Answers

Chapter 1

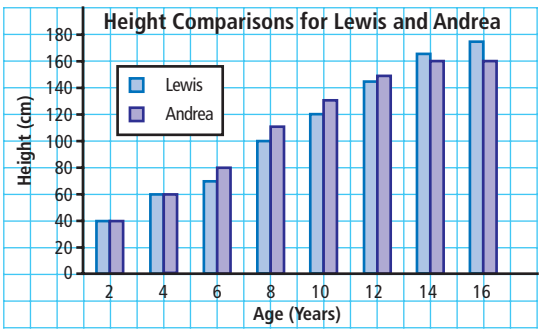
1.1 Advantages and Disadvantages of Different Graphs, pages 13–17

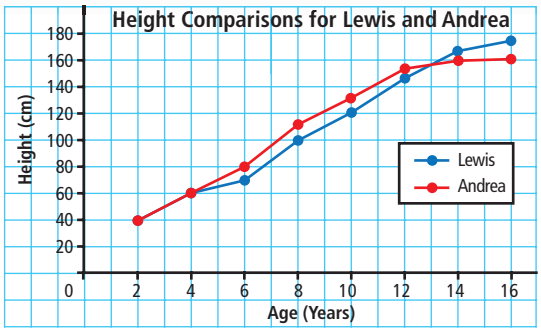
4. a) Ravi spends $10 more on food than on movies. The pictograph better shows how much more he spent on food than movies because each symbol in the pictograph represents $10, and no partial symbols were used. In the circle graph the percents must be multiplied by $200 to determine the amounts spent on food and movies. **b)** The circle graph shows that half of the circle is made up of the categories *Food* and *Clothing*. **c)** One advantage of the circle graph is that the categories are represented as percents of his total spending. One advantage of the pictograph is that it is a precise way of presenting each amount since the amounts are all multiples of ten. One disadvantage of the circle graph is that it is necessary to perform calculations to determine the dollar amounts spent on each category. One disadvantage of the pictograph is that the percent of his money spent on each category must be calculated.

5. Answers may vary. Example: **a)** The circle graph shows the percent of time out of a total of 40 h that each person practises each week. The bar graph shows the number of hours of practice each person does each week. **b)** "Which two people together use 75% of the practice time?" Min and Ann together use 75% of the practice time. **c)** "How much longer does Ann spend practising than Sara each week?" Ann spends 6 h more practising than Sara each week.

6. a) The line graph shows the change of growth from week 1 to week 4. The pictograph shows the height of the plant at the end of weeks 1, 2, 3, and 4. **b)** The plant grew at the same rate between weeks 1 and 2, and weeks 2 and 3. **c)** The plant changed the most in height between weeks 3 and 4. The line graph shows this change more clearly. **d)** One advantage of the line graph is that it shows the rate of change of the growth of the plant. One advantage of the pictograph is that it shows the height of the plant after each week. One disadvantage of the pictograph is that it does not show the rate of change in height.

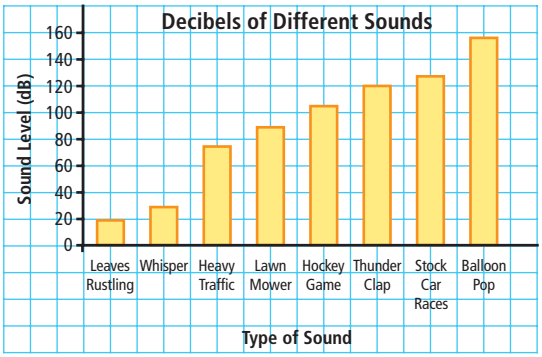
7. a)





b) The trends are similar in that both friends' heights are increasing from age 2 to age 14. The trends are different in that Andrea's height stops increasing after age 14, but Lewis' height continues to increase after age 14. **c)** The line graph shows their height trends more clearly because it shows changes in their heights over time. **d)** Because the heights are not parts of a whole, circle graphs would not be effective.

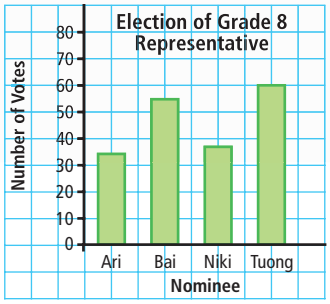
8. a)



A bar graph allows for an accurate comparison of sound levels. **b)** Because the data are not a comparison over a period of time, a line graph would not be a good choice of graph. **c)** Because the data do not represent a comparison of parts to a whole, a circle graph would not be a good choice of graph. **d)** A pictograph could be used, but it would not be as accurate as a bar graph because of the fractions of pictures required to represent these data.

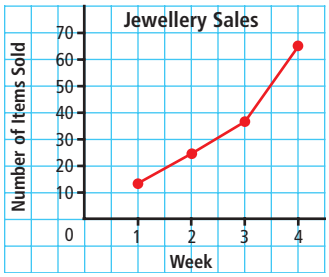
9. a) Science fiction books are 3.4 times as popular as history books. **b)** The circle graph shows the relationship between the different categories of books. **c)** The number of mystery books signed out is about the same as the total number of history and sports books because 10% + 13% = 23%. **d)** Because the circle graph shows the percent of the total for each category, the answer is more apparent. **e)** Science fiction: $4080, Mystery: $2760, Teen romance: $2400, Sports: $1560, History: $1200 **f)** The circle graph is easier to use because the percents are given, and they can be multiplied by $12 000.

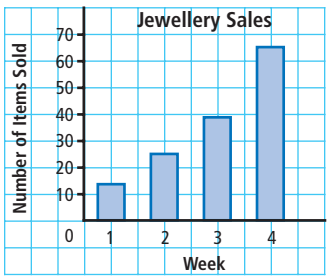
10. a)



b) The bar graph allows you to better estimate the actual number of votes. **c)** A line graph would not be the best choice because the data do not show a change over time. **d)** An advantage of using a circle graph is that you can show the percent of votes that each person received. A disadvantage is that you must calculate the number of votes each candidate received.

11. a) Answers may vary. Example:





b) The line graph shows the change of sales over the four weeks, while the bar graph shows the number of items sold for each of the four weeks. Both graphs are equally effective.

c) The store should continue to sell the jewellery because the line graph shows that the number of sales is steadily increasing over time.

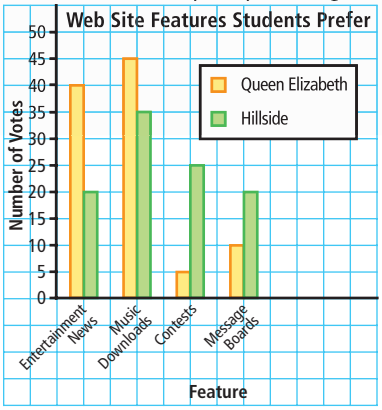
12. a) Answers may vary. Example:

b) A bar or circle graph would be most appropriate.

c) A bar graph would give the number of scores in each range.

Math Test Scores	
Range	**Frequency**
40 to 49	4
50 to 59	4
60 to 69	5
70 to 79	8
80 to 89	5
90 to 99	4
Total	30

13. a) Answers may vary. Example:



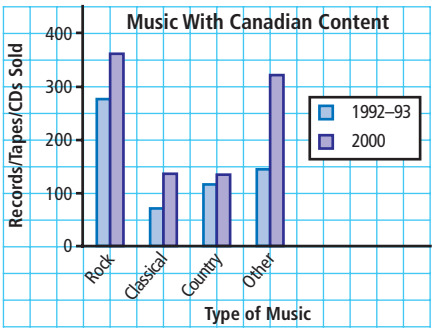
The double bar graph shows a comparison of both schools across the four different categories.

b) *Entertainment News* and *Music Downloads*

14. a) A bar graph or circle graph would be more appropriate for the data. **b)** A line graph is best for showing changes in data over time.

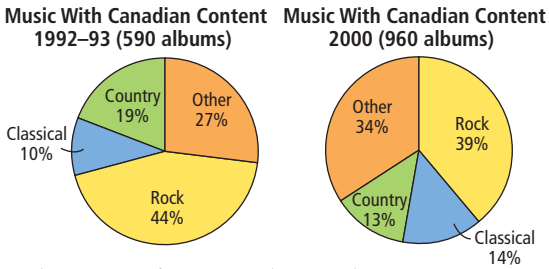
15. Answers may vary according to research. Example:

a)



Possible questions include, "How many more *Rock* albums with Canadian content were sold in 2000 than in 1992–93?" and "How have sales of *Classical* vs. *Country* albums with Canadian content changed from 1992–93 to 2000?" Answer to first question: Approximately 85. Answer to second question: In 1992–1993, more *Country* than *Classical* albums were sold. In 2000, more *Classical* albums were sold than *Country*.

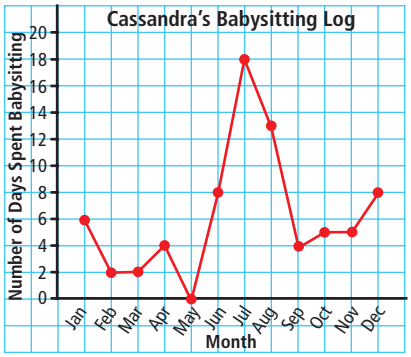
b)



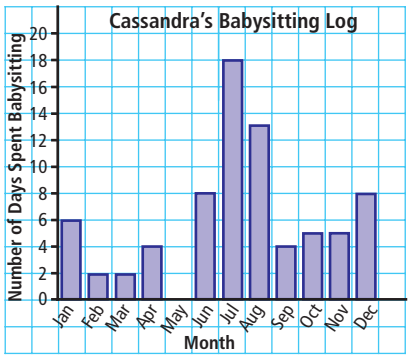
c) "What types of music with Canadian content increased in popularity between 1992–93 and 2000?" and "What type of music with Canadian content was the most popular in 1992–93?" Answer to first question: *Classical* and *Other*. Answer to second question: *Rock*.

d) An advantage to the double bar graph is that you can compare each type of music in each of the years. A disadvantage of the double bar graph is that you do not see what percent of the albums sold each year were a specific type. An advantage of the circle graph is that you can see what percent of the albums sold were each type of music. A disadvantage of the circle graph is that you must have two separate graphs to illustrate the data.

16. Answers may vary. Example: **a)** The graph could represent the number of days that Cassandra babysat for her neighbour in each month from January to December.



b)



c) It is difficult to quickly add all of her hours for the year. A pictograph may be easier for this task.

17. a) Answers may vary. Example: A survey question to ask members of your class could be, "What is your favourite season of the year: winter, spring, summer, or fall?" There are four choices, and there is a good chance that there will be a different number of people responding with each option. **b)** Since the total number of people responding to the question will be known, the percent for each response can be calculated. **c)** Answers may vary. Example: A survey question to ask members of your class could be, "How many hours a week do you spend watching television?" A bar graph or pictograph may be more suitable.

1.2 Misrepresenting Data, pages 23–27

4. a) The scale of the *y*-axis is misleading because it contains a break. **b)** The graph suggests that the temperature increased by a significant amount between 8 a.m. and 2 p.m. **c)** The graph should be redrawn with a consistent scale on the vertical axis from 0 °C to 32 °C, with no break.

5. a) 3 **b)** 2 **c)** Answers may vary. Example: It appears that candidate B received 3 times as many votes as candidate A. **d)** The graph could be redrawn with the vertical axis showing values from 0 to 200, with no break.

6. a) Apples seem to sell the best because the line containing the apple symbols is longer than the lines for the other fruit. **b)** Answers may vary. Example: It appears that about the same number of each fruit was sold because the line representing each type of fruit is approximately the same length. **c)** The pictograph should be redrawn so that each symbol is the same size, and the symbols should be spaced the same distance apart.

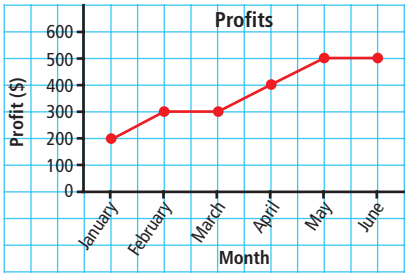
7. a) The Big Cheese appears to be the favourite burger because it is larger than the Bonzo Burger. **b)** Answers may vary. Example: The sizes of the burgers suggest a significant difference in the taste test results. **c)** Use a pictograph, with each symbol the same size, and space each symbol equally on the line.

8. Answers may vary. Example: **a)** The horizontal scale has a break from levels 0 to 10. Also, the width of each bar is not equal. **b)** Scott's progress appears to be more than twice as much as Bryce's progress. **c)** Start the scale at zero with no break between levels 0 and 10, and make Scott's and Bryce's bars have equal widths.

9. Answers may vary. Example: **a)** The vertical axis in Graph A has a uniform scale from 0 to 160 by units of 20. The vertical axis in Graph B has a break between 0 and 140, after which the scale increases uniformly by units of 2. **b)** In Graph A it appears that the sales were very near the same amount for each student. In Graph B it appears that Chris sold twice as many bars as Megan. **c)** Graph A is more accurate because the vertical scale has no break.

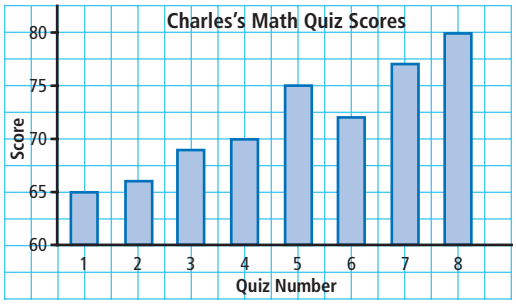
10. Answers may vary. Example: **a)** The vertical scale has a break between 0 and 200. **b)** The profits seem to be four times as high in June as they were in January.

c)

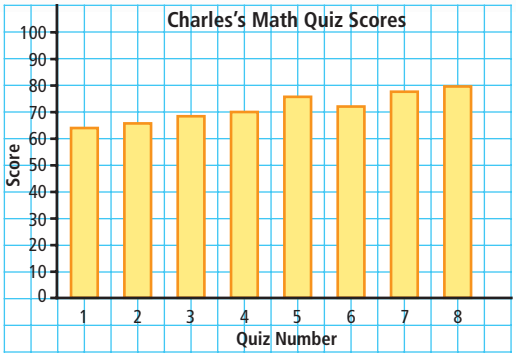


Profits are two and a half times as high in June as they were in January.

11. Answers may vary. Example: **a)**



b)



c) In Graph A it appears that Charles' scores have been increasing by a large amount. In Graph B the increase in scores does not seem as large.

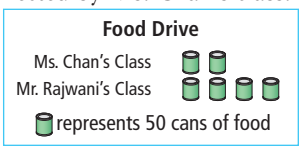
12. a) The vertical scale goes from 0 to 500, but the greatest number of votes was less than 200. Therefore, it appears that all three candidates were close to winning, and the title implies that all three candidates tied.

b) Answers may vary. Example: Candidate B barely won the election. **c)** No, the votes were not divided evenly three ways. Answer may vary. Example: A new title could be *Election Results*.

13. a) Answers may vary. Example: The information does not appear to be the same because the sector sizes in the graphs are different. **b)** The sizes of the sectors in Graph A do not appear to coincide with their percents.

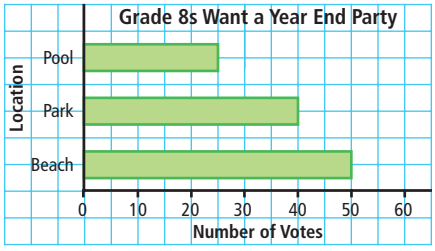
14. Answers may vary. Example: **a)** There is no scale or legend for comparison purposes. Also, the number of cans in each box is equal **b)** Mr. Rajwani's class appears to have collected 4 times the amount of food that was collected by Ms. Chan's class.

c)



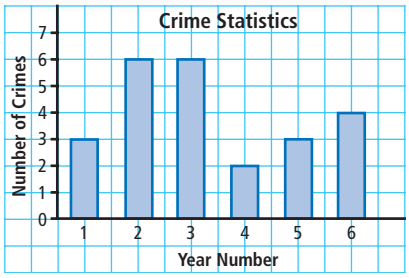
15. a) The beach appears to be about three and a half times as popular as the pool. **b)** No, the majority did not choose the beach. Only 50 out of the 115 votes cast were for the beach.

c) Answers may vary. Example:

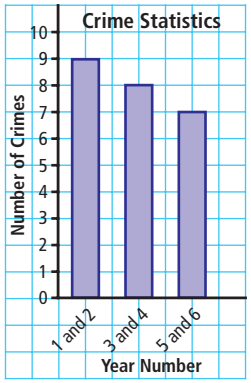


16. a) *Cool Flavours* probably created this graph because it appears that they sell twice as much ice cream as *Dairy Tasty*. **b)** Answers may vary. Example: There is no scale for comparison purposes.

17. a)

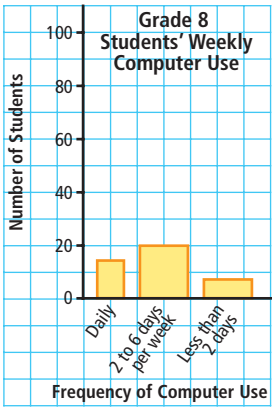


b)



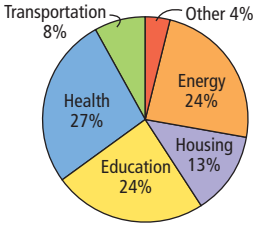
c) Answers may vary. Example: It appears from the second bar graph that the number of crimes is consistently decreasing. This does not support the data in the table. The number of crimes went down for year 4, but the number of crimes increased in the last two years. **d)** The second graph is misleading because the data for each year are not represented separately.

18. Answers may vary. Example:



19. a) Health **b)** Answers may vary. Example: The Health sector is at the front of the diagram and appears much larger than the Energy and Education sectors.

c) Answers may vary. Example:

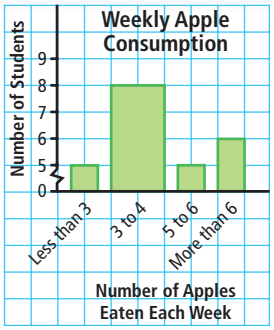


20. Answers may vary. Example: A possible question is, "How many apples do you eat each week?"

a)

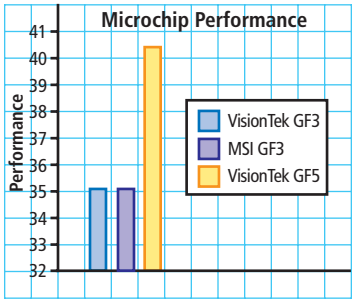
Number of Apples	Tally
Less than 3	𝍸
3 to 4	𝍸 |||
5 to 6	𝍸
More than 6	𝍸 |

b) See bar graph.
c) The wider bar in the "3 to 4" category and the break in the vertical axis make it appear that there are 8 times as many students eating 3 to 4 apples each week than there are eating less than 3 each week. There are actually less than twice as many students eating 3 to 4 apples each week than there are eating less than 3 each week.

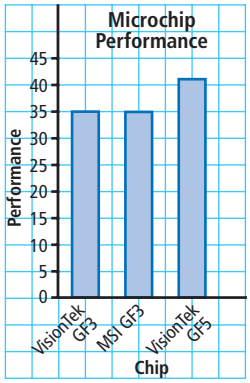


21. Answers may vary. Example: **a)** The scale on the horizontal axis of the line graph does not increase by units of 1 year. The 3-D circle graph distorts the size of the sections. Sales have increased by a large amount from 2004 to 2007, but the annual change is not shown. There are no percent labels on the circle graph. The data on the circle graph may not represent a typical day's sales.
b) Scale the horizontal axis on the line graph by units of 1 year. Change the 3-D circle graph to a 2-D circle graph. Include percent labels in the circle graph.

22. Answers may vary. Example:



a) See bar graph on right.
b) In the original graph, it looked like the VisionTek GF5 chip performed twice as well as the other two chips, but the performance among the chips is relatively similar, as shown in the second graph.



1.3 Critiquing Data Presentation, pages 32–35

4. a) Madison used a double bar graph to compare each type of communication by gender. **b)** The graph is not misleading because it is scaled uniformly with no breaks, and the bars are a consistent width. **c)** Answers may vary. Example: More girls use the Internet than boys. Boys and girls both prefer to communicate in person or on the Internet. **d)** The data do not show a change over time.

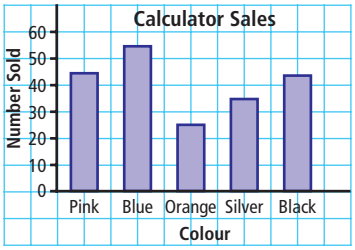
5. Answers may vary. Example: **a)** More grade 9 students spend less than 1 h on the Internet than grade 8 students. Twenty-four grade 8 students spend 2 h to less than 3 h on the Internet. **b)** No, the graph is not misleading. The scale is uniform, there are no breaks, and both axes are clearly labelled. **c)** No improvements are recommended. **d)** A comparison of time spent on the Internet of both grades can be shown on one graph. **e)** Two circle graphs (one for grade 8 students, one for grade 9 students) would show the percent of the students in each grade that use the Internet for each time interval. The circle graphs may be more informative.

6. a) Answers may vary. Example: Eighteen cars in the parking lot were sedans. Forty-eight percent of the cars in the parking lot were either SUVs or minivans. **b)** The graph is not misleading. The sections of the circle are labelled with the category name and percent. The title contains the total number of cars in the lot. **c)** Answers may vary. Example: A circle graph shows a comparison of each car type as a percent of the total number of cars. **d)** Answers may vary. Example: A bar graph could have been used to show a comparison of the number of cars of each type in the lot, but it would not have shown what percent of the cars in the lot was each type of car.

7. Answers may vary. Example: The bar graph shows that *Health* had almost twice as many votes as any other type of organization.

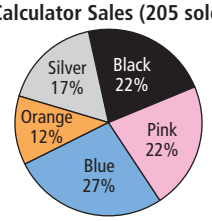
8. a) The size of the blue bar appears to be about three times as large as the orange one, but Truong is not correct. The scale indicates that 56 blue calculators were sold and that 25 orange calculators were sold.

b)



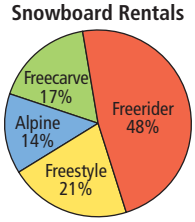
Answers may vary. Example: About twice as many blue calculators as orange calculators were sold.

c) Calculator Sales (205 sold)

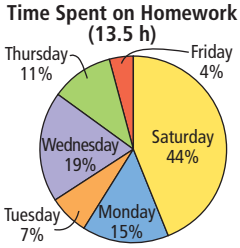


d) Answers may vary. Example: A circle graph shows the percent of the calculators sold for each colour.

9. Answers may vary. Example:
a) See circle graph on the right
b) Almost half of the rentals were of *Freerider*. **c)** The circle graph allows you to clearly see what percent of each type of board was rented. **d)** The type of graph should be a good choice for displaying the data, the graph should be designed in a way that represents the data accurately, and the graph should be informative.

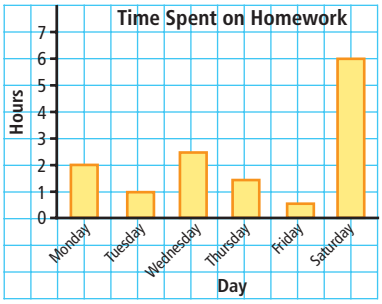


10. a) Although the graph shows that in each two-day period there is an increase in time spent, Chloe has not been increasing the time she spends doing homework over the last 6 days because she only spent 0.5 h doing homework on Friday, but 6 h on Saturday.
b) Yes, the graph is misleading.



c) Answers may vary. Example: Almost half of her homework time was spent on Saturday. Chloe spent the least amount of time doing homework on Friday.

d)

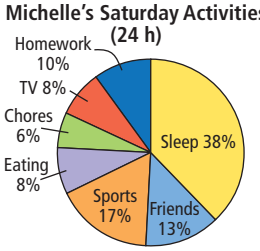


e) Answers may vary. Example: Chloe spent three times as long doing homework on Saturday as she did on Monday. She spent six times as long doing homework on Saturday as she did on Tuesday.
f) Answers may vary. Example: The bar graph is better if a comparison of number of hours is required. A circle graph is better if a comparison of percents is required.
11. Answers may vary. Example: **a)** Graph A makes it appear that there was a small change in minimum wage from 2001 to 2007. Graph B makes it appear that there was a large change in minimum wage from 2001 to 2007.
b) Graph A would support such a claim. Minimum wages have only increased from just over $6 to $8 in 7 years.
c) An employer would use Graph B because it appears that there has been a large increase in the minimum wage over the 7-year period.
12. Answers may vary. Example: **a)** *Connor's Cars* probably developed the bar graph because the drop in sales is not as obvious as it is in the line graph. **b)** *Amy's Autos'* sales have steadily increased. *Connor's Cars'* sales dropped significantly from March to April.

Chapter Review, pages 36–37

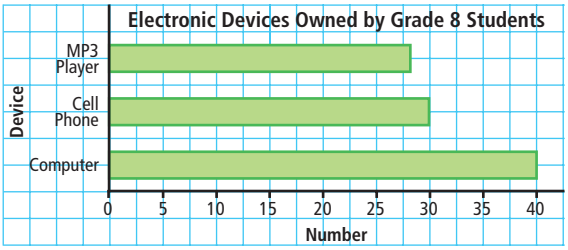
1. E **2.** A **3.** F **4.** C **5.** B
6. a) Answers may vary. Example: The circle graph allows you to determine the exact number of each type of book because it states the total number of books and the percent of each type. The bar graph also shows the number of books of each type, but the exact number is more difficult to read. **b)** The circle graph makes the distribution of the funds easier. Fiction: $500, Sports: $190, History: $60, Science Fiction: $250.

7. Answers may vary. Example:
a) The data could be displayed in a bar graph, a circle graph, or a pictograph.
b)

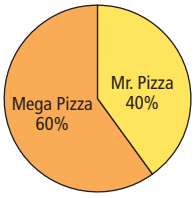


c) An advantage of a circle graph is that it shows what percent of Michelle's time is spent on each activity. A disadvantage of a pictograph is that it is difficult to show exact amounts.

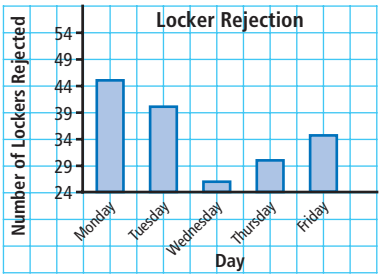
8. Answers may vary. Example: **a)** A bar graph could display the population of the western provinces and territories. **b)** A double bar graph could display the number of boys and girls in each of the grades 7, 8, and 9 at a school. **c)** A circle graph could be used to display how Ross spends his weekly allowance of $20. **d)** A line graph could show the monthly change in Internet usage over a period of one year.
9. a) False. The break in the horizontal axis makes it appear that the number of computers compared to the number of cell phones and MP3 players is much greater than it actually is.
b)



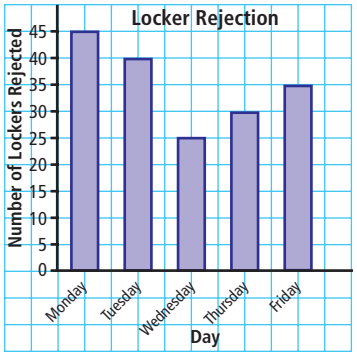
c) Answers may vary. Example: The number of cell phones is 75% of the number of computers.
10. Answer may vary. Example: **a)** It appears that *Mega Pizza* is twice as popular as *Mr. Pizza*.
b)



11. Answers may vary. Example:
a)



b)



c) The first graph makes it appear as if the number of rejected lockers on Monday is more than 20 times the number rejected on Wednesday, while the second graph shows that Monday's rejections were less than twice as many as Wednesday's.

12. a) Answers may vary. Example: The majority of the students are right-handed. There are approximately as many left-handed students as ambidextrous students. **b)** Yes, a circle graph is appropriate because it shows the percent of students in each category. **c)** Answers may vary. Example: A bar graph could be used. An advantage of a bar graph is that the number of students in each category would be displayed.

13. a) Graph A shows a comparison of all seasons' ratings. Graph B shows a comparison of season 4 ratings only. **b)** Answer may vary. Example: A title for Graph A could be *Open Mike Comics Gains Popularity* and a title for Graph B could be *Laughing Out Loud Is the Best Comedy*. **c)** Graph A was created by the producer of *Open Mike Comics* because it shows a steady increase in popularity of *Open Mike Comics*. **d)** Graph B appears to show that *Laughing Out Loud* is more than twice as popular as *Open Mike Comics*, so this graph was probably created by the producers of *Laughing Out Loud*.

Chapter 2

2.1 Two-Term and Three-Term Ratios, pages 51–54

5. a) 2 : 8 **b)** 21 : 26 **c)** 16 : 14 : 30
d) Answers may vary. Example: 13 : 28.

6. a) 1 : 4 **b)** 21 : 26 **c)** 8 : 7 : 15
d) Answers may vary. Example: 13 : 28.

7. a) $\frac{4}{10}$ **b)** $\frac{3}{9}$ **c)** $\frac{3}{15}$ **d)** $\frac{27}{60}$

8. a) 4 **b)** 15 **c)** 6 **d)** 1 **e)** 7 **f)** 5

9. a) Hockey and baseball have equivalent win-loss ratios. Express each ratio in decimal form and compare them.
b) $\frac{9}{15}$, 0.6, 60%

10. a)

b) 9 cars **c)** 1 : 4 : 6 **d)** $6:20 = \frac{3}{10} = 30\%$

11. a) blue to white **b)** blue to red to white **c)** red to all **d)** red and white to all

12. a) $\frac{8}{32}$, 25% **b)** 24 : 8 or 3 : 1

13. a) 12 games lost **b)** 16 : 12 or 4 : 3; The team lost 12 games. If they played 28 games, they won 28 − 12 or 16 games. The ratio 16 : 12 is equivalent to 4 : 3. **c)** 15 losses

14. a)

b) 36 adults. Answers may vary. Example: The ratio 3 : 8 is equivalent to the ratio 36 : 96. **c)** 60 adults. There are 96 adults in total minus 36 adults who are less than 150 cm tall equals 60 adults who are 150 cm or taller.

15. a) 2 : 6 : 5 of Romano to mozzarella to cottage cheese. **b)** 300 g of Romano and 750 g of cottage

16. a) 1 : 2 **b)** 1 : 2 **c)** Each length is $\frac{1}{2}$ of what it originally was.

17. a) 16 : 48 or 1 : 3 **b)** $12:44 = \frac{3}{11} = 0.\overline{27} = 27.\overline{27}\%$

18. a) 24 cm **b)** 1.5 m

19. a) $\frac{1608}{1800} = \frac{67}{75}$ **b)** 1.02
c) 0.56; Answers may vary. Example: The Churchill River is about twice as long as the Thelon River.

20. 4.5 kg of nitrogen, 6 kg of phosphorus, and 3 kg of potassium, for a total of 13.5 kg

21. a) 24 m × 38.9 m and 348 mm × 565 mm **b)** 10.4 m

22. a) $\frac{1}{4}$ **b)** $\frac{1}{4} = 0.25 = 25\%$ **c)** increase the slope; decrease the slope; decrease the slope; increase the slope

2.2 Rates, pages 60–62

4. a) 55 km/h **b)** 64 km/h **c)** 90 daffodils/h

5. a) 4 t/day **b)** 19.3 km/h **c)** 6 bellows/h

6. Gina: $\frac{\$78}{6\text{ h}} = \$13/\text{h}$; Asad: $\frac{\$192.50}{14\text{ h}} = \$13.75/\text{h}$. Asad has the greater hourly rate of pay.

7. a) Pkg 1: \$0.73/100 g; Pkg 2: \$0.62/100 g; Pkg 3: \$0.69/100 g **b)** Pkg 2 is the best buy because the cost per 100 g was the least. This is assuming the quality of mixed nuts is the same in all packages.

8. a) small size: $\frac{\$0.59}{250\text{ mL}} = \$0.00236/\text{mL}$;
medium size: $\frac{\$1.09}{500\text{ mL}} = \$0.00218/\text{mL}$;
large size: $\frac{\$1.99}{1000\text{ mL}} = \$0.00199/\text{mL}$
b) \$0.199/100 mL **c)** The large carton is the best buy because its unit rate is the least.

9. a) Answers may vary. There are four 250 mL small jars in one 1000 mL jar. Since \$2.79 × 4 is greater than \$9.59, four smaller jars would be more expensive for the equivalent amount of honey. This means the bigger jar is the better buy. **b)** small size: $\frac{\$2.79}{250\text{ mL}} = \$0.01116/\text{mL}$; large size: $\frac{\$9.59}{1000\text{ mL}} = \$0.00959/\text{mL}$. Therefore, the large size is the better buy.

10. Trevor: $\frac{84\text{ km}}{3\text{ h}} = 28\text{ km/h}$; Jillian: $\frac{70\text{ km}}{2.5\text{ h}} = 28\text{ km/h}$. They both rode at the same rate; therefore, neither is the fastest cyclist.

11. a) $\frac{\$9.96}{12\text{ bars}} = \$0.83/\text{bar}$ **b)** Answers may vary. Example: The answer to part a) is a rate because it is a comparison of two quantities in different units. A ratio is a comparison of quantities in the same units.

12. Saskatchewan Glacier: $\frac{1500\text{ m}}{75\text{ year}} = 20\text{ m/year}$; Peyto Glacier: $\frac{1320\text{ m}}{70\text{ year}} = 18.86\text{ m/year}$. The Saskatchewan Glacier has the greater annual rate of melting.

13. a) $\frac{60\text{ L}}{840\text{ km}} = 0.0714\text{ L/km}$ **b)** Answers may vary. Example: Multiply the answer by 100. **c)** Joe's vehicle has the lowest fuel consumption.

14. a) 416.4 euros **b)** 332.14 US dollars **c)** 518.72 Australian dollars

15. a) 1000 m race: 73.11 s; 1500 m race: 111.79 s; 3000 m race: 233.34 s **b)** 13.4 m/s **c)** 128.57 m

16. a) Daniel: 1.50 lawns/h; Grace: 1.33 lawns/h **b)** The difference is 0.17 lawn/h

17.

Planet	Radius (km)	Circumference (km)	Length of Day (h)	Rotation Rate (km/h)
Venus	6051	38 000	2808	13.5
Earth	6378	40 054	24	1669.8
Saturn	60 268	378 483	10 233	37

18. a) 0.8823; It represents that one Canadian dollar is equivalent to 0.8823 US dollar. **b)** \$617.61 **c)** 1.1158 **d)** \$627.35 US

19. 16.67 m/s

2.3 Proportional Reasoning, pages 67–69

4. a) 33¢/roll **b)** 2 kg/object

5. a) 47¢/pen **b)** 6 cm/block

6. \$21.00

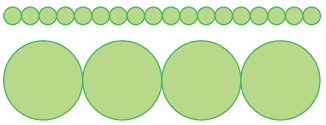
7. $\frac{\$35}{5\text{ h}} = \frac{\$x}{3\text{ h}}$ or $\frac{\$7}{1\text{ h}} = \frac{\$x}{3\text{ h}}$; \$21.00

8. a) 10 **b)** 2 **c)** 9 **d)** 9

9. a) 120 km **b)** 20 cans **c)** 89 beats **d)** \$64.00

10. a) $\frac{10\text{ beans}}{17\text{ g}} = \frac{30\text{ beans}}{51\text{ g}}$ **b)** $\frac{13\text{ boys}}{15\text{ girls}} = \frac{65\text{ boys}}{75\text{ girls}}$ **c)** $\frac{1\text{ cm}}{25\text{ km}} = \frac{6.4\text{ cm}}{160\text{ km}}$

11. Answers may vary. Example:



$\frac{18\text{ small gear turns}}{4\text{ large gear turns}} = \frac{54\text{ turns}}{x\text{ turns}}$; 12 times or turns.

12. a) $\frac{175\text{ mL}}{50\text{ mL}} = \frac{300\text{ mL}}{x\text{ mL}}$ **b)** $\frac{3\text{ home runs}}{17\text{ strikeouts}} = \frac{x\text{ home runs}}{187\text{ strikeouts}}$

13. 25 nickels

14. Answers may vary. Example:

As a unit rate: $\frac{30\text{ cm}}{6\text{ h}} = 5\text{ cm/h}$, so $\frac{45}{5} = 9\text{ h}$.

As a proportion: $\frac{30\text{ cm}}{6\text{ h}} = \frac{45\text{ cm}}{x\text{ h}}$, which results in $x = 9\text{ h}$.

15. Answers may vary. Example: $\frac{1\text{ figure}}{2\text{ squares}} = \frac{7\text{figures}}{x\text{ squares}}$.

16. \$50.00

17. a) \$52.80 **b)** $\frac{\$17.60}{2000\text{ g}} = \frac{\$x}{1600\text{ g}}$; $x = \$14.08$

18. a) \$2.50/ride **b)** \$45.00; Answers may vary. Example: Using unit rate: \$2.50 × 18 = \$45.00. Using a proportion: $\frac{\$2.50}{\text{ride}} = \frac{\$x}{18\text{ rides}}$, where $x = \$45.00$.

19. a) 4, 9 **b)** \$48, 192 km

20. 150 g of rice

21. 17.5 min

22. a) 1.8 m **b)** 48 cm or 0.48 m

23. 0.33 kg

24. a) Answers may vary. Example: The numerators consist of the whole numbers in consecutive order; the denominators consist of the even whole numbers in consecutive order. **b)** Answers may vary. Example: The numerators are multiples of 5 and the denominators are multiples of 6. **c)** Answers may vary. Example: The products are equal. **d)** Answers may vary. Example: The cross-products will be the same. Example: In the equivalent pair $\frac{7}{8} = \frac{14}{16}$, the cross-products are both 112.

25. a) Frog: 96 insects/day; dragonfly: 99 insects/day. The dragon fly eats 3 more insects per day. **b)** 693 insects **c)** 2976 insects

26. a) 1:2 **b)** 1:4

27. 20:35 or 4:7

28. 13.75 mL

Chapter Review, pages 70–71

1. D **2.** B **3.** E **4.** A **5.** G

6. a) 6:6 **b)** 6:12 **c)** $\frac{1}{2} = \frac{3}{6}$ **d)** 50%

7. a) 6:16 **b)** $\frac{3}{8}$ **c)** 8:4

8. a) 1:2:5 **b)** 8 **c)** blue cars to total **d)** silver to (non-silver, non-blue, non-red, and non-yellow) **e)** $\frac{1}{4}$, 25%

9. a) 8 **b)** 10:8

10. a) 24:6 **b)** 48:12 **c)** 4

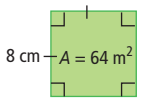
11. a) 50 steps/min **b)** \$0.90/L **c)** 624 km/h **d)** 50 kg/year
12. a) Answers may vary. Example: 4.98 : 13.95
b) Answers may vary. Example: \$4.98/3 kg **c)** The unit price in Winnipeg is \$1.66/kg. The unit price in Little Grand Rapids is \$4.65/kg. The difference in price/kg is \$2.99/kg.
13. a) fridge: 5.0¢/h; computer and monitor: 3.6¢/h; television: 1.9¢/h; treadmill: 26.6¢/h **b)** The television has the lowest rate of electricity consumption.
14. a) Shelley travelled farther. **b)** The difference is 2.5 km.
15. a) 16 kg **b)** \$10.50 **c)** 18 min
16. a) \$7.84 **b)** 5.3 cm
17. a) 8.40 cm **b)** 10.7 g **c)** 33 g
18. a) 5 m **b)** 51 cm

Chapter 3

3.1 Squares and Square Roots, pages 85–87

5. a) $4 = 2 \times 2$ **b)** Yes, the prime factor, 2, appears an even number of times. **c)**

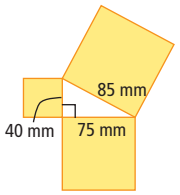
6. a) $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$ **b)** Yes, 64 is a perfect square. The prime factor, 2, appears an even number of times. **c)**



7. a) $42 = 2 \times 3 \times 7$; 42 is not a perfect square.
b) $169 = 13 \times 13$; 169 is a perfect square.
c) $256 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$; 256 is a perfect square.
8. a) $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$; 144 is a perfect square.
b) $60 = 2 \times 2 \times 3 \times 5$; 60 is not a perfect square.
c) $40 = 2 \times 2 \times 2 \times 5$; 40 is not a perfect square.
9. a) 100 square units **b)** 256 square units
10. a) 400 square units **b)** 289 square units
11. a) 81 **b)** 121
12. a) 9 **b)** 324
13. 7 mm
14. 30 cm
15. a) 7 **b)** 8 **c)** 25
16. a) 3 **b)** 5 **c)** 40
17. $54 = 2 \times 3 \times 3 \times 3$; No, 54 is not a perfect square because it has an odd number of factors of 2 and 3.
18. 196 m²
19. 1360 m
20. a) 36 m² **b)** 6 m
21. a) 56 m² **b)** Answers may vary. Example: 7 m by 8 m is one set of dimensions for the patio. **c)** No, it is not possible to make a patio with the same area that is a square since 56 is not a perfect square.
22. a) 630 m by 630 m **b)** 395 641 m² **c)** 622 m by 622 m *or* 623 m by 623 m *or* 624 m by 624 m *or* 625 m by 625 m *or* 626 m by 626 m *or* 627 m by 627 m.
23. 20 m
24. a) 10, 15, 21 **b)** The sum of any two consecutive triangular numbers is a perfect square.
25. a) 12 cm **b)** 1296 cm² **c)** 9 times **d)** 3 times **e)** To find the number of times the side length is enlarged, calculate the square root of the times that the area has been enlarged.
26. a) perfect squares: 100 and 10 000 **b)** $\sqrt{100} = 10$ and $\sqrt{10\,000} = 100$ **c)** Answers may vary. Example: The number 1000 is not a perfect square. The prime factorization of 1000 is $2 \times 2 \times 2 \times 5 \times 5 \times 5$. There is an odd number of factors of 2 and 5.
d) Any power of 10 with an even number of trailing zeros will be a perfect square.
e) No, 1 000 000 000 is not a perfect a square because it has an odd number of trailing zeros.
27. a) $\sqrt{6400} = 80$, $\sqrt{640\,000} = 800$, $\sqrt{64\,000\,000} = 8000$ **b)** Take the square root of 64 and then "add" half the number of trailing zeros from the original number.
c) There is an odd number of trailing zeros.
d) 800 000; Calculate the square root of 64, which is 8. Then count the number of trailing zeros, which is 10. Take half of that number of trailing zeros, which is 5, and attach that many zeros to 8.

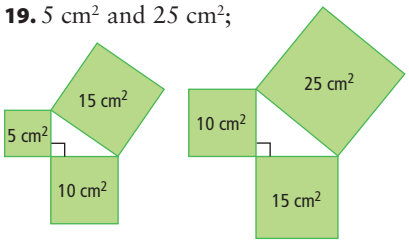
3.2 Exploring the Pythagorean Relationship, pages 92–94

4. 900 mm²; 1600 mm²; 2500 mm²
5. a)



b) 1600 mm²; 5625 mm²; 7225 mm²
c) $1600 + 5625 = 7225$
6. a) $25 + 144 = 169$ **b)** 5 cm; 12 cm; 13 cm
c) The sum of the areas of the two smaller squares is equal to the area of the largest square: $5^2 + 12^2 = 13^2$.
7. a) 81 cm²; 144 cm²; 225 cm² **b)** $81 + 144 = 225$ **c)** The sum of the areas of the two smaller squares is equal to the area of the largest square: $9^2 + 12^2 = 15^2$.
8. No, the triangle is not a right triangle. The sum of the areas of the smaller squares is not equal to the area of the largest square: $20^2 + 40^2 \neq 50^2$
9. a) 4 cm²; 9 cm²; 16 cm² **b)** No, the triangle is not a right triangle. The sum of the areas of the smaller squares is not equal to the area of the largest square: $2^2 + 3^2 \neq 4^2$.
10. Yes, the triangle is a right triangle. The sum of the areas of the two smaller squares is equal to the area of the largest square: $120^2 + 160^2 = 200^2$.
11. Answers may vary. Example: No, the triangle is not a right triangle. The sum of areas of the squares of the two shorter sides does not equal the area of the square of the longest side, the hypotenuse. $5^2 = 25$, $6^2 = 36$, and $8^2 = 64$; $25 + 36 \neq 64$.
12. a) 52 cm² **b)** 676 mm² **c)** 65 cm² **d)** 24 cm²
13. No, the garden is not a right triangle. The sum of the areas of the smaller squares is not equal to the area of the largest square: $4800 + 4800 \neq 9800$.

14. Triangle A is a right triangle: $9^2 + 12^2 = 15^2$.
Triangle B is not a right triangle: $7^2 + 8^2 \neq 11^2$.
Triangle C is a right triangle: $7^2 + 24^2 = 25^2$.
Triangle D is a right triangle: $16^2 + 30^2 = 34^2$.
Triangle E is not a right triangle: $10^2 + 11^2 \neq 14^2$.
15. No, the angle is not a right angle. The diagonal would have to be 10 m for the angle to be right angled.
$6^2 + 8^2 = 100$; $\sqrt{100} = 10$
16. Answers may vary. Example: Baldeep should ensure that the sum of the areas of the squares for the width and the length of the rectangle equals the area of the square that can be drawn on the diagonal of the rectangle:
$144 + 400 = 544$.
17. a) 1225 cm^2 **b)** 169 mm^2
18. a) 28 m^2 **b)** 16 m^2
19. 5 cm^2 and 25 cm^2;



20. Answers may vary. Example: The sum of the areas of the two smaller semicircles is equal to the area of the semicircle attached to the hypotenuse of the triangle.
21. a) 6, 8, and 10 form a Pythagorean triple: $6^2 + 8^2 = 10^2$. **b)** Answers may vary. Example: Multiply each number by 10: $60^2 + 80^2 = 100^2$. The results form a Pythagorean triple. **c)** No, there is no natural number that does not make a Pythagorean triple when 3, 4, and 5 are multiplied by it.

3.3 Estimating Square Roots, pages 99–100

4. Answers may vary for the estimates. **a)** 8.5 **b)** 10.1 **c)** 7.4
5. Answers may vary for the estimates. **a)** 3.7 **b)** 9.3 **c)** 11.7
6. Answers may vary. Example: 90
7. Answers may vary. Example: 130
8. 5, 6, 7, and 8
9. 17, 18, 19, 20, 21, 22, 23, 24
10. Answer may vary. Example: 5.2 m
11. a) Answers may vary. Example: 4.5 cm **b)** 4.5 cm
12. a) Answers may vary. Example: An estimate is 3.2 m. **b)** 3.3 m **c)** Yes, the rug will fit since its side length, 3.3 m, is smaller than the shorter side of the room.
13. a) 10.7 m **b)** Answers may vary. Example: 10 m or 11 m **c)** 100 m^2 or 121 m^2 **d)** She will choose the 121 m^2 dance floor since it is much closer to her desired size.
14. a) 60 **b)** No, there is only one answer. The number must be between 49 and 64. The only multiple of 12 in this range is 60.
15. $\sqrt{27}$, 5.8, 6.3, $\sqrt{46}$, 7
16. a) 27 m^2 **b)** Answers may vary. Example: The fitness centre should order dimensions of 5.1 m by 5.1 m so that the area does not exceed 75% of the space available.
17. a) 324 cm^2 **b)** 1296 cm^2 **c)** 36 cm by 36 cm
18. a) 3 **b)** Answers may vary. Example: 1.7 **c)** 1.73 **d)** Answers may vary. Example: 0.03
19. Answers may vary. Example: A reasonable estimate for the square root of 160 100 is 400. $16 \times 10\,000 = 160\,000$. The square root of 16 is 4. The square root of 10 000 is 100. The square root of 160 100 is approximately $4 \times 100 = 400$.
20. 14
21. 106 500 and 106 800

3.4 Using the Pythagorean Relationship, pages 104–105

3. a) 20 cm **b)** 34 m
4. a) 9.2 cm **b)** 13.6 cm
5. a) 36 cm^2; 64 cm^2 **b)** 100 cm^2 **c)** 10 cm
6. a) 24 cm **b)** 10 cm
7. a) 7.5 mm **b)** 10.2 mm
8. 206 cm
9. 13.4 m
10. 38.2 m
11. 72.2 cm
12. 8.6 cm
13. 12 mm
14. $b = 4$ m; $c = 7.2$ m
15. 4.5 cm
16. 14.8 mm

3.5 Applying the Pythagorean Relationship, pages 110–111

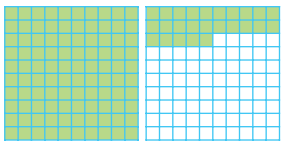
3. a) 420 m **b)** 323 m **c)** Maria walked further by 97 m.
4. 9.8 m
5. Yes, these dimensions could form a rectangle. Square both sides of the rectangle and then sum the values: $9^2 + 22^2 = 565$. Calculate the square root of 565, which is 23.8 cm. This length is equal to the length of the diagonal.
6. No, there is not a right angle at first base because $27^2 + 27^2 = 38.2^2$. Since the distance between home plate and second base is 37.1 m and not 38.2 m, the triangle is not a right triangle.
7. 12.6 cm
8. Answers may vary. Example: Shahriar is correct. The diagonal is 39.1 cm when calculated with the Pythagorean relationship, which is smaller than the advertised 42 cm diagonal.
9. a) 4.2 cm **b)** 34 cm
10. Yes, she will have enough room. The diagonal of the mat is $\sqrt{12^2 + 12^2} \approx 17.0$ m, according to the Pythagorean relationship. The gymnast requires 16 m for the tumbling run and she will have one metre to spare.
11. maximum of 291.7 cm, minimum of 279.1 cm
12. a) 9.65 m **b)** $19.30
13. 235 km
14. 15.6 mm

Chapter Review, pages 112–113

1. square root **2.** perfect square
3. hypotenuse **4.** Pythagorean relationship
5. prime factorization
6. a) 36 **b)** 121 **c)** 625
7. a) 7 **b)** 16 **c)** 10 000
8. No, the fabric has an area of 4×4 or 16 m^2. Lisa needs 17 m^2.
9. a) No, the triangle is not a right triangle. The sum of the two smaller squares is 16 cm^2 + 16 cm^2 = 32 cm^2. This does not equal the area of the largest square, which is 36 cm^2. **b)** 4 cm; 4 cm; 6 cm
10. Yes, the triangle is a right triangle since the sum of the squares of the two smaller sides is 225 + 1296 = 1521, which is equal to the square of the largest side.
11. Triangles A, C, and D are right triangles.
12. a) Answer may vary. Example: 30 cm^2 **b)** 5 cm, 6 cm **c)** Answer may vary. Example: 5.5 cm **d)** Answer may vary. Example: 5.5 cm
13. a) 3.2 **b)** $\sqrt{6}$ is closer to 2 than 3 because 6 is closer to 4 (2^2) than 9 (3^2). **c)** When 3.61 is squared the result is 13.0321, which is closest to 13.
14. a) $d = 13$ m **b)** $v = 12$ cm
15. a) 5.4 cm; 6.7 cm **b)** 15.7 cm
16. No, the ladder will not reach the window. The length the ladder needs to reach is greater than 4 m: $1^2 + 3.9^2 \approx 4.03^2$.
17. 99.0 cm

Chapter 4

4.1 Representing Percents, pages 128–129

4. a) 112% **b)** $\frac{2}{10}$% **c)** $85\frac{1}{3}$%
5. a) $\frac{3}{8}$% **b)** $125\frac{1}{2}$% **c)** 282%
6. a)

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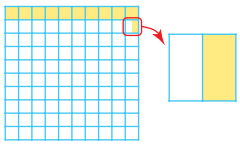
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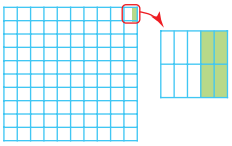
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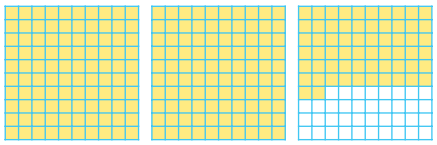
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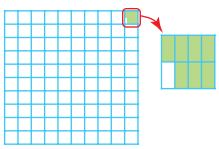
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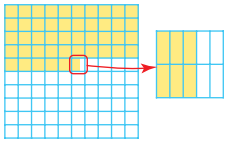

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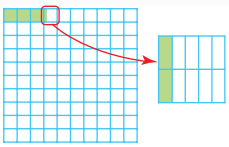
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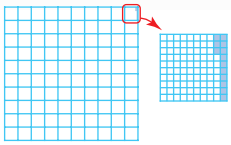
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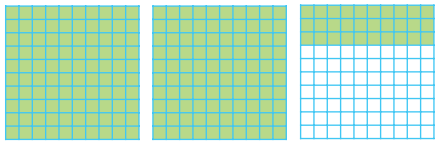
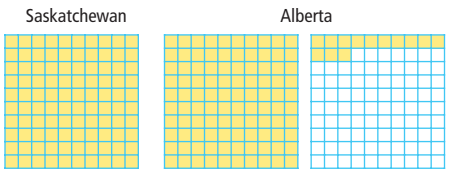
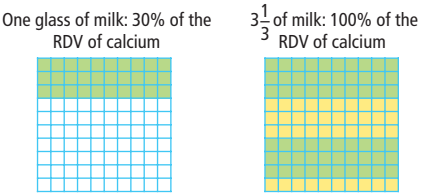
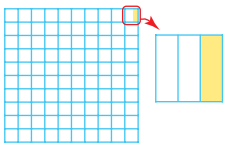
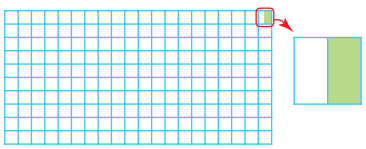
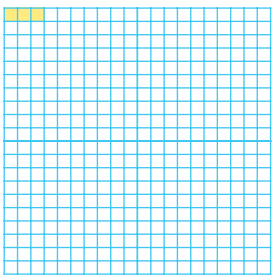

8. a) 3 **b)** 5 **c)** 12
9. Answers may vary. Example: Two situations where the percent will be greater than 100% are a mother's mass compared to her newborn child, and the volume of water in the Pacific Ocean in relation to a lake in Canada.
10. A scientist may need to relate the measurement of something that is less than 1% of its size. Example: The percent of different pollutants in the water will likely be between 0% ands 1%.
11.


12. Answers may vary.


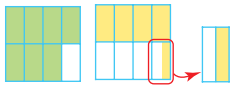
13. a)

b) Answers may vary. You must know how to convert a repeating decimal to fraction form.
14. a)

b)


15. Since one square on a hundred grid is equal to 1%, then one square on a thousand grid (10 hundred grids placed together) would be equal to 0.1%. If this pattern is continued, then very small percents can be expressed on larger grids. If a ten million grid was used, then 0.0000125% would be represented by 1.25 squares.

Grid Type (number of squares)	Value of One Square as a Percent
Hundred	1%
Thousand	0.1%
Ten thousand	0.01%
Hundred thousand	0.001%
Million	0.0001%
Ten million	0.000 01%

16. a) 1.7% **b)** 130%

c) $87\frac{1}{2}\%$; $56\frac{1}{4}\%$



4.2 Fractions, Decimals, and Percents, pages 135–137

4. a) 0.004 or 0.4% **b)** 0.405 or 40.5% **c)** 1.4 or 140%

5. a) 1.7 or 170% **b)** 0.105 or 10.5% **c)** 0.006 or 0.6%

6. a) 0.72% or $\frac{72}{10\,000} = \frac{9}{1250}$ **b)** 54.8% or $\frac{548}{1000} = \frac{137}{250}$

c) 345% or $\frac{345}{100} = \frac{69}{20}$

7. a) 25.6% or $\frac{256}{1000} = \frac{32}{125}$ **b)** 0.05% or $\frac{5}{10\,000} = \frac{1}{2000}$

c) 650% or $\frac{650}{100} = \frac{13}{2}$

8. a) 2.48 or $\frac{248}{100} = \frac{62}{25}$ **b)** 0.0056 or $\frac{56}{10\,000} = \frac{7}{1250}$

c) 0.7575 or $\frac{7575}{10\,000} = \frac{303}{400}$

9. a) 0.059 or $\frac{59}{1000}$ **b)** 5.5 or $\frac{550}{100} = \frac{11}{2}$

c) 0.008 or $\frac{8}{1000} = \frac{1}{125}$

10.

Percent	Fraction	Decimal
165%	$\frac{165}{100}$	1.65
230%	$\frac{230}{100}$	2.3
0.38%	$\frac{38}{10\,000}$	0.0038
19.9%	$\frac{199}{1000}$	0.199

11. a) $\frac{17}{25}$ or 0.68 or 68% **b)** $\frac{9}{24} = \frac{3}{8}$ or 0.375 or 37.5%

12. a) $\frac{33}{25}$ or 1.32 or 132% **b)** $\frac{47}{20}$ or 2.35 or 235%

13. 2000%

14. 2.25% or 0.0225 or $\frac{225}{10\,000} = \frac{9}{400}$

15. smallest to largest: 0.6%, $\frac{5}{8}\%$, 33.5%, 0.65, 1.32, 145%

16. approximately 0.4% or $0.00\overline{4}$ or $\frac{4}{900} = \frac{1}{225}$

17. Answers may vary. Example: **a)** "Ticket sales are $\frac{13}{10}$ of what they were this time last year." The number 1.3 sounds like a small number. **b)** "We are already at 0.605 of our target and we just started!" The decimal 0.605 is easily recognizable as more than half. **c)** "We have managed to cut our costs by $\frac{75}{10\,000}$." The large denominator makes this number sound large.

18.

Species	Number	Percent of Total	Fraction of Total	Decimal Equivalent
Chinook	143	53.56%	$\frac{143}{267}$	0.5356
Coho	122	45.69%	$\frac{122}{267}$	0.4569
Steelhead	2	0.75%	$\frac{2}{267}$	0.0075

19. 600% or 6.0 or $\frac{600}{100} = \frac{6}{1}$

20. 90 beats per minute: 120% or $\frac{6}{5}$ or 1.2;

125 beats per minute: $166.\overline{6}\%$ or $\frac{5}{3}$ or $1.\overline{6}$;

150 beats per minute: 200% or $\frac{200}{100} = \frac{2}{1}$ or 2.0

21.

Percent	Decimal	Fraction
a) 1000	10.00	$\frac{10}{1}$
b) 500	5.00	$\frac{5}{1}$
c) 250	2.50	$\frac{5}{2}$
d) 125	1.25	$\frac{5}{4}$
e) 62.5	0.625	$\frac{5}{8}$

4.3 Percent of a Number, pages 142–143

3. a) 6000 **b)** 0.75 **c)** 0.04

4. a) 12 **b)** 1000 **c)** 10.5

5. a) 1.3 **b)** approximately 144.88 **c)** $219.63

6. a) 3.25 **b)** 150.8 **c)** $191.25

7. a) 0.5% **b)** 5

8. $21.42

9. 5957.73 m

10. a) 75 mL **b)** 825 mL

11. approximately 649 004 km^2

12. 1100 km

13. a) Commission is the portion of the sale price that the real estate agent earns. **b)** $18 700

14. 50; 4% is half of 8%, and 50 is half of 100

15. Answer may vary. Example: $572.15, with an assumption that no rounding occurred after each bid.

16. 8

4.4 Combining Percents, pages 148–149

4. $38.04

5. $66.57

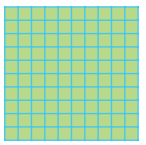
6. $38.25

7. a) 132 caribou **b)** The increase is not 30% because the 20% increase in the second year is based on the new population after the 10% increase in the first year.
8. Answers may vary based on the PST rate in your province. Example: Based on a total tax of 12% (GST = 5% and PST = 7%):

Item Purchased	Price	Total Tax (12%)	Total Cost
a) Boots	$119.99	$14.40	$134.39
b) Pants	$89.99	$10.80	$100.79
c) Gloves	$39.99	$4.80	$44.79
d) Helmet	$189.99	$22.80	$212.79

9. a) $23 736 **b)** $26 109.60
10. $362.10
11. a) $1060.90 **b)** 6.09%
12. a) swim: approximately 2.9%; bike: approximately 77.7%; run: approximately 19.4%
b) approximately 97.1%
13. 70%
14. 8%

Chapter Review, pages 150–151

1. percent **2.** fractional **3.** combined
4. a) 2 **b)** 6 **c)** 15
5. a) $\frac{7}{10}\%$ **b)** $\frac{3}{5}\%$ **c)** $50\frac{1}{4}\%$ **d)** 245%
6. a)

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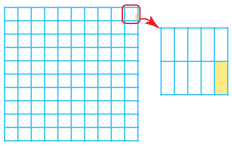
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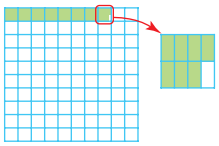
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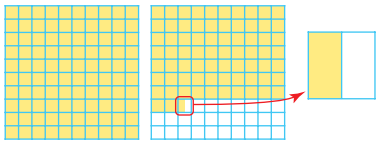
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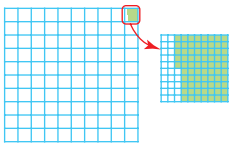
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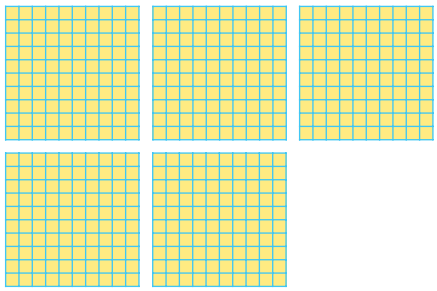

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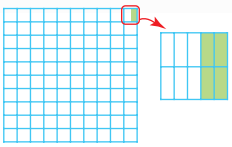
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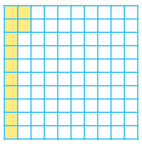
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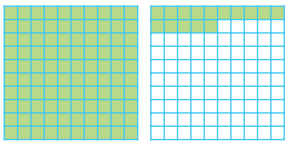
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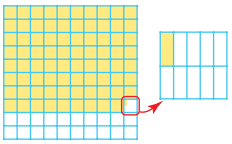
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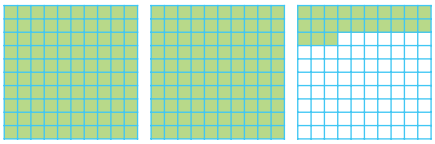
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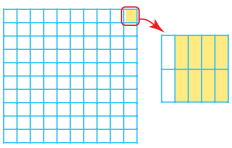

9.

Fraction	Decimal	Percent
a) $\frac{23}{200}$	0.115	11.5%
b) $\frac{19}{80}$	0.2375	$23\frac{3}{4}\%$
c) $\frac{3}{200}$	0.015	1.5%
d) $3\frac{17}{20}$	3.85	385%

10. a) $\frac{110}{100} = \frac{11}{10}$ or 1.1 **b)** Answer may vary. Example: It means that you must give more of an effort than you would normally.
11. a) 0.955 or $\frac{955}{1000} = \frac{191}{200}$; Kyle scored $\frac{191}{200}$ on his practice test. **b)** 1.4 or $\frac{140}{100} = \frac{7}{5}$; The store's sales increased by a factor of 1.4. **c)** 0.009 or $\frac{9}{1000}$; By getting your car tuned up, you can reduce emissions by 0.009 times the original amount.
12. a) 264.5 **b)** 40.4 **c)** 0.1 **d)** 0.8 **e)** 7656 **f)** 500
13. 6.25 cm
14. $5.50
15. a) 1814 trees **b)** fir: approximately 31%; pine: approximately 18%; larch: approximately 9%; cedar: approximately 5%; hemlock: approximately 37%
16. $329.31
17. a) No, the populations did not increase by the same amount. In the second year, the 7% increase in Cedarville is applied to the new population after the initial year increase of 7%. In Pinedale, the 15% increase is applied to the initial population of 1200.
b) Cedarville: 1387 people; Pinedale: 1380 people

Chapters 1–4 Review, pages 156–158

1. Answers may vary. Example: **a)** bar graph: compares data across categories **b)** double bar graph: compares two sets of data across categories **c)** circle graph: compares categories to the whole using percents **d)** line graph: shows changes in data over time

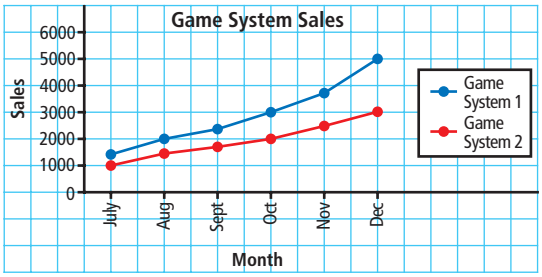
2. a) Answers may vary. Example: A pictograph uses symbols to compare the number of people who prefer different types of food. It would show more clearly that people prefer Italian and Chinese food.

b)

c) The data do not show changes over time.

3. a) Answers may vary. Example: Game system 1 is more popular than game system 2; more game system 1s and game system 2s were sold in December than in the other months; sales of game system 1 and game system 2 both increase each month.

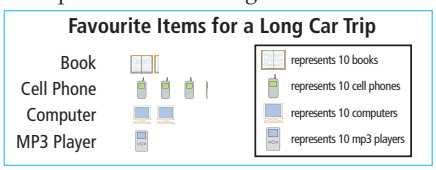
b)



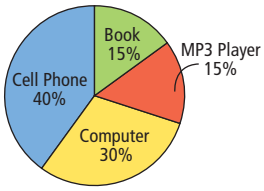
c) Answers may vary. Example: Sales of game system 1 are increasing faster than sales of game system 2; Sales of game systems 1 and 2 both increased from July to December. **d)** Answers may vary. Example: the bar graph; It is easier to see the increases in the bar graph. **e)** Answers may vary. Example: A bar graph's strength is that it is easy to compare two sets of data; a bar graph's limitation is that it is harder to see that one set of data is increasing faster than the other. A line graph's strength is that it is easy to see changes over time; a line graph's limitation is that it is harder to compare sales in a particular month.

4. a) Answers may vary. Example: This graph is misleading because computers appear to be the favourite; the line for computers is the longest one and the symbol for computers is much larger.

b)

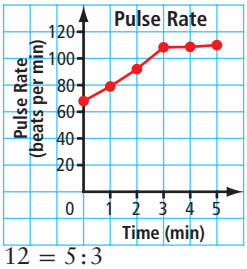


c)



d) Answers may vary. Example: One advantage of using a circle graph is that each section can be easily compared so you know which items are the most and least popular.

5. Answers may vary. Example:
a) See graph on right.
b) His pulse rate increases for the first 3 min and then levels off.
c) A line graph shows change over time, so you can see how Calvin's pulse rate changes over 5 min.



6. a) 12 **b)** $\frac{20}{32} = \frac{5}{8}$; 62.5% **c)** $20:12 = 5:3$

7. Answers may vary. Example: They should charge less than \$10.39 for their 4-kg bag of cat food. Calculate the price for 1 kg and multiply it by four.

8. a) Answers may vary. Example: Pasta Supreme appears to be the better buy because it is a much larger quantity for just a little bit more cost. **b)** Super Choice: \$0.14/100 g; Pasta Supreme: \$0.10/100 g **c)** Pasta Supreme is a better buy because it costs less per 100 g. **d)** Answers may vary. Example: Estimating unit costs is useful because it can help you determine the cheapest brand and help you save money.

9. a) Vehicle 1: 10.63 L/100 km;
Vehicle 2: 9.72 L/100 km; Vehicle 3: 10.63 L/100 km
b) Vehicle 2 has the lowest fuel consumption because it uses the least amount of fuel for 100 km.

10. a) \$2.56 **b)** 4.4 cm

11. 25

12. a) 64 **b)** 169 **c)** 289 **d)** 6400

13. a) 11 **b)** 30 **c)** 7 **d)** 16

14. a) 36; 49 **b)** 121; 144 **c)** 196; 225

15. a) 7.6 **b)** 11.8 **c)** 2.4 **d)** 5.4

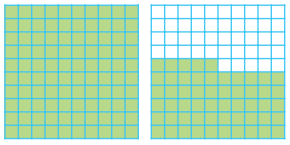
16. 9.5

17. Yes; $11^2 + 60^2 = 61^2$; $121 + 3600 = 3721$

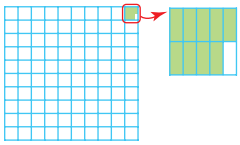
18. a) 118.6 m **b)** \$1779

19. 25 m

20.



21. 0.9%



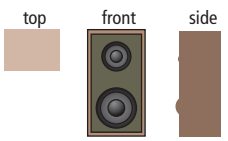
22. a) $0.6\overline{6}$; $\frac{2}{3}$ **b)** 300

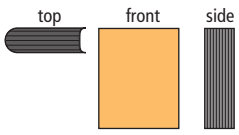
23. \$28.35

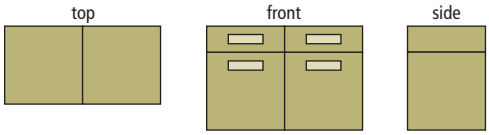
24. 18 000
25. $13.54
26. a) 800 **b)** 196

Chapter 5

5.1 Views of Three-Dimensional Objects, pages 168–169

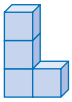
3. a)


b)


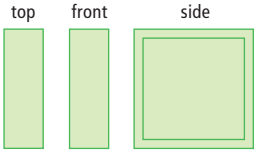
c)


4. top view: D; front view: A; side view: B

5. a)

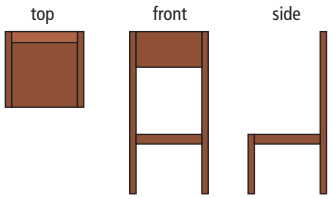

b)


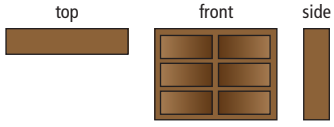
6. The new front view is the same as the original side view. The new top view is the same as the original top, but rotated 90° counterclockwise.

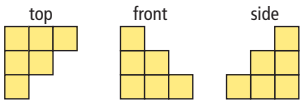


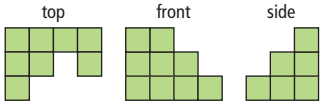
7. CD rack

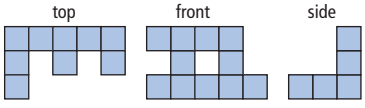
8. Answers may vary. Example: a chair and a bookcase:

Chair:


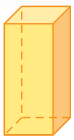
Bookcase:


9. a)


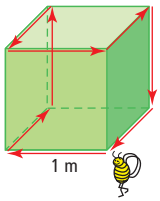
b)


c)


10. Answers may vary. Example: a cube and a square-based rectangular prism.

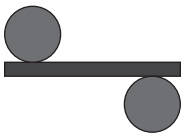


11. a) Answers may vary. Example:
b) 8 m



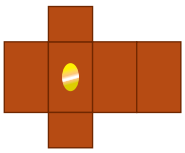
5.2 Nets of Three-Dimensional Objects, pages 173–175

3. a) Answers may vary. Example:

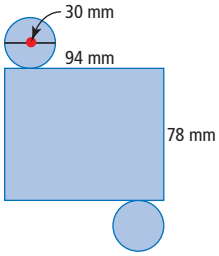


b) Answers may vary. Example:

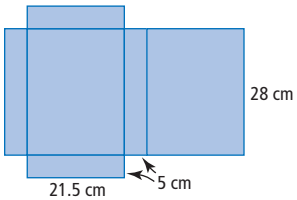
c) Answers may vary. Example:



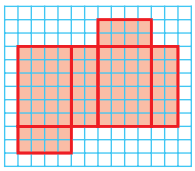
4. a) Answers may vary. Example:



b) Answers may vary. Example:



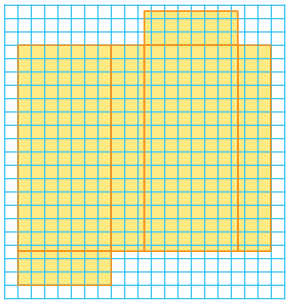
5. Answers may vary. Example:



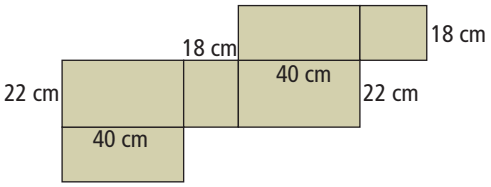
6. a) and **b)** triangular prism

7. rectangular prism: E; cylinder: B; triangular prism: C

8. Answers may vary. Example:

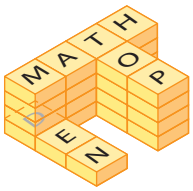


9. Answer may vary. Example:



10. a) and **b)** Both nets form the same triangular prism.

11. a) Answers may vary. Example:

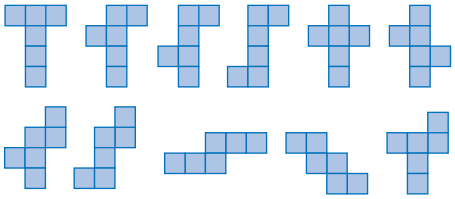


b) Answers may vary. Example:

M	A	T	H
E		O	
N		P	

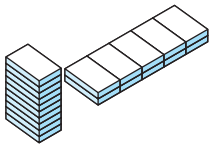
12. a) yellow **b)** green **c)** brown

13. There are 11 possible nets:



5.3 Surface Area of a Prism, pages 180–181

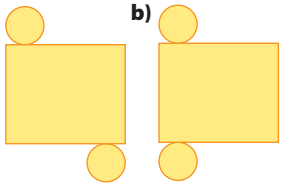
3. 819.5 cm^2
4. 397.0 cm^2
5. 7.7 m^2
6. 106.7 cm^2
7. 94 mm^2
8. a) 4 **b)** 6.36 m^2
9. Answers may vary. Example: 115 700 mm^2 (book cover of length 26 cm, width 21 cm, and thickness 2.5 cm)
10. 9.96 m^2
11. 70 m^2
12. The triangular prism would require less wrapping paper because its surface area of 770 cm^2 is less than the surface area of 1000 cm^2 of the rectangular prism.
13. 266 pans
14. a) 9 cm × 13.0 cm × 8.5 cm
b) Yes, these two sets of dimensions are possible: 9 cm × 6.5 cm × 17 cm and 9 cm × 32.5 cm × 3.4 cm.



15. a) 1 : 4 **b)** The ratio of the old surface area to the new surface area is 1 : 9. Yes, there is a pattern. The surface area is increased by a factor equal to the square of the multiplier of the edge length.
16. a) one 4-L can and two 1-L cans of wall paint plus one 4-L can of ceiling paint **b)** Answer may vary. Example: The paint costs $73.88. At a tax rate of 12% (GST and PST), the total cost would be $82.75.

5.4 Surface Area of a Cylinder, pages 186–187

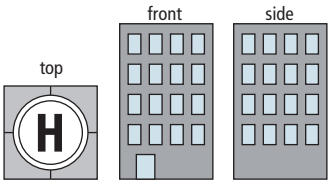
3. Answers may vary. Example:
a) **b)**



4. a) 736.3 cm^2 **b)** 2009.6 cm^2
5. a) 135.4 cm^2 **b)** 0.2 m^2
6. a) 88.31 cm^2 **b)** 149.15 cm^2
7. Answers may vary. Example: Use a formula. It is quicker, and you are less likely to miss part of the calculation.
8. 5604.9 cm^2
9. The 85-cm long container required more plastic. Its surface area of 3125.87 cm^2 is greater than the surface area of 2758.49 cm^2 of the other container.
10. 345.4 cm^2
11. 538.51 cm^2
12. 3228.31 mm^2
13. a) length: 251.2 cm; width: 21 cm **b)** 5275.2 cm^2

Chapter Review, pages 188–189

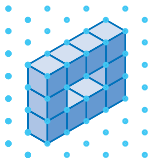
1. net
2. surface area
3. right prism
4. cylinder
5. triangular prism
6. rectangular prism
7. a) Answers may vary. Example:



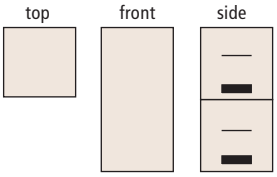
b) Answers may vary. Example:

8. a) Answers may vary. Example:

b) Answers may vary. Example:

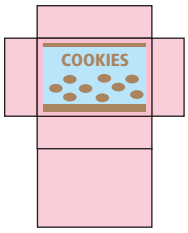


9. a) The new front view will be the same as the original side view. The new side view will be the same as the original front view. The new top view will be a 90° turn of the original top view.
b)

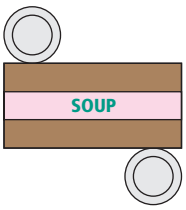


10. a) cylinder **b)** triangular prism **c)** rectangular prism

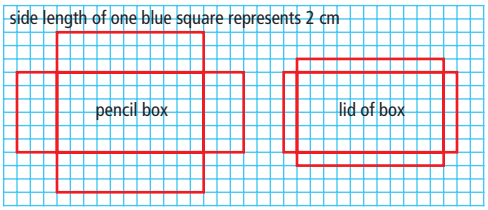
11. a) Answers may vary. Example:



b) Answers may vary. Example:



12. Answers may vary. Example:



13. a) 864 cm^2 **b)** 10.5 m^2

14. 3648 mm^2

15. a) 144 cm^2 **b)** 3865 cm^2

16. 5309 cm^2

17. 125.6 m^2

18. 92.9 cm^2

19. 19 939 cm^2

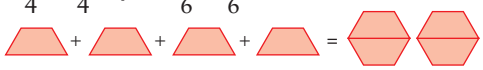
Chapter 6

6.1 Multiplying a Fraction and a Whole Number, pages 202–203

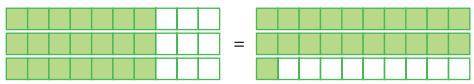
4. a) $4 \times \frac{1}{3} = \frac{4}{3}$ **b)** $3 \times \frac{2}{5} = \frac{6}{5}$

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

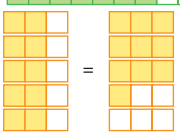
6. a) 2;



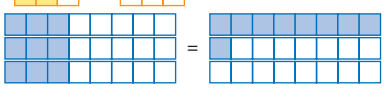
b) $\frac{21}{10}$;



c) $\frac{10}{3}$;



d) $\frac{9}{8}$;



7. a) $\frac{3}{8}$ **b)** $\frac{6}{4}$ **c)** $\frac{12}{5}$ **d)** $\frac{8}{3}$

8. $4 \times \frac{1}{2} = 2$; The width of the flag is 2 m.

9. $12 \times \frac{3}{4} = 9$; There are nine people on the minibus.

10. a) $\frac{1}{6}$ **b)** $6 \times \frac{1}{6} = 1$; The area of each face is 1 cm^2.

11. $12 \times \frac{5}{6} = 10$; Asma's car uses only 10 L of gasoline per 100 km.

12. $10\,000\,000 \times \frac{1}{5} = 2\,000\,000$; Nunavut is about 2 000 000 km^2.

13. a) 5; Example: Divide the previous product by two to continue the pattern. **b)** Answer may vary. Example: $9 \times 9 = 81$, $3 \times 9 = 27$, $1 \times 9 = 9$, $\frac{1}{3} \times 9 = 3$

14. Answers may vary. Example: Jane spends $\frac{1}{4}$ of her allowance on books. If Jane's allowance is \$8 each week, how much does she spend on books? Answer: $\frac{1}{4} \times 8 = 2$; She spends \$2 each week on books.

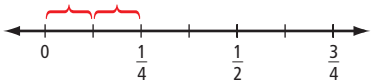
15. $30 \times \frac{4}{5} = 24$; Twenty-four students have brown eyes.

16. $15 \times \frac{1}{5} = 3$; The shortest side measures 3 cm. $15 - 3 = 12$, $12 \div 2 = 6$; The other two sides measure 6 cm each.

17. 341 cm

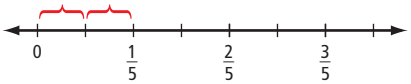
6.2 Dividing a Fraction by a Whole Number, pages 208–209

4. a) $\frac{1}{4} \div 2 = \frac{1}{8}$;

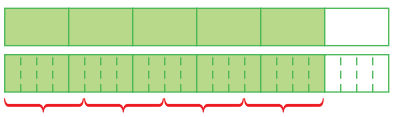


b) $\frac{1}{3} \div 3 = \frac{1}{9}$;

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



d) $\frac{5}{6} \div 4 = \frac{5}{24}$;



5. a) $\frac{3}{10}$ **b)** $\frac{1}{15}$ **c)** $\frac{1}{8}$ **d)** $\frac{1}{9}$

6. a) A serving of dhopa requires $\frac{1}{4}$ of a coconut.

b) A serving of molee curry requires $\frac{1}{8}$ of a coconut.

7. Each student gets $\frac{1}{6}$ of a full pitcher.

8. Each of these provinces represents $\frac{1}{15}$ of the area of Canada.

9. a) She averages $\frac{1}{12}$ of an hour per lap. **b)** 5 min

10. He averages $\frac{1}{15}$ of a tank per round trip.

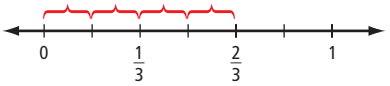
11. Vancouver has frost on about $\frac{3}{20}$ of the days in a year.

12. It takes $\frac{2}{5}$ of a roll to wrap three packages.

13. Answers may vary. Example: Ryan divides three quarters of a watermelon among himself and five friends. What fraction of the watermelon does each person receive? Answer: $\frac{1}{8}$

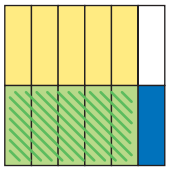
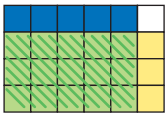
14. $\frac{8}{15}$, $\frac{10}{15}$ or $\frac{2}{3}$

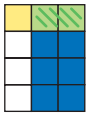
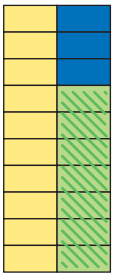
15. a)



b) Answers may vary. Example: The number line shows that there would be four sections of $\frac{1}{6}$.

6.3 Multiplying Proper Fractions, pages 214–215

3. a)  $\frac{5}{12}$ **b)**  $\frac{15}{24}$ or $\frac{5}{8}$

4. a)  $\frac{2}{12}$ or $\frac{1}{6}$ **b)**  $\frac{7}{20}$

5. a) Estimates will vary. Example: $\frac{1}{4}$; Answer: $\frac{1}{4}$

b) Estimates will vary. Example: 0; Answer: $\frac{3}{42}$ or $\frac{1}{14}$

c) Estimates will vary. Example: $\frac{1}{2}$; Answer: $\frac{9}{16}$

6. a) Estimates will vary. Example: $\frac{1}{2}$; Answer: $\frac{8}{25}$

b) Estimates will vary. Example: 1; Answer: $\frac{7}{10}$

c) Estimates will vary. Example: $\frac{1}{4}$; Answer: $\frac{12}{36}$ or $\frac{1}{3}$

7. $\frac{1}{8}$ of a pie

8. a) $\frac{1}{12}$ **b)** 2 h

9. approximately $\frac{1}{200}$

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

11. a) $\frac{1}{3}$ **b)** 28

12. Answers may vary. Example: A bottle is $\frac{3}{4}$ full of juice. If Karen drinks $\frac{1}{2}$ of the juice in the bottle, what fraction of a full bottle did she drink? Answer: $\frac{3}{8}$

13. $\frac{6}{52}$ or $\frac{3}{26}$

14. a) $\frac{1}{8}$ **b)** $\frac{1}{15}$ **c)** $\frac{1}{8}$ **d)** $\frac{7}{32}$

15. a) $\frac{5}{8}$ **b)** $\frac{7}{9}$ **c)** $\frac{3}{4}$ **d)** $\frac{5}{6}$

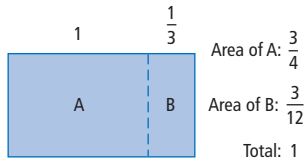
16. a) $\frac{1}{4}$ and $\frac{1}{4}$ **b)** $\frac{1}{3}$ and $\frac{1}{2}$ **c)** $\frac{1}{6}$ and $\frac{1}{2}$

6.4 Multiplying Improper Fractions and Mixed Numbers, pages 220–221

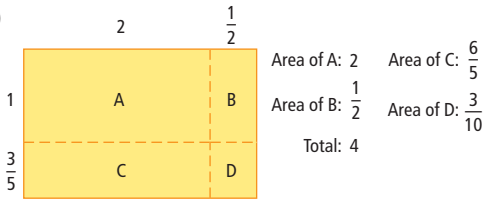
4. a) $3\frac{2}{3}$ **b)** $2\frac{5}{6}$ **c)** $12\frac{1}{2}$ **d)** $1\frac{3}{5}$

5. a) $\frac{19}{4}$ **b)** $\frac{23}{8}$ **c)** $\frac{19}{3}$ **d)** $\frac{25}{7}$

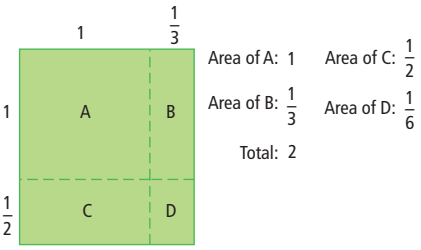
6. a)



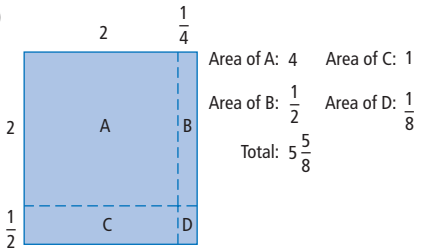
b)



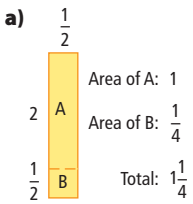
c)



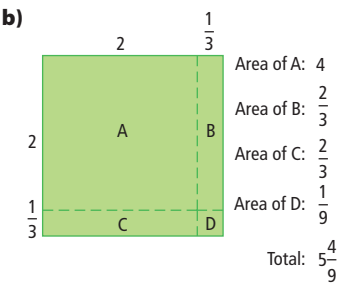
d)



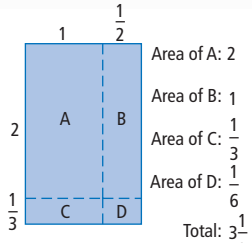
7. a)



b)

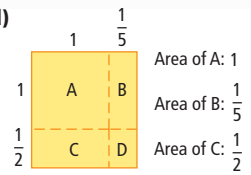


c)



Area of A: 2
Area of B: 1
Area of C: $\frac{1}{3}$
Area of D: $\frac{1}{6}$
Total: $3\frac{1}{2}$

d)



Area of A: 1
Area of B: $\frac{1}{5}$
Area of C: $\frac{1}{2}$
Area of D: $\frac{1}{10}$
Total: $1\frac{4}{5}$

8. a) Estimates may vary. Example: 1; Answer: $1\frac{1}{7}$

b) Estimates may vary. Example: 20; Answer: $18\frac{3}{4}$

c) Estimates may vary. Example: 4; Answer: $3\frac{2}{3}$

9. a) Estimates may vary. Example: 4; Answer: $4\frac{8}{9}$

b) Estimates may vary. Example: 12; Answer: $11\frac{1}{3}$

c) Estimates may vary. Example: 24; Answer: $22\frac{3}{4}$

10. $7\frac{1}{2}$ laps

11. 54 h

12. $3\frac{1}{2}$ h

13. a) $\frac{5}{8}$ h **b)** $37\frac{1}{2}$ min

14. $4\frac{3}{8}$ times as much as the den

15. $96 altogether

16. $1.75

17. Answers may vary. Example: The product is smaller than the mixed fraction. The product is larger than the proper fraction.

18. Answers may vary. Example: It took Mary $3\frac{1}{3}$ h to finish her project. Roger spent $1\frac{1}{2}$ times as long as Mary to complete his project. How many hours did it take Roger to complete his project? Answer: 5 h

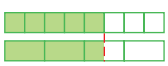
19. a) If each fraction is changed to its improper fraction form, the numerator is 13, and the denominator is twice the denominator of the previous term; $\frac{13}{48}$, $\frac{13}{96}$, $\frac{13}{192}$

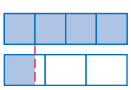
b) Each term is multiplied by $\frac{3}{2}$ to get the next term; $20\frac{1}{4}$, $30\frac{3}{8}$, $45\frac{9}{16}$

20. a) 15 **b)** 10 **c)** $12\frac{5}{6}$ **d)** $3\frac{11}{15}$

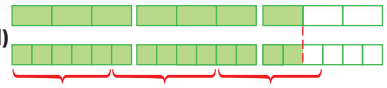
21. a) $1\frac{1}{2}$ **b)** $1\frac{1}{5}$ **c)** $2\frac{1}{2}$ **d)** $2\frac{1}{2}$

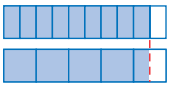
6.5 Dividing Fractions and Mixed Numbers, pages 227–229

5. a)  $\frac{5}{8} \div \frac{1}{4} = 2\frac{1}{2}$

b)  $\frac{1}{4} \div \frac{1}{3} = \frac{3}{4}$

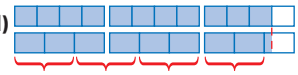
c)  $1\frac{1}{2} \div \frac{2}{3} = 2\frac{1}{4}$

d)  $2\frac{1}{3} \div \frac{5}{6} = 2\frac{4}{5}$

6. a)  $\frac{9}{10} \div \frac{1}{5} = 4\frac{1}{2}$

b)  $\frac{1}{4} \div \frac{3}{8} = \frac{2}{3}$

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

d)  $2\frac{3}{4} \div \frac{2}{3} = 4\frac{1}{8}$

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

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

9. a) $\frac{15}{16}$ **b)** $\frac{10}{17}$ **c)** 16

10. a) $\frac{13}{30}$ **b)** $\frac{10}{11}$ **c)** $\frac{1}{2}$

11. 8 performers

12. 6 cakes

13. 8 glasses

14. $\frac{2}{9}$ as much energy

15. $1\frac{5}{6}$ as much paint

16. $2\frac{1}{2}$ times as big as South America

17. 20 km/h

18. a) No. Answers may vary. Example: The reciprocal of $\frac{5}{6}$ is $\frac{6}{5}$. **b)** No. Answers may vary. Example: $\frac{9}{10} \times \frac{5}{6} = \frac{45}{60}$ **c)** Yes. Answers may vary. Example: $\frac{9}{10} \div \frac{5}{6} = 1\frac{2}{25}$

19. a) 4200 km **b)** 2000 km

20. $\frac{1}{50}$ of the Earth's surface

21. a) 8; The quotient is doubled each time the divisor is halved.

b) $9 \div 9 = 1$, $9 \div 3 = 3$, $9 \div 1 = 9$, $9 \div \frac{1}{3} = 27$

22. Answers may vary. Example: Mac can ride his scooter to his grandmother's house in $3\frac{3}{4}$ h. If he takes the bus, he can make the trip in $2\frac{1}{4}$ h. How many times longer does it take him to ride his scooter than it takes him to ride the bus? Answer: It takes Mac $1\frac{2}{3}$ times longer to ride his scooter.

23. $4\frac{1}{3}$ times as fast

24. $\frac{35}{39}$ of the area of Ellesmere Island

6.6 Applying Fraction Operations, pages 234–235

4. a) $\frac{5}{12}$ **b)** 4 **c)** $4\frac{3}{4}$

5. a) $\frac{9}{14}$ **b)** $2\frac{1}{2}$ **c)** $7\frac{7}{11}$

6. a) \$584 **b)** \$656 **c)** \$728 **d)** \$620

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

8. a) $\frac{3}{16}$ **b)** $\frac{1}{8}$

9. $\left(1 - \frac{5}{7}\right) \times 28 = 8$; $\frac{5}{7} \times 28 = 20$, $28 - 20 = 8$

10. a) 105 g **b)** 150 g **c)** 125 g

11. a) $4\frac{1}{4}$ pages **b)** \$1050 **c)** approximately \$247.06

12. \$40

13. a) $\frac{5}{2} \times \left(\frac{3}{5} - \frac{2}{5}\right) + \frac{1}{2} = 1$ **b)** $1\frac{1}{2} + 2\frac{1}{2} \div \left(\frac{3}{4} - \frac{1}{8}\right)$

c) $\left(\frac{2}{3} - \frac{1}{6} + \frac{5}{6}\right) \div \frac{16}{9} = \frac{3}{4}$

14. Answers may vary. Example: **a)** $\frac{1}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{1}{2}$

b) $\frac{1}{2} + \frac{1}{2} \div \frac{1}{2} - \frac{1}{2}$ **c)** $\left(\frac{1}{2} + \frac{1}{2}\right) \times \frac{1}{2} \times \frac{1}{2}$ **d)** $\left(\frac{1}{2} + \frac{1}{2} + \frac{1}{2}\right) \div \frac{1}{2}$

e) $\frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2}$ **f)** $\frac{1}{2} \div \frac{1}{2} \div \frac{1}{2} \div \frac{1}{2}$ **g)** $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2}$

h) $\left(\frac{1}{2} + \frac{1}{2}\right) + \left(\frac{1}{2} \times \frac{1}{2}\right)$ **i)** $\left(\frac{1}{2} + \frac{1}{2}\right) \div \frac{1}{2} + \frac{1}{2}$

15. $\frac{13}{12}$

16. There are 36 black notes and 52 white notes.

17. The racks hold 128, 64, and 32 CDs.

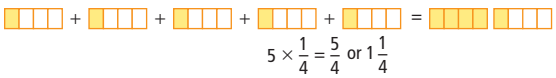
Chapter Review, pages 236–237

1. B **2.** C **3.** A

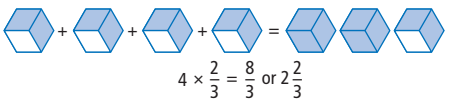
4. a) reciprocal **b)** Answer may vary. Example: The multiplier of a number to give a product of 1.

5. order of operations

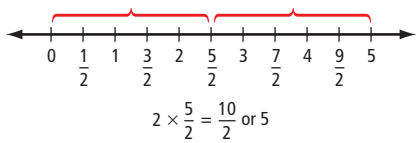
6. Answer may vary. Example: **a)**



b)



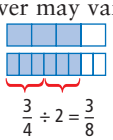
c)



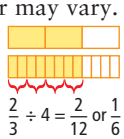
7. 9 kg

8. 4 cm

9. a) Answer may vary. Example:



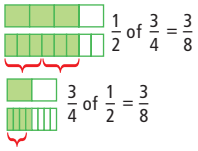
b) Answer may vary. Example:



10. $\frac{1}{12}$ of an onion

11. $\frac{3}{40}$ of the days of the year

12.



13. a) Estimates will vary. Example: $\frac{1}{4}$; Answer: $\frac{9}{25}$

b) Estimates will vary. Example: $\frac{1}{2}$; Answer: $\frac{1}{3}$

c) Estimates will vary. Example: 0; Answer: $\frac{1}{14}$

14. $\frac{1}{5}$ of the class

15. a) Estimates will vary. Example: 3; Answer: $\frac{48}{15}$ or $3\frac{1}{5}$

b) Estimates will vary. Example: 4; Answer: $\frac{49}{12}$ or $4\frac{1}{12}$

c) Estimates will vary. Example: 8; Answer: $\frac{19}{2}$ or $9\frac{1}{2}$

16. 1330 km

17. 84 h

18. approximately 44 cm

19. a) He multiplied the two numbers rather than dividing them. **b)** $\frac{2}{9}$

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

21. 30 days

22. $7\frac{1}{2}$ h

23. $1\frac{1}{2}$ times as long

24. a) $\frac{7}{8}$ **b)** $1\frac{4}{5}$

25. $3\frac{1}{2} \div \frac{1}{4} = 14$; $16 \times \frac{1}{4} = 4$; He only has enough pasta to cook 14 dinners. He would need four full packages of pasta to cook 16 dinners.

26. $\frac{1}{2}$ full

27. 6 m

Chapter 7

7.1 Understanding Volume, pages 250–253

3. a) 60 cm^3 **b)** 216 cm^3 **c)** 1920 cm^3

4. a) 96 cm^3 **b)** 72 cm^3 **c)** 126 cm^3

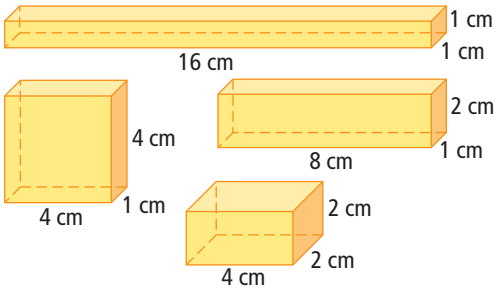
5. a) 60 cm^3; 60 cm^3 **b)** 960 cm^3; 960 cm^3

6. a) 153 cm^3; 153 cm^3 **b)** 375 cm^3; 375 cm^3

7. a) 4 cm **b)** 7 cm **c)** 4 cm

8. 75 cm^3

9. There are four ways to build a rectangular prism from 16 centimetre cubes.



Changing the orientation of each figure does not form a new figure.

Length (cm)	Width (cm)	Height (cm)	Volume (cm^3)
16	1	1	16
4	4	1	16
2	8	1	16
2	2	4	16

10. 125 000 cm^3
11. 93.6 cm^3
12. 0.1875 m
13. a) 1 687 500 cm^3 **b)** 1687.5 L
14. 24 530 m^3
15. 1.6%
16. a) Structure 1: 10 cubes; Structure 2: 14 cubes; Structure 3: 15 cubes **b)** Structure 1: 17 cubes; Structure 2: 22 cubes; Structure 3: 30 cubes
c) Structure 1: 27 cubes; Structure 2 : 36 cubes; Structure 3: 45 cubes **d)** volume of Structure 1: 216 cm^3, volume of Structure 2: 288 cm^3, volume of Structure 3: 360 cm^3
17. level of water in the tank: 15.25 cm
18. a) volume of cube to vo1ume of box = 1 to 8 **b)** area of base of cube to area of base of box = 1 to 4 **c)** height of cube to height of box = 1 to 2 **d)** When the side length of a cube is doubled, the area of the base is four times as large and the volume of the cube is eight times as large.

7.2 Volume of a Prism, pages 258–261

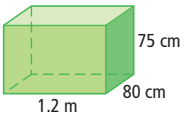
4. a) 15 m^3 **b)** 792 m^3 **c)** 49.6 m^3
5. a) 40 m^3 **b)** 504 cm^3 **c)** 213.759 mm^3 **d)** 253.952 cm^3
6. a) 1000 cm^3 **b)** 27 cm^3 **c)** 15.625 cm^3
7. a) 294 cm^3 **b)** 133.65 m^3 **c)** 13 440 000 mm^3
8. a) 84 m^3 **b)** 1200 cm^3 **c)** 514.15 mm^3
9. a) 200 cm^3 **b)** 320.625 cm^3 **c)** 5 460 000 mm^3
10. a) 200 cm^3 **b)** 84 cm^3 **c)** 1800 cm^3
11.

Length (cm)	Width (cm)	Height (cm)	Volume (cm^3)
7	2	5	70
12	9	10	1080
16	15	5	1200

12.

Base (cm)	Height of Triangle (cm)	Height of Prism (cm)	Volume (cm^3)
7	2	10	70
18	12	10	1080
20	14	5	700

13. The landscaper does not have enough gravel. She needs 0.728 $m^3$of gravel and has 0.5 m^3 of gravel. She will need 0.228 m^3 more gravel.
14. 4800 cm^3
15. 18 m^3
16. 460 800 cm^3



17. 40 trips
18. a) No. There is no whole number that can be cubed that will equal 18. **b)** Suki would need 27 cubes to make a 3 × 3 × 3 cube.
19. volume of cube: 343 cm^3 ; volume of rectangular prism: 360 cm^3; volume of triangular prism: 367.5 cm^3. Harvey the guppy will have the most water in the triangular prism.
20. 562.5 cm^3
21. 16 rectangular prisms with the dimensions shown in the table can be sketched.

Length (cm)	Width (cm)	Height (cm)
1	1	120
2	60	1
3	40	1
4	30	1
5	24	1
6	20	1
8	15	1
10	12	1
2	2	30
2	3	20
4	2	15
5	2	12
2	6	10
6	4	5
8	3	5
4	10	3

22. maximum volume of cement: 16.59 m^3, assuming the tank is 1 m high
23. Both prisms have the same volume.
24. a) depth of water: 0.8 m **b)** water left after 2.5 h: 810 m^3; new depth of water: 0.675 m **c)** length of time: 12 h

7.3 Volume of a Cylinder, pages 265–267

4. a) 1805.5 cm^3 **b)** 7385.28 cm^3 **c)** 1.1775 m^3
5. a) 628 cm^3 **b)** 4179.34 cm^3 **c)** 9.87844 m^3
d) 1589.625 cm^3
6. a) 1570 cm^3 **b)** 0.785 m^3 **c)** 1907.55 cm^3
7. a) 602.88 cm^3 **b)** 21.98 m^3 **c)** 4239 cm^3 **d)** 309.976875 m^3
8. 3 cm

9. 3234.9065 cm^3
10. a) P6 Truss solar array; volume: 6578.82438 m^3.
b) Estimate of the total volume is 7000 m^3. Total volume: 7209.078115 m^3
11. 3.925 m^3
12. Martha should buy the "Popcorn Lover's' container because it has a larger volume. The volume of the "Jumbo" popcorn container is 12 560 cm^3. The volume of the "Popcorn Lover's" container is 14 130 cm^3.
13. 5 m^3
14. 251.2 m^3
15. a) The volume of the cylinder is four times as large. The volume of the cylinder is calculated using the formula $V = (\pi \times r^2) \times h$. If the radius is doubled, the formula will be $V = (\pi \times (2r)^2) \times h$
$V = (\pi \times 4r^2) \times h$
$V = 4(\pi \times r^2) \times h$
b) The volume of the cylinder is twice as large. The volume of the cylinder is calculated using the formula $V = (\pi \times r^2) \times h$. If the height is doubled, the formula will be $V = (\pi \times r^2) \times 2h$
$V = 2(\pi \times r^2) \times h$
16. 1695.6 cm^3; Assume that one quarter of the block of cheese was cut away.
17. a) 1.884 m^3 **b)** 0.4 m^3 **c)** 0.628 m^3
18. 7 h

7.4 Solving Problems Involving Prisms and Cylinders, pages 273–275

3. a) To build a giant prism with a triangular base of length 5.6 m and height 6.8 m requires four prisms on the bottom layer. 4 + 3 + 3 + 2 + 2 + 1 + 1 = 16
The artist would need 16 small prisms to build the large prism. With 20 prisms, he has enough. **b)** 22.47 m^3
4. 46.9 cm
5. 2.826 m^3
6. 2.0 cm^3
7. 48 937.5 cm^3
8. One crate will be enough. The volume of the crate is 63 m^3 and the volume of the 25 000 boxes is 50 m^3.
9. All of the files will fit in the carton. The volume of the carton is 72 000 000 cm^3 and the volume of 9000 boxes is 70 200 000 cm^3.
10. a) 372 875 cm^3 **b)** 1 864 375 cm^3 **c)** To reach this goal the garbage can should be 0.5 full on each lunch hour on each of the five school days.
11. 60 cm
12. 91 pails
13. 27 prisms
14. $12.78 per jar
15. a) 1300 cm^3 **b)** You can check your calculations by dividing the shape into a different set of rectangular prisms.
16. a) 203 472 cm^3 **b)** 13 200 cm^3 **c)** 15.4 pails
17. Answers may vary. Example: Rolling the cylinder so that the circumference is 28 cm and the height is 22 cm will produce the larger volume. The cylinder with a circumference of 22 cm and a height of 28 cm has a volume of 1077 cm^3. The cylinder with a circumference of 28 cm and a height of 22 cm has a volume of 1373 cm^3.
18. 5 cm
19. 6280 cm^3
20. 2.5 m
21. a) 149 250 m^3 **b)** 4 h and 9 min

Chapter Review, pages 276–277

1. B **2.** D **3.** A **4.** C
5. a) 84 cm^3 **b)** 14 080 cm^3 **c)** 81 cm^3
6. a) 24 cm^3 **b)** 40 cm^3 **c)** 150 cm^3
7. 196 cm^3
8. a) 168 cm^3 **b)** 2250 cm^3
9. a) 1000 cm^3 **b)** 614.125 cm^3
10. a) 120 cm^3 **b)** 70 cm^3
11. a) 100 cm^3 **b)** 14 400 mm^3
12. 0.6 m^3
13. a) 55 080 m^3 **b)** 1311.4 truck loads **c)** 11 days
14. a) 125 600 cm^3 **b)** 327 910.2 m^3
15. a) 2317.32 cm^3 **c)** 4578.12 cm^3
16. 141.3 m^3
17. 76.93 m^3 or 77 m^3
18. 301.3 mm^3
19. 8.79 m
20. a) volume of water: 0.9375 m^3
b) length of time: 1 min 34 s

Chapter 8

8.1 Exploring Integer Multiplication, pages 291–292

5. a) $(+5) \times (+1)$ **b)** $(+2) \times (-6)$
6. a) $(+3) \times (+7)$ **b)** $(+4) \times (-4)$
7. a) $(+8) + (+8) + (+8)$
b) $(-6) + (-6) + (-6) + (-6) + (-6)$
8. a) $(+2) + (+2) + (+2) + (+2) + (+2) + (+2)$
b) $(-9) + (-9) + (-9) + (-9)$
9. a) $(+2) \times (+4)$ **b)** $(+4) \times (-2)$
10. a) $(+7) \times (+2)$ **b)** $(+6) \times (-1)$
11. a) $(-3) \times (-2)$ **b)** $(-3) \times (+3)$
12. a) $(-1) \times (+7)$ **b)** $(-2) \times (-5)$
13. a) $(+4) \times (+6) = 24$ **b)** $(+7) \times (-2) = -14$
c) $(-1) \times (+5) = -5$ **d)** $(-8) \times (-2) = 16$
14. a) $(+6) \times (+2) = 12$; The temperature increased 12 °C in 6 h. **b)** $(+4) \times (+8) = 32$; Ayesha repaid a total of $32.
15. $(+12) \times (-3) = -36$; The aircraft descends 36 m.
16. a) 40 m **b)** 12 m
17. 16 m
18. No. Doubling a negative integer results in an integer of lesser value.
19. a) 3 **b)** Yes; −6 **c)** The easiest solution is to multiply each integer in part a) by −4. Many other solutions are possible. Example:

−4	−22	14
−4	4	−12
−4	6	−14

20. Many solutions are possible. Example:

a)

1	1	−1
1	−1	1
−1	1	1

b)

1	−1	1
−1	−1	−1
1	−1	1

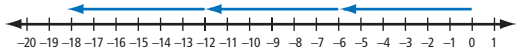
8.2 Multiplying Integers, pages 297–298

4. a) (+2) × (+4) **b)** (+3) × (−5)

5. a) (+2) × (−6) **b)** (+4) × (+4)

6. a) 

; 25

b) 

; −18

7. a) −28 **b)** +18

8. a) 40 **b)** −30 **c)** −35 **d)** 32

9. a) 36 **b)** 54 **c)** −24 **d)** 0

10. Estimates may vary. **a)** −408 **b)** 814 **c)** −1080 **d)** 1316

11. Estimates may vary. **a)** 252 **b)** −1326 **c)** 1188 **d)** 3025

12. $180

13. 1500 m

14. a) The first week, the value of her shares dropped by 4500¢ or $45.00. **b)** The second week, the value of her shares rose by 6375¢ or $63.75. **c)** Over the two-week period her shares rose by 1875¢ or $18.75.

15. 2400 m

16. −23 and −18

17. The least product is (+99) × (−82). The first two products have factors with like signs. Therefore, only the third product is negative.

18. Answers may vary. Example: **a)** Explain to your friend that the products are decreasing by five. So, as the pattern continues, the missing numbers are −5, −10, −15, and so on. **b)** Change the order of the factors to (+6) × (−2). Then, use the following pattern: (+6) × (+3) = 18, (+6) × (+2) = 12, (+6) × (+1) = 6, (+6) × 0 = 0, (+6) × (−1) = −6, (+6) × (−2) = −12.

19. a) Yes; (+2) × (+2) = 4 and (−2) × (−2) = 4. **b)** No. Since −4 is negative, the two factors must have opposite signs. Therefore, these factors cannot be equal.

20. a) (+6) × (+3) = +18 **b)** (+5) × (−2) = −10 **c)** (−4) × (+3) = −12 **d)** (−4) × (−4) = +16

21. a) (−1) × (−10), (−2) × (−5), (+1) × (+10), (+2) × (+5), (−10) × (−1), (−5) × (−2), (+10) × (+1), (+5) × (+2) **b)** (−1) × (+16), (+16) × (−1), (+1) × (−16), (−16) × (+1), (+2) × (−8), (−8) × (+2), (−2) × (+8), (+8) × (−2), (+4) × (−4), (−4) × (+4) **c)** (+1) × (−24), (−1) × (+24), (+2) × (−12), (−2) × (+12), (+3) × (−8), (−3) × (+8), (+4) × (−6), (−4) × (+6), (−24) × (+1), (+24) × (−1), (−12) × (+2), (+12) × (−2), (−8) × (+3), (+8) × (−3), (−6) × (+4), (+6) × (−4)

22. −9 and 4

23. Answers may vary. Example: The temperature dropped 6 °C/h over a 5-h period. What was the temperature at the end of the 5-h period if the original temperature was 0 °C?

24. Answers may vary. Example: A mine elevator descends at a rate of 2 m/s. How far would it descend in 5 min? Answer: (−2) × (+5) × (+60) = −600. The elevator would descend 600 m.

25. Descriptions may vary. Example: **a)** Each number is the previous number multiplied by 3. The next three numbers are 81, 243, and 729. **b)** Each number is the previous number multiplied by −2. The next three numbers are −16, +32, and −64. **c)** Each number is the previous number multiplied by 2. The next three numbers are −32, −64, and −128. **d)** Each number is the previous number multiplied by −4. The next three numbers are 512, −2048, and 8192.

26. a) One of the integers is 1. **b)** One of the integers is −1. **c)** The two integers have different signs, and neither integer is a 1, 0, or −1. **d)** Both integers are less than −1 or both integers are greater than +1.

27. a) −1, 0, 1 **b)** −2, −1, 0, 1, 2 **c)** No. Explanations may vary. Example: The sum of consecutive integers is zero only if the integers include zero and pairs of integers with opposite signs. Therefore, the number of integers must be odd.

28. a) −216 **b)** Yes; −1728 **c)** No.

29. a) The product of an even number of positive integers is positive. **b)** The product of an odd number of positive integers is positive. **c)** The product of an even number of negative integers is positive. **d)** The product of an odd number of negative numbers is negative.

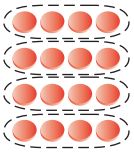
8.3 Exploring Integer Division, pages 304–305

3. a) (+10) ÷ (+2) = +5 **b)** (−16) ÷ (−4) = +4 **c)** (−14) ÷ (+2) = −7

4. a) (−4) ÷ (−2) = +2 **b)** (+9) ÷ (+3) = +3 **c)** (−12) ÷ (+6) = −2

5. a) (+14) ÷ (+2) = +7; (+14) ÷ (+7) = +2 **b)** (−10) ÷ (−2) = +5; (−10) ÷ (+5) = −2

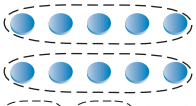
6. a) (+15) ÷ (+5) = +3; (+15) ÷ (+3) = +5 **b)** (−18) ÷ (−9) = +2; (−18) ÷ (+2) = −9

7. a)  (+16) ÷ (+4) = +4

b)  (−7) ÷ (+7) = −1

c)  (−12) ÷ (−6) = +2

8. a)  (−20) ÷ (−10) = +2

b)  (−10) ÷ (+2) = −5

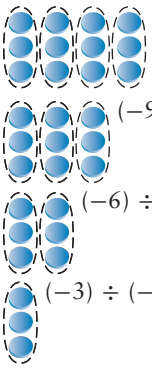
c)  (+4) ÷ (+2) = +2

9. 7 min

10. a) The temperature fell −18 °C **b)** −3 °C/ h; Assume that the rate of change was constant.

11. $2

12. a)



(−12) ÷ (−3) = +4

(−9) ÷ (−3) = +3

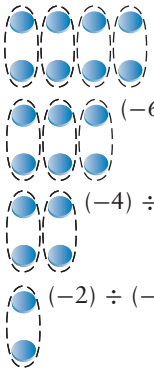
(−6) ÷ (−3) = +2

(−3) ÷ (−3) = +1

Descriptions may vary. Example: The quotients are decreasing consecutive integers starting with +4.

b) (+6) ÷ (−3) = −2

13. a)



(−8) ÷ (−2) = +4

(−6) ÷ (−2) = +3

(−4) ÷ (−2) = +2

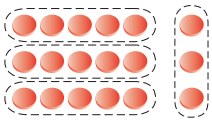
(−2) ÷ (−2) = +1

Descriptions may vary. Example: The quotients are decreasing consecutive integers starting with +4.

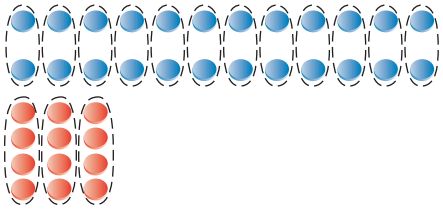
b) (+4) ÷ (−2) = (−2)

14. a) (−2000) ÷ (−500) = (+4) **b)** Answers may vary. Example: Let each chip represent 100 m. **c)** +4

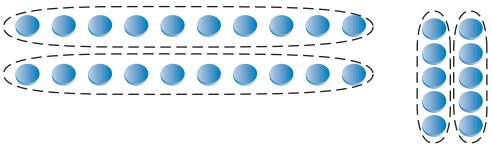
15. a) 15 positive chips are grounped by 5s into 3 groups. 3 positive chips are grouped by 3s into 1 group. Quotient is 1.



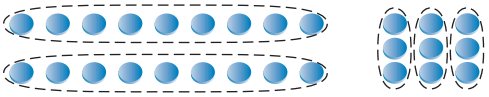
b) 24 negative chips are grouped by 2s into 12 groups. These 12 groups represent (−24) ÷ (−2) = 12. 12 positive chips are grouped by 4s into 3 groups. Quotient is 3.



c) 20 negative chips are separated into 2 groups of 10 chips. These 10 chips are grouped by 5s into 2 groups. Quotient is 2.



d) 18 negative chips are separated into 2 groups of 9 chips. These 9 chips are grouped by 3s into 3 groups. Quotient is −3.



16. In 3 h, the temperature will be −17 °C. Assume that the temperature continues to drop at the constant rate of 2 °C/h.

8.4 Dividing Integers, pages 310–311

5. a) (+18) ÷ (+9) = +2; (+18) ÷ (+2) = +9

b) (−12) ÷ (+3) = −4; (−12) ÷ (+4) = −3

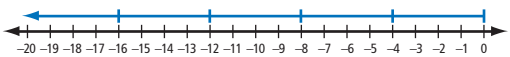
6. a) (−10) ÷ (+5) = −2; (−10) ÷ (−2) = +5

b) (+16) ÷ (+2) = +8; (+16) ÷ (+8) = +2

7. a)

The quotient is +2.

b)

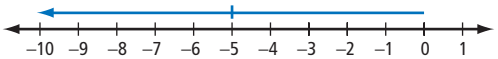


The quotient is +5.

c)

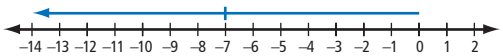
The quotient is −2.

d)



The quotient is +2.

8. a)

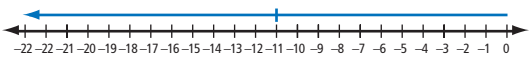


The quotient is +2.

b)

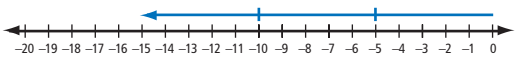
The quotient is +4.

c)



The quotient is −11.

d)



The quotient is +3.

9. a) +4; (+4) × (+5) = +20 **b)** −6; (−6) × (−6) = +36

c) −3; (−3) × (+19) = −57 **d)** +2; (+2) × (−42) = −84

10. a) +1 **b)** −19 **c)** 0 **d)** −4

11. 4 months

12. a) 6 m/min **b)** 8 m/min

13. 7

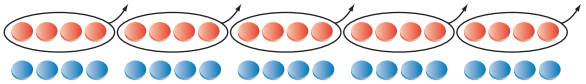
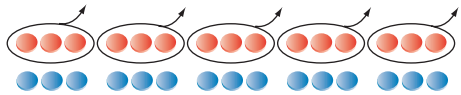
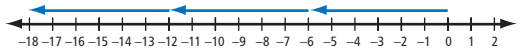
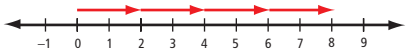
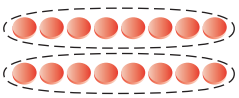
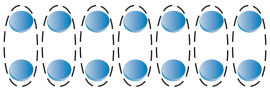
14. The drill cut through the floor at a rate of 3 cm/min. Assume that the cutting rate was constant.

15. $12
16. (+2408) ÷ (−43). In the first two expressions, the two integers have the same sign, so both these quotients are positive. In the third expression, the two integers have different signs, so the quotient is negative.
17. −16
18. a) (+72) ÷ (+8) = +9 **b)** (−120) ÷ (+12) = −10
c) (+143) ÷ (−13) = −11 **d)** (−84) ÷ (−14) = +6
19. A pump draws 80 L of water from a storage tank in 16 s. By how much does the volume of water in the tank change in 1 s?
20. Answers may vary. Example: Yvette borrows $80 from her brother and pays him back in 16 equal weekly payments. How much does she pay her brother each week?
21. a) Each number in the sequence is the previous number divided by 5. The next three terms are +200, +40, and +8. **b)** Each number in the sequence is the previous number divided by −2. The next three terms are −32, +16, and −8. **c)** Each number in the sequence is the previous number divided by 10. The next three numbers are −100, −10, and −1. **d)** Each number in the sequence is the previous number divided by −3. The next three numbers are +18, −6, and +2.
22. +30 and −10.

8.5 Applying Integer Operations, pages 315–317

4. a) +17 **b)** −11 **c)** +21
5. a) −3 **b)** 0 **c)** +4
6. a) 6 **b)** −14 **c)** −10
7. a) −32 **b)** 41 **c)** 3
8. −2 °C
9. a) a decrease of two subscribers per month **b)** 195
10. a decrease of 1000 people
11. −55
12. a) 12 strokes below par, or −12 **b)** 276
13. 90 °C
14. 12 weeks
15. 8 h
16. a) an increase of 50 m **b)** 10 m/min
17. 7:54 a.m.
18. a) $6000/month **b)** $12 000/month.
19. a) Rohana spent $150, saved $90, and still owes her sister $40. **b)** 4
20. a) 20 − 3 × (−8) = 44 **b)** 4 × 5 + (−2) × (−3) = 26
c) −62 ÷ (−11 + 9) = 31
d) [−3 + (−5)] × 3 ÷ (−4) − 13 = −7
21. a) 2 × 3 − 4 × 5 = −14 **b)** 3 × [14 + (−2)] − 30 = 6
22. −21 and −13
23. a) 130 **b)** 65%
24. Answers may vary. Example:
(−2) ÷ (−2) + (−2) ÷ (−2) = 2;
[−2 + (−2) + (−2)] ÷ (−2) = 3;
−2 × (−2) × (−2) ÷ (−2) = 4;
−2 × (−2) + (−2) ÷ (−2) = 5;
−2 − (−2) × (−2) × (−2) = 6;
−2 × (−2) + (−2) × (−2) = 8

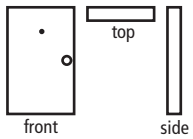
Chapter Review, pages 318–319

1. zero
2. the operation (subtraction) within the brackets
3. zero pair
4. a) (+2) × (−5) **b)** (−4) × (+2)
5. a)  The product is +9.
b) 
The product is −20.
c)  The product is +2.
d) 
The product is −15.
6. The sloth climbed down 18 m.
7. a) 
The product is −18.
b) 
The product is +8.
8. a) −56 **b)** 108
9. Estimates may vary. **a)** 770 **b)** −637
10. Possible answers are −3 and +33, +3 and −33, −9 and 11, 9 and −11, −1 and 99, and 1 and −99.
11. a) 5 × 52 **b)** $260
12. a) (+10) ÷ (+2) = +5; (+10) ÷ (+5) = +2
b) (−8) ÷ (−2) = +4; (−8) ÷ (+4) = −2
13. a)  The quotient is +2.
b)  The quotient is +7.
c)  The quotient is −1.
14. Answers may vary. Example: The value of a share of Orange Computers Limited fell $14 in 7 h. How much did the value fall per hour if the rate of fall was constant?
15. 
The quotient is +6.
16. (−247) ÷ (−13). The quotient of two integers with the same sign is positive. The quotient of two integers with different signs is negative. Therefore, only (−247) ÷ (−13) is positive.
17. a) +3 **b)** −8 **c)** −17 **d)** +8
18. Answers may vary. Example: The two integers are identical except for having different signs.
19. $18
20. a) −6 **b)** 4

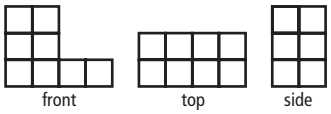
21. a) −7 **b)** No. Different sets of integers can have the same mean. Example: {−20, −16, 18, −25, 22, −21} and {−62, 9, −2, 1, 6, 6} both have a sum of −42 and a mean of −7.
22. a decrease of 2341 people per year
23. 70 s
24. $570

Chapters 5–8 Review, pages 324–326

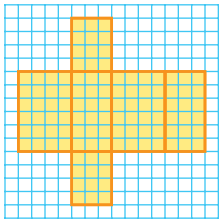
1. a)



b)



2.



3. 150.4 cm²
4. a) area with bottom: 8.25 m²
b) area without bottom: 5.73 m²
5. 83 m²
6. 187.68 cm²
7. cylinder A: about 14 130 cm²; cylinder B: about 39 564 cm²
8. a) 21 days **b)** 14 days
9. $\frac{1}{10}$ of a cake
10. $\frac{1}{2}$ of the lifespan of a bison
11. $\frac{1}{3}$ of Earth's surface
12. 54 cm
13. a) $1\frac{2}{5}$ **b)** $\frac{5}{7}$
14. winner: $450; runner-up: $300; third-place: $150
15. 40 km/h
16. *Method 1*: Since $\frac{1}{5}$ of the flagpole is 2 m long, the remaining $\frac{4}{5}$ must be four times as long, which is 8 m.
Method 2: Since $\frac{1}{5}$ of the flagpole is 2 m long, the length of the whole flagpole is 5 × 2 m, which equals 10 m. The length of portion above ground is 10 m − 2 m, which equals 8 m.
17. 0.196 m³
18. a) 1331 cm³ **b)** about 1020 cm³
19. 756.6 kg
20. a) 4630 cm³ **b)** 5898 cm³
21. 52 cm³
22. a) (+5) × (+3) = +15 **b)** (−14) × (−2) = +28
c) (−4) × (+8) = −32 **d)** (−6) × (+4) = −24
23. Estimates may vary. **a)** −308 **b)** 598
24. 1 and −20; −1 and 20; 2 and −10; −2 and 10; 4 and −5; −4 and 5
25. a) (+20) ÷ (+4) = +5 **b)** (−22) ÷ (−11) = +2
c) (−24) ÷ (+8) = −3 **d)** (−21) ÷ (−3) = +7
26. −1
27. a) Yes. Multiplication is repeated addition. Since the sum of any set of integers is an integer, the product of two integers is also an integer. **b)** No. Division of an integer by most other integers gives parts that do not contain a whole number of units. For example, the quotient of 5 divided by any integer greater than 5 or less than −5 is not an integer.
28. $200
29. −12 °C
30. 186 L
31. a) −2 **b)** 5
32. −20

Chapter 9

9.1 Analysing Graphs of Linear Relations, pages 337–341

4. a) The points appear to lie in a straight line. The total height increases by 20 cm for each additional step.
b)

Number of Steps	Total Height of Steps
1	20
2	40
3	60
4	80
5	100

c) total height on step 10: 200 cm
5. a) The points appear to lie in a straight line. The number of students increases by six for each additional teacher. The pattern starts with one teacher and increases to four teachers.
b)

Number of Teachers	Maximum Number of Students
1	6
2	12
3	18
4	24

c) maximum number of students: 48
6. a) The quantities of banana chips range from 0 g to 400 g. The graph is linear because the points appear to lie in a straight line.
b)

Quantity (g)	Cost (¢)
0	0
100	60
200	120
300	180
400	240

c) Yes, it is possible to buy amounts of banana chips that are not exactly multiples of 100 g.
7. a) Yes, the points appear to lie in a straight line, so the graph shows a linear relation. The number of cubes varies from one to three. For every increase of one cube, the height increases by 2 cm.

b)

Number of Cubes	Height (cm)
1	2
2	4
3	6

c) No, it is not possible to include a point for $c = 2.5$. The number of cubes must be whole numbers.

8. a)

x	y
1	2
2	4
3	6

b)

x	y
1	2
2	4
3	6
4	8
5	10
6	12

c) The points appear to lie in a straight line. For every increase of one in the x-value, there is an increase of two in the y-value. **d)** value of y when $x = 9$: 18

9. a)

Hours Worked	Gross Pay ($)
1	15
2	30
3	45
4	60
5	75

b) hourly rate of pay: \$15 **c)** Yes, it is reasonable to include a point for $h = 3.5$. An employee could work for three and a half hours.

10. a) Yes, it should be possible to purchase two flowers. **b)** There should be one point between the two points.

11. a) coordinates of point W: (40, 2) **b)** The number 40 represents the amount of money invested in dollars. The number 2 represents the amount of interest earned by the \$40 investment after two years, in dollars. **c)** The points lie in a straight line. For every increase in \$20 invested there is an increase in \$1 in the interest earned. **d)** simple interest earned on \$180 after one year: \$9

12. a)

Side Length, s (cm)	0	1	2	3	4	5	8	28	31
Perimeter, P (cm)	0	4	8	12	16	20	32	112	124

b) The points lie on a line. For every increase of 1 cm in the side length of the square, there is an increase of 4 cm in its perimeter. **c)** Yes, it is possible to have other points between those shown on the graph. It is possible to have squares with side lengths that are not whole numbers. Example: A square might have a side length of 1.7 cm. **d)** Yes, the graph represents a linear relationship because the points lie in a straight line.

13. a)

Quantity (g)	Cost (¢)
100	75
200	150
300	225
400	300

b) The points appear to lie in a straight line. The cost ranges from 75¢ to 300¢. **c)** estimated cost of 350 g of dried apricots: 260¢. **d)** actual cost of 350 g of dried apricots: 263¢. **e)** The difference in values was $263¢ - 260¢ = 3¢$.

14. a)

Boxes of Almonds	Profit ($)
0	0
2	1
4	2
6	3
8	4

b) The points appear to lie in a straight line. There is an increase of profit of \$1 for every two boxes of almonds sold. The profits range from \$1 to \$4.

c) profit on the sale of two boxes of almonds: \$1
d) value of P when the value b is 2: \$1
This is the same value as in part c), since both questions refer to the same point on the graph.

15. a) The number 2 refers to the number of minutes that Tom typed; 80 refers to the number of words that he typed in the two minutes. **b)** The typing speed for point A is 40 words per minute. **c)** Yes, it is a linear relation because the points appear to lie in a straight line. **d)** Answer may vary. Example: No. Fatigue, error correcting, or distractions can affect typing speed.

16. a)

Time (h)	Test Score (%)
1	60
2	70
3	80
4	90
5	100

b) Yes, the graph is a linear relation. The points appear to lie in a straight line. **c)** No, the rate cannot continue to increase at this same rate with more and more studying. Alana's test scores will reach 100% after five hours of studying. It is not possible for her success rate to improve beyond 100%.

17. a) Susie's wages: red points

b)

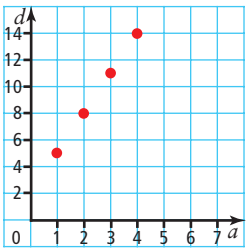
Time (h)	Total Pay for Mario ($)	Total Pay for Susie ($)
1	10	38
2	20	46
3	30	54
4	40	62
5	50	70

c) The two sets of points will meet at the point (15, 150).

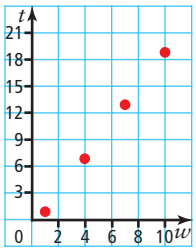
18. a) Mark: red points **b)** Kendal will run out of money in 21 days. **c)** 6 days

9.2 Patterns in a Table of Values, pages 348–351

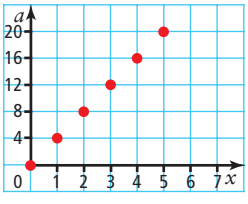
4.



5.

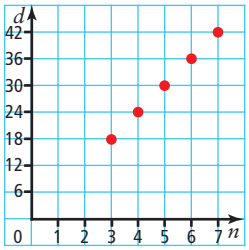


6. a)



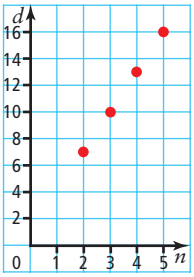
b) difference in value for consecutive x-values: 1; difference in value for consecutive a-values: 4 **c)** The value of a is equal to four times the value of x. **d)** $a = 4x$

7. a)

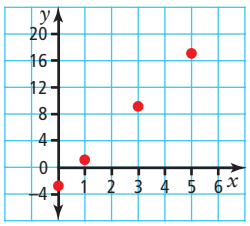


b) difference in value for consecutive n-values: 1; difference in value for consecutive d-values: 6
c) The value of d is six times the value of n.
d) $d = 6n$

8. a) The relationship is linear because the difference between consecutive values of each variable is constant. The graph confirms that the relationship is linear.



b) The relationship may be linear because the difference between three of the consecutive values of each variable is constant. The graph confirms that the relationship is linear.



9. a) The relationship is not linear. The difference between successive q-values is the same but the difference between successive p-values is not the same. **b)** The relationship is linear. The difference between successive x-values is the same and the difference between successive y-values is the same.

10. a)

Time, t (min)	1	2	3	4	5	6
Number of Words, w	90	180	270	360	450	540

b) Yes, the relation is linear because the consecutive values for each variable have the same difference.
c) $w = 90t$ where w is the number of words and t is the time in minutes. **d)** 1080 words.

11. a)

Increase in Mass Over 10 kg, m (kg)	Dosage, d (mg)
1	60
2	70
3	80
4	90
5	100
6	110
7	120
8	130
9	140
10	150

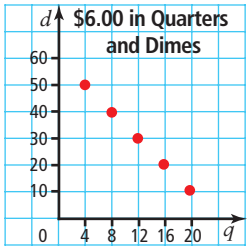
b) Yes. Consecutive values of m increase each time by 1, and consecutive values of d increase each time by 10.
c) $10m + 50$
d) $10(17) + 50 = 220$. The dosage is 220 mg.
e) Yes. The value of 0 kg represents a child with a mass of 10 kg.

12. a) The following five combinations of quarters and dimes each equal \$6.00: 4 quarters and 50 dimes, 8 quarters and 40 dimes, 12 quarters and 30 dimes, 16 quarters and 20 dimes, and 20 quarters and 10 dimes.

b)

Number of Quarters, q	Number of Dimes, d
4	50
8	40
12	30
16	20
20	10

c)

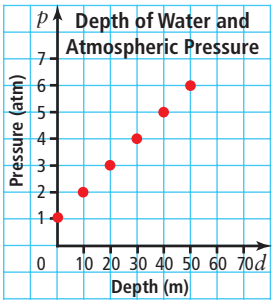


Yes, the relation is linear because the points appear to lie in a straight line. **d)** largest possible number of dimes: 55 (2 quarters); largest possible number of quarters: 22 (5 dimes)

13. a)

Depth (m)	Pressure (atm)
0	1
10	2
20	3
30	4
40	5
50	6

b)



Label the horizontal axis d for the depth and label the vertical axis p for pressure.
c) Divers tend to become dizzy at depths greater than 40 m.

14. a)

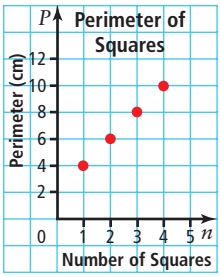
Figure Number	Number of Small Squares
1	4
2	7
3	10
4	13
5	16
6	19

b) $s = 3n + 1$ where n is the figure number and s is the number of squares. **c)** Figure 20: 61 squares **d)** 30 squares

15. a)

Number of Squares, n	1	2	3	4
Perimeter, P (cm)	4	6	8	10

b)

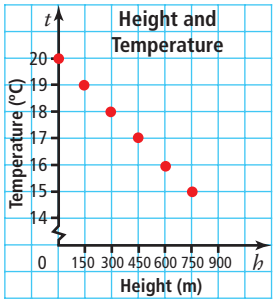


c) The perimeter increases by 2 cm for each additional small square that is added to the pattern.
d) $P = 2n + 2$ **e)** Perimeter of 50 squares: 102 cm

16. a)

Height (m)	0	150	300	450	600	750
Temperature (°C)	20	19	18	17	16	15

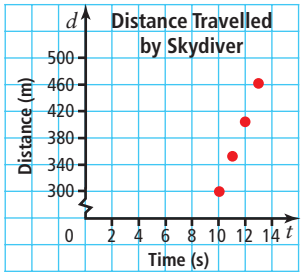
b)



c) Yes, the relationship is linear. There is a common difference between the consecutive values for both variables.
d) Height climbed if the temperature is 13 °C: 1050 m

17. a) There is a common difference between the consecutive values for both variables. The prediction is that the graph will be linear.

b)

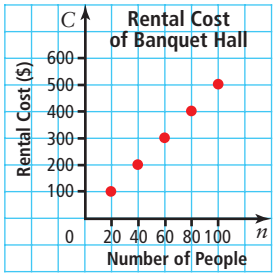


Yes, the prediction was correct.
c) The parachutist descends about 54 m per second after the parachute opens.

18. a)

Number of People, n	20	40	60	80	100
Rental Cost, C ($)	100	200	300	400	500

b)

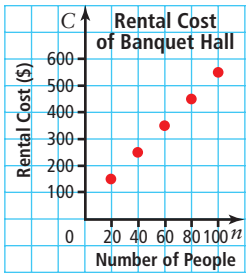


c) $C = 5n$

19. a)

Number of People, n	20	40	60	80	100
Rental Cost, C ($)	150	250	350	450	550

b)



The points on the graph are moved up an equal distance from each of the points on the graph in #18. **c)** $C = 5n + 50$; The variable n represents the number of people and the variable C represents the cost of renting the banquet hall.

20. a)

Number of Additional Days	0	1	2	3	4	5
Rental Cost ($)	40	75	110	145	180	215

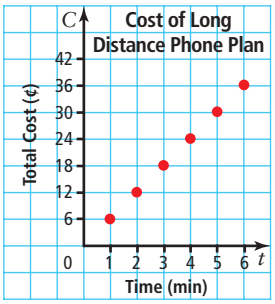
b) $C = 35n + 40$ **c)** $390; A better option would be to buy the snowboard equipment for $350.

9.3 Linear Relationships, pages 357–359

5. a)

Time, t (min)	1	2	3	4	5	6
Cost, C (¢)	6	12	18	24	30	36

b)

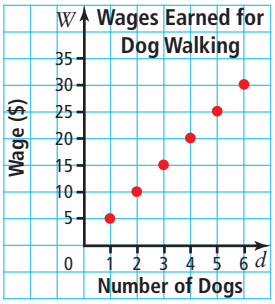


c) No. Any part minutes will be rounded up to the nearest minute.

6. a)

Number of Dogs, d	1	2	3	4	5	6
Wage, W ($)	5	10	15	20	25	30

b)

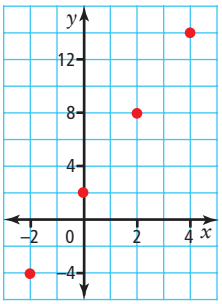


c) No, it is not reasonable to have points between the ones on the graph. The number of dogs walked will be a whole number.

7. a) $y = 27$ **b)** $y = -3$ **c)** $y = 10$ **d)** $x = 25$
8. a) $y = 10$ **b)** $y = -25$ **c)** $y = 3$ **d)** $x = 2$

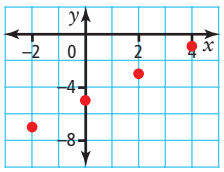
9. a)

x	y
−2	−4
0	2
2	8
4	14



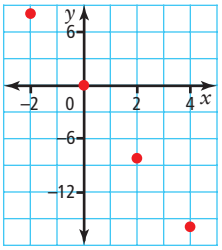
b)

x	y
−2	−7
0	−5
2	−3
4	−1



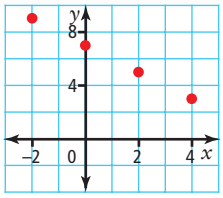
c)

x	y
−2	8
0	0
2	−8
4	−16



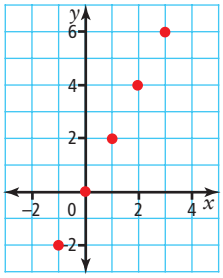
d)

x	y
−2	9
0	7
2	5
4	3



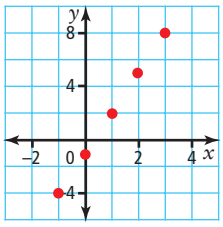
10. a) Answers may vary. Example:

x	y
−1	−2
0	0
1	2
2	4
3	6



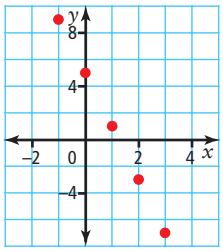
b)

x	y
−1	−4
0	−1
1	2
2	5
3	8



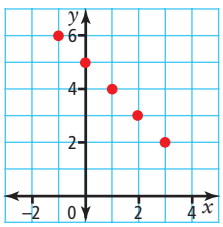
c)

x	y
−1	9
0	5
1	3
2	−3
3	−7



d)

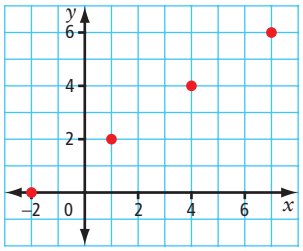
x	y
−1	6
0	5
1	4
2	3
3	2



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

12. a) $(0, 0)$ **b)** $y = -1$ **c)** $y = -3$

13. a)



b) Yes, it is reasonable to assume that there are points between the values given. Without any restrictions in the question, numbers with decimal values can be evaluated in linear relations.

14. a) Since the x-values are consecutive integers, consecutive y-values will have the same difference in the linear relation. The difference for this linear relation is two.

b)

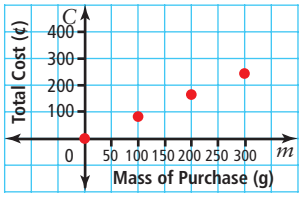
x	−3	−2	−1	0	1	2
y	0	2	4	6	8	10

15. a)

Mass of Purchase (g)	Cost (¢)
0	0
100	80
200	160
300	240
400	320

b) Answers may vary. Example: The most logical value is 400 g because the common difference between consecutive values of mass is 100 g.

c)

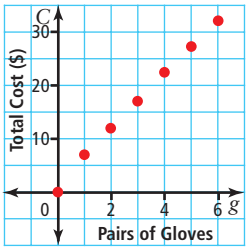


16. a) $1200 **b)** $1400 **c)** $6000

17. a)

Number of Pairs of Gloves, g	1	2	3	4	5	6
Total Cost, C ($)	7	12	17	22	27	32

b)



c) Yes, the points appear to lie in a straight line on the graph.

d) No. The values for g must be whole numbers because they represent the number of pairs of gloves.

e) This number could represent the cost of shipping or administrative charges.

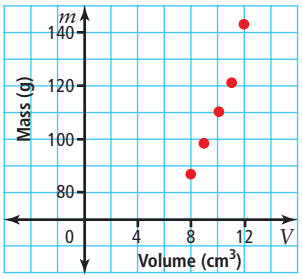
18.

Amount Spent ($)	Points Received
1	40
2	80
3	120
4	160
5	200

b) 4000 **c)** $2500

19. a) The difference between consecutive masses is 11 g except for the metal with a volume of 12 cm^3, which has a mass of 144 g in the given table. The correct mass is 132 g.

b)



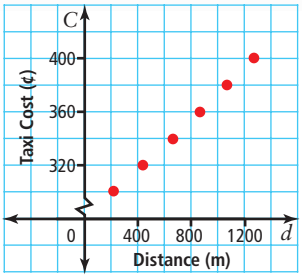
c) A straight line could be drawn through the first four points and extended to show that the correct mass associated with a volume of 12 cm^3 is 132 g.

20. a) $4.80; $7.00

b)

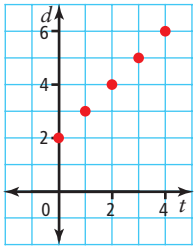
Distance Travelled, d (m)	210	420	630	840	1050	1260
Taxi Cost, C (¢)	300	320	340	360	380	400

c)

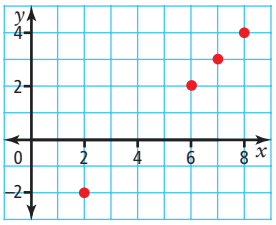


d) Yes, the relation is linear. The increase in cost for each 210 m travelled after the first segment is constant.

21. a) The value of d is 2 more than the value of t.



b) The y-value is four less than the x-value.



22. a)

x	−2	−1	0	1	2	3	11
y	−1	1	3	5	7	9	25

b) Yes, the relation is linear. The difference between consecutive x-values and the consecutive y-values is constant.

Chapter Review, pages 360–361

1. expression
2. linear relation
3. formula
4. equation
5. variable
6. table of values

7. a)

Time (h)	Pay ($)
0	0
1	9
2	18
3	27
4	36

b) Yes, the graph represents a linear relation. The points on the graph lie in a straight line and rate of pay is $9 for each hour worked. **c)** Yes, it is possible that Klaus works for part of an hour and is paid a portion of his hourly salary.

8. a) The graph shows the amount of money earned at a grade 8 car wash based on the number of cars washed. **b)** For every car that is washed $10 is collected. The points appear to lie in a straight line. **c)** cost of one car wash: $10

d)

Number of Cars	Income ($)
1	10
2	20
3	30
4	40

e) $150

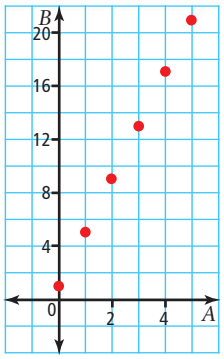
9. a) The points lie in a straight line. The x-values range between 0 and 6. The y-values range between 2 and 20.

b)

x	1	2	3	4	5	6
y	5	8	11	14	17	20

c) $y = 8$ when $x = 2$ **d)** $y = 17$ when $x = 5$

10. a)



b) The difference in consecutive A-values is one. The difference in consecutive B-values is four. **c)** In words: For every increase of one unit in the A-value there is a corresponding increase of four units in the B-value. As an expression: $B = 4A + 1$

11. a) Table 1: the m-variable increases by one unit; Table 2: the p-variable increases by two units; Table 3: the d-variable increases by one unit **b)** Table 1: the n-variable increases by two units; Table 2: the q-variable decreases by four units; Table 3: the C-variable increases alternately—by 3 units then by 2 units.

c) Table 1

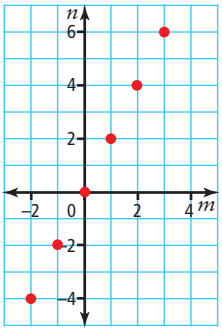


Table 2

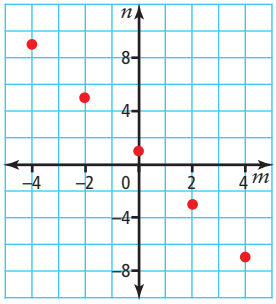
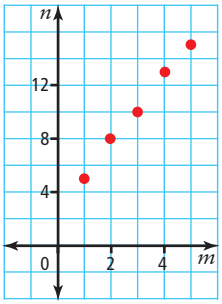


Table 3



12. a)

Number of Copies, n	0	1	2	3	4	5
Total Cost, C ($)	0	2	3	4	5	6

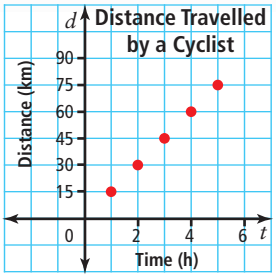
b) Yes, this is a linear relation for one or more copies. The consecutive values for both variables for one or more copies have a common difference. **c)** For one or more copies: $C = n + 1$ where C is the cost in dollars and n is the number of colour copies. **d)** $13

13. a) The variable t represents the time the cyclist travels in hours. The variable d represents the distance the cyclist travels in kilometres. **b)** 15 represents the constant speed of 15 km/h travelled by the cyclist.

c)

Time (h)	Distance (km)
1	15
2	30
3	45
4	60
5	75

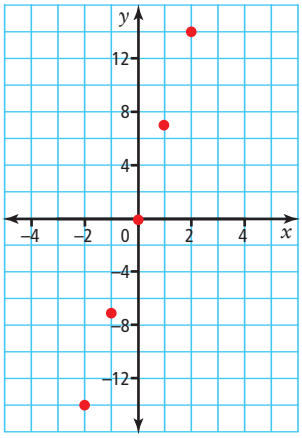
d)



e) Yes, it is reasonable to have points between the ones in the graph. The cyclist can travel for times that are not whole numbers of hours. **f)** 120 km

14. Equation A: $y = 7x$

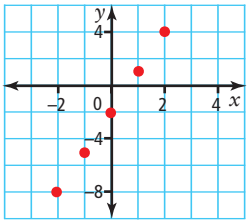
x	y
−2	−14
−1	−7
0	0
1	7
2	14



$y = -49$ when $x = -7$

Equation B: $y = 3x - 2$

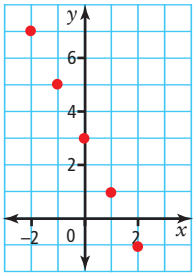
x	y
−2	−8
−1	−5
0	−2
1	1
2	4



$y = -23$ when $x = -7$

Equation C: $y = -2x + 3$

x	y
−2	7
−1	5
0	3
1	1
2	−1



$y = 17$, when $x = -7$

15. a) Both graphs are linear relations and both graphs cross the y-axis at $(0, 1)$. **b)** The points on the graph lie on straight lines that slant in different directions. The graph of $y = 2x + 1$ increases from left to right and the graph of $y = -2x + 1$ decreases from left to right.

Chapter 10

10.1 Modelling and Solving One-Step Equations: $ax = b$, $\frac{x}{a} = b$, pages 376–379

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

6. a) $-2 = \frac{m}{3}$ **b)** $-2n = -10$ **c)** $-4f = -12$ **d)** $\frac{p}{4} = -9$

7. a) $j = -8$ **b)** $n = -5$ **c)** $k = -18$ **d)** $x = 44$

8. a) $r = -4$ **b)** $p = 4$ **c)** $t = -60$ **d)** $d = -20$

9. a) $k = -4$ **b)** $t = -12$

10. a) $b = -5$ **b)** $x = 9$

11. a) -3 **b)** -4 **c)** -9 **d)** 4

12. a) 5 **b)** -4 **c)** 4 **d)** -21

13. a) $s = -3$ **b)** $j = 13$ **c)** $j = -26$ **d)** $t = 4$

14. a) $f = -7$ **b)** $q = -9$ **c)** $h = 21$ **d)** $k = -5$

15. a) -6 **b)** 3 **c)** -21 **d)** 17

16. a) 11 **b)** -12 **c)** 4 **d)** -3

17. a) $t = -36$ **b)** $h = -120$ **c)** $s = -105$ **d)** $x = 567$

18. a) $y = -20$ **b)** $k = 48$ **c)** $b = -10$ **d)** $r = 180$

19. a) Yes. **b)** Yes. **c)** Yes. **d)** No.

20. a) No. **b)** No. **c)** No. **d)** Yes.

21. a) $\frac{m}{4} = -4$ **b)** $m = -16$ °C

22. a) $13n = 312$; n is the number of litres. **b)** 24 L

23. a) $5p = 85$; p is the height of the pygmy owl in centimetres. **b)** 17 cm

24. a) $8m = 144$ **b)** $m = 18$ cm

25. Let x be the percent of right-handed boys.

$$\frac{1}{7}x = 11$$

$$x = 77$$

Therefore, 77% of boys are right-handed.

26. a) \$18 000 **b)** \$72 000

27. $\frac{12h}{2} = 30$; $h = 5$ cm

28. 9 min

29. a) 2994 m in fresh water; 3000 m in salt water **b)** Sandra

10.2 Modelling and Solving Two-Step Equations: $ax + b = c$, pages 385–387

3. a) $x = 1$ **b)** $g = 2$

4. a) $h = 2$ **b)** $z = 6$

5. a) $x = 3$ **b)** $t = -7$

6. a) $d = 3$ **b)** $z = 4$

7. a) Add 2 to both sides of the equation.
b) Subtract 3 from both sides of the equation.
c) Add 10 to both sides of the equation.
d) Add 1 to both sides of the equation.

8. a) Divide both sides of the equation by 4.
b) Divide both sides of the equation by -3.
c) Divide both sides of the equation by 2.
d) Divide both sides of the equation by -9.

9. a) $r = 2$ **b)** $m = 1$ **c)** $g = 4$ **d)** $f = 12.75$
10. a) $k = -7$ **b)** $n = -2$ **c)** $x = -3$ **d)** $n = 0.5$
11. a) No. **b)** No. **c)** Yes. **d)** No.
12. a) $3s$ represents triple his current savings. By subtracting 30 from $3s$, Matt will have the amount he needs: \$750. **b)** savings: \$260 **c)** Answers may vary. Example: Algebra tiles could be used to determine Matt's savings.
13. 3 extras
14. a) $4s + 2 = 14$
b) Percent of students who choose skiing: 3%
15. $2m - 50 = 299$; Jennifer has \$174.50 in her account now.
16. $2w - 3 = 9$; width of the classroom: 6 m
17. a) The value of 6 represents the number of metres that the eagle drops every second. **b)** 11.8 s
18. 108 m^2
19. 3 m
20. There are three possible values for m: 667, 668, and 669.
21. 3.7 km/h

10.3 Modelling and Solving Two-Step Equations: $\frac{x}{a} + b = c$, pages 392–393

4. a) $x = 21$ **b)** $b = -18$
5. a) $z = 15$ **b)** $d = -35$
6. a) $g = -16$ **b)** $n = -50$
7. a) $f = 25$ **b)** $n = 24$
8. a) Subtract 12 from both sides of the equation.
b) Add 2 to both sides of the equation.
c) Subtract 6 from both sides of the equation.
d) Subtract 11 from both sides of the equation.
9. a) Multiply both sides of the equation by -5.
b) Multiply both sides of the equation by 13.
c) Multiply both sides of the equation by 12.
d) Multiply both sides of the equation by 3.
10. a) $m = 48$ **b)** $c = 32$ **c)** $b = -56$ **d)** $n = 154$
11. a) $j = -32$ **b)** $r = 0$ **c)** $x = -120$ **d)** $n = 195$
12. a) No. **b)** Yes. **c)** No. **d)** Yes.
13. a) Brian's age: 8 years old **b)** Answers may vary. Example: Natasha is not getting enough sleep according to the formula. She needs 8.75 h of sleep.
14. $\frac{a}{2} - 2 = 5$; Cost of an adult ticket: \$14
15. a) -25 °C **b)** 9000 m
16. $\frac{m}{2} - 1 = 6$; 14% of students prefer math.
17. a) 3100 Calories **b)** 2831 is greater than the recommended amount of Calories, which is 2700.
c) $x = 7$

10.4 Modelling and Solving Two-Step Equations: $a(x + b) = c$, pages 398–399

4. a) $x = 6$ **b)** $s = 5$
5. a) $x = 4$ **b)** $x = -7$
6. a) $t = 6$ **b)** $j = 0$
7. a) $p = 1$ **b)** $n = 2$
8. a) $r = -9$ **b)** $m = 6$ **c)** $g = -26$ **d)** $f = -7$
9. a) $k = -10$ **b)** $n = 8$ **c)** $x = 3$ **d)** $w = -11$
10. a) No. **b)** No. **c)** Yes. **d)** No.
11. a) $3(s + 7) = 183$
b) Length of each side of old fence: 54 cm
12. a) 17 750 kJ **b)** -30 °C
13. a) $4(x + 4) = 96$ **b)** Maximum dimensions of the square picture: 20 cm by 20 cm
14. Rental time: 4 h
15. Parking time: 3 h
16. a) Andrew's current speed: 12 km/h **b)** 9 km/h
c) Answers may vary. Example: Andrew would not be able to get to his grandfather's apartment in two hours if he was riding his bicycle through a city with several traffic lights and several steep hills. It would also depend on the types of roads and the terrain that he would have to bicycle over, and on his athletic ability.

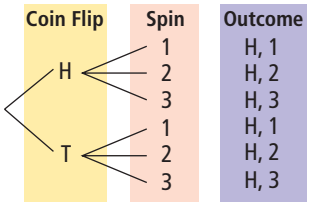
Chapter Review, pages 400–401

1. variable
2. equation
3. opposite operations
4. numerical coefficient
5. distributive property
6. constant
7. linear equation
8. a) $x = -3$ **b)** $n = -8$ **c)** $d = 2$ **d)** $x = -15$
9. a) $x = 2$ **b)** $r = -3$ **c)** $z = -4$ **d)** $t = -3$
10. a) $p = -15$ **b)** $n = -33$ **c)** $x = 36$ **d)** $a = 14$
11. Answers may vary. Example: Two equations which would result in an answer of five are $-3p = -15$ and $20 = 4x$.
12. a) $3c + 2 = 5$; $c = 1$ **b)** $-4x + 7 = -1$; $x = 2$
13. a) Yes. **b)** Yes. **c)** Yes. **d)** No.
14. a) $t = -4$ **b)** $j = -25$ **c)** $p = 4$ **d)** $n = 11.25$
15. a) $4d - 3 = 25$ **b)** Zoë has seven DVDs.
16. a) $v = -50$ **b)** $j = -4$
17. a) Subtract 13 from both sides of the equation. Then multiply both sides of the equation by -3. **b)** Add 7 to both sides of the equation. Then multiply both sides of the equation by 15. **c)** Subtract 2 from both sides of the equation. Then multiply both sides of the equation by -22. **d)** Add 16 to both sides of the equation. Then multiply both sides of the equation by -4.
18. a) $v = 12$ **b)** $d = 15$ **c)** $x = -42$ **d)** $n = 36$
19. $\frac{b}{5} - 1120 = 23\,761$; British Columbia had 124 405 soccer players in 2006.
20. a) $r = -2$ **b)** $w = -5$
21. a) $q = 9$ **b)** $g = -11$ **c)** $k = -14$ **d)** $x = 1$
22. $4(x + 6) = 372$; Without the border, the quilt is 87 cm by 87 cm.
23. The sides of the original octagon were 9 cm long.

Chapter 11

11.1 Determining Probabilities Using Tree Diagrams and Tables, pages 416–418

3. a)



b) (H, 1), (H, 2), (H, 3), (T, 1), (T, 2), (T, 3)

c) $P(\text{H, 2}) = \frac{1}{6}$ or $0.1\overline{6}$ or $16.\overline{6}\%$

4. a) (T, T), (T, W), (T, O), (W, T), (W, W), (W, O), (O, T), (O, W), (O, O) **b)** $P(\text{T, W}) = \frac{1}{9}$ or $0.\overline{1}$ or $11.\overline{1}\%$

c) $P(\text{that both letters are identical}) = \frac{1}{3}$ or $0.\overline{3}$ or $33.\overline{3}\%$

5. a)

		Blue Die			
		1	2	3	4
Green Die	1	1, 1	1, 2	1, 3	1, 4
	2	2, 1	2, 2	2, 3	2, 4
	3	3, 1	3, 2	3, 3	3, 4
	4	4, 1	4, 2	4, 3	4, 4

b) $P(\text{sum} > 5) = \frac{3}{8}$ or 0.375 or 37.5%

c) $P(\text{both numbers are identical}) = \frac{1}{4}$ or 0.25 or 25%

6. a)

		Die					
		1	2	3	4	5	6
Cards	3	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
	4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
	5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
	6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6
	7	7, 1	7, 2	7, 3	7, 4	7, 5	7, 6

b) $P(\text{both numbers are identical}) = \frac{2}{15}$ or $0.1\overline{3}$ or $13.\overline{3}\%$

c) $P(\text{sum of the two numbers is even}) = \frac{1}{2}$ or 0.5 or 50%

d) $P(\text{number on die} \geq \text{number on card}) = \frac{1}{3}$ or $0.\overline{3}$ or $33.\overline{3}\%$

7. a)

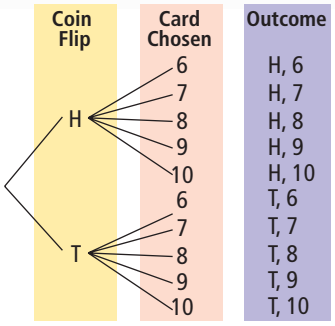
		Second Catch			
		W	T	C	Lost
First Catch	W	W, W	W, T	W, C	W, Lost
	T	T, W	T, T	T, C	T, Lost
	C	C, W	C, T	C, C	C, Lost
	Lost	Lost, W	Lost, T	Lost, C	Lost, Lost

b) $P(\text{whitefish, char}) = \frac{1}{8}$ or 0.125 or 12.5%

c) $P(\text{char, char}) = \frac{1}{16}$ or 0.0625 or 6.25%

d) $P(\text{she will catch nothing at all}) = \frac{1}{16}$ or 0.0625 or 6.25%

8. a)



b)

		Card Chosen				
		6	7	8	9	10
Coin Flipped	H	H, 6	H, 7	H, 8	H, 9	H, 10
	T	T, 6	T, 7	T, 8	T, 9	T, 10

c) $P(\text{outcome includes an even-numbered card}) = \frac{3}{5}$ or 0.6 or 60%

9. a)

		Second Baby	
		B	G
First Baby	B	B, B	B, G
	G	G, B	G, G

b) $P(\text{one boy and one girl}) = \frac{1}{2}$ or 0.5 or 50%

c) Assume that it is equally likely that a boy or girl is born for any birth.

10. a)

		Second Spin			
		T	E	E	N
First Spin	T	T, T	T, E	T, E	T, N
	E	E, T	E, E	E, E	E, N
	E	E, T	E, E	E, E	E, N
	N	N, T	N, E	N, E	N, N

b) $P(\text{T then E}) = \frac{1}{8}$ or 0.125 or 12.5%

c) $P(\text{E, E}) = \frac{1}{4}$ or 0.25 or 25%

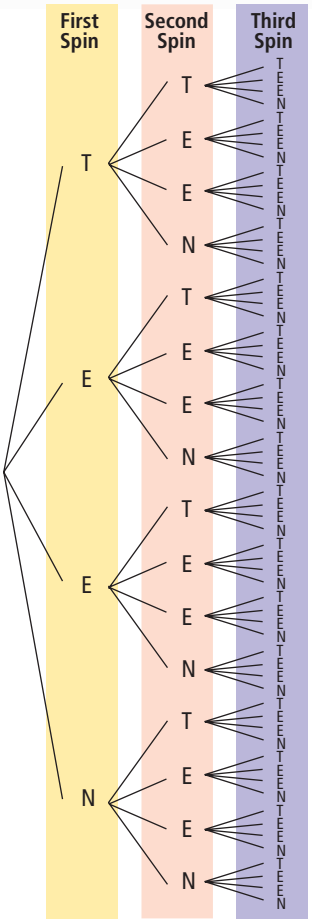
d) $P(\text{same letter on both spins}) = \frac{3}{8}$ or 0.375 or 37.5%

11. a) $P(\text{Thunder Road}) = \frac{1}{2}$ or 0.5 or 50%

b) $P(\text{skiing on a run containing the name "Bowl"}) = \frac{1}{4}$ or 0.25 or 25%

c) $P(\text{skiing on Thunder Road and Quick Break}) = \frac{1}{8}$; or 0.125 or 12.5%

12. a)



b) $P(\text{E, E, E}) = \frac{1}{8}$ or 0.125 or 12.5%

c) P(spinning three different letters in alphabetical order) $= \frac{1}{32}$ or 0.03125 or 3.125%

d) P(one letter appears exactly twice) $= \frac{21}{32}$ or 0.65625 or 65.625%

13. a) P(difference between the two numbers is two) $= \frac{2}{9}$ or $0.\overline{2}$ or $22.\overline{2}\%$

b) P(the sum is a multiple of three) $= \frac{1}{3}$ or $0.\overline{3}$ or $33.\overline{3}\%$

c) P(the product is a multiple of four) $= \frac{5}{12}$ or $0.41\overline{6}$ or $41.\overline{6}\%$

11.2 Outcomes of Independent Events, pages 423–425

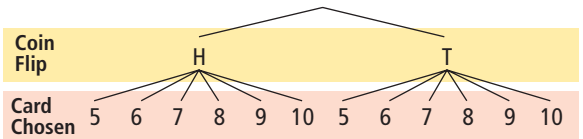
3. a)

		Spinner		
		1	2	3
Marble	G	G, 1	G, 2	G, 3
	R	R, 1	R, 2	R, 3
	B	B, 1	B, 2	B, 3
	Y	Y, 1	Y, 2	Y, 3

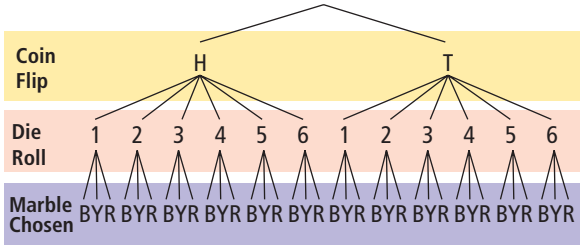
b) Possible outcomes: 12

c) Using the multiplication method, the number of possible outcomes is $4 \times 3 = 12$.

4. a) Answers may vary. Example: Using the multiplication method, the number of possible outcomes is $2 \times 6 = 12$ **b)** Answers may vary. Example: Using a tree diagram, the number of possible outcomes is 12.

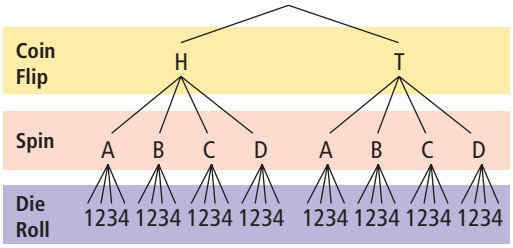


5. a)



b) Total number of possible outcomes: 36 **c)** Using multiplication, the total number of possible outcomes is $2 \times 6 \times 3 = 36$.

6. a)



b) Total number of possible outcomes: 32 **c)** Using multiplication, the total number of possible outcomes is $2 \times 4 \times 4 = 32$.

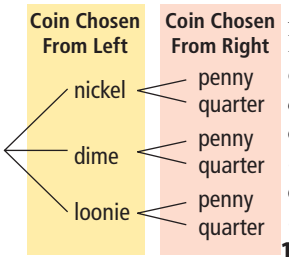
7. Shirt-pant combinations: 24

8. Possible routes: 12

9. Possible different combinations: 60

10. a) Using the multiplication method, the number of combinations of coins she could get is $3 \times 2 = 6$.

b)



Answers may vary. Example: Using a tree diagram, the number of combinations of coins is six.

c) Largest possible sum: $1.25

d) Smallest possible sum: $0.06

11. Answers may vary. Example: Jim has two pairs of shoes, four pairs of pants, and five dress shirts from which to choose. If he selects one item from each of the three types of clothing, how many combinations of clothing are possible?

12. a) Number of possible single-scoop ice-cream cones: 93 **b)** Number of possible two-scoop ice-cream cones: 2883 **c)** Number of possible two-scoop ice-cream cones with both flavours different: 2790. The number of double cones could be subtracted from the answer to part b): $2883 - (3 \times 31) = 2790$.

13. There are three drink choices and three main dish choices. Divide the total number of possible meal combinations, 36, by the number of desserts, 4. The quotient, 9, is equal to the product of the choices for the drink and main menu. The factor pairs of 9 are 3×3 and 1×9. Since there must be more than one choice in each category, the only choice of factor pairs is 3×3.

14. a) Possible colour-shape combinations: 30
b) Using a table

		Shapes					
		Square (SQ)	Circle (C)	Star (S)	Triangle (T)	Rectangle (RE)	Heart (H)
Beads	Red (R)	R, SQ	R, C	R, S	R, T	R, RE	R, H
	Blue (BL)	BL, SQ	BL, C	BL, S	BL, T	BL, RE	BL, H
	Black (BLK)	BLK, SQ	BLK, C	BLK, S	BLK, T	BLK, RE	BLK, H
	White (W)	W, SQ	W, C	W, S	W, T	W, RE	W, H
	Yellow (Y)	Y, SQ	Y, C	Y, S	Y, T	Y, RE	Y, H

the number of possible colour-shape combinations is 30.
c) Possible colour-shape combinations: 120
15. 256
16. 8 998 912

11.3 Determining Probabilities Using Fractions, pages 432–434

4. a)

		Die					
		1	2	3	4	5	6
Spinner	A	A, 1	A, 2	A, 3	A, 4	A, 5	A, 6
	A	A, 1	A, 2	A, 3	A, 4	A, 5	A, 6
	B	B, 1	B, 2	B, 3	B, 4	B, 5	B, 6
	B	B, 1	B, 2	B, 3	B, 4	B, 5	B, 6

b) $P(\text{spinning an A and rolling a two}) = \frac{1}{12}$

c) $P(\text{A, 2}) = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

5. a) Total number of possible outcomes: $4 \times 5 = 20$
b) Answers may vary. Example:
Method 1: Using multiplication,

$P(\text{blue, red}) = \frac{3}{4} \times \frac{3}{5} = \frac{9}{20}$

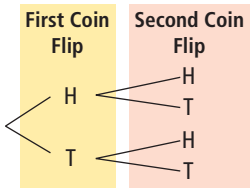
Method 2: Using a table,

		Bag 2				
		Yellow	Yellow	Red	Red	Red
Bag 1	Blue	B, Y	B, Y	B, R	B, R	B, R
	Blue	B, Y	B, Y	B, R	B, R	B, R
	Blue	B, Y	B, Y	B, R	B, R	B, R
	Green	G, Y	G, Y	G, R	G, R	G, R

$P(\text{blue, red}) = \frac{9}{20}$

6. a) $P(\text{H}) = \frac{1}{2}$ **b)** $P(\text{H, H}) = \frac{1}{4}$

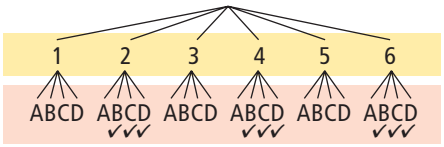
c) Using a tree diagram,
$P(\text{H, H}) = \frac{1}{4}$



7. a) $P(2, \text{B}) = \frac{1}{24}$ **b)** $P(\text{even number, consonant}) = \frac{3}{8}$

c) Use a tree diagram to determine that $P(2, \text{B}) = \frac{1}{24}$ and

$P(\text{even number, consonant}) = \frac{9}{24} = \frac{3}{8}$.



8. a) Answers may vary. Example: Use two 4-sided dice to simulate the type of seed chosen and the location. Roll the two dice ten times and record the seed type and location in a tally chart. A possible experimental probability is $P(\text{marigold, flower pot}) = \frac{1}{10}$.

b) $P(\text{marigold, flower pot}) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$

c) Answers may vary. Example: The experimental probability of $\frac{1}{10}$ is larger than the theoretical probability of $\frac{1}{16}$.

9. a) Red was the car colour that was spun last. There is only one tally mark for red and Trevor has to have at least one car of each colour.

b) Experimental probability $P(\text{blue}) = \frac{4}{13} = 0.\overline{307692}$

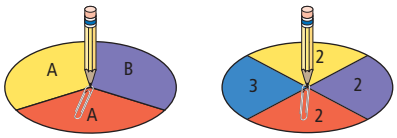
c) Theoretical probability $P(\text{blue}) = 20\% = 0.2$

d) Theoretical probability $P(\text{blue, blue}) = \frac{1}{25} = 0.04$

10. $P(\text{rain in Victoria, rain in Calgary}) = \frac{3}{4} \times \frac{1}{5} = \frac{3}{20}$

11. $P(\text{red, blue}) = \frac{3}{7} = 0.\overline{428571} = 42.\overline{857142}\%$

12. a)



b) $P(\text{A}) = \frac{2}{3}$ **c)** $P(2) = \frac{3}{4}$

13. a) Different pathways: 4 **b)** Answers may vary. Example: Numbers 1, 2, 3, and 4 on the die simulate the pump is working, and numbers 5 and 6 simulate the pump is not working. Roll the die ten times and determine the experimental probability that a specific pumping station is working.
c) $P(\text{at least one pathway is available to carry water between the two towns}) = \frac{7}{10} = 0.7$

14. a) $P(\text{happy with appetizer, happy with main course}) = \frac{3}{8}$ **b)** $P(\text{unhappy with appetizer, unhappy with main course}) = \frac{1}{8}$ **c)** The outcome where Jeremy is happy with only one of his food items has not been considered.

15. a) $P(\text{both players with hit a fair ball and get on base}) = 0.090$ **b)** $P(\text{first player gets a hit and the second player does not}) = 0.223$

16. a) $P(4, 7) = 0.006$ **b)** $P(4, \text{not } 4) = 0.071$
c) $P(4, \text{number less than } 4) = 0.018$

17. $P(C) = \frac{3}{5}$. The probability of $P(A, B) = \frac{3}{14}$. Divide the probability of the three events occurring, $P(A, B, C) = \frac{9}{70}$, by the value of $P(A, B) = \frac{3}{14}$ as follows: $\frac{9}{70} \div \frac{3}{14} = \frac{9}{70} \times \frac{14}{3} = \frac{3}{5}$.

Chapter Review, pages 436–437

1. independent events
2. sample space
3. simulation
4. probability
5. favourable outcome

6. a)

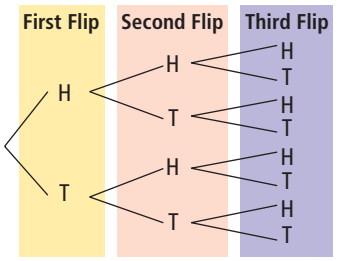
Blue Die \ Red Die	1	2	3	4	5	6
1	1, 1	1, 2	1, 3	1, 4	1, 5	1, 6
2	2, 1	2, 2	2, 3	2, 4	2, 5	2, 6
3	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6

b) $P(\text{the sum of the two numbers is 10}) = \frac{1}{12}$

c) $P(\text{the two numbers are identical}) = \frac{1}{6}$

d) $P(\text{the product of the two numbers is a multiple of 10}) = \frac{1}{6}$

7. a)



b) $P(H, H, H) = \frac{1}{8}$

c) $P(\text{two heads and one tail in any order}) = \frac{3}{8}$

8. a)

Card \ Die	1	2	3	4	5	6
3	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6
7	7, 1	7, 2	7, 3	7, 4	7, 5	7, 6
8	8, 1	8, 2	8, 3	8, 4	8, 5	8, 6
9	9, 1	9, 2	9, 3	9, 4	9, 5	9, 6

b) $P(\text{number on the card matches number on the die}) = \frac{2}{21}$ **c)** $P(\text{number on the card is larger than number on the die}) = \frac{16}{21}$ **d)** $P(\text{both numbers are even}) = \frac{3}{14}$

9. a) (H, 1), (H, 2), (H, 3), (T, 1), (T, 2), (T, 3)
b) Total number of outcomes: 6
c) Total number of outcomes $= 2 \times 3 = 6$

10. Combinations of choices: 48

11. Number of restaurants: 7. Multiply the number of hotel choices, 3, by the number of ski pass choices, 2. Then divide the total number of combinations by the product that was calculated: $42 \div 6 = 7$.

12. a) $P(\text{red marble}) = \frac{3}{5}$ **b)** $P(\text{green marble}) = \frac{4}{5}$
c) $P(\text{red marble, green marble}) = \frac{12}{25}$

13. a) $P(A, E) = 0.05$ **b)** $P(A, L, E) = 0.02$
c) The probability that it will snow in Abbotsford, Lethbridge, and Estevan today.

14. $P(1 \text{ or } 2, 3, \text{odd number}) = \frac{1}{36}$

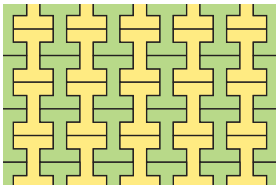
15. a) Theoretical probability, $P(\text{blue}) = 25\%$
b) Experimental probability, $P(\text{blue}) = 15\%$
c) Answers may vary. Example: The experimental probability is often different from the theoretical probability. **d)** Yes, the two probabilities would become closer to each other in value.

Chapter 12

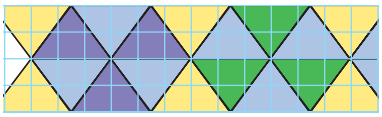
12.1 Exploring Tessellations With Regular and Irregular Polygons, pages 450–451

4. a) Yes. Each angle of a regular hexagon is 120°. The sum of three vertices of a regular hexagon is 360°.
b) No. Each angle of a regular heptagon is about 128.6°. Any number of vertices of this shape will not have the interior angle measures total exactly 360°.

5. Answers may vary. Example:

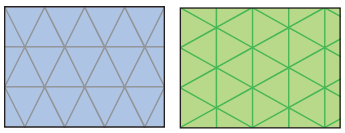


6. Answers may vary. Example:



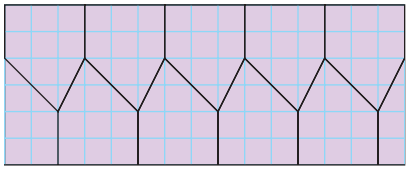
7. Answers may vary. Example: The tessellations of rectangular bricks on walls, of rectangular shingles on roofs, and of square tiles on floors.

8. Answers may vary. Example: One tessellation is drawn on triangular dot paper and the other is drawn on the same triangular dot paper rotated 90°.

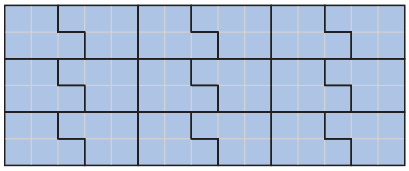


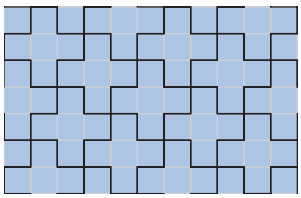
9. Answers may vary. For example,

10. a) Answers may vary. Example: A pentagon made of a rectangle and a triangle can tessellate the plane. At the point where the vertices meet, the sum of the interior angles measures is the sum of the three angles of the triangle (180°) and the two right angles of the rectangle (180°), which is 360°.



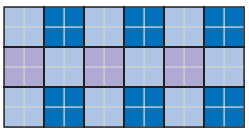
11. Answers may vary. Example:



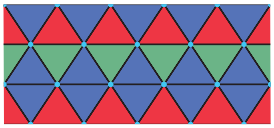


Yes, each of these two pentominos makes a tessellation because the plane is completely covered by repeated patterns of each shape without any overlap or gaps.

12. Answers may vary. Example:
Using a square on grid paper:

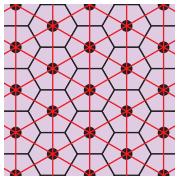


Use an equilateral triangle on triangular dot paper:

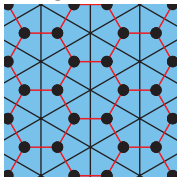


13. a) The dual is a translation of the original tessellation, so it also tessellates the plane. If the square is a unit square, the translation is half unit right and half unit down.

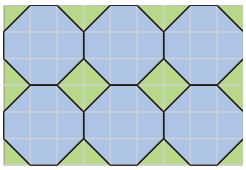
b) The dual is a tessellation of congruent equilateral triangles.



c) The dual is a tessellation of congruent regular hexagons.

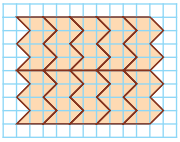


14. Answers may vary. Example: A regular octagon and a square can be used together to create a tessellation.

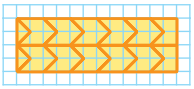


12.2 Constructing Tessellations Using Translations and Reflections, pages 455–456

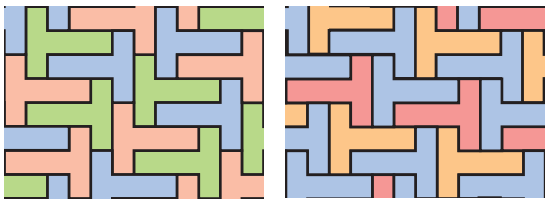
3. a) regular hexagon and equilateral triangle **b)** square and equilateral triangle **c)** regular octagon and square
4. Answers may vary. Example: **a)** translation or reflection **b)** reflection **c)** translation or reflection
5. a) The sum of the interior angle measures at the point where the vertices of the dodecagons meet is 360°.
b) Answers may vary. Example:



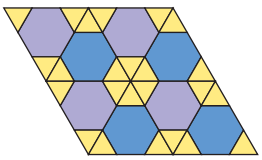
c) The sum of the interior angle measures at the point where the vertices of the decagons meet is 360°.
d) Answers may vary. Example:



e) The sum of the interior angle measures at the point where the vertices of the hexagons meet is 360°.
6. Answers may vary. Example:

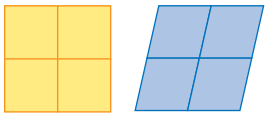


7. Answers may vary. Example:



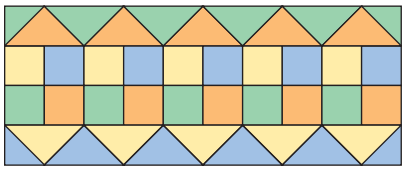
8. No. Each angle of the regular pentagon is 108° and each angle of the equilateral triangle is 60°. There is no combination of 108° vertices and 60° vertices that will have the interior angle measures total 360°.

9. The shapes a) and b) are reptiles. Answer may vary. Example:

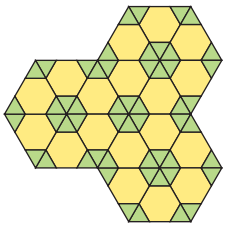


12.3 Constructing Tessellations Using Rotations, pages 459–460

3. a) square **b)** regular octagon and triangle
c) a cross shape and square
4. Answers may vary. Example: **a)** Rotate the square 90° about one of its vertices until a full turn is made. Then, rotate the larger square formed 90° about one of its vertices until a full turn is made. **b)** Rotate the square shape formed by a regular octagon and four isosceles triangles 90° about one of its vertices until a full turn is made. Then, translate the larger square horizontally to the right two times.
c) Rotate the shape formed by the cross shape with 4 small squares 90° about the free corner of the small square until a full turn is made. Then, translate the resulting shape horizontally to the right and vertically up and down.
5. a) Answers may vary. Example:
• Start with the top piece of the stained glass that is a 45° sector, or one-eighth, of the circle. Reflect it along a line making 45° with the horizontal.
• Reflect the resulting larger piece along the x-axis.
• Reflect the resulting larger piece along the y-axis.
b) Answers may vary. Example: Trim the edge of the 45° sector to make a right-angled triangle with the right angle touching the line of reflection. The resulting shape will be a square that tiles the plane.
6. Answers may vary. Example: Translate the combined shape of 4 squares and 4 isosceles triangles in four different colours horizontally to form the pattern.



7. Answers may vary. Example: The following tessellation is made using regular hexagons and equilateral triangles.

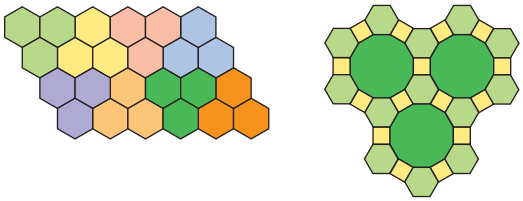


8. Shapes A, B, C, D, and G tessellate. Answers may vary. Example: A and B are quadrilaterals and all quadrilaterals tessellate the plane. C and D can tessellate by horizontal translation, fitting the part sticking out of the shape into the space going into the shape. G can tessellate by horizontal and vertical translations, fitting the parts sticking out into spaces going in.

9. a) and **b)** Answers may vary. Example: A combination of three regular hexagons (6, 6, 6) and a combination of one square, one regular hexagon, and one dodecagon will work.

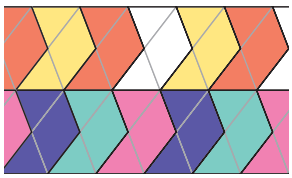
Tessellations Involving Three Regular Polygons	Shape 1	Shape 2	Shape 3	Shape 4
Triangle (60°)	1	0	0	0
Square (90°)	0	1	0	1
Pentagon (108°)	0	0	0	0
Hexagon (120°)	0	0	3	1
Octagon (135°)	0	2	0	0
Dodecagon (150°)	2	0	0	1
Number of sides	(3, 12, 12)	(4, 8, 8)	(6, 6, 6)	(4, 6, 12)
Sum of angles	60° + 2(150°) = 360°	90° + 2(135°) = 360°	3(120°) = 360°	90° + 120° + 150° = 360°

c) Answers may vary. Example:

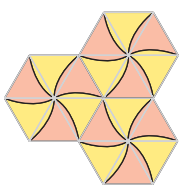


12.4 Creating Escher-Style Tessellations, pages 464–465

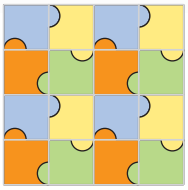
4. a) translation **b)** rotation
5. a) hexagon **b)** triangle
6. a) rotation and reflection **b)** rotation and translation
7. a) parallelogram **b)** square
8. Answers may vary. Example:



9. Answers may vary. Example:



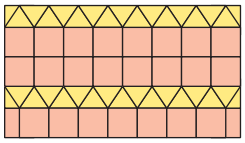
10. Answers may vary. Example:



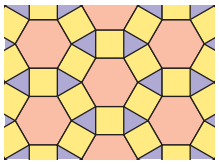
11. a) Answers may vary. Example: Staircases that appear to be upside down, people that appear to be walking right side up and upside down and sideways.

Chapter 12 Review, pages 466–467

1. tiling the plane **2.** plane
3. tessellation **4.** transformation
5. a) regular hexagon and equilateral triangle
b) rhombus, isosceles triangle, and regular hexagon
c) regular hexagon and equilateral triangle
d) regular hexagon, parallelogram, and equilateral triangle
6. The regular hexagons and equilateral triangles in #5 are regular polygons, while the isosceles triangles, rhombuses, and parallelograms are not. Regular polygons have equal interior angle measures and equal side lengths.
7. No. Answers may vary. Example: Each interior angle of a regular octagon is 135°, which is not a factor of 360°. However, two octagons and a square can tile the plane.
8. Answers may vary. Example: **a)** Translation or rotation of the combined shape. **b)** Translation of the dodecagon and reflections of the hexagon and rectangle.
9. Answers may vary. For example,

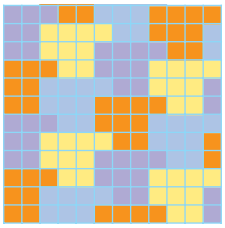


10. Answers may vary. Example:

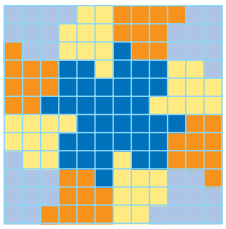


11. Answers may vary. Example: **a)** translation and reflection **b)** translation and reflection
12. Answers may vary. Example: A square that has the same side length as the shorter side of the irregular polygon.

13. a quadrilateral
14. a rotation about the centre of the regular hexagon
15. Answers may vary. Example:
Translation:

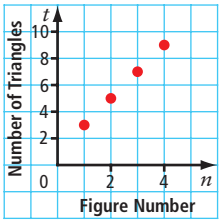


Rotation:



Chapters 9–12 Review, pages 473–475

1. a) 9 triangles
b)



c) Yes. When the four points are connected, they form a straight line.

2. Answers may vary. Example: **a)** I might have purchased hamburgers or sandwiches. The cost of one item is $3.
b) For every additional item purchased, the cost increases by $3.
c)

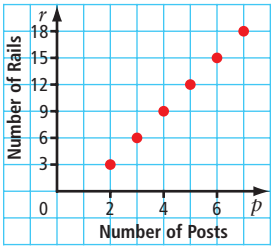
Quantity	2	3	4	5	6	7
Cost ($)	3	6	9	12	15	18

Use q for quantity and c for cost; q represents the quantity purchased and c represents the cost of purchase.
d) $c = 3q$ **e)** The cost is $24.

3. a)

Number of Posts, p	2	3	4	5	6	7
Number of Rails, r	3	6	9	12	15	18

b) Answers may vary. Example:



The relationship appears to be linear because the six points seem to lie on a straight line.
4. Answers may vary. Example: **a)** $y = 2x - 3$

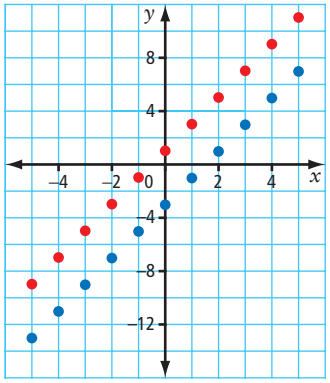
x	−5	−4	−3	−2	−1	0	1	2	3	4	5
y	−13	−11	−9	−7	−5	−3	−1	1	3	5	7

$y = 2x + 1$

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

These values for x are easy to graph.

b)



c) Similar: The points for the two graphs form parallel lines. Different: For the same x-value, the y-value on the graph of $y = 2x + 1$ is 4 greater than the corresponding y-value on the graph of $y = 2x - 3$.

5. a) $4x = 12$ **b)** $x = 3$

6. a) $s = -10$ **b)** $x = 3$ **c)** $v = 16$ **d)** $x = 3$

7. a) $x = -28$ **b)** $x = 8$ **c)** $x = -18$ **d)** $x = 5$

8. a) $10 = \frac{1}{3}x - 3$ **b)** Jason's father is 39 years old.

9. $40(x + 2) = 960$; $x = 22$
Elijah's regular hourly wage is \$22/h.

10. a) Answers may vary. Example: Use a table.

		Die 2					
		1	**2**	**3**	**4**	**5**	**6**
Die 1	**1**	1, 1	1, 2	1, 3	1, 4	1, 5	1, 6
	2	2, 1	2, 2	2, 3	2, 4	2, 5	2, 6
	3	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
	4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
	5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
	6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6

b) $P(\text{both even}) = \frac{9}{36} = \frac{1}{4}$

c) $P(\text{sum} \geq 6) = \frac{26}{36} = \frac{13}{18}$

11. a) $P(\text{odd number}) = \frac{2}{5}$ **b)** $P(\text{even number}) = \frac{2}{5}$

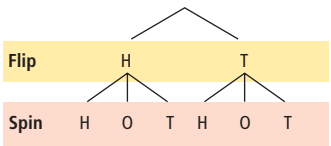
c) $P(\text{odd, then even}) = \frac{2}{5} \times \frac{2}{5} = \frac{4}{25}$

12. 12 options

13. a) $P(\text{H on disk}) = \frac{1}{2}$; $P(\text{H is spun}) = \frac{1}{3}$

b) $P(\text{H on disk, H is spun}) = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

c) Answers may vary. Example: Use a tree diagram.



From the tree diagram, $P(\text{H on disk, H is spun}) = \frac{1}{6}$.

14. a) Answers may vary. Example: The twins could use a spinner divided into four equal regions labelled with the four colours of the spinning tops. They can spin the spinner twice in each trial for at least 20 trials to find the probability of spinning blue in both spins.

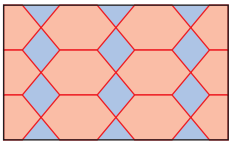
b) They need to assume that the spinning tops are identical.

c) $P(\text{experimental}) = \frac{1}{20}$ or 5%

d) $P(\text{theoretical}) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$ or 6.25%

15. Polygon A, a triangle, can tile the plane because two congruent triangles form a parallelogram, which is a quadrilateral. A quadrilateral can tile the plane because the sum of the interior angle measures is 360° at the point where the vertices of the quadrilaterals meet.
Polygon B, a regular hexagon, can tile the plane because each interior angle measure is 120°, which can total 360° at the point where the vertices of the hexagons meet.
Polygon C, a regular pentagon, cannot be used to tile the plane because each interior angle measure is 108°, which cannot total 360° at the point where the vertices of the pentagons meet.

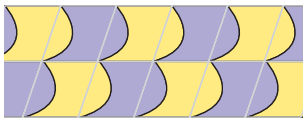
16. Answers may vary. Example:



The pattern is made up of squares and irregular hexagons. Translation is used to create the pattern.

17. Answers may vary. Example: A tessellating tile is made from a square by removing a piece from the bottom and left side of the square and translating these pieces to the opposite sides of the square. The tessellating tile is then translated horizontally and vertically to create the tessellation.

18. Answers may vary. Example:



A tessellating tile is made by removing a piece from the left side of a parallelogram and adding the piece to the other side. The tessellation is created by translating the tessellating tile horizontally and vertically.