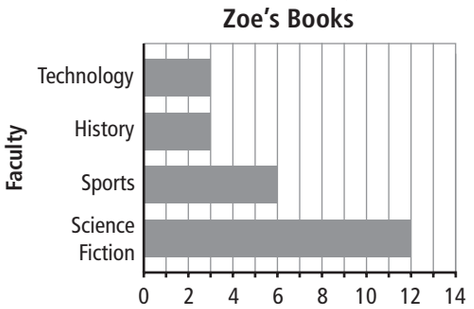
Workbook Answers

1 Get Ready

1. Answers may vary. Example: The location of the axes will change. The number of books will be along the *x*-axis; the type of books will be along the *y*-axis. The number of books for each bar will stay the same.



2. **a)** 10
b) Answers may vary. Example: Who has the most books in total? They have the same number of books.

3. **a)** Chat Lines, 10 h
b) No. Answers will vary. Example: Because there is no legend, the reader would not know what each sector of the graph represents.

4. **a)** Between April and May
b) Answers may vary. Example: Yes, the trend will continue because of the seasons.

5. **a)** 40
b) Answers may vary. Example: I added the total of full T-shirts and multiplied that by 10. Then, I added the half shirts and multiplied that by 5. I then added the two figures together.

1.1 Advantages and Disadvantages of Different Graphs

1. **d)** Circle graphs

2. **b)** Line graphs

3. **e)** Double bar graphs

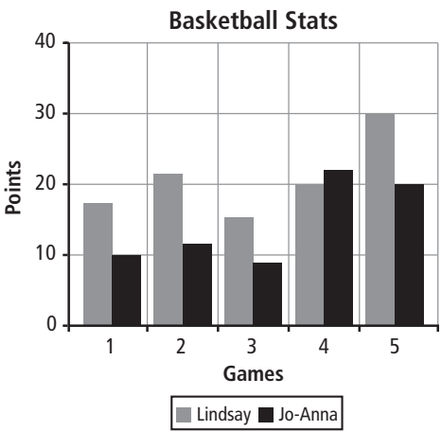
4. **c)** Pictographs

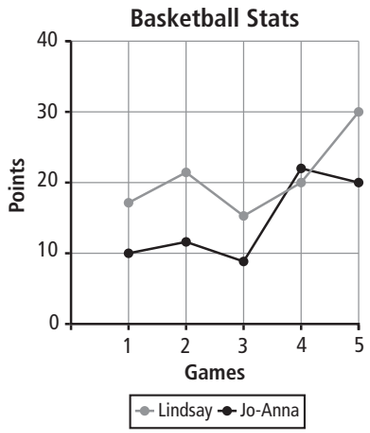
5. **a)** Bar graphs

6. **a)** 30 more Grade 9s attended the dance. Answers may vary. Example: This is shown easily on the pictograph by multiplying the number of symbols times 12.
b) Answers may vary. Example: You can easily calculate the number using the pictograph. Using the circle graph, you would have to calculate 12% of 300.
c) Answers may vary. Example: Circle graph: You can see at a glance the largest group that attended. Pictograph: This graph lets you calculate actual numbers easily.

7. **a)** 16 more in November than September. Answers may vary. Example: The pictograph showed this clearly. The line graph has a large scale, so the exact number for each month is not clear—you would have to estimate.
b) Between October and November.
c) Answers may vary. Example: Line graph: The exact amounts are not clear, based on the scale used. Pictograph: You have to multiply to determine the number for each month.

8. Answers may vary. Example:
a)





b) Answers may vary. Example: They both show the data given. To compare growth over time, the line graph is better. To look at the total number of points, the bar graph is better.

9. Answers may vary. Example:

a) I would draw a bar graph to show the comparison of each type of game. This would easily display the most popular and least popular type of game.

b) No, a line graph is best used for showing change over time. These data show the amount sold; they do not include any length of time.

1.2 Misrepresenting Data

1. a) data, false **b)** scale, visuals

2. a) Answers may vary. Example: Because of the break in the y-axis, this graph leads you to believe that Tina sold significantly more than Tim or Ty. The title also suggests that.

b) $500

c) Answers may vary. Example: The graph should be drawn using a proper scale and the title should be Employee Sales.

3. Answers may vary. Example:

a) Graph A shows rainfall by centimetres and Graph B by millimetres, but the amounts work out to be the same.

b) Because Graph A uses values in 10s and the bars look shorter, people might think Graph A shows less precipitation than Graph B shows.

c) I think the director should choose Graph A, because it looks like there is less rainfall when the amounts are shown in centimetres.

4. a) Tigers, by 6%

Answers may vary. Example:

b) The larger graphic and the title suggest that the difference in the number of fans supporting each team was significantly greater than it actually was.

c) You could draw a circle graph to show the difference in attendance.

5. a) 2 km

b) Answers may vary. Example: I would redraw the graph using bars the same width, and change the scale to show the difference more accurately.

6. Answers will vary. Example:

I used a bar graph with a large interval on the vertical axis to make the bars seem really large. I reversed the weeks on the horizontal axis to make it appear as though the band is practising longer each week.

1.3 Critiquing Data Presentation

1. c) usefulness

2. b) format

3. a) type

4. Answers may vary. Example:

a) It shows the comparison of all the snacks and makes it easier to see which are the most popular.

b) This graph does not show the other snacks that may be in the vending machine already, so there is no comparison and we do not know why the snacks should be changed.

5. Answers may vary. Example:

a) The conclusions are that one park has three activities and the other has one.

b) No, this is not the best graph, maybe use separate bar graphs showing all the types of activities in each park.

6. Answers may vary. Example:

a) The bar graph shows the number of positions available for each job each month, and the circle graph shows the percent of students working in each type of job.

b) The bar graph shows more information about job availability throughout the months; there is more of a chance to get a job in June or July with baseball, but delivering flyers remains steady.

c) The circle graph shows that about the same percent of students work at each job.

7. Answers may vary. Example:

a) This graph shows that Stephanie had five main interests that week: sports, computer, visiting, shopping, and reading. It also shows how she divided her spare time that week.

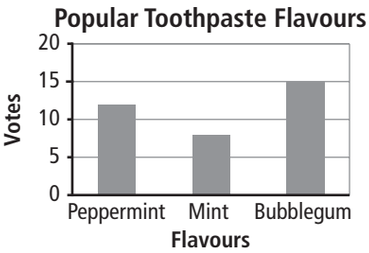
b) This graph shows that Stephanie has several interests. She appears to share her time among her five main interests, with a little more time spent playing sports. There is no indication of how long Stephanie spends doing each activity.

1 Link It Together

1. Answers may vary. Example:

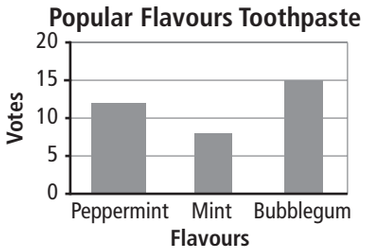
a) I believe the best way to show the data would be a bar graph because a bar graph will clearly compare the student preferences across flavours.

b)



c) One advantage of a bar graph is that you can clearly see the comparison between all three flavours, which one has the most votes, and which one the least votes. One disadvantage is that, depending on the scale, the exact number of votes could be difficult to identify.

2. a) Answers may vary. Example: You can mislead the reader by making the peppermint bar wider, which may make it appear more popular.



b) You could use a circle graph or a pictograph to show the same information. A circle graph would show the fraction of votes each flavour received. A pictograph would show the number of votes each flavour received.

1 Vocabulary Link

1. double bar graph
2. bar graph
3. trend
4. line graph
5. distort
6. circle graph
7. pictograph
8. interval
9. double line graph

2 Get Ready

1. **a)** 3 to 6, 3 : 6, $\frac{3}{6}$ **b)** 6 to 9, 6 : 9, $\frac{6}{9}$

2. **a)** white balls : black balls
b) black balls : total balls

3. **a)** Yes, because $2 \times 3 = 6$, and $3 \times 3 = 9$.
b) Yes, because $1 \times 4 = 4$, and $5 \times 4 = 20$.

4. Answers may vary.
a) $\frac{2}{8}, \frac{3}{12}$ **b)** $\frac{2}{6}, \frac{8}{24}$

5. **a)** 15, because $8 \times 3 = 24$, and $5 \times 3 = 15$.
b) 15, because $1 \times 5 = 5$, and $3 \times 5 = 15$.
Comparing Quantities: Answers may vary. For example: I would reuse the $\frac{2}{5}$ number line and number by tens.

6. Answers may vary. $\frac{14}{28}, \frac{2}{4}, \frac{7}{14}$

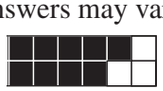
7. **a)** 10 **b)** 3

2.1 Two-Term and Three-Term Ratios

1. **a)** **False** A part-to-part ratio compares different parts of a group.
b) **True**
c) **False** A part-to-whole ratio can be written as a fraction, decimal, or percent.
For example, the ratio of flowers to leaves is $\frac{8}{12}$ or $\frac{2}{3}$, $0.6\overline{6}$, $66.\overline{6}\%$
d) **True**
e) **False** A two-term ratio compares two quantities measured in the same units.

2. **a)** 3 : 9, 1 : 3 **b)** 23 : 9 : 32
c) 5 : 15, 1 : 3 **d)** 8 : 6, 4 : 3
e) 10 : 20; 1 : 2 **f)** 16 : 20, 4 : 5

3. **a)** $\frac{1}{3} = \frac{2}{6}$ **b)** $\frac{2}{3} = \frac{10}{15}$ **c)** $\frac{5}{6} = \frac{10}{12}$ **d)** $\frac{40}{50} = \frac{80}{100}$

4. Answers may vary. Example:
a) 
b) 9 : 3
c) 9 : 12, 3 : 12
d) $\frac{3}{4}, \frac{1}{4}$

5. Answers may vary. Example:
a) hats : coats
b) coats : hooks : hats
c) hooks : coats
d) hooks : whole

6. **a)** 8 : 28 **b)** 20 : 8

7. 0.18 : 0.35 : 0.47

2.2 Rates

1. **a)** different **b)** fraction, percent
c) one **d)** price

2. **a)** 16.67 km/h **b)** 66 words/minute
c) 54 students/bus **d)** 23 apples/bag
e) \$9/h **f)** 88 km/h

3. **a)** \$7/h, \$9.90/h **b)** 82 km/h, 84 km/h
c) 4 h/day, 3 h/day

4. 9 L/100 km

5. **a)** Vanilla \$0.00745/g, Berry \$0.00598/g, Peach \$0.0049875/g
b) Vanilla \$0.745 /100 g, Berry \$0.598/100 g, Peach \$0.49875/100 g
c) The largest (peach) container costs the least money per gram.

6. **a)** Methods will vary. Example:
$\frac{1365}{6} = \frac{x}{12}$, x = \$2730
b) \$5.25/h

7. **a)** Canada 3.36, Ecuador 45.19, France 108.02, Netherlands 464.94, USA 29.77
b) Netherlands, France, Ecuador, USA, Canada
c) Yes, because it compares two quantities measured in different units.

2.3 Proportional Reasoning

1. ratios, equal

2. **a)** proportion, \$15 **b)** unit rate, \$15

3. **a)** 25 km/h **b)** \$0.25/pencil
c) 5 m/s **d)** \$2/kg

4. **a)** 3 **b)** 3 **c)** 25 **d)** 12

5. **a)** 8 roses **b)** 760 km

6. **a)** $\frac{40 \text{ cm}}{20 \text{ cm}} = \frac{50 \text{ cm}}{25 \text{ cm}}$
b) $\frac{60 \text{ mL}}{600 \text{ mL}} = \frac{100 \text{ mL}}{1000 \text{ mL}}$
c) $\frac{9.4 \text{ L}}{100 \text{ km}} = \frac{56.4 \text{ L}}{600 \text{ km}}$

7. 24 players

8. a) $\frac{5}{8} = \frac{x}{40}$ Trevor is expected to complete 25 passes.

b) $\frac{1}{16} = \frac{x}{32}$ He likely made 2 interceptions.

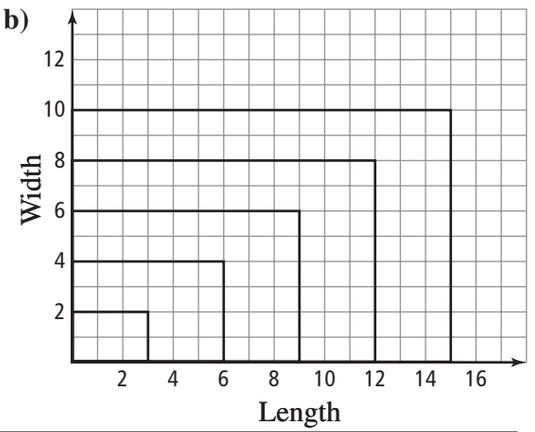
9. a) 16, 24 **b)** \$1.38, \$9.66

10. Car A **11.** 150 km

2 Link It Together

1. a) 2 : 3

b)



Rectangle	Length	Width	Area (square units)	Area Difference (square units)
P	3	2	6	-
Q	6	4	24	18
R	9	6	54	30
S	*12*	*8*	*96*	*42*
T	*15*	*10*	*150*	*54*

d) $\frac{2}{3}$ **e)** 216 square units

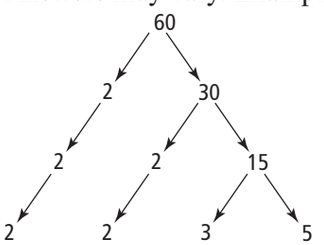
2 Vocabulary Link

1. c) proportion
2. h) unit rate
3. g) unit price
4. a) part-to-part ratio
5. b) part-to-whole ratio
6. f) two-term ratio
7. e) three-term ratio
8. d) rate

E	I	D	M	Z	B	Z	I	C	D	X	G	L	F	K	F	S	J	B	F
C	Y	K	T	Y	L	G	J	R	P	Z	B	E	X	J	J	D	B	Y	T
W	V	J	H	Z	G	U	I	C	A	M	F	D	H	W	O	Y	V	D	J
V	L	X	R	N	X	J	W	A	R	F	S	C	U	F	X	C	C	S	T
P	A	U	E	B	X	T	G	R	T	I	L	P	Y	T	P	Z	H	G	K
F	F	X	E	V	N	R	I	S	T	X	G	T	O	U	R	D	P	C	G
D	P	X	T	S	O	X	U	J	O	E	X	I	Q	J	O	Q	W	T	Q
T	U	U	E	X	V	L	H	M	P	Q	T	C	C	I	P	E	I	G	B
S	N	N	R	O	X	T	E	K	A	A	J	M	X	Q	O	N	W	B	U
I	I	I	M	Z	A	R	Q	E	R	K	C	T	B	G	R	E	M	M	L
I	T	T	R	F	L	I	M	M	T	W	F	F	Z	U	T	S	M	H	K
U	R	P	A	E	V	Y	R	A	R	L	H	D	E	V	I	N	J	J	P
G	A	R	T	S	L	E	K	P	A	K	T	R	X	C	O	M	A	P	J
G	T	I	I	F	T	F	T	M	T	L	B	Z	A	L	N	L	V	I	M
X	E	C	O	O	E	A	M	S	I	O	X	H	R	T	D	K	F	M	W
F	Y	E	W	N	N	J	L	C	O	M	P	Q	O	G	E	C	T	D	A
B	D	T	P	A	R	T	T	O	W	H	O	L	E	R	A	T	I	O	S
L	B	X	J	Z	I	Y	I	W	A	O	O	J	N	O	Z	M	L	H	O

3 Get Ready

1. a) Answers may vary. Example:



b) 1 and 60, 2 and 30, 3 and 20, 4 and 15, 5 and 12, 6 and 10

2. 1 and 12, 2 and 6, 3 and 4

3. a) 56 cm **b)** 33 m^2

4. a) 5, 6, 7, 8

b) 26, 27, 28, 29, 30, 31, 32, 33, 34, 35

5. a) 6.5 **b)** 30.5

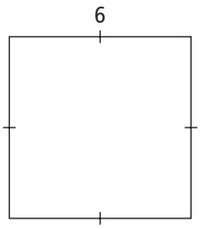
6. a) 7 **b)** 16

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

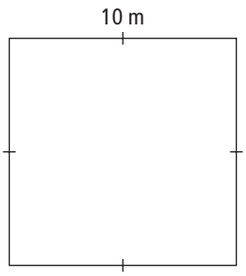
3.1 Squares and Square Roots

1. d) Prime number
2. b) Square number

3. e) Square root
4. c) Perfect square
5. a) Prime factorization
6. **a)** $2 \times 2 \times 3 \times 3$
b) Yes. Answers may vary. Example: There is one pair of 2s and one pair of 3s.
$2 \times 3 = 6$, $6 \times 6 = 36$
c) Answers may vary. Example:



7. **a)** $2 \times 2 \times 5 \times 5$
b) Yes. Answers may vary. Example: There is one pair of 2s and one pair of 5s.
$2 \times 5 = 10$, $10 \times 10 = 100$
c) Answers may vary. Example:



8. **a)** $2 \times 2 \times 41$
b) $2 \times 2 \times 7 \times 7$, perfect square
c) $3 \times 3 \times 5 \times 5$, perfect square
d) $13 \times 5 \times 5$

9. Strategies may vary. Example: $1296 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$. 1296 is a perfect square because it is the product of 36×36.

10. Yes. Answers may vary. Example: The prime factors of 9 and 16 repeat themselves. 9 is the product of 3×3 and 16 is the product of $2 \times 2 \times 2 \times 2$. The prime factors repeat themselves an even number of times. 10 is not a perfect square because its prime factors do not repeat themselves.

3.2 Exploring the Pythagorean Relationship

1. **a)** Answers may vary. Two are possible:
- Area of R + Area of S = Area of T
- $d^2 + e^2 = f^2$

b) Answers may vary. Example: The sum of the areas of the squares attached to the legs of a right triangle is equal to the area of the square attached to the hypotenuse.

2. **a)** J = 36 m^2, K = 64 m^2, L = 100 m^2
b) Answers may vary and should include two of the following:
- 36 m^2 + 64 m^2 = 100 m^2
- $6^2 + 8^2 = 10^2$
- Area of J + Area of K = Area of L

3. **a)** 64 cm^2, 8 cm; 225 cm^2, 15 cm; 289 cm^2, 17 cm
b) Answers may vary and should include one of the following:
- 64 cm^2 + 225 cm^2 = 289 cm^2
- $8^2 + 15^2 = 17^2$

4. **a)** 225 cm^2, 400 cm^2, 625 cm^2
b) Answers may vary and should include one of the following:
- 225 m^2 + 400 m^2 = 625 m^2
- $15^2 + 20^2 = 25^2$

5. Yes. Answers may vary. Example: The area of the square on the hypotenuse equals the total of the areas of the squares on each of the two legs.
6. **a)** 61 cm^2 **b)** 51 cm^2
7. **a)** 130 cm^2 **b)** 241 mm^2
8. Yes. Answers may vary. Example: The areas of the squares on the two smaller sides are 9 m^2 and 16 m^2. These add up to 25 m^2, which is the area of the square on the longest side.

3.3 Estimating Square Roots

1. Answers may vary for estimates. Example:
a) 6.3 **b)** 14
2. **a)** whole, exact
b) decimal, approximation

3. **a)** 4, 9 **b)** 16, 25 **c)** 64, 81 **d)** 81, 100
4. 26, 27, 28, 29, 30, 31, 32, 33, 34, 35
5. Answers may vary for estimates. Example:
a) 4.1 **b)** 9.2
6. Answers may vary for estimates.
a) 25, 36, 5.2 **b)** 49, 64, 7.4
c) 100, 121, 10.2 **d)** 121, 144, 11.8
7. Answers may vary for estimates. Example: 6.7 cm
8. 15
9. **a)** Answers may vary for estimates. Example: 7.7 m
b) Yes. Answers may vary. Example: If each side is about 7.7 m, multiply that times 4 to get 30.8 m, which is less than 32 m.
10. Answers may vary. Example: The maximum size of the rug should be approximately 14.4 m^2.

3.4 Using the Pythagorean Relationship

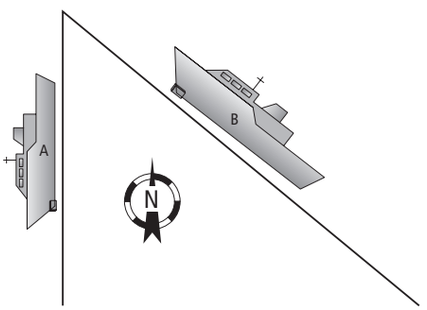
1. Pythagorean, length, hypotenuse, legs
2. **a)** 10 m **b)** 36 cm
3. **a)** 41 cm **b)** 37 m
4. **a)** 12 cm **b)** 12 cm
5. **a)** 3.3 cm **b)** 9.7 cm
6. 10.2 cm
7. **a)** 4.5 m **b)** 17 m
8. No. Answers may vary. Example: The areas of the squares on each leg add to 13 m^2. The area of the square on the long side is 25 m^2. If the ramp had a right triangle, these two values would be equal.

3.5 Applying the Pythagorean Relationship

1. **a)** Answers are in italics.
$d^2 = 12^2 + 5^2$
$d^2 = 144 + 25$
$d^2 = 169$
$d = \sqrt{169}$
$d = 13$
The hypotenuse is 13 km long.
b) Answers are in italics.
$15^2 + 20^2 = 25^2$
Left side: $15^2 + 20^2 = 225 + 400$
$= 625$
Right side: $25^2 = 625$
Yes, Yes
2. 12.7 cm
3. 100 m
4. 5.9 m
5. 6.9 cm
6. **a)** 15 cm **b)** 120 cm^2
7. No. Answers may vary. Example: The corners do not meet at right angles because $17^2 + 26^2 \neq 31^2$.
8. 250 km

3 Link It Together

1. Answers are in italics.
a) Factors: 1, 2, *4*, 8, 16; square root: *4*
b) Factors: 1, 3, *9*, *27*, 81; square root: *9*
c) Factors: 1, *2*, *3*, 4, *6*, *8*, *12*, 18, 24, *36*, *48*, 72, 144; square root: *12*
d) Factors: 1, *5*, 15, 45, *225*; square root: *15*
e) Factors: *1*, 5, *25*, *125*, 625; square root: *25*
2. **a)** Drawings may vary. Example:



b) Rescue boat A: $\frac{36}{60} = \frac{3}{5}$, $\frac{3}{5}$h × 15 km/h = 9 km.
Rescue boat B: $\frac{45}{60} = \frac{3}{4}$, $\frac{3}{4}$ × 20 km/h = 15 km.
c) $x^2 = 15^2 - 9^2$, $x^2 = 225 - 81$, $x^2 = 144$, $x = \sqrt{144}$, $x = 12$. The rescue boats were 12 km apart when they started.

3 Vocabulary Link

Across

2. perfect square
4. Pythagorean relationship

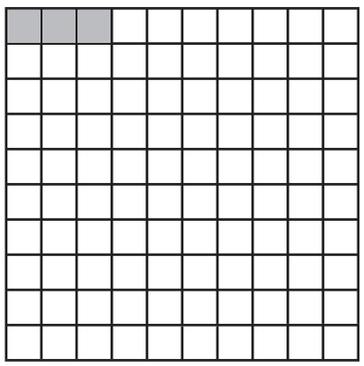
Down

1. square root
2. prime factorization
3. hypotenuse
5. legs

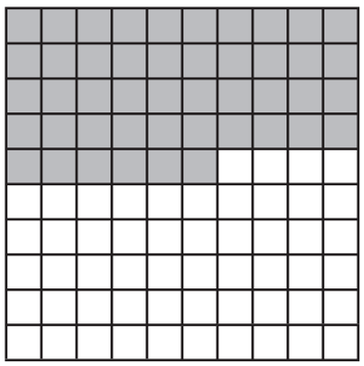
4 Get Ready

1. a) 25% **b)** 89% **c)** 64%

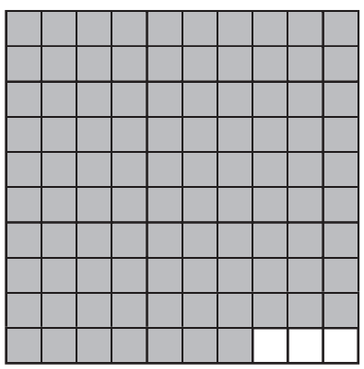
2. a)



b)



c)



3. a) $\frac{1}{4}$ or 0.25 or 25%
b) $\frac{3}{8}$ or 0.375 or 37.5%
c) $\frac{1}{2}$ or 0.50 or 50%
d) $\frac{4}{5}$ or 0.80 or 80%

4. a) $0.\overline{3}$ **b)** $0.\overline{45}$ **c)** $0.\overline{27}$

5. a) $0.8\overline{1}$ or $81.\overline{81}$% **b)** $0.\overline{7}$ or $77.\overline{7}$%
c) $0.8\overline{3}$ or $83.\overline{3}$%

6. Estimates may vary.
a) 17 **b)** 51 **c)** 52 **d)** 72

4.1 Representing Percents

1. c) shade more than one grid

2. a) shade squares from a hundred grid to show the whole number and part of one square to show the fraction

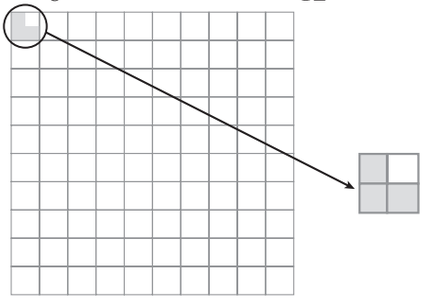
3. d) shade squares on a grid of 100 squares called a hundred grid

4. b) shade part of one square on a hundred grid

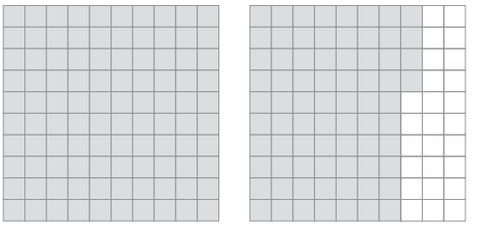
5. a) 144% **b)** $\frac{2}{3}$% **c)** 88.8%

6. a) $135\frac{7}{8}$% **b)** 256% **c)** $\frac{7}{12}$%

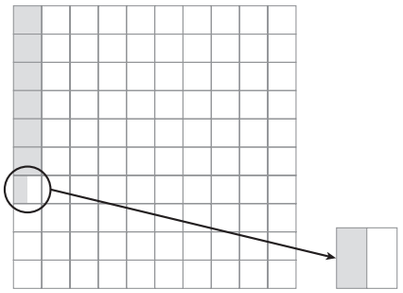
7. a)



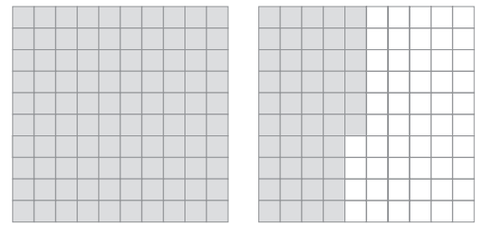
b)



8. a)



b)



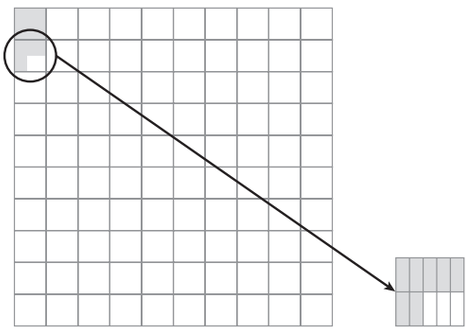
9. a) 3. Explanations will vary. Example: You need 3 full grids because 230% is more than 2 full grids but less than 3.

b) 7. Explanations will vary. Example: You need 7 full grids because 680% is more than 7 full grids but less than 8.

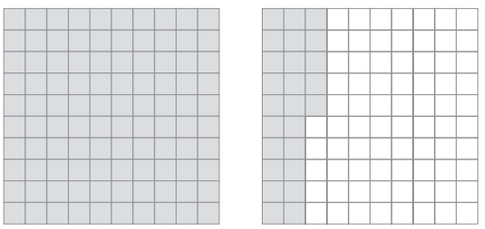
c) 4. Explanations will vary. Example: You need 4 full grids because 395% is more than 3 full grids but less than 4.

d) 15. Explanations will vary. Example: You need 15 full grids because 1420% is more than 14 full grids but less than 15.

10.



11.



4.2 Fractions, Decimals, and Percents

1. hundred grid, division, 0.15, 0.15

2. hundred grids, multiplication, 226%, 226%

3. fractions, decimals

4. a) 0.75 or 75% **b)** 0.07 or 7%
c) 1.8 or 180% **d)** 0.125 or 12.5%
e) 0.0375 or 3.75%

5. a) 425% or $\frac{425}{100} = 17/4$
b) 84.5% or $\frac{845}{1000} = \frac{169}{200}$
c) 0.62% or $\frac{62}{10\,000} = \frac{31}{5000}$

6. a) 7.35 or $\frac{735}{100} = \frac{147}{20}$
b) 0.165 or $\frac{165}{1000} = \frac{33}{200}$
c) 0.006 or $\frac{6}{1000} = \frac{3}{500}$

7. 125%

8. a) $\frac{21}{24}$ or $\frac{7}{8}$, 0.875, 87.5%
b) $\frac{5}{30}$ or $\frac{1}{6}$, $0.1\overline{6}$, $16.\overline{6}\%$
c) $\frac{65}{25}$ or $\frac{13}{5}$, 2.6, 260%

9. 0.00038, $\frac{38}{100\,000}$ or $\frac{19}{50\,000}$

10. 26.9%

4.3 Percent of a Number

1. a) \$0.66, dividing by ten
b) 9, halving **c)** \$0.64, doubling

2. decimal, multiply

3. a) 9000, doubling
b) 0.6, dividing by 10
c) 1, halving
d) 21, dividing by 10
e) 12, doubling, dividing by 10
f) 1350, doubling, halving

4. a) 1.26 **b)** 71.63 **c)** \$874.16
d) 501.88 **e)** \$467.82

5. \$23 287.50

6. 3094 mg

7. Estimates may vary.
a) \$1000, \$916.50
b) 1 600 000, 1 792 000 **c)** 3000, 3087

8. 6621 km

4.4 Combining Percents

1. d)

2. a)

3. c)

4. b)

5. Estimates may differ.
a) \$134, \$134.47 **b)** \$ 24.20, \$23.73
c) \$36.80, \$35.03 **d)** \$38.40, \$38.47

6. 46

7. **a)** \$67.20

b) Yes. Explanations will vary. Example: a 50% off sale would have resulted in a \$60 price. This did not happen with the first sale because the second price change gave 20% off the first sale price. This was less than 20% off the original price.

8. **a)** \$180 **b)** \$199.80

9. 0.93 km^2

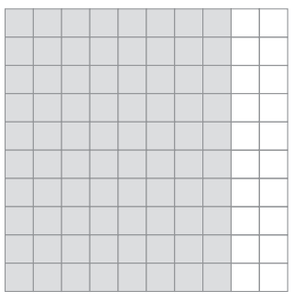
10. \$438.15

11. 22

12. \$9.68/h

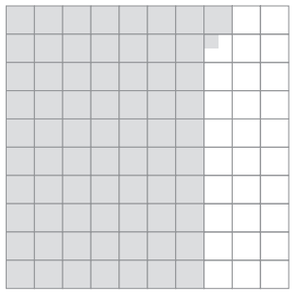
4 Link It Together

1. **a)**



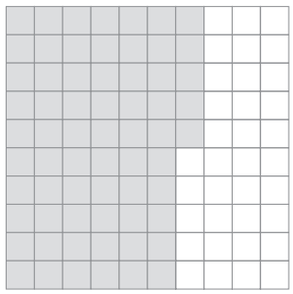
192 students

b)



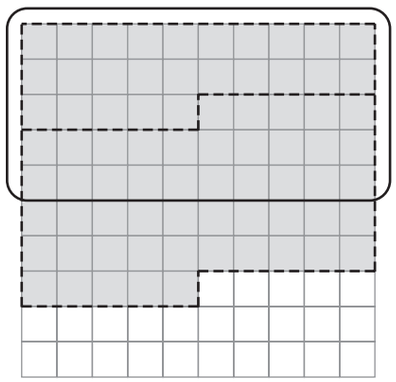
171 students

c)



312 attendees

2. **a)** Grids will vary. Example:



50%

b) 420

c) Answers will vary. Example: $66\frac{2}{3}$% of the students who attended brought two adults. This is a percent of the percent of students who attended. So, it is a smaller percent than $66\frac{2}{3}$% of the entire school population.

4 Vocabulary Link

1. d) greater than one

2. f) one

3. g) percent

4. c) fractional percent

5. b) double

6. e) halve

7. a) combined percent

I	G	J	F	R	A	C	T	I	O	N	A	L	P	E	R	C	E	N	T
D	T	D	U	J	I	X	P	D	L	C	F	W	J	G	Q	T	V	C	C
M	J	W	P	J	Q	O	R	Z	E	W	C	B	O	R	O	H	I	N	T
J	S	E	I	I	K	T	L	U	S	V	O	Y	T	E	O	W	U	A	O
D	T	G	O	Y	E	J	J	E	S	E	M	E	B	A	B	X	D	Y	O
G	S	H	Y	N	V	C	N	V	T	R	B	L	M	T	O	W	Z	Q	M
D	Z	L	M	H	E	B	C	E	H	Y	I	B	Z	E	U	J	N	W	W
N	M	G	N	D	H	E	L	O	A	S	N	P	E	R	C	E	N	T	G
Y	Y	S	M	O	T	B	F	J	N	M	E	W	O	T	I	F	S	H	C
B	W	H	O	X	U	B	F	Z	O	A	D	X	Q	H	E	O	Z	K	B
T	X	I	V	O	S	P	I	W	N	L	P	C	M	A	Z	P	U	Q	G
S	A	X	D	L	A	J	Z	Z	E	L	E	T	D	N	D	E	Z	F	H
I	V	E	U	K	B	D	J	B	B	A	R	Q	E	O	L	M	P	O	A
S	M	E	S	I	R	Z	E	L	B	M	C	Y	Y	N	U	K	H	U	L
J	V	K	I	J	F	E	N	Q	P	O	E	E	L	E	J	Y	S	A	V
W	J	M	H	J	R	F	Z	X	M	U	N	R	K	O	V	M	C	F	E
T	R	W	U	S	Z	X	R	K	C	N	T	O	O	Y	E	A	F	G	E
R	O	H	J	Q	R	L	E	J	H	T	S	V	H	N	R	X	Y	I	U

5 Get Ready

1. a) rectangular prism; 6; 12; 8
b) trangular prism; 5; 9; 6
c) cube; 6; 12; 8

2. a) 22.0 cm **b)** 12.6 cm^2

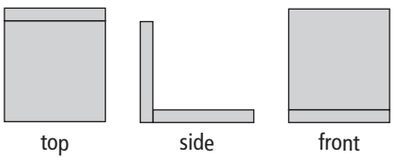
3. a) 16.5 cm^2 **b)** 50 cm^2 **c)** 30 cm^2

5.1 Views of Three-Dimensional Objects

1. a) three, 3-D
b) top, front, side, draw, build, 3-D

2. top, side, front

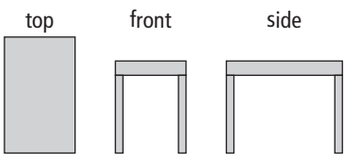
3.



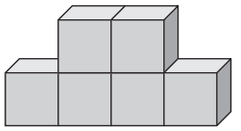
4. a)

b)

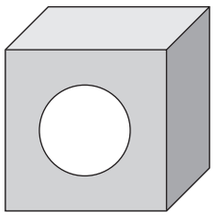
5.



6. a)



b)



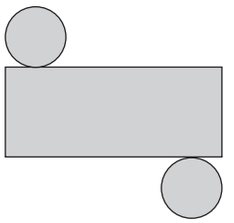
7. top: A; front: C; side: E

5.2 Nets of Three-Dimensional Objects

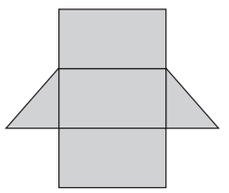
1. a) net **b)** 3-D object

2. Nets may vary. Example:

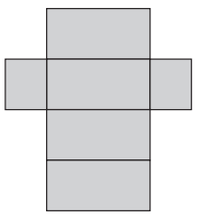
a)



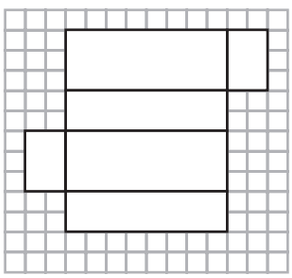
b)



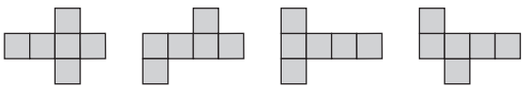
c)



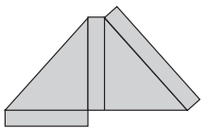
3. Nets may vary. Example:



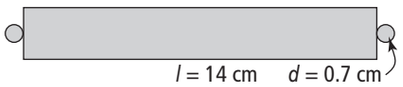
4. Make sure all results fold into a cube.
Answers will vary; here are examples:



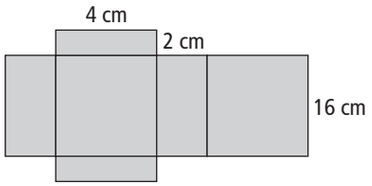
5. Answers will vary; here is an example:



6. a)



b) Nets may vary. Example: This box will have extra room around the pencils.

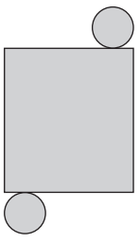


5.3 Surface Area of a Prism

1. face, surface area
2. a) 220.6 cm^2 **b)** 451.2 cm^2
3. a) 120 m^2 **b)** 140.1 m^2
4. 3.13 m^2
5. 124.5 m^2
6. a) 7.74 m^2 **b)** $193.11

5.4 Surface Area of a Cylinder

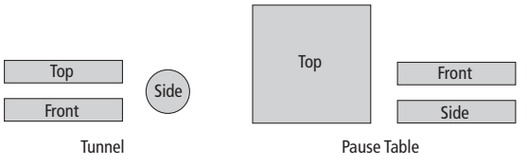
1. a) add, area **b)** cylinder **c)** circumference
2. Nets may vary. Example:



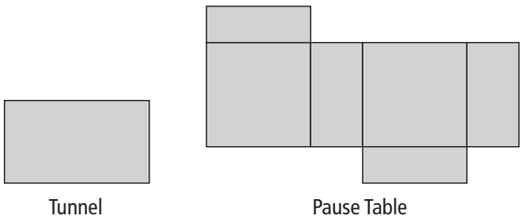
3. a) 1800 cm^2 **b)** 54 mm^2
4. 52.99 cm^2
5. a) 505.54 mm^2 **b)** 469.82 km^2
6. a) 229.8 cm^2
b) Answers may vary. The following is based on a container of 5.5 cm high and 13 cm in diameter (to give a little extra room in the container): 489.84 cm^2

5 Link It Together

1.



2. Nets may vary. The net for the tunnel should not show any ends. Example:



3. Tunnel = 10.36 m^2, Pause Table = 3.64 m^2

5 Vocabulary Link

Across

4. rectangular prism
6. triangular prism

Down

1. surface area
2. cylinder
3. prisms
5. net

6 Get Ready

1. a) $\frac{1}{3}$ **b)** $\frac{5}{6}$ **c)** $\frac{7}{10}$
2. a) $\frac{1}{4}$ **b)** $\frac{1}{2}$ **c)** $\frac{2}{15}$
3. a) $3\frac{4}{5}$ **b)** 6 **c)** $1\frac{1}{5}$ **d)** $5\frac{3}{7}$
4. a) $4\frac{3}{8}$ **b)** $7\frac{3}{10}$
5. a) $2\frac{1}{6}$ **b)** $2\frac{1}{4}$
6. a) 1 **b)** 4

6.1 Multiplying a Fraction and a Whole Number

1. multiplication **a)** 3, 3 **b)** 2, 2 **c)** 3, 12, 3

2. fraction, either, $\frac{2}{3}$

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

4. **a)** $4 \times \frac{2}{3} = \frac{8}{3}$ or $2\frac{2}{3}$ **b)** $2 \times \frac{8}{5} = \frac{16}{5}$ or $3\frac{1}{5}$ **c)** $6 \times \frac{1}{7} = \frac{6}{7}$

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

6. **a)** 2 **b)** $\frac{8}{9}$

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

8. 6 h

9. $2\frac{3}{4}$

10. Methods will vary. 225 m

6.2 Dividing a Fraction by a Whole Number

1. b)

2. c)

3. a)

4. **a)** $\frac{1}{6}$ **b)** $\frac{5}{12}$

5. **a)** $\frac{1}{12}$ **b)** $\frac{5}{18}$

6. **a)** $\frac{2}{9}$ **b)** $\frac{3}{10}$

7. **a)** $\frac{2}{3} \div 4$ **b)** Diagrams will vary. $\frac{1}{6}$

8. **a)** $\frac{3}{5}$ m $\div 2$ **b)** Diagrams will vary. $\frac{3}{10}$ m

9. **a)** Expressions may vary. Example: $\frac{9}{12} \div 4 = \frac{9}{48}$ or $\frac{3}{16}$

b) Diagrams will vary.

6.3 Multiplying Proper Fractions

1. paper folding

2. numerators, multiply

3. estimate

4. **a)** $1, \frac{5}{9}$ **b)** $0, \frac{4}{45}$ **c)** $\frac{1}{4}, \frac{3}{20}$ **d)** $\frac{1}{2}, \frac{6}{15}$ or $\frac{2}{5}$ **e)** $\frac{1}{2}, \frac{21}{40}$ **f)** $1, \frac{4}{5}$

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

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

7. $\frac{1}{2}, \frac{1}{2}$

8. Québec's population is approximately $\frac{2}{15}$ the population of Toronto.

9. Models will vary. $\frac{1}{25}$

10. $\frac{1}{12}$

6.4 Multiplying Improper Fractions and Mixed Numbers

1. **a)** **True**

b) **False** You can estimate the product of two mixed numbers or improper fractions by multiplying the whole numbers closest to them.

c) **False** Two mixed numbers can be multiplied by expressing them as improper fractions and then multiplying the numerators and multiplying the denominators.

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

3. **a)** $\frac{5}{2}$ **b)** $\frac{14}{3}$

4. Models will vary.

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

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

6. **a)** $10\frac{1}{2}$ h **b)** \$94.50

7. $16\frac{4}{5}$

8. $11\frac{1}{3}$ km

9. $2\frac{4}{5}$ h

10. 3 tanks

11. 18 years old

12. $9\frac{3}{4}$ h

6.5 Dividing Fractions and Mixed Numbers

1. b)

2. c)

3. a)

4. d)

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

6. **a)** $\frac{4}{5}$ **b)** $2\frac{1}{2}$ **c)** $1\frac{3}{8}$ **d)** $\frac{15}{23}$

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

8. **a)** $2, 1\frac{1}{2}$ **b)** $1\frac{1}{2}, 1\frac{6}{13}$

c) $2, 1\frac{9}{17}$

9. **a)** $1\frac{3}{4}, 1\frac{20}{21}$ **b)** $2\frac{2}{3}, 3\frac{1}{33}$

c) $1\frac{3}{4}, 1\frac{25}{32}$

10. 18

11. 5

12. $3\frac{3}{5}$ km/h

13. $3\frac{3}{4}$

6.6 Applying Fraction Operations

1. **a)** operation **b)** order

2. 3, 1, 2

3. **a)** $\frac{1}{3} \times \frac{3}{4}, \frac{7}{12}$ **b)** $\left(1\frac{1}{2} + \frac{5}{6}\right), 2\frac{1}{3}$

c) $\frac{7}{8} + \frac{2}{3}, \frac{7}{24}$ **d)** $1\frac{1}{2} \times \frac{1}{3}, \frac{3}{4}$

4. **a)** $6\frac{1}{2}$ **b)** $\frac{17}{18}$ **c)** $2\frac{5}{8}$ **d)** $1\frac{5}{32}$

5. \$528

6. $\left(1\frac{1}{2} \times \frac{1}{4}\right) \div 3 = \frac{5}{12}$

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

b) $1\frac{1}{4} - \frac{1}{8} \div \left(1\frac{1}{2} - \frac{3}{4}\right) = 1\frac{1}{12}$

c) $\frac{13}{5} - \left(\frac{3}{10} + \frac{7}{10}\right) \div \frac{1}{2} - \frac{3}{5} = 0$

d) $1\frac{1}{4} \times \left(2\frac{2}{5} \div 2\frac{1}{6}\right) - 1\frac{1}{3} = \frac{2}{39}$

8. Answers may vary. Examples:

a) $\frac{3}{3} \times 3 - 3$

b) $3 + \frac{3}{3} - 3$

c) $\frac{3}{3} + \frac{3}{3}$

d) $3 + (3 - 3) \times 3$

9. Expressions may vary. Example:

$2000 \times \left(\frac{1}{2} + \frac{1}{5}\right) = 1400$, 1400 km

6 Link It Together

1. **a)** 16 L **b)** $15\frac{11}{12}$ L

2. \$41.25

3. 5 L

4. \$31.25

6 Vocabulary Link

1. denominator
2. reciprocal
3. commutative property
4. numerator
5. proper fraction
6. quotient
7. product
8. order of operations
9. mixed number
10. dividend
11. improper fraction
12. divisor

7 Get Ready

1. The right prisms are a) and c) and the right cylinder is f). These figures have faces that meet the base at 90°.

2. Answers will vary.

a) between 175 and 200

b) between 720 and 800

c) between 140 and 210

3. **a)** 416 cm^2 **b)** 123.8 m^2 **c)** 226.5 cm^2

4. **a)** $4 \times 4 \times 4 = 64$

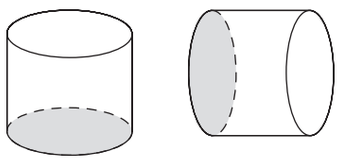
b) $3 \times 3 \times 3 \times 3 \times 3 = 243$

5. No, 3 to the power of 4 is $3 \times 3 \times 3 \times 3$, which is 81, and 4 to the power of 3 is $4 \times 4 \times 4$, which is 64.

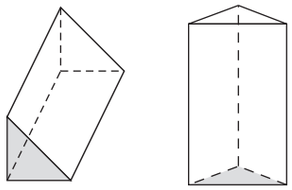
7.1 Understanding Volume

1. **a)** cylinder/prism, prism/cylinder, base, height
b) does not

2. **a)**



b)



3. **a)** 756 cm^3 **b)** 162 cm^3

4. **a)** 400 cm^3 **b)** 339 cm^3 **c)** 960 cm^3

5. 105 cm^3

6. **a)** Both have a volume of 200 cm^3.
b) Both have a volume of 10.5 m^3.

7. **a)** 7 cm **b)** 6.5 m

8. 24.3 m^3

9. The chocolate bar on the left has less chocolate.

7.2 Volume of a Prism

1. b

2. c

3. a

4. **a)** 540 cm^3 **b)** 119 m^3 **c)** 2560 cm^3

5. **a)** 91.1 cm^3 **b)** 343 cm^3

6. **a)** 162 cm^3 **b)** 63.8 m^3 **c)** 120 m^3

7. **a)** 384 cm^3 **b)** 672 m^3 **c)** 39 cm^3

8. The taller container on the left contains more juice.

9. 7.2 m^3

7.3 Volume of a Cylinder

1. circle

2. area, circle

3. volume, cylinder, area

4. **a)** 2119.5 cm^3 **b)** 2034.72 cm^3 **c)** 0.15 m^3

5. **a)** 1538.6 cm^3 **b)** 14.47 m^3

6. **a)** 1695.6 cm^3 **b)** 3229.49 cm^3
c) 113.04 m^3 **d)** 5000.45 cm^3

7. **a)** 471 cm^3 **b)** 8 cm

8. 0.064 m^3

7.4 Solving Problems Involving Prisms and Cylinders

1. **a)** prisms, cylinders **b)** formula **c)** diagram

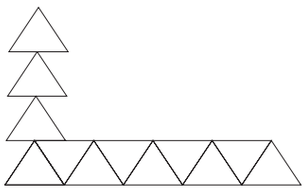
2. calculations

3. **a)** Diagrams will vary. **b)** 22

4. **a)** 788.53 cm^3 **b)** 938.47 cm^3

5. Cheyenne

6. **a)** Answers will vary. Example: I will fit five bead containers across the bottom row, then I will put four bead containers upside down on top of these five containers. I will build three other rows like this, making four rows of nine boxes each.
Height of triangle = 3 cm
Base of triangle = 4 cm
4 rows high = 12 cm
9 containers in a row
5 triangles across bottom = 20 cm



b) 36 **c)** 108

7 Link It Together

1. a) Answers will vary depending on the beads selected.

b) Favourites = 1.51 cm^3, Characteristics = 3.94 cm^3, Hobbies = 0.97 cm^3, Goals = 0.94 cm^3

c) Answers will vary depending on design.

7 Vocabulary Link

1. d) orientation
2. f) right prism
3. a) area
4. g) volume
5. c) height
6. e) right cylinder
7. b) base of a prism

H	K	H	J	X	R	M	O	E	Z	O	P	J	H	Y	Y	T	D	E	A
B	K	J	R	A	I	Q	H	I	O	K	I	K	T	A	G	N	U	B	A
N	M	F	V	H	G	B	U	Z	R	N	U	T	N	F	K	W	U	I	F
N	C	H	L	B	H	O	Q	H	I	E	J	V	Z	X	L	O	S	X	H
D	B	Z	I	A	T	E	M	S	E	V	D	V	G	V	K	A	T	N	L
I	D	Q	T	S	P	R	T	Q	N	G	B	G	J	L	F	G	U	Y	N
X	T	X	H	E	R	I	G	H	T	C	Y	L	I	N	D	E	R	C	P
B	M	A	E	O	I	D	F	F	A	W	P	B	F	F	A	J	P	E	R
G	T	X	A	F	S	C	A	E	T	Q	P	H	S	G	E	N	V	A	A
U	A	B	U	A	M	Y	A	L	I	D	L	E	K	J	S	H	N	R	J
Y	J	M	T	P	V	S	T	C	O	V	V	I	J	Y	R	O	S	B	Z
Z	Z	Z	B	R	Y	A	N	D	N	I	L	G	H	T	W	K	R	Y	R
C	J	E	A	I	Z	B	L	M	F	B	V	H	Q	V	R	D	C	Z	E
Q	P	G	C	S	E	C	T	R	M	P	O	T	R	V	D	T	N	L	G
W	A	W	M	M	X	L	W	D	Z	W	L	U	K	I	A	R	E	A	G
X	J	V	Z	K	Q	Q	J	D	D	W	U	W	B	T	Y	J	O	M	Z
E	Q	U	N	A	X	A	X	M	Y	Q	M	J	K	I	V	B	R	Z	F
O	D	P	P	K	G	V	I	V	U	O	E	T	H	B	J	E	F	Z	R

8 Get Ready

1. Explanations will vary. Examples:

a) +3%. An increase is a positive integer.

b) –20 m; If sea level 1 is 0, below sea level should be a negative integer.

2. a) +$15 **b)** –$15
3. a) +3 **b)** –5 **c)** +3
4. a) –8 **b)** +4
5. a) +9 **b)** –14 **c)** –3 **d)** +6
6. a) +3 **b)** –4 **c)** –8 **d)** +3
7. a) 37 **b)** 19 **c)** 13 **d)** 15

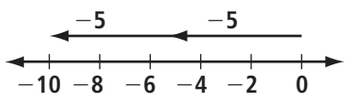
8.1 Exploring Integer Multiplication

1. a) positive, insert **b)** negative, zero
2. a) $(+5) \times (+4)$ **b)** $(-7) \times (+3)$
c) $(-3) \times (+5)$ **d)** $(+2) \times (+3)$
3. a) $(+1) + (+1) + (+1) + (+1)$
b) $(-6) + (-6) + (-6)$
c) $(-2) + (-2) + (-2) + (-2) + (-2)$
d) $(+9) + (+9)$
4. a) $(+3) \times (+3)$ **b)** $(-5) \times (+2)$
c) $(-2) \times (-2)$ **d)** $(-2) \times (+4)$
5. a) +16 **b)** −12 **c)** −8 **d)** +15
6. a) $(+6) \times (+8) = 48$, Serena will earn $48 dollars over 8 weeks.
b) $(+12) \times (-3) = -36$, The temperature dropped 36 degrees in 12 hours.

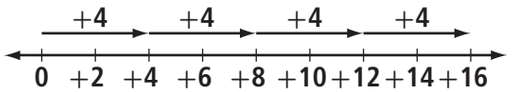
8.2 Multiplying Integers

1. number line, negative
2. a) sign **b)** positive, 28, 28
c) negative, −28, −28
3. same, −24
4. a) $(+2) \times (-3)$ **b)** $(+3) \times (+4)$
5. Number lines may vary. Example:

a)



b)



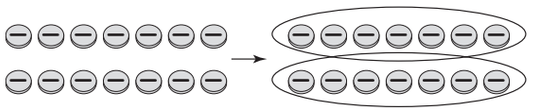
6. a) +42 **b)** −32 **c)** −45 **d)** +110
7. Estimates may vary.
a) +162 **b)** −480 **c)** −708 **d)** +1764
8. a) −40 **b)** +5 **c)** −2 **d)** +9 **e)** +7
9. a) $60 **b)** −$30

8.3 Exploring Integer Division

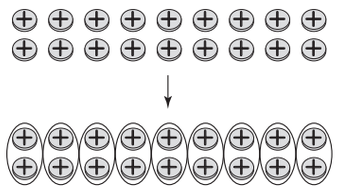
1. c) $(-10) \div (+2) = -5$
2. a) $(-8) \div (-4) = +2$
3. b) $(+6) \div (+2) = +3$
4. a) +2 **b)** +5 **c)** −2 **d)** +3
5. a) −5, +2 **b)** +8, −2 **c)** +2, +3

6. $-3, +4$

7. a) $+2$



b) $+2$



8. a) Each quotient is 1 less than the one before.

b) -2

9. a) $(+18) \div (+3) = +6$

b) $(-20) \div (+4) = -5$

10. $(+21) \div (+100)$; 0.21 h or 12.6 min

11. $(+750) \div (+10)$; \$75

8.4 Dividing Integers

1. some, number line

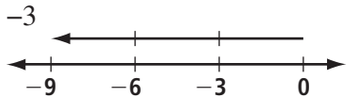
2. numerals, sign **a)** positive **b)** negative

3. a) $(+6) \div (+2) = +3$, $(+6) \div (+3) = +2$

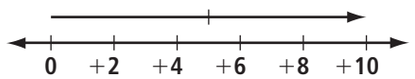
b) $(-8) \div (-2) = +4$, $(-8) \div (-4) = +2$

4. Number lines may vary. Examples:

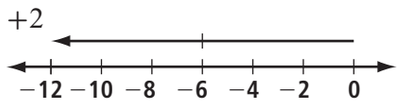
a) -3



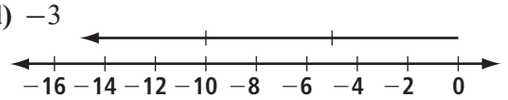
b) $+2$



c) $+2$



d) -3



5. a) -11 **b)** -3

6. a) $+16$ **b)** -1 **c)** -20

7. $(+286) \div (-13) = -22$

8. \$15 $\div$ $(+5) = +3$ She spent \$3 each day.

9. a) \$15 **b)** 3

10. $(-1972) \div (-35)$, because this quotient is positive and the others are negative

11. 200 m/min

12. 4819 sec or about 80 min

8.5 Applying Integer Operations

1. operation

2. order, operations

3. 1 Brackets; 2 Multiply and divide, from left to right; 3 Add and subtract, from left to right

4. a) -9 **b)** -3 **c)** -12 **d)** -7

5. a) -4 **b)** -31

6. a) 20

b) $(+12) + (-4) + (+6) + (-10) + (+15) + (+1) = 20$

7. a) 56 **b)** 420 **c)** 243 min

8. a) highest: hours 11 and 14; lowest: hours 8 and 13

b) Answers may vary. Example:

$$\frac{+2\ +1\ +1\ -3\ -1\ +4\ -1\ -2}{8}$$

9. Integer statements may vary.

a) $(+9) \times (+3) + (-1) + (+1) + (-2) + (-2) + (+3) + (-1) + (+1) = 26$

b) 36

8 Link It Together

1. $(+100) \times (+290) + (-9) \times (+1000) = +20\,000$, The charity had \$20 000 left.

2. $[(+1000) + (-100)] \div [(+7) + (+1)] = +112.50$, Each person received \$112.50

3. $[(+7) + (+1)] \times (+100) + (-1000) \times (+2) = -1200$

The people at the table won more than they paid for the tickets. The charity lost \$1200 on this table.

8 Vocabulary Link

1. sign rules

2. brackets

3. zero pair

4. order

5. left to right

6. integer

9 Get Ready

1. Descriptions will vary.
- **a)** letters of the alphabet beginning with *b* and skipping two letters each time
- **b)** integers beginning with 9 and decreasing by 5 each time

2. Descriptions will vary.

a)

Figure Number	1	2	3
Number of Squares	4	7	10

The number of squares begins with 4 and increases by 3 with each new figure.

b)

Figure Number	1	2	3
Number of Cubes	4	6	8

The number of cubes begins with 4 and increases by 2 with each new figure.

3. Variables may differ.
- **a)** $5p$, where p represents the number of pencils in each box
- **b)** $12d \div 4$, or $3d$, where d represents the number of DVDs in each carton

4. Answers are in italics.

Point	E	*C*	*G*	*D*	*A*	*B*	*F*
x	3	−1	2	3	*−1*	*0*	*3*
y	1	0	−1	2	*2*	*1*	*0*

9.1 Analysing Graphs of Linear Relations

1.

Number of Tickets	1	2	3	4	5
Cost ($)	10	20	30	40	50

2. a, b, e

3. Yes, because the points appear to lie in a straight line.

4. No, because there are no half tickets.

5. a) 3, 2, 9
- **b)** straight line, linear
- **c)** 1, 3
- **d)** Answers are in italics.

Number of Storeys	1	2	3	4	*5*	10
Total Height (m)	3	*6*	*9*	*12*	15	*30*

6. a) The points appear to lie in a straight line, showing a linear relation.
- **b)** 7.5
- **c)** Answers are in italics.

Volume (L)	Cost ($)
5	7.50
10	*15.00*
15	*22.50*
20	*30.00*

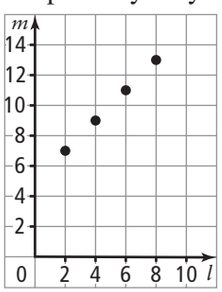
- **d)** Yes, gasoline is sold in any volume.
- **e)** $1.50
- **f)** 25 L = $37.50; 30 L = $45

7. a) Answers may vary. Example: Number of Customers
- **b)** The points appear to lie in a straight line, showing a linear relation. The graph shows that to move from one point to the next, you go one unit horizontally and four units vertically.
- **c)** Answers are in italics.

Number of Tables	1	*2*	*3*	4	5	6
Maximum Number of Customers	4	8	*12*	*16*	*20*	*24*

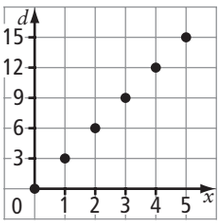
9.2 Patterns in a Table of Values

1. d) ordered pair
2. e) expression
3. a) table of values
4. c) words
5. b) graph
6. the same, the same
7. Graphs may vary. Example:



8. a) Explanations may vary. Example: The values increase by the same amount each time.

9. a)



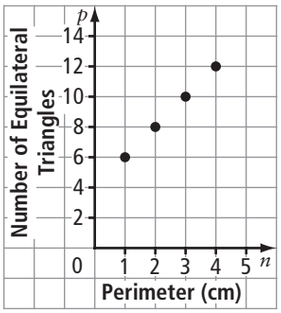
b) 1 **c)** 3 **d)** 3 **e)** $d = 3x$

10. 5

11. a) Answers are in italics.

Number of Triangles	1	2	3	4
Perimeter (cm)	6	8	*10*	*12*

b)



c) Answers may vary. Example: The perimeter of each triangle is twice the number of triangles plus 4.

d) Answers may vary. Example: $P = 2n + 4$, where P = perimeter and n = number of triangles

e) 64 cm

9.3 Linear Relationships

1. a) relation, formula, equation

b) values, reasonable

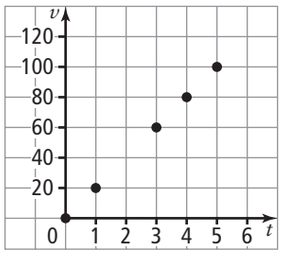
c) ordered

2. distance, time

3. a) Answers are in italics.

t	*v*
0	0
1	20
3	*60*
4	*80*
5	*100*

b)

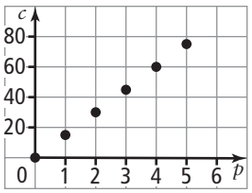


c) Answers will vary. Example: Yes, because the hose could be on for fractions of a minute. Also, if the hose were on for 2 min, 40 L would go through.

4. a) Answers are in italics.

p	0	1	2	3	4	5
c	*0*	*15*	*30*	*45*	*60*	*75*

b)



c) No, because you cannot print partial pages.

5. a) 14 **b)** −11 **c)** 4

6. a) Answers are in italics.

x	*−2*	*−1*	*0*	*1*	*2*
y	*−7*	*−3*	*1*	*5*	*9*

b) Answers are in italics.

x	*−2*	*−1*	*0*	*1*	*2*
y	*10*	*5*	0	*−5*	*−10*

c) Answers are in italics.

x	*−2*	*−1*	*0*	*1*	*2*
y	*5*	*4*	*3*	*2*	*1*

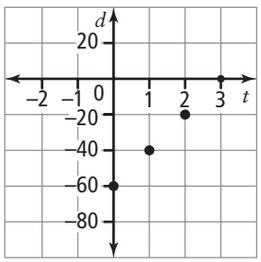
7. a) 0, 4 **b)** 1 **c)** 14

9 Link It Together

1.

Time (min)	0	1	2	3
Distance (m)	−60	−40	−20	0

2. a)



b) Scuba Diver's Rate of Ascent

c) Answers will vary. Example: The points appear to lie in a straight line. The graph shows that to move from one point to the next, you go 1 unit horizontally and 20 units vertically.

3. a) Each consecutive value for t changes by 1. Each consecutive value for d changes by 20.

b) $d = 20t - 60$, where d represents distance and t represents time in minutes.

4. No, because a scuba diver cannot swim above the water level.

5. Yes, the data points appear to be in a straight line.

9 Vocabulary Link

1. c) formula
2. f) table of values
3. e) relationship
4. d) linear relation
5. a) equation
6. b) expression
7. g) variable

N	I	V	B	V	M	J	H	A	G	V	Y	U	U	R	A	T	E	V	G
T	R	S	N	W	L	U	L	Z	Y	X	R	K	Z	G	E	E	I	O	Z
E	A	U	E	V	H	U	T	E	C	F	S	F	O	F	Z	Q	R	Z	G
I	L	B	Q	R	M	D	X	L	U	C	F	S	N	N	L	U	S	P	T
Z	Y	P	L	R	O	U	E	E	R	Q	L	W	U	Z	Q	A	O	I	U
E	Q	D	O	E	G	M	L	T	K	N	F	C	E	V	W	T	D	L	M
X	V	F	U	T	O	B	P	B	W	M	K	Q	I	T	F	I	L	U	S
P	M	Y	I	C	A	F	B	J	S	U	Z	L	E	N	Y	O	V	U	V
R	M	G	Z	I	W	E	V	Y	H	O	W	F	J	B	D	N	L	H	C
E	A	L	R	E	B	H	K	A	T	V	K	S	O	C	V	E	K	G	Z
S	F	A	T	Q	X	K	J	P	L	Y	R	M	A	U	A	F	F	K	U
S	V	Z	O	C	W	K	F	C	S	U	C	V	E	J	P	G	N	L	V
I	A	D	N	E	I	L	Q	D	I	X	E	S	N	E	N	X	U	G	W
O	S	E	V	L	E	R	N	U	W	X	B	S	D	D	S	G	B	S	B
N	J	L	I	N	E	A	R	R	E	L	A	T	I	O	N	K	C	R	E
W	T	J	R	E	L	A	T	I	O	N	S	H	I	P	Z	F	P	O	E
M	T	J	K	M	N	G	L	Y	P	S	H	Q	M	K	S	O	T	X	J
A	N	T	N	P	G	W	W	U	N	L	T	M	N	S	W	R	Z	E	D

10 Get Ready

1. a) 19 **b)** 53 **2.** 494 cm^2
3. a) $p + 7 = 12$ **b)** $x - 3 = 11$
c) $4s = 28$ **d)** $k \div 6 = 9$
4. a) 139 cm **b)** 25 min
5. a) $\underline{2n}\ \boxed{+4} = 18$ **b)** $\underline{3x}\ \boxed{+5} = 17$
c) $\underline{8y}\ \boxed{-70} = 94$ **d)** $27 = \underline{7q}\ \boxed{+6}$
6. a) $j = 8$ **b)** $t = 3$

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

1. b **2.** c **3.** a **4.** d
5. a) $2r = 8$ **b)** $-3s = 9$ **c)** $\frac{x}{4} = 4$
d) $-4m = -16$
6. a) $g = -8$ **b)** $p = -9$ **c)** $n = 30$
d) $b = -21$
7. Models will vary. **a)** $t = -3$ **b)** $b = -8$
8. a) -7 **b)** -8
9. a) $a = -5$ **b)** $k = 9$
10. a) 5 **b)** -4
11. a) no **b)** no **c)** yes **d)** yes
12. a) Equations may vary. Example: $3c = 48$; c is the cost of a child's ticket.
b) $c = 16$
13. a) $50i = e$ **b)** 50 000 h

10.2 Modelling and Solving Two-Step Equations: $ax + b = c$

1. isolate **2.** reverse **3.** substitution
4. negative **5.** positive
6. a) $3x + 2 = 8, x = 2$
b) $3x = -6; x = -2$
c) $2x - 7 = -17; x = -5$
7. a) $\boxed{5+}\ \underline{3x} = -7$ **b)** $\underline{4r}\ \boxed{-6} = 14$
c) $13 = -\underline{6y}\ \boxed{-11}$ **d)** $-89 = \underline{9t}\ \boxed{-26}$
8. a) $x = 3$ **b)** $p = 4$ **c)** $a = -3$
d) $d = -3$
9. a) Answers may vary. Example: $4v - 5 = h$, where $4v$ represents 4 times the number of games the Vampires won. Subtract 5 from that to get h, the number of games the Hornets won. **b)** 6

10. **a)** no **b)** yes **c)** yes **d)** yes
11. **a)** $3s + 7 = 40$ **b)** $s = 11$ cm
12. **a)** $150 + 72p = r$ **b)** \$1302 **c)** 25

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

1. **a)** isolate **b)** reverse, add, divide **c)** substituting, value
2. **a)** $x = 14$ **b)** $a = 8$
3. Models will vary. **a)** $x = 10$ **b)** $y = 6$ **c)** $n = -36$ **d)** $c = -49$
4. **a)** Subtract 2 from each side, then multiply both sides by 6.
b) Add 6 to each side, then multiply both sides by -3.
c) Subtract 7 from each side, then multiply both sides by -5.
d) Add 12 to each side, then multiply both sides by 11.
5. **a)** $d = -8$ **b)** $n = 32$ **c)** $b = 51$ **d)** $p = -13$
6. **a)** yes **b)** yes **c)** no **d)** yes
7. Equations will vary. Example: $\frac{j}{8} + 400 = 475, j = 600$
8. $f = 350$ km/h
9. **a)** $d = \frac{r}{3} + 137$ **b)** \$636 **c)** \$370

10.4 Modelling and Solving Two-Step Equations: $a(x + b) = c$

1. isolate **2.** undoing, opposite
3. dividing, distributive
4. answer, sides
5. **a)** $x = 6$ **b)** $x = 7$ **c)** $x = -3$ **d)** $x = -4$
6. **a)** $t = 7$ **b)** $r = -18$
7. **a)** $x = 4$ **b)** $s = 146$ **c)** $x = 6$
8. **a)** Answers will vary. Example: $P = 4(l + 4)$ **b)** 60 m
9. **a)** $3(s + 5) = \frac{180}{2}$ **b)** 25 km/h

10 Link It Together

1. In these answers, d represents depreciation, a represents the age of the car, and c represents the cost of the car.
a) $d = 1000a$ **b)** $d = a\left(\frac{c}{10}\right)$
c) $d = (c - 2750)\frac{a}{50}$
2. \$3000, \$6000, \$1035
3. Answers are in italics.

Age of Car (Yr)	Value of Car (\$)
0	30 000
1	*27 000*
2	*24 000*
5	*15 000*
8	*6000*
10	*0*

10 Vocabulary Link

1. constant
2. distributive
3. reverse
4. equation
5. linear
6. isolate
7. numerical coefficient
8. opposite operations
9. variable

11 Get Ready

1. **a)** 0.8, 80% **b)** $\frac{2}{3}$, $66.\overline{6}\%$
c) $0.\overline{36}$ or 0.3636..., 36% or $36.\overline{36}\%$
d) $\frac{1}{3}$, $0.\overline{3}$, or 0.3333...
2. $\frac{1}{3}$, $0.\overline{3}$, $33.\overline{3}\%$
3. **a)**

	1	2	3	4	5	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) (A, 1), (A, 2), (A, 3), (A, 4), (A, 5), (A, 6), (B, 1), (B, 2), (B, 3), (B, 4), (B, 5), (B, 6)

c) $\frac{4}{12}$ or $\frac{1}{3}$

4. $\frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$

5. $\frac{1}{2}$

11.1 Determining Probabilities Using Tree Diagrams and Tables

1. d) probabilities

2. e) P(A then B)

3. a) probability

4. c) P(A, B)

5. b) tree diagrams

6. Outcomes: (H, 1), (H, 2), (H, 3), (H, 4), (H, 5), (H, 6), (T, 1), (T, 2), (T, 3), (T, 4), (T, 5), (T, 6)

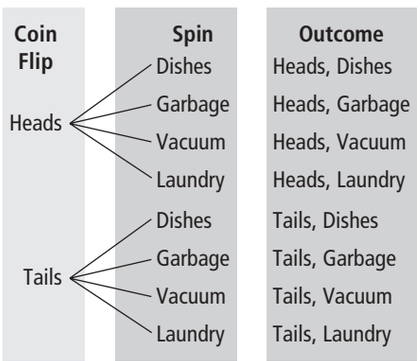
a) $\frac{1}{12}$ **b)** $\frac{3}{12}$ or $\frac{1}{4}$ **c)** 0

7. a)

	1	2	3	4
3	3, 1	3, 2	3, 3	3, 4
6	6, 1	6, 2	6, 3	6, 4
9	9, 1	9, 2	9, 3	9, 4

b) $\frac{6}{12}$ or $\frac{1}{2}$

8. a)



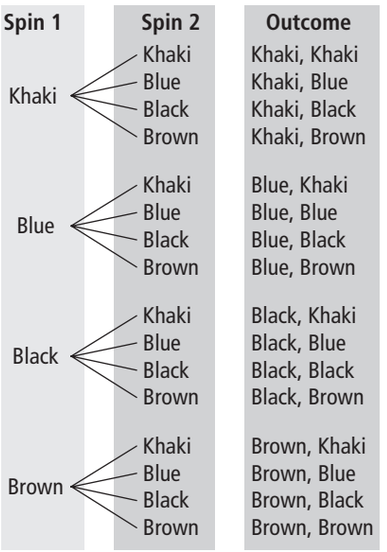
b) $\frac{1}{8}$

9. a)

	7	4	1	3	4	9
7	7, 7	7, 4	7, 1	7, 3	7, 4	7, 9
4	4, 7	4, 4	4, 1	4, 3	4, 4	4, 9
1	1, 7	1, 4	1, 1	1, 3	1, 4	1, 9
3	3, 7	3, 4	3, 1	3, 3	3, 4	3, 9
4	4, 7	4, 4	4, 1	4, 3	4, 4	4, 9
9	9, 7	9, 4	9, 1	9, 3	9, 4	9, 9

b) $\frac{1}{36}$

10. a)



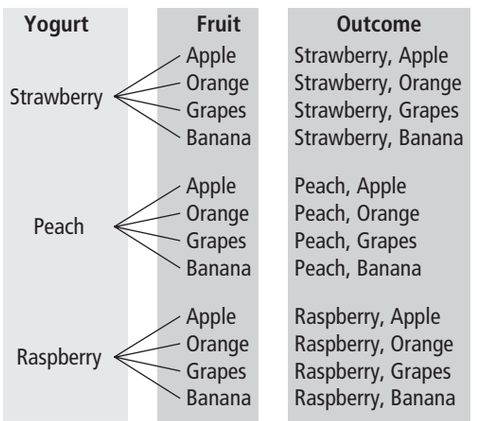
b) $\frac{4}{16}$ or $\frac{1}{4}$

11.2 Outcomes of Independent Events

1. Order may vary.

a) tree diagram **b)** table **c)** multiplication

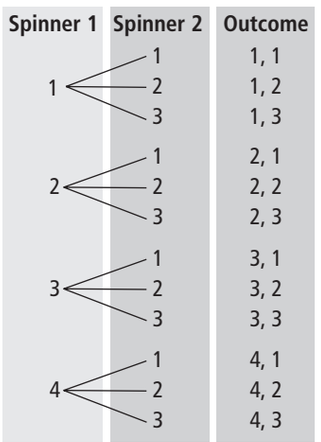
2. a)



b) 12 **c)** $3 \times 4 = 12$

3. a) $4 \times 3 = 12$

b) Methods may vary. Example:



4. a)

Crust	Meat	Toppings	Outcome
Thin	Pepperoni	Mushroom	Thin, Pepperoni, Mushroom
		Pineapple	Thin, Pepperoni, Pineapple
		Green Pepper	Thin, Pepperoni, Green Pepper
		Extra Cheese	Thin, Pepperoni, Extra Cheese
	Ham	Mushroom	Thin, Ham, Mushroom
		Pineapple	Thin, Ham, Pineapple
		Green Pepper	Thin, Ham, Green Pepper
		Extra Cheese	Thin, Ham, Extra Cheese
Regular	Pepperoni	Mushroom	Regular, Pepperoni, Mushroom
		Pineapple	Regular, Pepperoni, Pineapple
		Green Pepper	Regular, Pepperoni, Green Pepper
		Extra Cheese	Regular, Pepperoni, Extra Cheese
	Ham	Mushroom	Regular, Ham, Mushroom
		Pineapple	Regular, Ham, Pineapple
		Green Pepper	Regular, Ham, Green Pepper
		Extra Cheese	Regular, Ham, Extra Cheese
Stuffed	Pepperoni	Mushroom	Stufffed, Pepperoni, Mushroom
		Pineapple	Stufffed, Pepperoni, Pineapple
		Green Pepper	Stufffed, Pepperoni, Green Pepper
		Extra Cheese	Stufffed, Pepperoni, Extra Cheese
	Ham	Mushroom	Stufffed, Ham, Mushroom
		Pineapple	Stufffed, Ham, Pineapple
		Green Pepper	Stufffed, Ham, Green Pepper
		Extra Cheese	Stufffed, Ham, Extra Cheese

b) $3 \times 2 \times 4 = 24$ **c)** $3 \times 2 \times 3 = 18$

5. a)

Coin	Spinner	Die	Outcome
Heads	Green	1	H, G, 1
		2	H, G, 2
		3	H, G, 3
		4	H, G, 4
		5	H, G, 5
		6	H, G, 6
	Yellow	1	H, Y, 1
		2	H, Y, 2
		3	H, Y, 3
		4	H, Y, 4
		5	H, Y, 5
		6	H, Y, 6
	Blue	1	H, B, 1
		2	H, B, 2
		3	H, B, 3
		4	H, B, 4
		5	H, B, 5
		6	H, B, 6
Tails	Green	1	T, G, 1
		2	T, G, 2
		3	T, G, 3
		4	T, G, 4
		5	T, G, 5
		6	T, G, 6
	Yellow	1	T, Y, 1
		2	T, Y, 2
		3	T, Y, 3
		4	T, Y, 4
		5	T, Y, 5
		6	T, Y, 6
	Blue	1	T, B, 1
		2	T, B, 2
		3	T, B, 3
		4	T, B, 4
		5	T, B, 5
		6	T, B, 6

Multiplication, $2 \times 3 \times 6 = 36$

b) 36

6. a) Answers may vary. Example: Andre is taking a trip and has the following options. He can fly or take the train; he can leave on Monday, Tuesday, Wednesday, Thursday, or Friday; and he can choose an economy, regular, or first class fare. If he selects one option from each category, how many combinations are possible for his trip?

b) Answers may vary, based on question.

11.3 Determining Probabilities Using Fractions

1. a) multiplying, success

b) multiplying, tree diagrams, tables

c) simulation

d) results, experimental

2. a) Methods may vary. Example:

	Purple	Red	Orange
1	1, P	1, R	1, O
2	2, P	2, R	2, O
3	3, P	3, R	3, O
4	4, P	4, R	4, O

b) $\frac{1}{12}$

c) $P(4, \text{P}) = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

3. a) $P(\text{two gray pencils}) = \frac{2}{20}$ or $\frac{1}{10}$

b)

Case 1	Case 2	Outcome
B	B	B, B
	B	B, B
	B	B, B
	B	B, B
	G	B, G
B	B	B, B
	B	B, B
	B	B, B
	B	B, B
	G	B, G
G	B	G, B
	B	G, B
	B	G, B
	B	G, B
	G	G, G
G	B	G, B
	B	G, B
	B	G, B
	B	G, B
	G	G, G

4. a) Answers may vary. Example: I used a four-section spinner marked A, B, C, and D for the classes and pulled the words foyer, library, hallway, gymnasium, cafeteria, and office from a bag. I used a table to record my 20 trials. Experimental probability $P(8\text{C, foyer}) = \frac{1}{20}$ or 5%

	F	L	H	G	C	O
8A	✓		✓	✓✓	✓	
8B		✓	✓		✓	
8C	✓		✓	✓	✓✓	✓
8D	✓	✓✓	✓		✓	✓

b) Theoretical probability

$P(\text{8C, foyer}) = \frac{1}{4} \times \frac{1}{6} = \frac{1}{24}$ or 4.17%

c) Answers may vary depending on the results of the simulation. In this example, the theoretical probability is lower than the experimental probability.

5. a) $P(\text{both shots}) = 15\%$

b) Answers may vary. Example: I considered Greg's statistics and used two spinners. Spinner A represents the first shot. It has 10 equally-sized sectors. I shaded six of them. Spinner B represents the second shot. Spinner B has four equally-sized sectors. I shaded one of these sectors. The shaded sections are the shots he makes. I spun spinner A and then spin spinner B. I repeated this 25 times and recorded the results. Spinner A and spinner B must both land on the shaded part for Greg to make both shots.

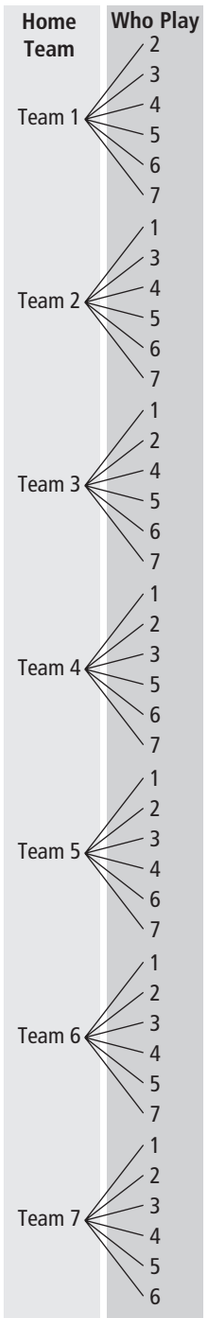
Makes Both Shot	Misses One or Both Shots
✓ ✓ ✓ ✓ ✓	✓ ✓

$P(\text{both shots}) = \frac{5}{25} = \frac{1}{5}$ or 20%

c) Answers may vary, depending on the results of the simulation. In this example, the experimental probability is higher than the theoretical probability.

11 Link It Together

1. a)



b) 42

c) 7 teams × 6 games each = 42 games

2. a) Answers may vary. Example: I assumed that each team had an equal chance of winning, so I used a two-section spinner

marked Win and Lose. The first 6 spins were for Team 1, the next 6 spins for Team 2, and so on.

	Win	Lose
1	✓ ✓ ✓	✓ ✓ ✓
2	✓ ✓	✓ ✓ ✓ ✓
3	✓ ✓ ✓ ✓	✓ ✓
4	✓ ✓ ✓	✓ ✓ ✓
5	✓ ✓ ✓	✓ ✓ ✓
6	✓ ✓	✓ ✓ ✓ ✓
7	✓	✓ ✓ ✓ ✓ ✓

b) Answers may vary, depending on the results of the simulation. According to the simulation, team 3 will win four games.

11 Vocabulary Link

1. b) favourable outcome
2. f) simulation
3. c) independent
4. e) sample space
5. a) experimental
6. d) probability
7. g) theoretical

H	X	F	Q	H	W	F	U	Z	J	E	I	Y	U	U	X	A	I	V	Z
N	F	D	R	X	X	A	B	D	J	X	K	E	J	Y	L	I	N	W	V
C	Y	Q	U	Z	V	V	V	J	J	P	R	N	L	N	W	L	D	W	T
M	M	E	P	Y	S	O	T	M	H	E	G	M	V	G	T	Q	E	F	W
M	F	D	O	F	A	U	R	R	X	R	A	V	Z	W	X	O	P	S	F
I	C	D	D	A	Z	R	Q	P	E	I	B	J	M	X	F	P	E	I	X
Z	W	G	B	Q	M	A	J	V	I	M	T	U	O	O	O	M	N	M	X
T	H	L	N	F	M	B	N	M	N	E	B	D	I	X	I	L	D	U	Z
K	Q	A	W	L	X	L	Y	D	Z	N	B	K	O	J	U	S	E	L	G
Q	Z	Q	O	T	H	E	O	R	E	T	I	C	A	L	Z	S	N	A	B
Z	D	M	S	Z	B	O	U	V	Z	A	H	O	L	W	E	J	T	T	L
G	B	N	P	P	L	U	M	A	H	L	T	D	N	I	B	E	N	I	K
N	S	W	C	J	Y	T	S	A	M	P	L	E	S	P	A	C	E	O	Q
T	H	C	F	D	E	C	C	Z	P	J	U	F	Z	J	J	C	C	N	K
A	M	W	Z	Z	I	O	S	P	R	O	B	A	B	I	L	I	T	Y	D
W	P	U	Q	J	R	M	U	F	Z	P	U	F	M	Q	T	J	C	T	S
F	M	X	A	C	P	E	X	N	I	N	B	C	V	V	Z	X	R	M	Z
R	V	H	L	A	D	B	I	N	Y	V	X	O	B	O	B	J	G	F	G

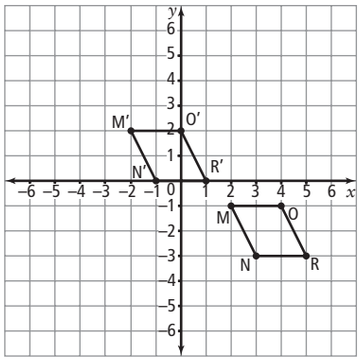
12 Get Ready

1. a) No. Answers may vary. Example: They are not congruent because one of the sides and some of the angles are not equal.
b) Yes. Answers may vary. Example: They are congruent because all angles and sides correspond.
c) No. Answers may vary. Example: They are not congruent because the circles are different sizes.
d) Yes. Answers may vary. Example: They are congruent because all angles and sides correspond.

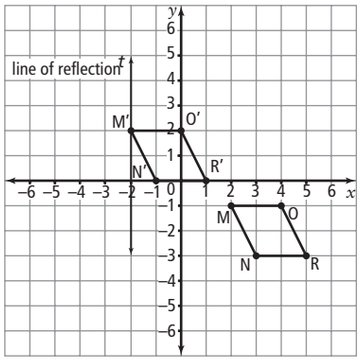
2. a) Regular. Answers may vary. Example: All sides and all angles are equal.
b) Regular. Answers may vary. Example: All sides and all angles are equal.
c) Irregular. Answers may vary. Example: Some of the sides and some of the angles are different.
d) Irregular. Answers may vary. Example: Some of the sides and some of the angles are different.

3. a) ΔTHE: $(-4, -2)$, $(-2, -2)$, and $(-2, -4)$. ΔT′H′E′: $(2, -2)$, $(0, -2)$ and $(0, 0)$.
b) Answers may vary. Example: The direction of rotation is clockwise or counter-clockwise, and the angle of rotation is 180°.

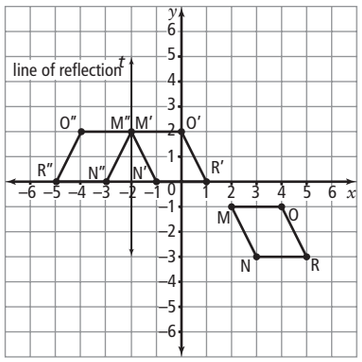
4. a)



b)



c)



12.1 Exploring Tessellations With Regular and Irregular Polygons

1. c) tessellations

2. d) three, b) regular

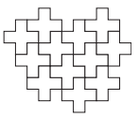
3. a) irregular

4. e) vertices

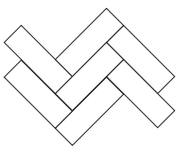
5. a) Yes. Answers may vary. Example: When you put together six triangles, the angle where they meet equals 360°.

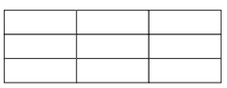
b) Yes. Answers may vary. Example: Where the vertices meet it can equal 360°.

6. Answers may vary. Example:

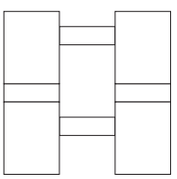


7. Answers may vary. Examples:



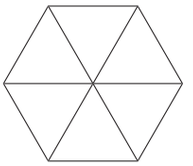
and 

8. Answers may vary. Example: This is the tiling pattern on the wall in our bathroom.

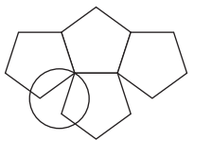


9. a) Answers may vary. Example: A shape can tessellate the plane if the sum of the vertices where they meet equals 360°.

b) Answers may vary. Example of shapes that tessellate the plane:



Example of shapes that do not tessellate the plane:



12.2 Constructing Tessellations Using Translations and Reflections

1. tessellations, polygons

2. interior

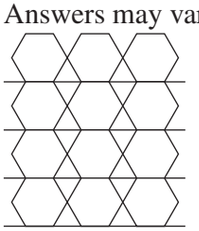
3. translations, reflections

4. tile, transformed

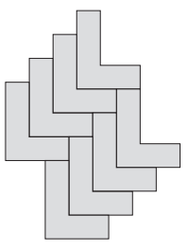
5. a) parallelogram, triangle

b) square, triangle

6. Answers may vary. Example:

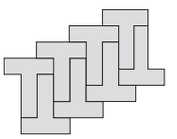


7. a) Answers may vary. Example:



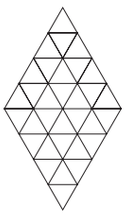
b) Answers may vary, but are limited to any four of T, I, F, H, E, and possibly V.

c) Answers may vary. Example:



8. a) Answers may vary. Example: a reflection and a translation
b) Answers may vary. Example: multiple translations or a translation and a reflection

9. Answers may vary. Example:



12.3 Constructing Tessellations Using Rotations

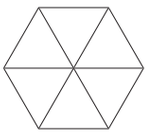
1. a) **False** Tessellations can be made with one or more polygons.
b) **True**
c) **False** Rotations can be used to create tessellations.

2. a) diamonds **b)** hexagons **c)** squares

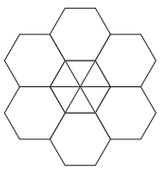
3. a) rotation
b) rotation or reflection or translation
c) reflection or rotation or translation

4. parallelograms: reflection; triangles: reflection, rotation and translation

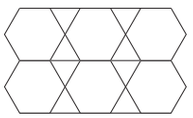
5. Answers may vary. Example:



6. a) Answers may vary. Example:



b) Answers may vary. Example:



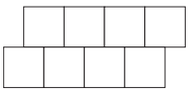
12.4 Creating Escher-Style Tessellations

1. a) Step 3 **b)** Step 5 **c)** Step 1
d) Step 4 **e)** Step 2

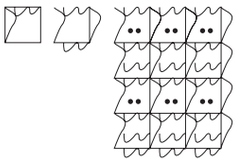
2. a) rotation **b)** translation

3. a) Answers may vary. Example: The original shape was a square. This was cut to make the shape of a teapot. Parts of the square that were cut off of one side were attached to another part. No part of the square was removed. The resulting teapot design was rotated to make the tessellation.
b) Answers may vary. Example: The original shape was a square. This was cut to make the shape of a cat's head.The area of the square was maintained. The head was translated left or right and up or down to make the tessellation.

4. a) Answers may vary. Example:



b) Answers may vary. Example:



12 Link It Together

1. a) Answers may vary.
b) Answers may vary. Example:
Step 1: Start with an 8 cm × 8 cm square heavy piece of paper.
Step 2: Draw a design on two adjacent edges.
Step 3: Cut out each design, and then tape it to a piece onto the opposite side. You must attach everything you cut out.

Step 4: Use this as your template and trace your design on the piece of paper. Do not leave any gaps or overlap your paper.

Step 5: Once you have covered the paper, add characteristics to create an animal (be creative), and then colour your design.

c) Answers may vary.

12 Vocabulary Link

1. Escher
2. transformation
3. plane
4. tiling the plane
5. tessellation