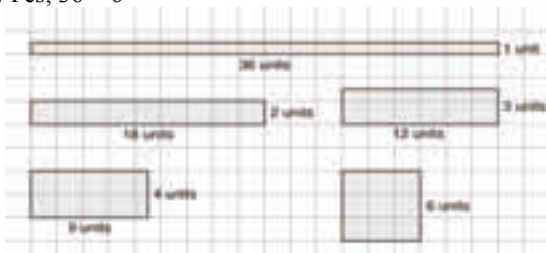


Unit 1 Square Roots and the Pythagorean Theorem, page 4

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)  $49 \text{ m}^2$                     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

| i)<br>Number<br>= 50 | ii)<br>Number<br>= 100 | iii)<br>Number<br>= 144 | iv)<br>Number<br>= 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.

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

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

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

$$\sqrt{12\ 345\ 678\ 787\ 654\ 321} = 11\ 111\ 111$$

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

- 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)  $64\text{ cm}^2$       b)  $44\text{ cm}^2$       c)  $7\text{ m}^2$       d)  $169\text{ m}^2$

- 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  $25\text{ cm}^2$ .

Draw 4 triangles each with area  $6\text{ cm}^2$  and place a small square with area  $1\text{ cm}^2$  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.



- 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  $70\text{ m}^2$ .

If my classroom were a square:  $s = 8.37\text{ m}$

- 19.a) 6.93 m by 6.93 m      b)  $16\text{ m}^2$

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

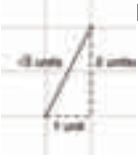
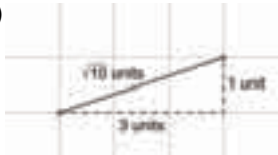
## Unit 1 Technology: Investigating Square Roots with a Calculator, page 29

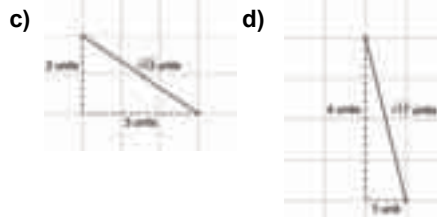
- 1.a) 21                      b) 4.36; Approximation  
c) 7.94; Approximation      d) 23

## 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)  $A = 16 \text{ cm}^2$       ii)  $s = \sqrt{16} \text{ cm}$   
b) i)  $A = 36 \text{ cm}^2$       ii)  $s = \sqrt{36} \text{ cm}$   
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)  $81 \text{ cm}^2$   
8.a)  $72 \text{ cm}^2$       b)  $\sqrt{72} \text{ cm}$       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

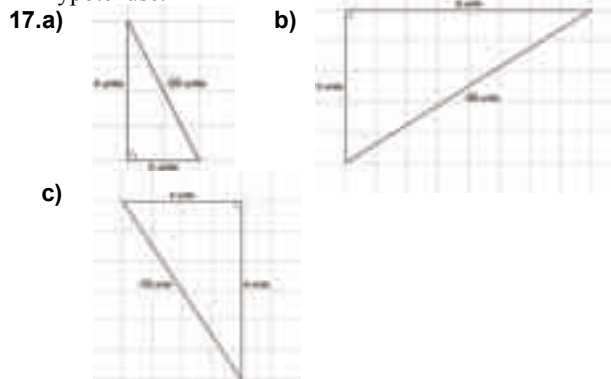
## 1.5 The Pythagorean Theorem, page 34

- 3.a)  $50 \text{ cm}^2$               b)  $52 \text{ cm}^2$   
4.a)  $64 \text{ cm}^2$               b)  $28 \text{ cm}^2$   
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) 



15.  $15^2 = 12^2 + 9^2$ ; Length of legs: 12 cm and 9 cm

16.  $3.535 \text{ cm}^2$ ,  $6.283 \text{ cm}^2$ ,  $9.817 \text{ cm}^2$   
The sum of the areas of the semicircles on the legs is equal to the area of the semicircle on the hypotenuse.



- 18.a)  $\sqrt{2} \text{ cm}$ ,  $\sqrt{3} \text{ cm}$ ,  $\sqrt{4} \text{ cm}$ ,  $\sqrt{5} \text{ cm}$ ,  $\sqrt{6} \text{ cm}$ ,  $\sqrt{7} \text{ cm}$

- 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;  
 $7^2 = 6^2 + (\sqrt{13})^2$   
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

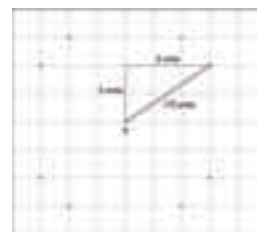
- 4.a) 29 cm      b) 12.2 cm      c) 15.8 cm  
 5.a) 24 cm      b) 15 cm      c) 5.7 cm  
 6.4 m  
 7.a) 26 cm or 21.8 cm  
 b) The unknown side could be a leg or the hypotenuse of the right triangle.  
 8.a) 6.7 units      b) 7.8 units  
 9. 65 cm  
 10. 91 m  
 11. 38.18 m  
 12.a) The area of the 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 cm

### 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<sup>2</sup>  
 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  $18^\circ\text{C}$ .  
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  $3^{\circ}\text{C}$  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)  $2^{\circ}\text{C}/\text{hour}$   
 b) The temperature must have been less than  $-20^{\circ}\text{C}$ .
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)  $\frac{(-4) + (-4)}{-4}$
15.  $-5^{\circ}\text{C}$
- 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.  $10^{\circ}\text{C}$

## 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.  $-10^{\circ}\text{C}$

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.  $-20^{\circ}\text{C}$

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)  $4 \times \frac{5}{12} = 1\frac{2}{3}$

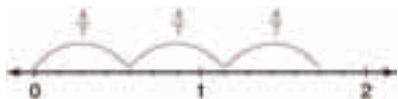


12.a) 12    b) 8    c) 6    d) 4    e) 3    f) 2

13.a) 24    b) 16    c) 18    d) 20    e) 9    f) 10



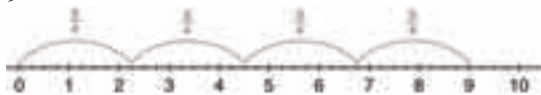
14.a)  $1\frac{5}{7}$



b)  $1\frac{1}{3}$



c) 9



d)  $2\frac{4}{5}$



15.a) 4



b) 3



c) 9



d) 6



16.a)  $2\frac{2}{5}$  b)  $3\frac{8}{9}$  c) 10 d)  $2\frac{1}{2}$  e)  $10\frac{1}{2}$  f)  $4\frac{1}{2}$

17.  $24 \times \frac{2}{3} = 16$ ; 16 hours

18.a) For example: Jerry ordered 5 pizzas for his birthday party.  $\frac{3}{8}$  of each pizza is left over.

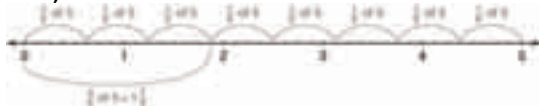
How much pizza is left over in total?

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

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?  $\frac{3}{8} \times 16 = 6$

20.  $\frac{4}{7} \times 28 = 16$ ; 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:  $6 \times \frac{1}{6} = 1$ ;  $37 \times \frac{1}{37} = 1$

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

### 3.2 Using Models to Multiply Fractions, page 113

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

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

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

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

9. For example:

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

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

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

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

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

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

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

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

$$\frac{3}{11} \times \frac{1}{2} = \frac{3}{22}; \frac{3}{2} \times \frac{1}{11} = \frac{3}{22}$$

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

14. For example: Gwen conducted an experiment involving  $\frac{4}{9}$  of the lab rats at her school. Of the

rats she used,  $\frac{1}{5}$  were female. What fraction of the

rats used were female?  $\frac{4}{9} \times \frac{1}{5} = \frac{4}{45}$

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

16.  $\frac{5}{8} \times \frac{3}{12} = \frac{5}{32}$   $\frac{3}{8} \times \frac{5}{12} = \frac{5}{32}$



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)  $11\frac{13}{16}$

### Unit 3 Mid-Unit Review, page 128

- 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)  $\frac{2}{9} + \frac{2}{9} + \frac{2}{9} + \frac{2}{9} + \frac{2}{9} = 1\frac{1}{3}$
- 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)  $3 \div \frac{1}{4} = 12$ ;  $3 \div \frac{3}{4} = 4$ ;  $3 \div 1\frac{1}{2} = 2$   
 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)  $\frac{11}{60}$

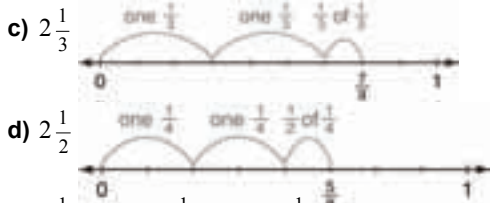
- 12.a)  $2 \div \frac{4}{6} = 3$ ;  $2 \div \frac{6}{4} = 1\frac{1}{3}$   
 $4 \div \frac{2}{6} = 12$ ;  $4 \div \frac{6}{2} = 1\frac{1}{3}$   
 $6 \div \frac{2}{4} = 12$ ;  $6 \div \frac{4}{2} = 3$
- b)  $4 \div \frac{2}{6}$  and  $6 \div \frac{2}{4}$  both have the greatest quotient of 12.  $2 \div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



- 14.a) 24    b)  $\frac{1}{24}$   
 c) The quotients are reciprocals.
15.  $\frac{25}{4} - 5 = \frac{25}{4} \div 5 = 1\frac{1}{4}$   
 $\frac{49}{6} - 7 = \frac{49}{6} \div 7 = 1\frac{1}{6}$
- 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)  $\frac{3}{5} \times \frac{10}{9} = \frac{1 \times 2}{1 \times 3} = \frac{2}{3}$     c) 1
- d) Yes;  $\frac{2}{3}$  is close to 1.
- 7.a)  $2\frac{1}{2}$
- 
- b)  $2\frac{1}{4}$
- 



- 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

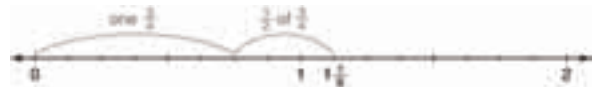
- 4.a)  $\frac{35}{8}$     b)  $\frac{23}{7}$     c)  $\frac{37}{6}$     d)  $\frac{9}{4}$   
 e)  $\frac{17}{10}$     f)  $\frac{23}{3}$     g)  $\frac{23}{9}$     h)  $\frac{27}{5}$
- 5.a)  $1\frac{5}{9}$     b)  $2\frac{2}{7}$     c)  $4\frac{4}{5}$     d)  $2\frac{1}{10}$   
 e)  $2\frac{1}{2}$     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)  $\frac{3}{5}$



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



- 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  $(\frac{3}{4} - \frac{1}{2}) + \frac{13}{6} \times \frac{1}{2}$  then multiplied by 4. Joe solved  $(\frac{3}{4} - \frac{1}{2}) + \frac{13}{6}$  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

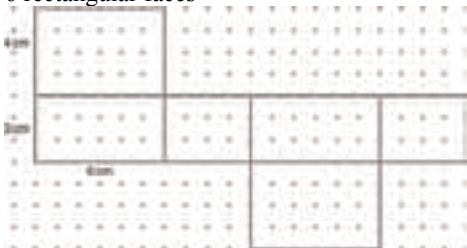
- 1.a) i) 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84  
ii) 1, 3, 7, 9, 21, 49, 63, 147, 441  
iii) 1, 2, 4, 59, 118, 236  
iv) 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 25, 30, 36, 45, 50, 60, 75, 90, 100, 150, 180, 225, 300, 450, 900  
b) 441 and 900; Both have an odd number of factors.
- 2.a) 7.2    b) 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

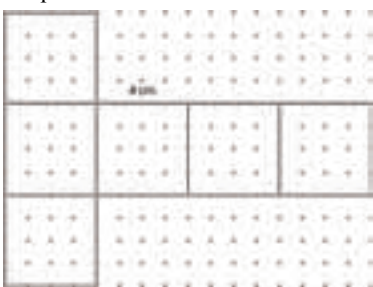
## Unit 4 Measuring Prisms and Cylinders, page 168

### 4.1 Exploring Nets, page 174

4. 6 rectangular faces



5. 6 square faces

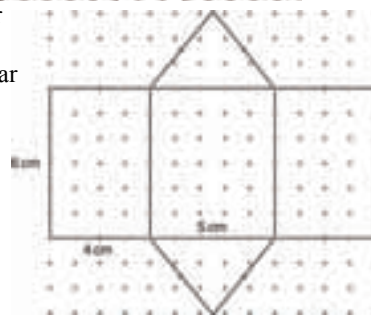


6. Net a; Net b cannot be folded into a rectangular prism.

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

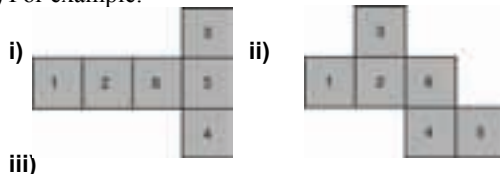
For example:



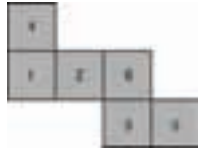
b) Right cylinder:  
 2 circles and 1 rectangle  
 For example:



13.a) For example:

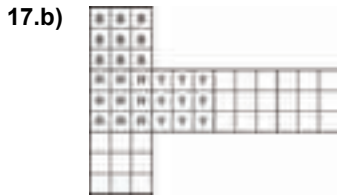


b) For example:



- 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.



- c) Both nets of a cube with different colour arrangements  
 d) Same net, different colour labels

#### 4.2 Creating Objects from Nets, page 180

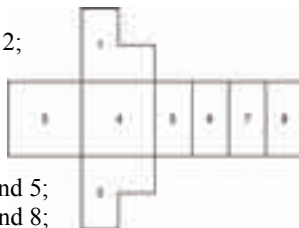
3. b

- 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;



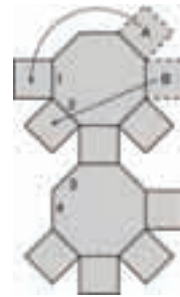
- 2 and 3; 2 and 4; 2 and 5; 2 and 6; 2 and 7;  
 2 and 8; 3 and 4; 3 and 6; 3 and 8; 4 and 5;  
 4 and 7; 5 and 6; 5 and 8; 6 and 7; 7 and 8

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

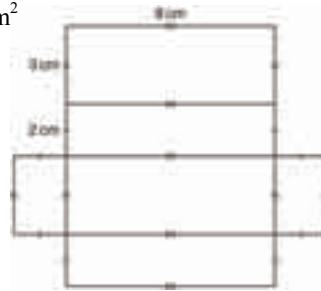
b)



#### 4.3 Surface Area of a Right Rectangular Prism, page 186

4.  $174 \text{ cm}^2$ ; Add the areas of all faces.

5.  $92 \text{ cm}^2$



6.a)  $160 \text{ cm}^2$     b)  $216 \text{ cm}^2$     c)  $82 \text{ cm}^2$

7.a)  $164 \text{ m}^2$     b)  $158 \text{ cm}^2$

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)  $9 \text{ cm}^2$     b) 3 cm

11.  $12\,000 \text{ m}^2$ ; 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)  $1580 \text{ cm}^2$     b)  $436 \text{ cm}^2$

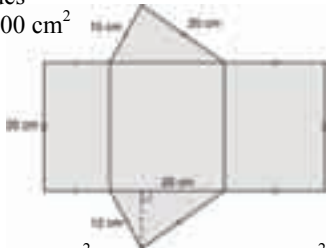
16. 2 m by 2 m by 5 m

17. 3 cm by 4 cm by 6 cm

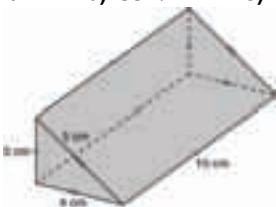


#### 4.4 Surface Area of a Right Triangular Prism, page 191

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



- 7.a) i)  $50 \text{ cm}^2$                       ii)  $48 \text{ m}^2$   
 b) The surface area of the prism is the same as the area of the net.  
 8. Prism D:  $528.0 \text{ cm}^2$ ; Prism A:  $147.7 \text{ cm}^2$ ;  
 Prism C:  $117.0 \text{ cm}^2$ ; Prism B:  $102.4 \text{ cm}^2$   
 9.a)  $336 \text{ cm}^2$     b)  $334.4 \text{ m}^2$     c)  $481.2 \text{ mm}^2$   
 10.



11. b  
 12. No; The surface area will increase by a factor of 4.  
 13.  $14\,400 \text{ cm}^2$   
 14.  $1872.7 \text{ cm}^2$ ; 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)  $374 \text{ cm}^2$

#### 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)  $88 \text{ cm}^2$                       b)  $447 \text{ cm}^2$   
 4.  $59\,318 \text{ m}^2$ ; Assuming the top and bottom are not glass  
 5.a)  $10\,752 \text{ cm}^2$   
 b) About  $10\,800 \text{ cm}^2$ ; Wrapping paper must overlap a bit

#### 4.5 Volume of a Rectangular Prism, page 198

- 4.a)  $120 \text{ cm}^3$     b)  $729 \text{ cm}^3$     c)  $6000 \text{ cm}^3$   
 5.b)  $11\,200 \text{ cm}^3$   
 6.a) A:  $120 \text{ cm}^3$ ; B:  $120 \text{ cm}^3$ ; C:  $120 \text{ cm}^3$   
 b) They are the same.            c) No  
 7.a)  $67.5 \text{ cm}^3$     b)  $96 \text{ cm}^3$     c)  $25.2 \text{ cm}^3$   
 9.a)  $420\,462 \text{ cm}^3$ ,  $626\,859 \text{ cm}^3$   
 b) About 1.5 times  
 10. 10 cm  
 11.a)  $40.6 \text{ m}^3$                       b) 3 trailers  
 12.a)  $2000 \text{ m}^3$     b)  $1800 \text{ m}^3$     c)  $1000 \text{ m}^3$   
 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)  $1260 \text{ cm}^3$                       b)  $42 \text{ cm}^3$   
 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)  $8640 \text{ cm}^3$     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)  $225 \text{ cm}^3$     b)  $312 \text{ cm}^3$   
 4.a)  $21.16 \text{ cm}^3$     b)  $217.5 \text{ cm}^3$     c)  $45 \text{ m}^3$   
 5.a)  $955.5 \text{ cm}^3$     b)  $240 \text{ m}^3$     c)  $3.83 \text{ m}^3$   
 6.a)  $532 \text{ cm}^3$     b)  $108 \text{ cm}^3$   
 7.  $18 \text{ cm}^3$   
 8. 7.5 cm  
 9.a) i)  $A = 5 \text{ cm}^2$ ,  $l = 1 \text{ cm}$ ;  $A = 1 \text{ cm}^2$ ,  $l = 5 \text{ cm}$   
 ii)  $A = 9 \text{ m}^2$ ,  $l = 1 \text{ m}$ ;  $A = 1 \text{ m}^2$ ,  $l = 9 \text{ m}$ ;  
 $A = 3 \text{ m}^2$ ,  $l = 3 \text{ m}$   
 iii)  $A = 8 \text{ m}^2$ ,  $l = 1 \text{ m}$ ;  $A = 4 \text{ m}^2$ ,  $l = 2 \text{ m}$ ;  
 $A = 2 \text{ m}^2$ ,  $l = 4 \text{ m}$ ;  $A = 1 \text{ m}^2$ ,  $l = 8 \text{ m}$   
 iv)  $A = 18 \text{ cm}^2$ ,  $l = 1 \text{ cm}$ ;  $A = 9 \text{ cm}^2$ ,  $l = 2 \text{ cm}$ ;  
 $A = 6 \text{ cm}^2$ ,  $l = 3 \text{ cm}$ ;  $A = 3 \text{ cm}^2$ ,  $l = 6 \text{ cm}$ ;  
 $A = 2 \text{ cm}^2$ ,  $l = 9 \text{ cm}$ ;  $A = 1 \text{ cm}^2$ ,  $l = 18 \text{ cm}$

- b) i) 2    ii) 3    iii) 4    iv) 6  
 10.a)  $120 \text{ cm}^3$     b) 6  
 11.  $10 \text{ m}^2$   
 12.a)  $1.125 \text{ m}^3$     b)  $3.375 \text{ m}^3$   
 13.b) A:  $180 \text{ cm}^3$ ; B:  $126 \text{ cm}^3$   
 c) Change the length of 7 cm to 10 cm  
 14.a)  $2250 \text{ cm}^3$     b) 18 cm    c) 60%  
 15.  $l = 11 \text{ cm}$

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)  $231.4 \text{ cm}^2$ ;  $113.9 \text{ cm}^3$   
 b) i)  $b = 7 \text{ cm}$ ,  $h = 6.2 \text{ cm}$ ,  $l = 21 \text{ cm}$   
 $b = 7 \text{ cm}$ ,  $h = 3.1 \text{ cm}$ ,  $l = 42 \text{ cm}$   
 $b = 3.5 \text{ cm}$ ,  $h = 6.2 \text{ cm}$ ,  $l = 42 \text{ cm}$   
 $b = 14 \text{ cm}$ ,  $h = 3.1 \text{ cm}$ ,  $l = 21 \text{ cm}$   
 $b = 3.5 \text{ cm}$ ,  $h = 12.4 \text{ cm}$ ,  $l = 21 \text{ cm}$   
 $b = 3.5 \text{ cm}$ ,  $h = 3.1 \text{ cm}$ ,  $l = 84 \text{ cm}$   
 ii) Either two of the dimensions are doubled or  
 one is increased by a factor of 4.  
 17.a)  $36 \text{ m}^2$ ,  $12 \text{ m}^3$     b)  $60 \text{ m}^2$ ,  $24 \text{ m}^3$   
 c)  $96 \text{ m}^2$ ,  $48 \text{ m}^3$     d)  $144 \text{ m}^2$ ,  $96 \text{ m}^3$

#### 4.7 Surface Area of a Right Cylinder, page 212

- 4.a)  $88 \text{ cm}^2$     b)  $25 \text{ cm}^2$     c)  $101 \text{ cm}^2$   
 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)  $50 \text{ cm}^2$     b)  $94 \text{ cm}^2$     c)  $251 \text{ m}^2$   
 8.a)  $214 \text{ cm}^2$     b)  $19\,046 \text{ mm}^2$     c)  $4 \text{ m}^2$   
 9.  $174 \text{ m}^2$     10.  $12 \text{ m}^2$   
 11.a)  $94 \text{ cm}^2$     b) 4255  
 12.  $191 \text{ cm}^2$     13.  $37\,267 \text{ cm}^2$  or  $4 \text{ m}^2$   
 14.a)  $14\,137 \text{ cm}^2$   
 b)  $1414 \text{ cm}^2$ ; Assuming the heads do not go over  
 the edge of the shell  
 15. Cylindrical tubes  
 16.a) 66 cm    b) 10.5 cm  
 c)  $346 \text{ cm}^2$     d)  $1352 \text{ cm}^2$   
 17.  $488 \text{ cm}^2$

#### 4.8 Volume of a Right Cylinder, page 218

- 4.a)  $785 \text{ cm}^3$     b)  $63 \text{ cm}^3$     c)  $1609 \text{ cm}^3$   
 5.a)  $503 \text{ cm}^3$     b)  $8836 \text{ mm}^3$     c)  $328 \text{ m}^3$   
 6.  $1571 \text{ cm}^3$     8.  $196 \text{ cm}^3$   
 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)  $462 \text{ cm}^3$     b)  $1583 \text{ cm}^3$   
 12.  $5301 \text{ cm}^3$     13.  $441\,786 \text{ cm}^3$   
 14.  $9\,521\,684 \text{ cm}^3$  or about  $9.5 \text{ m}^3$   
 15. 404 mL  
 16. A cylinder with radius 2 m and height 1 m

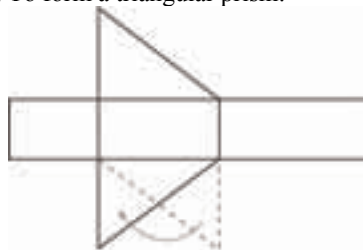
- 17.a)  $96 \text{ m}^3$     b)  $12\,219 \text{ m}^3$   
 c) 4.58 m by 4.58 m by 4.58 m  
 18. 28 cm

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

- 1.c)  $108 \text{ m}^2$     2.b)  $99 \text{ cm}^3$

#### 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:

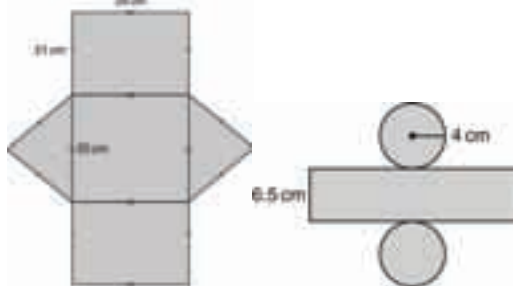


- 5.a)  $96 \text{ cm}^2$   
 b) Find the area of one face and multiply by 6.  
 6.a)  $72 \text{ m}^2$ ,  $36 \text{ m}^3$     b)  $15\,000 \text{ cm}^2$ ;  $125\,000 \text{ cm}^3$   
 c)  $114 \text{ cm}^2$ ;  $72 \text{ cm}^3$   
 7.a) 10 rolls and 1 can  
 b) Assuming you must buy whole rolls and 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:  $114 \text{ m}^2$ ; B:  $88 \text{ m}^2$ ; C:  $78 \text{ m}^2$ ; D:  $64 \text{ m}^2$   
 9.a)  $24 \text{ m}^3$     b)  $45 \text{ cm}^3$   
 10.a)  $7.2 \text{ cm}^2$     b)  $0.96 \text{ cm}^3$   
 11.a)  $14.2 \text{ m}^2$     b)  $2.3 \text{ m}^3$   
 c) Rotating an object will not change its volume.  
 12.  $6 \text{ m}^3$   
 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.  $49 \text{ m}^2$   
 16.  $12\,174 \text{ m}^2$

#### 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  
2 triangular bases 1 rectangle

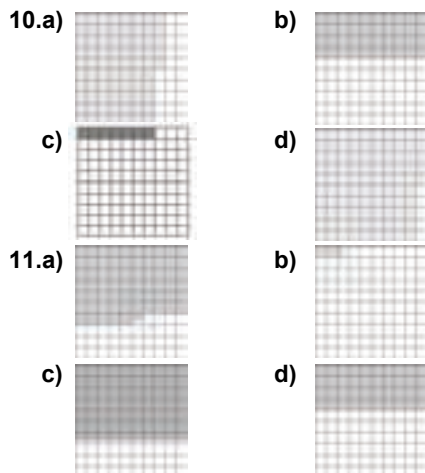


- 3. a)**  
**4.a)**  $632 \text{ cm}^2$    **b)**  $200 \text{ cm}^2$    **c)**  $88 \text{ cm}^2$   
**5.a)**  $220.5 \text{ m}^3$    **b)**  $120 \text{ m}^3$   
**6.a)**  $776 \text{ cm}^2$ ;  $1344 \text{ cm}^3$    **b)**  $17.99 \text{ m}^2$ ;  $3.0625 \text{ m}^3$   
**7.a)**  $166.95 \text{ cm}^3$    **b)**  $126 \text{ m}^3$   
**8.a)** The volume increases by a factor of 9.  
**c)**  $27.5625 \text{ m}^3$   
**9.a)**  $8.5 \text{ m}^2$    **b)**  $1.5 \text{ m}^3$   
**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



- 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)**  $0.00\bar{6}$ ;  $0.6\bar{6}\%$    **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;  $83.\bar{3}\%$  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)**  $\frac{1}{24}$ ;  $0.04\bar{1}\bar{6}$ ;  $4.1\bar{6}\%$

- 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,  $16.\bar{3}$  squares will be red, 12.25 squares will be green, and 18.375 squares will be blue.

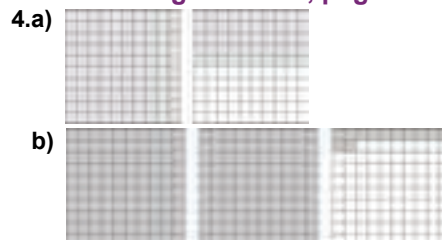
**19.** Kyle; 78.6% is greater than 76.6%.

**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





- 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)  $33.\bar{3}\%$     ii)  $66.\bar{6}\%$     iii) 100%  
 iv)  $133.\bar{3}\%$     v)  $166.\bar{6}\%$     vi) 200%

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

- c) i)  $233.\bar{3}\%$     ii)  $266.\bar{6}\%$     iii) 300%  
 iv)  $333.\bar{3}\%$     v)  $366.\bar{6}\%$     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.  $66.\bar{6}\%$

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)  $833.\bar{3}$  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)  $31.36\text{ cm}^2$

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


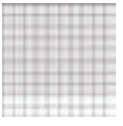

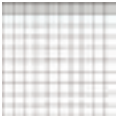
10. Choice A; \$35 for 2 DVDs is a better deal than \$40 for 2 DVDs.

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)  $83.\bar{3}\%$
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;  $6.\bar{6}\%$ ;  $\frac{1}{15}$   
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;  $\frac{8}{11}$ ;  $72.\bar{7}\%$ ; 3 : 11;  $\frac{3}{11}$ ;  $27.\bar{2}\%$   
iii) 3 : 6;  $\frac{1}{2}$ ; 50%, 1 : 6;  $\frac{1}{6}$ ;  $16.\bar{6}\%$ , 2 : 6;  
 $\frac{1}{3}$ ;  $33.\bar{3}\%$

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;  $\frac{5}{11}$ ;  $45.\bar{4}\%$   
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;  $\frac{1}{12}$ ;  $8.\bar{3}\%$ )

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:

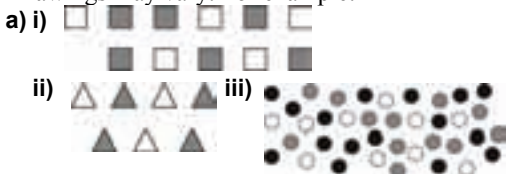
a) 

|             |   |    |    |
|-------------|---|----|----|
| 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:



- 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: 41.6%  
 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.  $2.6 \text{ m}^3$  cement,  $5.3 \text{ m}^3$  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

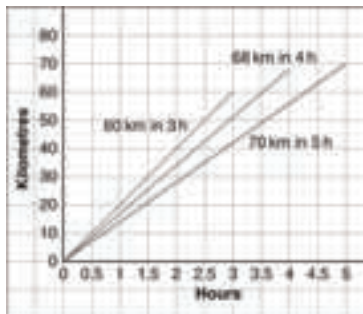
### 5.9 Exploring Rates, page 298

- 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)  $4.5^\circ\text{C}/\text{h}$   
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.  $520.8\bar{3}$  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<sup>2</sup>  
ii) About 137 people/km<sup>2</sup>  
iii) About 338 people/km<sup>2</sup>  
21.a) 8 km b) 12 km/h faster

## Unit 5 Unit Review, page 308

- 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:  $87.5\% > 83.\bar{3}\%$
- 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)  or   
 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) 16.6 m/s      b)  $11.\bar{1}$  m/s
- 30.a) \$9.50/h      b) \$237.50
- 31.a) i) \$1.07/L    ii) \$4.46/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)**  $n = -5$ ;  $-5^\circ\text{C}$
- 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<sup>2</sup>.
- 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 the skates are returned 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)  $\frac{m}{-2}+5=0$ ;  $m=10$



- 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)

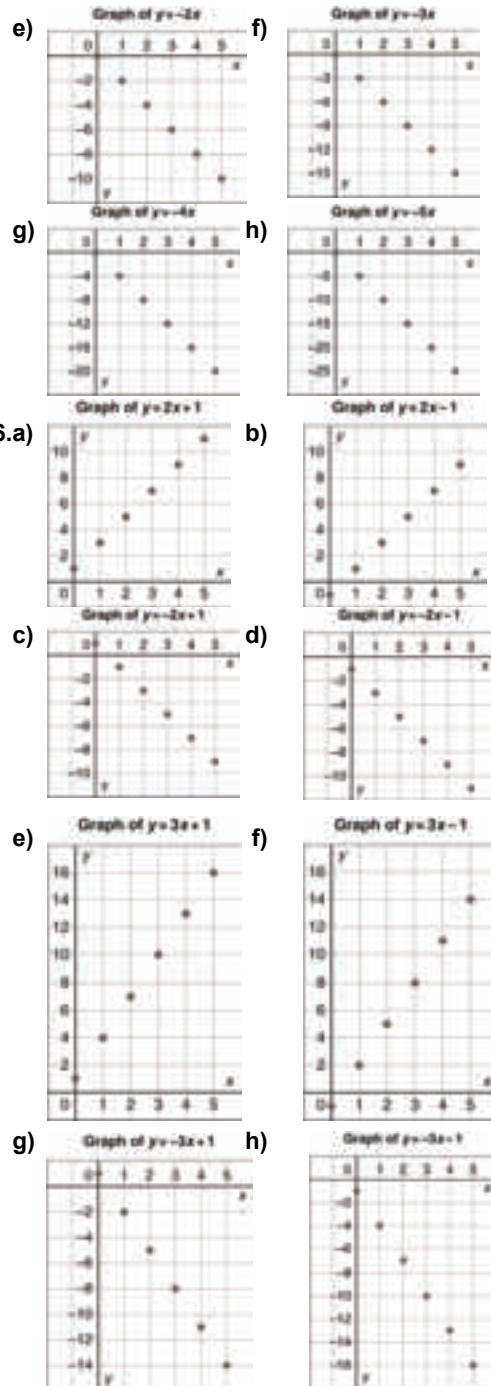
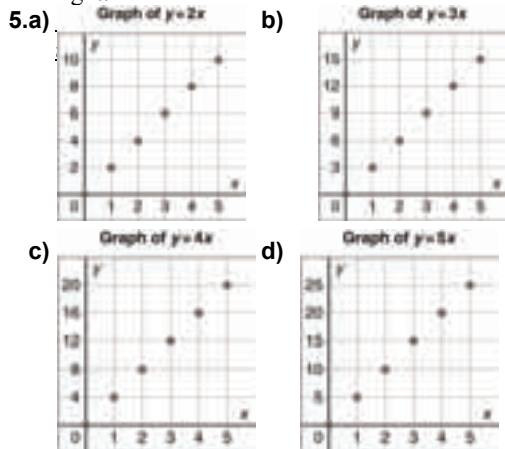
### 6.7 Graphing Linear Relations, page 363

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.

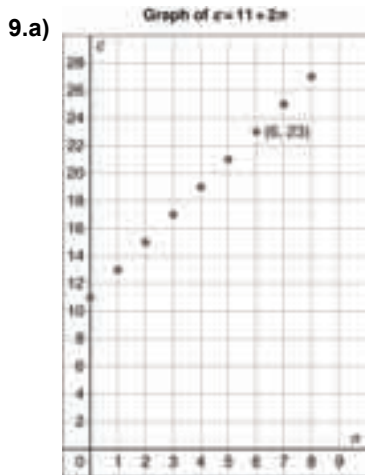


7. (2, 19), (3, 27), (5, 43)

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

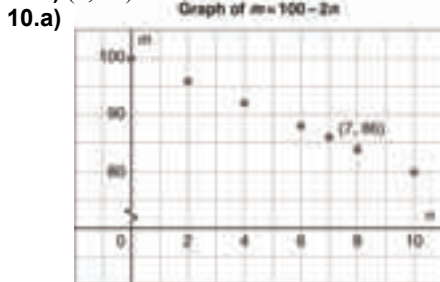
8. (-3, 13), (-2, 7), (2, -17), (3, -23)

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



- 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)

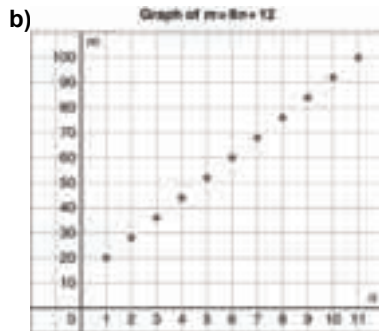


- b) The points go down and to the right.  
As the  $x$  value increases by 2, the  $y$  value decreases by 4.

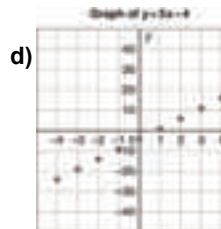
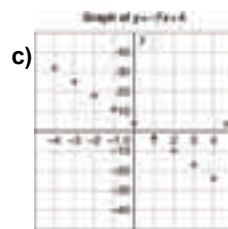
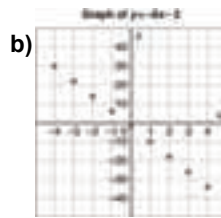
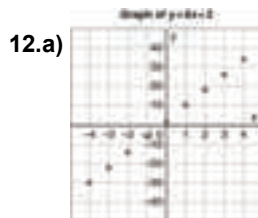
c) (7, 86)

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 |

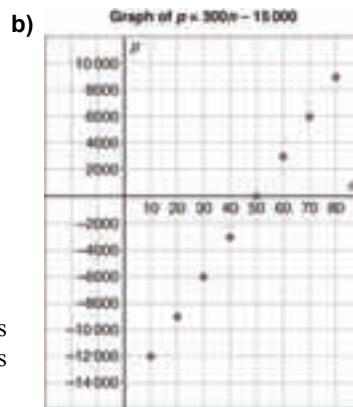


- c) The points lie on a line that goes up and to the right. As the  $x$  value increases by 1, the  $y$  value increases by 8.
- d) Yes



13.a)

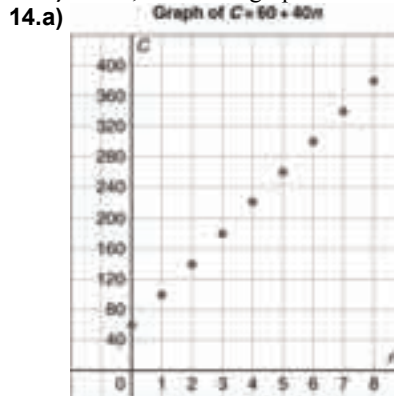
| $n$ | $p$     |
|-----|---------|
| 10  | -12 000 |
| 20  | -9 000  |
| 30  | -6 000  |
| 40  | -3 000  |
| 50  | 0       |
| 60  | 3 000   |
| 70  | 6 000   |
| 80  | 9 000   |



The negative values of  $p$  represent a loss of money.

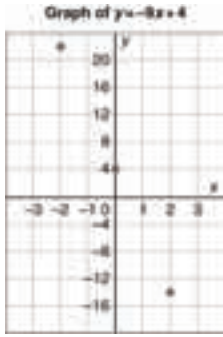
- c) As the value of  $n$  increases by 10, the value of  $p$  increases by 3000. The points lie on a line that goes up and to the right.

d) \$7500; I used the graph.

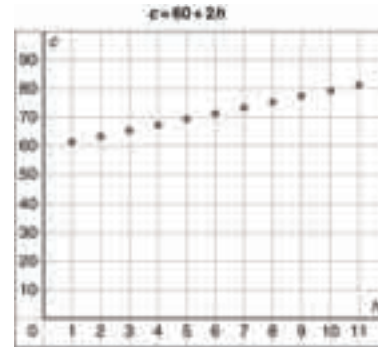
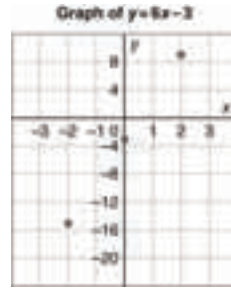


- b) When  $n$  increases by 1,  $C$  increases by 40. The points lie on a line that goes up and to the right.
- c) No; answers may vary. For example: You cannot work -1 h.

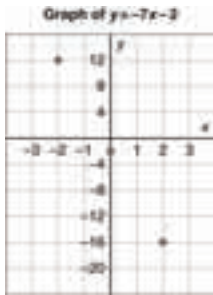
15.a) i)



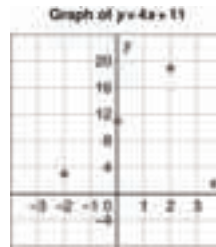
ii)



iii)



iv)

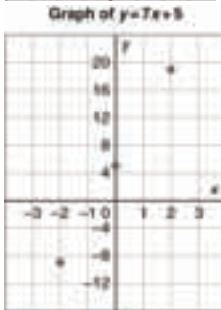


2. If Chris is planning on using the ATV for under 5 h, using the “Rambler” is cheaper. For more than 5 h, the “Northern” is cheaper; for exactly 5 h, the price is the same.

### 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

v)



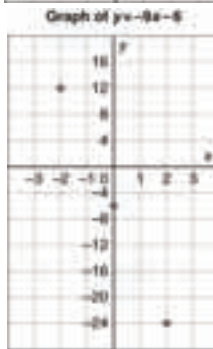
vi)



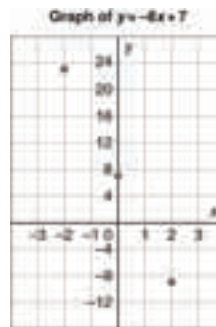
5. The order of the beads on a necklace is reversed when a necklace is flipped over.

- 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

vii)



viii)



### 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)  $h = -1$ ;  $-1^\circ\text{C}$   
 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.

- 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.

- 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)  $p = 17$

d)  $s = \frac{24}{5}$ , 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  |

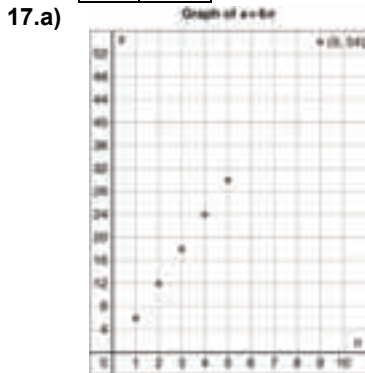
b)

| 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



b) When  $n$  increases by 1,  $s$  increases by 6.

c) (9, 54)

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

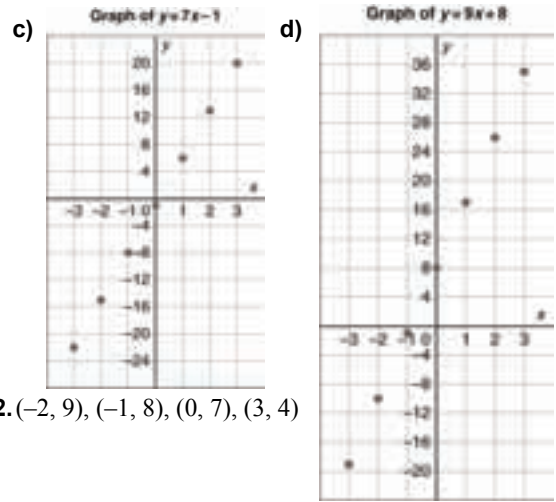
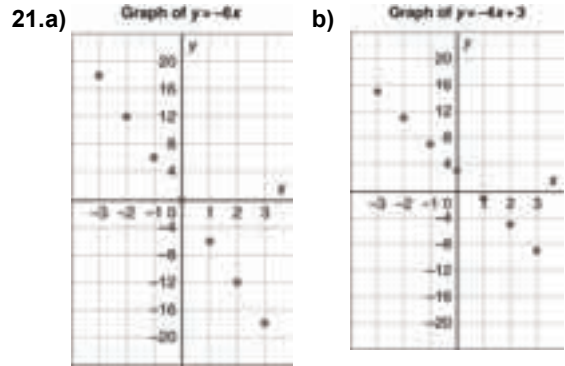
19.a)

| 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)

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



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)

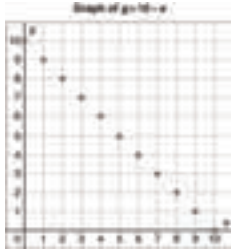
| x  | y   |
|----|-----|
| -3 | 19  |
| -2 | 13  |
| -1 | 7   |
| 0  | 1   |
| 1  | -5  |
| 2  | -11 |
| 3  | -17 |

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  |

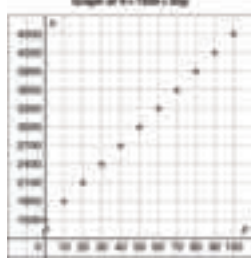
- b)  A scatter plot showing a linear relationship between a and g. The x-axis is labeled 'a' and ranges from 0 to 10. The y-axis is labeled 'g' and ranges from 0 to 10. The data points form a straight line with a negative slope, starting at (0, 10) and ending at (10, 0).
- c) When  $a$  decreases by 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)  $T = -15$ ;  $-15^\circ\text{C}$       b)  $c = -8$ ;  $-8^\circ\text{C}$

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)  A scatter plot showing a linear relationship between p and h. The x-axis is labeled 'p' and ranges from 0 to 100. The y-axis is labeled 'h' and ranges from 0 to 4500. The data points form a straight line with a positive slope, starting at (0, 1500) and ending at (100, 4500).
- c) When  $p$  increases by 10,  $h$  increases by 300.
- d) \$4350; \$45.79/person

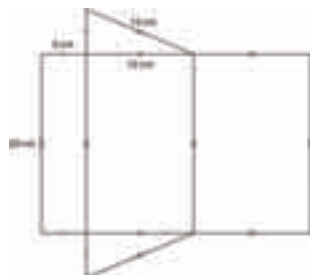
### Cumulative Review Units 1–6, page 378

- 1.a) 1      b) 256      c) 6.6      d) 121
- 2.a)  $20\text{ cm}^2$ ;  $\sqrt{20}\text{ cm}$       b)  $45\text{ cm}^2$ ;  $\sqrt{45}\text{ cm}$
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.  $832\text{ cm}^2$

9.a)  $600\text{ cm}^3$       b)



c)  $660\text{ cm}^2$

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.

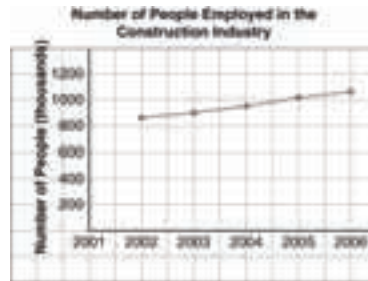
9.a) The line graph shows better the general decrease in attendance. The bar graph shows better the actual mean attendance numbers.

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.

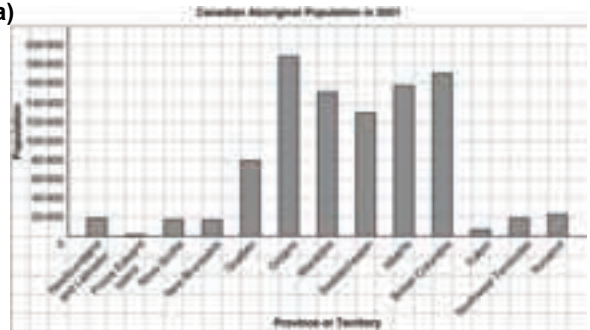
d) No; we are not interested in mean attendance numbers as parts of a whole.

10.a)



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)



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:

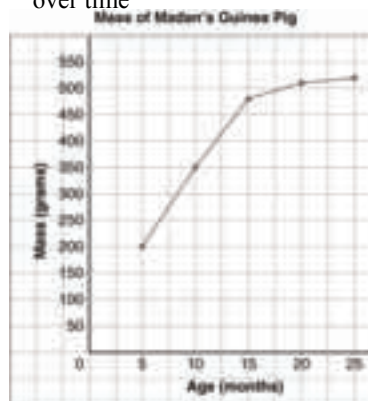
i) A line graph to show the trend over time

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)



b) Allows you to see a trend in data collected over a long period of time

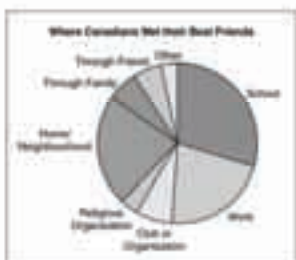
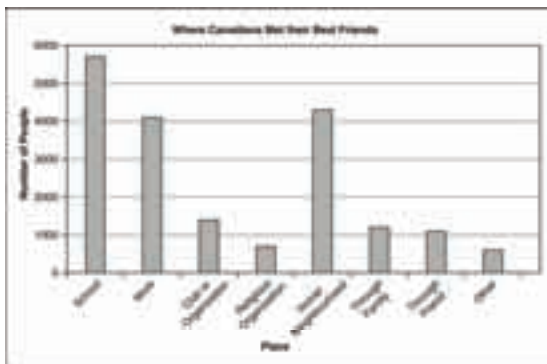
Difficult to read accurately the data because not all of the points are on grid lines

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



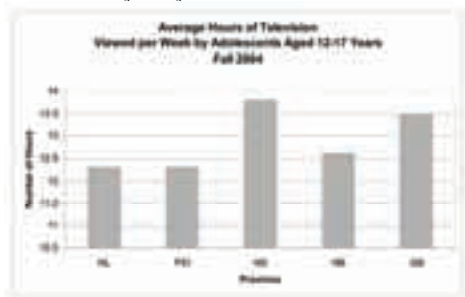
**Unit 7 Technology: Using Spreadsheets to Record and Graph Data, page 392**

1.a)



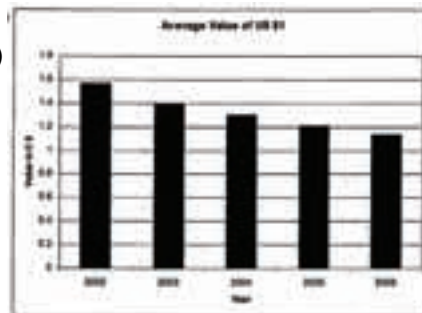
b) Answers may vary.

2.a)



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)



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.

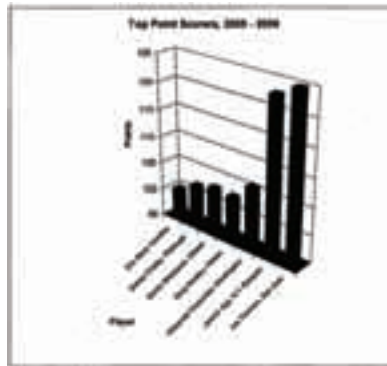
c) Bird; The symbols for birds are so large it looks like most students have birds.

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

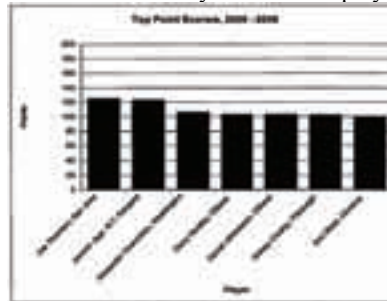
- b) The vertical axis should start at zero.
- 8.a) Manufacturer A has a lot more trucks still on the road.
- b) 97.5, 96.5, and 95.5
- c) Manufacturer A's trucks are about as dependable as those of the other three manufacturers; the four companies have nearly the same number of trucks on the road after 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.

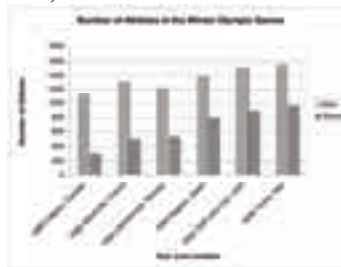


- b) This graph makes it look as though McGrady scored about as well as any of the other players.



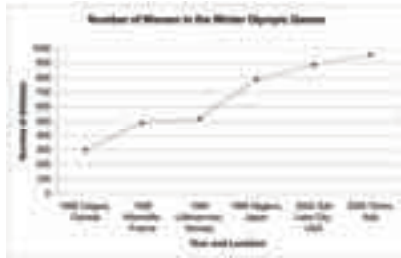
- 2. Answers may vary. For example:

- 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.

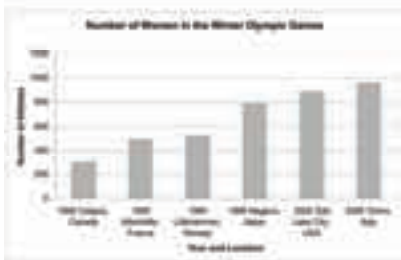
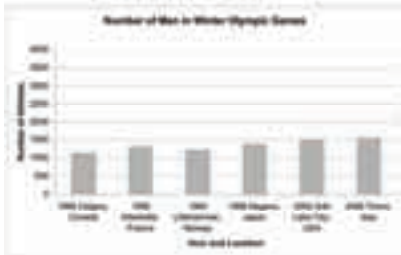


- b)





c)



### 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

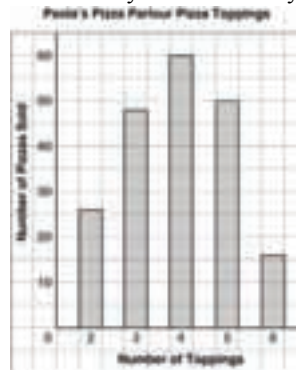
- 1.b) i)  $\frac{1}{8}$  or 12.5%      ii)  $\frac{1}{4}$  or 25%
- c) The results are very similar.

### 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.

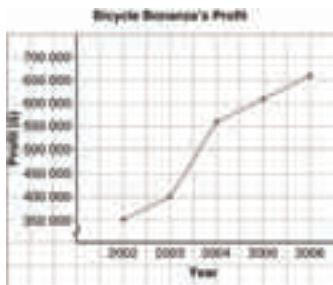
- 2.a) A circle graph shows the percent of students who chose each response. A pictograph is more visually appealing and makes it very easy to compare how many students chose each response.
- b) For example, a company who produces snack food might want to know which products are most popular.
- c) For 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)



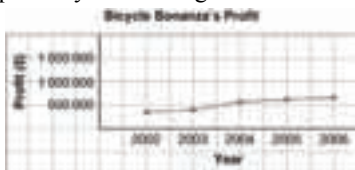
- b) Allows for immediate comparison between the different responses  
Does not show each number of pizzas sold as a percent of the total number of pizzas sold.  
May be difficult to read the value of the bars that do not end on grid lines.
- 5.a) Yes; she drew the same number of symbols next to each 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)



I created the impression of a large growth in profit by not starting the vertical axis scale at 0.

b)



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)  $\frac{7}{64}$

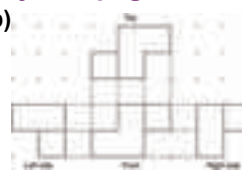
### Unit 8 Geometry, page 432

#### 8.1 Sketching Views of Objects, page 437

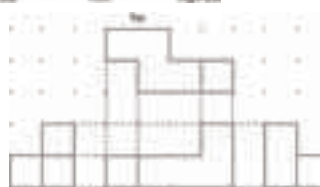
4.a)



b)



c)

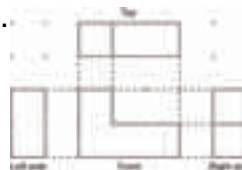


5.A: N, P; B: L, N, Q; C: L, Q; D: J, L, Q; E: K, M, Q

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

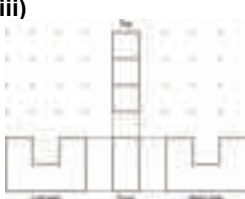
4.a) Front view: B; top view: E; left side view: A; right side view: A

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)



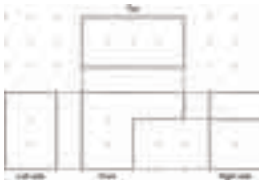
b)



9. i)



ii)



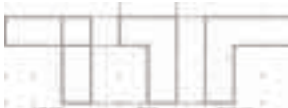
iii)



11.



12.



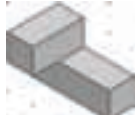
### 8.3 Building Objects from Their Views, page 450

4. Object C

5.



6.



7.

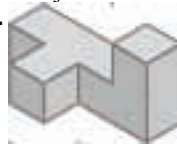


8.



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)



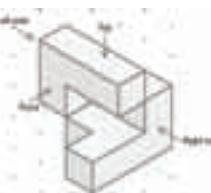
b)  $112 \text{ cm}^2$ ;  $56 \text{ cm}^3$

14.a)



b)

15.



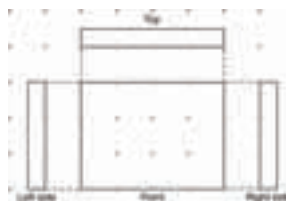
16.a) 9

b) 7

c) 4

### Unit 8 Mid-Unit Review, page 455

1.



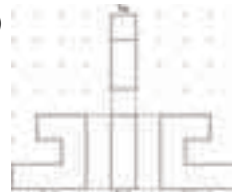
2.a)



b)



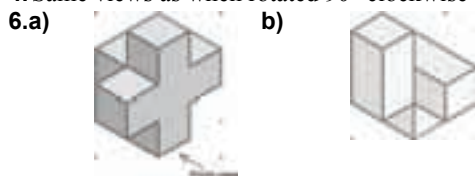
3.a)



b)



4. Same views as when rotated 90° clockwise



### 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°



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)  $90^\circ + 90^\circ + 90^\circ + 90^\circ = 360^\circ$

$$60^\circ + 60^\circ + 60^\circ + 60^\circ + 60^\circ + 60^\circ = 360^\circ$$

$$108^\circ + 108^\circ + 108^\circ = 324^\circ < 360^\circ$$

$$150^\circ + 150^\circ = 300^\circ < 360^\circ$$

$$120^\circ + 120^\circ + 120^\circ = 360^\circ$$

$$144^\circ + 144^\circ = 288^\circ < 360^\circ$$

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;  $45^\circ + 45^\circ + 90^\circ + 90^\circ + 45^\circ + 45^\circ = 360^\circ$

b) Yes;  $120^\circ + 120^\circ + 60^\circ + 60^\circ = 360^\circ$

c) No; Even though the sum of some angle measures may be 360°, gaps remain among shapes.

d) Yes;  $60^\circ + 60^\circ + 60^\circ + 60^\circ + 60^\circ + 60^\circ = 360^\circ$  and  $120^\circ + 120^\circ + 120^\circ = 360^\circ$

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;  $135^\circ + 135^\circ = 270^\circ < 360^\circ$

14. Regular octagon and square; The shape tessellates because the sum of the angles at each point is  $90^\circ + 135^\circ + 135^\circ = 360^\circ$ .

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.

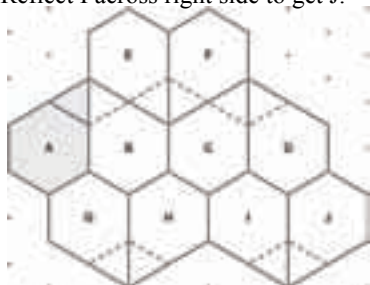
c) Shape J; rotation 180° about shared vertex

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  $60^\circ$  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  $180^\circ$
- 5. Answers will vary. For example:
  - a) Translate 1 unit down, then rotate  $180^\circ$  about top right vertex. Repeat.
  - b) Reflect across shared side, then reflect across shared vertex. Repeat.
  - c) Rotate  $90^\circ$  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.



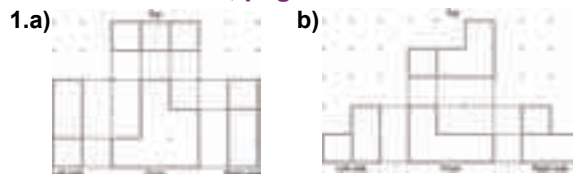
- c) The shapes are congruent, so area is conserved.
- 7. Translations, reflections followed by rotations
- 8. Answers will vary. For example:
  - A tessellation can be created by translating the shape 2 units up and 1 unit to the right, then repeating with the new shape.
- 9. Translations, reflections, rotations of  $90^\circ$ ,  $180^\circ$ , and  $270^\circ$
- 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  $90^\circ$ ,  $180^\circ$ , and  $270^\circ$  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.

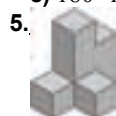
### Unit 8 Strategies for Success: Explaining Your Answer, page 481

- 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

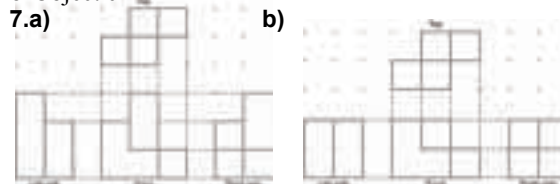
### Unit 8 Unit Review, page 483



- 4.a)  $90^\circ$  clockwise
- b)  $90^\circ$  clockwise or  $90^\circ$  counterclockwise
- c)  $180^\circ$  rotation



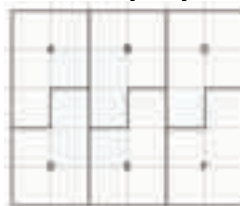
6. Object c



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

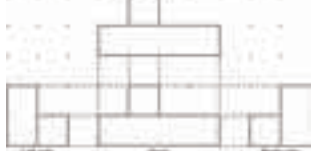
12. Answers will vary. For example:



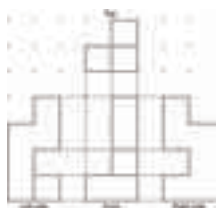
- 13.a) A and B  
15. Translations and rotations

Unit 8 Practice Test, page 486

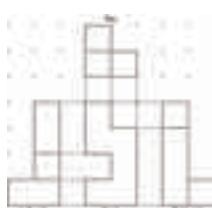
1.



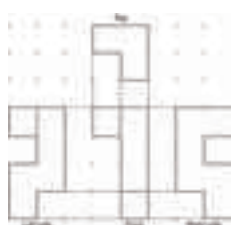
2.a)



b)



c)



3.

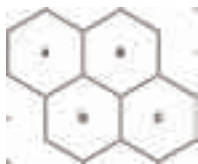


4. A: Reflection across the red line  
B:  $180^\circ$  rotation about P  
C, D: Reflection across the blue line then the red line

- 5.a) No;  $108^\circ + 108^\circ + 108^\circ = 324^\circ < 360^\circ$   
b) Yes;  $135^\circ + 45^\circ + 90^\circ + 90^\circ = 360^\circ$   
c) Yes;  $120^\circ + 120^\circ + 120^\circ = 360^\circ$

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  $60^\circ$  clockwise to obtain the next shape. Rotate the new shape  $60^\circ$  clockwise.

Repeat until tessellation is complete.  
Translate shaded shape 2 units to the right to get the next shape over. Rotate the shaded shape  $180^\circ$  about P to get the shape below.

Cumulative Review Units 1–8, page 492

- 1.a) Logan                      b) 7.3 m  
2.a) False;  $\sqrt{5} + \sqrt{2} \div 3.65 > 2.65 \div \sqrt{7}$   
b) True;  $\sqrt{46} \div 6.78$   
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   |

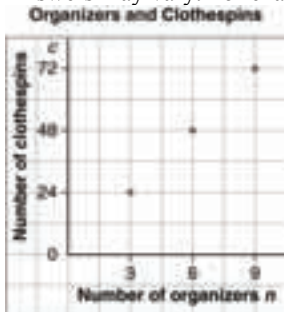
18.a) Answers may vary. For example:

| $n$ | $c$ |
|-----|-----|
| 3   | 24  |
| 6   | 48  |
| 9   | 72  |

b) 96

c) 18

d) Answers may vary. For example:



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:

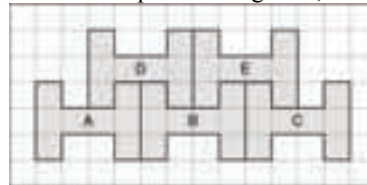
From A to B, translate 4 units right.

From A to C, translate 8 units right.

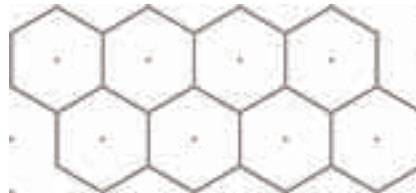
From A to D, translate 2 units right and 2 units up.

From A to E, translate 6 units right and 2 units up.

Since all shapes are congruent, area is conserved.



27. Yes



**acute angle:** an angle measuring less than  $90^\circ$

**acute triangle:** a triangle with three acute angles



**algebraic expression:** a mathematical expression containing a variable; for example,  $6x - 4$  is an algebraic expression

**approximate:** a number close to the exact value of an expression; the symbol  $\doteq$  means “is approximately equal to”

**area:** the number of square units needed to cover a region

**array:** an arrangement in rows and columns

**average:** a single number that represents a set of numbers (see *mean*, *median*, and *mode*)

**axis of rotation:** the straight line around which an object is turned

**bar graph:** a graph that displays data by using horizontal or vertical bars

**bar notation:** the use of a horizontal bar over a decimal digit to indicate that it repeats; for example,  $1.\bar{3}$  means 1.333 333 ...

**base:** the side of a polygon or the face of an object from which the height is measured

**bisector:** a line that divides a line segment or an angle into two equal parts

**capacity:** the amount a container can hold

**Cartesian Plane:** another name for a coordinate grid (see *coordinate grid*)

**central angle:** the angle between the two radii that form a sector of a circle; also called sector angle

**certain event:** an event with probability 1, or 100%

**chance:** a description of a probability expressed as a percent

**circle graph:** a diagram that uses sectors of a circle to display data

**circumference:** the distance around a circle, also known as the perimeter of the circle

**common denominator:** a number that is a multiple of each of the given denominators; for example, 12 is a common denominator for the fractions  $\frac{1}{3}$ ,  $\frac{5}{4}$ ,  $\frac{7}{12}$

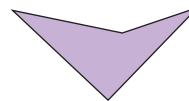
**common factor:** a number that is a factor of each of the given numbers; for example, 3 is a common factor of 15, 9, and 21

**commutative property:** the property of addition and multiplication that states that numbers can be added or multiplied in any order; for example,  $3 + 5 = 5 + 3$ ;  $3 \times 5 = 5 \times 3$

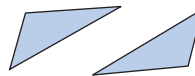
**composite number:** a number with three or more factors; for example, 8 is a composite number because its factors are 1, 2, 4, and 8

**composite shape:** the result of combining one or more shapes to make a new shape

**concave polygon:** has at least one angle greater than  $180^\circ$



**congruent:** shapes that match exactly, but do not necessarily have the same orientation

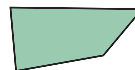


**consecutive numbers:** integers that come one after the other without any integers missing; for example, 34, 35, 36 are consecutive numbers, so are  $-2$ ,  $-1$ , 0, and 1

**conservation of area:** under a transformation, the area of a shape does not change

**constant term:** the number in an expression or equation that does not change; for example, in the expression  $4x + 3$ , 3 is the constant term

**convex polygon:** has all angles less than  $180^\circ$



**coordinate axes:** the horizontal and vertical axes on a grid

**coordinate grid:** a two-dimensional surface on which a coordinate system has been set up

**coordinates:** the numbers in an ordered pair that locate a point on the grid (see *ordered pair*)

**cube:** an object with six congruent square faces

**cubic units:** units that measure volume

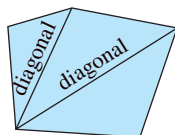
**cylinder:** an object with two parallel, congruent, circular bases



**database:** an organized collection of facts or information, often stored on a computer

**denominator:** the term below the line in a fraction

**diagonal:** a line segment that joins two vertices of a shape, but is not a side



**diameter:** the distance across a circle, measured through its centre

**digit:** any of the symbols used to write numerals; for example, 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9

**dimensions:** measurements, such as length, width, and height

**discount:** the amount by which a price is reduced

**discrete data:** data that can be counted

**distributive property:** the property stating that a product can be written as a sum or difference of two products; for example,  $a(b + c) = ab + ac$ ,  $a(b - c) = ab - ac$

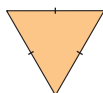
**dividend:** the number that is divided

**divisor:** the number that divides into another number

**double bar graph:** a bar graph that shows two sets of data

**equation:** a mathematical statement that two expressions are equal

**equilateral triangle:** a triangle with three equal sides



**equivalent:** having the same value; for example,  $\frac{2}{3}$  and  $\frac{6}{9}$ ; 3:4 and 9:12

**estimate:** a reasoned guess that is close to the actual value, without calculating it exactly

**evaluate:** to substitute a value for each variable in an expression

**even number:** a number that has 2 as a factor; for example, 2, 4, 6

**event:** any set of outcomes of an experiment

**experimental probability:** the probability of an event calculated from experimental results

**expression:** a mathematical phrase made up of numbers and/or variables connected by operations

**factor:** to factor means to write as a product; for example,  $20 = 2 \times 2 \times 5$

**formula:** a rule that is expressed as an equation

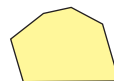
**fraction:** an indicated quotient of two quantities

**frequency:** the number of times a particular number occurs in a set of data

**greatest common factor (GCF):** the greatest number that divides into each number in a set; for example, 5 is the greatest common factor of 10 and 15

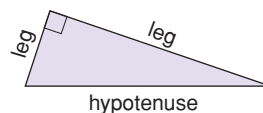
**height:** the perpendicular distance from the base of a shape to the opposite side or vertex; the perpendicular distance from the base of an object to the opposite face or vertex

**hexagon:** a six-sided polygon



**horizontal axis:** the horizontal number line on a coordinate grid

**hypotenuse:** the side opposite the right angle in a right triangle



**image:** the shape that results from a transformation

**impossible event:** an event that will never occur; an event with probability 0, or 0%

**improper fraction:** a fraction with the numerator greater than the denominator; for example, both  $\frac{6}{5}$  and  $\frac{5}{3}$  are improper fractions

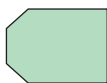
**independent events:** two events in which the result of one event does not depend on the result of the other event

**inspection:** solving an equation by finding the value of the variable by using addition, subtraction, multiplication, and division facts

**integers:** the set of numbers  
... -3, -2, -1, 0, +1, +2, +3, ...

**inverse operation:** an operation that reverses the result of another operation; for example, subtraction is the inverse of addition, and division is the inverse of multiplication

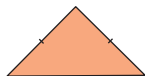
**irregular polygon:** a polygon that does not have all sides equal or all angles equal



**isometric:** equal measure; on isometric dot paper, the line segments joining 2 adjacent dots in any direction are equal

**isometric drawing:** a representation of an object as it would appear in three dimensions

**isosceles triangle:** a triangle with two equal sides



**legend:** part of a circle graph that shows what category each sector represents

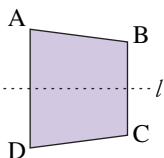
**legs:** the sides of a right triangle that form the right angle; (see *hypotenuse*)

**linear relation:** a relation that has a straight-line graph

**line graph:** a graph that displays data by using points joined by line segments

**line segment:** the part of a line between two points on the line

**line symmetry:** a shape that can be divided into 2 congruent parts, so that the parts coincide when the shape is folded along a line of symmetry



**lowest common multiple (LCM):** the lowest multiple that is the same for two numbers; for example, the lowest common multiple of 12 and 21 is 84

**mass:** the amount of matter in an object

**mean:** the sum of a set of numbers divided by the number of numbers in the set

**measure of central tendency:** a single number that represents a set of numbers (see *mean, median,* and *mode*)

**median:** the middle number when data are arranged in numerical order; if there is an even number of data, the median is the mean of the two middle numbers

**midpoint:** the point that divides a line segment into two equal parts

**mixed number:** a number consisting of a whole number and a fraction; for example,  $1\frac{1}{18}$  is a mixed number

**mode:** the number that occurs most often in a set of numbers

**multiple:** the product of a given number and a natural number; for example, some multiples of 8 are 8, 16, 24, ...

**natural numbers:** the set of numbers 1, 2, 3, 4, 5, ...

**negative number:** a number less than 0

**net:** a pattern that can be folded to make an object

**numerator:** the term above the line in a fraction

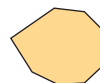
**numerical coefficient:** the number by which a variable is multiplied; for example, in the expression  $4x + 3$ , 4 is the numerical coefficient

**obtuse angle:** an angle whose measure is greater than  $90^\circ$  and less than  $180^\circ$

**obtuse triangle:** a triangle with one angle greater than  $90^\circ$



**octagon:** an eight-sided polygon



**odd number:** a number that does not have 2 as a factor; for example, 1, 3, 7

**operation:** a mathematical process or action such as addition, subtraction, multiplication, or division

**opposite integers:** two integers with a sum of 0; for example, +3 and -3 are opposite integers

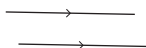
**ordered pair:** two numbers in order, for example, (2, 4); on a coordinate grid, the first number is the horizontal coordinate of a point, and the second number is the vertical coordinate of the point

**order of operations:** the rules that are followed when simplifying or evaluating an expression

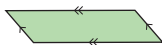
**origin:** the point where the  $x$ -axis and the  $y$ -axis intersect

**outcome:** a possible result of an experiment or a possible answer to a survey question

**parallel lines:** lines on the same flat surface that do not intersect



**parallelogram:** a quadrilateral with both pairs of opposite sides parallel



**part-to-part ratio:** a ratio that compares a part of the whole to another part of the whole

**part-to-whole ratio:** a ratio that compares a part of the whole to the whole

**pentagon:** a five-sided polygon



**percent:** the number of parts per 100; the numerator of a fraction with denominator 100

**percent decrease:** to calculate a percent decrease, divide the decrease by the original amount, then write the quotient as a percent

$$\text{Percent decrease (\%)} = \frac{\text{Decrease}}{\text{Original amount}} \times 100$$

**percent increase:** to calculate a percent increase, divide the increase by the original amount, then write the quotient as a percent

$$\text{Percent increase (\%)} = \frac{\text{Increase}}{\text{Original amount}} \times 100$$

**perfect square:** a number that is the square of a whole number; for example, 16 is a perfect square because  $16 = 4^2$

**perimeter:** the distance around a closed shape

**perpendicular lines:** intersect at  $90^\circ$

**pictograph:** a graph that uses a symbol to represent a certain number, and repetitions of the symbol illustrate the data (see page 384)

**plane:** a flat surface with the property that a line segment joining any two points lies completely on its surface

**polygon:** a closed shape that consists of line segments; for example, triangles and quadrilaterals are polygons

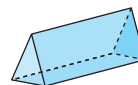
**polyhedron (plural, polyhedra):** an object with faces that are polygons

**population:** the set of all things or people being considered

**prediction:** a statement of what you think will happen

**prime number:** a whole number with exactly two factors, itself and 1; for example, 2, 3, 5, 7, 11, 29, 31, and 43

**prism:** an object that has two congruent and parallel faces (the *bases*), and other faces that are parallelograms



**probability:** the likelihood of a particular outcome; the number of times a particular outcome occurs, written as a fraction of the total number of outcomes

**product:** the result when two or more numbers are multiplied

**proper fraction:** a fraction with the numerator less than the denominator; for example,  $\frac{5}{6}$

**proportion:** a statement that two ratios are equal; for example,  $n:24 = 3:4$

**pyramid:** an object that has one face that is a polygon (the *base*), and other faces that are triangles with a common vertex

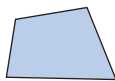


**Pythagorean Theorem:** the rule that states that, for any right triangle, the area of the square on the hypotenuse is equal to the sum of the areas of the squares on the legs

**Pythagorean triple:** three whole-number side lengths of a right triangle

**quadrant:** one of four regions into which coordinate axes divide a plane

**quadrilateral:** a four-sided polygon



**quotient:** the result when one number is divided by another

**radius (plural, radii):** the distance from the centre of a circle to any point on the circle

**range:** the difference between the greatest and least numbers in a set of data

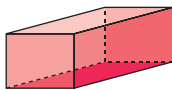
**rate:** a comparison of two quantities measured in different units

**ratio:** a comparison of two or more quantities with the same unit

**reciprocals:** two numbers whose product is 1; for example,  $\frac{2}{3}$  and  $\frac{3}{2}$

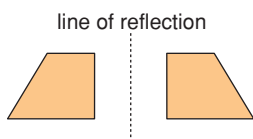
**rectangle:** a quadrilateral that has four right angles

**rectangular prism:** a prism that has rectangular faces



**rectangular pyramid:** a pyramid with a rectangular base

**reflection:** a transformation that is illustrated by a shape and its image in a line of reflection



**reflex angle:** an angle between  $180^\circ$  and  $360^\circ$



**regular polygon:** a polygon that has all sides equal and all angles equal

**regular prism:** a prism with regular polygons as bases; for example, a cube

**regular pyramid:** a pyramid with a regular polygon as its base; for example, a tetrahedron

**related denominators:** two fractions where the denominator of one fraction is a factor of the other

**relation:** a rule that associates two terms

**repeating decimal:** a decimal with a repeating pattern in the digits to the right of the decimal point; it is written with a bar above the repeating digits; for example,  $\frac{1}{15} = 0.0\overline{6}$

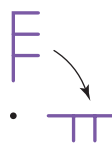
**rhombus:** a parallelogram with four equal sides

**right angle:** a  $90^\circ$  angle

**right triangle:** a triangle that has one right angle



**rotation:** a transformation in which a shape is turned about a fixed point



**scale:** the numbers on the axes of a graph

**scalene triangle:** a triangle with all sides different

**sector:** part of a circle between two radii and the included arc

**sector angle:** see *central angle*

**simplest form:** a ratio with terms that have no common factors, other than 1; a fraction with numerator and denominator that have no common factors, other than 1

**spreadsheet:** a computer-generated arrangement of data in rows and columns, where a change in one value results in appropriate calculated changes in the other values

**square:** a rectangle with four equal sides

**square number:** the product of a number multiplied by itself; for example, 25 is the square of 5

**square root:** a number which, when multiplied by itself, results in a given number; for example, 5 is a square root of 25

**statistics:** the branch of mathematics that deals with the collection, organization, and interpretation of data

**straight angle:** an angle measuring  $180^\circ$



**surface area:** the total area of the surface of an object

**symmetrical:** possessing symmetry (see *line symmetry*)

**systematic trial:** solving an equation by choosing a value for the variable, then checking by substituting

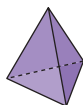
**term:** (of a fraction) the numerator or the denominator of the fraction

(of a ratio) each of the quantities constituting a ratio; for example, in the ratio 4:5, 4 and 5 are both terms

**terminating decimal:** a decimal with a certain number of digits after the decimal point; for example,  $\frac{1}{8} = 0.125$

**tessellate:** to use congruent copies of a shape to cover a plane with no overlaps or gaps

**tetrahedron:** an object with four equal triangular faces; a regular triangular pyramid



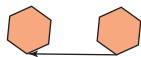
**theoretical probability:** the number of favourable outcomes written as a fraction of the total number of possible outcomes

**three-dimensional:** having length, width, and depth or height

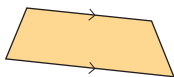
**three-term ratio:** a comparison of three quantities with the same unit

**transformation:** a translation, rotation, or reflection

**translation:** a transformation that moves a point or a shape in a straight line to another position on the same flat surface



**trapezoid:** a quadrilateral that has one pair of parallel sides



**triangle:** a three-sided polygon

**two-dimensional:** having length and width, but no thickness, height, or depth

**two-term ratio:** a comparison of two quantities with the same unit

**unit fraction:** a fraction that has a numerator of 1

**unit price:** the price of one item, or the price of a particular mass or volume of an item

**unit rate:** a quantity associated with a single unit of another quantity; for example, 6 m in 1 s is a unit rate; it is written as 6 m/s

**variable:** a letter or symbol representing a quantity that can vary

**vertex (plural, vertices):** the point where 2 sides of a shape meet, or the point where 3 or more edges of an object meet

**vertical axis:** the vertical number line on a coordinate grid

**volume:** the amount of space occupied by an object

**whole numbers:** the set of numbers 0, 1, 2, 3, ...

**x-axis:** the horizontal number line on a coordinate grid

**y-axis:** the vertical number line on a coordinate grid

**zero pair:** two opposite numbers whose sum is equal to zero

**zero property:** the property of addition that states adding 0 to a number does not change the number; for example,  $3 + 0 = 3$ ; for multiplication, multiplying a number by 0 results in the product 0; for example,  $3 \times 0 = 0$