$
c) i) $(-10) + (-2) = -12$ **ii)** $(+2) - (+14) = -12$
iii) $(-4) \times (+3) = -12$ **iv)** $(+24) \div (-2) = -12$
d) i) $(-7) + (+4) = -3$ **ii)** $(+7) - (+10) = -3$
iii) $(-1) \times (+3) = -3$ **iv)** $(+15) \div (-5) = -3$

15.a) -24 **b)** -32 **c)** -3

16.a) $2\frac{1}{3}$ **b)** $7\frac{1}{2}$ **c)** $2\frac{5}{8}$ **d)** $3\frac{4}{5}$

17.a) 28 **b)** $17\frac{1}{2}$ **c)** $\frac{25}{36}$

d) 6 **e)** $4\frac{1}{8}$ **f)** $13\frac{1}{5}$

18.a) 15 **b)** $\frac{5}{18}$ **c)** $2\frac{2}{9}$

d) $1\frac{1}{4}$ **e)** $1\frac{1}{4}$ **f)** $\frac{9}{14}$

19. $4\frac{8}{9}$ or about 5 bottles

20.a) $\frac{9}{16}$ **b)** $2\frac{7}{24}$ **c)** $1\frac{3}{7}$ **d)** $3\frac{1}{3}$

21.a) $4\frac{1}{4}$; subtraction **b)** $8\frac{1}{8}$; multiplication

Unit 4 Measuring Prisms and Cylinders, page 168

4.1 Exploring Nets, page 174

4. 6 rectangular faces
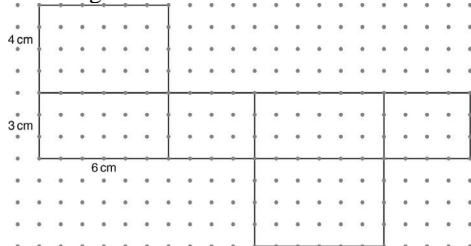
5. 6 square faces
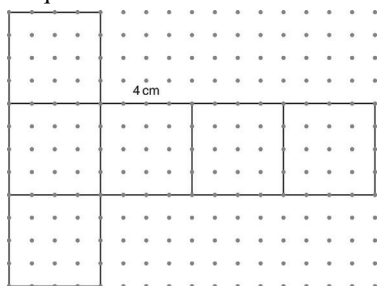
6. Net a; Net b cannot be folded into a rectangular prism.

7. 2 square faces and 4 rectangular faces
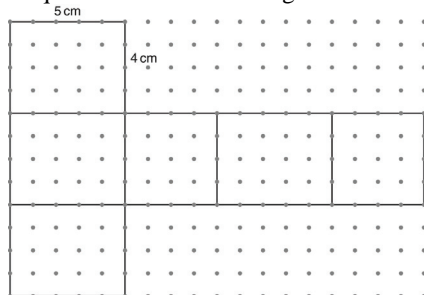
8. 2 triangular bases and 3 rectangular faces
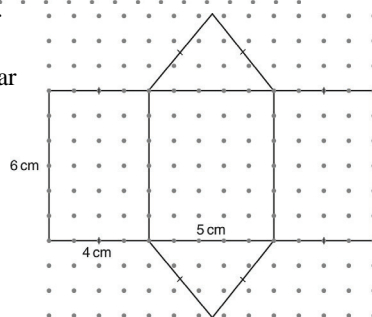
9.a, b) A and F; right hexagonal prism: 2 hexagonal bases and 6 square faces
B and D; pentagonal pyramid: 1 pentagonal base and 5 triangular faces
C and E; right pentagonal prism: 2 pentagonal bases and 5 rectangular faces

10. Net A, Net B, Net C

11. Net C

12.a) Right triangular prism: 2 equilateral triangular bases and 3 rectangular faces
For example:
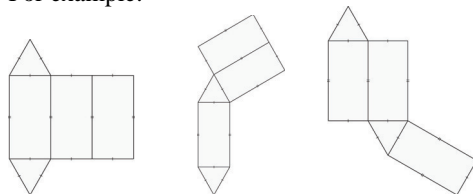
b) Right cylinder:
2 circles and 1 rectangle
For example:

13.a) For example:

i)

ii)

iii)
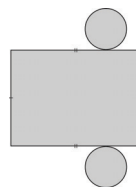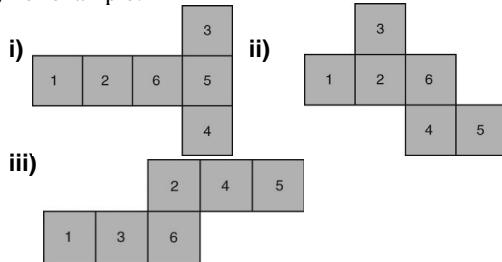
b) For example:
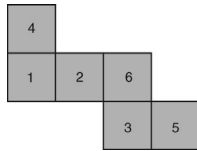
14.a) Square pyramid   **b)** Square prism
  c) Rectangular pyramid
  d) Pentagonal pyramid **e)** Triangular pyramid
15. Like a net, wrapping paper is folded into the
  shape of various objects.
  Unlike a net, wrapping paper is not folded to
  make an object.
16.a)
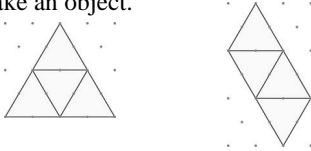
  b)
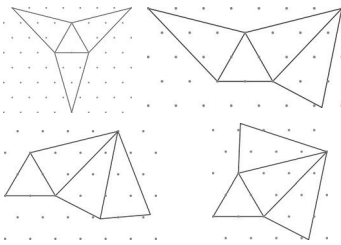
17.b)
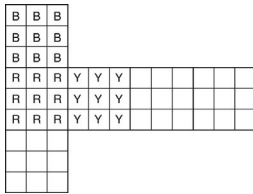
  c) Both nets of a cube with different colour
    arrangements
  d) Same net, different colour labels

4.2 Creating Objects from Nets, page 180

3. b
4.a) Right triangular prism
  c) 2 congruent triangular bases and 3 rectangular
    faces
5.a) C: Triangular pyramid
    D: Right triangular prism
    E: Right hexagonal prism
    F: Cube with pyramid on top
6.a) Right prism with 2 congruent L-shaped bases
  c) Yes; 2 congruent L-shaped bases and 6
    rectangular faces
  d) Parallel faces: 1 and 2;
    3 and 5; 3 and 7;
    4 and 6; 4 and 8;
    5 and 7; 6 and 8
    Perpendicular faces:
    1 and 4; 1 and 3; 1 and 5;
    1 and 6; 1 and 7; 1 and 8;
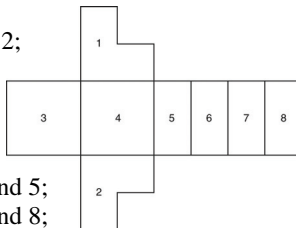
2 and 3; 2 and 4; 2 and 5; 2 and 6; 2 and 7;
2 and 8; 3 and 4; 3 and 6; 3 and 8; 4 and 5;
4 and 7; 5 and 6; 5 and 8; 6 and 7; 7 and 8
7.a) No
  b) There are several ways
    to correct the diagram.
    For example:
    Move squares A and B to:
    1 and 2; 3 and 4; 1 and 3;
    or 2 and 4.

8. A soccer ball is made of
  pentagons and hexagons.
  Each pentagon is joined to 5
  hexagons.
9.a) Net of a right rectangular pyramid
  b) Net of a right triangular prism
  c) Not a net   **d)** Not a net
10. a
11. B, C, E, F, H, J
12.a) 8 congruent faces
  b) 8 congruent triangular faces, each with equal
    angles and side lengths
13.a) Square pyramid   **b)**
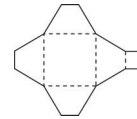
4.3 Surface Area of a Right Rectangular Prism, page 186

4. 174 cm^2; Add the areas of all faces.
5. 92 cm^2
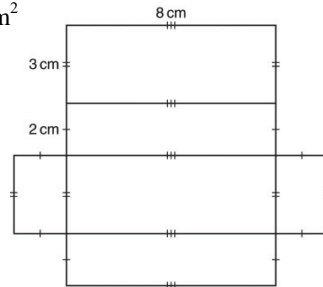
6.a) 160 cm^2 **b)** 216 cm^2 **c)** 82 cm^2
7.a) 164 m^2 **b)** 158 cm^2
9. For example:
  a) 4 cans
  b) The height of the room is 3 m. The ceiling and
    floor are not being painted.
10.a) 9 cm^2 **b)** 3 cm
11. 12 000 m^2; Assuming the windows cover
    one-quarter of 4 sides
12. 2 700 000 Euros
13. Greatest surface area: R; Least surface area: Q
14.i) Increases but doesn't double
  ii) Decreases but is not halved
15.a) 1580 cm^2 **b)** 436 cm^2
16. 2 m by 2 m by 5 m
17. 3 cm by 4 cm by 6 cm

4.4 Surface Area of a Right Triangular Prism, page 191

4. 81 cm^2; Add the areas of all faces.
5. Triangular bases and rectangular faces on the sides
6. 2100 cm^2

15 cm   20 cm
30 cm
25 cm
12 cm
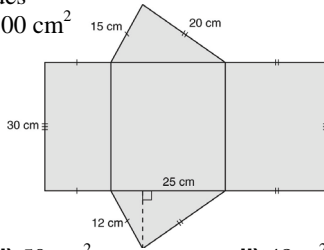
7.a) i) 50 cm^2 **ii)** 48 m^2
  b) The surface area of the prism is the same as the area of the net.
8. Prism D: 528.0 cm^2; Prism A: 147.7 cm^2; Prism C: 117.0 cm^2; Prism B: 102.4 cm^2
9.a) 336 cm^2 **b)** 334.4 m^2 **c)** 481.2 mm^2
10.

5 cm
3 cm
10 cm
4 cm
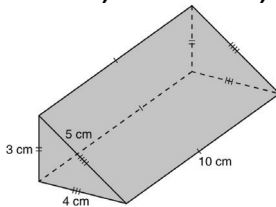
11. b
12. No; The surface area will increase by a factor of 4.
13. 14 400 cm^2
14. 1872.7 cm^2; Assuming the triangular bases are not covered
15. No, since the surface area of the rectangular prism does not include the side along which the cut was made
16. Between 7.33 cm and 11.5 cm
17.a) About 7.4 cm   **b)** 374 cm^2

Unit 4 Mid-Unit Review, page 194
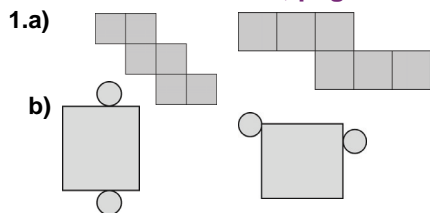
1.a)

  b)

2.a) A and C are nets
  b) A forms a regular triangular pyramid. C forms a pentagonal pyramid.
3.a) 88 cm^2 **b)** 447 cm^2
4. 59 318 m^2; Assuming the top and bottom are not glass
5.a) 10 752 cm^2
  b) About 10 800 cm^2; Wrapping paper must overlap a bit

4.5 Volume of a Rectangular Prism, page 198

4.a) 120 cm^3 **b)** 729 cm^3 **c)** 6000 cm^3
5.b) 11 200 cm^3
6.a) A: 120 cm^3; B: 120 cm^3; C: 120 cm^3
  b) They are the same.   **c)** No
7.a) 67.5 cm^3 **b)** 96 cm^3 **c)** 25.2 cm^3
9.a) 420 462 cm^3, 626 859 cm^3
  b) About 1.5 times
10. 10 cm
11.a) 40.6 m^3 **b)** 3 trailers
12.a) 2000 m^3 **b)** 1800 m^3 **c)** 1000 m^3
13.a) Possible dimensions: 1 cm by 2 cm by 18 cm; 1 cm by 1 cm by 36 cm; 1 cm by 3 cm by 12 cm; 1 cm by 4 cm by 9 cm; 2 cm by 2 cm by 9 cm; 1 cm by 6 cm by 6 cm; 3 cm by 3 cm by 4 cm; 2 cm by 3 cm by 6 cm
    Decimal solutions are possible as well.
  b) i) Prism with dimensions 1 cm by 1 cm by 36 cm
    ii) Prism with dimensions 3 cm by 3 cm by 4 cm
14.a) 1260 cm^3 **b)** 42 cm^3
  c) For example: Philip could cut the fudge into 3 columns and 10 rows.
  d) 7 cm by 2 cm by 3 cm
15.a) Doubles   **b)** Increases by a factor of 4
  c) Increases by a factor of 8
    True for all rectangular prisms
16. To double volume, double any one dimension. Surface area will increase but not double.
17.a) 8640 cm^3 **b)** 60 cm by 36 cm by 32 cm
  c) A box with dimensions 60 cm by 36 cm by 32 cm has the least surface area. So, the least amount of material is needed to make it.
18.a) Sketches may vary. Possible dimensions: 1 cm by 1 cm by 24 cm; 2 cm by 1 cm by 12 cm; 3 cm by 1 cm by 8 cm

4.6 Volume of a Right Triangular Prism, page 205

3.a) 225 cm^3 **b)** 312 cm^3
4.a) 21.16 cm^3 **b)** 217.5 cm^3 **c)** 45 m^3
5.a) 955.5 cm^3 **b)** 240 m^3 **c)** 3.83 m^3
6.a) 532 cm^3 **b)** 108 cm^3
7. 18 cm^3
8. 7.5 cm
9.a) i) $A = 5$ cm^2, $l = 1$ cm; $A = 1$ cm^2, $l = 5$ cm
    ii) $A = 9$ m^2, $l = 1$ m; $A = 1$ m^2, $l = 9$ m; $A = 3$ m^2, $l = 3$ m
    iii) $A = 8$ m^2, $l = 1$ m; $A = 4$ m^2, $l = 2$ m; $A = 2$ m^2, $l = 4$ m; $A = 1$ m^2, $l = 8$ m
    iv) $A = 18$ cm^2, $l = 1$ cm; $A = 9$ cm^2, $l = 2$ cm; $A = 6$ cm^2, $l = 3$ cm; $A = 3$ cm^2, $l = 6$ cm; $A = 2$ cm^2, $l = 9$ cm; $A = 1$ cm^2, $l = 18$ cm

b) i) 2   **ii)** 3   **iii)** 4   **iv)** 6
10.a) 120 cm^3 **b)** 6
11. 10 m^2
12.a) 1.125 m^3 **b)** 3.375 m^3
13.b) A: 180 cm^3; B: 126 cm^3
   c) Change the length of 7 cm to 10 cm
14.a) 2250 cm^3 **b)** 18 cm   **c)** 60%
15. l = 11 cm
   Possible b and h values: 1 cm, 36 cm;
   36 cm, 1 cm; 2 cm, 18 cm; 18 cm, 2 cm;
   3 cm, 12 cm; 12 cm, 3 cm; 4 cm, 9 cm;
   9 cm, 4 cm; 6 cm, 6 cm
16.a) 231.4 cm^2; 113.9 cm^3
   b) i) b = 7 cm, h = 6.2 cm, l = 21 cm
      b = 7 cm, h = 3.1 cm, l = 42 cm
      b = 3.5 cm, h = 6.2 cm, l = 42 cm
      b = 14 cm, h = 3.1 cm, l = 21 cm
      b = 3.5 cm, h = 12.4 cm, l = 21 cm
      b = 3.5 cm, h = 3.1 cm, l = 84 cm
   ii) Either two of the dimensions are doubled or
      one is increased by a factor of 4.
17.a) 36 m^2; 12 m^3 **b)** 60 m^2; 24 m^3
   c) 96 m^2; 48 m^3 **d)** 144 m^2; 96 m^3

4.7 Surface Area of a Right Cylinder, page 212

4.a) 88 cm^2 **b)** 25 cm^2 **c)** 101 cm^2
5.a) A cylinder with radius 2 cm and height 5 cm
   b) A cylinder with radius 1 cm and height 3 cm
   c) A cylinder with radius 2 cm and height 6 cm
6.a) 50 cm^2 **b)** 94 cm^2 **c)** 251 m^2
8.a) 214 cm^2 **b)** 19 046 mm^2 **c)** 4 m^2
9. 174 m^2 **10.** 12 m^2
11.a) 94 cm^2 **b)** 4255
12. 191 cm^2 **13.** 37 267 cm^2 or 4 m^2
14.a) 14 137 cm^2
   b) 1414 cm^2; Assuming the heads do not go over
      the edge of the shell
15. Cylindrical tubes
16.a) 66 cm   **b)** 10.5 cm
   c) 346 cm^2 **d)** 1352 cm^2
17. 488 cm^2

4.8 Volume of a Right Cylinder, page 218

4.a) 785 cm^3 **b)** 63 cm^3 **c)** 1609 cm^3
5.a) 503 cm^3 **b)** 8836 mm^3 **c)** 328 m^3
6. 1571 cm^3 **8.** 196 cm^3
9. The cylinders have the same volume because they
   have the same radius and height.
10. Bottle C; It has the greatest radius and height, and
   so the greatest volume.
11.a) 462 cm^3 **b)** 1583 cm^3
12. 5301 cm^3 **13.** 441 786 cm^3
14. 9 521 684 cm^3 or about 9.5 m^3
15. 404 mL
16. A cylinder with radius 2 m and height 1 m

17.a) 96 m^3 **b)** 12 219 m^3
   c) 4.58 m by 4.58 m by 4.58 m
18. 28 cm

Unit 4 Strategies for Success: Choosing the Correct Answer, page 220

1.c) 108 m^2 **2.b)** 99 cm^3

Unit 4 Unit Review, page 223

1. The net of a rectangular prism must have 3 pairs
   of congruent rectangles.
2.a) Right hexagonal prism   **b)** Cube
   c) Right cylinder   **d)** Pentagonal pyramid
3. Net A; To correct net B, move the rectangle from
   the top right to the bottom right.
4.a) Pentagonal pyramid **b)** Triangular pyramid
   c) To form a triangular prism:
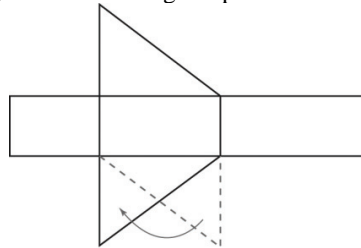
5.a) 96 cm^2
   b) Find the area of one face and multiply by 6.
6.a) 72 m^2; 36 m^3 **b)** 15 000 cm^2; 125 000 cm^3
   c) 114 cm^2; 72 cm^3
7.a) 10 rolls and 1 can
   b) Assuming you must buy whole rolls and cans
8.a) A: 1 m by 1 m by 28 m; B: 1 m by 2 m by 14 m
      C: 1 m by 4 m by 7 m; D: 2 m by 2 m by 7 m
   b) A: 114 m^2; B: 88 m^2; C: 78 m^2; D: 64 m^2
9.a) 24 m^3 **b)** 45 cm^3
10.a) 7.2 cm^2 **b)** 0.96 cm^3
11.a) 14.2 m^2 **b)** 2.3 m^3
   c) Rotating an object will not change its volume.
12. 6 m^3
13.a) Double the height or base of the triangle.
   c) The volume doubles.
14.a) 428 mL
   b) A pocket of air is left in the soup can.
15. 49 m^2
16. 12 174 m^2

Unit 4 Practice Test, page 226

1.a) A square prism with a square pyramid on top

2.a) 3 rectangular faces, **b)** 2 circles and
2 triangular bases 1 rectangle
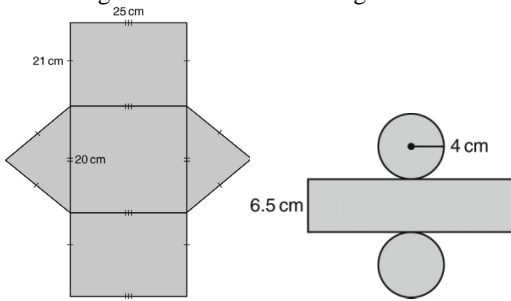
3. a
4.a) 632 cm^2 **b)** 200 cm^2 **c)** 88 cm^2
5.a) 220.5 m^3 **b)** 120 m^3
6.a) 776 cm^2; 1344 cm^3 **b)** 17.99 m^2; 3.0625 m^3
7.a) 166.95 cm^3 **b)** 126 m^3
8.a) The volume increases by a factor of 9.
 c) 27.5625 m^3
9.a) 8.5 m^2 **b)** 1.5 m^3
10. A piece of paper rolled into a cylinder lengthwise

Unit 5 Percent, Ratio, and Rate, page 232

5.1 Relating Fractions, Decimals, and Percents, page 239

6.a) $\frac{50}{100}$ or $\frac{1}{2}$; 0.50; 50% **b)** $\frac{36}{100}$ or $\frac{9}{25}$; 0.36; 36%

 c) $\frac{87}{100}$; 0.87; 87% **d)** $\frac{4}{100}$ or $\frac{1}{25}$; 0.04; 4%

7.a) $\frac{3}{100}$; 0.03 **b)** $\frac{51}{100}$; 0.51

 c) $\frac{98}{100}$ or $\frac{49}{50}$; 0.98 **d)** $\frac{29}{100}$; 0.29

8.a) $\frac{1}{8}$; 0.125; 12.5% **b)** $\frac{341}{400}$; 0.8525; 85.25%

 c) $\frac{139}{400}$; 0.3475; 34.75%

9.a) $\frac{147}{200}$; 0.735 **b)** $\frac{17}{80}$; 0.2125

 c) $\frac{7}{80}$; 0.0875 **d)** $\frac{3}{250}$; 0.012

10.a) **b)**
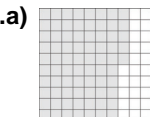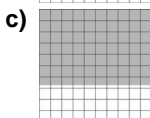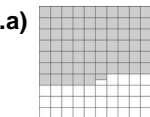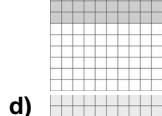
 c) **d)**

11.a) **b)**

 c) **d)**

12.a) $\frac{1}{400}$; 0.0025 **b)** $\frac{3}{500}$; 0.006

 c) $\frac{1}{200}$; 0.005 **d)** $\frac{19}{5000}$; 0.0038

13.a) $0.00\overline{6}$; $0.\overline{6}$% **b)** 0.045; 4.5%
 c) 0.014; 1.4% **d)** 0.032; 3.2%
14.a) $\frac{69}{200}$; 34.5% **b)** $\frac{23}{10\,000}$; 0.23%

 c) $\frac{73}{400}$; 18.25% **d)** $\frac{7}{1000}$; 0.7%

15. Fiona is correct.
16. Junita; $83.\overline{3}$% is greater than 82.5%.
17. Answers may vary. For example:

 a) i) $\frac{5}{8}$ means one whole divided into 8 equal

 parts, with 5 parts shaded
 ii) A cherry rhubarb pie is divided into 8 equal
 slices. Laura and her friends eat 3 slices.
 $\frac{5}{8}$ of the pie is left.

 b) i) $\frac{5}{8}$ means 5 objects divided into 8 equal

 groups.
 ii) 5 watermelons are shared among 8 people.
18.a) 16 red squares, 12 green
 squares, and 18 blue squares
 Shadings may vary.
 For example:
 b) $\frac{1}{24}$; $0.041\overline{6}$; $4.1\overline{6}$%

 c) In a 6-cm by 9-cm rectangle, 18 squares
 will be red, 13.5 squares will be green, and
 20.25 squares will be blue.
 Answers will vary. For example: Yes, but it
 would have been more complicated because it
 would involve part squares;

 In a 7-cm by 7-cm square, $16.\overline{3}$ squares will be
 red, 12.25 squares will be green, and 18.375
 squares will be blue.
19. Kyle; 78.6% is greater than $76.\overline{6}$%.
20.a) No

 b) $\frac{1}{16}$; The student made an error when he

 converted 6.25% to a fraction.
21.a) = **b)** > **c)** > **d)** < **e)** = **f)** =

5.2 Calculating Percents, page 246
 4.a)

 b)

c)

d)
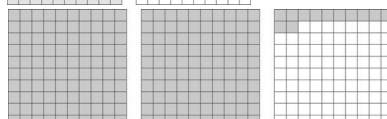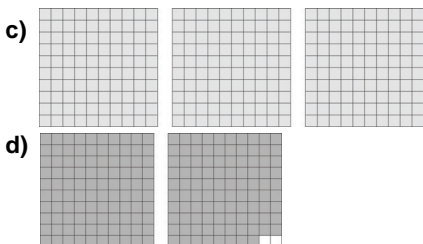
5.a) 1.2   **b)** 2.5   **c)** 4.75

   d) 0.003   **e)** 0.0053   **f)** 0.0075

6.a) $\frac{17}{10}$; 170%   **b)** $\frac{33}{10}$; 330%

   c) $\frac{3}{1000}$; 0.3%   **d)** $\frac{56}{10\,000}$; 0.56%

7. $25.20

8. Answers may vary. It is not possible for one individual to give 110% or to put in more than 100% of their effort.

9.a) Answers may vary. For example:

A charity has a goal for the amount of money they wish to receive in donations. It receives more than 100% of its goal.

A baker has a recipe for 6 dozen cookies. He wants to make 8 dozen, so he must use more than 100% of the ingredients in the original recipe.

   b) 5000 tickets were sold in a raffle for a new boat. The chance of winning written as a percent is between 0% and 1%.

If you guess every answer on a 100 question multiple-choice test, your chances of getting 100% are between 0% and 1%.

10.a) i) $33.\overline{3}\%$ **ii)** $66.\overline{6}\%$ **iii)** 100%

     iv) $133.\overline{3}\%$ **v)** $166.\overline{6}\%$ **vi)** 200%

   b) Each time the numerator increases by 1, the percent increases by $33.\overline{3}\%$.

   c) i) $233.\overline{3}\%$ **ii)** $266.\overline{6}\%$ **iii)** 300%

     iv) $333.\overline{3}\%$ **v)** $366.\overline{6}\%$ **vi)** 400%

11.a) i) 720   **ii)** 72   **iii)** 7.2   **iv)** 0.72

   b) The digits move one place to the right each time.

   c) i) 7200   **ii)** 0.072

12.a) 5 runners

13.a) Shapes may vary. For example:
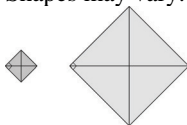
14. About 3140

   a) 3139.5 or about 3140   **b)** 3120

   c) No, the answers are different. Juan's answer is correct.

15.a) 168 people

16.a) About 20 people   **b)** 15 people   **c)** 1985

17. $66.\overline{6}\%$ **18.** $110 000

19. 58 cm

5.3 Solving Percent Problems, page 252

   3.a) 30   **b)** 16   **c)** 200   **d)** 150

   4.a) 20   **b)** 24   **c)** 800   **d)** 40

   5.a) 100%   **b)** 50%

   6.a) 20%   **b)** 25%

   7.a) $833.\overline{3}$ g   **b)** 500 cm   **c)** 1500 g

   8.a) 7.5%   **b)** About 138%

   9.a) About 4.55%   **b)** 41.2%

10. 169 840 miners

11. About 78.2%

12.a) Jemma: about 1.98 kg; George: 1.95 kg

   b) Explanations may vary. Jenna's mass after Week 2 is calculated on her mass after Week 1, which is greater than her birth mass.

13.a) 859 320 people   **b)** About 953 845 people

   c) About 37.64%

   d) No; the overall increase in population is greater than 35%.

14.a) About 13 711 crimes per 100 000 population

   b) No; the total decrease from 2004 to 2006 is less than 10%.

15.a) About 167 cm   **b)** About 180 cm

   Assumptions may vary. For example:

   The girls' height increases at the given average rate.

16. Answers will vary, based on gender and current height.

17. No. The original price is $20. It is greater than 120% of the sale price ($19.20).

18.a) 5.6 cm   **b)** 44%

   c) 31.36 cm^2 **d)** 68.64%

19. 200 marbles

20. Answers may vary. For example:

   5 m by 45 m or 15 m by 15 m

5.4 Sales Tax and Discount, page 260

   4.a) $1.05   **b)** $0.63   **c)** $1.54

   5.a) $5.40   **b)** $1.50   **c)** $1.08

   6.a) $0.97   **b)** $4.29   **c)** $3.64

   7.a) i) PST: $1.30; GST: $1.56

     ii) PST: $7.62; GST: $9.15

   b) i) $28.85   **ii)** $169.22

   8.a) i) $18.00   **ii)** $54.00

   b) i) $71.99   **ii)** $66.00

   c) i) $76.31   **ii)** $69.96
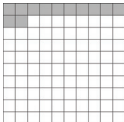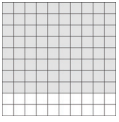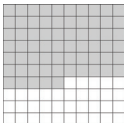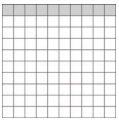
   9. $389 120

10. Choice A; $35 for 2 DVDs is a better deal than $40 for 2 DVDs.

11.a) About 40%   **b)** $12.07

12. No; the total reduction in price was less than 50%.

13. $44.95

14. No; the sale price including taxes is $127.79.

15. a) $42.36   **b)** $48.29

16. It makes no difference whether the discount is calculated before or after the tax is added. Anika will pay $59.33.

17. Strictly Sports offers the better deal. $41.44 is $0.95 cheaper than $42.39.

18. a) $87.72   **b)** $12.28

19. a) Yes; the total cost is $22.20.
    b) $17.80

20. The sale price of the skateboard including taxes is $32.47. $39.99 – 14% means a price of $34.39, which is more than the actual sale price of the skateboard.

Unit 5 Mid-Unit Review, page 263

1. a) $\frac{3}{5}$; 0.6   **b)** $\frac{39}{400}$; 0.0975

    c) $\frac{975}{1000}$ or $\frac{39}{40}$; 0.975

2. a)   **b)**

    c)   **d)**

3. a) $\frac{9}{50}$; 18%   **b)** $\frac{3}{500}$; 0.6%

    c) $\frac{7}{8}$; 87.5%   **d)** $\frac{3}{400}$; 0.75%

4. a) 1.45   **b)** 3.5   **c)** 0.0044   **d)** 0.002

5. Answers may vary. For example: No, a mark of 112% is not possible. If Jon answered correctly all the questions on the test, he would score 100%.

6. $45.50

7. a) 20   **b)** 50

8. 700 tickets   **9.** 16%   **10.** $28.93

11. a) $39.99   **b)** $45.19   **c)** $31.63   **d)** $13.56

12. $43.52

5.5 Exploring Ratios, page 266
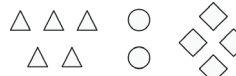
4. a) $\frac{5}{8}$ **b)** $\frac{3}{4}$ **c)** $\frac{4}{9}$ **d)** $\frac{24}{25}$

5. a) 95%   **b)** 80%   **c)** 37.5%   **d)** $83.\overline{3}$%

6. a) red candies to green candies
    b) blue candies to green candies
    c) green candies to the total number of candies
    d) red candies to green candies to blue candies
    e) red candies to green and blue candies

7. Answers may vary. For example:
    a) 3 : 15; 20%; $\frac{1}{5}$ **b)** 1 : 15; $6.\overline{66}$%; $\frac{1}{15}$
    c) 7 : 4; 7 to 4   **d)** 7 : 1 : 3; 7 to 1 to 3

8. a) 5 : 7   **b)** About 71.4%

9. a) i) 9 : 7   **ii)** 8 : 3   **iii)** 3 : 1 : 2

    b) i) 9 : 16; $\frac{9}{16}$; 56.25%; 7 : 16; $\frac{7}{16}$; 43.75%

      ii) 8 : 11; $\frac{8}{11}$; $72.\overline{72}$%; 3 : 11; $\frac{3}{11}$; $27.\overline{27}$%

      iii) 3 : 6; $\frac{1}{2}$; 50%, 1 : 6; $\frac{1}{6}$; $16.\overline{6}$%, 2 : 6;

      $\frac{1}{3}$; $33.\overline{3}$%

11. a) i) 8 : 3   **ii)** 5 : 1   **iii)** 3 : 1 : 5   **iv)** 8 : 25
    b) i) 5 : 3   **ii)** 3 : 1   **iii)** 3 : 1 : 3   **iv)** 4 : 16

12. Answers may vary. For example:
    a) $\frac{2}{7}$ as a ratio compares 2 out of 7 parts of a group to the total number of parts of the group. It can also be written as 2 : 7.
    b) There are 7 students in the student council: 2 boys and 5 girls. The ratio of boys to the total number of students is 2 : 7 or $\frac{2}{7}$ or about 28.57%.

13. Answers may vary. For example:
    a) or

    b)

    c)

    d) The ratio in part a may be a part-to-part or a part-to-whole ratio. The ratios in parts b and c are part-to-part ratios.

14. a) 11 cups
    b) i) 3 : 2   **ii)** 2 : 3   **iii)** 2 : 2 : 1
    c) 5 : 11; $\frac{5}{11}$; $45.\overline{45}$%
    d) i) 2 : 2   **ii)** 2 : 3   **iii)** 2 : 2 : 1
      4 : 10; $\frac{2}{5}$; 40%
    e) Answers will vary. For example: Patrick decides to add 1 extra cup of raisins to the recipe. Write the ratio of raisins to the total amount of ingredients.
     (*Answer:* 1 : 12; $\frac{1}{12}$; $8.\overline{3}$%)

15. Answers may vary. For example: ratio, problem, percent, taxes

16. No. Jeff got $\frac{2}{5}$ of the cranberries.

17. Answers may vary. For example:
    a) i) Squares to triangles: 3 : 5

ii) Green shapes to blue triangles: 2 : 1
iii) Red squares to red triangles: 2 : 3
iv) Green squares to all shapes: 1 : 11

b) Replace a red circle with a green square. The ratio of all red shapes to red triangles is 7 : 3; the ratio of green squares to triangles is 2 : 5.

18. Answers will vary. For example: 3 : 5 squirrel; cinnamon; mushroom

5.6 Equivalent Ratios, page 274

5. Answers may vary. For example:

a)

1st term	2	3	38
2nd term	4	6	76

b)

1st term	4	14	24
2nd term	6	21	36

c)

1st term	5	6	18
2nd term	20	24	72

6. Answers may vary. For example:

a)

1st term	6	9	15
2nd term	8	12	20

b)

1st term	28	98	1274
2nd term	8	28	364

c)

1st term	216	144	312
2nd term	225	150	325

7. Answers may vary. For example:

a)

1st term	2	4	16
2nd term	6	12	48
3rd term	12	24	96

b)

1st term	24	84	120
2nd term	10	35	50
3rd term	14	49	70

c)

1st term	12	168	264
2nd term	2	28	44
3rd term	4	56	88

8.a) 1 : 3   **b)** 2 : 3   **c)** 1 : 4 : 6 **d)** 22 : 14 : 3
9.a) 4 : 1   **b)** 1 : 3   **c)** 6 : 2 : 1 **d)** 4 : 8 : 3
10.a) 8   **b)** 60   **c)** 40   **d)** 7
11.a) 2 : 3 : 4 and 6 : 9 : 12; 8 : 5 : 4 and 16 : 10 : 8; 3 : 6 : 9 and 1 : 2 : 3; 3 : 4 : 5 and 9 : 12 : 15
b) Explanations may vary. For example:
In each pair, the first ratio is in simplest form. The second ratio is formed by multiplying the terms of the first ratio by the same number.

12. Answers may vary. For example:

a)

Fiction	3	21	51
Non-fiction	1	7	17

b) There is an infinite number of different answers for part a. The ratio in simplest form can be multiplied by any number.

13. 30 cm by 15 cm
14. Drawings may vary. For example:
a) i)
ii)   **iii)**

iv)
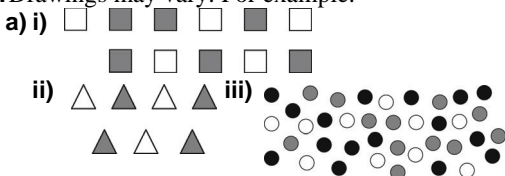
15.a) No   **b)** No   **c)** Yes   **d)** Yes
16.a) 12   **b)** 20
17.a) 12   **b)** 84   **c)** 12   **d)** 21
18.a) i) 8 : 1   **ii)** 8 : 9   **iii)** 1 : 9
   b) i) 17 : 1   **ii)** 17 : 18   **iii)** 1 : 18

Unit 5 Strategies for Success: Explaining Your Thinking, page 277

1. Yes; There are 365 (or 366) days in a year, so only the first 366 students can have a unique birthday. The remaining students will share a birthday with someone else.

2. $\frac{2}{3}$ cup sugar, 500 mL milk, $3\frac{1}{3}$ mL vanilla

3. $0.35 \times 12 = 4.20$
No; A dozen donuts will cost $4.20 with the coupon. $4.20 is more expensive than the sale price of $3.99.

5.7 Comparing Ratios, page 284

4.a) 1 : 4   **b)** 1 : 8   **c)** 1 : 7
   d) 1 : 9   **e)** 1 : 3   **f)** 1 : 6
5.a) 4 : 1   **b)** 5 : 1   **c)** 12 : 1
   d) 5 : 1   **e)** 7 : 1   **f)** 12 : 1
6.a) 5 cans of white paint and 7 cans of blue paint
   b) 3 cans of white paint and 4 cans of blue paint
7. Tara's
   a) $\frac{21}{35}; \frac{25}{35}$
   b) When the denominators are the same, look at the numerators to compare two fractions.
8. Henhouse B; Assumptions may vary. For example: I assume that the ratio of eggs produced daily by each henhouse is consistent.
9. Mixture A
10. Nadhu; 65 out of 117 is better than 54 out of 117, or $\frac{65}{117} > \frac{54}{117}$.
11.a) Calgary Cougars   **b)** No
12. Recipe A
13.a) Ms. Arbuckle's; 2 more fiction books than Mr. Albright's class
   b) Ms. Arbuckle: $41.\overline{6}\%$
   Mr. Albright: 42.9%
14.a) 2 : 1 and 3 : 2
   b) Add 1 more can of concentrate to B.
15.a) A: 4 : 12; B: 3 : 15; C: 2 : 3
   b) A: 1 : 3; B: 1 : 5; C: 1 : 1.5
   c) Shade C   **d)** Shade B
16. Marcel's reasoning is incorrect.
17. Glider A
18.a) 70   **b)** The second box, with a ratio of 3 : 2

19.a) No. The ratios are not equivalent.
  b) 3 scoops for 2 cups of water

5.8 Solving Ratio Problems, page 291

4.a) 36 **b)** 18 **c)** 10 **d)** 63 **e)** 33 **f)** 26
5.a) 12 **b)** 8 **c)** 7 **d)** 3 **e)** 3 **f)** 10
6.a) 9 **b)** 15 **c)** 10 **d)** 7 **e)** 70 **f)** 5
7.a) 27 **b)** 28 **c)** 12 **d)** 16 **e)** 33 **f)** 56
8. 225 shots
9. 148 dentists
10. 0.3 m or 30 cm
11.a) No. There are no measures given.
  b) 15 cm
12. 10 500 000 cm or 105 km
13. 5.14 cm
14.a) 0.15 m or 15 cm   **b)** 7.2 m
15. 8 cm
16.a) 10 trees
17. $2.\overline{6}$ m^3 cement, $5.\overline{3}$ m^3 gravel
18.a) 39 tickets **b)** 26 tickets **c)** $1111.50
19. 1.05 m
20.a) 24 students   **b)** 27 students
21. Ratio of my height : height of a flagpole = ratio of length of my shadow : length of shadow of flagpole

5.9 Exploring Rates, page 298

4.a) 60 words/min   **b)** 25 m/min
  c) 20 pages/h
5.a) 15 km/h **b)** 24 km/h **c)** 10 km/min
6.a) 55 flyers/h   **b)** 60 cupcakes/h
  c) 4.5°C/h
7.a) rate   **b)** rate   **c)** ratio   **d)** ratio
8.a) $1.13/L   **b)** $0.25/cob   **c)** $0.42/can
9.a) 1.5 goals/game
  b) 53 goals; assuming she continues to score at the same rate
10. 120 beats/min; when you run, your heart rate increases.
11.a) $0.48   **b)** $2.40   **c)** 25 m
12.a) $10.50/h   **b)** $367.50
13.a) $1.20 **b)** $3.00 **c)** $12.00 **d)** 1.5 kg
14.a) 30.3 m/s   **b)** 13.9 m/s
15.a) 144 km/h   **b)** 5.4 km/h
16.a) 25 km   **b)** 25 km/h
17.a) $50.00   **b)** £12
18.a) About 56   **b)** About 2
  Assumptions may vary. For example: Petra takes no breaks and works at an even rate.
19. 8 min/km
20.a) i) 7 min/km **ii)** 8 min/km **iii)** 8.5 min/km
  b) Answers may vary. For example: 6 h 36 min

5.10 Comparing Rates, page 303
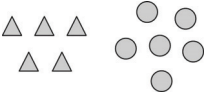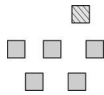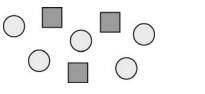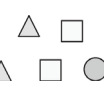
5.a) $133/week   **b)** 85 km/h
  c) $0.29/bottle   **d)** $0.33/can

6.a) $36.00 in 4 h   **b)** $4.50 for 6 muffins
  c) $0.99 for 250 mL
7.a) The 500-mL can is the better buy.
  b) Answers may vary. For example: Delaney may have only needed 110 mL.
  c) The customer may have needed 500 mL of mushroom soup, so she could go with the better deal.
8.a) 8 for $2.99   **b)** 2 L for $4.49
  c) 150 mL for $2.19   **d)** 125 g for $0.79
9.a) 87.5 km
  b) The average speed is the mean distance travelled each hour, or 87.5 km/h.
  c) 8 h
10.b)
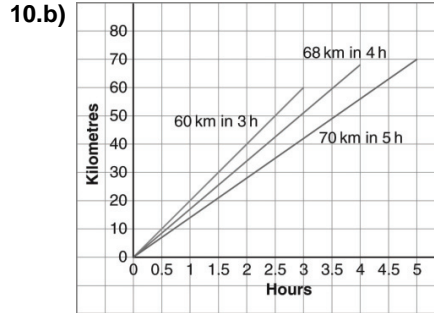
11.a) Petra's job; $9.25/h is better than $9/h.
  b) Answers may vary. For example: Yes, I would choose to work as a lifeguard. It pays more, and you get to work more hours per week.
12.a) $12\frac{2}{3}$ **b)** 304 points
13. About 4.92 cm
14.a) Brand B
  b) Brand A: $3.61/kg; Brand B: $2.21/kg
  c) Brand B is the better buy.
  d) Becky may not have enough money or room to store it.
15.a) i) $16\frac{2}{3}$ min   **ii)** About 31 min
  b) i) Swimming; 52 min
    ii) Cycling and walking
16. $520.8\overline{3}$ kg
17. Answers may vary. For example:
  a) A rate compares 2 quantities with different units: a bike travelled 40 m in 5 s.
  b) A unit rate compares a quantity to a unit: a snail crawls 1.75 km in 100 h or 0.0175 km/h.
18.a) Toyota Echo   **b)** 14 L
19. $8.73
20.a) i) About 3 people/km^2
    ii) About 137 people/km^2
    iii) About 338 people/km^2
21.a) 8 km   **b)** 12 km/h faster

1.a) $\frac{13}{20}$; 65% **b)** $\frac{69}{10\,000}$; 0.69%

  c) $\frac{3}{80}$; 3.75% **d)** $\frac{393}{400}$; 98.25%

2. Conner: 87.5% > 83.$\overline{3}$%

3.a) $\frac{19}{50}$; 0.38 **b)** $\frac{15}{16}$; 0.9375

  c) $\frac{79}{10\,000}$; 0.0079 **d)** $\frac{1}{500}$; 0.002

4.a) 1.6 **b)** 3.1 **c)** 0.0027 **d)** 0.009
5.a) 44 800 people
6. 25 cards **7.** 65
8.a) Both mandrills had the same mass at the end of month 2.
  b) No; by the end of month 2, Amy gained more than 45% of her original mass.
 9. 112.5 cm or 1.125 m
10.a) 205.8 cm by 235.2 cm **b)** 3.96%
11.a) $69.99 **b)** 28.6%
12. $76.27
13. $36.11; the cost would be the same.

14.a) i) 2 : 3 **ii)** 5 : 3 **iii)** $5 : 10 = \frac{1}{2} = 50\%$

    iv) 5 : 2 : 3

  b) i) 1 : 2 **ii)** 4 : 2 **iii)** $4 : 7 = \frac{4}{7} = 57.1\%$

    iv) 4 : 1 : 2
15.a) 7 : 4 **b)** 3 : 4 **c)** 3 : 11
16.a)

  b)

  c)

17.a) i) 1 : 3 **ii)** 3 : 1 **iii)** 3 : 8 **iv)** 1 : 6 : 3
  b) i) Purple to blue
    ii) Yellow to red or purple to green
    iii) Yellow to blue to red
18.a) 12 girls **b)** 3 : 2
19. Explanations may vary. For example: Divide terms by a common factor, such as 5 (5 : 2 : 6) or, multiply terms by the same number, such as 3 (75 : 30 : 90)
20.a) 30 **b)** 40 **c)** 35 **d)** 108
21.a) 8 : 1 **b)** $\frac{11}{12}$: 1 **c)** $1\frac{1}{2}$: 1 **d)** $2\frac{3}{4}$: 1
22.a) Stronger **b)** Weaker
23.a) Ms. Beveridge's class
  b) Answers will vary. For example: No; I used equivalent ratios. The ratios given are part-to-part ratios and I need part-to-whole ratios to use percents.
24. 180 pike **25.** About 14

26.a) 400 mL
  b) 15 people: about 2.14 L pop; 857.14 mL orange juice
    20 people: about 2.86 L pop; 1.14 L orange juice
27.a) 40 km/h **b)** 250 m/min **c)** $8.00/h
28.a) The cougar is faster. 936 m/min; 800 m/min
  b) Cougar to wild horse: 117 : 100
29.a) 16.$\overline{6}$ m/s **b)** 11.$\overline{1}$ m/s
30.a) $9.50/h **b)** $237.50
31.a) i) $1.07/L **ii)** 4.4\overline{6}$/kg **iii)** $0.44/100 g
32.a) 8.5 L for $7.31 **b)** 12 candles for $5.99
  c) 5 kg of grass seed for $2.79
33. Jevon
34. Aaron's job as a ticket seller pays more.

Unit 5 Practice Test, page 312

1.a) 132 **b)** 14 **c)** 2 **d)** 17.85
2.a) 39 **b)** 7 **c)** 28 **d)** 18

3.a) $5.16/h **b)** 12 min/puzzle **c)** $1\frac{1}{3}$ km/min

 4. 350 boxes
5.a) $57.37 **b)** $63.68
 6. No; the house is less expensive at the end of 2006.
7.a) 24 batteries for $9.29
  b) 100 g of iced tea mix for $0.29
8.a) The Tigers **b)** The Leos
 9. No; the medium size of orange juice is the best buy. It costs $2.17/L, compared to $2.79/L and $2.26/L.
10. Answers may vary. For example:
  a) The Jessup family ate 6 of 8 slices of the sugar pie, or $\frac{3}{4}$ of it.
  b) Carly has 6 yellow gumballs and 2 purple ones. The ratio of yellow gumballs to all gumballs is 6 : 8 or 3 : 4 or $\frac{3}{4}$.
  c) 4 sisters split 3 brownies and got $\frac{3}{4}$ of a brownie each.
  d) The ladybug flew 3 km in 4 h.

Unit 6 Linear Equations and Graphing, page 316

6.1 Solving Equations Using Models, page 324

5.a) $s = 4$ **b)** $t = -3$ **c)** $a = 3$ **d)** $b = -6$
6.a) $x = 2$ **b)** $s = 3$ **c)** $c = 1$ **d)** $m = -2$
7.a) $6n + 3 = 21$; $n = 3$
8.a) $6n - 3 = 21$; $n = 4$
9.a) $3n + 4 = 22$; $n = 6$

10.a) No; Curtis' model should subtract 2 unit tiles.
  b) Change the two yellow unit tiles on the left side of the model to red; $x = 5$
11.a) $x = 3$ **b)** $x = -5$ **c)** $x = 6$ **d)** $x = -3$
12.a) Breanna added an extra a-mass on the left side of the scale.
  b) The balance scales should show 3 identical a masses in one pan and three 8-g masses in the other pan; $a = 8$
13.a) $x = -5$ **b)** $x = 5$ **c)** $x = -5$ **d)** $x = -8$
14.a) $4a + 2 = 34$; $a = 8$
15.a) $n = 1$ **b)** $n = 5$ **c)** $n = 20$
16. Answers will vary. For example:
  a) All equations that have positive values and an integer solution; for example: $3b + 2 = 11$; $b = 3$
  b) All equations that have at least one negative value but an integer solution. For example: $4f - 2 = 10$; $f = 3$
  c) All equations that can be solved with balance scales can be solved with algebra tiles.
17.a) One heart, one star, and two smiley faces equal one heart, one smiley face, and three stars.
  b) 22 g; it is not possible to determine the mass of a heart.
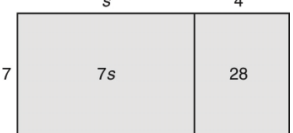
6.2 Solving Equations Using Algebra, page 331

5.a) $x = 4$ **b)** $a = 3$ **c)** $m = 2$
  d) $x = 3$ **e)** $x = 4$ **f)** $x = 6$
6.a) $x = -4$ **b)** $x = -4$ **c)** $x = -3$ **d)** $x = -5$
7.a) $x = -5$ **b)** $n = 3$ **c)** $t = \frac{1}{2}$
  d) There are no mistakes.
8.a) $x = -6$ **b)** $x = 3$ **c)** $x = -2$ **d)** $x = -4$
9.a) $72 + 24w = 288$ **b)** $w = 9$
10.a) $85 + 2s = 197$ **b)** $s = 56$
11.a) $x = -6$ **b)** $c = -5$ **c)** $b = -4$
  d) $a = -5$ **e)** $f = -3$ **f)** $d = 11$
12.a) $n = \frac{1}{3}$ **b)** $x = \frac{3}{2}$ **c)** $p = \frac{4}{5}$
  d) $p = \frac{1}{5}$ **e)** $e = \frac{3}{4}$ **f)** $g = \frac{4}{5}$
13.a) $2n + 7 = -3$ **b)** $n = -5$; $-5°C$
14. Answers may vary. For example:
  a) A family wants to spend a day fishing. They rent 2 fishing boats, and some rods for \$720. How many rods did they rent?
  b) $2 \times 300 + 20r = 720$; $r = 6$
  c) Use guess and test.
15. Answers may vary. For example:
  a) A basement is flooded with 316 L of water. After how many minutes of pumping is there 1 L of water left?
  b) $316 = 15m + 1$; $m = 21$; 21 min

6.3 Solving Equations Involving Fractions, page 336

3.a) $t = 30$ **b)** $a = 56$ **c)** $b = 18$ **d)** $c = 27$
4.a) $d = -20$ **b)** $f = -40$ **c)** $k = -36$ **d)** $m = 35$
5.a) $\frac{b}{4} = 8$ **b)** $b = 32$; 32 golf balls
6.a) $\frac{n}{6} = 9$; $n = 54$ **b)** $\frac{n}{-4} = -3$; $n = 12$
  c) $\frac{n}{-5} = 7$; $n = -35$
7.a) $n = 28$ **b)** $m = 33$ **c)** $x = 24$ **d)** $s = 22$
8.a) $f = 18$ **b)** $t = -36$ **c)** $w = -25$ **d)** $e = -63$
9.a) $\frac{n}{-3} + 1 = 6$; $n = -15$ **b)** $3 - \frac{n}{9} = 0$; $n = 27$
  c) $\frac{n}{-2} + 4 = -3$; $n = 14$
10.a) $\frac{s}{2} - 11 = 12$ **b)** $s = 46$; 46 baseballs
11.a) Yes; each student gets $\frac{n}{5}$ of the bag, then gives 1 treat to the teacher, and is left with 9 treats.
  b) $n = 50$; 50 treats
12.a) $\frac{s}{3} + 5 = 41$ **b)** $s = 108$; 108 students
13.a) Correct **b)** $t = 48$ **c)** $r = -40$
14.b) $n = 105$

6.4 The Distributive Property, page 342

4.a) i) 77 **ii)** 77 **b) i)** 25 **ii)** 25 **c) i)** -10 **ii)** -10
  The expressions in each pair are equivalent.
5. Five groups of 1 positive x-tile and 2 positive unit tiles are equivalent to 5 x-tiles and 10 unit tiles. Both use the same tiles, only the tiles are grouped differently.
6.

7.a) $2x + 20$ **b)** $5a + 5$ **c)** $10f + 20$
  d) $72 + 6g$ **e)** $64 + 8y$ **f)** $5s + 30$ **g)** $27 + 3p$
  h) $44 + 4r$ **i)** $7g + 105$ **j)** $63 + 9h$
8.a) $3x - 21$ **b)** $4a - 12$ **c)** $9h - 45$ **d)** $56 - 7f$
  e) $5 - 5s$ **f)** $6p - 12$ **g)** $88 - 8t$ **h)** $30 - 2v$
  i) $10b - 80$ **j)** $11c - 44$
9. $P = 2(b + h)$; $P = 2 \times b + 2 \times h$
10. Answers will vary. For example: In multiplication, the order of the terms does not matter. The area of a rectangle with $b = 2$ cm and $h = 1$ cm is $b \times h = h \times b = 2$ cm^2.
11. The expression in Part a: $54 - 9t$ is equal to $9(6 - t)$.
12.a) $-6c - 24$ **b)** $-8a + 40$ **c)** $10f - 70$
  d) $-24 - 3g$ **e)** $-64 + 8y$ **f)** $2s - 10$
  g) $5t + 40$ **h)** $-81 + 9w$
13. Expressions in parts c and d are equivalent.

c) $2(t + 3) = 2t + 6$ or $6 + 2t$
d) $9 + x = x + 9$
14.a) $15(25 + 14)$ or $15 \times 25 + 15 \times 14$
  b) $585; Answers may vary. For example: I prefer the unexpanded expression. It is easier to solve.
15.a) $5(9 + 8)$ or $5 \times 9 + 5 \times 8$
  b) $85; Answers may vary. For example: I prefer the unexpanded expression. It is easier to solve.
16.a) iv   **b)** ii   **c)** iii   **d)** i
17. $2(3(m + 2)) = 6(m + 2) = 6m + 12$
18.a) i) $7y + 21$ **ii)** $3t - 15$
  iii) $32 - 8s$ **iv)** $-12p - 36$
  b) i) $7(5 + y - 2)$ $7(5 + y) - 7(2)$
    $7 \times 5 + 7y - 7 \times 2$ $7(5 - 2 + y)$
    $7 \times 5 + 7(y - 2)$
19.a) $14 + 2b + 2c$ **b)** $-66 + 11e - 11f$
  c) $r - s + 8$ **d)** $60 + 10v + 10w$
  e) $5j - 75 - 5k$ **f)** $4g - 48 + 4h$

6.5 Solving Equations Involving the Distributive Property, page 347

4.a) $x = 7$ **b)** $p = 15$ **c)** $y = 3$ **d)** $a = -5$
5.a) $a = -13$ **b)** $r = 14$ **c)** $y = -2$ **d)** $c = 16$
6.a) $2(c + 3) = 20$ **b)** $c = 7$
7. The equation doubles the cards Marc had before he was given 3 more cards.
8.a) $2(w + 8) = 26$ **b)** $w = 5$; 5 cm
9.a) $6(x - 5) = 90$ **b)** $x = 20$; $20
10.a) $8(6 + m) = 264$ **b)** $m = 27$; $27
11.a) $-5(n + 9) = 15$ **b)** $n = -12$
12.a) $-4(n - 7) = 36$ **b)** $n = -2$
13.a) No
  b) Kirsten divided the right side of the equation by $+8$ instead of -8. The correct solution is $x = 2$.
14.a) $t = 0$ **b)** $p = \frac{13}{2}$, or 6.5
  c) $r = \frac{3}{4}$, or 0.75   **d)** $s = -12$
15.a) $1500 = 25(n + 40)$ **b)** $n = 20$; 20 guests
16. Answers may vary. For example:
  a) Glenn and Lisa won a radio contest for a free roller-skating party for themselves and five other friends. The cost per person includes a $2.00 skate rental deposit that is returned to the renter when the skates are returned.
    If the total value of the roller-skating party works out to be $42, what is the cost per person, before and after the skates are returned?
  b) $n = 8$; The cost per person is $8 before and $6 after.
17.a) $p = 5$ **b)** $x = \frac{3}{8}$, or 0.375
  c) $s = \frac{1}{2}$, or 0.5

Unit 6 Mid-Unit Review, page 350

1.a) $x = -9$ **b)** $x = -9$ **c)** $x = 3$ **d)** $x = -4$
2.a) $3g + 4 = 13$ **b)** $g = 3$; 3 granola bars
3.a) $x = -9$ **b)** $x = -3$ **c)** $x = \frac{1}{3}$ **d)** $x = \frac{5}{6}$
4.a) $125 + 12p = 545$ **b)** $p = 35$
5.a) $n = -32$ **b)** $m = 15$
  c) $b = -18$ **d)** $f = -32$
6.a) $\frac{n}{-7} = 4$; $n = -28$ **b)** $\frac{k}{-9} = -3$; $k = 27$
  c) $\frac{m}{-2} + 5 = 0$; $m = 10$
7.
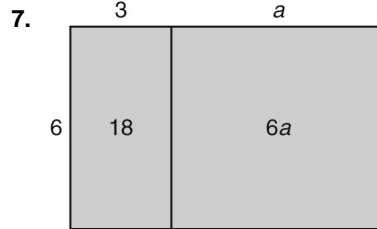
8.a) $3x + 33$ **b)** $60 + 5y$ **c)** $28 - 7a$ **d)** $12t - 72$
9.a) $x = 5$ **b)** $p = 7$ **c)** $r = -1$ **d)** $s = -7$
10.a) $2(n + 6) = 26$ **b)** $n = 7$; 7 points

6.6 Creating a Table of Values, page 356

4.a)

x	y
1	2
2	3
3	4
4	5
5	6

b)

x	y
1	4
2	5
3	6
4	7
5	8

c)

x	y
1	2
2	4
3	6
4	8
5	10

5.a)

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

b)

x	y
1	1
2	3
3	5
4	7
5	9

c)

x	y
1	-1
2	-3
3	-5
4	-7
5	-9

6. $(2, 11), (4, 29), (5, 38)$

7.a)

h	w
1	7
2	14
3	21
4	28
5	35

b) 15 h   **c)** $168

8.a)

x	y
-3	-1
-2	0
-1	1
0	2
1	3
2	4
3	5

b)

x	y
-3	-6
-2	-5
-1	-4
0	-3
1	-2
2	-1
3	0

c)

x	y
-3	1
-2	2
-1	3
0	4
1	5
2	6
3	7

9.a)

x	y
–3	9
–2	7
–1	5
0	3
1	1
2	–1
3	–3

b)

x	y
–3	11
–2	6
–1	1
0	–4
1	–9
2	–14
3	–19

c)

x	y
–3	–27
–2	–19
–1	–11
0	–3
1	5
2	13
3	21

10. (1, 2), (5, –10), (7, –16)

11.a) (–8, 23) **b)** (12, –17) **c)** (–12, 31) **d)** (15, –23)

12.a)

n	m
0	100
1	98
2	96
3	94
4	92
5	90

b) 20 months   **c)** 86 kg

13.a) m represents the product, t represents the number 9 is being multiplied by.

b)

t	m
0	0
1	9
2	18
3	27
4	36
5	45

c) Patterns may vary. For example: The tens digit in the product increases by 1 each time and the ones digit decreases by 1 each time. The value of m starts at 9 and increases by 9 each time. The sum of the digits of m is equal to 9.

d) Yes; 126 is divisible by 9 because its digits add up to 9.

e) 153

14.a) (–4, –14) **b)** (–7, –26) **c)** (3, 14) **d)** (–1, –2)

15.a) (–2, –18) **b)** (–8, –48) **c)** (6, 22) **d)** (1, –3)

6.7 Graphing Linear Relations, page 363

4.a) When x increases by 1, y increases by 4. The points lie on a line that goes up to the right.

b) When x increases by 1, y decreases by 3. The points lie on a line that goes down to the right.

5.a) Graph of y = 2x

b) Graph of y = 3x

c) Graph of y = 4x

d) Graph of y = 5x

e) Graph of y = –2x

f) Graph of y = –3x

g) Graph of y = –4x

h) Graph of y = –5x

6.a) Graph of y = 2x + 1

b) Graph of y = 2x – 1

c) Graph of y = –2x + 1

d) Graph of y = –2x – 1

e) Graph of y = 3x + 1

f) Graph of y = 3x – 1

g) Graph of y = –3x + 1

h) Graph of y = –3x – 1
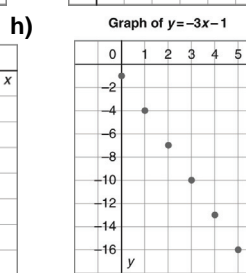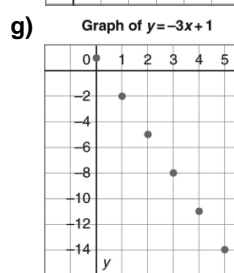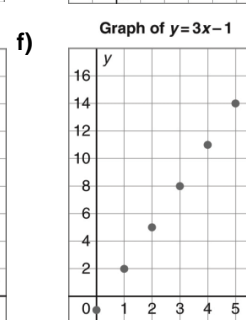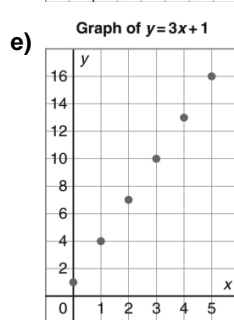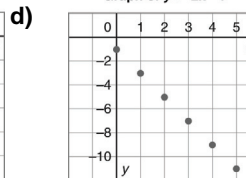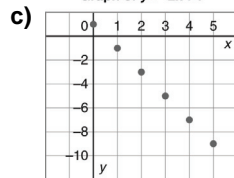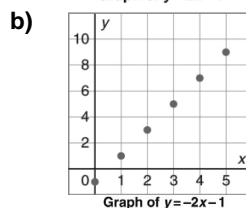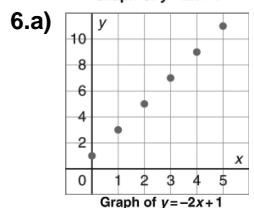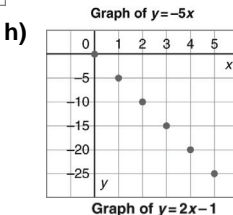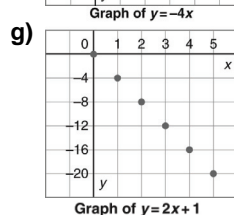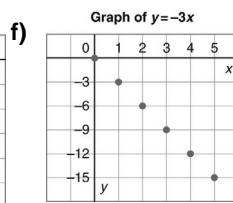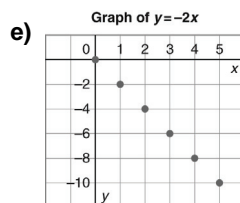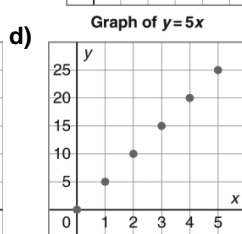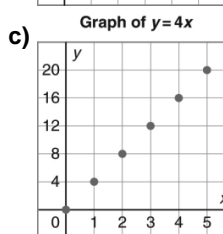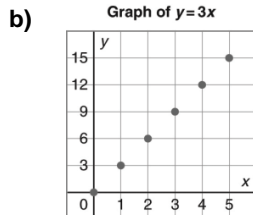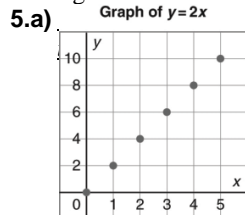
7. (2, 19), (3, 27), (5, 43)

To find a missing number, substitute the given number into the equation and then solve for the unknown.

8. (–3, 13), (–2, 7), (2, –17), (3, –23)

To find the missing numbers, substitute the given numbers into the equation and then solve for the remaining unknown.

9.a)

Graph of c = 11 + 2n

Point labeled (6, 23)
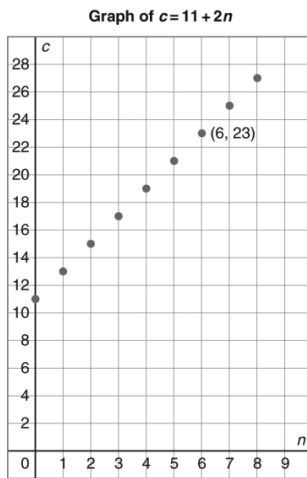
b) The points go up and to the right.
As the x value increases by 1, the y value increases by 2.

c) (6, 23)

10.a)

Graph of m = 100 − 2n

Point labeled (7, 86)
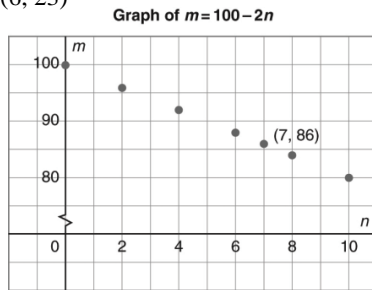
b) The points go down and to the right.
As the x value increases by 2, the y value decreases by 4.

c) (7, 86)

11.a)

n	m
1	20
2	28
3	36
4	44
5	52
6	60
7	68
8	76
9	84
10	92
11	100

b)

Graph of m = 8n + 12
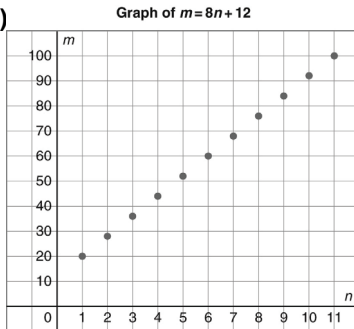
c) The points lie on a line that goes up and to the right. As the x value increases by 1, the y value increases by 8.

d) Yes

12.a)

Graph of y = 8x + 2

b)

Graph of y = −8x − 2

c)

Graph of y = −7x + 4

d)

Graph of y = 5x − 4
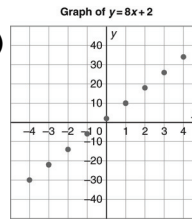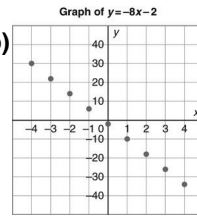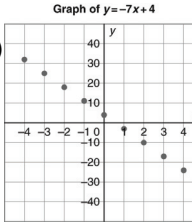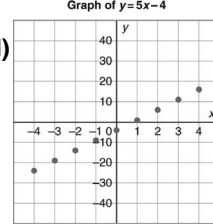
13.a)

n	p
10	−12 000
20	−9 000
30	−6 000
40	−3 000
50	0
60	3 000
70	6 000
80	9 000
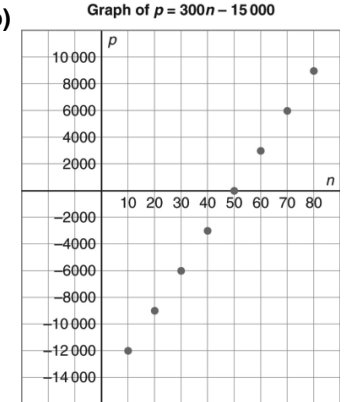
The negative values of p represent a loss of money.

b)

Graph of p = 300n − 15 000

c) As the value of n increases by 10, the value of p increases by 3000. The points lie on a line that goes up and to the right.

d) $7500; I used the graph.

14.a)

Graph of C = 60 + 40n
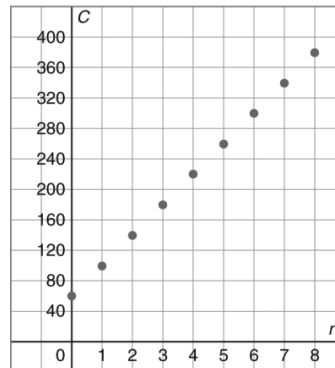
b) When n increases by 1, C increases by 40.
The points lie on a line that goes up and to the right.

c) No; answers may vary. For example:
You cannot work −1 h.

15.a) i) Graph of $y = -9x + 4$
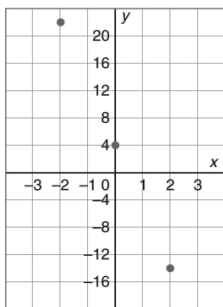
ii) Graph of $y = 6x - 3$
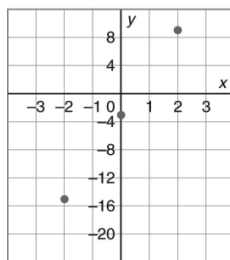
$c = 60 + 2h$
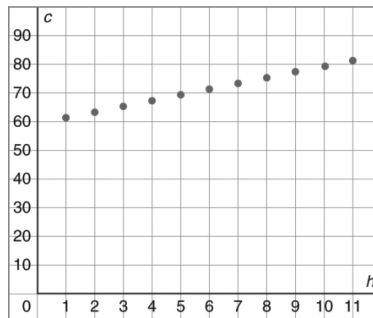
iii) Graph of $y = -7x - 2$

iv) Graph of $y = 4x + 11$

2. If Chris is planning on using the ATV for under 5 h, using the "Rambler" is cheaper. For more than 5 h, the "Northern" is cheaper; for exactly 5 h, the price is the same.

Unit 6 Strategies for Success: Choosing a Strategy, page 369

1. 152 fence posts   **2.** 16 teams
3. Ivan has $25.00 and Marsha has $35.00.
4.a) $7.95   **b)** $22.95
5. The order of the beads on a necklace is reversed when a necklace is flipped over.
  a) There are 3 different necklaces which can be made: Green, Yellow, Red; Yellow, Red, Green; Red, Green, Yellow
  b) There are 6 different necklaces which can be made: Green, Yellow, Red, Red; Yellow, Green, Red, Red; Yellow, Red, Green, Red; Green, Red, Yellow, Red; Red, Green, Yellow, Red; Green, Red, Red, Yellow

v) Graph of $y = 7x + 5$

vi) Graph of $y = 3x - 8$
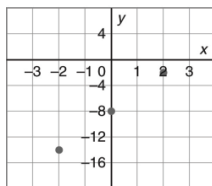
vii) Graph of $y = -9x - 6$ **viii)** Graph of $y = -8x + 7$

Unit 6 Unit Review, page 371

1.a) $7c = 56$ **b)** $c = 8$; 8 coins
2.a) $x = 5$ **b)** $x = -2$ **c)** $x = 4$
  d) $x = -4$ **e)** $x = 6$ **f)** $x = -6$
3.a) $8 + 3g = 29$ **b)** $g = 7$; 7 gardens

4.a) $x = 4$ **b)** $x = 3$ **c)** $x = \frac{2}{3}$

  d) $x = -7$ **e)** $x = \frac{1}{3}$ **f)** $x = 2$

5.a) $3h + 6 = 3$ **b)** $h = -1$; $-1°C$
6.a) $p = 12$ **b)** $t = -90$
  c) $w = -54$ **d)** $e = -88$
7. $h = 14$

8.a) $\frac{f}{5} = 52$ **b)** $f = 260$; 260 fish
9.

	4	x
3	12	3x
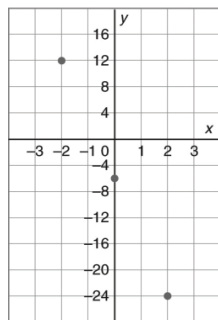
10.a) $6x + 54$ **b)** $33 - 12c$
  c) $-35s + 25$ **d)** $-12a + 8$
11.b) $5t - 20$
12.a) $x = 3$ **b)** $b = 12$ **c)** $p = 17$
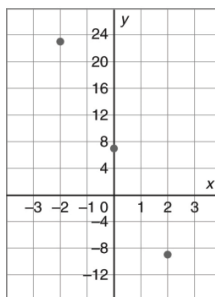
b) Graphs ii, iv, v, and vi go up and to the right. Graphs i, iii, vii, and viii go down and to the right.
c) If the x term is positive, the graph goes up to the right; if it is negative, the graph goes down to the right.

Unit 6 Technology: Using Spreadsheets to Graph Linear Relations, page 367

1. When the input increases by 1, the output increases by 2.

d) $s = \dfrac{24}{5}$, or 4.8

13.a) $-4(x - 7) = 36$ **b)** $x = -2$

14.a) No

b) $c = -9$; Chas should have written $+10$ after multiplying -2 and -5.

15.a)

x	y
-3	-11
-2	-10
-1	-9
0	-8
1	-7
2	-6
3	-5

b)

x	y
-3	8
-2	7
-1	6
0	5
1	4
2	3
3	2

16.a)

n	s
1	6
2	12
3	18
4	24
5	30
6	36
7	42
8	48

b) 42
c) 11
d) 6 packages

17.a)

Graph of $s = 6n$
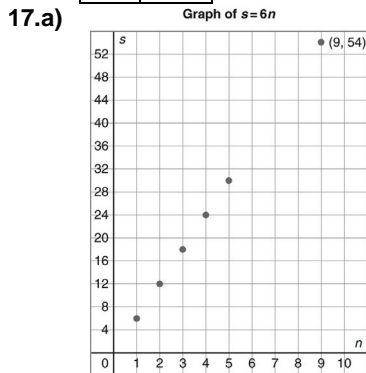
b) When n increases by 1, s increases by 6.
c) (9, 54)

18.a) 18 **b)** 3 **c)** -52 **d)** 0

19.a)

n	p
0	200
1	240
2	280
3	320
4	360
5	400
6	440
7	480

b) $560
c) 7 memberships

20.a)

Graph of $p = 200 + 40n$

b) When n increases by 1, p increases by 40.
c) (5, 400)

21.a)

Graph of $y = -6x$

b)

Graph of $y = -4x + 3$

c)

Graph of $y = 7x - 1$

d)

Graph of $y = 9x + 8$
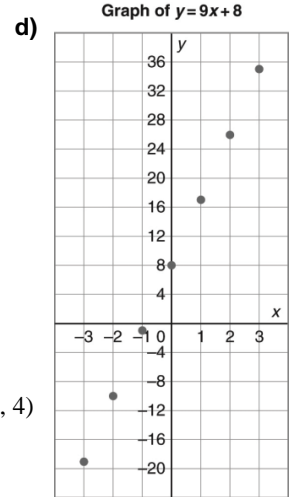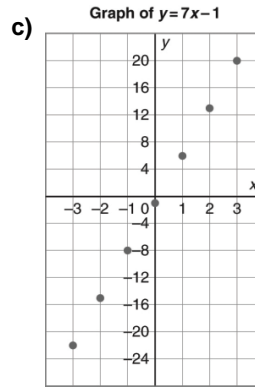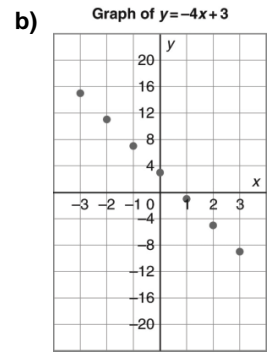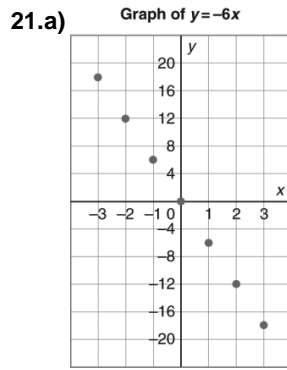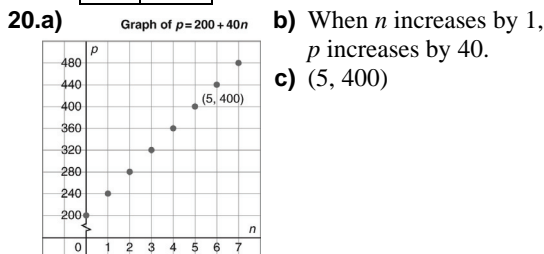
22. $(-2, 9)$, $(-1, 8)$, $(0, 7)$, $(3, 4)$

Unit 6 Practice Test, page 374

1. $s = 2$

2.a) $3 - 3r = -6$; $3 - 3r + 3r = -6 + 3r$; $3 + 6 = -6 + 6 + 3r$; $9 = 3r$; $3 = r$

3.a)

b) No, you could not draw a picture to show that $-4(x + 3)$ and $-4x - 12$ are the same, because it is not possible to draw a rectangle with negative side lengths and areas.

4.a) $x = 12$ **b)** $n = -21$ **c)** $p = 42$ **d)** $x = 8$

5.a) $14p + 200 = 424$ **b)** $p = 16$; 16 people

6.a)

x	y
-3	19
-2	13
-1	7
0	1
1	-5
2	-11
3	-17

b)

x	y
-3	-25
-2	-18
-1	-11
0	-4
1	3
2	10
3	17

7.a)

a	g
10	0
9	1
8	2
7	3
6	4
5	5
4	6
3	7
2	8
1	9
0	10

b)

Graph of $g = 10 - a$
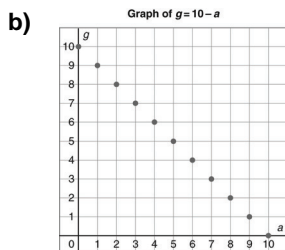
c) When a decreases by 1, g increases by 1.

d) (5, 5) because both boys get an equal share

8.a) 0   **b)** 22   **c)** 3   **d)** –38

Unit 6 Unit Problem: Planning a Ski Trip, page 376

1. You should choose company A: Company A charges \$5525; company B charges \$7225.

2. $851 = 23p$; $p = 37$; 37 students

3.a) $T = -15$; –15°C   **b)** $c = -8$; –8°C

4.a)

p	h
0	1500
10	1800
20	2100
30	2400
40	2700
50	3000
60	3300
70	3600
80	3900
90	4200
100	4500

b)

Graph of $h = 1500 + 30p$
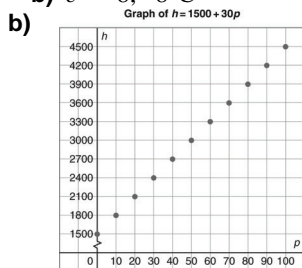
c) When p increases by 10, h increases by 300.

d) \$4350; \$45.79/person

Cumulative Review Units 1–6, page 378

1.a) 1   **b)** 256   **c)** 6.6   **d)** 121

2.a) 20 cm²; $\sqrt{20}$ cm   **b)** 45 cm²; $\sqrt{45}$ cm

3. $(+24) \times (-3) = -72$; 72 s

4.a) –60   **b)** +80   **c)** –19   **d)** –19

5.a) $\frac{5}{12}$ **b)** $1\frac{3}{5}$ **c)** $5\frac{3}{5}$ **d)** $4\frac{19}{24}$

6.a) 5   **b)** 4

   c) The hygienist sees 4 patients and has $\frac{1}{2}$ of $1\frac{1}{6}$ h free time.

7.c) A box with base 2 units by 4 units.

8. 832 cm²

9.a) 600 cm³   **b)**

   c) 660 cm²
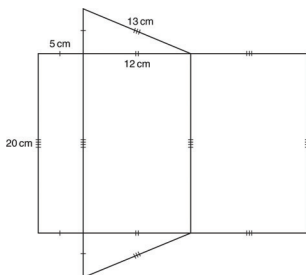
10. 12%

11.a) i) 9 : 1   **b)** 1 : 2   **c)** 5 : 6   **d)** 2 : 1 : 9

   b) 27

12.a) 12 rolls of paper towels for \$5.59

   b) 500 mL of mouthwash for \$3.99

13.a) \$46.65   **b)** \$38.84

14.a) $x = -5$ **b)** $s = -7$ **c)** $t = 96$ **d)** $f = -40$

15. $A = 8(6 + x)$; $A = 48 + 8x$

16.a) $-2(x + 11) = -4$ **b)** $x = -9$

17.a) (2, –13)   **b)** (0, 5)

   c) (–3, 32)   **d)** (4, –31)

18.a) Answers may vary.

For example:

n	p
10	80
20	110
30	140

   b) \$185   **c)** 70

Unit 7 Data Analysis and Probability, page 380

7.1 Choosing an Appropriate Graph, page 387

3.a) Answers will vary. For example:

   Adult women watch TV 4 h more than adult men.

   Children watch 15 h of TV a week.

   Teens watch 2 h less of TV than children.

b) Answers will vary. For example:

   Adult women watch more TV than adult men.

   Teens watch the least amount of TV.

   Adult women watch more TV than any other age group.

c) The bar graph; It is easier to determine the number of hours of television each group watches.

4.a), b)

	Strengths	Limitations
Bar Graph	The heights of the bars can be used to compare the responses. It is easy to read.	The percent of students who chose each response cannot be read from the graph.
Pictograph	The key is one symbol equals 3 students. The key can be used to calculate the total number of students who littered.	Some people may find this graph difficult to read accurately because not all of the symbols are complete.

   c) Answers may vary. For example: the bar graph; it is easier to read than the pictograph with partial pictures.

d) A line graph would not be appropriate because the data were not collected over time. A circle graph would be appropriate if you wanted to know percents.

5.a) Answers will vary. For example:
7 people got an A.
1 more person got a B than a C.
3 people got a D.

b) Answers will vary. For example:
More people got a B than any other grade.
More than half the class got an A or B.
About 75% did not get an A.

c) The bar graph; you can see the exact number of students.

d) Bar graphs, since they show the actual number of students, and his class has more students who got As and Bs

e) Ms. Taylor's class; it had a higher percent of students who got As and Bs

6.a) Both compare the winning times of the men's and women's 400-m hurdles at six Olympic games.

b) The line graph makes it easier to compare women's or men's times from one Olympic game to the next.
The bar graph makes it easier to compare women's and men's times for a particular year.

c) The line graph makes it difficult to accurately read the times.
The double bar graph makes it difficult to compare from one year to the next.

d) i) The double line graph; it clearly shows the change from one year to the next.
ii) The bar graph; the difference in bar heights for any year is easy to see.

7. Answers will vary. For example:
a) Practice run times for 2 months
b) Student shoe sizes
c) Average heights of boys and girls for several grades
d) Number of apples eaten in a week
e) How a student spends her time during summer vacation

8.a) Yearly sales; it shows a trend over time.
b) Answers may vary. For example: Bar graph; it would break down the number of pairs by size.

9.a) The line graph shows better the general decrease in attendance. The bar graph shows better the actual mean attendance numbers.
b) For both graphs, it is difficult to accurately read the numbers that are not directly on a grid line.
c) Answers may vary. For example: The line graph; it shows best the change over time.
d) No; we are not interested in mean attendance numbers as parts of a whole.

10.a)

Number of People Employed in the Construction Industry
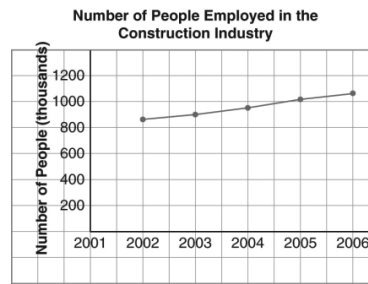
b) Allows you to see a trend in data which are collected over a period of time
Difficult to read accurately because none of the points are on a grid line

11.a)

Canadian Aboriginal Population in 2001
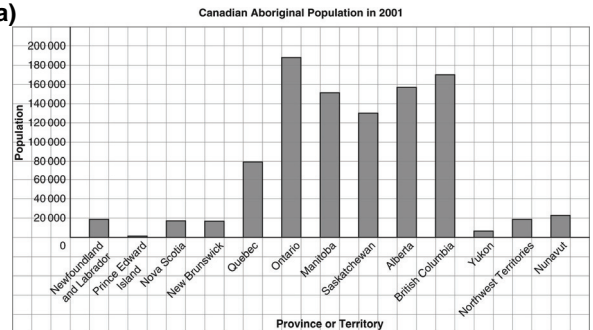
b) Allows for direct comparison of populations in different regions
Difficult to read accurately the exact populations
Does not show populations as percents

12. Answers may vary. For example:
i) A line graph to show the trend over time
ii) A double bar graph to compare her parents
iii) A circle graph to show the percent of time her brother spent on each activity
iv) A line graph to show the change in height over time

13.a)

Mass of Madan's Guinea Pig
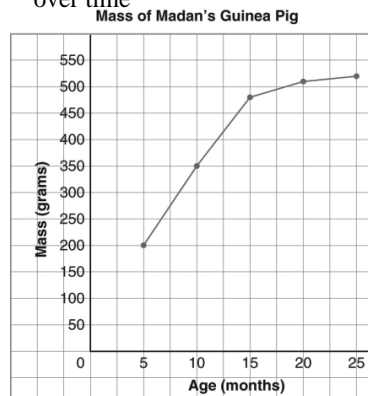
b) Allows you to see a trend in data collected over a long period of time
Difficult to read accurately the data because not all of the points are on grid lines

c) 8 months: about 290 g; 30 months: about 525 g

Unit 7 Technology: Using Spreadsheets to Record and Graph Data, page 392

1.a)

Where Canadians Met their Best Friends

Where Canadians Met their Best Friends

b) Answers may vary.

2.a)

Average Hours of Television Viewed per Week by Adolescents Aged 12-17 Years Fall 2004
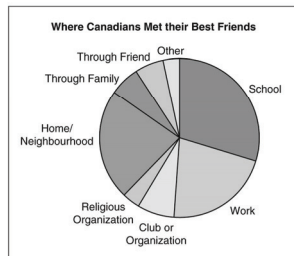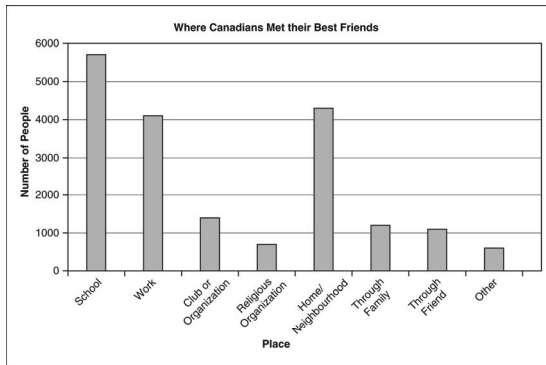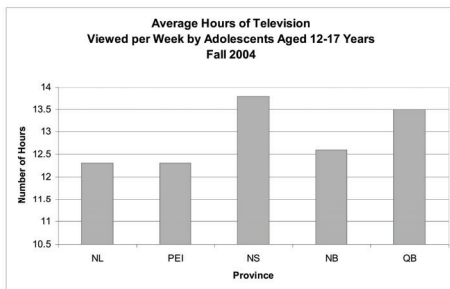
b) Circle graph; since each piece of data is independent and should not be represented as part of a whole
Line graph since data are not collected over time

3. a)

Average Value of US $1

Average Value of US $1
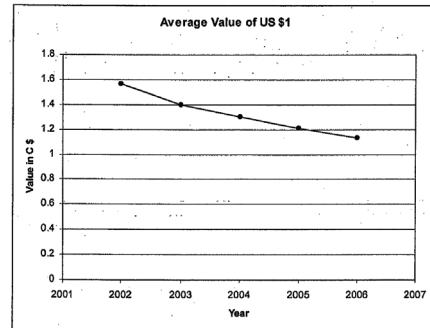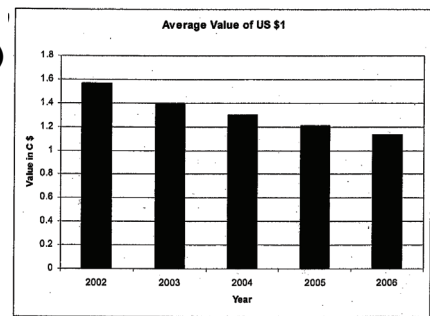
b) The line graph; the data are collected over a period of time.

c) A circle graph, because the data do not represent parts of a whole.

7.2 Misrepresenting Data, page 399

3. Graph B is misleading because its vertical axis does not start at zero, making it appear that Russ sold at least twice as much as the others.

4.a) Graph A gives the impression that half the students want to go to Stanley Park.
Graph B gives the impression that the votes are roughly equal.

b) Graph A is misleading because its horizontal axis doesn't start at zero.
Graph B is misleading because the scale on its horizontal axis is too large.

c) The creator of Graph A would most likely like to go to Stanley Park.

d) Answers may vary. For example: The creator of Graph B probably doesn't want to go anywhere.

e) Start the horizontal axis at 0, and let 1 grid square represent 1 student.

5. Conclusions a and b are incorrect.
Both conclusions were based on Graph A, whose vertical axis doesn't start at 0.

6.a) No; Nick thought the larger symbols represented a greater number of animals.

b) All the fish symbols should be drawn the same size.

c) Bird; The symbols for birds are so large it looks like most students have birds.

7.a) No; the drop is only 5% from 3rd to 4th term.

b) The vertical axis should start at zero.

8.a) Manufacturer A has a lot more trucks still on the road.

b) 97.5, 96.5, and 95.5

c) Manufacturer A's trucks are about as dependable as those of the other three manufacturers; the four companies have nearly the same number of trucks on the road after 10 years.

d) Start the vertical axis at zero.

9.a) Kathy's plant

b) The symbols are drawn in different sizes; it looks like Arlene's plant is the tallest.

c) Make all symbols the same size.

d) No; Arlene probably drew it to make her plant look the tallest.

10.a) More girls participate in sports than boys.

b), c) The girls' bars are thicker and the boys' scale larger.

d) Use the same scale and the same bar width for both.

e) A double bar graph

11.a) The graph is misleading because the angle it is drawn on makes the closest bars appear taller.

b) Do not draw the graph on an angle.

13. By making the symbols of a pictograph different sizes

By altering where an axis begins its numbering

By slightly removing a sector from a circle graph

14.a) No, because you don't know how much money either of them has to spend, only the percent they spend on each activity

b) A double bar graph

15.a) Draw a bar graph with a large scale that starts at $50 000.

b) Draw a bar graph with a small scale.

c) Draw a bar graph. Start the vertical axis at 0 and let 1 grid square represent $25 000.

16. Answers may vary. For example:

a) Draw a 3-D bar graph on an angle to make the Pizza bar appear larger.

b) Draw a bar graph with a large scale.

c) Draw a bar graph and start the vertical scale at 195.

Unit 7 Technology: Using Spreadsheets to Investigate Formatting, page 405

1.a) This graph makes it appear that Thornton made 3 times as many points as some of the players.

Top Point Scorers, 2005 - 2006
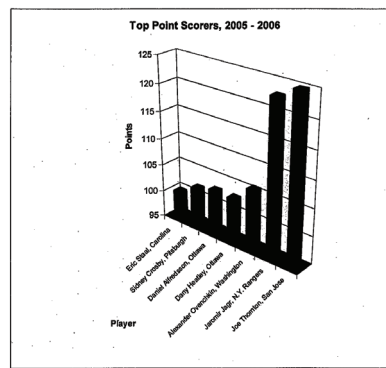
b) This graph makes it look as though Jagr scored about as well as any of the other players.

Top Point Scorers, 2005 - 2006
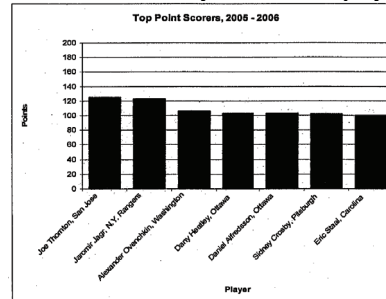
2. Answers may vary. For example:

a) This double bar graph accurately shows the number of men and women in the Olympics because it has an appropriate scale, no enlarged bars, and the vertical axis starts at zero.

Number of Athletes in the Winter Olympic Games

b)

Number of Men in the Winter Olympic Games

Number of Women in the Winter Olympic Games

c)

Number of Men in Winter Olympic Games

Number of Women in the Winter Olympic Games
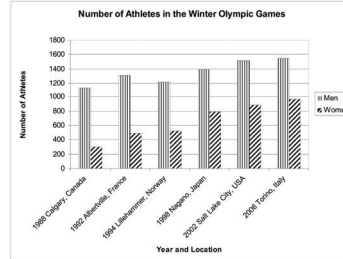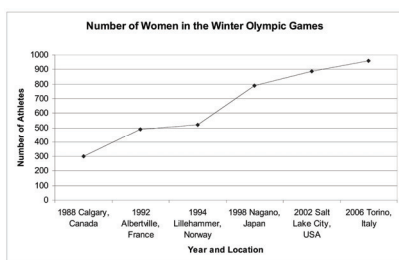
Unit 7 Mid-Unit Review, page 406

1.a) The bar graph shows the number of endangered species of each type of animal. The circle graph shows the percent of endangered species of each type of animal.
  b) The bar graph allows for comparison of numbers. The circle graph shows percents or parts of a whole.
  c) In the circle graph, the original numbers are lost. The bar graph does not show percents.
  d) The bar graph; Percents of endangered species are less relevant than actual numbers.
  e) No; The data were not collected over a period of time.

2.a) No; The Hawks have scored more points per game and are improving faster.
  b) The smaller scale on the Ravens' graph and the fact that their vertical axis doesn't start at 0.
  c) Have the same scales and start both vertical axes at the same number

7.3 Probability of Independent Events, page 411

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

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

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

6.a) i) $\frac{3}{100}$ **ii)** $\frac{3}{20}$ **iii)** $\frac{3}{100}$ **iv)** $\frac{6}{25}$

7.a) $\frac{1}{36}$ **b)** $\frac{1}{36}$ **c)** $\frac{5}{12}$ **d)** $\frac{1}{4}$ **e)** $\frac{1}{4}$

8.a) i) $\frac{1}{24}$ **ii)** $\frac{5}{78}$

  c) $\frac{1}{312}$; The rule is much faster than using a tree diagram.

9. The probability of rolling the same colour twice is $\frac{1}{16}$. However, Marcus forgets that there are 4 different colours. So, a person actually has a $\frac{1}{4}$ chance of winning.

10.a) $\frac{1}{5}$
  b), c) Answers may vary depending on assumptions. For example: $\frac{1}{25}$; I assumed he places the first pair of socks back in the drawer before trying again.

11.a) $\frac{1}{4}$ **b)** For example:

	B	G
B	BB	GB
G	BG	GG

12.a) i) $\frac{1}{12}$ **ii)** $\frac{1}{9}$ **iii)** $\frac{1}{9}$
  b) No; the colour of the first marble will affect which marbles are left and their probabilities for being drawn.

13.a) $\frac{1}{5}$ **b)** $\frac{9}{10}$ **c)** $\frac{1}{10}$ **d)** 0

14. $\frac{1}{16}$

15. Answers will vary. For example:
  a) Rolling a number less than 7 and tossing heads
  b) Rolling a 2 or 5 and tossing tails
  c) Rolling a 1, 3, 4, or 6 and tossing heads

7.4 Solving Problems Involving Independent Events, page 420

4.a) $\frac{1}{8}$ **b)** $\frac{1}{8}$ **c)** $\frac{1}{8}$

5.a) $\frac{1}{216}$ **b)** $\frac{1}{36}$

6.a) $\frac{1}{32}$ **b)** $\frac{3}{16}$ **c)** $\frac{1}{8}$

7. $\frac{1}{10\,000}$

8.a) $\frac{1}{1000}$ **b)** $\frac{1}{10}$ **c)** $\frac{6561}{10\,000}$

9.a) $\frac{1}{64}$ **b)** $\frac{1}{32}$ **c)** $\frac{3}{104}$

10.a) $\frac{1}{1024}$ **b)** $\frac{9}{1024}$ **c)** $\frac{243}{1024}$

11. $\frac{1}{17\,576}$

12.a) $\frac{27}{512}$ **b)** $\frac{9}{1024}$ **c)** $\frac{5}{512}$

13.a) About 0.013%

   b) $\frac{1}{6}$; The events are independent.

   c) No; the probability of drawing the white marble 6 times in a row looks at 6 events and their outcomes altogether, so it is much less likely to happen.

14.a) $\frac{5}{64}$ **b)** $\frac{7}{192}$ **c)** 0

15.a) 30%   **b)** 21%   **c)** 49%

16.a) $\frac{1}{216}$ **b)** $\frac{215}{216}$

   c) The sum is 1 because rolling 6s and not rolling 6s account for all possibilities.

Unit 7 Technology: Using Technology to Investigate Probability, page 423

1.b) i) $\frac{1}{8}$ or 12.5%   **ii)** $\frac{1}{4}$ or 25%

   c) The results are very similar.

Unit 7 Unit Review, page 424

1.a) Line graph:
The number of barrels of oil produced increased every year except for 1999 and 2005.
The lowest production year was 1999.
The highest production year was 2004.
Bar graph:
The amount of oil produced never exceeded 2.5 million barrels.
The amount of oil produced never dropped below 1.5 million barrels.
Oil production was fairly steady from 1998 to 2001.

   b) The line graph is more appropriate to display the data because it clearly shows the change from year to year.

2.a) A circle graph shows the percent of students who chose each response. A pictograph is more visually appealing and makes it very easy to compare how many students chose each response.

   b) For example, a company who produces snack food might want to know which products are most popular.

   c) For example, Sarah is throwing a birthday party and she's inviting the entire class. She wants to know how many people prefer each kind of snack food.

3.a) The number of awards each group of dogs won.

   b) Answers may vary. For example: The bar graph; it isn't important what percent of the awards each type of dog won, but how many awards each group won.

   c) No; the data do not change over time

   d) Yes; however, you would have to use symbols or divide a symbol into many smaller pieces.

4.a)

Paola's Pizza Parlour Pizza Toppings
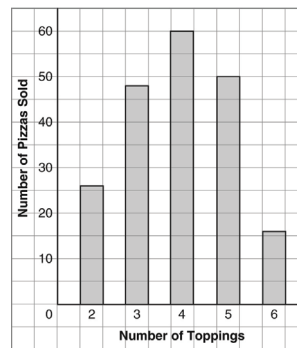
   b) Allows for immediate comparison between the different responses
Does not show each number of pizzas sold as a percent of the total number of pizzas sold.
May be difficult to read the value of the bars that do not end on grid lines.

5.a) Yes; she drew the same number of symbols next to each category

   b) Carrots

   c) The symbols for carrots are enlarged to make them appear more popular.

6. The "Not Ready" sections are not drawn to scale; they are drawn shorter to make the percents appear smaller.

7. The second graph; because it does not start the scale on the horizontal axis at 0, but rather at 10; it appears that Party Pizza has at least 10 times as many wrong orders as Pizza Place

8. No; the graph is misleading because its vertical axis does not start at 0. This shortens the bar for the 11-year-olds to look as though very few of them have cell phones

9.a)

Bicycle Bonanza's Profit
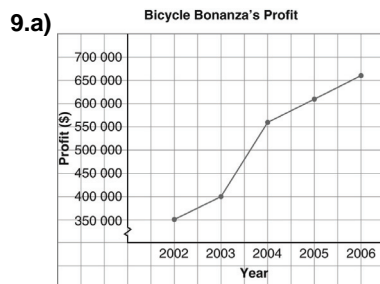
I created the impression of a large growth in profit by not starting the vertical axis scale at 0.

b)

Bicycle Bonanza's Profit
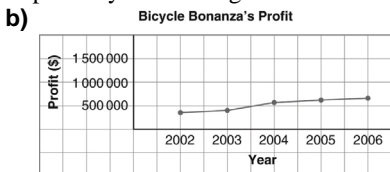
I created the impression of very little growth in profit by using a very large scale on the vertical axis.

10.a) $\frac{1}{6}$

11.a) $\frac{1}{3}$ **b)** $\frac{1}{3}$ **c)** $\frac{1}{9}$ **d)** $\frac{1}{9}$ **e)** 0

12.a) $\frac{1}{3}$ **b)** $\frac{1}{27}$ **c)** $\frac{8}{27}$

13.a) $\frac{1}{2197}$ **b)** $\frac{1}{140\ 608}$ **c)** $\frac{9}{676}$

14. $\frac{1}{1024}$

15.a) $\frac{1}{64}$ **b)** $\frac{1}{64}$ **c)** $\frac{1}{64}$ **d)** $\frac{3}{64}$

Unit 7 Practice Test, page 428

1.a) Answers may vary. For example:
   i) A bar graph does not allow data to be displayed as percents or parts of a whole.
   ii) In a circle graph, the original data are lost, only the percents are shown.
  b) A pictograph would likely be a bad choice; the data would require a large number of symbols. A line graph could not be used because the data were not collected over a period of time.
  c) A bar graph; the actual number of students would be shown

2.a), b) The first graph gives the impression that sales have not increased substantially by using a large scale that goes far beyond the data. The second graph gives the impression that sales have increased dramatically because the vertical axis does not start at 0 and the scale is very small.
  c) Use an appropriate scale that starts at 0.

3.a) $\frac{1}{4}$ **b)** $\frac{1}{18}$ **c)** $\frac{1}{12}$ **d)** $\frac{1}{6}$

4.a) $\frac{3}{4}$ **b)** $\frac{9}{64}$ **c)** $\frac{7}{64}$

Unit 8 Geometry, page 432

8.1 Sketching Views of Objects, page 437

4.a)   **b)**

c)
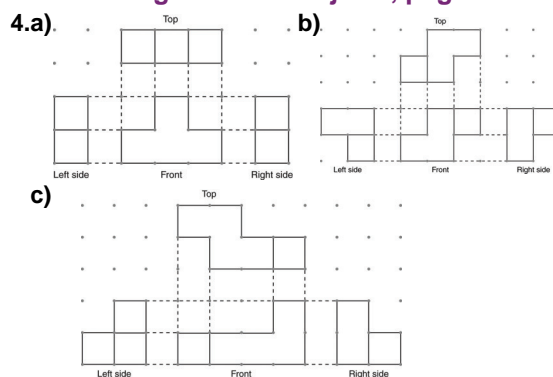
5. A: N, P; B: L, N, Q; C: L, Q; D: J, L, Q; E: K, M, Q

8.   **9.**

10.   **12.**

13.   **14.**
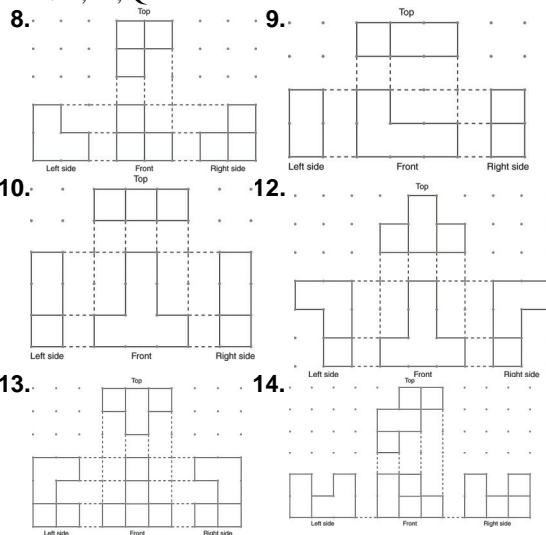
15. 7 possible objects

16.
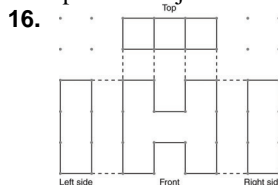
17.a) No
  b) Answers may vary. For example: Front, back, and side views the same
  c) Answers may vary. For example: Front and side views the same
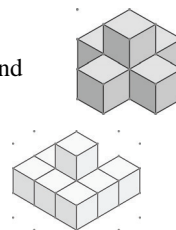
d) Answers may vary. For example: No views the same
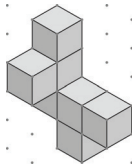
8.2 Drawing Views of Rotated Objects, page 444

3.a) Horizontally 90° counterclockwise
  b) Horizontally 180°
  c) Horizontally 90° clockwise
4.a) Front view: B; top view: E; left side view: A; right side view: A
  b) Front view: G; top view: C; left side view: F; right side view: D
5. Part a
6. Students' answers should show the rectangle representing the vertical side piece.
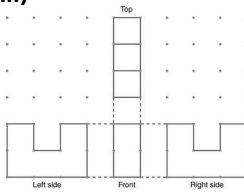
7.i), iii) **ii)**
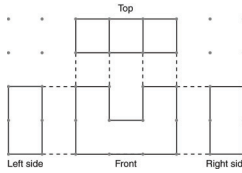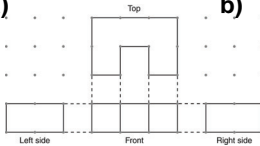
8.a) **b)**
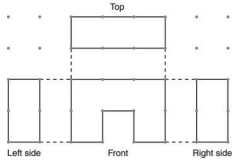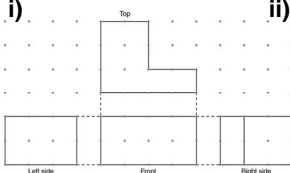
9. i) **ii)**
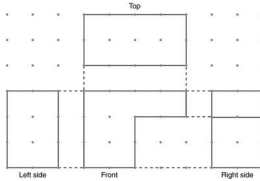
iii)
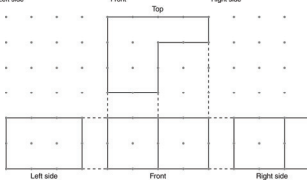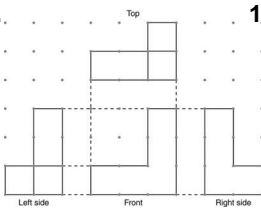
11. **12.**
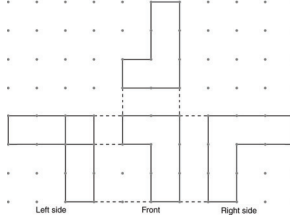
8.3 Building Objects from Their Views, page 450

4. Object C
5.
6.

7.

8.
Front view
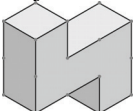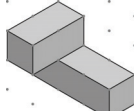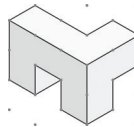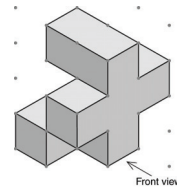
9. b) A staircase **c)** Yes
  d) Yes; build the same object but without the middle cube on its back.

10.
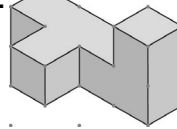
11. Answers will vary. For example:
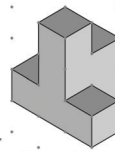
13.a) **b)** 112 cm^2; 56 cm^3
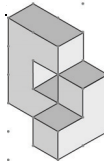
14.a) **b)**
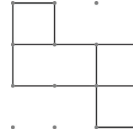
15.
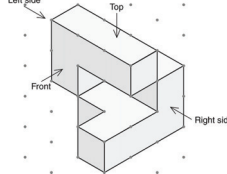
16.a) 9 **b)** 7 **c)** 4

Unit 8 Mid-Unit Review, page 455

1.
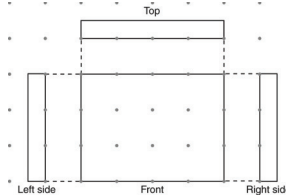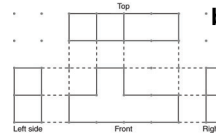
2.a) **b)**
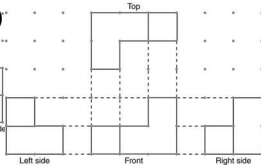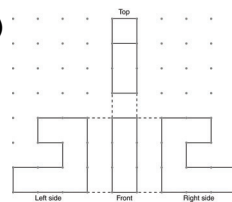
3. a) **b)**
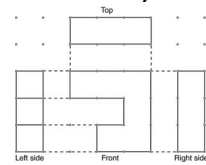
4. Same views as when rotated 90° clockwise

6.a)   **b)**

Front view
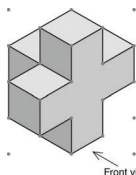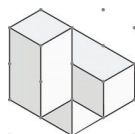
8.4 Identifying Transformations, page 460

5.a) Reflection **b)** Rotation of 180° or reflection
  c) Translation 1 unit left
  d) Translation 1 unit right
6.a) B   **b)** D   **c)** A   **d)** C   **e)** F
7.a) Rotation of 90° counterclockwise
  b) Translation 2 units up
  c) Rotation of 90° counterclockwise
  d) Rotation of 180°
8.
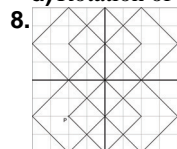
9. A could be a translation image of D or E, or a
    rotation image of C.
    B could be a reflection image of D, or a rotation
    image of D.
    C could be a rotation image of A, D, or E.
    D could be a reflection image of B, a translation
    image of A or E, or a rotation image of C.
    E could be a translation image of A or D, or a
    rotation image of C.
10.a) The shape should have at least 2 axes of
    symmetry.
  b) The shape should have 1 axis of symmetry.
  c) The shape should not have any axes of
    symmetry.
12. Translation: 3 units up along the diagonal
    Rotation: 120° counterclockwise or 240°
    clockwise
    Reflection

8.5 Constructing Tessellations, page 467

6.a) Designs i and iii are tessellations since there are
    no gaps between shapes.
  b) Designs ii and iv are not tessellations since
    there are gaps between shapes.
7.a) Yes   **b)** Yes   **c)** No
  d) No   **e)** Yes   **f)** No
8.a) $90° + 90° + 90° + 90° = 360°$
    $60° + 60° + 60° + 60° + 60° + 60° = 360°$
    $108° + 108° + 108° = 324° < 360°$
    $150° + 150° = 300° < 360°$
    $120° + 120° + 120° = 360°$
    $144° + 144° = 288° < 360°$
  b) Triangle, square, hexagon

9. Answers will vary. For example:
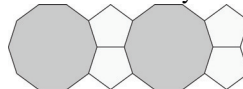
10. No; multiples of 90° and 120° do not add up to
    360°.
11.a) Yes; $45° + 45° + 90° + 90° + 45° + 45° = 360°$
  b) Yes; $120° + 120° + 60° + 60° = 360°$
  c) No; Even though the sum of some angle
    measures may be 360°, gaps remain among
    shapes.
  d) Yes; $60° + 60° + 60° + 60° + 60° + 60° = 360°$
    and $120° + 120° + 120° = 360°$
  e) No; Even though the sum of some angle
    measures may be 360°, gaps remain among
    shapes.
  f) No; Even though the sum of some angle
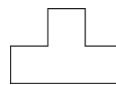   measures may be 360°, gaps remain among
    shapes.
12.a) Answers will vary. For example:
    Shapes e and f combine to form a hexagon that
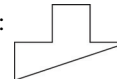   tessellates.
13. No; $135° + 135° = 270° < 360°$
14. Regular octagon and square; The shape tessellates
    because the sum of the angles at each point is
    $90° + 135° + 135° = 360°$.
16. For example:

17.a) No   **c)** For example:

18.a) No   **c)** For example:

8.6 Identifying Transformations in Tessellations, page 476

3. Answers will vary. For example:
  i) a) Shape C; translation to the right
    b) Shape F; line of reflection is the shared
      side.
    c) Shape E; rotation 120° counterclockwise
      about shared vertex
  ii) a) Shape B; translation to the right
    b) Shape B; line of reflection is the shared
      side.
    c) Shape D; rotation 180° about shared vertex
  iii)a) Shape H; translation down
    b) Shape E; line of reflection is the shared
      side.
    c) Shape J; rotation 180° about shared vertex
4. Answers will vary. For example:
  i) a) Shape E; Translation down and to the right
    b) Shape D; Line of reflection is the shared
      side.

c) Shape D; Rotation 60° counterclockwise about shared vertex

ii) a) Shape C; Translation to the right
b) Shape B; Line of reflection is the shared side.
c) Shape E; Rotation 180°

5. Answers will vary. For example:
a) Translate 1 unit down, then rotate 180° about top right vertex. Repeat.
b) Reflect across shared side, then reflect across shared vertex. Repeat.
c) Rotate 90° clockwise about centre vertex. Repeat.

6.a) Answers will vary. For example:
Translate A 4 units to the right to get C.
Translate B 4 units to the right to get D.
Translate E and F down and to the left to get G and H.
Translate E and F down and to the right to get I and J.
b) Answers will vary. For example:
Reflect A across right side to get B.
Reflect B across right side to get C.
Reflect C across right side to get D.
Reflect E across right side to get F.
Reflect G across right side to get H.
Reflect I across right side to get J.
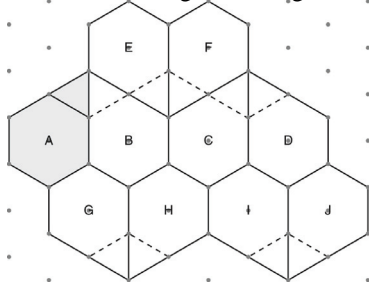
c) The shapes are congruent, so area is conserved.
7. Translations, reflections followed by rotations
8. Answers will vary. For example:
A tessellation can be created by translating the shape 2 units up and 1 unit to the right, then repeating with the new shape.
9. Translations, reflections, rotations of 90°, 180°, and 270°
12. Answers will vary. Students' answers should describe translations, rotations, and reflections.
13. Divide each square into 4 identical squares. Rotate the smaller square in the top left corner 90°, 180°, and 270° to get the other three smaller squares.
14.c) Label the shapes A, B, C, D, and E starting from the top left and going clockwise.
Translate A 8 units right to get C.
Translate A 4 units down and 4 units right to get D.

Translate B 4 units down and 4 units left to get E.

Unit 8 Strategies for Success: Explaining Your Answer, page 481

1. $39.96
2. 4 tables of 8 people and 9 tables of 10 people;
9 tables of 8 people and 5 tables of 10 people;
14 tables of 8 people and 1 table of 10 people
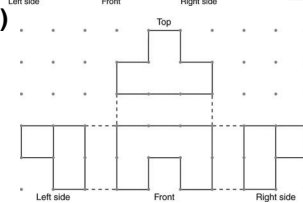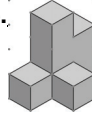
Unit 8 Unit Review, page 483
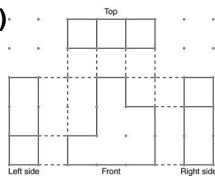
1.a) **b)**
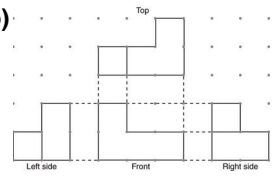
3.b)

4.a) 90° clockwise
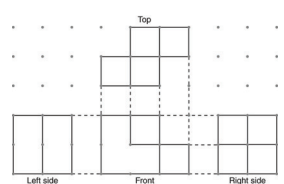**b)** 90° clockwise or 90° counterclockwise
c) 180° rotation

5.
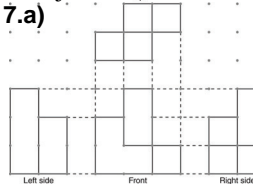
6. Object c
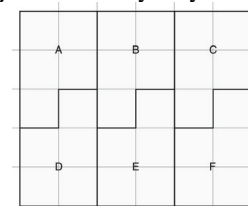**7.a)** **b)**

8.a) D **b)** C **c)** A **d)** B
9. Each image is the same.
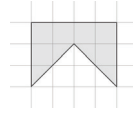**10.a)** Answers may vary. For example:

b) Translate A and D to the right to obtain the other shapes.
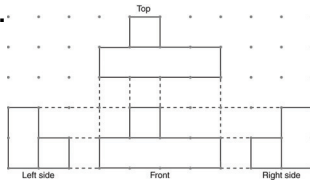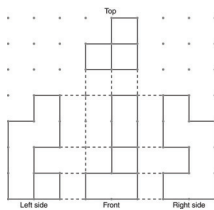**11.a)** No **b)** Yes **c)** Yes
12. Answers will vary. For example:

13.a) A and B

15. Translations and rotations

Unit 8 Practice Test, page 486

1.

2. a) **b)**

c)

3.

Front view

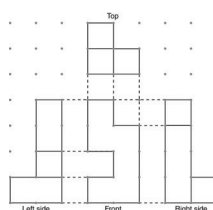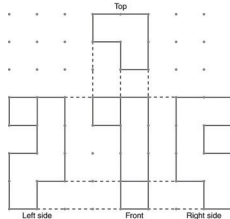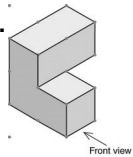**4.** A: Reflection across the red line
B: 180° rotation about P
C, D: Reflection across the blue line then the red line

5.a) No; 108° + 108° + 108° = 324° < 360°
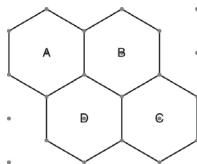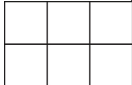**b)** Yes; 135° + 45° + 90° + 90° = 360°
c) Yes; 120° + 120° + 120° = 360°

6. Answers will vary. For
example:
A and D can either be
translated 2 units to the
right or reflected across
their right sides to obtain
B and C. Since all shapes
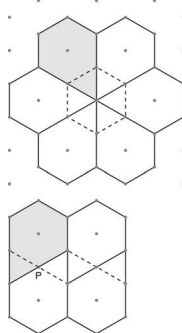are congruent, area is conserved.

7. Answers may vary. For example:

8. Answers may vary.
For example:
Start from the shaded shape
and rotate 60° clockwise to
obtain the next shape. Rotate
the new shape 60° clockwise.

Repeat until tessellation is complete.
Translate shaded shape 2 units to the right to get
the next shape over. Rotate the shaded shape 180°
about P to get the shape below.

Cumulative Review Units 1–8, page 492

1.a) Logan **b)** 7.3 m

2.a) False; $\sqrt{5} + \sqrt{2} \doteq 3.65 > 2.65 \doteq \sqrt{7}$
b) True; $\sqrt{46} \doteq 6.78$
c) True; $\sqrt{36} + \sqrt{64} = 6 + 8 = 14$

3. $20

4.a) –6 **b)** 2 **c)** 2 **d)** –1

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

6.a) $\frac{7}{12}$ h **b)** 7 batches

7. Cube

8.a) Triangular prism **b)** Cylinder
c) Hexagonal prism

9.a) 1 unit by 1 unit by 60 units; least like cube,
242 square units
b) 3 units by 4 units by 5 units; most like cube,
94 square units

10.a) $\frac{253}{400}$, 0.6325 **b)** $\frac{9}{800}$, 0.01125
c) $\frac{7}{2500}$, 0.0028 **d)** $\frac{7}{1000}$, 0.007

11.a) $7\frac{1}{2}$% of $2.00 is $0.15; cost in 2007: $2.15
12% of $2.15 is $0.26; cost in 2008: $2.41
b) No; $119\frac{1}{2}$% of $2.00 is $2.39

12.a) i) 3 : 8 **ii)** 5 : 12
b) i) $\frac{3}{8}$ **ii)** $\frac{5}{12}$
c) 2 : 5

13.a) 36 **b)** About 36 min

14.a) 8 apples/min **b)** 12 fence posts/h
c) 12 km/h

15.a) 52 + 12d **b)** –35 + 42c
c) –72d + 56 **d)** 48e – 6

16.a) Adding 7 to both sides of the equation, instead
of subtracting 5 from both sides
b) Yes; Substitute –4 for x into the original
equation.
c) It did not affect the solution because Felix
always did the same operations on both sides of
the equations.

17.a)

x	y
–2	6
–1	3
0	0
1	–3
2	–6

b)

x	y
–2	5
–1	4
0	3
1	2
2	1

18.a) Answers may vary. For example:

n	c
3	24
6	48
9	72

b) 96 **c)** 18

d) Answers may vary. For example:

Organizers and Clothespins
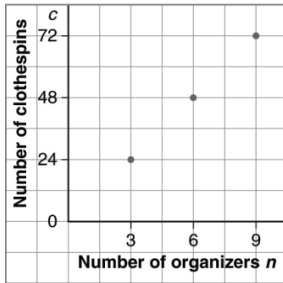
e) Linear **f)** (6, 48)

19.a) Answers may vary. For example:
The bar graph allows you to determine easily the difference in percents among various uses of water.
The circle graph shows the different water uses as parts of a whole.

b) Answers may vary. For example: In both graphs, we cannot tell how many people were surveyed.

c) Circle graph; because various water uses are parts of a whole

d) No; because the data was not collected over a period of time

20.a) The first graph gives the impression that government funding has not increased much. The second graph gives the impression that government funding has increased dramatically.

b) The first graph uses a large scale on the vertical axis. The second graph starts its vertical axis at 155 000.
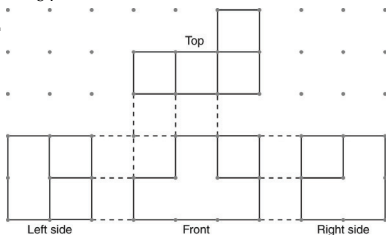
c) Groups advocating for more government funding would use the first graph to show the government is not giving enough money. The government would use the second graph to show it is providing a lot more money.

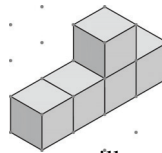**21.a)** $\frac{49}{400}$ **b)** $\frac{3}{100}$ **c)** $\frac{21}{200}$ **d)** $\frac{39}{400}$

22. $\frac{77}{1000}$ or 7.7%

23.a) $\frac{1}{64}$

24.

25.
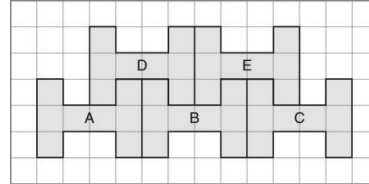

26. Answers will vary. For example:
From A to B, translate 4 units right.
From A to C, translate 8 units right.
From A to D, translate 2 units right and 2 units up.
From A to E, translate 6 units right and 2 units up.
Since all shapes are congruent, area is conserved.

27. Yes