Workbook Answers

1 Get Ready

1. a) A = +1, B = −2, C = +4, D = −4
b) N = −5, P = −15, Q = +10

2. a) 6 **b)** 6 **c)** 9 **d)** 10 **e)** 24

3. a) A = −4
b) B = 3
c) C = 5

4. F = (4, 3) G = (0, 0) H = (0, 2)
I = (2, 2) J = (3, 0)

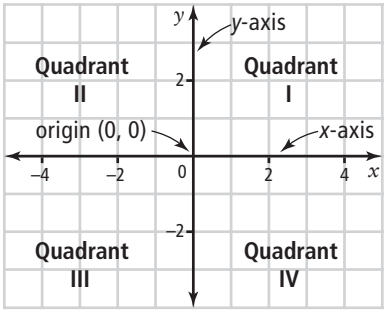
5. a) translation
b) rotation
c) reflection

6. a) 180° clockwise
b) 270° clockwise
c) 90° counterclockwise
d) 360° counterclockwise

1.1 The Cartesian Plane

1. a) Cartesian **b)** quadrant

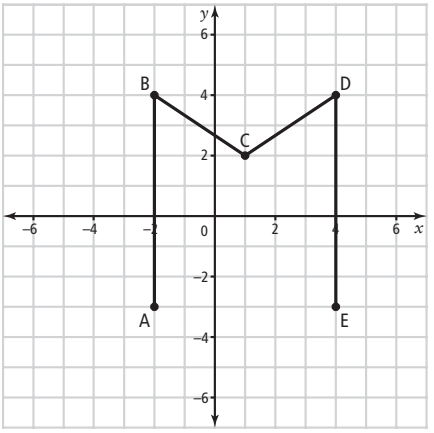
2.



3. A(−3, −2), B(2, 0), C(1, 5), D(0, −3), E(−5, 3), F(3, −4)

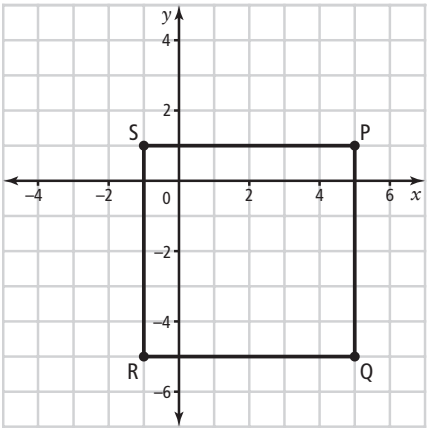
4. a) R **b)** V **c)** P **d)** S **e)** Q **f)** T

5. a)



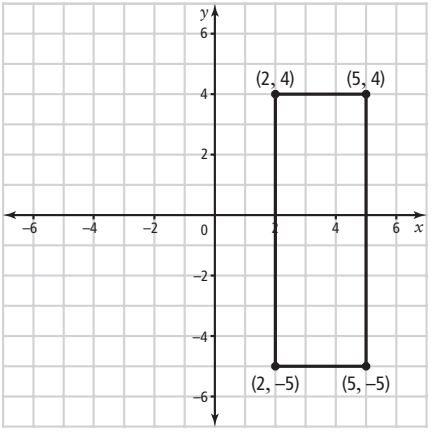
b) the letter "M"

6. a)



b) 36 square units
c) 24 units

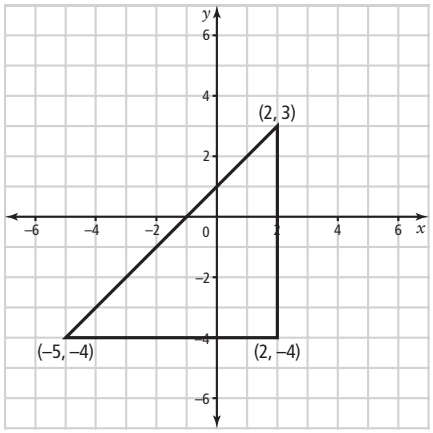
7. Answers will vary.
a–b) For example:



c) 3 units and 10 units

8. Answers will vary.

a–b) For example:



c) Two sides of the triangle are equal.

1.2 Create Designs

1. a) Step 3

b) Step 1

c) Step 4

d) Step 2

2. a) −5 to 2

b) −1 to 4

3. E(0, 5), (4, 5), (4, 2), (0, 2); F(−1, 1), (2, 1), (3, −1), (−2, −1); G(−4, 6), (−2, 6), (−4, 2), (−6, 2); H(4, −2), (2, −4), (4, −6), (−3, −4)

4. a) (7, 3), (7, 1), (7, −1), (7, −3), (−1, −3), (−1, −1), (−1, 1), (−1, 3)

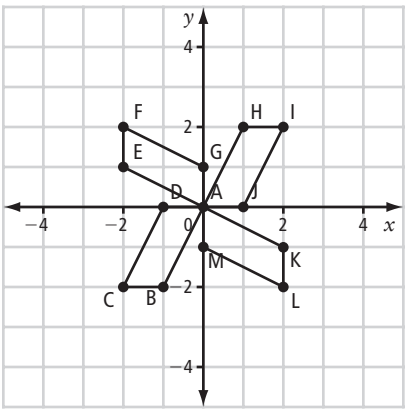
b) Answers will vary. For example: Plot and connect all 8 vertices around the outside edge of the design; colour the design.

5. a–b) The order will vary.

Design A: Connect (−6, 3) to (−3, 3) to (−3, −1) to (−6, −1) to (−6, 3) to (−4, 5) to (−1, 5) to (−3, 3). Connect (−1, 5) to (−1, −1) to (−3, −1).

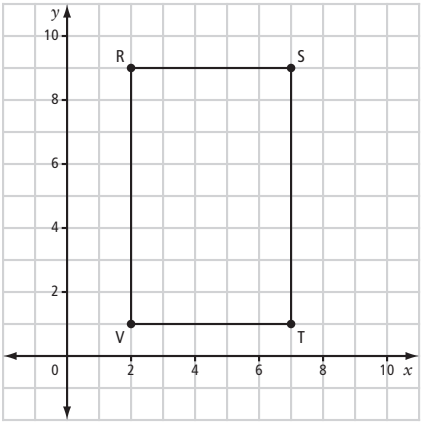
Design B: Connect (1, 2) to (5, 2) to (5, −3) to (1, −3) to (1, 2) to (3, 4) to (5, 2).

6. a)



b) Answers will vary. For example: the petals from a flower; the parts of a windmill or pin wheel.

7. a–d)



e) rectangle

f) (5, 8)

1.3 Transformations

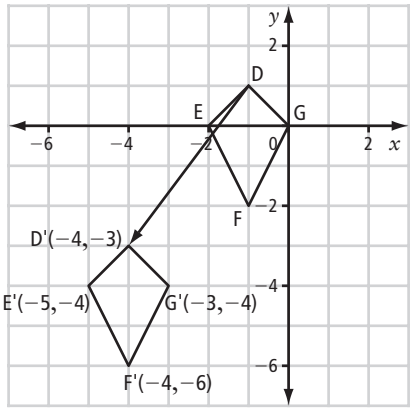
1. a) translation **b)** rotation **c)** reflection

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

3. a) 6 units left and 4 units down

b) 6 units right and 5 units down

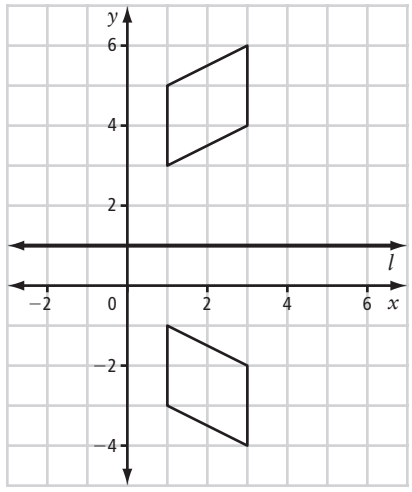
4. a–c)



5. a) Yes

b) Answers will vary. For example: Each vertex is the same distance from the line of reflection, l, as its reflected vertex.

6.



7. a) A(−4, −1), S(−4, −5), M(−3, −5), E(−3, −1); A′(2,−1), S′(2, 3), M′(1, 3), E′(1, −1)

b) 180° counterclockwise

8. a) (−1, 2)

b) 180° clockwise, 180° counterclockwise

1.4 Horizontal and Vertical Distances

1. a) horizontal

b) vertical

c) D′

d) D″

2. a) 7 units horizontally right, 1 unit vertically up

b) 10 units horizontally right, 3 units vertically down

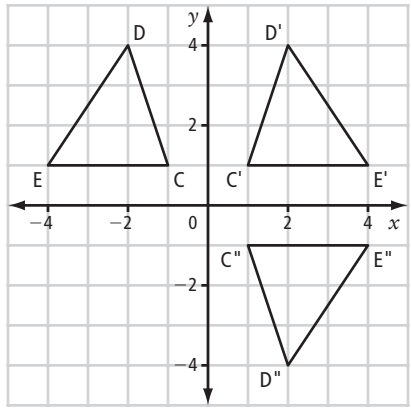
c) 6 units horizontally right, 4 units vertically down

d) 3 units horizontally right, 3 units vertically down

3. a) S′(1, 0), U′(3, −1), V′(3, −2), T′(1, −1)

b) 6 units horizontally right, 3 units vertically down

4. a)



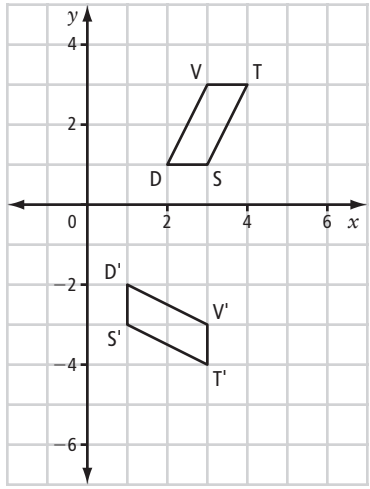
b) C to C′: 2 units horizontally right; C′ to C″: 2 units vertically down

c) C′ to C″: 2 units vertically down
D′ to D″: 8 units vertically down
E′ to E″: 2 units vertically down

d) C″(1,−1), D″(2,−4), E″(4,−1)

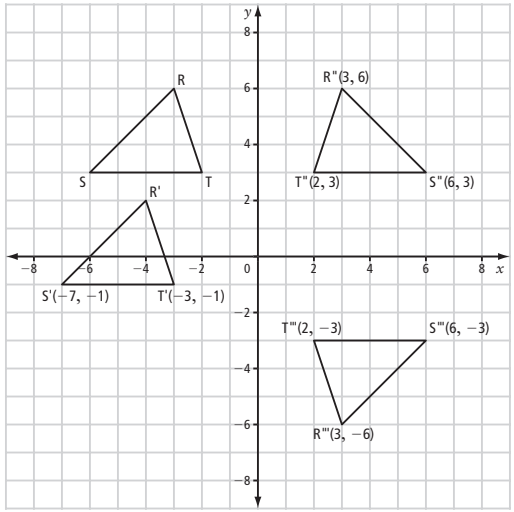
e) The signs are opposite.

5. a–e)



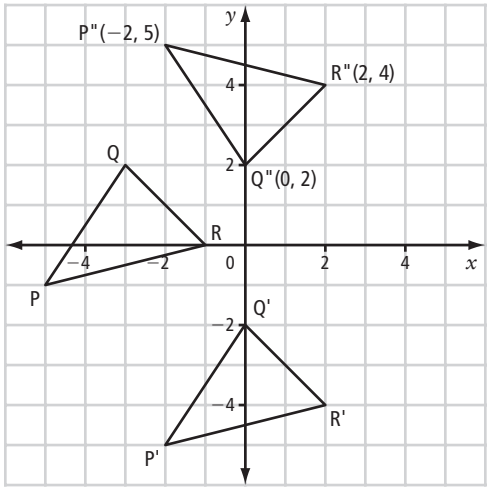
f) Rotate parallelogram DVTS clockwise 90° about (0, 0).

6. a–f)



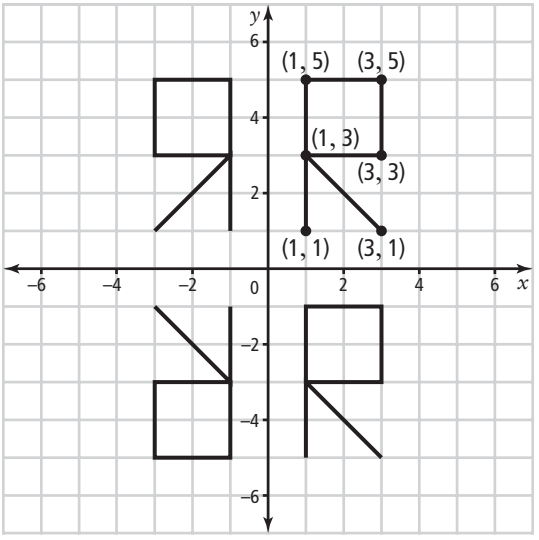
1 Link It Together

1. a–d)



e) P to P″: 3 units horizontally right, 6 units vertically up; R to R″: 3 units horizontally right, 4 units vertically up; Q to Q″: 3 units horizontally right.

2. a–e) Answers will vary. For example:



c) Reflect R about the *y*-axis.

d) Rotate the original design 180° about the origin.

e) Translate the original design 6 units vertically down.

1 Vocabulary Link

1. quadrants
2. translation
3. *y*-axis
4. coordinates
5. *x*-axis
6. Cartesian plane
7. reflection
8. origin
9. transformations
10. rotation
11. vertex

2 Get Ready

1. a–d)

Thousands	Hundreds	Tens	Ones	•	Tenths	Hundredths	Thousandths
1	3	4	9	•	5	2	
		4	5	•	0	6	9
	1	0	0	•	0	5	
			0	•	4	5	5

2. a) 2.8, 1.9, 1.8
b) 365.9, 365.7, 358

3. a) $2.4 > 2 > 1.9$
b) $5 > 4.3 > 0.7$

4. Answers may vary.
a) $100 + 46 = 146$
b) $100 \times 5 = 500 - 1 \times 5 = 495$

5. $83 \times 7 + 234 \div 6 = 581 + 39 = 620$

6. a) 68 **b)** 15

7. a) 89 **b)** 12

2.1 Add and Subtract Decimal Numbers

1. g) 0.1

2. c) Underestimate

3. f) 0

4. h) 0.10

5. b) Overestimate

6. d) Front-end estimation

7. e) Relative size estimation

8. a–f) Use front-end or relative size estimation strategies.
a) 97.11
b) 296.971
c) 22.73
d) 1587.58
e) 523.8
f) 210.48 cm

9. a) 81.7
b) 130.05
c) $602.75
d) $294.99
e) 83.24 m
f) 4.604 cm

10. a) 25.62
b) 152.61 m
c) 2.700
d) $319.97

11. No, 0 is not always a placeholder. In 1.05 it represents the tenths, while in 1.50 it is a placeholder for the hundredths.

12. 8.2 cm

13. Answers will vary. For example: I think Oden has enough money because $2.35 + $0.65 equals $3, and $2 + $3 = $5, which is an overestimate. $5 is enough money.

14. Parcel A has a mass of 13.56 kg.

2.2 Multiply Decimal Numbers

1. Step 1; Step 3; Step 2

2. a) A
b) B
c) B

3. a–f) Use front-end or relative size estimation strategies.
a) 14.40
b) 31.9369
c) 42.16
d) 284.571
e) 563.03
f) 424.116

4. Estimates may vary.
a) $2 \times 5 = 10$; 13.0
b) $40 \times 0.3 = 12$; 12.36
c) $5 \times 4 = 20$; 18.72
d) $80 \times 0.6 = 48$; 49.86
e) $\$500 \times 0.5 = \$250$; $262.50
f) $60 \times 7 = 420$; 439.2

5. a) 776.250
b) 776.250
c) 0.776250
d) 7.76250

6. 100 times larger; $0.001 \times 100 = 0.1$ or $100 \times \frac{1}{1000} = \frac{1}{10} = 0.1$

7. a) $13.05
b) $59.67
c) $43.92

8. a) 18 hours
b) $150.30

9. a) $2.1 \times 0.9; 0.9 > 0.8$
b) $1; 0.9 < 1$
c) $5.6 + 5.6; 2 > 1.9$

2.3 Divide Decimal Numbers

1. e) Front-end estimation
2. a) Number line estimation
3. b) Estimate, then use a calculator
4. c) Divide as whole numbers, then estimate to place the decimal

5. a–f) Estimates may vary.
a) 4.12
b) 5.2
c) 5.33
d) 60.0
e) 6.71
f) 4.8

6. a–d) Estimates may vary.
a) 10.48
b) 113.7
c) 30.6
d) 27.9

7. a) $2.50
b) $1.06
c) $0.50

8. 15 energy bars

9. Estimates may vary; 15 hours

10. a) $7.8 \div 0.98; 1 > 0.98$
b) $16 \div 0.5; 160 \div 5 = 32$
c) $2 \div 0.001; 2000 \times 1 = 2000$
d) $9.3; 1.02 > 1$
e) $536 \div 0.68; 0.72 > 0.68$

2.4 Order of Operations and Decimal Numbers

1. a)

Q	U	S	A	A	D	L	B	M
A	M	U	L	T	I	P	L	Y
B	R	A	C	K	V	R	T	L
O	R	D	E	R	I	O	C	P
D	R	A	O	R	D	E	A	A
A	E	P	C	S	E	D	R	L
S	R	A	C	K	E	T	T	E
A	D	D	E	K	E	R	B	M
C	O	R	D	A	D	T	U	R
T	C	A	R	T	B	U	S	M

b) STEP 1: BRACKETS;
STEP 2: MULTIPLY and DIVIDE
STEP 3: ADD and SUBTRACT

2. a) $(5 + 6 \div 3) \times 2$
b) $(5 + 4) \times 4 \div 2$
c) $9 + (3 \div 6) + 5$
d) $(18 + 3 - 3) \times 5$

3. a) $8 + 3.1 \times 4 = 20.4$
b) $16 \div 8 + 9.3 - 7.8 = 3.5$
c) $(6.1 - 4.3) \times 4 = 7.2$
d) $(15.4 + 3.6) \div 4 = 4.75$

4. a) $7 + (5 \times 3.2) = 23$
b) $(10.6 + 4.4) - (8.1 - 3.1) = 10$
c) $(16 \div 4) + 5 - 1 = 8$
d) $(15.5 - 6.5) \times 3 = 27$

5. a) Estimates may vary. For example: $(2 \times \$7.00) + (3 \times \$2.00) + (4 \times \$1.00) = \$24$. This estimate is high because all the numbers were rounded up.
b) Estimates may vary. For example: $\$24 - (\$2.00 + \$2.00) = \$20$. This estimate is high because all the numbers were rounded up.
c) $19.28

6. a) Estimates may vary. For example: $(1 + 2 + 2 + 3) \div 4 = 2$ h per day.
b) 7.7 h
c) 38.5 h

7. a) 6.2
b) 8
c) 2.5
d) 5.4

8. a–c) 31.5
d) The answers are all the same because $6.3 = 6.0 + 0.3$ and because $5 \times (6 + 0.3) = 5 \times 6 + 5 \times 0.3$.

2 Link It Together

1. a) $23.65
b) Zach can buy up to 4 decorations.
c) Answers will vary. For example, a collar with 3 decorations and a 4-letter name would cost $22.25.

2 Vocabulary Link

Across

6. order of operations
2. estimate

Down

1. overestimate
3. front-end
4. relative size
5. underestimate

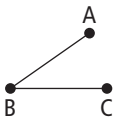
3 Get Ready

1. a) AB, BC, AC, AD, BE, DE, AE, CE
b) AB, DE, AD, and BE are 1.6 cm; BC is 1.7 cm; AE is 2.2 cm; CE is 2.5 cm; AC is 3.3 cm

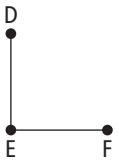
2. a) AB, DE, AD, and BE
b) AD and BE; AB and DE

3. a) 90°
b) 45°
c) 136°

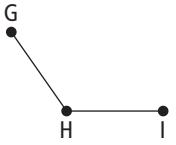
4. a)



b)

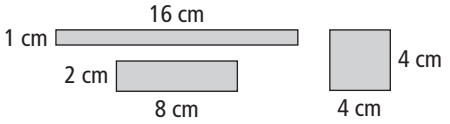


c)



5. a) 12 cm^2
b) 12 cm^2
c) 48 cm^2
d) 48 cm^2

6. Answers will vary. For example,



$A_1 = 1 \times 16 = 16$ cm^2
$A_2 = 2 \times 8 = 16$ cm^2
$A_3 = 4 \times 4 = 16$ cm^2

7. 7 cm^2

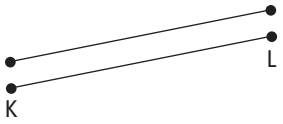
3.1 Parallel and Perpendicular Line Segments

1. c) parallel lines
2. f) distance
3. e) perpendicular lines
4. a) d) paper folding
b) a) right triangle
c) b) ruler

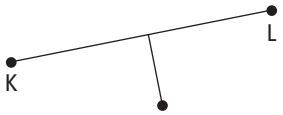
5. a) AD, BE, CF
b) GI and AD, GI and BE, GI and CF

6. Answers may vary.

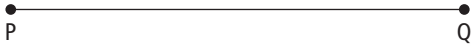
a)



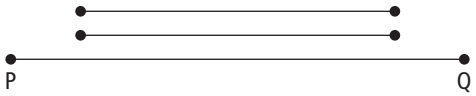
b)



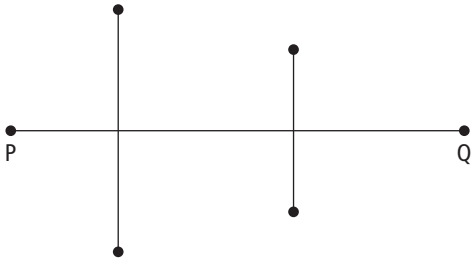
7. a)



b) Answers may vary. For example,



c) Answers may vary. For example,



8. Answers may vary.

a) EFHMNWZ

b) EFHLTX

c) 3

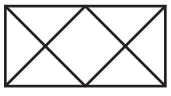
9. a) perpendicular

b) Answers may vary. For example, 3:45 or 6:00.

10. a) books, shelves, vertical supports, books to vertical supports

b) books to shelves, shelves to vertical supports

11. Answers may vary. For example,



3.2 Draw Perpendicular Bisectors

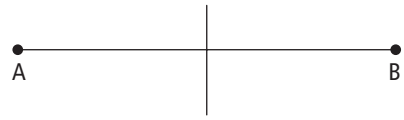
1. a) right angles, half

b) perpendicular bisector

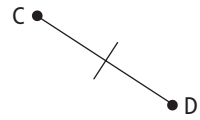
2. a) right triangle

b) compass

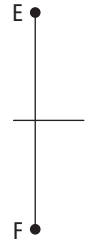
3. a)



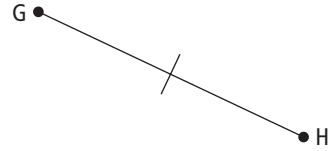
b)



4. a)



b)

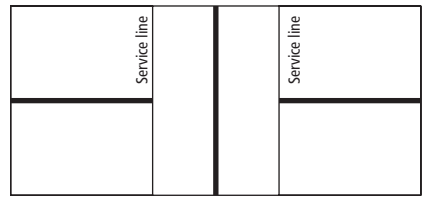


5. a) Place the Mira on the perpendicular bisector. Each point of the original line should reflect onto itself.

b) A paper folded along the perpendicular bisector will make the original line segment lie on top of itself.

6. a, b, d

7. a) and **b)**



3.3 Draw Angle Bisectors

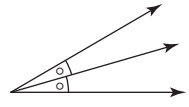
1. equal

2. a) compass

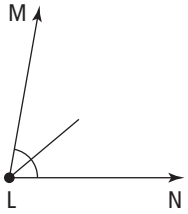
b) ruler

c) folding

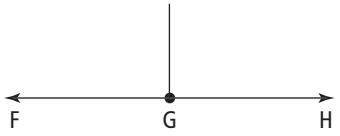
3. Examples may vary.



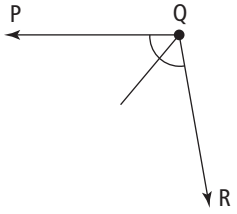
4. a)



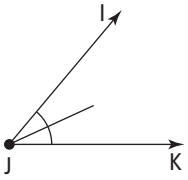
b)



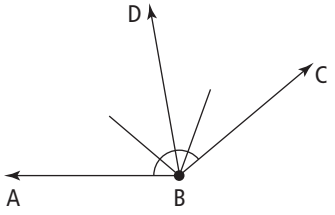
5. a)



b)



6. a)

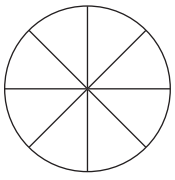


b) the bisector for ∠ABD

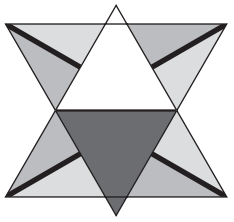
c) the bisector for ∠DBC

7. yes

8.

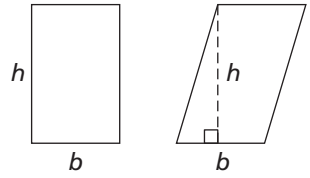


9. Designs will vary depending on the number of angle bisectors drawn. For example,



3.4 Area of a Parallelogram

1.



2. a) *h*, *b*

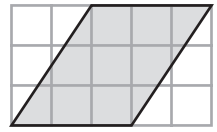
b) *h*, *b*

3. perpendicular

4. a) 15 cm^2

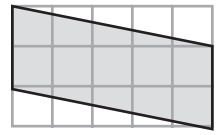
b) 6 cm^2

5. a) Drawings may vary. For example,



9 cm^2

b) Drawings may vary. For example,



10 cm^2

6. a) 36 m^2

b) 52.5 cm^2

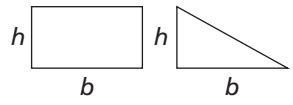
c) 28.125 cm^2

7. 4 m

8. 1500 mm^2

3.5 Area of a Triangle

1.



2. a) *b*, *h*

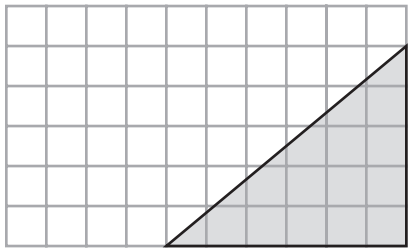
b) 2, base

3. height

4. a) 12 cm^2

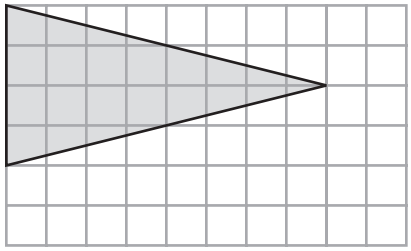
b) 7.5 cm^2

5. a) Triangles may vary. For example,



15 cm^2

b) Triangles may vary. For example,



16 cm^2

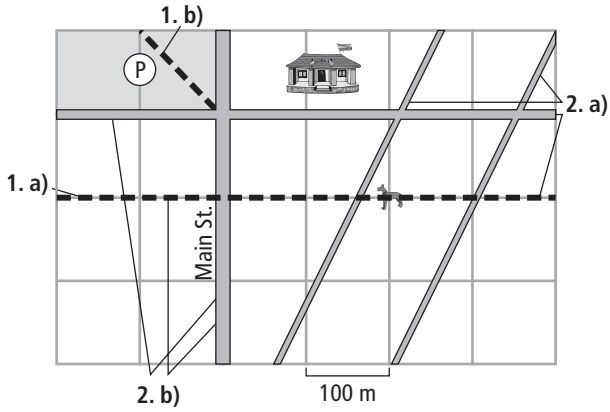
6. a) 6 cm^2
b) 25.5 m^2
c) 84.64 cm^2

7. 210 mm^2

8. Yes, because the base and the height are the same.

3 Link It Together

1. and **2.**



3. a) 15 000 m^2
b) 22 500 m^2

3 Vocabulary Link

1. a) height
b) angle
c) base

2. a) bisector
b) obtuse
c) acute

3. a) parallelogram
b) parallel

4. a) perpendicular
b) bisector

4 Get Ready

1. a) 69, 70, 71
b) 109, 110, 111

2. a) 120
b) 1807
c) 12.3

3. a) right
b) left
c) right

4. a) 1
b) 2
c) 0.5

5. a) A
b) 50
c) 32.5

6. $25 < L < 35$, $L > 31$, $L < 33$

7. a) $<$
b) $>$
c) $=$
d) $<$

8. $1.71 > 1.701 > 1.7$

9. a) Andrea, Alicia, and Pat
b) 88 cm

4.1 Connect Fractions, Decimals, and Percents

1. percent
a) 25
b) 75

2. number line; fractions; $29\% < \frac{3}{10} < 0.32$

3. place value; decimals; 0.4; 0.39; $0.39 < 0.4 < 0.43$

4. **a)** 7.5 km

b) \$11.30

5. Explanations will vary.

a) 192

b) 600 km

6. 0.97, 0.99, 0.98; $\frac{99}{100} > 0.98 > 97\%$

7. 0.1, 0.01, 0.001; $0.001 < 1\% < \frac{1}{10}$

8. **a)** $50\% = \frac{1}{2}$

$70 \div 2 = 35$

b) $10\% = \frac{1}{10}$

$60 \div 10 = 6$

c) 10% of 105 = 10.5

$20\% = 2 \times 10.5 = 21$

9. **a)** 10 m

b) 33

c) \$6

10. **a)** Answers will vary between $\frac{21}{100}$ and $\frac{39}{100}$, because 20% is $\frac{20}{100}$ and 40% is $\frac{40}{100}$.

b) Answers will vary between 0.81 and 0.99, because 80% is 0.80 and 100% is 1.0.

c) Answers will vary between 0.11 and 0.19.

11. 16.0 is placed correctly, because 16.9 is too close to 20 (at the 19 mark) and 18.6 is placed after 20.

12. **a)** $40\% = 10\% \times 4$

b) \$84.80

c) \$127.20

4.2 Fractions, Decimals, and Percents

1. repeating; $0.\overline{3}$

2. terminating; $\frac{3}{10}$; $\frac{35}{100}$; $\frac{359}{1000}$

3. divide; denominator; 0.4

4. **a)** 0.5

b) 0.2

c) 0.40

d) 0.62

e) 0.788

f) 0.885

5. **a)** $0.\overline{2}$

b) $0.\overline{01}$

c) $0.\overline{213}$

d) $2.\overline{43}$

6. **a)** $0.333\ldots = 0.\overline{3}$

b) $0.555\ldots = 0.\overline{5}$

c) $0.818181\ldots = 0.\overline{81}$

d) $0.212121\ldots = 0.\overline{21}$

7. Answers will vary depending on whether you use front-end or relative size estimation.

a) Front end; 30%

b) Relative size; 50%; Front end; 25%

8. **a)** A: 0.702; B: 0.733; C: 0.743

b) $0.743 > 0.733 > 0.702$

9. **a)** $\frac{23}{100}$

b) $\frac{17}{100}$

c) $\frac{559}{1000}$

10. 40%

4.3 Applications of Percents

1. **a)** Yes, because 0.3 is smaller than 0.333… or $\frac{1}{3}$.

b) 0.333…, because $1 \div 3$ results in a repeating decimal, which is bigger than 0.3.

2. You could convert the ratios to a common denominator, or calculate the percents to find out.

3. Estimates will vary depending on whether you use front-end or relative size estimation.

a) 10% of 552 is greater.

50% of 96 = 48; 10% of 552 = 55.2

b) 10% of 56 is greater.

10% of 56 = 5.6; 1% of 451 = 4.51

c) 15% of 364 is greater.

60% of 72 = 43.2; 15% of 364 = 54.6

4. Answers are in italics.

	1%	10%	100%
a)	*4.5*	*45*	450
b)	*6.1*	61	*610*
c)	3.2	*32*	*320*
d)	*0.65*	6.5	*65*
e)	*0.38*	*3.8*	38

5. Wednesday

6. **a)** Maize Flakes: 9.5%; Glacial Flakes: 38.2%; Fruit Flakes: 38.7%; Product 21: 13.0%

b) Fruit Flakes > Glacial Flakes > Product 21 > Maize Flakes

7. $30.

8. **a)** $265.50

b) $619.50

9. Estimates may vary.

a) Front-end estimate: $183; Relative size estimate: $200

b) $179.41

4 Link It Together

1. **a)** 11%, because it is more than $\frac{1}{10}$. 0.1 $= \frac{1}{10}$.

b) 2.5%, because it is less than 0.25. 0.25 $= \frac{1}{4}$.

c) $\frac{1}{12}$, because it is 0.083, which is less than 0.3. 50% of 0.6 = 0.3 $= \frac{3}{10}$ = 30%.

2. **a)** Store A: $90; Store B: $105

b) Front-end estimate: 30%

c) Store B

d) $276.80

4 Vocabulary Link

Examples will vary.

1. ascending; $1 < 2 < 3$

2. repeating; $0.\overline{3}$, $0.\overline{21}$, $0.\overline{857}$

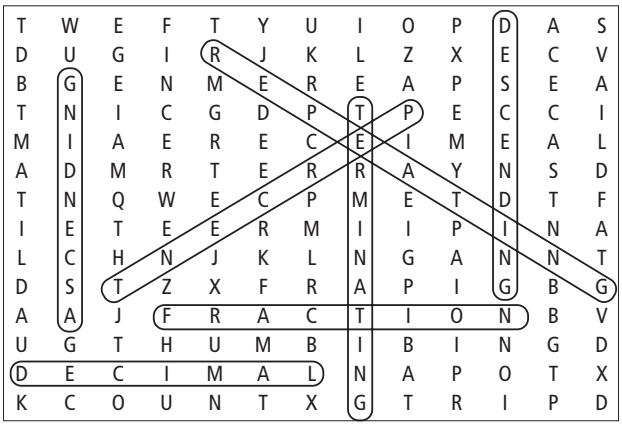
3. percent; 10%; 10; $\frac{10}{100}$; 0.1

4. terminating; 0.25; 0.5; 0.1

5. descending; $10 > 9 > 8$

6. fraction; $\frac{2}{3}$

7. decimal; 0.93 save percentage



5 Get Ready

1. **a)** 0.5

b) 0.4

c) 0.7

d) 0.25

2. **a)** 50%

b) 40%

c) 70%

d) 25%

3. **a)** 0.75, 75%

b) 0.85, 85%

c) 0.375, 37.5%

d) 0.5, 50%

4. **a)** heads, tails; equally likely

b) red, blue, yellow; not equally likely

5. **a)** 1, 2, 3, 4, 5, 6; equally likely

b) 1, 2, 3, 4, 5; not equally likely

6. **a)** red, black, green, yellow, orange; not equally likely

b) Hiker's Lane, Ambler's Alley, Wilderness Walk; equally likely

7. **a)** dog

b) 13

c) 50

8. **a)** 38

b) Saturday

c) kilts

5.1 Probability

1. h) favourable, f) possible

2. e) fraction, c) ratio, i) percent

3. g) 1, a) 100%

4. b) 0, d) 0%

5. **a)** $\frac{1}{4}$, 1:4, 25%

b) $\frac{1}{3}$, 1:3, $33.\overline{3}\%$

c) $\frac{2}{8}$, 2:8, 25%

d) $\frac{5}{6}$, 5:6, $83.\overline{3}\%$

e) $\frac{0}{2}$, 0:2, 0%

6. **a)** 5

b) $\frac{1}{5}$, 1:5, 20%

7. **a)** $\frac{4}{8}$, 4:8, or 50%

b) $\frac{6}{8}$, 6:8, or 75%

c) $\frac{7}{8}$, 7:8, or 87.5%

8. **a)** $\frac{4}{9}$, 4:9, or $44.\overline{4}\%$

b) $\frac{9}{9}$, 9:9, or 100%

9. **a)** $\frac{4}{12}$, 4:12, or 33%

b) $\frac{6}{12}$ = 6:12 = 50%

5.2 Organize Outcomes

1. independent

2. **a)** tables

b) tree diagrams

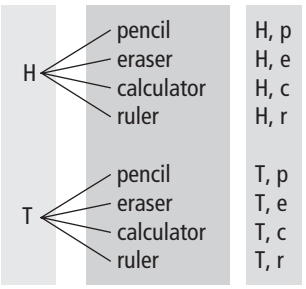
c) other diagrams

3. **a)**

	Die			
Spin	**1**	**2**	**3**	**4**
S	S, 1	S, 2	S, 3	S, 4
B	B, 1	B, 2	B, 3	B, 4
F	F, 1	F, 2	F, 3	F, 4

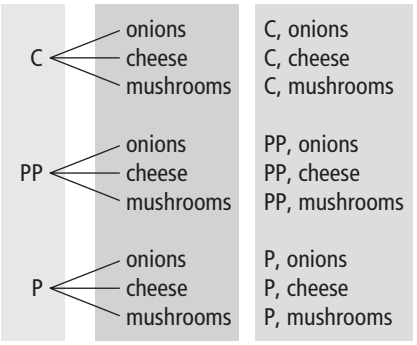
b) (S, 1), (S, 2), (S, 3), (S, 4), (B, 1), (B, 2), (B, 3), (B, 4), (F, 1), (F, 2), (F, 3), (F, 4)

4. **a)**



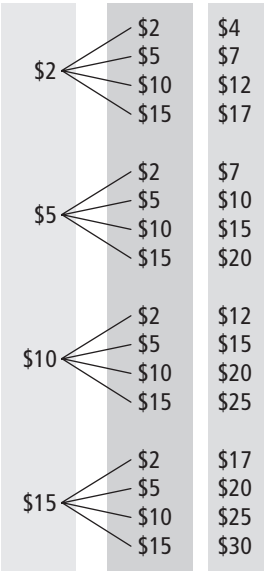
b) (H, p), (H, e), (H, c), (H, r), (T, p), (T, e), (T, c), (T, r)

5. **a)**



b) (C, onions), (C, cheese), (C, mushrooms), (PP, onions), (PP, cheese), (PP, mushrooms), (P, onions), (P, cheese), (P, mushrooms)

6. **a)**



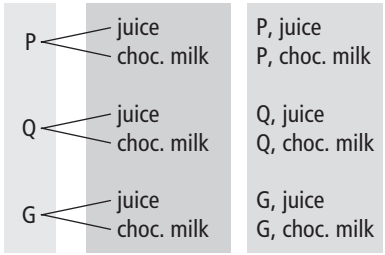
b) $\frac{8}{16}$, 8:16, or 50%

5.3 Probabilities of Simple Independent Events

1. favourable, divide, outcomes

2. tree, table, organizer

3. a)



b) $\frac{1}{6}$, 1:6, or 16.7%

4. a) Answers will vary. For example: Student A and Student Z get to spin a spinner with A, B, C, D, E to pick which question they will answer.

b) Answers will vary. For example: What is the probability that student A will spin question B?
P(student A, question B) = $\frac{1}{10}$, 1:10, or 10%

5. a)

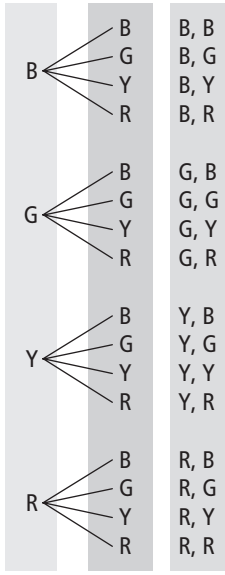
City	Home		
	House	Apartment	Condo
Va	H, Va	A, Va	C, Va
Vi	H, Vi	A, Vi	C, Vi
B	H, B	A, B	C, B
W	H, W	A, W	C, W
C	H, C	A, C	C, C
E	H, E	A, E	C, E
R	H, R	A, R	C, R
S	H, S	A, S	C, S

b) 24

c) $\frac{1}{24}$, 1:24, or 4%

d) $\frac{4}{24}$, 4:24, or 17%

6. a)



b) $\frac{2}{16}$, 2:16, or 13%

c) 12

7. a)

Numbered Spinner				
Colour Die	1	2	3	4
Blue	B, 1	B, 2	B, 3	B, 4
Green	G, 1	G, 2	G, 3	G, 4
Yellow	Y, 1	Y, 2	Y, 3	Y, 4
Red	R, 1	R, 2	R, 3	R, 4
White	W, 1	W, 2	W, 3	W, 4
Pink	P, 1	P, 2	P, 3	P, 4

b) $\frac{1}{24}$, 1:24, or 4.2%

c) $\frac{4}{24}$ or $\frac{1}{6}$, 4:24 or 1:6, 16.7%

5.4 Applications of Independent Events

1.

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

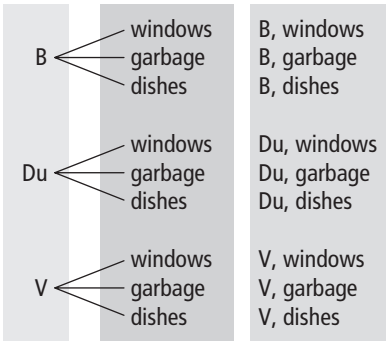
2. a)

	Juice	Water	Milk
Apple	A, J	A, W	A, M
Orange	O, J	O, W	O, M
Carrots	C, J	C, W	C, M
Banana	B, J	B, W	B, M

b) $\frac{4}{12}$, 4:12, or 33.3%

c) $\frac{1}{2}$, 1:12, 8.3%

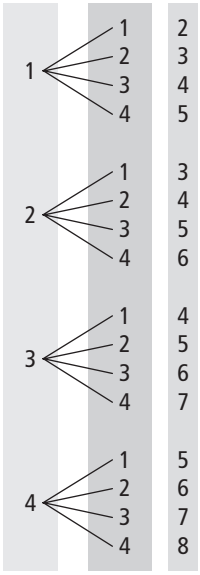
3. a)



b) $\frac{1}{9}$, 1:9, or 11.1%

c) Answers will vary. Make sure your probability matches the combination that you choose.

4. a)



b) $\frac{8}{16}$, 8:16, or 50%

c) Answers may vary. For example, a sum of 5 or greater.

5.5 Conduct Probability Experiments

1. Experimental probability

2. Theoretical probability

3. Experimental probability

4. a) $P(\text{game 2}) = \frac{22}{100}$, 22:100, or 22%

b) $P(\text{game 2}) = \frac{25}{100}$, 25:100, or 25%

c) Experimental probability is less than the theoretical probability.

d) Experimental probability would equal the theoretical probability. $\frac{25}{100}$, 25:100, or 25%

5. a) $\frac{8}{20}$, 8:20, or 40%

b) $\frac{10}{20}$, 10:20, or 50%

c) The experimental probability is less than the theoretical probability.

6. a) Answers will vary. For example,

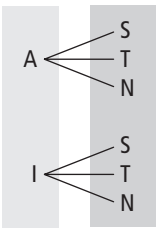
Coin Outcomes	Experimental Results
H, H	3
H, T	5
T, H	6
T, T	6

b) Answers will vary. For example:
What is the experimental probability of not getting any tails?
$P(\text{no tails}) = \frac{22}{100}$, 22:100, or 20%
What is the theoretical probability of not getting any tails?
$P(\text{no tails}) = \frac{25}{100}$, 25:100, or 25%

5 Link It Together

1. a) 60
b) $\frac{30}{60}$, 30:60, or 50%
c) $\frac{30}{60}$, 30:60, or 50%
d) $\frac{42}{60}$, 42:60, or 70%

2. a)



b) $\frac{2}{6}$, 2:6, or 33%

5 Vocabulary Link

1. h) sample space
2. e) outcome
3. f) probability
4. a) equally likely
5. c) favourable outcome
6. i) tally chart
7. d) independent
8. k) tree diagram
9. j) theoretical
10. g) random
11. b) experimental

6 Get Ready

1. a) 1, 2, 3, 6
b) 1, 2, 5, 10
c) 1, 2, 3, 4, 6, 8, 12, 24

2. 100, 456, 294. Answers may vary. For example, they are even numbers.

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

4. Diagrams may vary.
a)
b)
c)

5. Answers may vary.
a) $\frac{4}{12} = \frac{1}{3}$
b) $\frac{2}{5} = \frac{4}{10}$

6. Answers may vary.
a) $\frac{1}{2}$ $\frac{2}{4}$
b) $\frac{8}{10}$ $\frac{4}{5}$
c) $\frac{3}{4}$ $\frac{9}{12}$

7. a) 0
b) 1
c) $\frac{1}{2}$
d) $\frac{1}{2}$

8. $\frac{1}{2}$, since $\frac{1}{4}$ is exactly halfway between 0 and $\frac{1}{2}$.

6.1 Divisibility

1–5. Examples may vary.

1. even; 12

2. 9; 27

3. three; 8

4. common; $\frac{2}{3}$

5. cannot; 4 cats cannot be divided among 0 people.

6. 955, 1090

7. a)

Number	8	10
700		√
416	√	
3296	√	
1720	√	√
280	√	√
190		√

b) 2, because 2 is the smallest common factor of 8 and 10.

8. a) 1, 2, 3, 4, 6, 12

b) 1, 5, 7, 35

c) 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

9. a) 1, 2, 4

b) 1, 3

c) 1, 2, 4

10. a) 1, 5

b) 1, 2, 4, 8

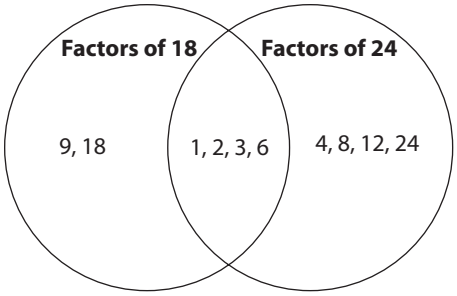
c) 1, 3, 9

11. a) 1, 2, 4, 8, 16

b) 1, 2, 3, 4, 6, 8, 12, 24

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

12. a)



b) 6

13. a) $\frac{5}{6}$

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

c) $\frac{5}{6}$

d) $\frac{1}{5}$

e) $\frac{8}{9}$

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

14. 30

15. a) 1, 2, 3, 6, 9, 18

b) Yes, because 3 is a factor of 18.

6.2 Add Fractions With Like Denominators

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

2. numerators

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

4. a) Addition statement: $\frac{1}{4} + \frac{1}{4}$
Estimate: $\frac{1}{2}$
Calculation: $\frac{2}{4}$

b) Addition statement: $\frac{3}{6} + \frac{2}{6}$
Estimate: 1
Calculation: $\frac{5}{6}$

c) Addition statement: $\frac{1}{3} + \frac{2}{3}$
Estimate: 1
Calculation: 1

d) Addition statement: $\frac{1}{4} + \frac{3}{4}$
Estimate: 1
Calculation: 1

5. a) Addition statement: $\frac{2}{5} + \frac{3}{5}$
Estimate: 1
Calculation: $\frac{5}{5}$

b) Addition statement: $\frac{1}{3} + \frac{1}{3}$
Estimate: $\frac{1}{2}$
Calculation: $\frac{2}{3}$

6. a) Addition statement: $\frac{2}{6} + \frac{2}{6}$
Calculation: $\frac{2}{3}$

b) Addition statement: $\frac{1}{6} + \frac{3}{6}$
Calculation: $\frac{2}{3}$

c) Addition statement: $\frac{3}{10} + \frac{5}{10}$
Calculation: $\frac{4}{5}$

d) Addition statement: $\frac{2}{4} + \frac{2}{4}$
Calculation: $\frac{4}{4}$

7. a) $\frac{3}{4}$

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

c) 1

d) $\frac{5}{8}$

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

6.3 Subtract Fractions With Like Denominators

1. a) True

b) False. When subtracting fractions using models or diagrams, remove parts of the whole that are the same size.

c) True

d) False. To subtract fractions with like denominators, subtract the numerators. The denominator stays the same.

2. a) Subtraction statement: $\frac{3}{3} - \frac{2}{3}$
Estimate: $\frac{1}{2}$
Calculation: $\frac{1}{3}$

b) Subtraction statement: $\frac{5}{2} - \frac{2}{6}$
Estimate: $\frac{1}{2}$
Calculation: $\frac{3}{6}$

3. a) Subtraction statement: $\frac{3}{4} - \frac{1}{4}$
Estimate: $\frac{1}{2}$
Calculation: $\frac{2}{4}$

b) Subtraction statement: $\frac{3}{3} - \frac{2}{3}$
Estimate: $\frac{1}{2}$
Calculation: $\frac{1}{3}$

4. a) $\frac{1}{3}$

b) $\frac{2}{7}$

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

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

6. $\frac{3}{3} - \frac{2}{3} = \frac{1}{3}$

7. $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$

8. $\frac{10}{12} - \frac{4}{12} = \frac{6}{12}$

6 Link It Together

1. a) Yes.

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

2. 42

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

6 Vocabulary Link

1. numerator
2. equivalent fractions
3. common factor
4. lowest terms
5. fraction
6. divisible
7. denominator
8. factors

7 Get Ready

1. a) 3, 6, 9

b) 5, 10, 15

c) 8, 16, 24

d) 10, 20, 30

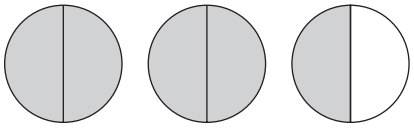
2. 40 1

3. a) $\frac{3}{2}$, $1\frac{1}{2}$

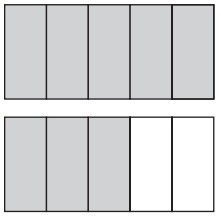
b) $\frac{16}{6}$, $2\frac{4}{6} = 2\frac{2}{3}$

4. Diagrams may vary.

a) mixed number



b) improper fraction



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

b) $\frac{1}{6}$

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

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

6. $\frac{1}{8}, \frac{1}{6}, \frac{1}{4}, \frac{1}{3}$

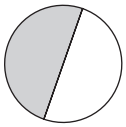
7. **a)** $\frac{1}{2}, \frac{2}{4}$, equivalent

b) $\frac{1}{3}, \frac{4}{8}$

c) $\frac{2}{5}, \frac{3}{9}$

d) $\frac{5}{6}, \frac{10}{12}$, equivalent

8. $\frac{3}{6} = \frac{1}{2}$ Diagrams may vary. For example,



9. Circle the fractions in a, c, and d.

a) Common factor of 2.

c) Common factor of 3.

d) Common factor of 3.

7.1 Common Denominators

1. multiples; 6

2. common denominator; $\frac{3}{6}, \frac{4}{6}$

3. equivalent; $\frac{6}{12}$, 3, 2, $\frac{2}{12}$

4. 15; $\frac{10}{15}, \frac{3}{15}$

5. 20; $\frac{16}{20}, \frac{5}{20}$

6. 30; $\frac{6}{30}, \frac{25}{30}$

7. 24; $\frac{20}{24}, \frac{9}{24}$

8. 25; $\frac{2}{5}$

9. **a)** $\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{5}{15} = \frac{11}{33}$

b) $\frac{4}{32} = \frac{2}{16} = \frac{3}{24} = \frac{1}{8} = \frac{9}{72}$

10. 12; $\frac{2}{12}, \frac{6}{12}, \frac{4}{12}, \frac{8}{12}, \frac{9}{12}, \frac{6}{12}$;
$\frac{1}{6} < \frac{1}{3} < \left(\frac{2}{4} = \frac{1}{2}\right) < \frac{2}{3} < \frac{3}{4}$

7.2 Add and Subtract Fractions With Unlike Denominators

1. sizes

2. **a)** models; diagrams

b) common

3. estimate

4. $\frac{1}{3} + \frac{1}{6}$; Estimate: $\frac{1}{2}$; $\frac{3}{6}$

5. **a)** $\frac{8}{9}$

b) $\frac{5}{8}$

c) $\frac{9}{20}$

6. **a)** $\frac{3}{6} - \frac{4}{12}$; Estimate: 0; $\frac{2}{12}$

b) $\frac{3}{5} - \frac{1}{3}$; Estimate: $\frac{1}{2}$; $\frac{4}{15}$

c) $\frac{5}{6} - \frac{2}{3}$; Estimate: 0; $\frac{1}{6}$

7. **a)** $\frac{3}{8}$

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

c) $\frac{2}{15}$

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

9. **a)** $\frac{9}{20}$

b) $\frac{11}{20}$

c) more

10. **a)** Kyle

b) Examples will vary.

11. **a)** $\frac{12}{15}$

b) $\frac{5}{12}$

7.3 Add Mixed Numbers

1. a, c

2. b, c, a

3. d

4. **a)** $1\frac{1}{6} + 1 = 2\frac{1}{6}$

b) $1\frac{2}{6} + 1\frac{4}{6} = 3$

c) $1\frac{4}{5} + 2\frac{1}{5} = 4$

5. a) 3

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

c) $5\frac{2}{5}$

d) $8\frac{1}{5}$

6. a) $1\frac{2}{6} + \frac{1}{3} = 1\frac{4}{6}$

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

c) $1\frac{1}{4} + 1\frac{3}{4} = 3$

7. a) $5\frac{2}{3}$

b) $3\frac{8}{9}$

c) $6\frac{1}{4}$

d) $6\frac{7}{12}$

8. $6\frac{1}{12}$ h

9. $10\frac{1}{10}$ km

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

7.4 Subtract Mixed Numbers

1. a) whole; fractions

b) unlike

2. estimate

3. regrouped; improper

4. a) $2\frac{3}{4} - 1\frac{1}{4} = 1\frac{2}{4}$

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

c) $2\frac{5}{9} - 1\frac{8}{9} = \frac{6}{9}$

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

b) $\frac{1}{9}$

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

d) $2\frac{2}{3}$

6. a) $1\frac{3}{4}$

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

c) $1\frac{7}{12}$

d) $1\frac{1}{9}$

7. $1\frac{3}{4}$

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

9. $1\frac{2}{3}$

10. a) $1\frac{7}{12}$

b) $8 - 7 = 1$

7 Link It Together

1. a) The answers are in italics.

Minutes	Fraction of an hour	Lowest Terms
Example, *30*	$\frac{30}{60}$	$\frac{1}{2}$
50	$\frac{50}{60}$	$\frac{5}{6}$
45	$\frac{45}{60}$	$\frac{3}{4}$
40	$\frac{40}{60}$	$\frac{2}{3}$
20	$\frac{20}{60}$	$\frac{1}{3}$
15	$\frac{15}{60}$	$\frac{1}{4}$
5	$\frac{5}{60}$	$\frac{1}{12}$

b) minutes; hour

2. a) $30\frac{40}{60}$

b) $9\frac{20}{60}$

7 Vocabulary Link

1. d) mixed number

2. e) multiples

3. f) proper fraction

4. b) improper fraction

5. c) common denominator

6. a) equivalent fractions

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

8 Get Ready

1. a) 2 cm
b) 2.4 cm
c) 0.9 cm
d) 2.0 cm

2. Answers may vary.
a) 6 cm
b) 7.5 cm
c) 3 cm
d) 6 cm

3. a–b) Answers may vary. Estimate the distance around each circle by multiplying the distance across times 3.

4. a) $2 \times 2 \times 2 \times 2 \times 2 = 32$
b) $3 \times 3 \times 3 = 27$
c) $5 \times 5 \times 5 \times 5 = 625$
d) $6 \times 6 = 36$

5. Answers may vary. For example:
$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$;
$5^2 = 5 \times 5 = 25$; $2^5 \neq 5^2$

6. a) $P = 32$ cm; $A = 64$ cm^2
b) $P = 22$ cm; $A = 28$ cm^2
c) $P = 44$ cm; $A = 64$ cm^2

7. a) 77 cm^2
b) 225 cm^2

8.1 Construct Circles

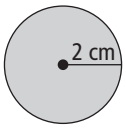
1. Top label: radius; bottom label: diameter

2. a) diameter; radius
b) radius; diameter

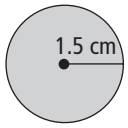
3. using a string and pencil, using a compass

4. Use a ruler to check that each circle has the correct radius.

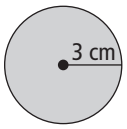
a)



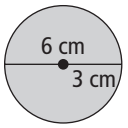
b)



5. Use a ruler to check that the circle has the correct radius.

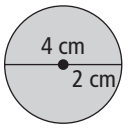


6. a) 6 cm
b–c) The circles for parts b) and c) should be the same size.



7. a) Always true

8. a) 2 cm
b–c) The circles for parts b) and c) should be the same size.



9. Circle B is bigger because its diameter is 36 cm.

8.2 Circumference of a Circle

1. a) circumference, **c)** diameter

2. a) circumference, **c)** diameter

3. a) pi

4. b) pi, **c)** diameter

5. b) pi, **d)** radius

6. Estimates will vary but should be similar to the following examples.
a) Front end estimation: 6 m; Relative size: 9 m
b) Front end estimation: 0 km; Relative size: 3 km

7. **a)** 2.2 m b) 13.2 km

8. Estimates will vary but should be similar to the following examples.

a) Front end estimation: 0 m; Relative size: 3 m; Calculation: 3.1 m

b) Front end estimation: 18 m; Relative size: 21 m; Calculation: 21.4 m

9. 157 mm

10. **a)** $r = 5.3$ cm

b) The circumference would be doubled. Examples will vary but should be similar to the following example.

C of 5-cm-radius circle $= 3.14 \times 2 \times 5$

$C = 31.4$ cm

C of 10-cm-radius circle $= 3.14 \times 2 \times 10$

$C = 62.8$ cm

11. **a)** Answers may vary. For example: The diameter of the basketball hoop is 0.5 m, so a basketball with a diameter of less than 0.5 m will fit through the hoop.

b) Answers may vary. For example: The diameter of the basketball hoop is 0.5 m. Three mini-basketballs have a combined diameter of 0.6 m. Therefore, three of them cannot fit through the hoop at one time.

8.3 Area of a Circle

1. **a)** radius

b) radius

c) area

2. Estimates may vary. For example:

a) Front end estimation: 0 km^2; Relative size: 3 km^2

b) Front end estimation: 4800 mm^2; Relative size: 4800 mm^2

3. **a)** 9.1 cm^2 b) 2041.8 cm^2

4. Estimates may vary. For example:

a) Front end estimation: 12 m^2; Relative size: 27 m^2; Calculation: 16.6 m^2

b) Front end estimation: 3 km^2; Relative size: 3 km^2; Calculation: 4.5 km^2

5. **a)** 2374.63 mm^2 **b)** 66.44 mm^2

6. 65.58 m^2

7. 50.24 m^2

8. 28.26 m^2 + 28.26 m^2 = 56.52 m^2

9. A circle with a diameter of 60 cm is smaller. Explanations will vary. For example:

- A circle with a diameter of 60 cm will have a radius of 30 cm, which is smaller than 35 cm.
- A circle with a radius of 35 cm has an area of 3846.5 cm^2, and a circle with a diameter of 60 cm has an area of 2826 cm^2.

8.4 Interpret Circle Graphs

1. **c)** 100%

2. **d)** small

3. **f)** percent values

4. **a)** category, b) percents

5. **a)** sports

b) 60 students

c) 40 students

6. **a)** approximately 326 students

b) approximately 399 students

c) Answers may vary. For example: More grade 7 students use the cafeteria because they are new to the school and they may not know of other places to go for lunch.

7. **a)** Sarah: shopping; Ross: music

b) Sarah; Sarah spends $20 on shopping, and Ross spends $7.50 on shopping. Sarah spends $12.50 more on shopping than Ross does.

c) movies and music; shopping and snacks

8. **a)** activity; 18 min

b) activity and instruction

c) 37.8 min

8.5 Create Circle Graphs

1. 360°

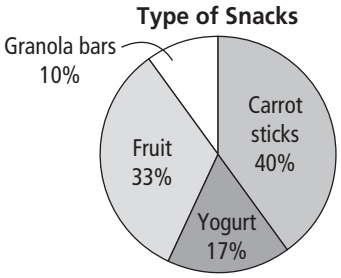
2. 3, 2, 4, 1

3. 2, 3, 1

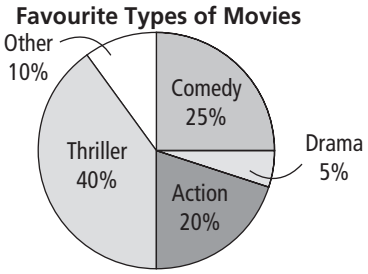
4. a) Answers are in italics.

Type	Number of Students	Percent of Total	Decimal Value Equivalent	Central Angle
Carrot sticks	12	*40%*	*0.40*	*144°*
Yogurt	5	*17%*	*0.17*	*61°*
Fruit	10	*33%*	*0.33*	*119°*
Granola bars	3	*10%*	*0.10*	*36°*
Totals	*30*	*100%*	*1.00*	*360°*

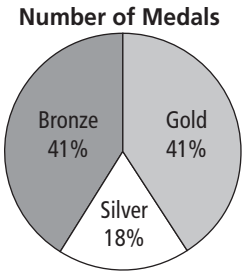
b)



5.



6. a)

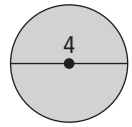


b) Answers may vary. For example: In Torino in 2006, Canada won 7 gold (29%), 10 silver (42%), and 7 bronze (29%) medals.

c) Answers may vary. For example: Compared to 2002, Canada won fewer gold and bronze medals and more silver medals in 2006.

8 Link It Together

1. a)



b) $C = 12.6$ units

c) $A = 12.6$ square units

2. a)–c) Answers may vary. Make sure that you include activities for the full 24 h. Have a partner check your graph for accuracy, and then answer the two questions you asked about your graph.

8 Vocabulary Link

1. circle
2. diameter
3. circle graph
4. sector
5. pi
6. radius
7. central angle
8. circumference

9 Get Ready

1. a) $+1$

b) -1

c) -7

d) $+5$

2. a) ⊕⊕

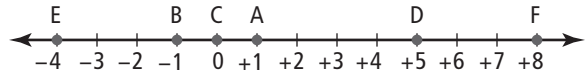
b) ⊖⊖⊖⊖

c) ⊕⊕⊕⊕⊕⊕⊕

d) ⊖⊖⊖⊖⊖⊖⊖⊖

3. A = 0, B = −6, C = −8, D = +5, E = +2, F = −2

4.



5. Explanations may vary. These are examples.
a) $+5$; if the ground is considered 0 m, 5 m above 0 would be $+5$.
b) -8; since you would have \$8 less than you did before spending it.
c) -2; if standing still is 0, then 2 steps backward would be -2.

6. a) $+5$
b) -5

7. $+6, -8, +12, +18, -18$

8. a) $=$
b) $>$
c) $<$
d) $>$
e) $<$
f) $>$

9. Explanations may vary. These are examples.
a) $+7 < +9$; 9 m above sea level is higher than 7 m above sea level.
b) $+12 > -3$; The high temperature must be greater than the low temperature.

10. $-7 < -6 < -3 < -2 < 0 < +2$

11. $+5 > +3 > +2 > 0 > -7 > -9$

9.1 Explore Integer Addition

1. c

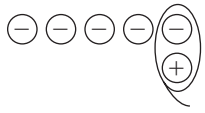
2. a

3. b

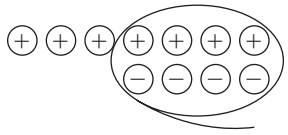
4. a) $(+6) + (-4)$ **b)** $(-5) + (+2)$
c) $(-3) + (+3)$ **d)** $(+8) + (-4)$

5. a) $+5$

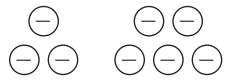
b) -4



c) $+3$



d) -8



6. a) $(+10) + (-4)$ **b)** $+6$°C

7. a) $(-5) + (-19) = -24$
b) $(+30) + (-24) = +6$
Mariam has \$6 left.

8. a) Answers may vary.
$(+36) + (+16) = +52$ She has 52 emails.
$(-36) + (-16) = -52$ She has 52 emails that she has not read.
b) $(+5) + (-3) = +2$ John had 5 books and returned 3. He now has 2 overdue books.
c) $(+14) + (-4) = +10$ The backpack had a mass of 14 kg. With the lunch and books removed, the total mass was 10 kg.
d) $(-6) + (+25) = +19$ She owed \$6, so that is a negative amount. She earned \$25, so now she has \$19.
e) $(+12) + (+3) = +15$ He had 12 potatoes, then he found 3 more. So now he has 15.

9. a) 3 negative tokens $= -3$
$(+5) + (-8) = -3$
$(-5) + (+2) = -3$
b) Answers will vary and can include the following:

Set 1 

Set 2

9.2 Add Integers

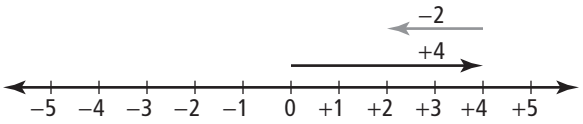
1. arrow

2. a) direction **b)** length

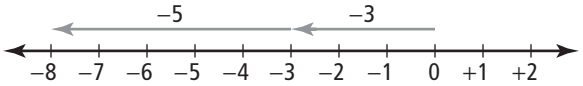
3. horizontal or vertical

4. a) $(+5) + (-8) = -3$
b) $(-8) + (+8) = 0$
c) $(+10) + (-9) = +1$

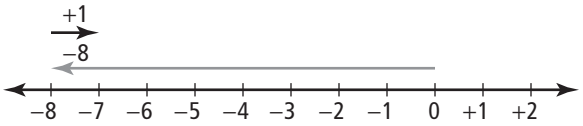
5. a) $+2$



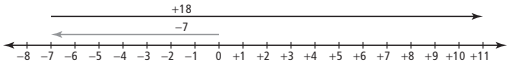
b) -8



c) -7

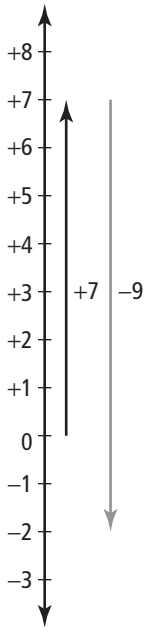


6. a)



b) $(-7) + (+18) = +11$

7.



8. a) The 7 of diamonds and 8 of hearts make -15. $(-7) + (-8) = -15$

b) The 5 of spades and 4 of hearts make $+1$. $(+5) + (-4) = +1$

c) This will take three cards: 5 of spades, 3 of clubs, and 8 of hearts. $(-8) + (+3) + (+5) = 0$

9.3 Explore Integer Subtraction

1. integer

2. a) removing **b)** zero

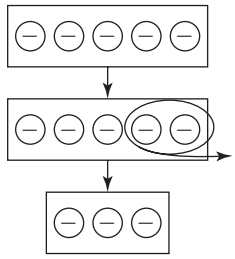
3. two

4. a) $(+6) - (+1) = +5$

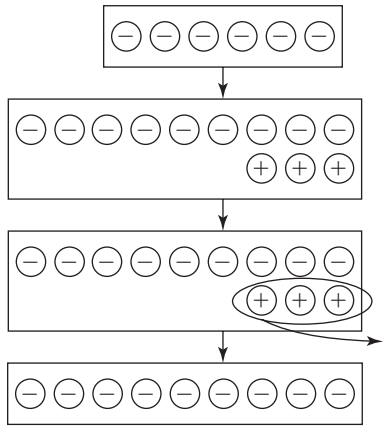
b) $(-11) - (-5) = -6$

c) $(-5) - (+1) = -6$

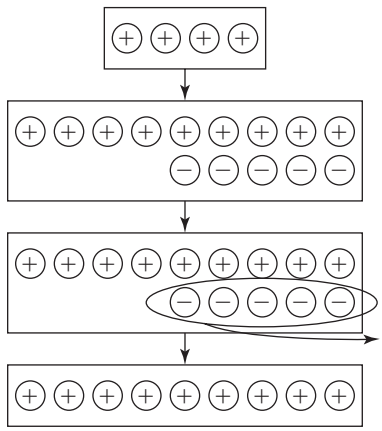
5. a) -3



b) -9



c) $+9$



6. a) $0 - (+3) = -3$; $(+3) - 0 = +3$

b) $(-4) - (-6) = +2$; $(-6) - (-4) = -2$

c) $(-5) - (+8) = -13$; $(+8) - (-5) = +13$

7. $(+7) - (+3) = +4$

8. a) $(-2) + (-2) = -4$

b) This could be shown one of two ways:

$(-4) - (-1) = -3$

$(-1) - (-4) = +3$

There is a difference of 3 points between the two players.

9.4 Subtract Integers

1. opposite, $+5$

2. number

3. a) -5

b) $+3$

c) $+8$

d) -4

4. a) $(+5) - (+7) = -2$

b) $(+3) - (+8) = -5$

5. a) $(+3) - (+5) = -2$; $(+5) - (+3) = +2$

b) $(+2) - (-3) = +5$; $(-3) - (+2) = -5$

c) $(-1) - (-4) = +3$; $(-4) - (-1) = -3$

6. a) $(34) - (-58) = 92$

The difference between these two temperatures is 92ºC.

b) $(+34) - (-58) = 92$

$(-58) - (+34) = -92$

The difference is 92ºC.

7. $(-86) - (+5959) = -6045$

$(+5959) - (-86) = +6045$

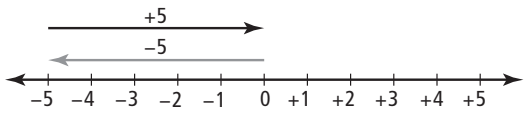
The difference is 6045 m.

8. a) $(-18) - (+15) = -33$

$(+15) - (-18) = +33$

The difference is 33.

b)



His total score was 0.

9.5 Apply Integer Operations

1. a) False. When solving problems with integers, you may have to decide when to add and when to subtract integers.

b) True

2. a) − **b)** − **c)** − **d)** +

3. a) $(-9) - (-10) = +1$

Subtract; the largest number is $+1$.

b) $(+7) - (-5) = +12$

Subtract; the largest number is $+12$.

c) $(+11) - (-4) = +15$

Subtract; the largest number is $+15$.

4. a) $(-8) + (-6) = -14$

$(-6) + (-8) = -14$

Add; the smallest number is -14.

b) $(-6) - (+13) = -19$

Subtract; the smallest number is -19.

c) $(-2) - (+15) = -17$

Subtract; the smallest number is -17.

d) $(-5) - (+10) = -15$

Subtract; the smallest number is -15.

5. a) $(+12) - (-4) = +16$

b) $(-4) - (+9) = -13$

c) $(-5) + (-4) + (+9) = 0$

6. $(+31) + (-3) = +28$

The contents have a mass of 28 kg.

7. a) $(-7) - (+1) = -8$

There is a time difference of 8 h.

b) She needs to make the call earlier in the day. If she called at noon (-6), it would be 8 p.m. in Toulouse. She needs to call at 10 a.m. $(-8$ h).

9 Link It Together

1. a) \$128.11, \$42.36, −\$20.09, \$710.71

b) $(-\$102.69) + (-\$85.75) + (-\$62.45) = -\$250.89$

c) $(-\$85.75) - (-\$62.45) = \$23.30$

2. a) Yes

b) $(+\$710.71) + (-\$625.00) = +\$85.71$

3. a) No

b) $(+\$85.71) + (-\$249.00) = -\$163.29$

9 Vocabulary Link

Across

1. zero pair

8. consecutive numbers

Down

2. opposite integers
3. horizontal
4. vertical
5. integers
6. greater than
7. less than
9. model

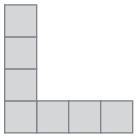
10 Get Ready

1. a) 

b) 

2. a) 9, 11, 13
b) 30, 25, 20
c) 15, 18, 21
d) 2000, 1000, 0

3. 4, 6, 8, 10

4. a) 

b)

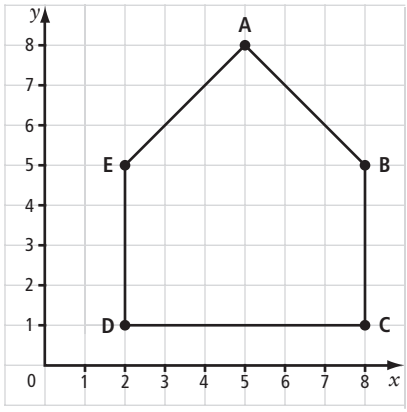
Figure Number	1	2	3	4	5
Number of Squares	1	3	5	7	9

5. a) 21
b) Answers may vary. For example: each number is 4 more than the previous number.
c) Answers may vary. For example, determine that the numbers increase, not decrease. Then, determine that they increase by 4 each step. Chack that 4 is correct.

6. a) Answers may vary. For example, to determine the number of white squares double the deck number and add six.
b) 46

7. a) Move 5 units to the right. Then, move 2 units up.
b) Move 7 units to the right. Then, move 3 units up.
c) Move 4 units to the right. Then, move 6 units up.

8. a)–c)



The shape is a pentagon or a house.

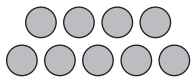
10.1 Describe Patterns

1. a) number **b)** shape

2. predict, next, 13

3. fractions, repeating

4. a) Answers may vary. For example, multiply the figure number times 2 and add 1.
b)



c) 11

5. a) Answers may vary. For example, multiply the figure number times 2.
b)

c) 12

6. a) Answers may vary. For example, as the fifths increase by one, the decimal equivalent increases by two tenths.
b) $\frac{4}{5}$, 0.8
c) Answers may vary. For example, the pattern resets with the decimal part starting again at 0.2, but the whole number starts at 1. $\frac{6}{5}$ is 1.2.

7. a) 0.625
b) 1.375; That would be 1 whole plus 0.375 for the $\frac{3}{8}$.

8. a) Figure 3: $\frac{4}{7}$, 0.57; Figure 4: $\frac{5}{9}$, 0.56; Figure 5: $\frac{6}{11}$, 0.55

b) Answers may vary. For example:
Black Tiles: add 1 to the number.
Total # Tiles: Multiply the figure number times 2 and add 1.
Decimal: The number decreases by one hundredth.

10.2 Variables and Expressions

1. a) numerical coefficient, b) variables, c) constant

2. letter, variable

3. a) 2, 1

b) If the base is represented by n, the perimeter is $3n$.

4. a)

Figure	1	2	3	4	5
Rectangles	4	5	6	7	8

b) Answers may vary. For example, the number of rectangles is equal to the figure numbers plus 3.

c) If the figure number is represented by n, the total number of rectangles is $n + 3$.

5. a)

Figure	1	2	3	4	5
Perimeter	6	12	18	24	30
Total Toothpicks	12	24	36	48	60

b) Answers may vary. For example, the number of toothpicks in the perimeter is 6 times the figure number. The total number of toothpicks in each figure is double the number in the perimeter or 12 times the figure number.

c) If p is the number of toothpicks in the perimeter, then the total number is 2p.

d) 36

6. a) variable = height, $3h + 5$

b) variable = perimeter, $p - 2$

c) variable = Cynthia's age, $c + 10$

d) variable = number of juice boxes, $\frac{2}{3}$

7. a) Answers may vary. For example, 5 km further than the distance Roberta ran.

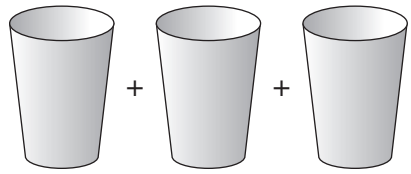
b) The distance Roberta ran.

10.3 Evaluate Expressions

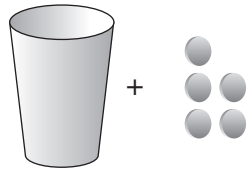
1. The cup is a variable. The chips are a constant.

2. b **3.** c **4.** a

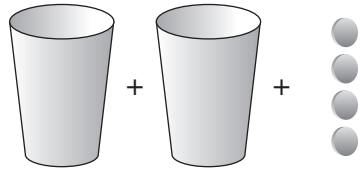
5. a)



b)



c)



6. a) $2x + 3$ **b)** $4y$ **c)** $3y + 6$

7. a) 10

b) 7

c) 9

8. a)

Figure	1	2	3	4	5	6
Toothpicks	4	8	12	16	20	24

b) 56

9. a) 5, 8, 11, 14, 17, 20, 23

b) $3f + 2$

c) figure number

d) 62

10.4 Graph Linear Relations

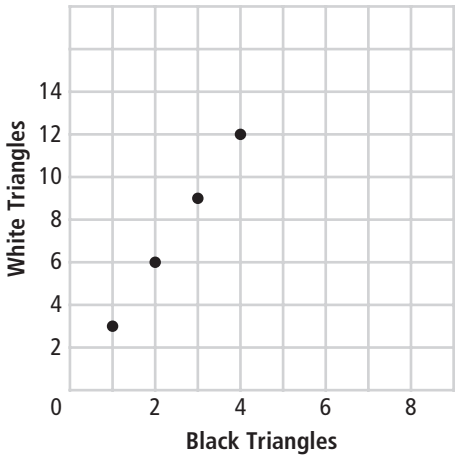
1. a) table of values
b) graph

2. a) D **b)** R **c)** W **d)** R

3. a)

	Figure 1	Figure 2	Figure 3	Figure 4
Black Triangles	1	2	3	4
White Triangles	3	6	9	12

b)



c) Words: The pattern forms a straight line beginning at (1, 3). Each y-coordinate is three times the x-coordinate.
Horizontal and Vertical Distances: The points increase by 1 unit to the right and then 3 units up, starting at (1, 3).
Relationship: The relationship is linear and can be expressed as $(x, 3x)$ or $y - 3x$.

4. a)

CDs	1	2	3	4	5
Cost	$15	$30	$45	$60	$75

b) The cost increases by $15 for each CD.

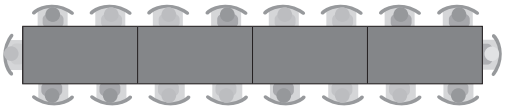
5. a)

Adults	1	2	3	4	5
Students	8	16	24	32	40

b) 14; This is rounded up to the nearest whole number.

10 Link It Together

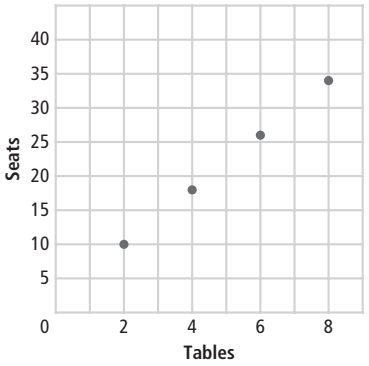
1. a)



b)

Tables	2	4	6	8
Seats	10	18	26	34

c)

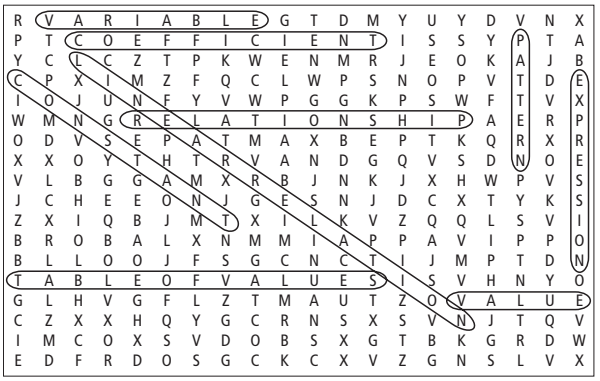


d) If t represents the number of tables, then the number of guests can be represented by $4t + 2$.

e) 62

10 Vocabulary Link

1. d) linear relation
2. h) value
3. c) expression
4. g) table of values
5. e) pattern
6. b) constant
7. i) variable
8. a) coefficient
9. f) relationship

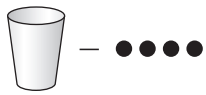


11 Get Ready

1. **a)** 8
b) 3
2. **a)** 50
b) 11.2
3. $P = 20.8$ cm
$A = 27.04$ cm^2
4. $P = 7.2$ m
$A = 2.53$ m^2
5. 3.18 m
6. **a)** Add 4 to the preceding number. 16, 20
b) Subtract 4 from the preceding number. 12, 8
7. **a)** 12, 15, 18
b) 6, 0, −6

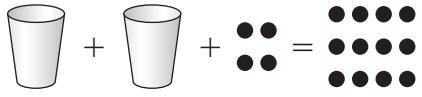
11.1 Expressions and Equations

1. **a)** variable
b) numerical coefficient
c) constant
d) operation
e) equation
2. Examples will vary.

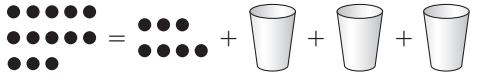


x represents an unknown number of counters in a cup.
3. **a)** $x + 8$
b) $2x + 4 = 6$
4. **a)** none, x, 8
b) 2, x, 4 and 6
5. **a)**

$x + 3$
b)



$2x + 4 = 12$
c)

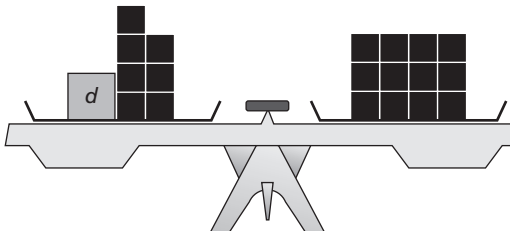


$13 = 7 + 3x$
6. **a)** $\boxed{x} + \underline{3}$
b) $②x + \underline{4} = \underline{12}$
c) $\underline{13} = \underline{7} + ③\boxed{x}$
7. **a)** $x + 4$, 8; $x + 4 = 8$
b) $3x - 5$, 7; $3x - 5 = 7$
8. **a)** $2x - 1$, 5; $2x - 1 = 5$
b) 10, $3x - 2$; $10 = 3x - 2$
9. **a)** $p + 7$
b) $9w + 8$
10. **a)** $2t - 4 = 8$
b) $3a - 10 = 26$
c) $h \div 5 = 32$
11. Answers may vary. For example:
a) four times a number plus five
b) three times the result of a number minus ten
c) nine plus the product of five and a number

11.2 Solve One-Step Equations: $x + a = b$

1. b
2. c
3. d
4. a
5. **a)** $b = 3$
b) $y = 16$
c) $g = 5$
d) $m = 12$
6. **a)** $c = 19$
b) $f = 3$
c) $d = 5$
d) $p = 24$
7. **a)** 5
b) 14
8. **a)** $s = 7$
b) $r = 3$
9. **a)** $s = 5$
b) $y = 3$
c) $t = 6$
d) $b = 24$

10. a) Drawings will vary. For example:



b) 12

c) $d = 5$

11. a) $e + 201 = 224$

b) 23 mm

11.3 Solve One-Step Equations: $ax = b, \frac{x}{a} = b$

1. a) mental

b) balance

c) variable, operation

2. answer, left, equal

3. a) 3

b) 2

4. 8

5. a) $x = 5$

b) $g = 8$

6. a) $y = 10$

b) $d = 35$

7. a) 6

b) 5

8. $x = 7$

9. $4

10. a) 7

b) 5

11. a) $d = 60$

b) $s = 42$

12. 60 km/h

13. a) yes, $6 \times 6 = 36$

b) no, $7 \times 6 \neq 49$

14. a) no, $10 \div 10 \neq 100$

b) yes, $10 \div 2 = 5$

15. 69 cm

16. a) $w = 2r$

b) 6 c

11.4 Solve Two-Step Equations: $ax + b = c$

1. $y = 7$, $12 = r$

2. a) $10 = 3a + 1$, $\frac{r}{8} - 10 = 22$

b) Answers will vary. For example,

$$10 = 3a + 1$$
$$10 - 1 = 3a + 1 - 1$$
$$\frac{9}{3} = \frac{3a}{3}$$
$$3 = a$$

3. a) $x = 3$

b) $x = 1$

4. a) $p = 2$

b) $r = 5$

5. a) subtract

b) add

c) add

d) subtract

6. divide

7. a) $y = 11$

b) $m = 7$

c) $a = 6$

d) $w = 20$

8. a) yes, $8(5) + 8 = 48$

b) no, $5(5) - 2 \neq 25$

9. a) C = cost of call in cents, t = time in minutes

b) 49¢

10. a) $C = 12 + 3h$

b) 5 h

11. 11 years old

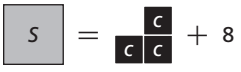
12. a) $2d + 2(4.50) = 49$

b) $20

11 Link It Together

1. a) $S = 3c + 8$

b) Models will vary. For example, where c = campers and S = total space.



c) 15

2. a) $\frac{k}{5} - 1 = C$

k = the number of kids or campers

C = the number of counsellors

b) 2

11 Vocabulary Link

1. opposite operations
2. expression
3. equation
4. numerical coefficient
5. constant
6. variable
7. model

12 Get Ready

1. 8, 9, 10
2. a) 24, 26, 32, 33, 37
b) 13
c) 152
3. a) 7.0, 7.5, 7.9, 8.0, 8.1
b) 23.4 Explanations may vary. For example, they may want to eliminate the scores given by judges who are overly generous or severe.
4. a)–b)

Number of Siblings	Tally	Frequency
0	𝍸	5
1	IIII	4
2	𝍸 I	⑥
3	𝍸	5
4	II	2
5	IIII	4
6	II	2
7	II	2

5. Answers will vary depending on survey results.
6. a) Prince Edward Island
b) Nova Scotia, New Brunswick
c) 94.9%
d) 5.1%

12.1 Median and Mode

1. d
2. c
3. b
4. a
5. e
6. a) median: 5
mode: 7
b) median: 15
mode: 18
7. a) median: 9
mode: 3
b) median: 19
mode: none
8. a) $7
b) $8
9. a) 4
b) 4
10. a) 30
b) 20
c) Answers may vary. For example, if the number of people who were 20 and 30 each increased by two, then the mode would still be 30 and the median would still be 20.
11. Answers will vary. For example, 1, 2, 3, 3, 4.

12.2 Mean

1. a) add, divide
b) does not
2. 6
3. a) 6
b) 2
c) 75
4. a) 9
b) 2.5
c) 95
5. 32 min
6. a) 9
b) 19
7. a) 730 mm
b) $60.8\overline{3}$ mm
c) 6

8. a) 4.25 h
b) to **d)** Answers will vary.

12.3 Range and Outliers

1. a) range, spread
b) highest, lowest
2. a) outliers
b) data set
3. a) 17
b) 13
c) 13
4. a) 11
b) 19
5. a) 150
b) 1, 75
c) 22
6. a) 74.6
b) 91.0
7. a) April 25
b) April 1
c) 24
8. a) 82
b) 113
c) Answers will vary. For example,
- This might be a mistake.
- Terrace-Kitimat may get an unusually large amount of snow.

12.4 The Effects of Outliers

1. a) False. Outliers can affect all measures of central tendency.
b) True.
c) False. Some outliers are just as important as the other data, while others should be removed.
2. a) 19 years
b) median: 17.5 years
mean: 19.4 years
c) 35; Answers may vary. For example, the age of 35 should stay because it is a valid age.
3. a) 28
median: 9
mean: 12
b) 0, 28; The zero value should stay because it is accurate, but 28 should probably be removed because it is based on a different-sized drink than the rest.
4. a) 4.5
b) median: 4.25
mean: 3.75
c) 0.5; The outlier should probably be removed because it is so far outside the range of the rest that it is probably a data collection error.
d) Both the mean and median will increase.
e) Answers may vary. For example, now that I see this new piece of data, I think that 0.5 should stay in the data set too because it's close to this new data.
5. a) 45
b) median: 10
mean: 12.85
Answers may vary depending on how you read the bar graph.
c) 50; Answers may vary. For example:
- 50 is more than twice the size of any other numbers in the data, but represents an unusually hot summer. It is accurate, so it should remain.
- Since 50 represents a very unusual circumstance, it should be removed to get more representative measures of central tendency.

d) Removing the outlier would not change the median, but would lower the mean to 9.75.

12.5 Choose the Best Measure of Central Tendency

1. a) mode
b) median or mean
c) median

2. a) mean: 12.43
median: 15
mode: 4

b) Answers will vary. Either median or mean can be used since the numbers are relatively close together, but the mode would not represent the majority of data.

3. a) mean: 7.5
median: 8
mode: 10

b) Median, since the data set contains one unusually low mark.

c) Answers may vary. For example, Juan may not have studied for that test or may not understand that particular topic.

4. a) mean: 240.2
median: 288
mode: 288

b) Median, since the data set contains one unusually low number.

5. a) grade 9

b) grade 7: 13.5; grade 8: 21; grade 9: 26

c) mean: 20.17
median: 21
mode: 22

d) Mode, because the mode is an actual number in the set.

12 Link It Together

1–2. Answers depend on survey results.

3. Yes, the mode can apply since it is a measure of frequency, not a calculation.

12 Vocabulary Link

1. mode
2. outlier
3. tendency
4. range
5. mean
6. median