

Answers

Unit 1 Numbers, Variables, and Equations, page 4

Skills You'll Need, page 6

1. a) 4^3 b) 2^7 c) 7^2 d) 12^5
 2. a) $5 \times 5 \times 5 \times 5$; 625 b) 11×11 ; 121
 c) $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$; 256
 d) $12 \times 12 \times 12$; 1728
 3. a) 3^3 b) 6^2 c) $8^2, 4^3, 2^6$ d) 2^2
 e) 5^3 f) 2^3 g) 7^3 h) $25^2, 5^4$
 4. a) i) 10^4 ii) 10^7 iii) 10^3 iv) 10^8
 b) For example: The exponent equals the number of zeros when the number is written in standard form. The exponent equals the number of 10s when the number is written in expanded form.
 5. a) 10 000 b) 1 000 000
 c) 10 000 000 000 d) 1 000 000 000 000
 6. No. $10^6 - 10^4 = 1\,000\,000 - 10\,000 = 990\,000$;
 $10^2 = 100$
 7. a) 1100 b) 11 000 c) 110 000
 8. a) $x = 9$ b) $x = 4$ c) $x = 12$ d) $x = 7$
 e) $x = 17$ f) $x = 102$ g) $x = 45$ h) $x = 20$
 i) $x = 10$

1.1 Numbers in the Media, page 11

1. a) 144 b) 414 c) 960 d) 2500
 2. a) 70 b) 399 c) 7.872 d) 875
 e) 1110 f) 3292 g) 125 h) 120
 3. a) Estimate b) Exact c) Exact
 4. a) \$5790.6 million
 b) \$706.2 million; \$859.6 million; \$909.9 million; \$910.7 million
 c) *Star Wars Episode 1—The Phantom Menace* and *Lord of the Rings—The Two Towers*; \$1850.2 million
 d) *Titanic* and *Harry Potter and the Sorcerer's Stone*
 e) For example: No; older movies would have earned less money because the cost of going to the movies has increased since 1997.
 f) "What were the total earnings in the U.S. of the top five movies?" (Answer: \$2068.2 million)
 5. a) 19 700 m
 b) For example: About 1640 ladders; I assumed each ladder was 12 m long.
 6. a) 2500 L b) 2250 L c) 98 000 L
 d) About 14.5 kg of rice, 0.7 kg of beef, 48 kg of wheat
 7. For example: "In two weeks, how much more money does a miner earn than a construction worker?" (Answer: \$718)
 8. a) For example: Yes, a person drinks water, uses water to bathe or shower, to cook, to wash dishes, and to do laundry.
 b) 300 L of water could fill 3 bathtubs, or 150 2-L bottles.
 9. a) Swimming b) Baseball

- c) For example: About 840 000; I assumed the percents in 2004 were the same as they were in 1998, and that the population was about one-half males and one-half females.
 d) "In 1998, what percent of males chose a sport not listed in the table as the most popular sport?" (Answer: About 60.7%)

10. For example: I would group pairs of numbers that add to 50, then add; 1275.

1.2 Prime Factors, page 17

1. a) 36 b) 392 c) 675 d) 180
 e) 384 f) 567 g) 441 h) 700
 2. a) 3, 7 b) 2, 7 c) 2, 5 d) 5
 e) 19 f) 2, 5 g) 7, 11 h) 2, 3
 3. a) $2^4 \times 3$ b) $3^2 \times 7$ c) $2^4 \times 5^2$ d) 2^4
 e) $2^3 \times 3 \times 5$ f) 5×11 g) $2^2 \times 3^2$ h) $2^3 \times 11$
 4. a) 11 b) 2, 3, 4, 6, 8, 12, 24
 c) 3 d) 5, 25
 5. a) 336, 672, 1008 b) 288, 576, 864
 c) 616, 1232, 1848 d) 252, 504, 756
 6. a) 30 b) For example: 60, 150
 7. No. Since 2 is a factor of 4, the least number that has 2, 3, 4, and 5 as factors is $3 \times 4 \times 5 = 60$.
 8. No. I can always find a number greater than the "greatest number," by multiplying by any of the 3 factors.
 9. a) 7182 b) $2 \times 3^3 \times 7 \times 19$
 10. For example: a) 1225 b) $5^2 \times 7^2$
 11. a) 231 b) 3, 7, 11, 33
 12. a) 700
 b) 2, 4, 5, 7, 10, 14, 20, 25, 28, 35, 50, 70, 100, 140, 175, 350, 700
 13. a) Yes. For example:
 16 has 4 prime factors: $2 \times 2 \times 2 \times 2$;
 9 has 2 prime factors: 3×3 ;
 64 has 6 prime factors; $2 \times 2 \times 2 \times 2 \times 2 \times 2$;
 2, 4, and 6 are all even numbers.
 b) $3025 = 5 \times 5 \times 11 \times 11$; since each prime factor of 3025 occurs an even number of times, 3025 is a perfect square.
 14. No. 4 is not a prime number.
 15. No, the product of the first four prime numbers is $2 \times 3 \times 5 \times 7 = 210$, which is greater than 150.
 16. Doors with numbers that are perfect squares will be open: 1, 4, 9, 16, 25, 36, 49, 64, 81, and 100.
- ### 1.3 Expanded Form and Scientific Notation, page 21
1. a) $8 \times 10^5 + 3 \times 10^4 + 4 \times 10^3$
 b) $9 \times 10^7 + 8 \times 10^6 + 9 \times 10^5 + 7 \times 10^4 + 7 \times 10^3 + 1 \times 10^2 + 8 \times 10^1 + 3$
 c) $7 \times 10^6 + 1 \times 10^1$
 d) $2 \times 10^4 + 3 \times 10^3 + 2 \times 10^2 + 3 \times 10^1 + 2$
 2. a) $4 \times 10^3 + 6 \times 10^2 + 6 \times 10^1 + 7$
 b) $2 \times 10^4 + 4 \times 10^3 + 2 \times 10^2 + 4 \times 10^1$
 c) $7 \times 10^7 + 7 \times 10^3$

- 3.a) 3 b) 5 c) 6 d) 4 e) 2 f) 1
 4.a) 1.532×10^6 b) 3.1×10^4 c) 4.6×10^9
 d) 1.5×10^2 e) 6.0001×10^6 f) 1.47032×10^5
 5.a) 6.1×10^2 , 616, 1.6×10^3 , 1616
 b) 248 555, 2.453×10^6 , 2.4531×10^6 , 2 453 101
 6. For example: The decimal point goes after the first non-zero digit, giving a number between 1 and 10. Then, the number of places to the original position of the decimal point is one less than the number of digits in the number.
 7. 5.1024×10^3 km or about 5.1×10^4 km
 8.a) 100 000 000 000 b) 8.6×10^6
 c) 30 000 000 000 d) 2.08×10^2
 9.a) No. 1.2756×10^4
 b) Large numbers are easier to read in scientific notation.
 10. 70 000
 11.a) The frequency of violet light is greater by 3.2×10^4 Hz.
 b) For example: Yes. It is easier to compare the numbers between 1 and 10 and the powers of 10.
 12.a) New Brunswick: 7.514×10^5 ;
 Nova Scotia: 9.37×10^5 ; Ontario: 1.23927×10^7 ;
 Quebec: 7.5428×10^6 ; Manitoba: 1.1703×10^6 ;
 Northwest Territories: 4.28×10^4 ;
 British Columbia: 4.1964×10^6 ; Prince Edward Island: 1.379×10^5 ; Yukon: 3.12×10^4 ;
 Alberta: 3.2019×10^6 ; Saskatchewan: 9.954×10^5 ;
 Newfoundland and Labrador: 5.17×10^5 ;
 Nunavut: 2.96×10^4
 b) 2.16239×10^7
 c) New Brunswick, Prince Edward Island, and the Northwest Territories
 d) For example: In parts b and c, it was easier to add the numbers in standard form because the exponents were different.
 13. For example: I am 13 years old. I assumed my heart beats 80 times per minute.
 $546\,624\,000$; 5.46624×10^8 ;
 $500\,000\,000 + 40\,000\,000 + 6\,000\,000 + 600\,000 + 20\,000 + 4000$;
 $5 \times 10^8 + 4 \times 10^7 + 6 \times 10^6 + 6 \times 10^5 + 2 \times 10^4 + 4 \times 10^3$
 14. $4.32 \div 10^3$

Unit 1 Mid-Unit Review, page 24

- 1.a) For example: 6550; I rounded each number to the nearest ten before adding.
 b) Gretzky and Francis
 c) For example: "Which players have about three times as many assists as goals?"
 (Answer: Bourque and Coffey)
 2.a) $2^2 \times 3 \times 37$ b) 2×3^4 c) $2 \times 3 \times 17$ d) $5^2 \times 7^2$
 3.a) 135, 270 b) 112, 224 c) 288, 576 d) 180, 360
 4.a) 2, 4, 5, 10, 20 b) 2, 4, 8 c) 3, 9 d) 2, 4
 5.a) 2^3 is a product of 2s, and 2 is a prime number.
 b) 4 is not a prime number.
 6. 400, 275, 693, 37 856; from least to greatest: 275, 400, 693, 37 856
 7.a) For example: No. Two is the only even prime number. Three consecutive whole numbers will have at least one even number other than 2.
 b) Yes. For example: 2×3
- 8.a) $8 \times 10^8 + 6 \times 10^6 + 8 \times 10^4 + 7 \times 10^3 + 1 \times 10^2 + 3 \times 10^1 + 7$
 b) $2 \times 10^7 + 2 \times 10^4 + 2 \times 10^2 + 2 \times 10^1$
 9.a) 5.6×10^6 b) 7.73291×10^5
 c) 9.2×10^9 d) 6.2×10^1
 10. b and d

1.4 Order of Operations, page 27

- 1.a) 36 b) 24 c) 121 d) 25 e) 0 f) 2
 2.a) 32 000 b) 0.6 c) 4.61 d) 98.12 e) 47.97 f) 512
 3. $3 \times \$24.99 + 2 \times \$14.99 = \$104.95$
 4.a) 64 m^2 b) 100 m^2 c) 91 m^2
 5.a) 6.175 m b) 6.9 m c) 5.175 m
 6.a) $(10 + 2) \times 3^2 - 2 = 106$ b) $10 + 2 \times (3^2 - 2) = 24$
 c) $(10 + 2) \times (3^2 - 2) = 84$ d) $(10 + 2 \times 3)^2 - 2 = 254$
 7.a) $20 \div (2 + 2) \times 2^2 + 6 = 26$
 b) $20 \div 2 + 2 \times (2^2 + 6) = 30$
 c) $20 \div (2 + 2 \times 2^2) + 6 = 8$
 d) $(20 \div 2 + 2) \times (2^2 + 6) = 120$
 8.a) 49, 128, 1024, 625; from greatest to least: 4^5 , 5^4 , 2^7 , 7^2
 b) 9, 8, 1, 25;
 from greatest to least: $(3 + 2)^2$, 3^2 , 2^3 , $(3 - 2)^2$
 c) 72.25, 90.25, 65.5, 102.5; from greatest to least:
 $103.5 - 1^2$, $(10.5 - 1)^2$, $(7.5 + 1)^2$, $61.5 + 2^2$
 d) 104.04, 33.64, 12, 3.16; from greatest to least:
 $(2.2 + 8)^2$, $(8 - 2.2)^2$, $8 + 2^2$, $8 - 2.2^2$
 9. \$1059.76
 10. For example:
 a) $(2 \times 6) + 4 + 8$ b) $2 \times 6 \times 4 - 8$
 c) $(6 + 4) \times (8 - 2)$ d) $(2^4 - 6) \times 8$
 11. For example: $(4 \times 4) \div (4 \times 4) = 1$; $(4 \div 4) + (4 \div 4) = 2$;
 $(4 + 4 + 4) \div 4 = 3$; $4 \times (4 - 4) + 4 = 4$;
 $(4 \times 4 + 4) \div 4 = 5$; $(4 + 4) \div 4 + 4 = 6$; $44 \div 4 - 4 = 7$;
 $4 + 4 + 4 - 4 = 8$; $4 + 4 + 4 \div 4 = 9$; $(44 - 4) \div 4 = 10$
 12. No, for example: $2^2 + 3^2 = 4 + 9 = 13$; $(2 + 3)^2 = 5^2 = 25$
 13. For example: $92/01/27$; $9 \times (2 + 0 - 1) = 2 + 7$
 14. For example: $123 + 4 + 5 + 6 + 7 + 8 - 9 = 144$

1.5 Using a Model to Solve Equations, page 32

- 1.a) Mass A = 30 g b) Mass B = 55 g
 c) Mass C = 65 g d) Mass D = 50 g
 2.a) $x = 2$ b) $x = 5$ c) $x = 7$ d) $x = 8$
 e) $x = 15$ f) $x = 27$
 3.a) $x = 11$ b) $x = 6$ c) $x = 19$ d) $x = 1$
 4. $x = 19$
 5.a) There are many possibilities. For example: In the left pan, 30 g, 5 g, and x ; in the right pan, 20 g and 40 g
 b) $x = 25$
 6.a) For example: In the left pan, x , x , x , x , x , 10 g; in the right pan, 50 g, 50 g, 5 g
 b) $x = 19$

1.6 Using Algebra Tiles to Solve Equations, page 38

- 1.a) $x = 4$ b) $x = 7$ c) $x = 10$
 d) $x = 12$ e) $x = 13$ f) $x = 14$
 2.a) $x = 4$ b) $x = 7$ c) $x = 10$
 d) $x = 12$ e) $x = 13$ f) $x = 14$

3. $x = 6$; the number is 6.
 4. $x = 17$; the number is 17.
 5. i) $x = 3$ ii) $x = 4$ iii) $x = 1$ iv) $x = 3$
 6. $x = 6$; the number is 6.
 7. $x = 13$; the side length is 13 cm.
 8. $x = 7$; the number is 7.
 9. For example: "Eight more than a number is 13. Let x represent the number.
 Then, an equation is $8 + x = 13$. Solve the equation.
 What is the number?" (Answer: $x = 5$)

10. a) $x = -2$ b) $x = -3$ c) $x = -4$
 11. a) $5 + 2x = 1$; $x = -2$ b) $2x - 5 = -1$, $x = 2$

Unit 1 Unit Review, page 42

1. For example: "About how many hours did each Canadian spend volunteering?" (Answer: About 100 h)
 2. a) $64 = 2^6$ b) $42 = 2 \times 3 \times 7$
 c) $60 = 2^2 \times 3 \times 5$ d) $30 = 2 \times 3 \times 5$
 3. a) 48 b) 100
 4. a) 253
 b) For example: 9 999 999 823; after this number, the display is in scientific notation.
 5. c
 6. a) i) 5 ii) 105, 210, 315
 b) i) 2, 4, 5, 10, 20 ii) 100, 200, 300
 c) i) 5, 25 ii) 75, 150, 225
 d) i) 2, 3, 6 ii) 180, 360, 540
 7. a) For example: 8 and 9; 25 and 42
 b) For example: 12 and 16; 25 and 100
 c) The lowest common multiple is less than the product of two numbers if the numbers have at least one common factor. If they do not have any common factors, the lowest common multiple is the product of the two numbers.
 8. a) Caspian Sea, Superior, Victoria, Huron, Michigan, Tanganyika, Baikal, Great Bear, Aral, Malawi
 b) Malawi and Michigan
 9. a) $9 \times 10^6 + 3 \times 10^5 + 3 \times 10^4 + 7 \times 10^3$
 b) $9 \times 10^5 + 7 \times 10^4 + 7 \times 10^3 + 1 \times 10^2 + 8 \times 10^1 + 3$
 c) $1 \times 10^8 + 6 \times 10^6 + 4 \times 10^4 + 5 \times 10^1 + 5$
 d) $7 \times 10^4 + 3 \times 10^3 + 5 \times 10^2 + 3 \times 10^1 + 2$
 10. a) 1.5×10^6 b) 4.2×10^4 c) 6×10^8 d) 2.7×10^1
 11. a) 6000 b) 8 430 000 c) 720 000 d) 328 000 000
 12. a) 17 b) 105 c) 115 d) 3.11
 13. a) 100 m^2 b) 108 m^2 c) 72 m^2
 14. a) $x = 5$ b) $x = 8$ c) $x = 9$ d) $x = 9$
 15. 13 stamps
 16. a) $x = 9$ b) $x = 6$ c) $x = 3$ d) $x = 10$
 17. a) $x = 3$ b) $x = 11$ c) $x = 2$ d) $x = 1$
 18. $x = 19$; 19 books can be bought.
 19. $x = 9$; Kumar has 9 cards.

Unit 1 Practice Test, page 45

1. For example: I assumed there are 4 people in the household, and that each person flushes the toilet 6 times per day.
 a) 480 L b) 336 L

2. For example: Both methods use powers of 10 multiplied by a number greater than or equal to 1 and less than 10. Expanded form shows the number as the sum of numbers, each written as a product of a whole number and a power of 10. Scientific notation shows the number as a product of two factors, one factor is a number greater than or equal to 1, and less than 10. The other factor is a power of 10.

3. a) For example: 1122 b) $2 \times 3 \times 11 \times 17$
 4. a) \$35 b) $25 + 0.10m$ c) \$92.50
 5. a) $x = 12$ b) $x = 10$ c) $x = 11$
 6. 13

Unit 1 Unit Problem: Planning a Ski Trip, page 46

Part 1

1. From greatest elevation to least elevation: Telluride, Aspen Highlands, Vail, Big Sky, Steamboat, Jackson Hole, Heavenly, Sun Valley, Kicking Horse, Whistler/Blackcomb
 2. a) 4 students b) 8 students
 3. a) 3°C b) -6°C
 4. Company A

Unit 2 Applications of Ratio, Rate, and Percent, page 48

Skills You'll Need, page 51

1. a) i) 52:21 ii) 41:4
 b) i) 36:31 ii) 82:11
 c) i) 6:7 ii) 41:4
 d) i) 27:37 ii) 41:5
 2. 82:8 and 41:4; 82:10 and 41:5; 30:35 and 6:7
 3. a) 75 heartbeats/min b) \$9.35/ticket
 c) \$2.25/ball d) \$9.75/h
 4. a) 80 km/h b) 8 h 45 min
 5. a) i) 0.3, 30% ii) 0.8, 80%
 iii) 1.05, 105% iv) 0.03, 3%
 b) i) $0.25, \frac{1}{4}$ ii) $0.34, \frac{17}{50}$ iii) $2.5, \frac{5}{2}$ iv) $0.02, \frac{1}{50}$
 c) i) $15\%, \frac{3}{20}$ ii) $7\%, \frac{7}{100}$
 iii) $40\%, \frac{2}{5}$ iv) $115\%, \frac{23}{20}$

2.1 Using Proportions to Solve Ratio Problems, page 55

1. a) $t = 36$ b) $v = 18$ c) $x = 10$
 d) $a = 3$ e) $b = 15$ f) $l = 20$
 2. 225 shots
 3. a) 10 trees b) Yes. Use a model.
 4. 148 dentists
 5. $4\frac{2}{3}$ times
 6. 64 students
 7. a) No, it only tells the proportion. b) 15 cm
 8. 24 shots
 9. a) 39 b) 26 c) \$1111.50
 10. a) 24 students b) 27 students

11. Ratio of my height: height of a flagpole = ratio of length of my shadow:length of shadow of flagpole

2.2 Scale Drawings, page 59

- 1.a) 450 cm b) 0.02 cm
 2. For example: 1:2000
 3. Answers may vary.
 4. About 1:8025
 5.a) 105 km b) 6 cm
 6.a) 9.6 cm by 12.8 cm b) 6.2 cm by 8.4 cm
 7. For example: About 1:200; I assumed the page is 25 cm long.
 8. 14:1

2.3 Comparing Rates, page 67

- 1.a) \$133/week b) 85 km/h
 c) About \$0.29/bottle d) \$0.33/can
 2.a) 8 grapefruit for \$2.99 b) 125 g for \$0.79
 c) 150 mL for \$2.19 d) 2 L for \$4.49
 3. About \$7.25
 4.a) 87.5 km
 b) The average speed is the mean distance travelled in 1 h.
 c) 8 h
 5.a) 60 km in 3 h
 6. For example:
 a) About 13 points b) About 312 points
 7. About 4.9 cm
 8. Mei-Lin
 9. About 209 bags or 520.8 kg
 10.a) i) About 17 min ii) About 31 min
 b) i) Swimming; 52 min ii) Cycling and walking
 c) For example: "How long would a person have to skip to burn the calories in a medium peach?" (Answer: About 6 min)
 11.a) i) About 3 people/km² ii) About 134 people/km²
 iii) About 338 people/km²
 b) From least density to greatest density: Canada, China, India

Unit 2 Mid-Unit Review, page 69

- 1.a) $x = 50$ b) $y = 27$ c) $z = 5$ d) $a = 28$
 2. 1600 girls
 3.a) About 310 bass b) About 190 pike
 4. 13.25 cm
 5.a) For example: 3:1 b) For example: 1:150
 7. 0.36 mm
 8.a) \$1.07/L b) \$4.47/kg c) \$4.38/kg
 9.a) 8.5 L for \$7.31 b) 12 bagels for \$5.99
 c) 5 kg for \$2.79
 10.a) 43 words b) 129 words c) About 538 words
 11. 42 km/h

2.4 Calculating Percents, page 72

- 1.a) 1.2 b) 2.5 c) 4.75
 d) 0.003 e) 0.0053 f) 0.0075

- 2.a) i) $33.\overline{3}\%$ ii) $66.\overline{6}\%$ iii) 100%
 iv) $133.\overline{3}\%$ v) $166.\overline{6}\%$ vi) 200%
 b) Percents start at $33.\overline{3}\%$. They increase by $33.\overline{3}\%$ each time.
 c) Multiply $33.\overline{3}\%$ by the numerator each time.
 i) $233.\overline{3}\%$ ii) $266.\overline{6}\%$ iii) 300%
 3.a) i) 720 ii) 72 iii) 7.2 iv) 0.72
 b) The decimal point moves 1 place to the left each time.
 c) i) 7200 ii) 0.072
 4.a) About 5 runners
 b) 1% of 618 is about 6, so 0.8% of 618 should be a bit less than 6.
 5.a) 168 people
 b) 100% of 120 = 120; 50% of 120 = 60; 150% of 120 = 120 + 60 = 180
 So, 140% would be a bit less than 180.
 6. About 84%
 7.a) Less than 20 b) 15
 c) The population decreased by 1985 people.

2.5 Solving Percent Problems, page 76

- 1.a) 20 b) 24 c) 800 d) 40
 2.a) $833.\overline{3}$ g b) 500 cm c) 1500 g
 3.a) About 7.1% b) 30%
 4. 1800 cm³
 5.a) About 5% b) About 5.3%
 6. 169 840
 7. 250
 8.a) 36 papers b) About 36 min
 9.a) About 167 cm b) About 180 cm
 10. Answers may vary.
 11.a) Canada: About 0.31 km²; U.S.: About 0.03 km²; Mexico: About 0.02 km²
 b) i) About 223% ii) About 406%
 c) Answers may vary.

2.6 Sales Tax, Discount, and Commission, page 79

1. i) a) About \$2.00; about \$1.75
 b) \$2.08, \$1.82 c) \$29.89
 ii) a) About \$12.00; about \$10.50
 b) \$12.20, \$10.67 c) \$175.32
 2. i) a) About \$20.00 b) \$18.00
 c) \$71.99 d) \$82.79
 ii) a) About \$60.00 b) \$54.00
 c) \$66.00 d) \$75.90
 3.a) 40% b) \$13.10
 4. Choice B is the better deal.
 Price after rebate: \$21 000
 Price with 20% discount: \$20 000
 5. Choice A
 6. \$3000
 7. \$389 120
 8.a) About \$150 b) \$167.80

9. Store B
 10. \$44.95
 11. a) \$86.00 b) \$66.26
 12. a) \$86.96 b) \$13.04

2.7 Simple Interest, page 84

1. a) 0.05 b) 0.07 c) 0.03 d) 0.0125
 e) 0.035 f) 0.0325 g) 0.0575 h) 0.025
 2. a) \$9.00 b) \$44.00 c) \$48.00
 3. a) \$840.00 b) \$1800.00 c) \$740.00
 4. a) \$75; \$2575 b) \$1080; \$7080.00
 c) \$14; \$714.00
 5. a) \$560 b) \$53.33
 6. \$518.75
 7. \$3489.58
 8. For example: “Marie invested the money in her friend’s business at an annual interest rate of 4% for 5 years. Calculate the simple interest Marie received.”
 (Answer: \$200 000)
 9. \$3048.16
 10. 7.5%

Unit 2 Unit Review, page 89

1. \$36
 2. a) 3 b) 6
 3. 14 games
 4. a) 400 mL
 b) About 2 L of pop and 800 mL of orange juice
 About 3 L of pop and 1.2 L of orange juice
 5. About 0.17 cm or 1.7 mm
 6. 18 cm
 7. 210 h
 8. a) 0.125 km/min b) 7.5 km/h
 9. Jevon: 0.6 laps/min; Kieran: about 0.4 laps/min
 Jevon had the greater average speed.
 10. a) 29.2 kg b) Answers may vary.
 11. a) About 20 jars b) 17 jars
 12. 25 cards
 13. 17.25 m
 14. 65
 15. 40 300 t
 16. 112.5 cm
 17. a) 205.8 cm by 235.2 cm b) 3.96%
 18. a) \$69.99 b) About 28.6%
 19. \$77.61
 20. a) \$17 500 b) \$332 500 c) \$7875
 21. \$37.50
 22. a) \$174.38 b) \$1674.38 c) \$93.02

Unit 2 Practice Test, page 91

1. 0.51 L
 2. a) 455 km b) About 60.7 L
 c) About 6 h 30 min d) About 49 min
 3. Yes; about 55.6%
 4. a) About 400 boxes b) 350 boxes
 5. \$4340
 6. No, the house is less expensive at the end of 2004.

Unit 3 Geometry and Measurement, page 94

Skills You’ll Need, page 97

3. a) 432 cm^2 ; 576 cm^3 b) 210 mm^2 ; 196 mm^3
 c) About 53.6 m^2 ; about 26.4 m^3
 d) 150 cm^2 ; 125 cm^3
 4. a) 25 m^2 b) 24 cm^2 c) 2.64 cm^2
 5. a) 7.265 m b) 0.43 m^2
 c) 0.98 m^3 d) 4280 L; $4.28 \times 10^3 \text{ L}$
 e) 875 cm; $8.75 \times 10^2 \text{ cm}$
 f) $13\,600 \text{ cm}^2$; $1.36 \times 10^4 \text{ cm}^2$
 g) $14\,980\,000 \text{ cm}^3$; $1.498 \times 10^7 \text{ cm}^3$
 h) 9870 cm^3 ; $9.87 \times 10^3 \text{ cm}^3$

3.1 Building and Sketching Objects, page 104

1. For example: A and H; top view, bottom view
 B and J; top view, bottom view
 B and L; front view
 C and I; top view, bottom view
 D and J; left side view, right side view
 5. c) The number of vertices + the number of faces – the number of edges = 2

3.2 Sketching and Folding Nets, page 109

1. i) a) Rectangular prism
 d) The front and back faces of the prism are two congruent 6-cm by 8-cm rectangles, the top and bottom faces are two congruent 2-cm by 8-cm rectangles, and the side faces are two congruent 2-cm by 6-cm rectangles.
 ii) a) Triangular prism
 d) The front face of the prism is a 2-cm by 3-cm rectangle, the top and bottom faces are two congruent equilateral triangles with side length 2 cm, and the side faces are two congruent 2-cm by 3-cm rectangles.
 3. Answers may vary.
 4. b) The cardboard net has other parts attached to it to allow for gluing the box together.
 6. a) Irregular hexagonal prism

Unit 3 Mid-Unit Review, page 111

2. a) The object resembles a doughnut.
 3. i) a) Rectangular prism
 d) The front and back faces of the prism are two congruent 6-cm by 7-cm rectangles, the top and bottom faces are two congruent 3-cm by 6-cm rectangles, and the side faces are two congruent 3-cm by 7-cm rectangles.
 ii) a) Parallelogram based prism
 d) The front and back faces of the prism are two congruent 2-cm by 1-cm rectangles, the top and bottom faces are two congruent 2-cm by 3-cm

parallelograms, and the side faces are two congruent 3-cm by 1-cm rectangles.

- iii) a) Right triangular prism
 d) The bases are 2 congruent right triangles, the other faces are rectangles. The object looks like a ramp.

3.3 Surface Area of a Triangular Prism, page 115

- 1.a) 50 cm^2 b) 48 m^2
 2.a) 153 m^2 b) 0.324 m^2
 3.a) $2\,567\,200 \text{ cm}^2$ b) 268 cm^2
 4.a) 39.4 m^2 b) 34.4 m^2
 5. Answers may vary.
 6.a) 2 cm and 12 cm; 3 cm and 8 cm; 4 cm and 6 cm; 6 cm and 4 cm; 8 cm and 3 cm; 12 cm and 2 cm
 b) A prism with length 12 cm, and the equilateral triangles have side length 2 cm.
 7. 1.44 m^2
 8.a) A right triangle with legs of lengths 3 cm and 4 cm, and hypotenuse with length 5 cm
 b) 84 cm^2
 9. 471 cm^2

3.4 Volume of a Triangular Prism, page 119

- 1.a) 21.16 cm^3 b) 217.5 cm^3 c) 45 m^3
 2.a) 955.5 cm^3 b) 240 m^3 c) About 3.8 m^3
 3.a) 531.96 cm^3 b) 108 cm^3
 4.a) For example: 1 cm by 2 cm by 5 cm
 b) For example: 2 m by 3 m by 3 m
 c) For example: 2 m by 4 m by 2 m
 d) For example: 3 cm by 3 cm by 4 cm
 5. 18 cm^3
 6. No, the base of a triangular prism is one of the two triangular faces that name the prism.
 7. 7.5 cm
 8.a) $SA = 36 \text{ m}^2$; $V = 12 \text{ m}^3$
 b) The surface area increases, but less than doubles. The volume doubles. $SA = 60 \text{ m}^2$; $V = 24 \text{ m}^3$
 c) The surface area more than doubles. The volume is 4 times as great. $SA = 96 \text{ m}^2$; $V = 48 \text{ m}^3$
 d) The surface area is 4 times as great and the volume is 8 times as great. $SA = 144 \text{ m}^2$; $V = 96 \text{ m}^3$
 9.a) 1.125 m^3
 b) She will need 3.375 m^3 more concrete.
 10.a) $SA = 231.35 \text{ cm}^2$; $V = 113.9 \text{ cm}^3$
 b) i) For example: $b = 7 \text{ cm}$, $h = 6.2 \text{ cm}$, $l = 21 \text{ cm}$
 ii) The base and height of the triangular faces are doubled.
 11.a) 292 m^2 ; 336 m^3 b) 68.25 cm^2 ; 28.125 cm^3

Reading and Writing in Math: Features of Word Problems, page 123

1. \$39.96
 2. 4 tables for eight and 9 tables for ten, 9 tables for eight and 5 tables for ten, 10 tables for eight and 1 table for ten
 3. 12

4. $\frac{2}{5}$; The probability of the tiles not matching and the probability of the tiles matching are not equal. So, the game is not fair.
 5. Answers may vary.

Unit 3 Unit Review, page 125

- 3.a) Trapezoidal prism
 d) The top and bottom faces are congruent trapezoids. The side faces are two congruent 5.7-cm by 6-cm rectangles. The back face is a 6-cm by 6-cm rectangle. The front face is a 14-cm by 6-cm rectangle.
 4.a) 7.2 cm^2 b) 0.96 cm^3
 5.a) 14.16 m^2 b) 2.295 m^3
 6. 6 m^3
 7. For example: $b = 1 \text{ m}$, $h = 1 \text{ m}$, $l = 42 \text{ m}$; $b = 2 \text{ m}$, $h = 21 \text{ m}$, $l = 1 \text{ m}$; $b = 3 \text{ m}$, $h = 7 \text{ m}$, $l = 2 \text{ m}$; $b = 6 \text{ m}$, $h = 7 \text{ m}$, $l = 1 \text{ m}$; $b = 7 \text{ m}$, $h = 3 \text{ m}$, $l = 2 \text{ m}$; $b = 7 \text{ m}$, $h = 6 \text{ m}$, $l = 1 \text{ m}$
 8.a) Double the length of one of the legs of the triangular bed. The other leg stays the same. The hypotenuse increases.
 b) For example: One leg could become 12 m *or* one leg could become 16 m.
 c) The volume of the soil doubles.
 9.a) $341\,760 \text{ cm}^3$; I assumed the bucket was tilted up, and that the soil would not fall out as the tractor was moving. Also, the soil was not heaped in the bucket.
 b) 4 times as much; $2 \times 2 = 4$
 c) $1\,367\,040 \text{ cm}^3$
 10. Assume the prism is a right triangular prism.
 a) For example: 1 m by 2 m by 25 m; 2 m by 5 m by 5 m; 5 m by 10 m by 1 m; 5 m by 5 m by 2 m
 c) i) For example: 1 m by 2 m by 100 m; 2 m by 4 m by 25 m; 2 m by 5 m by 20 m
 ii) For example: The base and the height of the triangular faces are doubled.

Unit 3 Practice Test, page 127

2. $SA = 17.99 \text{ m}^2$, $V = 3.0625 \text{ m}^3$
 3.a) The volume of the prism is 9 times as great: $3 \times 3 = 9$
 c) $V = 27.5625 \text{ m}^3$
 4.a) All the prisms have the same volume.
 b) Prism D has the least surface area.
 5.a) For example: $b = 1 \text{ cm}$ and $h = 60 \text{ cm}$; $b = 2 \text{ cm}$ and $h = 30 \text{ cm}$; $b = 3 \text{ cm}$ and $h = 20 \text{ cm}$; $b = 4 \text{ cm}$ and $h = 15 \text{ cm}$; $b = 5 \text{ cm}$ and $h = 12 \text{ cm}$; $b = 6 \text{ cm}$ and $h = 10 \text{ cm}$; and the triangular faces with dimensions in the reverse order to those listed
 c) For example: $b = 5 \text{ cm}$, $h = 12 \text{ cm}$, third side of triangular face = 13 cm; $SA = 270 \text{ cm}^2$
 $b = 6 \text{ cm}$, $h = 10 \text{ cm}$, third side of triangular face = 11.7 cm; $SA = 253.9 \text{ cm}^2$

Unit 4 Fractions and Decimals, page 132

Skills You'll Need, page 134

- 1.a) 5 b) 16 c) 5
 2.a) 30 b) $\frac{25}{3}$ c) $\frac{28}{9}$

- 3.a) 495 b) 440

4.1 Comparing and Ordering Fractions, page 137

- 1.a) $\frac{1}{2}$ b) $\frac{5}{6}$ c) $\frac{2}{3}$ d) $\frac{3}{4}$
 e) $\frac{1}{3}$ f) $\frac{3}{4}$ g) $\frac{3}{4}$ h) $\frac{2}{5}$
- 2.a) $\frac{3}{8}, \frac{1}{2}, \frac{4}{5}$ b) $\frac{3}{5}, \frac{7}{10}, \frac{6}{8}$
 c) $\frac{7}{4}, \frac{6}{3}, \frac{5}{2}$ d) $\frac{7}{5}, \frac{13}{6}, \frac{10}{3}$
- 3.a) $\frac{19}{10}, \frac{9}{4}, \frac{11}{3}$ b) $1\frac{9}{10}, 2\frac{1}{4}, 3\frac{2}{3}$ c) $1\frac{9}{10}, 2\frac{1}{4}, 3\frac{2}{3}$

d) Ordering mixed numbers; when the whole numbers are different

4. Yes

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

- 6.a) $\frac{0}{1}, \frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{3}{4}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}$
 b) $\frac{0}{1}, \frac{1}{5}, \frac{1}{4}, \frac{2}{3}, \frac{1}{2}, \frac{1}{5}, \frac{2}{5}, \frac{3}{4}, \frac{4}{5}, \frac{1}{1}$

7.a) For example: $\frac{21}{4}, \frac{22}{4}, \frac{23}{4}, \frac{16}{3}, \frac{17}{3}, \frac{26}{5}, \frac{27}{5}, \frac{28}{5}, \frac{29}{5}, \dots$

b) No. There are fractions for each possible denominator.

- 8.a) $\frac{3}{3}, \frac{3}{4}, \frac{3}{5}, \frac{3}{6}, \frac{4}{4}, \frac{4}{5}, \frac{4}{6}, \frac{4}{7}, \frac{5}{5}, \frac{5}{6}, \frac{5}{7}, \frac{5}{8}, \frac{6}{6}, \frac{6}{7}, \frac{6}{8}$

- b) $\frac{3}{6}, \frac{3}{5}, \frac{4}{6}, \frac{3}{4}, \frac{5}{5}, \frac{3}{4}, \frac{5}{6}, \frac{6}{6}, \frac{5}{4}, \frac{6}{5}, \frac{6}{3}, \frac{4}{3}, \frac{4}{3}, \frac{3}{3}$

c) i) none

- ii) $\frac{3}{4}, \frac{3}{5}, \frac{4}{5}, \frac{4}{6}, \frac{5}{6}$ iii) $\frac{4}{3}, \frac{5}{3}, \frac{5}{4}, \frac{6}{3}, \frac{6}{4}, \frac{6}{5}$

- 9.a) $\frac{22}{32}$ b) $\frac{919}{999}$

4.2 Adding Fractions, page 141

- 1.a) $\frac{7}{9}$ b) $\frac{5}{6}$ c) $\frac{5}{6}$ d) $\frac{11}{12}$

- e) $\frac{11}{15}$ f) $\frac{1}{2}$ g) $\frac{1}{3}$ h) $\frac{5}{8}$

- 2.a) $\frac{7}{8}$ b) $2\frac{11}{20}$ c) $1\frac{37}{42}$ d) $2\frac{19}{30}$

- e) $1\frac{7}{24}$ f) $1\frac{13}{35}$ g) $2\frac{25}{36}$ h) $3\frac{13}{30}$

3. $\frac{29}{30}$

4. Answers may vary.

- a) i) $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ ii) $\frac{3}{8} + \frac{3}{8} = \frac{3}{4}$ iii) $\frac{9}{20} + \frac{9}{20} = \frac{9}{10}$

- b) i) $\frac{1}{4} + \frac{2}{8} = \frac{1}{2}$ ii) $\frac{6}{16} + \frac{3}{8} = \frac{3}{4}$ iii) $\frac{18}{40} + \frac{9}{20} = \frac{9}{10}$

- 5.a) $\frac{1}{5} + \frac{3}{5}, \frac{2}{5} + \frac{2}{5}, \frac{1}{5} + \frac{1}{5} + \frac{2}{5}, \frac{7}{10} + \frac{1}{10}, \frac{8}{15} + \frac{1}{5} + \frac{1}{5}, \dots$

- b) $\frac{1}{10} + \frac{3}{5}, \frac{1}{5} + \frac{1}{2}, \frac{3}{10} + \frac{2}{5}, \frac{1}{10} + \frac{3}{10}, \frac{1}{3} + \frac{1}{5} + \frac{1}{6}, \dots$

- c) $\frac{1}{9} + \frac{1}{9}, \frac{2}{18} + \frac{3}{18}, \frac{1}{12} + \frac{1}{12} + \frac{1}{18}, \frac{1}{27} + \frac{1}{27} + \frac{4}{27}, \dots$

- 6.a) $7\frac{7}{12}$ b) $4\frac{2}{5}$ c) $4\frac{7}{20}$ d) $2\frac{13}{24}$ e) $3\frac{4}{15}$ f) $7\frac{11}{40}$

7. $6\frac{7}{15}$ h

- 8.a) $1\frac{11}{12}$ b) $1\frac{29}{60}$ c) $2\frac{29}{30}$ d) $2\frac{1}{60}$ e) $5\frac{3}{5}$ f) $2\frac{11}{30}$

- 9.a) Yes b) No c) No d) No e) No
 f) Yes g) No h) Yes i) Yes

- 10.a) $\frac{1}{2} + \frac{1}{4}$ b) $\frac{1}{4} + \frac{1}{6}$ c) $\frac{1}{2} + \frac{1}{5}$

11. $7\frac{1}{2}$; I used mixed numbers.

4.3 Subtracting Fractions, page 146

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

- e) 1 f) $\frac{13}{9}$ g) 3 h) $\frac{3}{14}$

- 2.a) $\frac{1}{12}$ b) $\frac{1}{5}$ c) $\frac{3}{20}$ d) $\frac{13}{24}$

- e) $\frac{1}{12}$ f) $\frac{11}{15}$ g) $\frac{13}{10}$ h) $\frac{7}{15}$

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

- 4.a) $\frac{31}{12}$ b) $\frac{14}{15}$ c) $\frac{23}{20}$ d) $\frac{13}{15}$

- e) $\frac{29}{10}$ f) $\frac{53}{30}$ g) $\frac{5}{6}$ h) $\frac{41}{24}$

- 5.a) $\frac{3}{2} - \frac{4}{5}, \frac{3}{2} - \frac{5}{4}, \frac{3}{4} - \frac{2}{5}, \frac{3}{5} - \frac{2}{3}, \frac{2}{4} - \frac{2}{5}, \frac{3}{4} - \frac{5}{2}, \frac{5}{4} - \frac{2}{3}, \frac{2}{4} - \frac{2}{5}, \frac{2}{3} - \frac{2}{3}$

- $\frac{5}{2} - \frac{3}{4}, \frac{5}{2} - \frac{4}{3}, \frac{4}{2} - \frac{2}{5}, \frac{2}{4} - \frac{2}{3}$

- b) $\frac{5}{2} - \frac{3}{4}$ c) $\frac{3}{5} - \frac{2}{4}$

- 6.a) $2\frac{11}{20}$ b) $1\frac{31}{40}$ c) $1\frac{11}{30}$ d) $\frac{19}{30}$ e) $3\frac{1}{18}$ f) $2\frac{17}{18}$

- 7.a) i) $2\frac{1}{5}$ ii) $3\frac{4}{7}$ iii) $4\frac{1}{6}$

8. Answers may vary.

- a) $\frac{9}{10} - \frac{2}{5}$ b) $\frac{5}{6} - \frac{1}{12}$ c) $\frac{2}{15} - \frac{1}{30}$ d) $\frac{1}{4} - \frac{1}{12}$ e) $\frac{1}{2} - \frac{1}{4}$

- 9.a) 12 books b) 18 books

- 10.a) $\frac{1}{2}, \frac{1}{6}, \frac{1}{12}, \frac{1}{20}$

- b) For example: $\frac{1}{5} - \frac{1}{6} = \frac{1}{30}, \frac{1}{6} - \frac{1}{7} = \frac{1}{42}, \frac{1}{7} - \frac{1}{8} = \frac{1}{56}$

c) For example: The denominators of the fractions increase by 1 each time.

The denominator of the difference is the product of the denominators of the fractions that are subtracted.

11. 24

12. $\frac{11}{30}$

4.4 Using Models to Multiply Fractions, page 150

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

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

3. $\frac{3}{7} \times \frac{1}{6} = \frac{1}{14}, \frac{5}{6} \times \frac{3}{8} = \frac{5}{16}, \frac{4}{9} \times \frac{3}{5} = \frac{4}{15}$

- 4.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) The areas in i) and ii) are the same. Likewise for iii) and iv), and v) and vi).

5. Each expression results in $\frac{15}{96}$.

4.5 Multiplying Fractions, page 153

- 1.a) $\frac{5}{16}$ b) $\frac{2}{5}$ c) $\frac{9}{40}$
 2.a) $\frac{2}{5}$ b) $\frac{1}{4}$ c) $\frac{1}{24}$ d) $\frac{39}{16}$ e) $\frac{11}{8}$ f) $\frac{49}{24}$
 3. $\frac{7}{12}$

- 4.a) i) 1 ii) 1 iii) 1 iv) 1 v) 1 vi) 1

b) All products are 1. For example: $\frac{2}{3} \times \frac{3}{2}$, $\frac{11}{19} \times \frac{19}{11}$, $\frac{5}{7} \times \frac{7}{5}$.

The fractions are reciprocals.

- 5.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) $2\frac{11}{40}$

6. No. The sum of two fractions with denominators greater than 1 is greater than the product of the two fractions.

- 7.a) $\frac{4}{81}$ b) $\frac{216}{125}$ c) $\frac{81}{10\,000}$ d) $\frac{625}{16}$

- 8.a) i) $\frac{5}{2} \times \frac{4}{5}$ ii) $\frac{7}{3} \times \frac{9}{7}$ iii) $\frac{11}{5} \times \frac{20}{11}$

iv) $\frac{9}{4} \times \frac{20}{9}$

- b) $\frac{3}{2} \times \frac{2}{3}$ i) $\frac{6}{2} \times \frac{2}{3}$ ii) $\frac{9}{2} \times \frac{2}{3}$ iii) $\frac{12}{2} \times \frac{2}{3}$

iv) $\frac{15}{2} \times \frac{2}{3}$

- c) $\frac{30}{2} \times \frac{2}{3}$

9. $\frac{10}{9}$

10. $\frac{1}{6}$

Unit 4 Mid-Unit Review, page 156

1. $\frac{1}{4}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{2}{3}$, $\frac{3}{4}$

2. Paola; $\frac{3}{4}$ is greater than $\frac{5}{7}$

- 3.a) $\frac{2}{5}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{3}$ b) $\frac{2}{3}$, $\frac{7}{12}$, $\frac{8}{10}$, $\frac{5}{6}$

- 4.a) $2\frac{1}{2} = \frac{5}{2}$ b) $2\frac{1}{6} = \frac{13}{6}$ c) $2\frac{1}{12} = \frac{25}{12}$ d) $2\frac{1}{20} = \frac{41}{20}$

Each fraction is added to its reciprocal. The numerator and denominator of the first fraction in each sum increase by 1 each time.

Each sum is 2 whole ones plus a unit fraction. The denominator of the unit fraction is the product of the denominators of the fractions that are added.

5. No. $\frac{59}{60}$ of the pail will be full.

- 6.a) $4\frac{5}{8}$ b) $5\frac{1}{2}$ c) $5\frac{17}{40}$ d) $4\frac{7}{24}$ e) $5\frac{2}{9}$ f) $3\frac{23}{30}$

7. Yes; the sum of the numbers in any row, column, or diagonal is 1.

- 8.a) $\frac{1}{10}$ b) $\frac{22}{21}$ c) $\frac{17}{20}$ d) $\frac{1}{10}$

- 9.a) $1\frac{1}{2}$ b) $3\frac{1}{40}$ c) $\frac{17}{20}$ d) $\frac{27}{40}$

10.a) Farrah b) $\frac{1}{30}$

- 11.a) $\frac{7}{16}$ b) $\frac{3}{8}$ c) $\frac{1}{2}$ d) $\frac{8}{15}$

- 12.a) $\frac{4}{15}$ b) $\frac{21}{40}$ c) $8\frac{4}{15}$ d) $4\frac{76}{81}$

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

4.6 Using Models to Divide Fractions and Whole Numbers, page 159

- 1.a) i) 6 ii) 3

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

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

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

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

- 4.a) $\frac{4}{15}$ b) $5\frac{1}{3}$ c) $\frac{1}{10}$ d) 8 e) 6 f) $\frac{5}{16}$

5. 4

6. $\frac{2}{3} \div 4 = \frac{1}{6}$, $4 \div \frac{2}{3} = 6$

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

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

b) Both $4 \div \frac{2}{6}$ and $6 \div \frac{2}{4}$ have a quotient of 12.

Both $2 \div \frac{6}{4}$ and $4 \div \frac{6}{2}$ have a quotient of $\frac{4}{3}$.

8. For example: $\frac{36}{5} \div 6 = \frac{6}{5}$, $\frac{36}{5} - 6 = \frac{6}{5}$,

$\frac{25}{4} \div 5 = \frac{5}{4}$, $\frac{25}{4} - 5 = \frac{5}{4}$

4.7 Dividing Fractions, page 163

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

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

- 3.a) $2\frac{1}{3}$, or $\frac{7}{3}$ b) $\frac{6}{11}$ c) $7\frac{1}{2}$, or $\frac{15}{2}$ d) $\frac{20}{27}$

- 4.a) $\frac{57}{80}$ b) $1\frac{5}{28}$ c) $1\frac{17}{18}$ d) 1

- 5.a) $\frac{25}{9}$ or $2\frac{7}{9}$ b) 1 c) $\frac{1}{15}$ d) $\frac{35}{58}$

- 6.a) i) $1\frac{1}{5}$ or $\frac{6}{5}$ ii) $\frac{5}{6}$ iii) $1\frac{11}{24}$ or $\frac{35}{24}$

- iv) $\frac{24}{35}$ v) $2\frac{1}{12}$ or $\frac{25}{12}$ vi) $\frac{12}{25}$

b) Pairs of division statements have the same fractions, in a different order. The quotients in each pair are reciprocals.

$\frac{3}{8} \div \frac{2}{5} = \frac{15}{16}$, $\frac{2}{5} \div \frac{3}{8} = \frac{16}{15}$

$\frac{7}{9} \div \frac{1}{3} = \frac{7}{3}$, $\frac{1}{3} \div \frac{7}{9} = \frac{3}{7}$

7.a) There are 24 possible different division statements.

For example: $\frac{2}{3} \div \frac{4}{5}, \frac{2}{5} \div \frac{4}{3}, \frac{5}{4}, \frac{3}{2}, \frac{4}{5}, \frac{3}{2}, \frac{5}{4}, \dots$

b) $\frac{1}{3}$ or $\frac{10}{3}$ is the greatest quotient. $\frac{3}{10}$ is the least quotient.

8. Statement c) has the greatest value, $4\frac{4}{5}$.

9. For example: $\frac{4}{8} \div \frac{3}{5}, \frac{5}{4} \div \frac{6}{8}, \frac{5}{4} \div \frac{3}{4}$

4.8 Converting Between Decimals and Fractions, page 167

1.a) i) 0.6 ii) 0.75 iii) 0.8 iv) 0.83 v) 0.857142

b) Terminating decimals do not fill the calculator screen.

2.a) $\frac{73}{100}$ b) $\frac{153}{200}$ c) $\frac{1753}{2000}$ d) $\frac{3}{5000}$

3.a) $\frac{5}{10} = 0.5$ b) $\frac{40}{100} = 0.4$ c) $\frac{75}{100} = 0.75$

d) $\frac{52}{100} = 0.52$ e) $\frac{38}{100} = 0.38$

4.a) $0.\overline{285714}$ b) $0.\overline{27}$ c) $0.\overline{2}$

d) 0.294 117 647 e) $0.\overline{384615}$

5. I could use long division.

6. 0.2 a) 0.8 b) 1.4 c) 1.8 d) 2.2

7.a) For example: $\frac{76}{100}, \frac{38}{50}, \frac{19}{25}, \frac{152}{200}, \frac{228}{300}, \dots$

b) No, I can multiply the numerator and denominator by any natural number to find equivalent fractions.

8.a) 1, 2, 1.5, $1.\overline{6}$, 1.6, 1.625; The numbers alternate between being greater than or less than the preceding number.

b) $1.\overline{615384}, 1.\overline{619047}, 1.\overline{61747059}, 1.\overline{618}$; the numbers get closer to about 1.618.

9.a) $0.\overline{142857}, 0.\overline{285714}, 0.\overline{428571}, 0.\overline{571428}, 0.\overline{714285}, 0.\overline{857142}$ Tenth digit increases from least to greatest, other digits follow the same sequence.

b) $0.\overline{1}, 0.\overline{2}, 0.\overline{3}, 0.\overline{4}, 0.\overline{5}, 0.\overline{6}, 0.\overline{7}, 0.\overline{8}$ Tenth digit increases by 1 each time, and always repeats.

c) $0.\overline{09}, 0.\overline{18}, 0.\overline{27}, 0.\overline{36}, 0.\overline{45}, 0.\overline{54}, 0.\overline{63}, 0.\overline{72}, 0.\overline{81}, 0.\overline{90}$ Repeating digits are the multiples of 9, in increasing order.

10.a) 0.01, 0.1, $0.\overline{1}, 1.01$ b) 0.3, $0.\overline{3}, 0.35, 1.\overline{3}, 2.3$

c) 0.46, 0.64, $0.\overline{6}, 1.06, 1.46$

4.9 Dividing by 0.1, 0.01, and 0.001, page 170

1.a) 5.47, 54.7, 547, 5470, 54 700, 547 000

b) 8.79, 87.9, 879, 8790, 87 900, 879 000

c) 0.345, 3.45, 34.5, 345, 3450, 34 500

d) 0.0652, 0.652, 6.52, 65.2, 652, 6520

e) 65.4212, 654.212, 6542.12, 65 421.2, 654 212, 6 542 120

f) 0.002 34, 0.0234, 0.234, 2.34, 23.4, 234

g) 0.089, 0.89, 8.9, 89, 890, 8900

h) 0.1001, 1.001, 10.01, 100.1, 1001, 10 010

2.a) 0.147 b) 14 700 c) 96.4 d) 12 300

e) 34.5 f) 1.23 g) 2345 h) 123

3.a) 1 b) 10 c) 0.01 d) 0.1 e) 0.1 f) 0.01

g) 0.01 h) 0.1 i) 0.01

4.a) 2340 b) 3.45 c) 0.1223 d) 12 e) 13.2

f) 0.05 g) 0.0725 h) 7.25 i) 14.56

5. No. If the divisor is a decimal less than 1, and the dividend is not 0, the quotient is greater than the dividend; for example: $13.2 \div 0.01 = 1320$

6.a) 1781 b) 4250 c) 1.12 d) 10.5 e) 1060 f) 30 200

7.a) 1.55 cm; 23.1 cm b) 15.5 cm; 33 cm

c) 155 cm; 310.2 cm d) 1550 cm; 3100.02 cm

e) 15 500 cm; 31 000.002 cm

8.b) i) 16 cm^2 ii) 26.4 cm^2 iii) 41.28 cm^2

c) Larger, because the divisor is less than 1.

d) The rectangle 6 cm by 4.4 cm would be similar if each side length were divided by 0.1.

i) 160 cm^2 ii) 2640 cm^2 iii) $41 280 \text{ cm}^2$

Reading and Writing in Math: Providing Math Information, page 173

1.a) The total amount of money spent.

b) "Shazi spent \$4.80 on candy bars. She bought some 30¢ candy bars and some 60¢ candy bars. She bought 10 bars in total. How many candy bars did she buy at each price?" (Answer: 6 at 60¢, and 4 at 40¢)

2.a) The cost of bicycles and tricycles

b) 30 tricycles and 20 bicycles

3.a) How many times does each team play each other? Does it include playoff games?

Unit 4 Unit Review, page 175

1.a) $\frac{1}{3}$ b) $\frac{3}{5}$ c) $\frac{1}{2}$ d) $\frac{13}{20}$

2.a) Lalo

b) Any number of questions that is divisible by both 3 and 5 (multiples of 15)

3.a) $\frac{1}{4}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}$ b) $\frac{1}{3}, \frac{3}{8}, \frac{2}{5}, \frac{3}{7}, \frac{7}{10}$

4.a) $\frac{7}{6}, \frac{7}{8}, \frac{3}{4}, \frac{1}{2}$ b) $\frac{4}{3}, \frac{3}{4}, \frac{4}{10}, \frac{3}{12}, \frac{1}{6}$

c) $\frac{4}{5}, \frac{2}{3}$ and $\frac{4}{6}, \frac{2}{4}, \frac{4}{10}$

5.a) $\frac{9}{8}$ b) $\frac{47}{42}$ c) $\frac{61}{15}$

6.a) $\frac{3}{20}$ b) $\frac{13}{12}$ c) $\frac{55}{72}$ d) $\frac{7}{30}$

7.a) $4\frac{1}{6}$ b) $1\frac{19}{30}$ c) $7\frac{1}{24}$ d) $\frac{3}{4}$

8. $1\frac{17}{40}$ cups

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

e) $\frac{6}{25}$ f) $\frac{9}{40}$ g) $8\frac{1}{3}$ h) $3\frac{5}{24}$

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

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

12. 12 glasses of milk can be filled from the jug.
13. a) $\frac{3}{20}$ b) $\frac{8}{15}$ c) $1\frac{5}{8}$ d) $\frac{5}{12}$
14. Jaiden can knit 20 squares in 25 h.
15. If the fraction is a proper fraction, the quotient is less than 1. If the fraction is an improper fraction, and it is greater than the divisor, the quotient is greater than 1. If the fraction is an improper fraction, and it is less than the divisor, the quotient is less than 1.

16. a) 9 b) 3 c) 2 d) $1\frac{7}{9}$
 e) $2\frac{2}{3}$ f) $1\frac{1}{2}$ g) $5\frac{19}{25}$ h) 1
17. a) $3\frac{3}{4}$ b) $\frac{5}{24}$ c) 2 d) $\frac{21}{100}$
18. a) $\frac{14}{17}$ b) $1\frac{49}{66}$ c) $2\frac{6}{11}$ d) $\frac{1}{2}$

19. The quotient is less than 1 if the dividend is less than the divisor.

The quotient is greater than 1 if the dividend is greater than the divisor.

20. a) i) $\frac{3}{2}$ ii) $\frac{3}{2}$
 b) i) $\frac{1}{2}$ ii) $\frac{1}{2}$
 c) i) $\frac{3}{5}$ ii) $\frac{3}{5}$
 d) i) $\frac{5}{9}$ ii) $\frac{5}{9}$

Product and quotient in each pair are equal.

21. a) $\frac{3}{8}$ b) $\frac{15}{8}$ c) $\frac{10}{3}$ d) $4\frac{1}{4}$
22. a) $\frac{1}{4}$ b) $\frac{3}{4}$ c) $\frac{8}{25}$ d) $\frac{1}{200}$
23. a) 0.125 b) 0.6 c) 0.492 d) 0.95
24. a) $0.\overline{6}$ b) 0.428571 c) 0.230769 d) $0.3\overline{6}$
25. b) 0.34, 0.35, 0.36, 0.37, 0.38, 0.39, 0.40, 0.41, 0.42, 0.43, ..., 0.71, 0.72, 0.73, 0.74
26. a) 5780 b) 4.41 c) 458

Unit 4 Practice Test, page 177

1. a) $\frac{43}{20}$ b) $\frac{19}{30}$ c) $\frac{4}{21}$ d) $2\frac{1}{7}$
2. Part c: $3\frac{1}{9}$
3. The product of reciprocals is 1; $\frac{4}{3} \times \frac{3}{4} = 1$
4. a) 0.142857 b) 2
5. 3; $\frac{2+3}{7+3} = \frac{5}{10} = \frac{1}{2}$
6. a) $\frac{1}{5}$
- b) 30; The number of students is a multiple of 3 and 5.
7. a) 0.875 b) $\frac{16}{25}$ c) 0.45 d) $\frac{1}{250}$
8. a) The second fraction; $\frac{3+1}{5+1} = \frac{4}{6}$
- b) $\frac{2+1}{3+1} = \frac{3}{4}$; $\frac{17+1}{18+1} = \frac{18}{19}$; $\frac{101+1}{120+1} = \frac{102}{121}$; the second fraction is always greater.

Unit 4 Unit Problem: Dividing a Square, page 178

- Part 1: $\frac{1}{12}$ units²; $\frac{3}{16}$ units²; $\frac{11}{24}$ units²; $\frac{13}{48}$ units²
 $\frac{1}{12}$, $\frac{3}{16}$, $\frac{13}{48}$, $\frac{11}{24}$
- Part 2: Square A: $\frac{1}{2}$ Square B: $\frac{1}{4}$
 Square C: $\frac{1}{3}$ Square D: $\frac{2}{3}$

Cumulative Review, Units 1–4, page 180

1. a) 24 276
 b) Estimates may vary; 27 is the closest answer.
2. a) 2×19 b) 3×5 c) $2^2 \times 3^2 \times 7$ d) $3 \times 5 \times 7$
3. a) $3.036 21 \times 10^5$ b) $3.036 28 \times 10^5$
 c) 7; 7 cannot be written as a power of 10.
4. a) $40 \div 5 + 3 \times (2^2 - 1) = 17$
 b) $(40 \div 5) + 3 \times 2^2 - 1 = 19$
 c) $40 \div 5 + (3 \times 2)^2 - 1 = 43$
 d) $40 \div (5 + 3) \times (2^2 - 1) = 15$
5. 25
6. 8
7. 1.625 km
8. a) 3 b) 99.3%
9. \$5625
10. a) \$10, \$510 b) \$385, \$3135
 c) \$421.88, \$4921.88
12. a) 42 cm² b) 15.6 cm³
13. a) For example: Any 3 whole numbers with a product of 24
 b) For example: Any 3 whole numbers with a product of 48
14. a) = b) = c) > d) < e) < f) <
15. a) $\frac{13}{20}$ b) $\frac{7}{8}$ c) $\frac{5}{8}$ d) $\frac{2}{5}$ e) $3\frac{19}{36}$ f) $4\frac{11}{24}$
16. a) $\frac{5}{6}$ b) $\frac{1}{2}$ c) $\frac{1}{9}$ d) 4 e) $\frac{1}{4}$ f) $\frac{1}{9}$
 Parts c and f have the least value.
17. a) 0.26 b) 0.25
 c) 0.255 d) $0.\overline{27}$; 0.25, 0.255, 0.26, $0.\overline{27}$
18. a) 32 750 b) 327 500 c) 3 275 000
 d) 6550 e) 65 500 f) 655 000

Unit 5 Data Management, page 182

Skills You'll Need, page 185

1. a) Pennies: 24%, Nickels: 30%, Dimes: 18%, Quarters 28%
 b) Hats: 20%, Socks: 40%, Sweaters: 15%, Gloves: 20%, Shoes: 5%
2. a) Denise; the graph goes down to the right. This means the amount is decreasing.
 b) David; the graph goes up to the right. This means the amount is increasing.

- c) Diana; the graph is horizontal. The amount stays the same.
- d) Denise: \$60; David: \$270; Diana: \$200

5.1 Relating Census and Sample, page 189

- 1.a) Sample; not all students are surveyed.
 - b) Census; all the 13-year-old students are surveyed.
 - c) Sample; not all customers are surveyed.
- 2.a) Biased; only people interested will return the completed survey.
 - b) Reliable; students were selected at random.
 - c) Biased; only those who read the fitness magazine are surveyed.
 - d) Biased; players were not surveyed.
- 3.a) Too costly to survey all teenagers in Canada who play hockey
 - b) Too costly and difficult to survey all Canadian families
 - c) Too costly, difficult, and time consuming to test all AAA batteries in calculators
4. Internet—disadvantages: data may not be up to date; advantage: a lot of data available
Telephone survey—disadvantage: some people do not want to respond; advantage: can be a random sample
- 5.a) 13–25-year-olds in Brantford
 - b) 1-L juice cartons made by the juice company
 - c) All the schools in the board
6. i) a) Biased
 - b) Survey a random sample of all the students in the school.
 ii) a) Biased
 - b) Survey every 10th person who comes in the store, no matter what shoes they are wearing.
 iii) a) Biased
 - b) Interview different types of people in the city, not just those at fitness centres.
 iv) a) Biased
 - b) Conduct a telephone survey of a random sample of people.
- 7.a) Sample; there are too many people and it is too costly to survey everyone who uses the new suntan lotion.
 - b) Sample; too costly and too time consuming to survey all Canadians who eat yogurt
 - c) Census; it is possible to ask all students in the school in Grades 6, 7, and 8.
 - d) Census; you could ask all your friends.
8. For example: Give a survey to all students in the school; the survey should be returned to the office. Use a list of all students in the school; survey every 10th student on the list.

Technology: Using *Census at School* to Get Secondary Data, page 193

- 1.a) September b) Yes
2. 1.4%
3. 11.2%

5.2 Inferring and Evaluating, page 196

1. Answers may vary. For example: Elise; her times are more consistent.
- 2.a) Not necessarily because the sample is too small. Also, the cats were not given a choice of food.
 - b) 7 out of 10 cats were hungry.
- 3.a) The government spent a lot more money on water purification in 1994, compared to earlier years. The spending peaked in 1998.
 - b) i) Spending has decreased from its peak in 1998.
 - ii) Spending has increased significantly since 1993.
- 4.a) More students chose swimming than chose any other activity.
 - b) 9 students preferred water activities and 11 students preferred land activities.
- 5.a) No, we do not know if the 120 students were a random sample; so we cannot claim the inference is valid for the whole school.
 - b) One-third of all students surveyed thought the library hours should be extended.
- 6.a) Draw a bar graph.
 - b) 60% of all car accidents do not happen close to home.
 - c) Twice as many accidents happen in parking lots than occur on country roads. 50% of all accidents occur on highways or in parking lots.
- 7.a) The number of young people, sorted by age group and gender, who eat fruits and vegetables 5 to 10 times per day
 - b) i) More females than males, especially between the ages of 25 and 34, eat fruits and vegetables 5 to 10 times per day.
 - ii) Almost twice as many men aged 25–34 eat 5 to 10 servings of fruits and vegetables per day than do men aged 20–24.
 - c) i) Males aged 12–24 eat the least number of fruits and vegetables per day.
 - ii) 15–19 year old females and 20–24 year old females eat about the same amount of fruits and vegetables per day.
 - d) i) The number of people 12–34 years, sorted by age group and gender, who eat fruits and vegetables more than 10 times per day
 - ii) No, this table shows that more males aged 12–14 and 15–19 eat more than 10 servings of fruits and vegetables per day than do their female counterparts.

5.3 The Shape of Data, page 203

- 1.b) The attendance decreased as the season progressed.
- c) The team was always losing and students lost interest. Students had too much homework as the school year progressed.

- 2.a)** 174 000, 165 000, 126 000, 160 000, 127 000, 194 000, 140 000, 173 000, 155 000, 123 000, 155 000, 122 000, 193 000, 138 000
I drew a double-bar graph so that I could compare the populations in each city over the two year period.
- b)** The population in each city decreased from 1996 to 2001. For each city, the bar for 2001 is shorter than the bar for 1996.
- c)** For example: St. John's: 172 000, Sudbury: 145 000, Saint John: 120 000, Chicoutimi: 150 000, Thunder Bay: 117 000, Regina: 192 000, Trois-Rivières: 136 000
- 3.a)** The average daily temperature (°C) for 1 year, each month, for Vancouver and Hawaii
- b)** I used a double-line graph.
- c)** In Vancouver, the temperature rises to a high in July, then falls through to December.
In Hawaii, the temperature falls from January to July, then rises from July to December.
- d)** The best time to visit Vancouver is June to August.
The best time to visit Hawaii is October to April.
- e)** Tourists, travel agents, golfers, and so on
- 4.a)** Scatter plot: the graph displays two related sets of data that are measured.
- b)** Yes: as students get older, their heights increase.
- 5.a)** The average annual earnings of Canadian males and females from 1993 to 2002
- b)** I used a double-bar graph as there are two sets of countable data.
- c)** The average annual earnings of females and males are increasing.
- d)** For example: About \$21 000
- e)** For example: About \$39 500
- f)** Males earn more money than females.

Technology: Using a Spreadsheet to Create Graphs, page 205

- 1.a)** Phys-Ed **b)** Geography
- c)** History, Geography
- d)** For example: Phys-Ed is girls' favourite subject.
Geography is liked least by boys.
More boys than girls like science.
- 2.** It is easier to see the relative sizes of the sectors than to compare the numbers in the table.
- 3.a)** The cost of the average ticket prices in Ontario increased gradually from 1996 to 2003.
- b)** For example: Movie theatres: About \$7.50
Drive-Ins: About \$8.00
- c)** For example: Movie theatres: About \$9.00,
Drive-Ins: About \$9.50
- d)** From 2000 to 2003; from 1996 to 1998 for movie theatres and from 1997 to 1999 for drive-ins
- e)** It costs more to see a movie at the drive-in than at the theatre.

- 4.a)** I drew a double-bar graph to display the two sets of data.
- b)** What is the breakfast item liked most by boys? (Milk)
What is the breakfast item liked most by girls? (Milk)
What is the breakfast item liked least by boys? (Cereal bar)
- c)** Answers may vary.

Unit 5 Mid-Unit Review, page 210

- 1.a)** It would be too costly and time consuming to collect the prices of all ski equipment across Canada.
- b)** It would be too costly and time consuming to survey all Canadian families.
- 2.a)** There was a greater range of abilities for the students in class N than in class M because the range in time in class N is 15 min and the range in time in class M is 6 min.
- b)** For example: Students in class M check their answers before they hand in their test papers. No paper was handed in prior to 40 min.
- 3.a)** Laura almost always outsells Jamar.
- b)** Jamar's sales have been increasing steadily from January to June. Laura consistently sells about \$126 000 worth of merchandise.
- 4.b)** A female is more likely to be born on a Friday.
A male is more likely to be born on a Thursday.
- c)** Double-line graph **d)** Answers may vary.

5.4 Applying Measures of Central Tendency, page 213

- 1.a) i)** Mean $\hat{=}$ 69.1, Median = 68, Modes = 65 and 68
- ii)** 30, 90, 93
- iii)** Mean $\hat{=}$ 68.4, Median = 68, Modes = 65 and 68
The mean decreased. The median and mode remained the same.
- b) i)** Mean $\hat{=}$ \$739.58, Median = \$675.00,
Mode = \$625.00
- ii)** \$1250.00
- iii)** Mean $\hat{=}$ \$693.18, Median = \$650.00,
Mode = \$625.00
The mean and the median decreased. The mode stayed the same.
- c) i)** Mean = 4.96 min, Median = 5 min, Mode = 5 min
- ii)** Answers may vary.
For example: There are no outliers.
- iii)** Mean, median, and mode remained the same.
- d) i)** Mean = 6.6, Median = 7, Mode = 7
- ii)** 1, 2, 15
- iii)** Mean = 6.86, Median = 7, Mode = 7
The mean increased. The median and mode remained the same.
- 2.a) i)** Mean $\hat{=}$ 74.1, Median = 73, Modes = 70 and 73
- ii)** Each measure of central tendency increased by 5.
- b) i)** Mean $\hat{=}$ \$729.58, Median = \$665.00,
Mode = \$615.00

- ii) Each measure of central tendency decreased by \$10.
- c) i) Mean = 14.88 min, Median = 15 min, Mode = 15 min
- ii) Each measure of central tendency was multiplied by 3.
- d) i) Mean = 3.3, Median = 3.5, Mode = 3.5
- ii) Each measure of central tendency was divided by 2.
- 3.a) Yes
- b) No, there are 450 raisins in 30 cookies, but not necessarily 150 raisins in 10 cookies.
- 4. No, 23 is one of the modes; the mean temperature is about 26.4°C.
- 5.b) Mean = 308.4 t; Median = 305 t; Mode = 305 t
- c) Answers may vary. For example: 395; Mean $\hat{=}$ 304.3 t
The mean decreases by about 4 t.
- d) The median or the mode as they were not affected by the outlier
- 6. For example: 4, 4, 4, 7, 8, 10, 12
- 7.a) i) 85% ii) 90% iii) 95%
- b) No, his mark in math would have to be greater than 100%.
- 8. No, her mean mark is 83.5%. There are 4 exams. The total of all 4 exams must be divided by 4 to find the mean mark.
- 9.a) 460 raisins
- b) i) I used a stem-and-leaf plot as I could see the shape of the data. I could easily find the mode, and I could pick out any outliers.
- ii) The outliers are 400 and 499. The mean increases from 454.5 to 455.2.
- iii) No. The mean, with and without the outliers, is less than 460, which is the number stated in the advertisement.
- 10.a) Median = 58.5; Modes = 42, 56, 57
- b) 95 and 37
- c) The mean, median, and mode each increase by 3.
The range stays the same.

5.5 Drawing Histograms, page 218

- 1.a) Histogram—the data are grouped into intervals.
- b) Bar graph—the data are not continuous, and cannot be grouped into intervals.
- 2.a) The number of hours per week that elementary school students spend participating in sports, by gender
- c) Boys spend more hours per week participating in sports. 51% of boys spend at least 6 h per week on sports. Only 38% of girls spend at least 6 h per week on sports.
- 3.a) Bar graph—the data are not continuous, and cannot be grouped into intervals.
- b) Histogram—the data can be grouped into intervals, and the data are continuous.
- 4.b) Median = 114; Mode = 125
The middle number of ice cream bars sold is 114.
The number of ice cream bars sold most often is 125.
- d) You can tell the median and mode from a stem-and-leaf plot.
- f) On most days in July, more than 100 ice cream bars were sold.
- 5.a) ii) Most of the prices lie between \$30 and \$89.
- iii) Median—Yes
Mode—No
- b) ii) Most books have a thickness of between 10 mm and 49 mm.
- iii) Median—Yes
Mode—No
- 6.a) Histogram—the data are grouped into intervals, and the data are continuous.
- b) Histogram—the data can be grouped into intervals, the data are continuous; and a frequency table can be made.
- d) For example: Yes, only about 8% of Elias' school achieved a mark of 50 or less, while in all other schools 11% of the students achieved this mark.

Technology: Using *Fathom* to Draw Histograms and Investigate Outliers, page 223

- 1.a) 2.0000 starting at 1.0000; Yes
- b) Mean $\hat{=}$ \$15.68; Median = \$15.00
- c) 75, 90; Mean $\hat{=}$ \$18.86, Median = \$15.50
The mean and median have increased.
- 2.a) 10.0000 starting at 5.0000
- b) Mean = \$51.23; Median = \$46.44
- c) 0.89, 399.99; Mean = \$60.56, Median = \$46.44
The mean has increased. The median stayed the same.

5.6 Drawing Circle Graphs, page 225

- 1. For example, 25% of the students are from Toronto. 25% of the students are from Ottawa and Belleville.
- 2. i) Yes, each number of students can be written as a fraction of the whole.
- ii) No, there are two sets of data and the data are grouped in intervals. I would use a double-bar graph.
- iii) No, the data cannot be written as a fraction of the whole. I would draw a bar graph.
- iv) No, there are two sets of data, and the data cannot be written as a fraction of a whole. I would use a double-bar graph.
- 3.b) Answers are rounded to the nearest dollar. History: \$1042; Science: \$750; Biography: \$542; Geography: \$433; Fiction: \$917; Reference: \$733; French: \$583
- 4.a) 40 878 000 people b) About 2.2%
- c) About $\frac{704}{6813}$

- e) About 81.8% entered by automobile, about 0.3% by train, about 3.9% by bus, and about 1.6% by another method.
5. Protein: 9.2%; Fat: 21.7%; Sugar: 29.5%; Starch: 33.6%; Dietary Fibre: 6.0%

Reading and Writing in Math: Identifying Key Verbs in Math Problems, page 228

1. Construct, draw, list
- a) Cube, rectangular prism, cylinder, tetrahedron, triangular prism, square pyramid
- c) For example: Cylinder, 8 units²; cube, 24 units²; rectangular prism, 32 units²
2. Draw, relate, justify, solve
- a) For each province, the median age is in the 20–64 age group.
- b) For example: For each province, I would draw a circle graph for the percent of population in each age group. I could draw a triple bar graph for the percent of population in each age group.
- c) Saskatchewan has the greatest percent of the population that is 65+.
- d) Nunavut has the greatest percent of the population that is 0–19.

Unit 5 Unit Review, page 230

- 1.a) It is too costly and time consuming to test the entire population of batteries.
- b) It is too costly and time consuming to test every light bulb.
- c) There are too many Grade 8 students in the world. It would be too costly and time consuming to survey the entire population.
- 2.a) Census; all students in the class voted.
- b) Sample; not all teenagers in Ontario were surveyed.
3. No, Rob needs to consider the percent of the population who drive cars, and the percent who drive motorcycles.
- 4.a) Double-bar graph because there are two sets of data. Circle graph for each grade
- c) About the same numbers of Grade 7 and Grade 8 students were born in the autumn and in the spring. The bars, in each case, are about the same height.
- 5.a) I chose a double-line graph because there are two sets of data and the data are continuous.
- b) In Halifax, the rainfall decreases from January to June, then increases from June to August, decreases in September, then increases rapidly from September to December. In Yellowknife, the rainfall is low and constant from January to June, then increases to August, then decreases from August to December.
- c) The amount of rainfall is much greater in Halifax than in Yellowknife. The rainiest season in Halifax is winter.
- 6.a) I chose a double-bar graph as there are 2 sets of data.

- b) No, more girls than boys went to games 2, 3, 6, and 7, but for games 6 and 7, the number of boys was close to the number of girls.

More boys than girls went to games 1, 4, and 5.

- 7.a) Mean = \$61 100; Median = \$67 000
Modes = \$67 000 and \$45 000
- b) The median is less affected by the high and low salaries. It is the middle salary.
- c) Most employees earn \$45 000 to \$72 000.
- d) \$108 000 and \$24 000
Mean = \$60 346.15
The mean decreases without the outliers. The median and mode stay the same.
- 8.a) False b) False c) False
- 9.a) 208, 176, 265, 222, 333, 237, 225, 269, 303, 295, 238, 175, 257, 209, 271, 210, 252, 261, 293, 306, 287, 230, 268, 249, 301, 226, 267, 291, 312, 298
- b) Range = 158 s; Median = 263 s; no mode
- d) You can identify each piece of data from the stem-and-leaf plot. In the frequency table, you know only how many pieces of data are in each interval. You do not know the values of the data.

- 10.b) 40% c) 5 a.m. to 5:59 a.m.
- d) Most people wake up between 5 a.m. and 7:59 a.m. More people wake up between 6 a.m. and 6:59 a.m. than any other interval.
- 11.a) Histogram—the data are grouped in intervals. Circle graph—find each number as a fraction of the whole.
- c) About 176

Unit 5 Practice Test, page 233

- 1.a) I chose a histogram because the data can be grouped into intervals.
- b) Few songs are longer than 360 s.
- c) 5 min = 300 s
Median = 283 s; Mode = 220 s; Mean = 285 s
All measures of central tendency are less than 300 s. So, the advertisement is not true.
- d) Most songs are less than 6 minutes long.
- 2.a) For example: 1, 5, 5, 5, 5, 5, 6, 6, 9, 9, 10, 10, 10, 10
- b) Mean = 7.8; Median = 7.5; Mode = 5
The mean and the median increase. The mode stays the same.
3. For example: Music 50%, D.J. Talk 7%, Commercials 20%, Sports 8%, News 15%
4. Students can argue both for and against the claim that there are as many Canadians who would like to have a common currency with the United States as those who would not.

Unit 6 Circles, page 236

Skills You'll Need, page 238

1. a) i) 4 m ii) 57 m iii) 2 m
b) i) 47 mm; 5 cm ii) 47.2 cm; 47 cm
iii) 1.058 m; 1.06 m

6.1 Investigating Circles, page 240

1. 12 cm
2. 4 cm
3. a), b) A large number that is too many to count
4. 1.9 cm
5. 15 cm
6. 0.6 m
7. 15 glasses; all glasses are cylindrical and they can touch.
8. a) $\angle APB = 90^\circ$ b) $\angle AQB = 90^\circ$
c) $\angle APB = \angle AQB = 90^\circ$
9. Answers may vary. For example: 15 cm, 7.5 cm; 2.5 cm, 1.25 cm; 9.6 cm, 4.8 cm; 8.8 cm, 4.4 cm; 1.5 cm, 0.75 cm; 1.8 cm, 0.9 cm; 2.6 cm, 1.3 cm
10. Fix one end of a measuring tape on the circumference. Walk around the circle with the measuring tape at ground level, until you reach the maximum distance across the circle, which is the diameter. The centre of the circle is the midpoint of the diameter.

6.2 Circumference of a Circle, page 245

1. a) About 30 cm b) About 42 cm c) About 45 m
2. a) 31.4 cm b) 44.0 cm c) 47.1 m
3. a) About 8 cm; about 4 cm b) About 0.8 m; about 0.4 m
c) About 13.3 cm; about 6.7 cm
4. a) 7.6 cm; 3.8 cm b) 0.764 m; 0.382 m
c) 12.7 cm; 6.4 cm
5. Less than; π is greater than 3.
6. a) About 7.5 m
b) About \$33.98, assuming the edging does not have to be bought in whole metres
7. a) About 289 cm b) About 346 times
8. About 71.6 cm
9. No, because π never terminates or repeats. So, the circumference will never be a whole number.
10. a) The circumference doubles.
b) The circumference triples.
11. a) About 40 075 km
b) There would be a gap of about 160 m under the ring. You would be able to crawl, walk, and drive in a school bus under the ring.

6.3 Area of a Circle, page 250

1. a) About 27 cm^2 b) About 108 cm^2 c) About 432 cm^2
2. a) 28.27 cm^2 or 2827 mm^2
b) 113.10 cm^2 or $11\,310 \text{ mm}^2$
c) 452.39 cm^2 or $45\,239 \text{ mm}^2$
3. a) The area is 4 times as great.
b) The area is 9 times as great.

4. a) The area of the circle is approximately halfway between the area of the smaller square and the area of the larger square. 75 cm^2 is halfway between 50 cm^2 and 100 cm^2 .
b) About 78.5 cm^2 c) Answers may vary.
5. a) About 104 cm^2 b) About 16 cm^2
6. a) i) 1 cm^2 ii) 0.0001 m^2 iii) $1 \text{ cm}^2 = 0.0001 \text{ m}^2$
b) $70\,686 \text{ cm}^2$
7. a) 0.0707 m^2 or 707 cm^2
b) 1.0603 m^2 or $10\,603 \text{ cm}^2$; 3.3929 m^2 or $33\,929 \text{ cm}^2$; 5.6549 m^2 or $56\,549 \text{ cm}^2$
8. 78 m^2
9. Two large pizzas are the better deal.

Unit 6 Mid-Unit Review, page 252

1. 7.2 cm
2. 1.8 cm
3. a) $\angle QCR$ is two times the measure of $\angle QPR$.
b) Yes
4. a) About 57 mm b) About 59.7 mm
5. About 78.5 cm
6. Fold the plate so that one-half coincides with the other. The fold line is the diameter. Measure the diameter, then use the formula $C = \pi d$.
7. a) About 5 m; about 2.5 m
b) 4.78 m or 478 cm; 2.39 m or 239 cm
8. a) The circumference of a circle with radius 9 cm is double the circumference of a circle with diameter 9 cm.
9. 651.44 cm^2 or $65\,144 \text{ mm}^2$
10. 2642.0794 m^2 or $26\,420\,794 \text{ cm}^2$
11. About $13\,685 \text{ cm}^2$
12. a) The area of a circle with radius 6 cm is 4 times the area of a circle with diameter 6 cm.
b) Yes

6.4 Volume of a Cylinder, page 255

1. a) 503 cm^3 b) 8836 mm^3 c) 328 m^3
2. About 1570.8 cm^3
3. a) 461.8 cm^3 b) 438.7 cm^3
4. $5\,301\,438 \text{ mm}^3$ or 5301 cm^3
5. a) 96.2 m^3 b) About $12\,217.4 \text{ m}^3$
c) 4.58 m by 4.58 m by 4.58 m

Reading and Writing in Math: Explaining Solutions, page 257

1. 1.024 cm
2. On Day 7
3. 35 triangles
4. a) 0.92 m, 0.37 m, 0.15 m, 0.06 m
b) 6 bounces
5. Superior: 33.6%; Michigan: 23.7%; Huron: 24.4%; Erie: 10.5%; Ontario: 7.8%
6. Answers may vary.
For example: 10 breaths/min are 68 328 000 breaths in 13 years.
7. a) $\frac{1}{10}$ b) $\frac{7}{10}$ c) $\frac{1}{2}$ d) $\frac{7}{10}$

6.5 Surface Area of a Cylinder, page 260

- 1.a) 50 cm^2 b) 94 cm^2 c) 251 m^2
2.a) 214 cm^2 b) $19\,046 \text{ mm}^2$ c) 4 m^2
3. 174 m^2
4. 12 m^2
5.a) 94 cm^2 b) About 4244 cylinders
6. About 191 cm^2

Unit 6 Unit Review, page 262

2. Cut out the tracing. Fold the tracing so one-half coincides with the other. The fold line is the diameter. Measure the diameter. The radius is one-half the diameter.
3. 135 mm ; 14 cm
4. 35 m or 3500 cm
5. 452.3893 m^2 or $4\,523\,893 \text{ cm}^2$
6. 637.94 cm^2 or $63\,794 \text{ mm}^2$
7.a) The circumference is halved.
 b) The area is one-quarter of what it was.
8.a) 201 m^2 b) 50.3 m
9.a) 427.5 mL
 b) For example: To allow for expansion in case the contents of the can freeze
10. $12.44 + 16.21 + 19.98 = 48.63$; about 49 m^2

Unit 6 Practice Test, page 263

1. Answers may vary.
2.a) 94 cm ; 707 cm^2 b) 25 mm ; 50 mm^2
 c) 11 mm ; 10 m^2
3.a) 50 m b) About 8 m
 c) About 201 m^2 d) About 30 m^3
4.a) $C = 2\pi r$, and π is not a terminating or repeating decimal. So, the circumference will never be exact.
 b) For example: i) $C \approx 99.9 \text{ cm}$ ii) $r = 15.9 \text{ cm}$
5. A piece of paper rolled into a cylinder widthwise.

Unit 7 Geometry, page 266

Skills You'll Need, page 268

1. 360°
2. A 180° rotation about the midpoint of the side they share
3.a) Figure A is translated 4 units right.
 b) A 180° rotation about the vertex they share
 c) Figure G is translated 4 units left.
 d) A 180° rotation about the midpoint of the side they share
 e) A 180° rotation about the vertex they share
4.a) i) $\angle B = 100^\circ$; $\angle A = 44^\circ$; $\angle C = 36^\circ$
 ii) $\angle E = 125^\circ$; $\angle F = 24^\circ$; $\angle D = 31^\circ$
 iii) $\angle G = 89^\circ$; $\angle H = 45.5^\circ$; $\angle J = 45.5^\circ$
 iv) $\angle K = 60^\circ$; $\angle M = 60^\circ$; $\angle N = 60^\circ$
b) i) scalene ii) scalene
 iii) right iv) equilateral
c) i) scalene, obtuse, obtuse scalene
 ii) scalene, obtuse, obtuse scalene
 iii) acute, isosceles, acute isosceles
 iv) equilateral, acute

5. For example: The length of the longest side must be less than the sum of the lengths of the other two sides.
6. $x = 11, 12, 13, 14, 15$

7.1 Angle Properties of Intersecting Lines, page 274

- 1.a) 34° b) 34° c) 146° d) 180°
2.a) $\angle TWR$ b) $\angle SWT$
 c) $\angle PWQ$ and $\angle TWR$ d) $\angle SWP$
3.a) 146° b) 34° c) 124°
4.a) 80° b) 55° c) 152°
5.a) $\angle AFB$ and $\angle EFD$ b) $\angle AFE$ and $\angle DFB$ c) $\angle EFC$
6.a) Each angle must be 90° .
 b) Each angle must be 45° .
 c) For example: 100° and 80° (any two unequal angles that add to 180°)
 d) For example: 80° and 10° (any two unequal angles that add to 90°)
7. 55° ; 55°
8. 120° at A; 50° at B; 90° at C; 100° at D;
 the total angle Karen turns through is 360° .

Technology: Using The Geometer's Sketchpad to Investigate Intersecting Lines, page 276

7. Opposite angles are equal.
10. Sum of the angles is 180° .
11. Sum of the angles is always 180° .
22. Sum of the angles is 90° .

7.2 Angles in a Triangle, page 281

1. 180°
2. $\angle K = 120^\circ$; $\angle M = 30^\circ$
3.a) $\angle A = \angle B = \angle C = 60^\circ$ because $\triangle ABC$ is equilateral.
4. $\angle ACB = 40^\circ$; $\angle A = 105^\circ$
5.a) $\angle TRS = 110^\circ$ b) $\angle PSQ = 50^\circ$
 c) $\angle PQS = 45^\circ$
6.a) No; the 3 angles in a triangle add to 180° , so 2 angles cannot add to 180° .
 b) Yes; the 2 acute angles in a right triangle are always complementary.
7. $a = 45^\circ$
8. The diagonals form 2 pairs of congruent isosceles triangles, one pair with angle measures $40^\circ, 70^\circ, 70^\circ$, and the other pair with angle measures $20^\circ, 20^\circ, 140^\circ$.
9.b) Each resulting right triangle has angle measures $25^\circ, 65^\circ$, and 90° .
10.a) No; no b) No; no
11. 108°
12. The sum of the angles in a triangle is always 180° .
13. For example: Acute, right, obtuse, scalene, isosceles, equilateral, and combinations of these
14. $\angle PQR = 90^\circ$

7.3 Angle Properties of Parallel Lines, page 287

- 1.a) $\angle EMG$ and $\angle MNK$; $\angle FMN$ and $\angle JNH$; $\angle EMF$ and $\angle MNJ$; $\angle GMN$ and $\angle KNH$; Yes
 b) $\angle GMN$ and $\angle MNJ$; $\angle FMN$ and $\angle MNK$; Yes
 c) $\angle GMN$ and $\angle KNM$; $\angle FMN$ and $\angle JNM$; Yes
2.a) For example: b and h ; c and g
 b) d and h ; c and e c) c and h ; d and e

- 3.a) AB and EC b) AC and BC
 c) $\angle ABC$ and $\angle ECD$ d) $\angle BAC$ and $\angle ACE$
 e) $\angle ECD = 50^\circ$; $\angle ACE = 65^\circ$; $\angle BCA = 65^\circ$
 4.a) $\angle AGC = 145^\circ$; $\angle CGB = 35^\circ$
 b) $\angle ABE = 145^\circ$; $\angle ABF = 35^\circ$; $\angle DGB = 145^\circ$
 5. $\angle SPQ = 55^\circ$; $\angle TPR = 25^\circ$; $\angle QPR = 100^\circ$
 6.a) equal b) equal
 c) equal d) equal
 e) supplementary f) equal
 g) complementary h) supplementary
 7.a) $\angle GBD = 60^\circ$; $\angle DBC = 50^\circ$; $\angle BDF = 120^\circ$;
 $\angle BCE = 110^\circ$; $\angle BCD = 70^\circ$
 8. $\angle KGH = 125^\circ$; $\angle KGF = 55^\circ$; $\angle HGJ = 55^\circ$; $\angle GHJ = 35^\circ$
 9. $\angle RQP = 45^\circ$; $\angle SPR = 50^\circ$; $\angle PSR = 80^\circ$
 10.b) $\angle B = \angle D = 129^\circ$; $\angle C = 51^\circ$
 c) When opposite sides are equal and parallel, or when opposite angles are equal
 11. For example: Draw a transversal. Alternate angles should be equal.
 12. Corresponding angles are not equal and alternate angles are not equal. Interior angles are not supplementary.
 13. $x = 20^\circ$; $\angle ADC = 60^\circ$; $\angle CAD = 40^\circ$

Technology: Using *The Geometer's Sketchpad* to Investigate Parallel Lines and Transversals, page 290

10. The alternate angles are equal.
 14. The corresponding angles are equal.
 17. The angles are supplementary.
 18. The sum of interior angles is 180° .
 20. Alternate angles are not equal and corresponding angles are not equal. Interior angles are not supplementary.

Unit 7 Mid-Unit Review, page 292

- 1.a) $\angle JKM = 65^\circ$ b) $\angle NJM = 53^\circ$
 c) $\angle JNM = 102^\circ$
 2.a) i) $\angle CBA = 20^\circ$ ii) $\angle CAB = 130^\circ$
 iii) $\angle ACB = 30^\circ$
 b) i) $\angle CBA = 46^\circ$ ii) $\angle CAB = 88^\circ$
 iii) $\angle ACB = 46^\circ$
 3.a) 178° b) 89°
 4.a) $\angle BEF = 40^\circ$ b) $\angle ADE = 40^\circ$
 c) $\angle BAD = 140^\circ$ d) $\angle GDE = 140^\circ$
 5.a) $\angle SQT = 36^\circ$ b) $\angle QRW = 36^\circ$
 c) $\angle PRV = 72^\circ$
 6. $\angle ABF = 52^\circ$; $\angle FBG = 58^\circ$; $\angle CBG = 70^\circ$;
 $\angle EFB = 128^\circ$; $\angle BGF = 70^\circ$; $\angle BGH = 110^\circ$;
 $\angle EFK = 52^\circ$; $\angle GFK = 128^\circ$; $\angle FGM = 110^\circ$;
 $\angle HGM = 70^\circ$; $\angle GMK = 70^\circ$; $\angle FKM = 52^\circ$;
 $\angle EKF = 38^\circ$; $\angle EKJ = 90^\circ$

7.4 Constructing Bisectors, page 296

- 1.b) The distances to each point from A and from B are equal.
 2.a) The arcs intersect at the midpoint of the segment.
 b) The arcs do not intersect.
 3. It is more accurate.
 5.a) 3 methods: paper folding, ruler and compass, Mira
 6.c) 2

- 7.a) 90° b) $KA = KB = KC$
 c) Perpendicular bisectors of the sides of the triangle; the point that is the same distance from each vertex of the triangle
 9.a) For example: Join the 3 points to form a triangle. Construct the perpendicular bisector of each side. The point where the bisectors meet is the centre of the circle, O. Draw a circle with centre O, through the vertices of the triangle.
 10.d) The bisector of $\angle A$ is also the perpendicular bisector of BC.
 e) i) Yes ii) Yes iii) No
 11. Yes; no, only quadrilaterals with opposite angles supplementary

7.5 Constructing Angles, page 302

- 2.a) $\angle E = \angle F = 45^\circ$
 b) Construct a right isosceles triangle.
 3.b) For example: The method in the *Example* was easier.
 4.a) One way b) 2 ways
 5. Yes; for example: $360^\circ - 60^\circ$, $180^\circ + 120^\circ$
 6. For example: Construct a 180° angle and a 60° angle
 8.a) $\angle A = 90^\circ$; $\angle B = 60^\circ$; $\angle C = 30^\circ$

7.6 Creating and Solving Geometry Problems, page 305

- 1.a) BA and CE b) AC and BC
 c) $\angle ABC$ and $\angle ECD$ d) $\angle BAC$ and $\angle ACE$
 e) $\angle ACE$ and $\angle ECD$ f) $x = 35^\circ$; $y = 35^\circ$; $z = 55^\circ$
 2.a) $x + 80^\circ + 60^\circ = 180^\circ$ b) $x = 40^\circ$
 3.a) $\triangle PQS$ and $\triangle QRS$
 b) $\angle PQS$ and $\angle SQR$ or $\angle PSQ$ and $\angle QSR$
 c) $x = 110^\circ$; $y = 70^\circ$
 4. $x = 55^\circ$; $y = 30^\circ$; $z = 25^\circ$; $s = w = 65^\circ$; $t = 60^\circ$
 5. $\angle ACD$ measures 65° .
 $\angle ADC = 65^\circ$; $\angle DAC = 50^\circ$; $\angle DAE = 40^\circ$;
 $\angle DEB = 90^\circ$; $\angle BDE = 65^\circ$; $\angle EBD = 25^\circ$;
 $\angle DEA = 90^\circ$; $\angle EDA = 50^\circ$
 6. $x = y = z = 40^\circ$; $w = 50^\circ$
 8. AB is parallel to CE, so $\angle ABC = \angle BCE = 90^\circ$ (alternate angles)
 $\angle BCA + \angle BCE + \angle ECD = 180^\circ$ (straight angle), so
 $\angle BCA + \angle ECD = 90^\circ$
 9. Yes

Reading and Writing in Math: Reasonable Solutions and Concluding Statements, page 309

1. a 2. d 3. c 4. c

Unit 7 Unit Review, page 312

- 1.a) $\angle AFB$ or $\angle EFC$ b) $\angle EFA$
 c) $\angle CFE$ d) $\angle BFC$ or $\angle AFE$
 e) $\angle AFE$
 2.a) $\angle AFE = 65^\circ$ b) $\angle AFB = 115^\circ$
 c) $\angle BFC = 65^\circ$
 3.a) 56° b) 146° c) 34°
 4.a) $\angle BEA$ and $\angle CED$; $\angle BEC$ and $\angle AED$
 b) $\triangle CDE$ c) $\triangle ABE$
 d) $\angle ABE = 70^\circ$; $\angle BEA = 40^\circ$; $\angle CED = 40^\circ$;
 $\angle ECD = 50^\circ$

5. For example: Two angles are equal, and the sum of angles in the triangle is 180° .
- 6.a) $\angle C = 43^\circ$ b) $\angle C = 26^\circ$
 7.a) 89° b) 1°
- 8.a) QR and TS; RS and QT
 b) $\angle RQT$ and $\angle QRS$; $\angle RQT$ and $\angle QTS$;
 $\angle QTS$ and $\angle TSR$; $\angle TSR$ and $\angle SRQ$
 c) $\angle RQT = 50^\circ$; $\angle QRS = 130^\circ$; $\angle RST = 50^\circ$;
 $\angle STQ = 130^\circ$
 d) Opposite angles in a parallelogram are equal.
- 9.d) The ruler and compass method is most accurate.
- 10.d) The ruler and compass method is most accurate.
- 12.a) AC, DF, and GK b) $\triangle BCE$
 c) i) $\angle BCE = 24^\circ$ ii) $\angle CEF = 24^\circ$
 iii) $\angle FEH = 66^\circ$ iv) $\angle EHG = 66^\circ$
 v) $\angle HED = 114^\circ$ vi) $\angle HEB = 138^\circ$
- 13.a) $x = 37^\circ$ b) $y = 45^\circ$
 c) $\angle BAC = 82^\circ$ d) 180° ; yes

Unit 7 Practice Test, page 315

- 1.a) $\angle DBC$
 b) $\angle DBC = 52^\circ$; $\angle ABD = 128^\circ$
 2. $v = 25^\circ$; $y = w = 35^\circ$; $x = 120^\circ$
 3. $\angle DCB = 130^\circ$; $\angle DCE = 65^\circ$; $\angle CAB = 65^\circ$;
 $\triangle ABC$ and $\triangle CDE$ are similar isosceles triangles.
 5. $\angle DEB$ and $\angle EDB$

Unit 8 Square Roots and Pythagoras, page 320

Skills You'll Need, page 322

- 1.a) 42.25 cm^2 b) 3 cm^2 c) 4.5 cm^2 d) 5.625 cm^2
 2. $36 = 6 \times 6 = 6^2$; six squared is thirty-six.
 3.a) 5^2 b) 9^2 c) 8^2 d) 13^2
 4. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225
 5.a) 10, 15, 21
 b) 4, 9, 16, 25, 36; the sums are square numbers.
 6.a) 1 b) 5 c) 9 d) 3
 e) 4 f) 10 g) 11 h) 15

8.1 Constructing and Measuring Squares, page 327

- 1.a) 9 b) 1 c) 16 d) 8 e) 49 f) 12
 g) 100 h) 13 i) 36 j) 11 k) 144 l) 25
 2.a) 18 units^2 ; $\sqrt{18}$ units b) 53 units^2 ; $\sqrt{53}$ units
 c) 34 units^2 ; $\sqrt{34}$ units
 3.a) 6 cm b) 7 m c) $\sqrt{95}$ cm d) $\sqrt{108}$ m;
 the side lengths of the squares in parts a and b are whole numbers.
 4.a) 25 units^2 ; 5 units b) 13 units^2 ; $\sqrt{13}$ units
 c) 26 units^2 ; $\sqrt{26}$ units d) 29 units^2 ; $\sqrt{29}$ units
 5. About 229 m
 6. A square with area 2 units^2 has side length $\sqrt{2}$ units.
 The area of the enclosing square is 2^2 , or 4 units^2 .
 The area of the 4 congruent triangles formed is

$4 \times \left(\frac{1}{2} \times 1 \times 1\right) \text{ units}^2 = 2 \text{ units}^2$. The area of the original square is $4 \text{ units}^2 - 2 \text{ units}^2 = 2 \text{ units}^2$.

7. Let the given diagonal be a diagonal for Square A. Draw Square B with side length equal to the given diagonal. Then, the side length of Square A is the square root of half the area of Square B.

8.2 Estimating Square Roots, page 331

1. About 2.6
 2.a) $\sqrt{30}$; 30 is about halfway between 25 and 36.
 $\sqrt{64}$; $\sqrt{64}$ 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.
 3.a) 2 and 3 b) 3 and 4 c) 7 and 8
 d) 6 and 7 e) 13 and 14
 4. For example: $\sqrt{82}$, $\sqrt{83}$, $\sqrt{84}$, $\sqrt{85}$, $\sqrt{86}$
 5.a) False; $\sqrt{17}$ is between $\sqrt{16} = 4$ and $\sqrt{25} = 5$.
 b) True; $\sqrt{10}$ is about 3 and $\sqrt{5} + \sqrt{5} \doteq 2 + 2 = 4$
 c) True; 131 is between $11^2 = 121$ and $12^2 = 144$.
 6. Estimates may vary. a) About 4.8 b) About 3.61
 c) About 8.83 d) About 11.62 e) About 7.87
 7.a) About 9.59 cm b) About 20.74 m
 c) About 12.25 cm d) About 5.39 m
 8.a) About 11.75 m by 11.75 m b) About 47 m
 9. About 1.4 m by 1.4 m
 10. For example: The classroom measures 15 m by 18 m. Its area is 270 m^2 . If the classroom was a square, it would have a side length of about 16.43 m.
 11.a) The carpet is a square with side length about 6.93 m.
 b) 16 m^2
 12. Always a perfect square; for example:
 $12^2 \times 28^2 = 112\,896$, and the square root of 112 896 is 336.
 13.a) i) 11 ii) 111 iii) 1111 iv) 11 111
 b) $\sqrt{12\,345\,654\,321} = 111\,111$;
 $\sqrt{1\,234\,567\,654\,321} = 1\,111\,111$;
 $\sqrt{123\,456\,787\,654\,321} = 11\,111\,111$;
 $\sqrt{12\,345\,678\,987\,654\,321} = 111\,111\,111$

Technology: Investigating Square Roots with a Calculator, page 335

- 1.a) 2.0 cm b) 4.0 cm c) 8.0 cm d) 95.0 mm

Unit 8 Mid-Unit Review, page 336

1. i) a) 16 cm^2 b) 49 cm^2 c) 2 cm^2
 ii) a) $\sqrt{16}$ cm b) $\sqrt{49}$ cm c) $\sqrt{2}$ cm
 iii) a) $16 = 4^2$ b) $49 = 7^2$
 2.a) $\sqrt{24}$ cm b) 81 cm^2
 c) A square root of a square number is a whole number.
 For example: Square root of 36 is 6, or $\sqrt{36} = 6$.
 3.a) 32 cm^2 b) $\sqrt{32}$ cm c) About 5.7 cm

- 4.a) 1 and 2 b) 8 and 9 c) 7 and 8 d) 5 and 6
 5.a) 30 b) 50 c) 20 d) 90 e) 100 f) 1000
 6.b) No; π is an irrational number.
 7. $r \doteq 13.2$ cm; $d \doteq 26.5$ cm
 8. About 35.9 cm

8.3 The Pythagorean Relationship, page 339

- 1.a) Yes; $25 + 38 = 63$ b) No; $25 + 38 \neq 60$
 2.a) 10 cm b) 13 cm
 c) About 4.47 cm d) About 5.83 cm
 3.a) 9 cm b) 24 cm
 c) About 9.8 cm d) About 6.71 cm
 4.a) About 7.62 cm b) 20 cm c) 20 cm
 5.a) 3, 4, 5; 6, 8, 10; 5, 12, 13; 9, 12, 15; 10, 24, 26;
 15, 20, 25; 12, 16, 20
 b) They are all multiples of either 3, 4, 5 or 5, 12, 13.
 c) For example: Multiply each of 3, 4, 5 by 10: 30, 40, 50; multiply each of 5, 12, 13 by 20: 100, 240, 260.
 6. If $3^2 + 5^2 = 7^2$, the triangle is a right triangle.
 Since $3^2 + 5^2 = 34$ and $7^2 = 49$, the triangle is not a right triangle.
 7. For example: 1 unit and $\sqrt{17}$ units; 2 units and $\sqrt{14}$ units; 3 units and 3 units; 4 units and $\sqrt{2}$ units;
 I found lengths of legs such that the sum of the squares of the leg lengths equals the square of the hypotenuse.
 10.c) The sum of the areas of the semicircles on the legs of the triangle equals the area of the semicircle on the hypotenuse.

Technology: Using *The Geometer's Sketchpad* to Verify the Pythagorean Theorem, page 342

14. The area of the square on the hypotenuse is equal to the sum of the areas of the squares on the legs.
 16. The area of the square on the hypotenuse is equal to the sum of the areas of the squares on the legs.
 17. No

Reading and Writing in Math: Communicating Solutions, page 345

1. 375; use a calculator to add; add $23 + 25 + 27$, then multiply the sum by 5; $5(23) + 5(25) + 5(27)$
 2.a) 15
 b) 15: AB, AC, AD, AE, AF, BC, BD, BE, BF, CD, CE, CF, DE, DF, EF
 c) In both cases, there are 15 different possibilities.
 3.a) Each purple triangle has area 25 cm^2 . Each purple square has area 50 cm^2 .
 b) Each larger orange triangle has area 50 cm^2 . Each smaller orange triangle has area 12.5 cm^2 .
 4. Yes; there are 365 days in the year so at least two of the 400 students in the school will have birthdays on the same day.
 5. $\frac{2}{3}$ cup of sugar, 500 mL of milk, about 3.3 mL of vanilla
 6. No; if she uses the coupon she will pay $\$0.35 \times 12 = \4.20 .
 7. 21 times

8.4 Applying the Pythagorean Theorem, page 348

- 1.a) $c = 29$ cm b) $c \doteq 12.2$ cm c) $c \doteq 15.8$ cm

- 2.a) $a = 24$ cm b) $b = 15$ cm c) $a \doteq 5.7$ cm
 3.a) $c = 25$ cm b) $a \doteq 10.9$ cm c) $b \doteq 9.3$ cm
 4. 4 m

- 5.a) 26 cm or about 21.8 cm
 b) The legs can be 10 cm and 24 cm, and the hypotenuse is 26 cm; or one leg can be 10 cm, the hypotenuse can be 24 cm, and the other leg is about 21.8 cm.
 6.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.
 7. 65 cm
 8. About 57.4 cm
 9. Point F; I made a right triangle with AB as the hypotenuse. The triangle has legs of lengths 4 units and 3 units, and hypotenuse 5 units. The right triangle with hypotenuse AF also has legs of lengths 4 units and 3 units. Point G is also 5 units from A.
 10. About 216.9 m
 11. 37.3 m
 12. 17 cm
 13. About 291.2 km

8.5 Special Triangles, page 353

- 1.a) $h = 12$ cm b) $c \doteq 4.2$ cm c) $h \doteq 8.66$ cm
 2.a) $h \doteq 17.32$ cm b) $x \doteq 16.97$ cm c) $c \doteq 18.38$ cm
 3.a) $A \doteq 10.8 \text{ cm}^2$ b) $A \doteq 13.4 \text{ cm}^2$ c) $A \doteq 31.2 \text{ cm}^2$
 4.a) $A \doteq 93.5 \text{ cm}^2$ b) $V \doteq 1309.4 \text{ cm}^3$ c) $A \doteq 691 \text{ cm}^2$
 5.a) $A = 12.5 \text{ cm}^2$; side length = $\sqrt{12.5}$ cm
 b) $P \doteq 24.14$ cm c) $P \doteq 17.1$ cm
 d) Three side lengths of Figure D are also side lengths of Figure E.
 6.a) $V \doteq 24\,438 \text{ cm}^3$ b) $A \doteq 4509 \text{ cm}^2$
 7. $A = 36 \text{ cm}^2$, $P \doteq 29.0$ cm

Unit 8 Unit Review, page 355

- 1.a) 2 b) 3 c) 5 d) 6 e) 8 f) 9
 2.a) 7.4 b) 8.7 c) 9.7 d) 10.2 e) 6.8 f) 10.7
 3.a) 6.8 b) 9.2 c) 11.0 d) 34.6
 4. 130 cm
 5.a) 34 cm b) 28 cm c) About 16.2 cm
 6.a) Two units right and 3 units up; $2^2 + 3^2 = (\sqrt{13})^2$
 b) Yes, a right triangle with legs 2 units and 3 units can be placed in many positions such that one vertex is at X.
 7. About 31.2 km
 8. 42 cm
 9. About 97.4 cm^2
 10.b) About 693.7 cm^2 c) About 1202.9 cm^3

Unit 8 Practice Test, page 357

- 1.a) 25 units^2 b) 5 units; $5^2 = 25$
 2. About 8.37 cm
 3.a) 3.6 cm, 2.2 cm, 2 cm
 b) Yes, but they cannot form a right triangle because $2.2^2 + 2^2 \neq 3.6^2$
 4.a) About 16.2 m b) About 80.8 m

Cumulative Review, Units 1–8, page 360

1. a) 6.8 b) 5.51 c) 25.86 d) 51.9
- 2.a) 24 slices for \$3.29 b) 3.78 L for \$5.98
c) 100 g for \$0.29 d) 12-pack for \$5.99
4. For example:
- a) $3 \div 6 = \frac{1}{2}$
 $\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$
 $\frac{2}{8} \div \frac{3}{6} = \frac{1}{2}$
c) $\frac{2}{3} \div \frac{5}{6} = \frac{4}{5}$
 $\frac{1}{4} \div \frac{5}{16} = \frac{4}{5}$
 $\frac{3}{5} \div \frac{3}{4} = \frac{4}{5}$
- b) $\frac{3}{8} \div \frac{9}{16} = \frac{2}{3}$
 $\frac{5}{9} \div \frac{5}{6} = \frac{2}{3}$
 $\frac{4}{7} \div \frac{6}{7} = \frac{2}{3}$
d) $\frac{1}{3} \div \frac{2}{5} = \frac{5}{6}$
 $\frac{3}{4} \div \frac{9}{10} = \frac{5}{6}$
 $\frac{2}{5} \div \frac{12}{25} = \frac{5}{6}$
- 5.a) Sample b) Census c) Sample d) Sample
- 6.a) I chose a double-line graph because there are two sets of data, and the data are continuous.
b) Both lines go up to the right. The line for the bean plant is steeper.
c) Estimates may vary. For example: If the same growth pattern continues, the bean plant could be around 80 cm by Day 39 and the sunflower could be around 70 cm.
7. $\triangle CGH$ is isosceles. Two sides have equal length as they are both radii of the circle.
8. Circle with radius 30 cm; its area is about 2827 cm^2 while the circle with circumference 1 m has area of about 796 cm^2 .
9. Area of cardboard is about 1759.3 cm^2 .
- 10.a) $\angle CBD$ b) $\angle EBC$
- 11.a) i) $\angle EDG$ and $\angle DGF$; $\angle BDG$ and $\angle DGH$
ii) $\angle EDG$ and $\angle DGH$; $\angle ABH$ and $\angle BHG$
iii) $\angle CDE$ and $\angle DGF$; $\angle CBD$ and $\angle BHG$
b) $\angle CHG = 65^\circ$, $\angle JHK = 65^\circ$, $\angle CGH = 65^\circ$,
 $\angle FGN = 65^\circ$
c) $\angle BCD = 50^\circ$; isosceles
12. Estimates may vary. For example:
a) 7.2 b) 7.9 c) 9.5 d) 8.7
- 13.a) No; The sum of the areas of the two smaller squares is not equal to the area of the largest square.
b) Yes
14. 5 cm

Unit 9 Integers, page 362

Skills You'll Need, page 364

1. $-7, -5, -1, 0, +2, +4, +10$
- 2.a) $<$ b) $>$ c) $<$ d) $>$ e) $<$ f) $<$
- 3.a) +8 b) -19 c) +9 d) -11 e) +6 f) -9
g) +2 h) -3 i) +3 j) -2 k) 0 l) -5
- 4.a) $(-5) + (+8) = +3$; $+3^\circ\text{C}$ b) $(+8) + (-6) = +2$; \$2
- 5.a) -4 b) +3 c) +4 d) -7 e) +5 f) -7
- 6.a) +11 b) +9 c) -12 d) +6 e) +16 f) -10

9.1 Adding Integers, page 370

- 1.a) -1 b) -2 c) -6 d) -5 e) -6 f) 0
- 2.a) -5 b) +5 c) -3 d) -6
- 3.a) i) -8 ii) +5 iii) -2 iv) +8
b) i) $(-8) + (+8) = 0$ ii) $(+5) + (-5) = 0$
iii) $(-2) + (+2) = 0$ iv) $(+8) + (-8) = 0$
c) The sum of two opposite integers is always 0.
- 4.a) i) +14 ii) +10 iii) +14 iv) +13
b) All the expressions and sums contain only positive integers.
The sum of two positive integers is always a positive integer.
c) For example: $(+4) + (+6) = (+10)$
- 5.a) i) -14 ii) -10 iii) -14 iv) -13
b) All the expressions and sums contain only negative integers.
The sum of two negative integers is always a negative integer.
c) For example: $(-12) + (-8) = (-20)$
- 6.a) $-1, -4, -2, -3, -6, +1, -7, +2$
b) $+1, +3, +2, +2, +5, -1, +6, -2$
7. If both integers are positive, the sum is positive. If both integers are negative, the sum is negative. If the integers are opposite integers, the sum is 0. If the integers have different signs, the sign of the sum matches the sign of the numerically larger number.
- 8.a) +331 b) +294 c) -296 d) -18 e) -109 f) +76
- 9.a) $(+5) + (-6) + (-2) + (+4) + (+6) + (-2)$
b) +5; up \$5 c) \$37; \$45
- 10.a) -3 b) +10
- 11.a) 9 ways: $(-9) + (+7)$; $(-8) + (+6)$; $(-7) + (+5)$;
 $(-6) + (+4)$; $(-5) + (+3)$; $(-4) + (+2)$; $(-3) + (+1)$;
 $(-2) + (0)$; $(-1) + (-1)$
b) 8 ways: $(-9) + (+5)$; $(-8) + (+4)$; $(-7) + (+3)$;
 $(-6) + (+2)$; $(-5) + (+1)$; $(-4) + (0)$; $(-3) + (-1)$;
 $(-2) + (-2)$

9.2 Subtracting Integers, page 374

- 1.a) +4 b) -5 c) 0 d) +36 e) +43 f) +39
- 2.a) +2 b) +12 c) -7 d) -22
- 3.a) -4 b) -4 c) -8 d) +13 e) +10 f) -15
- 4.a) -381 b) +111 c) +80 d) +370
5. i) a) +7, -5 b) $-15, -8$ c) +51, -17
d) +2, -6 e) +21, -14
ii) a) +12; $+12^\circ\text{C}$ b) -7 ; -7°C
c) +68; 68 m above sea level
d) +8; 8 over par e) +35; a rise of \$35
- 6.a) i) $+15^\circ\text{C}$ ii) $+9^\circ\text{C}$ iii) $+38^\circ\text{C}$ iv) -16°C
v) $+29^\circ\text{C}$
b) Winnipeg
c) Perth is in the southern hemisphere.
- 7.a) $(-7) - (-4)$; $(+4) - (+7)$; $(-2) - (+1)$
b) $(+4) - (+2)$; $(+1) - (-1)$; $(-1) - (-3)$
c) $(+5) - (+5)$; $(-4) - (-4)$
- 8.a) Regina; Victoria

- b) Halifax: 66°C; Regina: 93°C; Thunder Bay: 81°C; Victoria: 52°C
- c) Regina d) 38.5°C e) -34°C
- f) What is the mean record low temperature?
(Answer: -34°C)
- 9.a) +2 b) +9 c) +14 d) -19
e) 0 f) -135 g) -10 h) -602
- 10.a) +26, +33, +40; For example: Start at +5. Add +7 each time.
b) +2, +4, +6; For example: Start at -4. Add +2 each time.
c) -9, -5, -1; For example: Start at -21. Add +4 each time.
d) -2, -3, -4; For example: Start at +1. Add -1 each time.
- 11.a) -5 and -7
b) Find two integers with a sum of 0 and a difference of +12. (Answer: 6 and -6)

9.3 Adding and Subtracting Integers, page 379

- 1.a) +2 b) +7 c) -1 d) +2 e) +2 f) +15
g) -7 h) -16 i) -15 j) -2 k) -23 l) +12
- 2.a) +8 b) -33 c) +1
- 3.a) i) -2; -2 ii) -4; -4 iii) -6; -6 iv) -8; -8
b) In each pair, the expression is written as an addition and as a subtraction, and the sums are equal.
c) For example: $-5 + 11$; $11 - 5$; $-5 + 4$; $4 - 5$
- 4.a) -1, -3, -5, -7, -9, -11; For example: Start at -1. Add -2 each time.
b) -4, -6, -8, -10, -12, -14; For example: Start at -4. Subtract +2 each time.
5. \$16

9.4 Multiplying Integers, page 383

- 1.a) Negative b) Positive c) Negative d) Positive
- 2.a) -24 b) +20 c) -27 d) -42 e) -30 f) +42
g) 0 h) -200 i) +420
- 3.a) -16 b) -132 c) -1 d) +120
- 4.a) +4 b) -3 c) +6 d) -6
e) -4 f) -12 g) -30 h) -2
- 5.a) +16, +32, +64; Start at +1. Multiply by +2 each time.
b) -216, +1296, -7776; Start at +1. Multiply by -6 each time.
c) +27, -81, +243; Start at -1. Multiply by -3 each time.
d) -16, -20, -24; Start at -4. Add -4 each time.
- 6.a) i) -21; -21 ii) +32; +32 iii) +45; +45 iv) -60; -60
b) No
- 7.a) -5 and -8 b) +9 and -8 c) Answers may vary.
- 8.a) i) +6 ii) -24 iii) +120
iv) -720 ; $(-2)(-3)(-4)(-5)(-6)(-7) = +5040$,
 $(-2)(-3)(-4)(-5)(-6)(-7)(-8) = -40\ 320$,
 $(-2)(-3)(-4)(-5)(-6)(-7)(-8)(-9) = +362\ 880$,
 $(-2)(-3)(-4)(-5)(-6)(-7)(-8)(-9)(-10) = -3\ 628\ 800$
- b) i) Positive ii) Negative
c) Yes

9. The product of a positive number multiplied by itself is positive. The product of a negative number multiplied by itself is positive.
10. For example: (-1) and (+36); (-2) and (+18); (-3) and (+12); (-4) and (+9); (-6) and (+6); (-9) and (+4); (-12) and (+3); (-18) and (+2); (-36) and (+1); (-1), (-4), and (-9)
11. No. For example: $(-2) \times (+3) = -6$ and -6 is less than both -2 and +3
12. -16 and +9
- 13.a) -5 b) -9

9.5 Dividing Integers, page 387

- 1.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.
- 2.a) i) +8 ii) -5 iii) -7 iv) -6
b) i) $(+24) \div (+8) = +3$ ii) $(+45) \div (-5) = -9$
iii) $(-28) \div (-7) = +4$ iv) $(-66) \div (-6) = +11$
- 3.a) -2 b) +3 c) +4 d) -3 e) +4 f) -12
g) -25 h) 0 i) +25
- 4.a) $(-56) \div (-7) = +8$ b) 8 days
- 5.a) +81, -243, +729; Start at -3. Multiply by -3 each time.
b) +30, -36, +42; Start at +6. Add +6. Alternate the sign each time.
c) -40, -160, +80; Start at +5. Alternate between multiplying by +4 and dividing by -2.
d) +8, -4, +2; Start at -64. Divide by -2 each time.
e) -100, +10, -1; Start at +100 000. Divide by -10 each time.

- 6.a) When the divisor is greater than the quotient: dividing two positive integers; and dividing a positive integer by a negative integer
- b) When both the dividend and the divisor are negative
- c) When the dividend and the divisor have different signs
- d) When the dividend and the divisor are equal
- e) When the dividend and the divisor are opposite integers
- f) When the dividend is 0
- 7.a) -12 b) +97 c) -84 d) +44
- 8.a) +4 b) -1 c) +7
9. For example: +2, -4, +6; +8, +2, -6; +2, -2, +4; +6, -6, +4; +8, -8, +4

Unit 9 Mid-Unit Review, page 389

- 1.a) -6, -4, -1, 0, +2, +13, +20
- 2.a) -12 b) -3 c) +7 d) -2
- 3.a) -13 b) -7 and -6; -20 and +7; -11 and -2
- 4.a) -9 b) -3 c) +7 d) -24 e) -12
- 5.a) +425 b) -681
- 6.a) $+27\,599 + (-2600) + (-2600) + (-2600) + (-2600)$
b) \$14 599
- 7.a) -9 b) +11 c) -30 d) +24
- 8.a) -32 b) +1200 c) -28 d) -72 e) 0 f) -32
- 9.a) -8°C b) +1050 L c) +\$10 501
- 10.a) -9 b) +2 c) 0 d) -26 e) +46 f) +1

9.6 Order of Operations with Integers, page 391

- 1.a) i) 0 ii) 6
b) The brackets are in different positions.
- 2.a) +23; multiplication b) -18; addition
c) +25; multiplication d) -14; multiplication
e) -3; the division in brackets f) -6; division
- 3.a) -1 b) +18 c) -500 d) +2 e) +12 f) -6
- 4.a) +10 b) +15 c) -14 d) -16 e) -7 f) -5
- 5.a) Robert
b) When Christian multiplied -2 by -4 , he got -8 instead of $+8$. Brenna performed the subtraction first.
6. $(-2)^2 \times (-100) \div 4 \times 5 = -500$
7. $405 + 4(-45) = 225$; \$225
8. -5°C
- 9.a) $(-24 + 4) \div (-5) = +4$ b) $(-4 + 10)(-2) = -12$
c) $(-10 - 4) \div (-2) = +7$

9.7 Graphing on a Coordinate Grid, page 396

1. A(2, 3); B(0, 5); C(1, -2); D(-6, 0); E(0, -5); F(0, 0); G(-1, -1); H(-5, 3); J(4, 0); K(-5, -6)
- 2.a) B, E, F b) D, F, J c) B, E, and F; H and K
d) A and H; D, F, and J e) F and G f) none
4. In Quadrant 1, both coordinates are positive. In Quadrant 2, the x -coordinate is negative and the y -coordinate is positive. In Quadrant 3, both coordinates are negative. In Quadrant 4, the x -coordinate is positive and the y -coordinate is negative.
5. For example: A(2, 1), B(2, -2), C(-2, -3); area = 6 units²

6. There are 3 different rectangles with side lengths that are whole numbers of units. There are many more rectangles with side lengths that are decimals.
- 7.b) $N(-3, -2)$
- 8.b) $A = 75$ units²
9. Answers may vary. For example, E(-2, 0); E(-5, -3); E(-2, 3)

9.8 Graphing Translations and Reflections, page 400

- 1.a) Reflection in the y -axis
b) Translation 3 units right and 3 units down
- 2.a) A and C; the parallelograms are congruent and have the same orientation.
b) A and B are related by a reflection in the y -axis; B and C are related by a reflection in the x -axis. In each case, the parallelograms are congruent but have different orientations.
- 4.a) After a reflection in the x -axis: A(1, 3) \rightarrow A'(1, -3); B(3, -2) \rightarrow B'(3, 2); C(-2, 5) \rightarrow C'(-2, -5); D(-1, -4) \rightarrow D'(-1, 4); E(0, -3) \rightarrow E'(0, 3); F(-2, 0) \rightarrow F'(-2, 0)
The sign of the y -coordinate changes.
b) After a reflection in the y -axis: A(1, 3) \rightarrow A''(-1, 3); B(3, -2) \rightarrow B''(-3, -2); C(-2, 5) \rightarrow C''(2, 5); D(-1, -4) \rightarrow D''(1, -4); E(0, -3) \rightarrow E''(0, -3); F(-2, 0) \rightarrow F''(2, 0)
The sign of the x -coordinate changes.
c) I can check the coordinates of the reflection images. If they match the patterns, the images are drawn correctly.
- 5.b) A(1, 3) \rightarrow A'(-3, 1); B(3, -2) \rightarrow B'(-1, -4); C(-2, 5) \rightarrow C'(-6, 3); D(-1, -4) \rightarrow D'(-5, -6); E(0, -3) \rightarrow E'(-4, -5); F(-2, 0) \rightarrow F'(-6, -2)
Each x -coordinate decreases by 4. Each y -coordinate decreases by 2.
c) Add the number of units moved to the right, to the x -coordinate or, if the movement is to the left, subtract the number of units from the x -coordinate. Add the number of units moved up to the y -coordinate or, if the movement is down, subtract the number of units from the y -coordinate.
- 6.b) The line segments are horizontal. The y -axis is the perpendicular bisector of each line segment.
7. The coordinates of each point are interchanged to get the coordinates of its image.
- 8.b) Answers may vary. The figure has a line of symmetry that is parallel to the mirror line.
9. Answers may vary.
10. For example:
a) Escalators, conveyor belts
b) Mirrors, windows, lakes, and puddles
- #### 9.9 Graphing Rotations, page 405
- 1.a) 90° rotation about the origin
b) 180° rotation about the origin
2. The figure was rotated 90° clockwise about the origin (Image 1), reflected in the x -axis (Image 2), and translated 5 units right and 5 units down (Image 3).
- 3.d) Both images have the same coordinates.
Yes. A rotation of -90° is equivalent to a rotation of $+270^{\circ}$.
- 4.b) $OA = OA'$, $OB = OB'$, $OC = OC'$

- f) The numbers of tiles in the frames are the odd numbers, starting at 1. No frame has an even number of tiles.

i) Yes ii) No iii) Yes

10.4 Solving Equations with Algebra Tiles, page 438

- 1.a) Two times a number equals the number plus five.
 $x = 5$
- b) Three times a number minus two equals the number.
 $x = 1$
- c) Seven times a number minus nine equals four times the number. $x = 3$
- d) Six minus a number equals two times the number.
 $x = 2$
- 2.a) $x = 6$ b) $x = 2$ c) $x = 3$ d) $x = 2$
3. i) a) Two more than two times a number equals three times the number minus five.
b) $x = 7$
- ii) a) Six less than five times a number equals eight minus two times the number.
b) $x = 2$
- iii) a) Three times a number minus thirteen equals the number minus seven.
b) $x = 3$
4. $x = 4$
- 5.a) $n = 1$
- 6.a) $t = 10$
- 7.a) $l = 6$ c) $SA = 216 \text{ cm}^2$; $V = 216 \text{ cm}^3$
- 8.a) $n + (n + 1) + (n + 2) = 63$ or $3n + 3 = 63$
b) $n = 20$; 20, 21, 22
- 9.a) $x = -3$ b) $x = -2$

10.5 Solving Equations Algebraically, page 442

- 1.a) $x = \frac{3}{2}$ b) $x = \frac{2}{3}$ c) $x = \frac{3}{2}$ d) $x = \frac{12}{5}$
- 2.a) $x = 3$ b) $n = 2$ c) $a = \frac{11}{4}$ d) $m = \frac{1}{2}$
- 3.a) $3n + 10 = 25$; $n = 5$ b) $3n - 10 = 25$; $n = \frac{35}{3}$
c) $\frac{n}{2} - 25 = 10$; $n = 70$ d) $25 - \frac{n}{2} = 10$; $n = 30$
- 4.a) $72 + 24n = 288$ b) $n = 9$; After 9 weeks
c) Substitute $n = 9$ into the equation in part a.
- 5.a) $85 + 2n = 197$ b) 56 students
- 6.a) i) 37 ii) 77
b) i) 14 ii) 25
- 7.a) 17 b) 13 c) 27
- 8.a) Water flows into a bathtub at a rate of 15 L/min. There are 75 L of water in the bathtub. How long was the tap running?
b) $15x = 75$
 $x = 5$; 5 min
- 9.a) The cost of renting a boat is \$300. Each person on the trip rents a rod. The cost to rent a fishing rod is \$20. The total paid for the boat and rod rental was \$380. How many people went fishing?
b) $300 + 20n = 380$
 $n = 4$; 4 people

c) Guess and check

10.a) $n^2 + 2 = 123$ b) $n = 11$; 11

Unit 10 Unit Review, page 447

- 1.a) $6x + 54$ b) $33 + 12x$
c) $35x + 30y + 25$ d) $12a + 20b + 28c$
- 2.a) 8, 11, 14, 17, 20
Each term is 3 more than the previous term.
Start at 8. Add 3 each time.
- b) 20, 25, 30, 35, 40
Each term is 5 more than the previous term.
Start at 20. Add 5 each time.
3. i) a) Start at 8. Add 4 each time.
b) 32 c) $4n + 4$ d) 284
- ii) a) Start at 5. Add 2 each time.
b) 17 c) $2n + 3$ d) 143
- 4.a) 6, 8, 10, 12; the perimeter increases by 2 units each time
b) 22 cm c) $2n + 4$ d) 104 units
- 5.a) Twelve decreased by a number equals three times the number. $x = 3$
b) Four times a number minus seven equals two times the number plus three. $x = 5$
c) Three times a number minus eight equals the number. $x = 4$
d) Three minus seven times a number equals seven minus nine times the number. $x = 2$
- 6.a) $n = 4$
- 7.a) $x = \frac{2}{3}$ b) $x = \frac{5}{2}$ c) $x = \frac{10}{3}$ d) $x = \frac{8}{3}$
- 8.a) $125 + 12n = 545$ b) $n = 35$; 35 people
- 9.a) 3, 7, 11, 15, 19
b) i) 20th ii) 35th iii) 99th
- 10.a) $6n + 1$ b) i) 25th ii) 51st iii) 72nd

Unit 10 Practice Test, page 449

- 1.a) A number increased by five equals nine less than three times the number. $x = 7$
b) Two times a number minus five equals ten. $x = \frac{15}{2}$
- 2.a) 13, 16, 19, 22, 25, 28
Each term is 3 more than the previous term.
Start at 13. Add 3 each time.
b) $10 + 3n$ c) 85
d) Substitute $n = 31$ into the expression.
- 3.a) $75 + 3n$ b) \$150
c) $75 + 3n = 204$; $n = 43$
4. a) 292 b) 59th

Unit 10 Unit Problem: Choosing a Cell Phone Plan, page 450

Part 1

1. CanTalk: 42 54 66 78 90
Connected: 45 55 65 75 85
In-Touch: 48 56 64 72 80
2. CanTalk; In-Touch; In-Touch
3. All lines are straight lines going up to the right. Lines vary in steepness. They intersect at (100, 60). They all

intersect at \$60. The cost for 100 additional minutes is the same, for all plans.

For example: I would choose In-Touch so that if she uses more than her allowed minutes, she will be paying the least amount possible.

Part 2

CanTalk: $30 + 0.30n$; \$55.50

Connected: $35 + 0.25n$; \$56.25

In-Touch: $40 + 0.20n$; \$57.00

CanTalk: $30 + 0.30n = 80$; About 166 minutes

Connected: $35 + 0.25n = 80$; 180 minutes

In-Touch: $40 + 0.20n = 80$; 200 minutes

Unit 11 Probability, page 452

Skills You'll Need, page 454

1.a) $\frac{8}{235} \div 0.034$ or 3.4% b) $\frac{28}{175} = 0.16$ or 16%

2.a) False b) True c) False d) True

11.1 Probability Range, page 458

1.a) 0.25 or 25% b) 1.0 or 100% c) $0.\bar{3}$ or 33. $\bar{3}$ %

d) 0.1 or 10% e) 0.0 or 0%

2. 65%

3. About 10 781 votes

4.a) 0.22 or 22% b) 0.2 or 20%

5. For example:

a) Monday immediately follows Sunday.

b) Roll a 1 on a number cube labelled 1 to 6.

c) A coin will land heads.

d) The pointer will land red on a spinner with 4 congruent parts, 3 parts red and 1 part blue.

e) Roll a 7 on a number cube labelled 1 to 6.

6.a) About 0.953 or about 95%

b) About 2817 bulbs

7.a) 0.5 or $\frac{1}{2}$

b) About $0.\bar{3}$ or 33. $\bar{3}$ % $\left(\frac{1}{3}\right)$

c) About $0.1\bar{6}$ or 16. $\bar{6}$ % $\left(\frac{1}{6}\right)$

8.a) 3, 4, 5, 6; 4, 5, 6, 7; 5, 6, 7, 8; 6, 7, 8, 9

b) 3, 4, 5, 6, 7, 8, 9

c) 3: 0.0625 or 6.25% $\left(\frac{1}{16}\right)$

4: 0.125 or 12.5% $\left(\frac{1}{8}\right)$

5: 0.1875 or 18.75% $\left(\frac{3}{16}\right)$

6: 0.25 or 25% $\left(\frac{1}{4}\right)$

7: 0.1875 or 18.75% $\left(\frac{3}{16}\right)$

8: 0.125 or 12.5% $\left(\frac{1}{8}\right)$

9: 0.0625 or 6.25% $\left(\frac{1}{16}\right)$

d) The probabilities add to 100% or 1.

e) i) The sum is 6. ii) The sum is not 6.

iii) The sum is 3, 4, 5, 6, 7, 8, or 9.

iv) The sum is 3, 4, 5, 6, 7, 8, or 9.

9.a) 0.68 or 68%

b) 0.44 or 44%

c) 0.84 or 84%

d) 1.0 or 100%

11.2 Tree Diagrams, page 463

1.a) Answers may vary.

b) For example: About 10 times; 0.1 or 10%

c) Pink, red; pink, black; pink, yellow; blue, red; blue, black; blue, yellow; green, red; green, black; green, yellow

d) $0.\bar{1}$ or 11. $\bar{1}$ % $\left(\frac{1}{9}\right)$

e) They are very close.

2.a) $0.08\bar{3}$ or 8. $\bar{3}$ % $\left(\frac{1}{12}\right)$

b) $0.\bar{3}$ or 33. $\bar{3}$ % $\left(\frac{1}{3}\right)$

c) 0.25 or 25% $\left(\frac{1}{4}\right)$

d) $0.8\bar{3}$ or 83. $\bar{3}$ % $\left(\frac{5}{6}\right)$

3. Roll the tetrahedron twice; probability of winning is $\frac{1}{8}$ or

0.125. Probability of winning by rolling the tetrahedron and spinning the pointer is $\frac{1}{10}$ or 0.1. Probability of

winning by spinning the pointer twice is $\frac{2}{25}$ or 0.08.

4.a) MMMM, MMMF, MMFM, MMFF, MFMM, MFMF, MFFM, MFFF, FMMM, FMMF, FMFM, FMFF, FFMM, FFMF, FFEM, FFFF

b) $\frac{4}{16} = \frac{1}{4}$ or 25%

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

c) $\frac{6}{16}$ or $\frac{3}{8}$

5.a) Answers may vary.

b) Answers may vary.

c) Answers may vary. For example:

i) 0.05

ii) 0.09

iii) 0.02

d) 1, H; 1, D; 1, C; 1, S; 2, H; 2, D; 2, C; 2, S; 3, H; 3, D; 3, C; 3, S; 4, H; 4, D; 4, C; 4, S; 5, H; 5, D; 5, C; 5, S; 6, H; 6, D; 6, C; 6, S

e) i) $\frac{1}{24}$ or 0.041 $\bar{6}$

ii) $\frac{1}{12}$ or 0.08 $\bar{3}$

iii) $\frac{1}{4}$ or 0.25

f) The theoretical and experimental probabilities are very close. The experimental probabilities should get closer and closer to the theoretical probabilities.

6. $\frac{1}{8}$ or 0.125

7.a) $\frac{1}{6}$ or 0.1 $\bar{6}$

b) Decreased; the probability of winning becomes $\frac{1}{27}$ or 0.037.

c) Answers may vary.

Unit 11 Mid-Unit Review, page 466

- 47%
- $\frac{53}{80} = 0.6625 = 66.25\%$
- likely
 - impossible
 - unlikely
 - unlikely
- $\frac{29}{30} = 0.9\bar{6}$ or $96.\bar{6}\%$; $\frac{1}{30}$ or $0.0\bar{3}$ or $3.\bar{3}\%$
 - About 8217 people
- Eric; Eric's batting average is 0.509 while Fari's batting average is 0.460.
- 1, 1; 1, 2; 1, 3; 1, 4; 1, 5; 1, 6; 2, 1; 2, 2; 2, 3; 2, 4; 2, 5; 2, 6; 3, 1; 3, 2; 3, 3; 3, 4; 3, 5; 3, 6; 4, 1; 4, 2; 4, 3; 4, 4; 4, 5; 4, 6; 5, 1; 5, 2; 5, 3; 5, 4; 5, 5; 5, 6; 6, 1; 6, 2; 6, 3; 6, 4; 6, 5; 6, 6
 - $\frac{1}{18}$ or $0.0\bar{5}$
 - $\frac{1}{4}$ or 0.25
 - $\frac{1}{6}$ or $0.1\bar{6}$
 - $\frac{11}{36}$ or $0.30\bar{5}$
 - $\frac{4}{9}$ or $0.4\bar{4}$
- Answers may vary.
 - The two probabilities are close.
- Answers may vary.

11.3 Simulations, page 469

- Answers may vary.
- Toss a coin and roll a number cube 6 times, one for each student in the group.
Record if any month occurred 3 or more times.
An estimate of the probability is:
 $\frac{\text{number of times a month occurred 3 or more times}}{\text{number of times the experiment was conducted}}$
- Toss a coin: heads represents female and tails represents male.
 - Toss the coin 4 times. Conduct the experiment 100 times. Record how many times you get exactly 3 heads.
 - About $\frac{1}{5}$
 - $\frac{1}{4}$
 - The answers are close.
- The result would be the same as the probability there are exactly 3 girls in a family of 4 children.
- 4-part spinner—red, blue, green, yellow
Land on red, the answer is correct.
Land on any of the other colours, the answer is incorrect.
 - Answers may vary.
 - Answers may vary.
- Choose red. Every time the spinner lands on red, Moira gets a hit. Spin the spinner 4 times to represent one game.
 - Spin the spinner 120 times.
 - Answers may vary.
- Toss a coin. Let heads represent rain and tails represent sun. Toss the coin 6 times. Record the number of times you get exactly 3 heads. Conduct the simulation 100 times.
- A spinner divided into 10 equal parts: 3 parts red (misses) and 7 parts blue (makes).
Spin the spinner twice.
Record the number of times the spinner lands on blue.

- Experimental probability:
 $\frac{\text{number of times spinner lands on blue both times}}{20}$

11.4 Odds For and Against, page 472

- 5:1
 - 4:48 or 1:12
 - 6:30 or 1:5
- 1:5; 12:1; 5:1
- 4:2 or 2:1
 - 1:1
 - 32:4 or 8:1
- 1:2; 1:1; 1:8
- 7:16
 - 20:3
- 1:3
- 3:2
- “There are ten cards labelled 1 to 10.
What are the odds of choosing a card greater than 7?”
(Answer: 3:7)
 - Odds of choosing any given number are 1:9.

Reading and Writing in Math: Extending a Problem, page 474

- Take the \$20; odds of pulling out a total greater than \$20 from the bag are $\frac{2}{5}$.
- 100; 400
 - The number of figures needed to make the pattern would not change.
- 24@3 kg, 1@11 kg, and 1@17 kg
 - 13@3 kg, 4@11 kg, and 1@17 kg
 - 2@3 kg, 7@11 kg, and 1@17 kg
 - 11@3 kg, 3@11 kg, and 2@17 kg
 - 9@3 kg, 2@11 kg, and 3@17 kg
 - 7@3 kg, 1@11 kg, and 4@17 kg
- Myles' car used more gas.
- 210 blocks
- \$59
 - 100 km
 - 66 km
- 81 square units
 - 36 square units
 - 49 square units
 - 1 square unit
 - 64 square units
- For example: “What is the mean temperature in Swift Current, Saskatchewan, over these five days?”
(Answer: 3.8°C)

Unit 11 Unit Review, page 477

- 1 or 100%
 - 0 or 0%
 - $\frac{1}{8}$ or 0.125 (12.5%)
 - 0 or 0%
 - $\frac{2}{3}$ or $0.\bar{6}$ or $66.\bar{6}\%$
 - 1 or 100%
 - For example: $\frac{1}{2}$ or 0.5 or 50%

- 40%
- 67 500 voters

4.a)

×	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

- Player A: About 100 points
Player B: About 48 points

- c) No, Player A will almost always win.
 d) Yes, but it would have 36 branches and I would need a long piece of paper.
- 5.a) Rye, T, M; R, T, S; R, T, C; R, H, M; R, H, S;
 R, H, C; R, P, M; R, P, S; R, P, C; WW, T, M;
 WW, T, S; WW, T, C; WW, H, M; WW, H, S;
 WW, H, C; WW, P, M; WW, P, S; WW, P, C
- b) i) $\frac{1}{6}$ or 0.16 ii) $\frac{2}{9}$ or 0.2
- 6.a) 2, 3, 4, 6, 8, 9, 12
 b) $2: \frac{1}{9}$; $3: \frac{1}{9}$; $4: \frac{2}{9}$; $6: \frac{2}{9}$; $8: \frac{1}{9}$; $9: \frac{1}{9}$; $12: \frac{1}{9}$
- c) 2, 3, 8, 9, and 12—only one way to get each of these products
 4 and 6—there are two ways to get each of these products
- d) $\frac{1}{3}$
 e) $\frac{8}{9}$; all but 12 are less than 10
- 7.a) HHH, HHT, HTH, HTT, THH, THT, TTH, TTT
 b) $\frac{1}{8}$
- 8.a) There are two possible outcomes: male, female
 Let heads represent a male puppy.
 Let tails represent a female puppy.
- b) Let an outcome of 1, 2, or 3 represent a male puppy.
 Let an outcome of 4, 5, or 6 represent a female puppy.
- c) If the spinner has 4 congruent parts, colour 2 parts red and 2 parts blue.
 Let the spinner landing on red represent a male puppy.
 Let the spinner landing on blue represent a female puppy.
- 9.a) Use a tetrahedron labelled 1 to 4.
 Let a roll of 1, 2, or 3 represent a computer that is not defective.
 Let a roll of 4 represent a defective computer.
 Roll the tetrahedron 6 times.
 How many times did you roll a 4?
 Repeat this experiment many times.
 Count how many times three 4s showed out of 6.
- 10.a) i) 10:26 or 5:13 ii) 6:30 or 1:5
 b) i) 12:12 or 1:1 ii) 17:1
11. 3:1

Unit 11 Practice Test, page 479

- 1.a) $\frac{7280}{45\,550} = \frac{1456}{9110} = \frac{728}{4550} = \frac{364}{2275} = \frac{52}{325} = 0.16$ or 16%
- b) No, you have a 16% chance of getting a free bagel.
- 2.a) $\frac{1}{2}$ or 0.5 or 50%; $\frac{3}{4}$ or 0.75 or 75%
- b) Weng-Wai's game is fair as the probabilities of an even sum and an odd sum are equal, 0.5.

Sarojinee's game is not fair as the probabilities are not equal; $\frac{3}{4} \neq \frac{1}{4}$

- 3.a) $\frac{1}{8}$ b) 0.25 or $\frac{1}{4}$
 c) $\frac{3}{16}$ d) $\frac{1}{4}$

4. September has 30 days: 15 even and 15 odd
 Toss a coin. Heads represents an even-numbered day.
 Tails represents an odd-numbered day.
 Toss the coin 3 times. Record if you get three tails.
 Repeat the simulation 100 times.

Cumulative Review, Units 1–11, page 484

- 1.a) $300 + 30 + 5$; 3.35×10^2
 b) $6000 + 200 + 70 + 2$; 6.272×10^3
 c) $20\,000 + 4000 + 200 + 40 + 2$; 2.4242×10^4
- 2.a) $x = 7$ b) $x = 13$ c) $x = 12$ d) $x = 10$
- 3.a) For example: part iii, 1: 100. The drawing is 9.85 cm long.
 b) Yes
4. 1200
5. 110 cm²
- 6.a) 0.5 b) 0.75 c) 1.5 d) 1.75
- 7.a) i) 16 ii) 20 iii) 18 iv) 9
 a) i) $\frac{1}{5}$ ii) $\frac{1}{3}$ iii) $\frac{1}{10}$ iv) $2\frac{4}{15}$
- 8.b) Mean ≈ 46.29 ; Median = 40.5; Mode = 47
 c) The outliers are 8, 74, and 125; mean without outliers ≈ 40.1 . The outliers affect the mean.
- 9.a) 0–10 min: 165.5°; 11–20 min: 99.75°; 21–30 min: 46.58°; 31–40 min: 13.68°; 41–50 min: 20.29°; 51–60 min: 9°; more than 60 min: 5.2°
 b) About 160; for example, I assumed the percent of students who take more than 30 minutes to travel to school will remain the same.
- 10.a) About 75.4 cm; 452.4 cm²
 b) About 18.84 cm; 28.27 cm²
 c) The circumference in part a is 4 times as great as the circumference in part b.
 d) The area in part a is 16 times as great as the area in part b.
- 11.a) About 198.6 cm³ b) About 93.5 cm²
12. $a = 52^\circ$, $b = 110^\circ$, $c = 138^\circ$
- 13.b) 3 points that are not on a line make a triangle. The intersection of the perpendicular bisectors of the sides of the triangle is its circumcentre.
- 15.a) About 5.2 cm b) 36.66 cm
 c) About 9.9 cm d) About 38.7 m
16. a) -5 b) 10 c) -17 d) -5
 e) 7 f) 8 g) -22 h) -4
17. a) -24 b) -7 c) 210 d) 7
18. a) -24 b) -32 c) -24
- 19.a) Quadrants 2 and 3
 b) Quadrants 1 and 2

- c) Along the y -axis
 d) Along a horizontal line through -1 on the y -axis
 e) Along the bisector of the angle between the positive x -axis and positive y -axis
20. a) $42x + 7$ b) $48n + 20y$
 c) $18x + 42y + 72$ d) $15a + 9b + 27c$
21. a) i) Start at 3. Add 2 each time.
 ii) 23 iii) $2n + 1$ iv) 141
 b) i) Start at 5. Add 3 each time.
 ii) 35 iii) $3n + 2$ iv) 212
 c) i) Start at 7. Add 4 each time.
 ii) 47 iii) $4n + 3$ iv) 283
 d) i) Start at 9. Add 5 each time.
 ii) 59 iii) $5n + 4$ iv) 354
22. a) $s = 3$ cm b) $4 \times 3 = 3 + 9 = 12$ c) 9 cm
23. a) D-green; D-green; D-red; E-green; E-green; E-red;
 F-green; F-green; F-red
 b) i) $\frac{1}{3}$ ii) $\frac{2}{3}$ iii) $\frac{2}{9}$ iv) $\frac{1}{9}$
24. Answers may vary.

Extra Practice

Unit 1, page 488

1. a) *Twister*: \$495 million; *My Big Fat Greek Wedding*:
 \$356.4 million; *Police Academy*: \$120 million; *Good
 Will Hunting*: \$225.5 million; *X-Men*: \$294 million
 b) *Twister*, *My Big Fat Greek Wedding*, *X-Men*, *Good
 Will Hunting*, *Police Academy*
 c) \$631.3 million
 d) For example: "Which two movies earned the most?"
 (Answer: *Twister* and *X-Men*)
2. a) i) 1, 2, 3, 6, 9, 18 ii) 126, 252, 378
 b) i) 1, 2, 5, 10 ii) 280, 560, 840
 c) i) 1, 2, 4, 8 ii) 80, 160, 240
 d) i) 1 ii) 33, 66, 99
3. 5^2
4. For example: A prime number has no factors other than
 itself and 1.
5. a) 50 000 724 b) 648 459
 6. a) 1.6276×10^5 b) $2.120\ 219\ 2 \times 10^7$
 c) $1.017\ 91 \times 10^5$
 7. a) $3 \times 10^5 + 7 \times 10^4$ b) $1 \times 10^3 + 1 \times 10^2 + 4 \times 10$
 c) $2 \times 10^7 + 1 \times 10^5$
 8. a) 38.5 b) 1.2 c) 28.8
 9. a) $x = 5$ b) $x = 17$ c) $x = 1$ d) $x = 8$
 10. $x = 8$; 8 DVDs

Unit 2, page 489

1. Science (80%)
 2. a) $h = 20$ b) $k = 2$ c) $b = 5$ d) $r = 12$
 3. 50 chocolate cones
 4. 120 km
 5. a) About 2.23 m/s b) About 1.82 m/s
 The pole climber is faster than the tree climber.

6. \$56.88
 7. 33.3%
 8. 12 volunteers
 9. a) \$120 b) \$96.6
 10. 1500%
 11. 1500
 12. \$5.00
 13. a) \$675 b) About \$158 c) \$5675

Unit 3, page 490

2. 480.5 m^2 , $4\ 805\ 000 \text{ cm}^2$
 3. a) 156.5 cm^2 , $0.015\ 65 \text{ m}^2$ b) 180.4 m^2 , $1\ 804\ 000 \text{ cm}^2$
 4. a) 80 cm^3 b) 2.45 m^3
 5. b) 2448 cm^3
 6. 72.8 cm^3
 7. For example: $l = 5$ cm, $h = 2$ cm, $b = 4$ cm, where l is the
 length of the prism; b and h are the height and base of a
 triangular face
 8. For example: $a = b = 6$ cm, $l = 11$ cm, where a and b are
 the equal sides of a triangular face, and l is the length of
 the prism

Unit 4, page 491

1. a) i) No ii) No iii) Yes
 b) $\frac{30}{400} \cdot \frac{40}{225} \cdot \frac{20}{100}$, or, in reduced form, $\frac{3}{40} \cdot \frac{8}{45} \cdot \frac{1}{5}$
 2. $\frac{1}{2}$ and $\frac{1}{4}$; $\frac{1}{3}$ and $\frac{3}{4}$
 3. a) $\frac{11}{6} = 1\frac{5}{6}$ b) $\frac{19}{12} = 1\frac{7}{12}$ c) $\frac{2}{9}$ d) $\frac{8}{35}$ e) $\frac{5}{12}$ f) $\frac{3}{4}$
 4. a) $\frac{25}{36}$ b) 6 c) $\frac{1}{8}$ d) $13\frac{1}{5}$
 5. a) $2\frac{2}{9}$ b) $1\frac{1}{4}$ c) $1\frac{1}{4}$ d) $\frac{9}{14}$
 6. a) $1\frac{2}{15}$ b) $3\frac{1}{4}$
 c) $1\frac{1}{5}$ d) $3\frac{1}{3}$
 7. a) $\frac{3}{4}$ b) $\frac{3}{8}$ c) $\frac{3}{16}$ d) $\frac{9}{16}$
 8. 4 times as great

Unit 5, page 492

1. a) Census b) Sample
 2. a) Biased
 b) For example: Ask a random sample of students.
 3. a) I used a stem-and-leaf plot.
 b) I used a histogram since the data are numerical and
 can be grouped into intervals.
 c) For example: The largest group of students spends
 10–19 min travelling to school.
 d) For example: Most students travel less than 30 min to
 school.
 4. b) For example: Both girls are growing; Kelsi is always
 taller than Courtney; both girls grew at a faster rate
 before age 6; their growth rate slowed down after
 age 6.

- c) i) Estimates may vary. For example: Kelsi's height at age 5 was around 108 cm. I assumed that Kelsi grew at the same rate from ages 3 to 6.
 ii) For example: Courtney's height at age 15 will probably be around 160 cm. I assumed that Courtney's growth rate decreased a little after age 12.
 d) No, the growth rate changes.
- 5.a) 7500; 11 500; 12 800; 12 100; 12 400; 12 300; 8 600
 c) i) About 16% ii) About 21%
 d) Answers may vary.

Unit 6, page 493

- 1.a) 12 cm; 38 cm b) 2.1 m; 13.2 m
 c) 12.5 cm; 25 cm d) 142.6 mm; 448 mm
- 2.a) 60 mm; 120 mm; 380 mm
 b) 210 cm; 420 cm; 1320 cm
 c) 125 mm; 250 mm; 785 mm
 d) 7.13 cm; 14.26 cm; 44.8 cm
- 3.a) 3.14 m b) About \$14.77
- 4.a) About 75.4 m b) 14 m
 c) About 88 m d) About 452.4 m²
 e) About 615.8 m² f) 163.4 m²
5. About 1413.7 cm²
 6. About 58.9 cm²
 7. About 6 647 610 L
 8. About 192.4 mL
 9. The cylinder with radius 2 m and height 1 m has greater volume.
 10. About 3.7 m²; about 37 267 cm²

Unit 7, page 494

- 1.a) $\angle DGF = 20^\circ$ b) $\angle AGE = 90^\circ$
 c) $\angle DGF = \angle EGC = 20^\circ$ d) $\angle DGF = \angle EGC = 20^\circ$
 e) $\angle CGF = \angle DGE = 160^\circ$
2. $\angle Q = \angle R = 52^\circ$
3. $\angle BAC = \angle BCA = 64^\circ$; $\angle A = 92^\circ$; $\angle D = 36^\circ$; $\angle ACD = 116^\circ$
4. $\angle SPT = 50^\circ$; $\angle RPS = 30^\circ$
- 5.a) Yes, if the supplementary angle is less than 90°
 b) Yes
- 6.a) PQ and RS b) PS and RQ
 c) $\angle RTS$ and $\angle PTQ$
 d) $\angle QPT$ and $\angle TSR$; $\angle PQT$ and $\angle TRS$
 e) $\angle PTQ = 48^\circ$; $\angle TSR = 74^\circ$; $\angle TRS = 58^\circ$;
 $\angle PQT = 58^\circ$

Unit 8, page 495

- 1.a) 20 cm^2 ; $\sqrt{20} \doteq 4.47$ b) 45 cm^2 ; $\sqrt{45} \doteq 6.71$
- 2.a) 1 cm^2 ; $\sqrt{2} \text{ cm} \doteq 1.41 \text{ cm}$
 b) i) 4 cm^2 ; $\sqrt{8} \text{ cm} \doteq 2.82 \text{ cm}$
 ii) 9 cm^2 ; $\sqrt{18} \text{ cm} \doteq 4.24 \text{ cm}$
 iii) 16 cm^2 ; $\sqrt{32} \text{ cm} \doteq 5.66 \text{ cm}$

- c) Length of diagonal $= \sqrt{2 \times \text{area}}$; $\sqrt{98} \doteq 9.9$
- 3.a) About 7.5; $\sqrt{57}$ is halfway between $\sqrt{49}$ and $\sqrt{64}$.
 b) About 12.5; $\sqrt{157}$ is halfway between $\sqrt{144}$ and $\sqrt{169}$.
 c) About 16.1; $\sqrt{257}$ is very close to $\sqrt{256}$.
- 4.a) 6.557 b) 35.440 c) 44.721
5. 40 km farther
- 6.a) $h \doteq 9.5 \text{ cm}$ b) $c \doteq 32.5 \text{ cm}$ c) $x \doteq 27.5 \text{ cm}$
7. About 3.46 m

Unit 9, page 496

- 1.a) $-6 + 4 = -2$ b) $-121 + 83 = -38$
 c) $+15 - 23 = -8$
- 2.a) -10 b) -4 c) $+5$ d) -1 e) -2 f) -8
- 3.a) 4 b) -7 c) 0 d) -24 e) 56 f) -24
4. \$518
 5. 34°C
- 6.a) $8 + 4 = 12$ b) $(-10) - (-7) = -3$
 c) $(-2) + (-3) = -5$
- 7.a) 14 b) 60 c) -36 d) -25
- 8.a) -1 b) -24
- 9.a) A(3, -2) is in Quadrant 4, B(-1, 0) is on the x-axis, between quadrants 2 and 3, and C(-3, 4) is in Quadrant 2.
 b) Reflection
 c) 90° rotation (clockwise or counterclockwise) about the origin
 d) The line meets the y-axis at (0, 1) and the x-axis at (1, 0).

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- 1.a) b b) 0 c) c d) d
- 2.a) $8x + 16y + 12$ b) $18c + 45d + 27$
 c) $20x + 5y + 15$ d) $21a + 35b + 28$
- 3.a) 2, 4, 6, 8, 10, 12, ...
 Start at 2. Add 2 each time.
 b) 3, 5, 7, 9, 11, 13, ...
 Start at 3. Add 2 each time.
 c) 1, 3, 5, 7, 9, 11, ...
 Start at 1. Add 2 each time.
 d) 5, 7, 9, 11, 13, 15, ...
 Start at 5. Add 3 each time.
- 4.a) Start at 2. Add 3 each time.
 c) 44 d) $3n - 1$ e) 224
- 5.a) For example: "How much will it cost for Sally and her parents to rent the bowling alley?"
 b) $a = 75 + 3 \times 3 = 84$; \$84
- 6.a) $x = 5$ b) $x = 8$
 c) $x = 4$ d) $x = 4$
- 7.a) $4x + 7 = 63$; $x = 14$ b) $5x - 6 = 29$; $x = 7$
 c) $\frac{x}{3} - 10 = 2$; $x = 36$ d) $10 - \frac{x}{3} = 1$; $x = 27$
- 8.a) $14 = 5 + 3n$

- b) $n = 3$; Tudor was parked for $2\frac{1}{2}$ h.
 d) Yes, Tudor could have been parked anywhere between 2 h and 1 min and 2 h and 30 min.
 9. a) 19th b) 27th c) 49th

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1. a) 45 times b) 60 times c) 75 times
 2. For example:
 a) 0.1 b) 0.9 c) 0.75 d) 0.2 e) 0.5
 3. a), b) Part a: $\frac{2}{19} = 10.5\%$; part c: $\frac{3}{4} = 75\%$;
 part e: $\frac{1}{16} = 6.25\%$
 c) For example: The other events do not have numerical values.
 4. a) A spinner with 3 congruent sectors; spin the spinner 5 times.
 b), c) Answers may vary.
 5. No. There is a probability of 50% for each player to win the coin toss. The student council would lose \$1 every other toss.
 6. a) Possible outcomes: H1, H2, H3, H4, H5, H6, O1, O2, O3, O4, O5, O6, C1, C2, C3, C4, C5, C6, S1, S2, S3, S4, S5, S6
 b) $\frac{1}{4} = 25\%$ c) $\frac{1}{24} \doteq 4.17\%$ d) $\frac{1}{12} \doteq 8.\bar{3}\%$
 7. No. The probability that the team will lose is about 57%.

Take It Further, page 499

1. 4 socks
 2. $8888 - 8888 = 0$
 4. For example: First row: 1, 4, 2, 3; second row: 3, 2, 4, 1; third row: 4, 1, 3, 2; fourth row: 2, 3, 1, 4
 5. 27

6. For example: $\frac{7}{7} \times \frac{7}{7} \times 7 \times 7$
 7. All 12 months
 8. 21 squares
 9. It is impossible because pages 121 and 122 are on opposite sides of the same sheet of paper.
 10. \$2.50
 11. 24 ways
 12. 90
 13. Navid is 41 and Daria is 14.
 14. For example: $9 \times (5 - 2) - 8$
 15. 28
 16. 8 years old
 17. Bag B gives a better chance of winning.
 18. 15 possible numbers
 19. For example: 1, 2, 3, 9; 4, 5, 6; 7, 8, 0
 20. 12 dogs
 21. 15 handshakes
 22. For example: Shauna has 25 cards and Marissa has 35 cards.
 23. NINE
 24. 27, 29, 31, 33
 25.
$$\begin{array}{r} 7 \\ 413 \\ 685 \\ 2 \end{array}$$

 26. a) 10. Start at 92. Multiply the 2 digits, then subtract the product from the previous term each time.
 b) 8. Start at 77. Multiply the 2 digits to get the next term.
 c) 90. Start at 6. Alternate between adding 3 and multiplying by 2.
 Patterns a and b; they are decreasing patterns.
 27. Both trips took the same amount of time.