Glossary

Instructional Words

C

calculate [*calculer*]**:** Complete one or more mathematical operations; compute

clarify [*clarifier*]**:** Make a statement easier to understand; provide an example

classify [*classer* ou *classifier*]**:** Put things into groups according to a rule and label the groups; organize into categories

compare [*comparer*]**:** Look at two or more objects or numbers and identify how they are the same and how they are different

conclude [*conclure*]**:** Judge or decide after reflection or after considering data

construct [*construire*]**:** Make or build a model; draw an accurate geometric shape (e.g., Use a ruler and a protractor to construct an angle.)

create [*inventer* ou *créer*]**:** Make your own example

D

describe [*décrire*]**:** Tell, draw, or write about what something is or what something looks like; tell about a process in a step-by-step way

determine [*déterminer*]**:** Decide with certainty as a result of calculation, experiment, or exploration

draw: 1. [*dessiner*] Show something in picture form (e.g., Draw a diagram.)
2. [*tirer*] Pull or select an object (e.g., Draw a card from the deck. Draw a tile from the bag.)

E

estimate [*estimer*]**:** Use your knowledge to make a sensible decision about an amount; make a reasonable guess (e.g., Estimate 3210 + 789.)

evaluate [*évaluer*]**:** 1. Determine if something makes sense; judge
2. Calculate the value as a number

explain [*expliquer*]**:** Tell what you did; show your mathematical thinking at every stage; show how you know

explore [*explorer*]**:** Investigate a problem by questioning, brainstorming, and trying new ideas

extend [*prolonger*]**:** 1. In patterning, continue the pattern
2. In problem solving, create a new problem that takes the idea of the original problem further

J

justify [*justifier*]**:** Give convincing reasons for a prediction, an estimate, or a solution; tell why you think your answer is correct

M

measure [*mesurer*]**:** Use a tool to describe an object or determine an amount (e.g., Use a protractor to measure an angle.)

model [*représenter* ou *faire un modèle*]**:** Show or demonstrate an idea using objects and/or pictures (e.g., Model addition of integers using red and blue counters.)

P

predict [*prédire*]**:** Use what you know to work out what is going to happen (e.g., Predict the next number in the pattern 1, 2, 4, 7,…)

R

reason [*raisonner* ou *argumenter*]**:** Develop ideas and relate them to the purpose of the task and to each other; analyze relevant information to show understanding

relate [*établir un lien* ou *associer*]**:** Describe how two or more objects, drawings, ideas, or numbers are similar

represent [*représenter*]**:** Show information or an idea in a different way that makes it easier to understand (e.g., Draw a graph. Make a model. Create a rhyme.)

S

show (your work) [***montrer son travail*** ou ***présenter sa démarche***]**:** Record all calculations, drawings, numbers, words, or symbols that make up the solution

sketch [***esquisser***]**:** Make a rough drawing (e.g., Sketch a picture of the field with dimensions.)

solve [***résoudre***]**:** Develop and carry out a process for finding a solution to a problem

sort [***trier*** ou ***classer***]**:** Separate a set of objects, drawings, ideas, or numbers according to an attribute (e.g., Sort 2-D shapes by the number of sides.)

V

validate [***valider***]**:** Check an idea by showing that it works

verify [***vérifier***]**:** Work out an answer or solution again, usually in another way; show evidence of

visualize [***imaginer***]**:** Form a picture in your head of what something is like; imagine

Mathematical Words

A

algebraic expression [***expression*** (n.f.) ***algébrique***]**:** The result of applying arithmetic operations to numbers and variables; e.g., $3x$ or $5x + 2$. Sometimes this is just called an expression.

angle bisector [***bissectrice*** (n.f.)]**:** A line that cuts an angle in half to form two equal angles

B

base [***base*** (n.f.)]**:** The side of a shape that is measured for calculating the area or perimeter of a shape. Each base has a corresponding height that creates a 90° angle with the base. Any side of a shape can be the base of the shape.

C

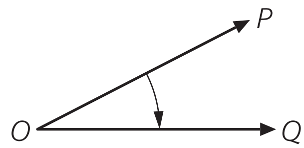
Cartesian coordinate system [***système*** (n.m.) ***de coordonnées cartésiennes***]**:** A method (named after mathematician René Descartes) for describing a location by identifying the distance from a horizontal number line (the x-axis) and a vertical number line (the y-axis). The location is represented by an ordered pair of coordinates (x, y). The axes intersect at (0, 0), which is called the origin.

centre of rotation [***centre*** (n.m.) ***de rotation***]**:** A fixed point around which other points in a shape rotate in a clockwise (cw) or counterclockwise (ccw) direction; the centre of rotation may be inside or outside the shape

circle graph [***diagramme*** (n.m.) ***circulaire***]**:** A graph that shows how the parts make up a whole

circumference [***circonférence*** (n.f.)]**:** The boundary of a circle; the length of this boundary

clockwise (cw) [***dans le sens*** (n.m.) ***des aiguilles d'une montre***]**:** Turning in a sense similar to the hands of a clock; e.g., a turn from direction OP to direction OQ is a clockwise turn (Also see **counterclockwise**.)



common denominator [***dénominateur*** (n.m.) ***commun***]**:** A common multiple of two or more denominators; e.g., for $\frac{2}{3}$ and $\frac{3}{6}$, a common denominator would be any multiple of 6. If you use the least common multiple of the denominators, the common denominator is called the lowest common denominator.

common factor [***diviseur*** (n.m.) ***commun***]**:** A whole number that divides into two or more other numbers with no remainder; e.g., 4 is a common factor of 12 and 24

common multiple [***multiple*** (n.m.) ***commun***]**:** A number that is a multiple of two or more given numbers; e.g., 12, 24, and 36 are common multiples of 4 and 6

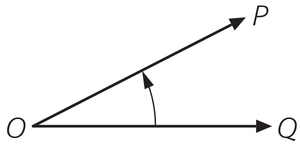
complementary event [***événement*** (n.m.) ***complémentaire***]**:** The set of outcomes in the sample space in which the event does not happen; e.g., when rolling a die, the event (rolling 2) has the complementary event (rolling 1, 3, 4, 5, or 6)

constant [*constante* (n.f.)]**:** A quantity that does not change; e.g., in $2 \times n + 5$, 5 is a constant

convex [*convexe*]**:** A design where all interior angles measure no greater than 180°

coordinates [*coordonnées* (n.f.pl.) *d'un point ou coordonnées* (n.f.pl.)]**:** An ordered pair, used to describe a location on a grid labelled with an x-axis and a y-axis; e.g., the coordinates (1, 3) describe a location on a grid that is 1 unit horizontally from the origin and 3 units vertically from the origin

counterclockwise (ccw) [*dans le sens* (n.m.) *contraire des aiguilles d'une montre*]**:** Turning in a sense opposite to the hands of a clock; e.g., a turn from direction OQ to direction OP is a counterclockwise turn (Also see **clockwise**.)



D

diameter [*diamètre* (n.m.)]**:** A line segment that joins two points on the circumference of a circle and passes through the centre; the length of this line segment

digital root [*racine* (n.f.) *numérique*]**:** The number obtained by adding the digits of a number, then repeating the digit addition for each new number found, until a single-digit number is reached; e.g., the digital root of 123 is $1 + 2 + 3 = 6$

divisibility rule [*règle* (n.f.) *de divisibilité ou caractères* (n.m.pl.) *de divisibilité*]**:** A way to determine if one whole number is a factor of another whole number without actually dividing the entire number

dodecagon [*dodécagon* (n.m.)]**:** A polygon with 12 straight sides and 12 angles

E

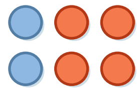
equally likely outcomes [*résultats* (n.m.pl.) *également probables*]**:** Two or more outcomes that have an equal chance of occurring; e.g., the outcome of rolling a 1 and the outcome of rolling a 2 on a 6-sided die are equally likely outcomes because each outcome has a probability of $\frac{1}{6}$

equation [*égalite* (n.f.); *remarque: en français, une équation comporte obligatoirement une inconnue*]**:** A statement that two quantities or expressions are equivalent; e.g., $4 + 2 = 6$ and $6x + 2 = 14$

equivalent [*équivalent*]**:** Equal in value; e.g., two equivalent fractions are $\frac{1}{2}$ and $\frac{2}{4}$, two equivalent ratios are 6 : 4 and 9 : 6, and the fraction $\frac{1}{2}$ is equivalent to the decimal 0.5

equivalent rate [*rapport* (n.m.) *équivalent*]**:** A rate that describes the same comparison as another rate; e.g., 2 for \$4 is equivalent to 4 for \$8

equivalent ratio [*rapport* (n.m.) *équivalent*]**:** A ratio that represents the same relationship as another ratio; e.g., 2 : 4 is an equivalent ratio to 1 : 2 because both ratios describe the relationship of the blue counters to the red counters. There are 2 red counters for each blue counter, but also 4 red counters for every 2 blue counters.



event [*événement* (n.m.)]**:** A set of one or more outcomes in a probability experiment; e.g., the event of rolling an even number with a six-sided die consists of the outcomes of rolling a 2, a 4, or a 6

experimental probability [*probabilité* (n.f.) *expérimentale*]**:** In a probability experiment, the ratio of the number of observed favourable outcomes to the number of trials, or repetitions, of the experiment

expression [*expression* (n.f.) *numérique*]**:** See **algebraic expression** [*expression algébrique* (n.f.)]

F

factor [*facteur* (n.m.)]**:** One of the numbers you multiply in a multiplication operation

2	×	6	=	12
↑		↑		
factor		factor		

favourable outcome [*résultat* (n.m.) *favorable*]**:** The desired result in a probability experiment

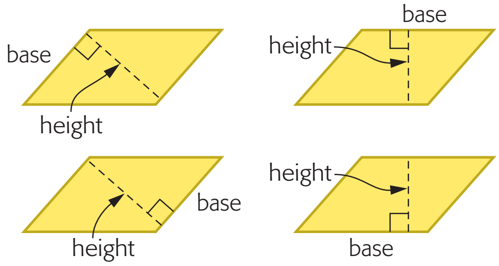
formula [*formule* (n.f.)]**:** A rule represented by symbols, numbers, or letters, often in the form of an equation; e.g., area of a rectangle = length × width, or $A = l \times w$

G

greatest common factor (GCF) [*plus grand diviseur* (n.m.) *commun, ou PGDC*]**:** The greatest whole number that is a factor of two or more whole numbers; e.g., 4 is the greatest common factor of 8 and 12.

H

height [*hauteur* (n.f.)]**:** A line segment drawn to form a right angle with the side of a shape



heptagon [*heptagone* (n.m.)]**:** A polygon with 7 straight sides and 7 angles

hexagon [*hexagone* (n.m.)]**:** A polygon with 6 straight sides and 6 angles

hypotenuse [*hypoténuse* (n.f.)]**:** The longest side of a right triangle; the side opposite the right angle

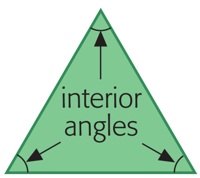
I

improper fraction [*fraction* (n.f.) ***impropre***]**:** A fraction whose numerator is greater than its denominator; e.g., $\frac{5}{4}$ is an improper fraction

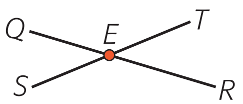
independent events [*événements* (n.m.pl.) ***indépendents***]**:** Two events are independent if the probability of one is not affected by the probability of the other

integer [*nombre* (n.m.) ***entier ou entier*** (n.m.)]**:** The counting numbers (+1, +2, +3,…), zero (0), and the opposites of the counting numbers (–1, –2, –3,…)

interior angle [*angle* (n.m.) ***intérieur***]**:** The inside angle of a polygon



intersection point [*le point d'intersection* (n.m.)]**:** The point where two lines or line segments cross each other; e.g., *QR* intersects *ST* at intersection point *E*

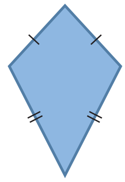


isolate [*isoler*]**:** To show the same equation in an equivalent way so the variable is alone on one side

isometric drawing [*diagramme* (n.m.) ***isométrique***]**:** A 3-D view of an object in which
- vertical edges are drawn vertically
- width and depth are drawn diagonally
- equal lengths on the object are equal on the drawing

K

kite [*cerf-volant* (n.m.)]**:** A convex quadrilateral with two pairs of equal adjacent sides

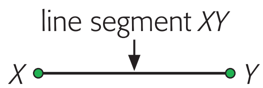


L

least common multiple (LCM) [*plus petit multiple* (n.m.) ***commun, ou PPMC***]**:** The least whole number that has two or more given whole numbers as factors; e.g., 12 is the least common multiple of 4 and 6

linear relation [*rapport* (n.m.) ***linéaire ou relation*** (n.f.) ***de variation directe***]**:** A relation whose plotted points lie on a straight line

line segment [*segment* (n.m.) ***de droite ou segment*** (n.m.)]**:** Part of a line with two endpoints; it is named using the labels of the endpoints; e.g., the line segment joining points *X* and *Y* is called *XY*



lowest terms [*sous forme* (n.f.) ***irréductible***]**:** An equivalent form of a fraction with numerator and denominator that have no common factors other than 1; e.g., $\frac{3}{4}$ is the lowest term form of $\frac{12}{16}$, since $\frac{3}{4} = \frac{12}{16}$ and 3 and 4 have no common factors other than 1

M

mean [*moyenne* (n.f.)]**:** A representative value of a set of data; it is determined by sharing the total amount of the data evenly amongst the number of values in the set; e.g., consider the set of data: 3, 6, 8, 14, 9. There are 5 values, whose sum is 40. The mean is 8, because 40 divided equally among 5 values would give each number the value 8. That is, $40 \div 5 = 8$.

median [*médiane* (n.f.)]: A representative value of a set of data; the middle value of the ordered data. When there is an odd number of values, the median is the middle value; e.g., the median of 2, 3, and 4 is 3. When there is an even number of values, it is the value halfway between the two middle values; e.g., the median of 2, 3, 4, 5, 6 and 6 is 4.5.

midpoint [*milieu* (n.m.)]: The point on a line segment that divides the line segment into two equal parts

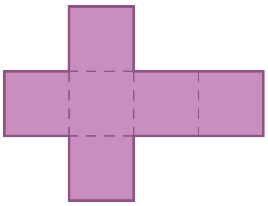
mixed number [*nombre* (n.m.) *mixte*]: A number expressed as a whole number and a fraction; e.g., $2\frac{1}{2}$ is a mixed number

mode [*mode* (n.m.)]: A representative value of a set of data; the value or item that occurs most often in a set of data. A set of data might have no mode, 1 mode, or more than 1 mode; e.g., the mode of 1, 5, 6, 6, 6, 7, and 10 is 6.

multiple [*multiple* (n.m.)]: The product of a whole number and any other whole number; e.g., when you multiply 10 by the whole numbers 0 to 4, you get the multiples 0, 10, 20, 30, and 40

N

net [*développement* (n.m.)]: A 2-D pattern you can fold to create a 3-D object; e.g., this is a net for a cube

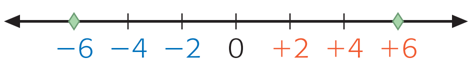


numerical coefficient [*coefficient* (n.m.)]: The multiplier of a variable; e.g., in $2 \times n + 5$, 2 is the numerical coefficient of n

O

octagon [*octogone* (n.m.)]: A polygon with 8 straight sides and 8 angles

opposite integers [*nombres entiers opposés* (n.m.pl.) *ou entiers* (n.m.pl.) *opposés*]: Two integers the same distance away from zero; e.g., +2 and −2 are opposite integers



order of operations [*priorité* (n.f.) *des opérations*]: A set of rules people use when calculating, in order to get the same answer. The rules for the order of operations are:
Step 1: Do the operations in brackets first.
Step 2: Divide and multiply from left to right.
Step 3: Add and subtract from left to right.
To remember the rules, think of "BDMAS": Brackets, Divide and Multiply, Add and Subtract.

origin [*origine* (n.f.)]: The point from which measurement is taken; in the Cartesian coordinate system, it is the intersection of the vertical and horizontal axes and is represented by the ordered pair (0, 0)

outcome [*résultat* (n.m.)]: A result of an event or experiment. For example, rolling a 1 is one possible outcome when you roll a die.

outcome table [*tableau* (n.m.) *des résultats*]: A chart that lists all possible outcomes of a probability experiment

outlier [*observation* (n.f.) *aberrante*]: A data value that is far from the other data values

P

parallel [*parallèle*]: Always the same distance apart; e.g., line segments AB and CD are parallel

part-to-part ratio [*rapport partie/partie*]: A comparison of two parts of the same whole; e.g., 2 : 4 compares the number of red tiles to the number of blue tiles

part-to-whole ratio [*rapport partie/tout*]: A comparison of part of a whole to the whole (e.g., 2 : 6 compares the number of red tiles to the total number of tiles) that can be written as a fraction, such as $\frac{2}{6}$

pattern rule [*règle* (n.f.) *de la suite*]: A way to describe a pattern that compares a characteristic of the figure to the figure number; e.g., a pattern rule for the pattern shown below is $b = 4 \times n + 1$, where b is the number of blocks in figure n

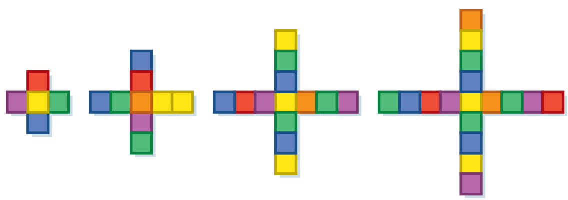
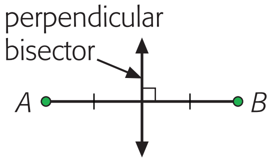


figure 1 figure 2 figure 3 figure 4

percent [*pourcentage* (n.m.)]**:** A part-to-whole ratio that compares a number or an amount to 100; e.g., $25\% = 25:100 = \frac{25}{100}$

perfect square [*carré* (n.m.) *parfait*]**:** The product of a whole number multiplied by itself; e.g., 49 is a perfect square because $49 = 7 \times 7$

perpendicular bisector [*bissectrice* (n.f.) *perpendiculaire*]**:** A line that intersects a line segment at 90° and divides it into two equal lengths; any point on the perpendicular bisector to AB is equidistant from endpoints A and B



π (pi) [*(pi)* (n.m.) ou **π**]**:** The ratio of the circumference of a circle to its diameter; its value is about 3.14

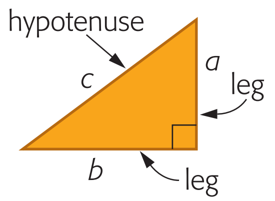
plane [*plan* (n.m.)]**:** A flat surface that goes on forever in two different directions

prime number [*nombre* (n.m.) *premier*]**:** A number with only two factors, 1 and itself; e.g., 17 is a prime number since its only factors are 1 and 17

probability [*probabilité* (n.f.)]**:** A number from 0 to 1 that shows how likely it is that an event will happen

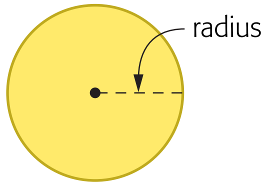
proportion [*proportion* (n.f.)]**:** A number sentence that shows two equivalent ratios or fractions; e.g., $1:2 = 2:4$ or $\frac{1}{2} = \frac{2}{4}$

Pythagorean theorem [*théorème* (n.m.) *de Pythagore*]**:** Statement of a relationship in which the sum of the squares of the lengths of the legs of a right triangle is equal to the square of the length of the hypotenuse. This is written algebraically as $a^2 + b^2 = c^2$.



R

radius [*rayon* (n.m.)]**:** Half the diameter of a circle—the distance from the centre of a circle to a point on the circumference



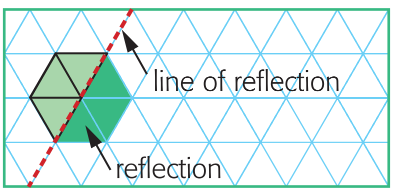
range [*étendue* (n.f.)]**:** The difference between the greatest and least number in a set of data; e.g., the range of 6, 7, 7, 8, 9 is 3, because $9 - 6 = 3$

rate [*rapport* (n.m.)/*relation* (n.f.)]**:** A comparison of two amounts measured in different units; e.g., cost per item or distance compared to time. The word "per" means "to" or "for each" and is written using a slash (/); e.g., a typing rate of 250 words/8 min

ratio [*rapport* (n.m.) / *relation* (n.f.)]**:** A comparison of two numbers (e.g., 5 : 26 is the ratio of vowels to letters in the alphabet) or of two measurements with the same units (e.g., 164 : 175 is the ratio of two students' heights in centimetres). Each number in the ratio is called a term.

reciprocal [*réciproque* (n.f.)]**:** The fraction that results from switching the numerator and the denominator; e.g., $\frac{4}{5}$ is the reciprocal of $\frac{5}{4}$

reflection [*réflexion* (n.f.)]**:** The result of a flip of a 2-D shape; each point in a 2-D shape flips to the opposite side of the line of reflection, but stays the same distance from the line (Also see **transformation**.)



relation [*relation* (n.f.)]**:** A property that allows you to use one number to get information about another number

repeating decimal [*suite* (n.f.) ***décimale périodique***]**:** A decimal in which a block of one or more digits eventually repeats in a pattern; e.g., $\frac{25}{99} = 0.252\,525\ \ldots$, $\frac{31}{36} = 0.861\,111\,1\ \ldots$, $\frac{1}{7} = 0.142\,857\,142\,857\ldots$. These repeating decimals can also be written as $0.\overline{25}$, $0.86\overline{1}$, and $0.\overline{142\,857}$.

rotation [*rotation* (n.f.)]**:** A transformation in which each point in a shape moves about a fixed point through the same angle

S

sample space [*espace* (n.m.) ***des échantillons***]**:** All possible outcomes in a probability experiment

scatter plot [*diagramme* (n.m.) ***de dispersion***]**:** A graph that attempts to show a relationship between two variables by means of points plotted on a coordinate grid

solution to an equation [*solution* (n.f.) ***d'une équation***]**:** A value of a variable that makes an equation true; e.g., the solution to $6x + 2 = 14$ is $x = 2$

speed [*vitesse* (n.f.)]**:** The rate at which a moving object travels a certain distance in a certain time; e.g., a sprinter who runs 100 m in 10 s has a speed of 100 m/10 s = 10 m/s

square root [*racine* (n.f.) ***carrée***]**:** One of two equal factors of a number; e.g., the square root of 81 is 9 because 9×9, or 9^2, $= 81$; sometimes called a root

statistics [*statistique* (n.f.)]**:** The collection, organization, and interpretation of data

T

terminating decimal [*fraction* (n.f.) ***décimal finie***]**:** A decimal that is complete after a certain number of digits with no repetition; e.g., 0.777

tessellation [*mosaïque* (n.f.)]**:** The tiling of a plane with one or more congruent shapes without any gaps or overlaps

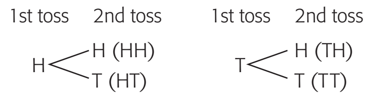
theoretical probability [*probabilité* (n.f.) ***théorique***]**:** The ratio of the number of favourable outcomes to the number of possible equally likely outcomes; e.g., the theoretical probability of tossing a head on a coin is $\frac{1}{2}$, since there are 2 equally likely outcomes and only 1 is favourable

three-term ratio [*rapport* (n.m.) ***à trois termes***]**:** A ratio that compares three quantities; e.g., the ratio 2 : 3 : 5 (or, 2 to 3 to 5) describes the ratio of red to blue to yellow squares

transformation [*transformation géométrique* (n.f.)]**:** The result of moving a shape according to a rule; transformations include translations, rotations, and reflections

translation [*translation* (n.f.)]**:** The result of a slide; the slide must be along straight lines, left or right, up or down (Also see **transformation**.)

tree diagram [*diagramme* (n.m.) ***en arbre ou arbre*** (n.m.)]**:** A way to record and count all combinations of events, using lines to connect the two parts of the outcome



trial [*essai* (n.m.) ***ou événement*** (n.m.)]**:** A single event or observation in a probability experiment

U

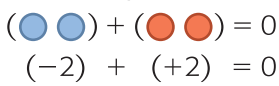
unit rate [*valeur* (n.f.) ***unitaire***]**:** A rate in which the second term is 1; e.g., in swimming, 12 laps/6 min can be written as a unit rate of 2 laps/min

V

variable [*variable* (n.f.)]**:** A letter or symbol, such as a, b, x, or n, that represents a number; e.g., in the formula for the area of a rectangle, the variables A, l, and w represent the area, length, and width of the rectangle

Z

zero principle [*principe* (n.m.) ***de la somme des nombres opposés***]**:** When two opposite integers are added, the sum is zero; e.g.,



Answers

Chapter 1, p. 1

1.2 Recognizing Perfect Squares, pp. 8–9

1. a), b), d), and f)

2. a) e.g., 1225 equals a whole number, 35, multiplied by itself, so it is a perfect square.
b) e.g., $484 = 22 \times 22$ or 22^2
c) e.g., 45 is a whole number, so 45^2 or 2025 must be a perfect square.

3. e.g., The diagram shows that $289 = 17 \times 17$ or 17^2.

4. a) $16 = 4 \times 4$ or 4^2 **c)** $1764 = 42 \times 42$ or 42^2
b) $144 = 12 \times 12$ or 12^2

5. Yes, e.g., 225 can be written as 15×15 or 15^2.

6. a) 36 **c)** 121 **e)** 625 **g)** 10 000
b) 81 **d)** 144 **f)** 1600 **h)** 1 000 000

7. e.g., She can group the factors as $(5 \times 9) \times (5 \times 9)$ or 45×45 or 45^2.

8. Yes, e.g., $13 \times 13 = 169$, so 169 is a square, and $31 \times 31 = 961$, so 961 is also a square.

9. e.g., an 8-by-8 and a 2-by-2 square with two congruent 2-by-8 rectangles

10. a) two, 900 and 961
b) e.g., The greatest perfect square must be 29^2 or 841 because the next square is 30^2 or 900. The least perfect square must be 32^2 because 31^2 is 961.

11. yes

12. e.g., The result will be even if the number squared is even, and odd if the number squared is odd.

13. e.g., Each square number can be written as a number multiplied by itself, so when two square numbers are multiplied, the product can also be grouped to show a number multiplied by itself.

14.

Number	11	12	13	14	15	16	17	18	19	20
Square	121	144	169	196	225	256	289	324	361	400
Ones digit of square	1	4	9	6	5	6	9	4	1	0

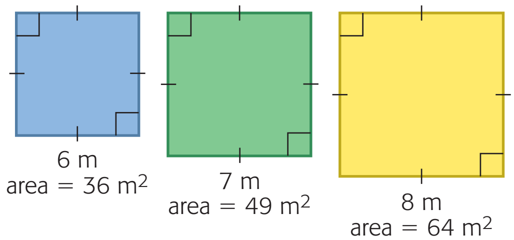
15. a) 1 **b)** 4 **c)** 5 **d)** 4

16. No, e.g., if the ones digit of the square is 6 then the ones digit of the number squared can be 4 or 6.

17. e.g., Use the factor 17 to show that $17^2 = 289$.

1.3 Square Roots of Perfect Squares, pp. 13–15

1. a)



b) 6 m, 7 m, and 8 m

2. a) 2 **b)** 4 **c)** 9 **d)** 20

3. a) e.g., 7, 21, 21, 63, and $\sqrt{441} = 21$
b) e.g., 21×21 or $21^2 = 441$

4. 27

5. a) 4-by-16, 8-by-8
b) e.g., She can choose the square with equal side lengths of 8, which is the square root.
c) 12
d) e.g., Sanjev's factor rainbow shows each factor matched to a partner. This matching is like showing the dimensions of rectangles with the same area used in Maddy's method.

6. a) 1 **b)** 0 **c)** 5 **d)** 10 **e)** 20 **f)** 30

7. a) e.g., $\sqrt{31 \times 31}$ is 31 because 31×31 represents the area of a square and 31 is the side length or square root.
   b) e.g., $\sqrt{43 \times 43}$ is 43 because 43^2 is a perfect square. The square root of a whole number squared is the whole number.
   c) e.g., The factors can be arranged in $\sqrt{2 \times 2 \times 3 \times 3}$ as $\sqrt{(2 \times 3) \times (2 \times 3)}$ $= \sqrt{6 \times 6}$ or 6^2, so the square root must be 6.

8. a) 32 b) 121

9. yes

10. 16 m

11. a) e.g., $10^2 = 100$ and $20^2 = 400$, so the square root of 225 must be between 10 and 20.
   b) e.g., Only numbers with a ones digit of 5 when squared will also have a ones digit of 5.
   c) e.g., The ones digit of the square root must be 5, and the square root must be between 10 and 20, so 15 must be the square root.

12. a) yes b) 26

13. a)

Ones digit of perfect square	Ones digit of square root
0	0
1	1 or 9
2	not possible
3	not possible
4	2 or 8
5	5
6	4 or 6
7	not possible
8	not possible
9	3 or 7

   b) No, e.g., the only time you can predict the ones digit of a square root is when the ones digit of the perfect square is 0 or 5.

14. a) 17 b) 21 c) 47 d) 55

15. e.g., Use estimating and predicting the ones digit after squaring, or identify all the factors of 324.

16. a) 10 b) 100 c) 1000

17. 10 000

18. a) e.g., The only factor that cannot be paired with a different number is 77, which is the square root of 5929.
   b) e.g., $77^2 = 5929$

19. e.g., If a whole number has an odd number of factors, then you can pair each factor except for one. This factor must be the square root.

20. e.g., Squaring a number and taking the square root gives the original number.

1.4 Estimating Square Roots, pp. 18–20

1. a) about 3.8 b) about 5.5

2. a) 2.8 b) 6.5 c) 12.8 d) 31.3

3. 31.3, e.g., $\sqrt{979}$ should be just greater than $\sqrt{900} = 30$.

4. a) reasonable
   b) not reasonable, $\sqrt{15} \doteq 3.9$
   c) reasonable
   d) not reasonable, $\sqrt{289} = 17$
   e) not reasonable, $\sqrt{342} \doteq 18.5$
   f) reasonable

5. a) 4.2 c) 6.2 e) 28.3
   b) 8.7 d) 12.2 f) 62.4

6. a) e.g., Take the square root of the area of the square to determine the side length.
   b) e.g., 3000 is between $50^2 = 2500$ and $60^2 = 3600$, so the side length must be between 50 m and 60 m.
   c) 54.8 m

7. e.g., a) 7 b) 20 c) 1 d) 25

8. a) about 663 m
   b) e.g., I calculated $663^2 = 439\,569$, which is close to 440 000 or 880×500.

9. a) e.g., 29 is between 25 and 36, so $\sqrt{29}$ is between $\sqrt{25} = 5$ and $\sqrt{36} = 6$
   b) e.g., 26, 27, and 28

10. a) 4.5 s c) 9.0 s e) 20.1 s
   b) 6.4 s d) 13.5 s f) 45.0 s

11. 35

12. a) e.g., choose 20. $20^2 = 400$; $400 + 2 \times 20 = 440$; $440 + 1 = 441$; $\sqrt{441} = 21$; $21 - 20 = 1$
   b) All answers are equal to 1.

13. 2025

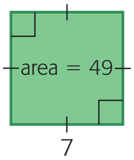
14. **a)** 2.236 **c)** 223.607
b) 22.361 **d)** 2236.068

15. **a)** When the number increases by a factor of 100, the square root increases by a factor of 10.
b) 22 360.680

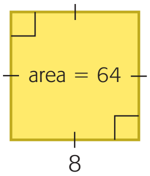
16. e.g., Determine the side length s of the square with area 5 square units to determine the square root. $s^2 = 5$, so s is about 2.2.

Mid-Chapter Review, p. 23

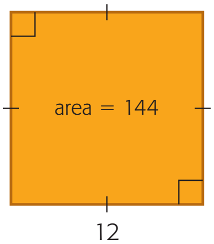
1. **a)**



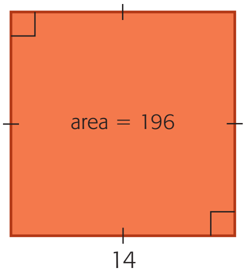
b)



c)



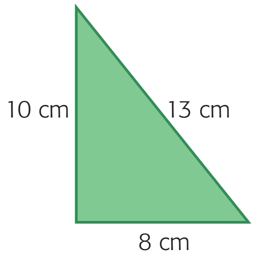
d)



2. 64, 81
3. C
4. e.g., 11 025 = (3 × 5 × 7) × (3 × 5 × 7), which represents 105 × 105 or 105^2
5. 36, 6
6. e.g., Determine the square root of the area, $\sqrt{900} = 30$, so the side length is 30 m.
7. e.g., The only factor of 81 that is not paired with a partner that is a different number is 9, so $\sqrt{81} = 9$.
8. **a)** about 3.5 **c)** about 30.4
b) about 4.1 **d)** about 39.8
9. 100 cm

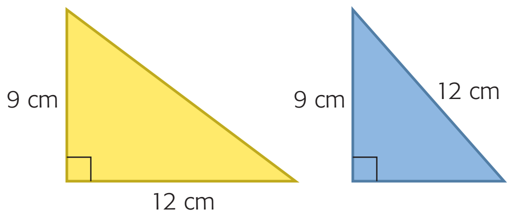
1.6 The Pythagorean Theorem, pp. 29–31

1. $\triangle GHI$
2. **a)** 26 cm **b)** 8 cm
3. e.g., The sum of the areas of the two smaller squares equals the area of the largest square.
4. **a)**



b) yes
c) e.g., $10^2 + 8^2 = 164$, but $13^2 = 169$, so the triangle is not a right triangle

5. **a)** $3^2 + 4^2 = 25$ and $5^2 = 25$
b) $5^2 + 12^2 = 169$ and $13^2 = 169$
c) $7^2 + 24^2 = 625$ and $25^2 = 625$
d) $8^2 + 15^2 = 289$ and $17^2 = 289$
e) $9^2 + 40^2 = 1681$ and $41^2 = 1681$
f) $11^2 + 60^2 = 3721$ and $61^2 = 3721$
6. **a)** yes **b)** yes
7. about 66 m
8. **a)** 24 m **b)** about 23.9 m
9. **a)** 7.8 cm **b)** 6.3 km **c)** 4.1 cm **d)** 5.8 cm
10. 5 units
11. about 7.1 cm each
12. e.g., If the carpenter measures 5 m from the corner of each wall, then the walls form a right triangle, since $3^2 + 4^2 = 5^2$.
13.



14. e.g., If the diagonal of a square has a length of 8 cm, by the Pythagorean theorem the side length of the square can only be $\sqrt{32}$ cm. Many rectangles can have different side lengths with this diagonal.

1.7 Solve Problems Using Diagrams, p. 35

1. 200 cm
2. about 1098 cm
3. 204
4. **a)** 9 **b)** 11
5. 20 cm
6. about 29.4 km

7. 25
8. e.g., What is the length of x to one decimal place? 11.2 m

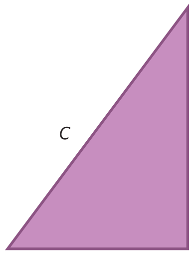
Chapter Self-Test, pp. 36–37

1. a) 121 b) 196
2. a) e.g., 25 can be written as a whole number multiplied by itself or as 5^2.
   b) $16 + 9 = 4^2 + 3^2$
3. a) 1 b) 49 c) 225 d) 900
4. 4
5. a) 18 cm b) about 6.5 cm
6. e.g., $\sqrt{90}$ is between $\sqrt{81} = 9$ and $\sqrt{100} = 10$, so $\sqrt{90}$ is between 9 and 10, about 9.5.
7. about 807 km
8. $\triangle DEF$
9. about 4.47 units
10. 10 cm and about 7.1 cm

Chapter Review, pp. 39–40

1. a) perfect square c) perfect square
   b) not a perfect square d) not a perfect square
2. e.g., 529 cm^2 is a perfect square, and its square root is the side length of the square.
3. 160 m
4. e.g., A square with an area of 11 cm^2 will have a side length of $\sqrt{11}$ cm. By comparing this square to the other two, $\sqrt{11}$ must be between 3 and 4.
5. a) about 2.6 c) about 20.6
   b) about 5.7 d) about 30.4
6. about 16.2 m
7. a) e.g., The diagram represents the problem because it shows 9 chairs in front of the square and the remaining 121 chairs in equal rows and columns.
   b) $s^2 + 9 = 130$, where s represents the number of rows and columns
   c) e.g., If $s^2 + 9 = 130$, I can remove 9 chairs from the diagram to get $s^2 = 121$, so s must be 11 because $11^2 = 121$.
   d) 11, 11

8. about 900 km
9. 5 cm, 5.6 cm, and 5.6 cm
10. 30 units



Chapter 2, p. 42

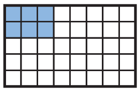
2.1 Multiplying a Whole Number by a Fraction, pp. 49–50

1. $4\frac{2}{3}$
2. a) $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4}$
   b) $\frac{15}{4}$
   c) $\frac{15}{4}, 3\frac{3}{4}$
3. a) $\frac{2}{3}$ c) $\frac{18}{8}, 2\frac{1}{4}$ e) $\frac{21}{6}, 3\frac{1}{2}$
   b) $\frac{15}{5}, 3$ d) $\frac{8}{5}, 1\frac{3}{5}$ f) $\frac{32}{2}, 16$
4. b), c), e), f)
5. $4\frac{1}{6}$ h
6. 4 cups
7. Yes, e.g., a quarter is $\frac{1}{4}$ of a dollar, so multiplying by 17 will tell how many dollars it is worth.
8. a) They are the same—both end up at $\frac{12}{5}$.
   b) e.g., $5 \times \frac{4}{8}$ and $4 \times \frac{5}{8}$
9. a) $\frac{4}{5}$
   b) 40%, 80%
   c) $\frac{4}{5} = 80\%$, so the answers are equal.
10. 11.5
11. e.g., $6 \times \frac{5}{8}$; $3 \times \frac{10}{12}$; $10 \times \frac{3}{5}$
12. e.g., $8 \times \frac{8}{10}$; $35 \times \frac{2}{10}$; $14 \times \frac{4}{8}$
13. e.g., I exercised $\frac{2}{3}$ of an hour, 4 days in a row. How many hours did I exercise?
14. $\frac{4}{5}$

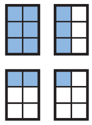
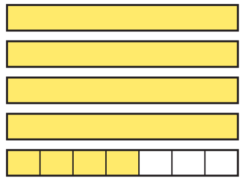
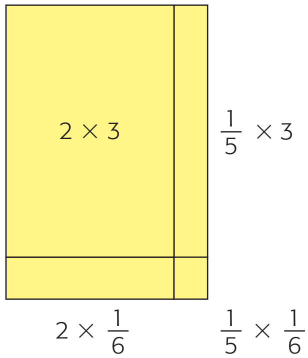
15. $\frac{2}{5}$

16. a) e.g., Each time, you have 5 sets of 2 parts.
    b) e.g., because sometimes the parts are thirds, sometimes fifths, and sometimes sevenths

2.3 Multiplying Fractions, pp. 54–56

1. a) $\frac{4}{9} \times \frac{3}{4}$ b) $\frac{3}{7} \times \frac{2}{3}$
2. $\frac{3}{10}$
3. about $\frac{1}{55}$
4. a) $\frac{3}{4} \times \frac{1}{2}$ b) $\frac{2}{3} \times \frac{4}{5}$ c) $\frac{1}{2} \times \frac{5}{7}$
5. a) $\frac{3}{16}$ b) $\frac{4}{15}$ c) $\frac{1}{15}$ d) $\frac{1}{4}$ e) $\frac{1}{5}$ f) $\frac{2}{5}$
6. a) $\frac{7}{12}$ b) $\frac{1}{6}$ c) $\frac{3}{10}$ d) $\frac{8}{15}$
7. a) e.g.,

   b) e.g., $\frac{1}{4} \times \frac{6}{10}$ and $\frac{3}{20} \times \frac{2}{2}$
8. $\frac{1}{5}$
9. a) $\frac{5}{12}$ b) 10 h
10. $\frac{4}{15}$
11. a) $\frac{1}{160}$ b) $\frac{1}{20}$
12. $\frac{1}{5}$
13. e.g., A gas tank was $\frac{2}{3}$ full. $\frac{3}{5}$ of the gas was used for a trip. What fraction of the tank is still full?
14. a) 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$
    b) e.g., To continue the pattern, $\frac{1}{2} \times \frac{1}{2}$ should be half of $1 \times \frac{1}{2}$. Since $1 \times \frac{1}{2} = \frac{1}{2}$, it should be $\frac{1}{4}$.
15. a) $\frac{1}{35}$ b) $\frac{1}{12}$ c) $\frac{7}{20}$
16. a) 0.12
    b) $\frac{12}{100}$, $\frac{12}{100}$ is the same as 0.12
17. $\frac{1}{100}$
18. The product is less than each fraction because you are taking only a part of either fraction.
19. a) e.g., It is a multiple of 5.
    b) e.g., It might be a multiple of 3, but it does not have to be if you write the fraction in lowest terms. e.g., $\frac{1}{3} \times \frac{3}{5} = \frac{1}{5}$ but $\frac{3}{4} \times \frac{3}{5} = \frac{9}{20}$ and the numerator is a multiple of 3.

2.5 Multiplying Fractions Greater Than 1, pp. 61–63

1. a) e.g., about 4 b) e.g., about 49
2. a) $4\frac{4}{5}$ b) $2\frac{2}{7}$
3. 1 dozen
4. a) $1\frac{1}{2}$ b) $\frac{15}{16}$ c) $\frac{8}{15}$ d) $2\frac{1}{8}$ e) $1\frac{3}{7}$ f) $\frac{7}{27}$
5. $11\frac{11}{12}$
6. a) e.g.,

   b) e.g.,

   c) e.g.,


7. a) $7\frac{1}{2}$ b) $3\frac{3}{4}$ c) $4\frac{4}{5}$ d) $7\frac{1}{5}$ e) $8\frac{4}{9}$ f) $1\frac{11}{24}$
8. a) $3\frac{1}{8}$ cups b) $4\frac{1}{6}$ cups
9. 2 times as much
10. a) e.g., Most likely his estimate would be $3 \times 4 = 12$, so his answer would not be far off his estimate.
    b) e.g., Use a model to show $3\frac{1}{3} \times 4\frac{3}{8} = 14\frac{7}{12}$.
11. $2\frac{2}{9}$
12. Mount Columbia is $26\frac{9}{20}$ times as high.
13. a) $7\frac{41}{50}$
    b) $3\frac{4}{10} = 3.40$, and $2\frac{3}{10} = 2.30$, $3.4 \times 2.3 = 7.82$
    c) e.g., The answers were the same; both times you had to multiply 34 by 23 and adjust the result to make it hundredths instead of ones.
14. e.g., $\frac{8}{5}$, $\frac{5}{4}$, and $\frac{7}{3}$
15. e.g., Mark has $3\frac{1}{2}$ times as many marbles as I have, and Kyle has $2\frac{1}{3}$ times as many as Mark has. how many times as many marbles does Kyle have as I have?

16. Disagree, e.g., $2\frac{2}{3} \times 3\frac{3}{4} = 10$, which is not a mixed number using twelfths.

Mid-Chapter Review, pp. 66–67

1. a) $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}, \frac{6}{5}, 1\frac{1}{5}$

b) $\frac{5}{12} + \frac{5}{12} + \frac{5}{12} + \frac{5}{12}, \frac{20}{12}$ or $\frac{5}{3}, 1\frac{2}{3}$

c) $\frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5} + \frac{3}{5}, \frac{24}{5}, 4\frac{4}{5}$

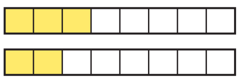
d) $\frac{4}{9} + \frac{4}{9} + \frac{4}{9} + \frac{4}{9} + \frac{4}{9}, \frac{20}{9}, 2\frac{2}{9}$

2. a) $\frac{9}{8}$ or $1\frac{1}{8}$ **c)** $\frac{25}{6}$ or $4\frac{1}{6}$

b) $\frac{10}{9}$ or $1\frac{1}{9}$ **d)** $\frac{8}{5}$ or $1\frac{3}{5}$

3. e.g., $8 \times \frac{3}{5}$

4. e.g.,



5. a) $\frac{1}{14}$ **b)** $\frac{3}{4}$ **c)** $\frac{1}{3}$

6. a) $\frac{1}{18}$ **b)** $\frac{12}{35}$

7. a) $\frac{3}{6} \times \frac{2}{5} = \frac{1}{5}$

b) $\frac{2}{4} \times \frac{6}{7} = \frac{3}{7}$

c) $\frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$

8. Yes, e.g., $\frac{2}{8} \times \frac{1}{5} = \frac{2}{40}$, which is equivalent to $\frac{1}{20}$.

9. $\frac{3}{16}$

10. a)

11. a) $1\frac{1}{2}$ **c)** $2\frac{2}{9}$ **e)** $10\frac{5}{16}$

b) $\frac{16}{25}$ **d)** $5\frac{2}{5}$ **f)** $20\frac{2}{5}$

12. $1\frac{2}{5}$

2.6 Dividing Fractions by Whole Numbers, pp. 70–71

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

2. a) $\frac{2}{7}$ **b)** $\frac{5}{21}$

c) You need to use an equivalent fraction in part b) to make equal parts, but not in part a).

3. a) $\frac{1}{4} \times \frac{5}{6}$ **b)** You want $\frac{1}{4}$ of 5 out of 6.

4. a) $\frac{2}{9}$ **c)** $\frac{1}{6}$ **e)** $\frac{2}{15}$

b) $\frac{1}{18}$ **d)** $\frac{1}{10}$ **f)** $\frac{7}{24}$

5. a) e.g., The quotients are $\frac{2}{9}, \frac{7}{16}$, and $\frac{8}{27}$; $\frac{7}{16}$ is almost $\frac{1}{2}$ and $\frac{8}{27} > \frac{8}{32}$, which is $\frac{1}{4}$, but $\frac{2}{9} < \frac{2}{8}$, which is $\frac{1}{4}$.

6. $\frac{5}{24}$ of a can

7. $\frac{5}{24}$

8. a) $\frac{4}{25}$

b) $80\% \div 5 = 16\%$

c) $16\% = \frac{16}{100} = \frac{4}{25}$; that was the answer to a).

9. e.g., **a)** I have $\frac{2}{3}$ of the lawn left to rake. Three of my friends agree to share the job with me. How much do we each have to rake?

b) Each rakes $\frac{1}{6}$ of the lawn.

10. a) You are always dividing 8 pieces into 2 groups, so you get 4 in a group.

b) because the piece sizes are different

11. Yes, e.g., if you divide a fraction by, for example, 5, you divide each piece into 5 and keep one of them. Since the original number of parts was the denominator of the fraction, you would have 5 times as many.

2.7 Estimating Fraction Quotients, pp. 74–75

1. e.g., You can see that about 7 of the $\frac{1}{12}$ make up the $\frac{5}{9}$.

2. a) 2 **b)** 2 **c)** 4

3. e.g., 8 of the tenths are close to $\frac{5}{6}$.

4. e.g., about 2

5. a) about 4 **c)** about 6 **e)** about 8

b) about 6 **d)** about 7 **f)** about 1

6. about 2

7. e.g., $\frac{7}{8}$ is close to 1 and $\frac{2}{7}$ is close to $\frac{1}{4}$. It is easier to figure out how many fourths are in 1.

8. a) e.g., $\frac{1}{4} \div \frac{1}{7}$ **b)** e.g., $\frac{4}{5} \div \frac{1}{4}$

9. a) e.g., $\frac{4}{10} \div \frac{1}{11}$ **b)** e.g., $\frac{1}{3} \div \frac{1}{24}$ **c)** e.g., $\frac{1}{4} \div \frac{1}{80}$

10. about 40

11. e.g., You have $\frac{7}{8}$ of a can of sauce and you need $\frac{1}{3}$ cup for a recipe. How many recipes can you make?

12. e.g., $\frac{5}{6} > \frac{3}{4}$, so not even 1 whole $\frac{5}{6}$ fits into $\frac{3}{4}$.

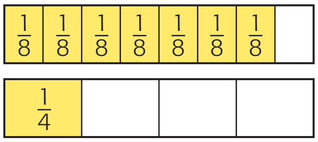
13. a) e.g., Estimate using $1 \div \frac{2}{10} = 5$ or estimate using $\frac{77}{88} \div \frac{14}{88}$, which is about $70 \div 14 = 5$.

b) e.g., I think the first way is easier.

2.8 Dividing Fractions by Measuring, pp. 79–80

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

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



3. a) $\frac{5}{6}$ **b)** $3\frac{3}{4}$

4. $6\frac{2}{3}$

5. a) $\frac{3}{4} \div \frac{5}{8}$ **b)** $2 \div \frac{2}{5}$

6. a) 15 **b)** $2\frac{1}{10}$ **c)** $6\frac{2}{3}$ **d)** $\frac{18}{25}$

e.g., Use a common denominator of 30 by multiplying the numerator and the denominator of $\frac{3}{5}$ by 6 and of $\frac{5}{6}$ by 5. The two fractions are then renamed $\frac{18}{30}$ and $\frac{25}{30}$. The $\frac{18}{30}$ fills out $\frac{18}{25}$ of the $\frac{25}{30}$, so the quotient is $\frac{18}{25}$.

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

8. e.g., You can pour 10 glasses of juice from a pitcher. How many glasses can you pour from $\frac{1}{3}$ of a pitcher? Solution: $\frac{1}{3} \div \frac{1}{10} = \frac{10}{3}$, or $3\frac{1}{3}$

9. a) 13 times

b) e.g., Each time Alana checks the turkey there is $\frac{1}{3}$ of an hour less time until it is cooked.

10. e.g., Use equivalent fractions with a denominator of 10 and divide the numerators. $\frac{6}{10} \div \frac{5}{10} = \frac{6}{5}$

11. a) $\frac{3}{8}$ **b)** $\frac{9}{10}$ **c)** $\frac{16}{27}$ **d)** $1\frac{11}{45}$ **e)** $1\frac{5}{22}$ **f)** $\frac{16}{21}$

12. a) multiplication

b) division or multiplication

13. Yes, order matters; e.g., if one fraction fits into another more than once, if you switch the fractions, the larger one will not fit in even once.

14. e.g., There are 6 sixths in 1, so if you are trying to figure out how many sixths fit into one piece, you will get 6. Finding out how many sixths fit inside another number is the same as counting how many units of 6 pieces can fit inside. One is division by $\frac{1}{6}$ and the other is multiplication by 6, so they are the same thing.

15. a) division

b) e.g., $2\frac{1}{2} \div \frac{1}{3}$ gives a fraction. If each section was $\frac{1}{3}$ of an hour long, the quotient would be a whole number.

16. e.g., $\frac{5}{a} = \frac{2}{a} + \frac{2}{a} + \frac{1}{a}$; If you divide by $\frac{2}{a}$, you can see there are 2 groups of $\frac{2}{a}$ in $\frac{5}{a}$. The $\frac{1}{a}$ is half of $\frac{2}{a}$, so there are $2\frac{1}{2}$ groups.

2.9 Dividing Fractions Using a Related Multiplication, pp. 85–86

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

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

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

4. $3\frac{1}{3}$ snack packs

5. e.g., When dividing, you multiply by the reciprocal. You would be multiplying $\frac{7}{8}$ by $\frac{4}{3}$, which is greater than 1, and you would get a product greater than $\frac{7}{8}$.

6. b) and d)

7. a) 2; $\frac{64}{35}$ **b)** 4; $\frac{68}{15}$ **c)** 4; $\frac{105}{28}$

8. a) 3 **b)** $2\frac{4}{5}$ **c)** $1\frac{5}{6}$ **d)** $3\frac{8}{9}$ **e)** $1\frac{31}{33}$ **f)** $2\frac{29}{35}$

9. a) ii) and iii)

b) e.g., If the first fraction is greater than the second, then the answer is greater than 1.

10. a) $2\frac{2}{9}$ **b)** $4\frac{1}{6}$ **c)** not greater than 2 **d)** $2\frac{5}{8}$

11. e.g., $\frac{1}{2}$ and $\frac{4}{3}$

12. a) $13\frac{1}{3}$ pages/min

b) 15 pages/min

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

14. a) $6\frac{2}{3}$ laps b) $4\frac{4}{9}$ laps c) $3\frac{1}{3}$ laps

15. a) 1.5 b) $\frac{3}{2}$
  c) e.g., The answers are equivalent.

16. 5 blue blocks

17. a) e.g., A small glass of juice holds $\frac{2}{3}$ as much as a large glass. How many small glasses can you fill by pouring in juice from $1\frac{1}{8}$ large glasses?
  b) e.g., It takes $2\frac{2}{3}$ glasses of juice to fill a pitcher. If you have room to fill $1\frac{2}{5}$ pitchers, what fraction of the $2\frac{2}{3}$ glasses of juice can you use?

2.10 Order of Operations, pp. 90–91

1. a) 9 b) $\frac{25}{36}$

2. e.g., $\frac{2}{5} \div \frac{1}{4} + \frac{3}{8} = 1\frac{39}{40}$,
$\frac{2}{5} \div \frac{3}{8} + \frac{1}{4} = 1\frac{19}{60}$,
$\frac{2}{5} + \frac{1}{4} \div \frac{3}{8} = 1\frac{1}{15}$

3. a) $1\frac{1}{12}$ b) $1\frac{2}{3}$ c) $1\frac{37}{60}$ d) $\frac{29}{120}$ e) $\frac{37}{10}$ f) $\frac{19}{24}$

4. a) e.g., $\frac{1}{2} - \frac{2}{9} \div \frac{4}{5} = \frac{2}{9}$, $\frac{4}{5} - \frac{2}{9} \div \frac{1}{2} = \frac{16}{45}$,
$\frac{4}{5} \div \frac{1}{2} - \frac{2}{9} = 1\frac{17}{45}$
  b) e.g., $\left(\frac{4}{5} - \frac{1}{2}\right) \div \frac{2}{9} = 1\frac{7}{20}$

5. a) and b)

6. a) $\frac{9}{35}$ b) $6\frac{7}{12}$ c) $12\frac{1}{2}$ d) $\frac{22}{28}$ e) $5\frac{7}{9}$ f) $4\frac{4}{63}$

7. a) i) $\frac{23}{30}$ ii) $\frac{101}{120}$ iii) $\frac{19}{30}$
  b) e.g., Inserting brackets in the same expression in different places can change the answer.

8. 144

9. $2 + \left(\frac{1}{4} + \frac{1}{3}\right) \times \frac{3}{7} - \frac{2}{5} \times \frac{3}{8} \div \left(\frac{1}{10} + \frac{1}{5}\right)$

10. e.g., $a = \frac{35}{36}$, $b = \frac{1}{36}$, and $c = \frac{5}{6}$
or $a = \frac{48}{49}$, $b = \frac{1}{49}$, and $c = \frac{6}{7}$

11. a), b), d)

12. e.g., $\frac{4}{5} + \frac{1}{3} \times \frac{3}{5}$

13. e.g., Some students might add before they multiply, and get a different answer.

2.11 Communicate about Multiplication and Division, pp. 94–95

1. a) e.g., 8 out of every 9 students I surveyed had a brother or sister, and $\frac{2}{3}$ of those who had a brother also had a sister. What fraction of the students I surveyed had both a brother and a sister? Solution: $\frac{16}{27}$.
  b) e.g., because you are taking one fraction of another fraction. It is $\frac{2}{3}$ of the $\frac{8}{9}$ that I had information about, not $\frac{2}{3}$ of the whole group.
  c) e.g., $\frac{16}{27}$ is close to $\frac{18}{27}$, which is $\frac{2}{3}$. Since $\frac{8}{9}$ is close to 1, $\frac{2}{3}$ of it should be close to $\frac{2}{3}$.

2. In the first grid, $\frac{2}{3}$ represents the first two rows, and $\frac{3}{5}$ of each row is shaded. This gives 6 shaded boxes out of 15. In the second grid, $\frac{3}{5}$ represents the first 3 rows, and $\frac{2}{3}$ of the row is shaded. This also gives 6 shaded boxes out of 15.

3. a) e.g., Small pizzas are $\frac{3}{5}$ the size of medium ones. There were 3 small pizzas for 4 people to share. What was the size of a medium pizza that each one got?
  b) e.g., Another calculation I could have done would be $\frac{3}{5} \times \frac{1}{4} \times 3$, since dividing by 4 is always the same as multiplying by $\frac{1}{4}$.

4. a) $2 \div \frac{2}{3}$ is the same as $\frac{6}{3} \div \frac{2}{3}$.
  b) e.g., $2 \div \frac{2}{3}$ means that 2 wholes are divided into thirds and the thirds are put in groups of 2.

5. e.g., To calculate $\frac{1}{5}$ of 3.55, I took $\frac{1}{5}$ of each hundredths grid. $\frac{1}{5}$ of the first hundredths grid is 20 hundredths, and $\frac{1}{5}$ of the second and third grids is also 20 hundredths each. $\frac{1}{5}$ of the last grid is $55 \div 5 = 11$ hundredths. This gives a total of $20 + 20 + 20 + 11 = 71$ hundredths, so the total is $3.55 + 0.71 = 4.26$.

6. $\frac{42}{10} \times \frac{2}{10} = \frac{84}{100}$ $\frac{84}{100} = 0.84$

7. a) e.g., $60\% = \frac{60}{100}$ or $\frac{30}{50}$ or $\frac{3}{5}$; 1.5 = 2 halves + 1 half, or $\frac{3}{2}$.
  b) e.g., No, I think it is easier to calculate 60% of 1 and then 60% of 0.5—60% of 1 is 0.6, and 60% of 0.5 is 0.3, so 60% of 1.5 = 0.9.

8. e.g., Another name for 1 is $\frac{n}{n}$. It does not matter what value you use for n, as long as it is not zero. When you multiply $\frac{a}{b} \times \frac{n}{n}$, you end up multiplying the numerator by n and the denominator by n. Multiplying by 1 does not change anything.

9. Agree; e.g., $1\frac{2}{5} \times \frac{1}{2} = 1.4 \times 0.5 = 0.7$; Disagree; e.g., $1\frac{1}{3} \times \frac{1}{4}$ is about 1.33×0.25; it is easier to multiply as fractions, e.g., $\frac{4}{3} \times \frac{1}{4} = \frac{1}{3}$.

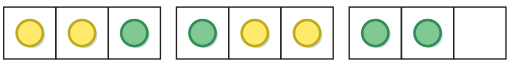
10. e.g., Alike: when you multiply the numerators and multiply the denominators, you are multiplying whole numbers. Different: the answer can be a fraction that cannot be expressed as a whole number.

11. e.g., You know that 6×3 is 18 and $3\frac{1}{2} \times 6$ is 21. Since these numbers are less than or equal to the given numbers, the product of $3\frac{1}{2}$ and $6\frac{1}{3}$ must be greater than 21.

12. e.g., Since $\frac{5}{8}$ is exactly twice the size of $\frac{5}{16}$, it will fit into $\frac{15}{16}$ exactly half as many times.

Chapter Self-Test, p. 96

1. e.g.,



2. a) $\frac{1}{6}$ b) $\frac{1}{3}$ c) $\frac{24}{35}$

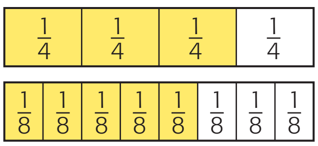
3. e.g., Multiplying by $\frac{5}{6}$ means taking $\frac{5}{6}$ of something; that is only part of it, not all of it, so the answer is less than the number you started with.

4. a) $\frac{3}{8}$ b) $\frac{5}{18}$ c) $\frac{1}{14}$ d) $\frac{15}{56}$

5. e.g., $2\frac{1}{4} + \frac{2}{3} \times \frac{9}{4} = 3\frac{3}{4}$ or $\frac{5}{3} \times \frac{9}{4} = \frac{15}{4}$ or $3\frac{3}{4}$

6. a) $3\frac{3}{10}$ b) $4\frac{29}{40}$ c) $2\frac{9}{20}$ d) $1\frac{5}{27}$

7. a) e.g.,



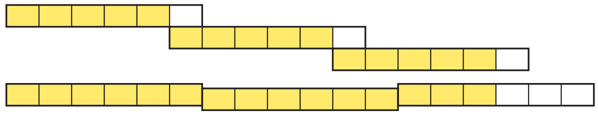
b) $\frac{3}{4} \times \frac{8}{5} = 1\frac{1}{5}$

8. a) 2 b) $3\frac{1}{8}$ c) $\frac{8}{25}$ d) $2\frac{4}{5}$

9. a) $\frac{9}{16}$ b) $\frac{25}{144}$ c) $\frac{1}{4}$

Chapter Review, pp. 99–100

1. e.g.,

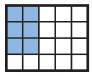


2. a) $6\frac{2}{5}$ b) $3\frac{3}{5}$ c) $2\frac{4}{7}$ d) 8

3. a) $\frac{1}{10}$ b) $\frac{1}{3}$ c) $\frac{1}{2}$ d) $\frac{1}{3}$

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

5.

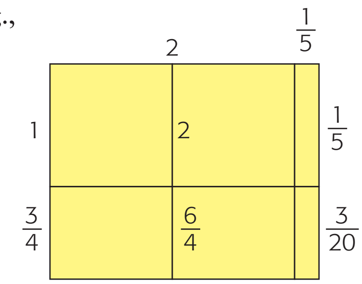


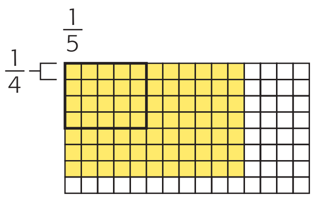
6. a) $\frac{4}{63}$ b) $\frac{6}{35}$ c) $\frac{5}{12}$ d) $\frac{1}{7}$

7. $\frac{2}{9}$

8. a), c), d)

9. e.g.,

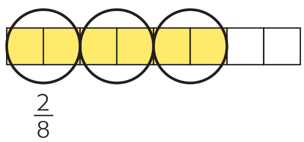




10. a) $\frac{7}{5}$ b) $\frac{156}{20}$ or $\frac{39}{5}$

11. 45 employees

12. e.g.,



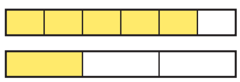
13. a) $\frac{3}{10}$ b) $\frac{9}{20}$ c) $\frac{2}{15}$

14. e.g., You have halves that you are dividing by 3, or into sixths.

15. a) and c)

16. $\frac{1}{2} \div \frac{1}{4}$

17. e.g.,



18. e.g., Since each set of numbers has a common denominator, you need to compare only the numerators, so $\frac{4}{6} \div \frac{3}{6} = \frac{4}{3}$ and $\frac{4}{5} \div \frac{3}{5} = \frac{4}{3}$.

19. **a)** 5 **b)** $2\frac{1}{2}$ **c)** $3\frac{1}{3}$ **d)** $1\frac{11}{16}$

20. $\frac{9}{2} \div \frac{1}{4} = 18$

21. $\frac{8}{9}$ of her sugar

22. A; e.g., you can tell which fraction is the largest by comparing the numerators. If the fractions have the same denominator, compare the numerators to determine the greatest value.

23. $3 \times \left(\frac{2}{3} + \frac{1}{3}\right) \div \frac{1}{4} = 12$

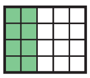
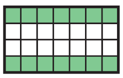
24. e.g., 4.5 is $4\frac{1}{2}$, or $\frac{9}{2}$, and 0.5 is $\frac{1}{2}$, so $\frac{9}{2} \times \frac{1}{2} = \frac{9}{4}$, or 2.25.

Chapter 3, p. 102

3.1 Using Two-Term Ratios, pp. 110–112

1. **A.** 2:5, 2:5 = 4:□, 10
   B. 3:5, 3:5 = □:15, 9
   C. 2:5, 2:5 = 8:□, 20
   D. 3:9, 3:9 = 4:□, 12

2. **a)** 6 **b)** 15

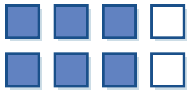
3. **a)** e.g.,  **b)** e.g., 

4. **a)** e.g., 3 to 8, 6 to 16, 12 to 32
   b) e.g., 1:9, 2:18, 3:27
   c) e.g., 4:3, 8:6, 16:12
   d) e.g., $\frac{2}{5}, \frac{4}{10}, \frac{6}{15}$
   e) e.g., 1 to 6, 2 to 12, 14 to 84
   f) e.g., $\frac{6}{16}, \frac{9}{24}, \frac{12}{32}$

5. e.g., In figures A and B, 3 out of 5 columns are shaded, representing a ratio of 3:5. In figure C, 6 out of 10 columns are shaded and both parts of the ratio can be divided by 2, which is the same as 3:5.

6. **a)** 3 **b)** 9 **c)** 6 **d)** 20

7. **a)** e.g., 400:1000
   b) e.g., 60 to 7
   c) e.g., 200 to 180

8. **a)** e.g., 
   b) e.g., blue to white = 3:1, blue to total = $\frac{3}{4}$
   c) e.g., 6:2 and $\frac{6}{8}$ 

9. **a)** e.g., 30:420 = 1:14
   b) e.g., 150:2100 = 1:14
   c) 15 h

10. B

11. 820 bears

12. 172 cm

13. e.g., In the aquatic world races, the U.S. won 35 medals and Australia won 22, so the ratio was 35:22. It is a ratio, since you are comparing two quantities.

14. **a)** e.g., The probability is $\frac{8}{30}$, since a 5 was rolled 8 times out of 30. It is a part-to-whole ratio.
    b) 8:4
    c) yes, rolls of 1 to the rolls of 6
    d) e.g.,

Roll of	1	2	3	4	5	6
How many times	1	2	2	2	2	1

15. **a)** e.g., the ratio of the number of teachers to the total number of students and teachers on a field trip
    b) e.g., the ratio of the number of times you spin a number on a spinner to the number of times you do not spin that number

16. 12 cm, 16 cm

17. e.g., To get an equivalent ratio, you multiply both terms by the same amount.

3.2 Using Ratio Tables, pp. 116–117

1. **a)**

Boys	2	20	40	**10**	30
Girls	3	**30**	**60**	15	45

b)

Bottles of juice	60	**6**	**18**	**66**	54
Bottles of water	90	9	27	99	**81**

2. **a)** 54 **b)** 45 **c)** 33 **d)** 96

3. 0.5 L

4. a) 15 b) 945 c) 14 d) 36

5. a) 20.25 kg b) 80 kg

6. a) e.g., 3 cm on the map represents 2 000 000 cm or 20 000 m or 20 km.
   b) 10.2 cm

7. 3000 people

8. a) e.g., 4 blue, 9 red, and 16 blue, 36 red
   b) e.g., 8 blue, 9 red; 16 blue, 18 red; 24 blue, 36 red

9. e.g., Using a ratio table is helpful when solving proportions. It is easy to multiply, divide, add, and subtract to determine equivalent ratios.

Mid-Chapter Review, p. 121

1. a) e.g., 8 : 18, 16 : 36, 32 : 72 b) yes; yes

2. a) 1 b) 35 c) 34

3. a) $\frac{3}{8}$ b) 1.25 L

4. a) 50 : 50 b) 16 : 12

5. a)

Number of days	7	**49**	**140**	28	**56**
Number of school days	5	35	100	**20**	40

b)

Number of dimes	**1**	9	**8**	6	**80**
Value of dimes	10¢	90¢	80¢	**60¢**	800¢

6. 49

7. 20 red, 12 blue, and 4 purple

3.4 Using Rates, pp. 124–125

1. a) e.g., 0.5 goals/game, 20 goals/40 games
   b) e.g., 20 km/2 h, 0.17 km/min
   c) e.g., 2 penalties/5 games, 0.4 penalties/game

2. a) 4 km/h b) 8 km

3. a) 108 b) 160 c) $90 d) 4

4. a) 3 CDs
   b) e.g., Since 28 is half of 56, it is easier to divide 4 in half to get 2.

5. a) $1.85/kg b) $1.58/L c) $12.59/m^2

6. a) 1.92 points/game b) about 152

7. 9 kg

8. 11 520 times

9. e.g., to decide which of two brands costs less

10. about 11 min

11. e.g., My mom drove 240 km in 3 h. What is her speed in km/h? Answer: Write the distance and time as a ratio, 240 : 3 = 80 : 1. Her speed is 80 km/h.

3.5 Communicate about Ratios and Rates, p. 128

1. yes

2. 1800 flyers. e.g., He gets $1/40 flyers. To get $45, he needs to deliver 45 × 40 = 1800 flyers.

3. no

4. a) 55¢
   b) e.g., 550 g of golden raisins
   c) yes

5. 2400 KB, 1200 KB

6. no

7. solution to 8 : 10 = 20 : ■

8. no

3.6 Using Equivalent Ratios to Solve Problems, pp. 132–133

1. 158.4 cm

2. no

3. a) 3.3 min b) 13.3 min c) 23.3 min

4. about 200 000

5. about 119 min

6. pig: about 367 m, chicken: about 300 m

7. about 79.7 km/h

8. 58.5 cm

9. e.g., for a school of 800 students, 320

10. a) 44.1 : 30.5
    b) 21.1 million tonnes

11. a) about 2530 km^2
    b) more crowded
    c) 4.9 billion

12. e.g., Set up a proportion, 212 hits/1000 at bats = ■ hits/400 at bats, and solve for the number of hits.

13. e.g., Two out of every three students who tried out for the musical were girls. If 48 students tried out, how many were boys? Answer: 16

    e.g., Two cans of tuna cost $3. How much will 5 cans cost? Answer: $7.50

Chapter Self-Test, p. 134

1. a) e.g., 15 : 27, 25 : 45 **b)** 50 : 90, 90 : 162

2.

blue	3	24	27	54	51
yellow	4	32	36	72	68
red	8	64	72	144	136

3. a) 10 **b)** 9 **c)** 28 **d)** 21

4. 150 cells

5. $104

6. 45 cats

7. 96 000

8. about 6 min

9. $8.90, e.g., Calculate the unit rate for 1 bar, multiply the unit rate by the number of bars.

Chapter Review, p. 136

1. a) e.g., 18 : 40, 36 : 80 **c)** e.g., 7 to 1, 14 to 2
b) e.g., $\frac{8}{10}$, $\frac{16}{20}$ **d)** e.g., 6 : 0.5, 12 : 1

2. a) 72 **b)** 136 **c)** 4

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

4.

Boys	15	30	45	5	50
Girls	18	36	54	6	60

5. 82.5

6. $\frac{8}{15}$, $\frac{4}{15}$, $\frac{2}{15}$, $\frac{1}{15}$

7. a) 8 cookies/$1 **b)** 2.5 kg of sugar/$1

8. 3 tosses for 50¢

9. e.g., I would show that 20 : 30 is equivalent to 2 : 3, since 20 ÷ 10 : 30 ÷ 10 = 2 : 3; 2 : 3 is equivalent to 25 : 37.5, not 25 : 35, since 2 × 12.5 : 3 × 12.5 = 25 : 37.5.

10. 400 g of lettuce, 200 g of cabbage, and 150 g of carrots

11. 12 L/100 km

Cumulative Review: Chapters 1–3, pp. 138–139

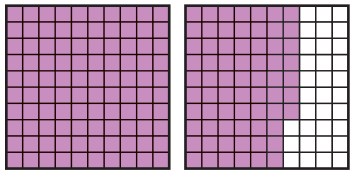
1. B	**6.** A	**11.** B	**16.** B
2. C	**7.** D	**12.** D	**17.** B
3. C	**8.** C	**13.** B	**18.** D
4. A	**9.** A	**14.** C	**19.** C
5. B	**10.** A	**15.** D	

Chapter 4, p. 140

4.1 Percents Greater than 100%, pp.147–149

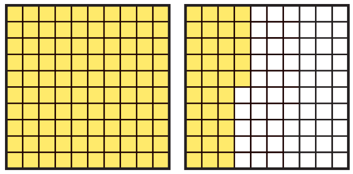
1. 215%

2.

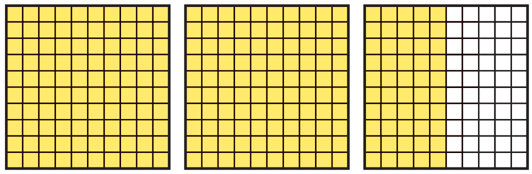


3. 165 cm

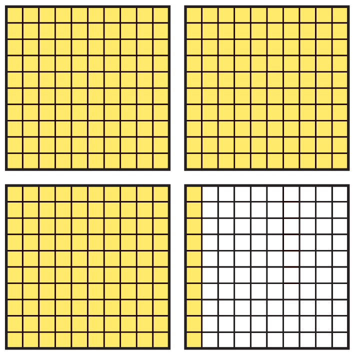
4. a)



b)



c)



5. e.g., Paul would be correct if the first grid represents 100%, and Rebecca would be correct if the two grids together represent 100%.

6. a) 48 **b)** 260 **c)** 52.8 **d)** 45

7. 350%

8. a) $45 **b)** $155

9. e.g., The comparison would not make sense because litres and hours are different quantities.

10. a) 1110 **b)** 1350

11. a) 320 students **b)** 40%

12. a) 400% **b)** 400% **c)** e.g., about 140%
d) e.g., What percent of its side length is the perimeter of an equilateral triangle? 300%

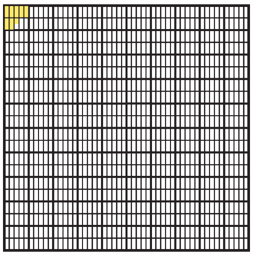
13. a) e.g., about 400% **b)** e.g., about 25%

14. a) e.g., 2 and 10

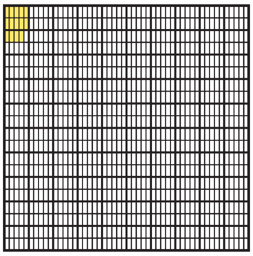
b) 20%; 2 is $\frac{1}{5}$ of 10 and $\frac{1}{5}$ = 20%

4.2 Fractional Percents, pp. 152–153

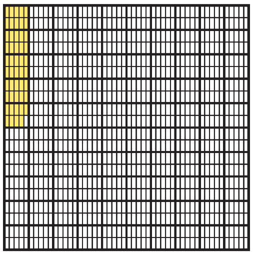
1. a)



b)



c)



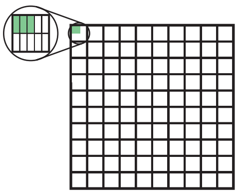
2. 5 g of sugar

3. a) 3.5% **b)** 4.75%

4. a) 5 g **b)** 0.5 g **c)** 12.5 g

5. a) e.g., 2; 1% of 630 is about 600 ÷ 100 = 6, so 0.1% = 0.6; 0.3% is 3 times as much. 3 × 0.6 = 1.8. Since 630 is more than 600, the estimate should be increased to 2.

b)



c) 1.89

6. 2.5 g

7. a) 9.3 mL **b)** 0.3 mL

8. $8000

9. a) 0.1% of a number is the number divided by 1000, and 1 m is equal to 1000 mm. 1000 mm ÷ 1000 = 1 mm.

b) 0.32%

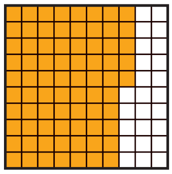
10. a), b), c)

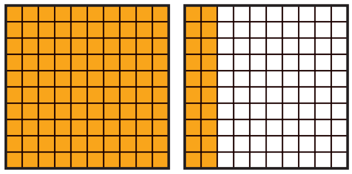
11. when the number is a multiple of 1000

12. No; e.g., 5.1% is 0.1% more than 5%; if the number is very big, then 0.1% could still be a lot. e.g., If the number is 1 000 000, 0.1% is 1000, so the numbers would be 1000 apart.

4.3 Relating Percents to Decimals and Fractions, pp. 157–158

1. a) 75% **b)** 120%





2. a) 0.011 **b)** $\frac{11}{1000}$

3. a) $\frac{3}{8}$, 0.375, 37.5% **b)** $\frac{34}{10}$, 3.4, 340%

4. a) $\frac{32}{1000}$, 0.032 **b)** 125%, 1.25 **c)** 6.4%, $\frac{64}{1000}$

5. $\frac{136}{100}$ and 1.36

6. a) 16.67% **b)** 58.33% **c)** 25%

7. a) e.g., 40%

b) The bar was 40 mm long and the shaded part was 16 mm, which is 0.4 of 40.

c) e.g., 0.40 and $\frac{2}{5}$

8. a) $\frac{9}{100}$ **b)** 9% **c)** about 130 min

9. $\frac{41}{10}$ and 4.1

10. 450%

11. a) $\frac{14}{6}$, 233% **b)** 2 red, 3 blue

12. a) e.g., Set up the proportion $\frac{20}{☐} = \frac{2.5}{100}$ and solve it by getting a common denominator of 100 × ☐. The numerators of 20 × 100 and 2.5 × ☐ would be equal. To solve 20 × 100 = 2.5 × ☐, divide 20 by 2.5 and then multiply by 100.

b) 0.025 is $\frac{1}{100}$ of 2.5, so there are 100 times as many pieces of size 0.025 as pieces of size 2.5 in a number. So, ☐ ÷ 0.025 = 100 × ☐ ÷ 2.5 and I know from part a) that that is a way to calculate the answer.

13. 100%

14. e.g., To write a decimal as a percent, just multiply by 100 using mental math. If the fraction is an easy one, like $\frac{1}{10}$ or $\frac{1}{100}$, it is easy to write as a percent.

4.4 Solving Problems Using a Proportion, pp. 161–162

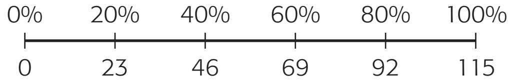
1. e.g., The percents go from 0 to 425; 425% is a bit more than 400%, and 400% is 4 groups of 100%. Since 100% is 85 from the second number line, to get 425% of 85 multiply 85 by 4 and add a bit.

2. 32.24 kg

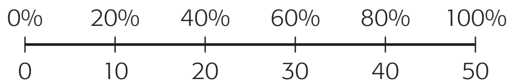
3. a) 108 **b)** 180 **c)** 24 **d)** 11

4. e.g., 32; 20 is a little more than halfway to 100%, so the number is between 30 and 40, or about 32.

5. e.g., **a)**



b)



6. about 2.8 billion downloads

7. a) $\frac{5}{1000}$ **b)** 0.5% **c)** 20 000%

8. e.g., 3 330 000

9. e.g., 1.26 million

10. e.g., A percent is a ratio where the second term is 100. If you are trying to compare one number to another and write it as a percent, you are trying to get an equivalent ratio where the second term is 100.

4.5 Solving Percent Problems Using Decimals, pp. 165–167

1. a) 0.152 × 35 = ■, 5.32
b) 1.24 × 18 = ■, 22.32
c) 40 ÷ 0.055 = ■, 727.27
d) 30 ÷ 1.60 = ■, 18.75

2. 560

3. a) 7 **b)** 1.125 **c)** 160 **d)** 3000

4. a) What is 45% of 36?
b) What is 120% of 45?
c) What is 0.4% of 180?
d) 56 is 7% of what number?
e) 36 is 180% of what number?
f) 90 is 0.5% of what number?

5. a) $209.99 **b)** $83.99 **c)** $52.49

6. $500

7. about 80

8. about 187

9. The 13.3% of the population that they make up now is a percent of the current population and not the population in 2045.

10. 1 691 648 people

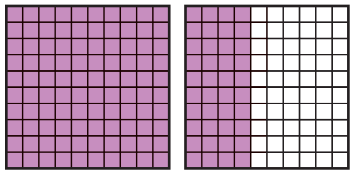
11. $164.62

12. 8

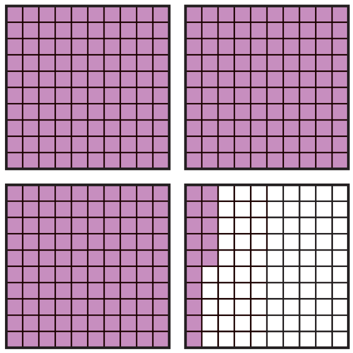
13. a) e.g., Last year, the school population was 400 students. The population grew by 125%. What is the new population?
b) e.g., A school population is now 400 students, which is 125% of the original population. What was the original population?
c) e.g., 3.5% of the students in a school of 400 competed in a math contest. How many students competed?

Mid-Chapter Review, p. 169

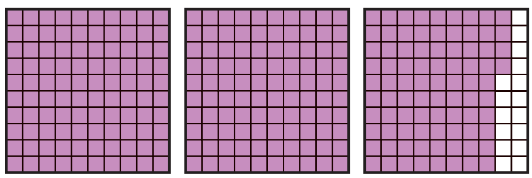
1. a)

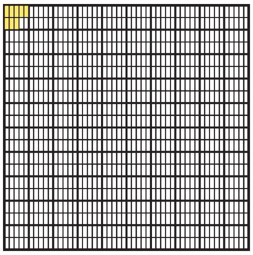


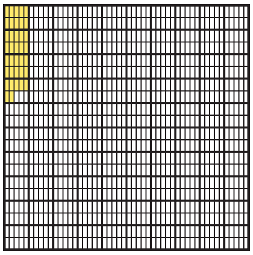
b)

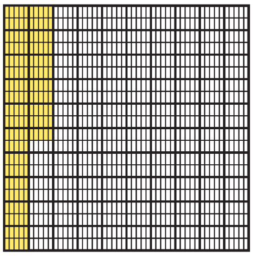


c)



2. a) 

b) 

c) 

3. action: 20 students, fantasy: 5 students, sports: 15 students

4. a) e.g., 150%, 135 is close to 150, and 95 is close to 100, and $\frac{150}{100}$ is 150%.

b) e.g., 120%, 29 is close to 30, and 26 is close to 25, and $\frac{30}{25}$ is 120%.

c) e.g., 0.5%, 6 is about $\frac{1}{100}$, or 1%, of 640, and 3 is half of that.

5. 27

6. 40

7. a) 15.15 L **b)** 220 L

4.6 Solve Problems by Changing Your Point of View, p. 173

1. a) $0.8 \times$ price **b)** $1.05 \times$ price

2. e.g., Double 20% and then add half of the number; or triple 20% and subtract half of the number.

3. $51.44

4. $508.50

5. 64 cm^2

6. e.g., Bella 10 days, Alan 3 days, and Richard 15 days; or Bella 20 days, Alan 6 days, and Richard 30 days

7. $540

8. e.g., When you use a ratio table, you can decide what percents to put together to make the necessary percent, so it is your own point of view.

4.8 Combining Percents, pp. 176–177

1. discount $84.99, final cost $267.71

2. $28 400

3. a) $35.99 **b)** $131.99 **c)** $1.80

4. a) i) $134.96 **ii)** $74.99 **iii)** $24.84
b) i) $141.71 **ii)** $78.74 **iii)** $26.08

5. Yes; suppose the item was $100, the discount was 10%, and the taxes were 5%. If you do the taxes first and then the discount, you would take 90% of $105 = $94.50. If you take the discount first and then do the taxes, you would take 105% of $90 = $94.50.

6. $87.50

7. the second store

8. a) 14% **b)** 15.6%

9. The 25% is based on a price of $150, so the added amount is 25% of 150. However, the reduction is based on the new price, which is higher, so the reduction is 25% of a higher number. The reduction is greater than the increase, so the final price is not the original price.

4.9 Percent Change, pp. 181–183

1. a) 65 **b)** 125 **c)** 40 **d)** 49.75

2. a) e.g., 10% of 8500 is 850 and 8% is less than 10%.
b) 108% **c)** 9180 **d)** 92.59%

3. a) 50% decrease **c)** 300% increase
b) 12.5% increase **d)** 10% decrease

4. 250%

5. 95.5%

6. $220

7. a) 15.09%; 30 782 − 26 745 = 4037. Compare 4037 to the 2001 population since that is the population that increased. $\frac{4037}{26\,745} = 0.1509$, so the percent increase is 15.09%.
b) 35 427

8. a) 11.48% **b)** 111.48%

9. a) 3939 homes **b)** 3374 homes

10. No, the increase was 1.5 hours, which is 3 times $\frac{1}{2}$ hour. That means the increase was only 300%.

11. 137.5%

12. about 1.6 kg

13. 19.3 million

14. 6.7 million

15. a) 3.5% b) $7.76

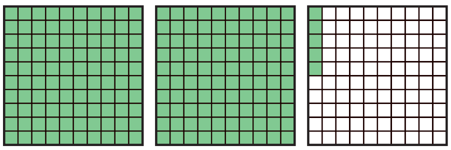
16. b), c), d); e.g., A decrease of 25% means the new price is 75% of the old one. The first choice is 125% of the old price, not 75%, but all of the others are 75% of the original price.

Chapter Self-Test, p. 185

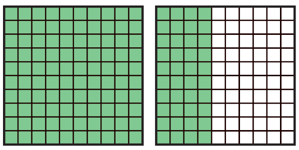
1. a) 77 b) 67.5
2. 3.5%
3. about 9.1%
4. 6700 km
5. 124 students
6. a) $42.83 b) 95%
7. 700%

Chapter Review, pp. 187–188

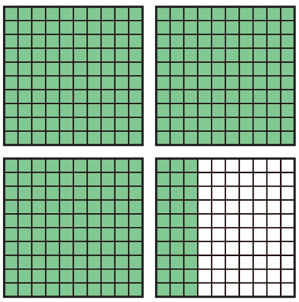
1. a)



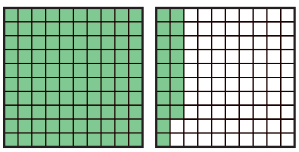
b)



c)



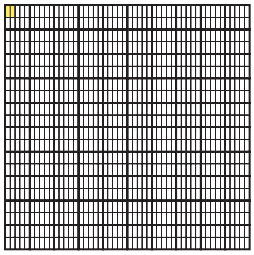
d)



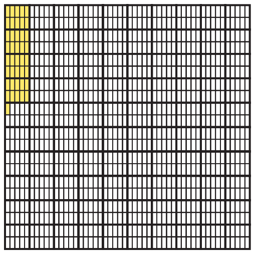
2. e.g., On Tuesday, I did homework for 1 h and on Wednesday I did it for 2 h, so the time spent on homework increased by 200%.

3. a) 240%
   b) because the number of litres is not a percent of time

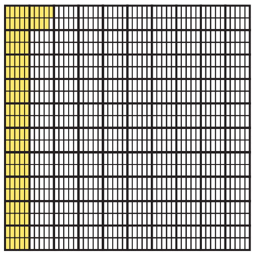
4. a)



b)



c)



5. 615 students

6. a) $\frac{40}{100}$, 0.4, 40% b) $\frac{205}{100}$, 2.05, 205%

7. a) 250% b) 0.4% c) 158%

8. 12.5%

9. a) 40 b) 20.8 c) 250% d) 20 000

10. 3.2%

11. a) 11.2 b) 23.6 c) 45

12. 250 students

13. a) 65% b) 105%

14. a) $24.13 b) $44.82 c) $5.38 d) $50.20

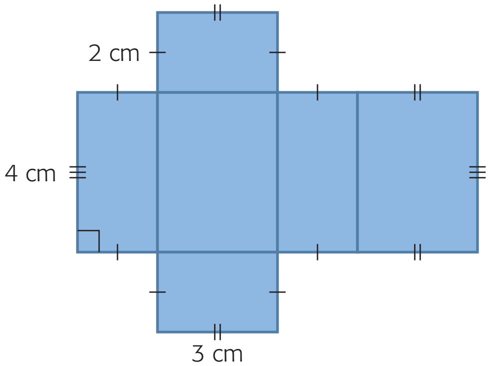
15. a) 300% increase c) 900% increase
    b) 25% decrease d) 90% decrease

16. 40.3%

Chapter 5, p. 190

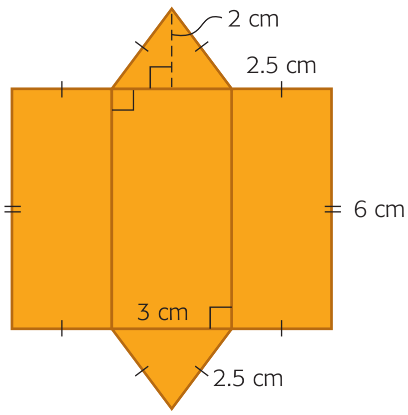
5.2 Drawing the Nets of Prisms and Cylinders, pp. 198–199

1.

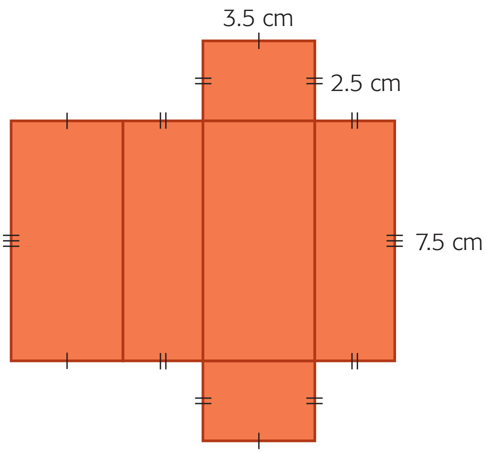


2. A and C

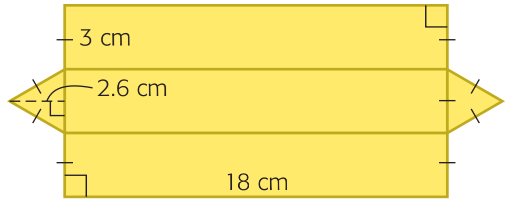
3.



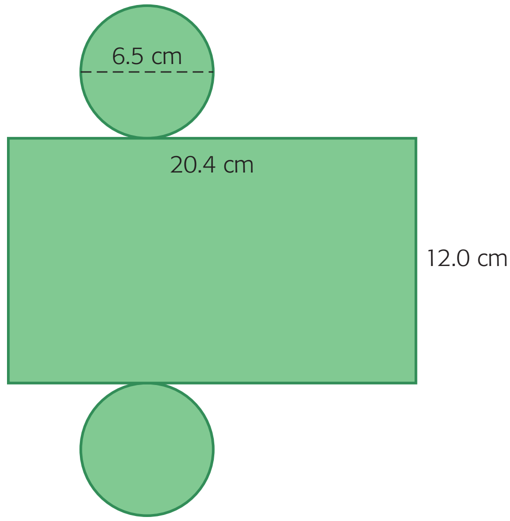
4. a)



b)



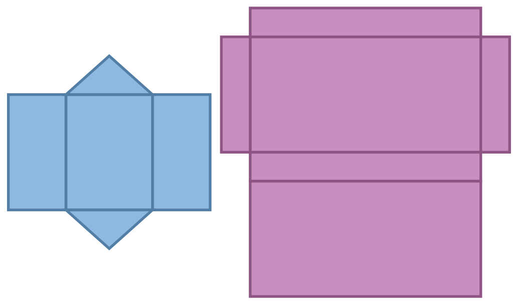
c)



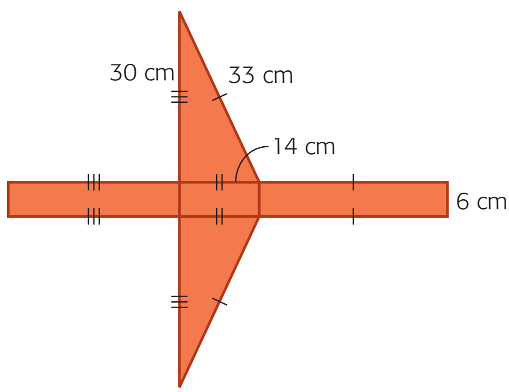
5. a) triangular prism **b)** cube

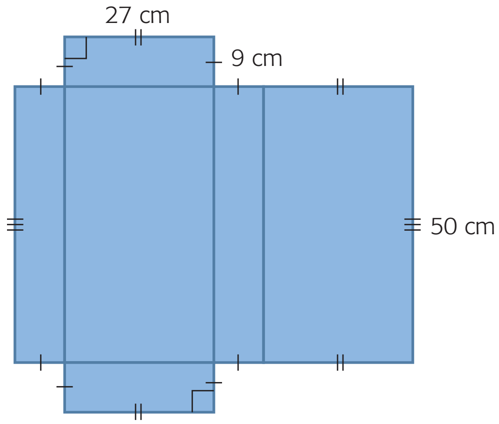
6. a) one rectangular prism and one triangular prism with the same width

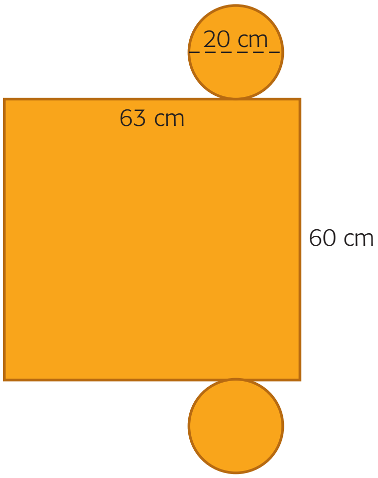
b)



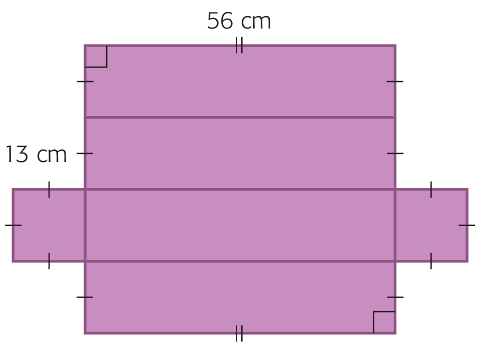
7. a)



b) 

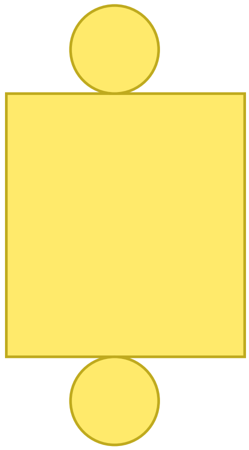
c) 

8. e.g., assuming the rolls are in a 1-by-8 array, standing up:

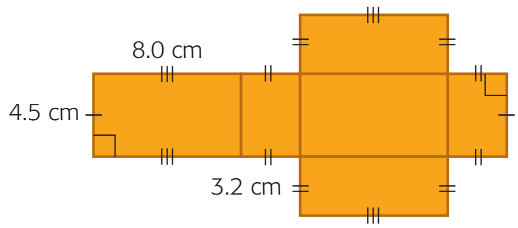


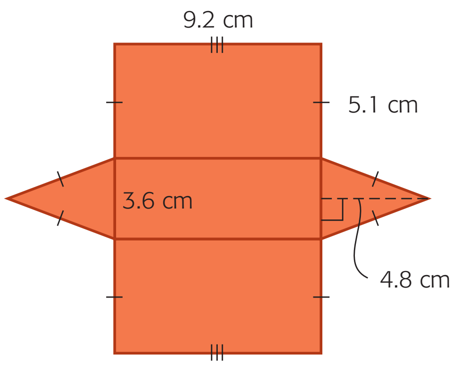
9. a) e.g., If the net has 6 sides, all of them rectangles, then it is likely to be a rectangular prism. If it has 5 sides, 2 of which are congruent triangles and 3 of which are congruent rectangles, it is likely to be a triangular prism. If it has two circles and a rectangle, it is likely to be a cylinder.

b) e.g., For a rectangular prism, draw the base rectangle, and the sides of the base around it. Add the top of the prism to one side. For a triangular prism, draw the base rectangle, and then the triangular bases of the prism at the ends of the rectangle. Draw the two other sides of the prism, connected on each side of the base. For a cylinder, draw two circles with the same radius as the cylinder. In between them, draw a rectangle whose length is the height of the cylinder and whose width is the circumference of the cylinder.



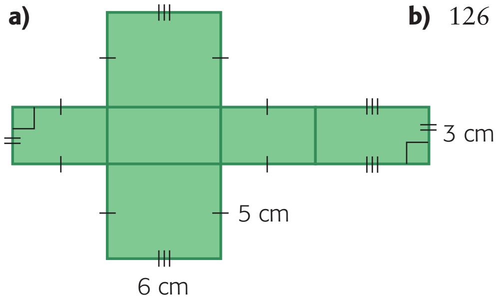
5.3 Determining the Surface Area of Prisms, pp. 205–206

1. a) 

b) 

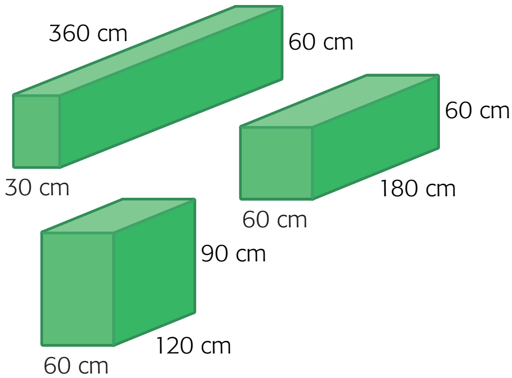
2. rectangular prism 152 cm^2, triangular prism 144.24 cm^2

3. a)

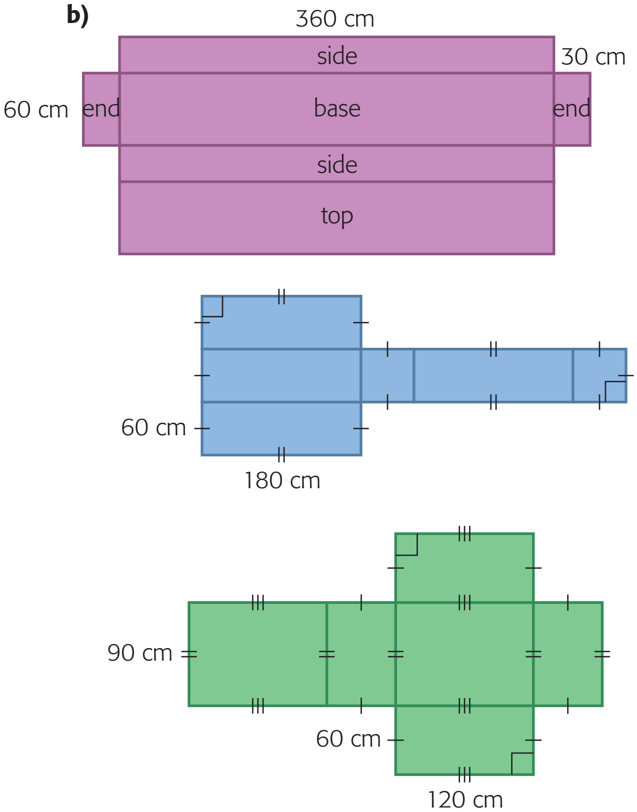


b) 126 cm^2

4. a)



b)



c) 68 400 cm^2; 50 400 cm^2; 46 800 cm^2

d) e.g., The crate with the least surface area is 60 cm by 90 cm by 120 cm.

5. yes

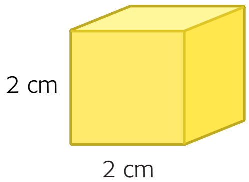
6. a) 39.1 m^2 **b)** 3 cans

7. 20.6 m^2

8. figure B

9. greater than

10. a) e.g.,



b) e.g., The new surface area is 4 times greater than the original surface area.

c) e.g., The new surface area is $\frac{1}{4}$ of the original surface area.

11. a) 376 m^2 **b)** e.g., h = 6 m, b = 6 m, l = 17.5 m

12. e.g., to calculate how much material needs to be used to build or cover the prism

13. a) 5 separate areas but only 2 or 3 different areas

b) 6 separate areas but only 3 different areas

5.4 Determining the Surface Area of Cylinders, pp. 212–213

1. a) about 251 cm^2 **b)** about 353.3 cm^2

2. a) about 314 cm^2 **b)** about 184.3 cm^2

3. a) about 408.2 cm^2

b) about 361.1 cm^2

c) about 452.2 cm^2

4. about 19 m^2

5. a) about 0.60 m^2 **b)** about 0.17 m^2

6. a) about 188.9 m^2 **b)** $175

7. If both cylinders have the same height but the circular base of each cylinder is different, the cylinders will have different surface areas.

8. about 2.4 m^2

9. about 1.3 m^2

10 a) about 162.9 m^2

b) about 2491.6 m^2

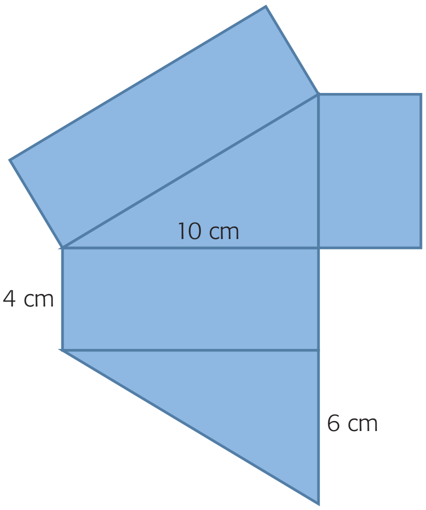
c) about 201.0 cm^2

11. 53 CDs

12. Alike: you have to calculate the area of each surface and add them together. You can use the formula for the area of a rectangle to calculate at least one face of each. Different: you have to use the formula for the area of a circle to find the surface area of a cylinder.

Mid-Chapter Review, p. 216

1.

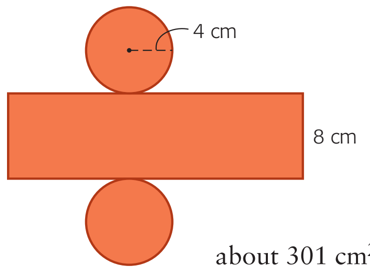


2. a) No, both circular faces are on the same side.
b) yes
c) No, circular faces are not on opposite sides.

3. 272 cm^2

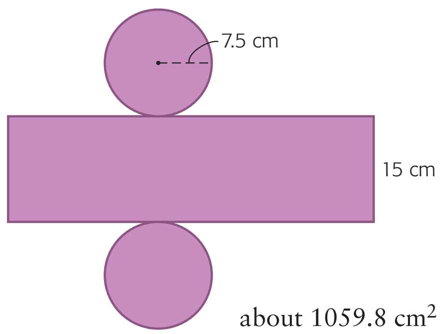
4. 8.28 m^2

5. a)



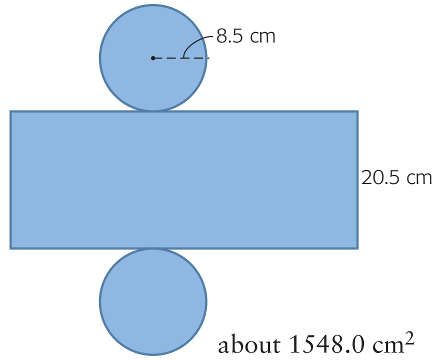
about 301 cm^2

b)



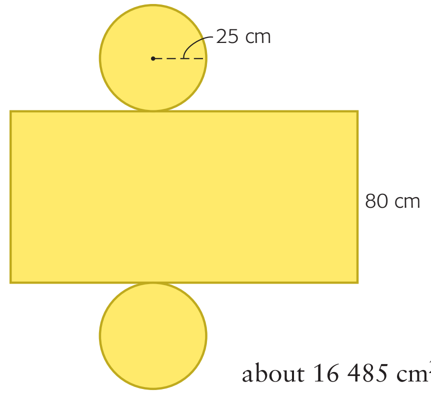
about 1059.8 cm^2

c)



about 1548.0 cm^2

d)



about 16 485 cm^2

6. about 2.8 m^2

5.5 Determining the Volume of Prisms, pp. 220–222

1. a) 84 cm^3 **b)** 43.0 cm^3 **c)** 165 cm^3

2. a) 1440 cm^3 **b)** 720 cm^3

3. a) 72 cm^3 **c)** 1020.0 cm^3 **e)** 42 cm^3
b) 650.0 cm^3 **d)** 12.0 cm^3 **f)** 21.0 cm^3

4. a) 60 cm^3
b) No, because B has the same dimensions as A, so they have the same volume.

5. a) 160 cm^3
b) No, because both A and B are equal to half of a rectangular prism 10 cm × 4 cm × 8 cm.

6. a) 512 cm^3 **b)** 0.5 cm^3 **c)** 21.0 km^3

7. a) 288 cm^3 **b)** 9.6 cm **c)** 3 cm

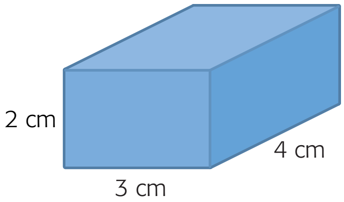
8. a) 144 cm^3 **b)** 40 cm

9. B; its volume is greater than A's, so Anthony would get more nails for the same price.

10. e.g., 41 160 cm^3

11. 432 000 cm^3 or 0.432 m^3

12. a)



b) It is 8 times the original.

c) It is $\frac{1}{8}$ the original.

13. the family size

14. a) red 384 cm^3, white 384 cm^3, blue 128 cm^3, yellow 288 cm^3, purple 512 cm^3, green 352 cm^3

b) purple

15. e.g., A classroom about 8 m wide, 10 m long, and 3 m high has a volume of 240 m^3.

16. no, if the bases are also equal

5.6 Determining the Volume of Cylinders, pp. 225–226

1. a) about 314 m^3 **b)** about 337.6 cm^3

2. a) about 8204.0 cm^3 **b)** about 143.3 cm^3

3. a) about 48.1 cm^3 **b)** about 31.4 cm^3

4. 72 times

5. e.g., about 27 500 L

6. about 220 cm^3

7. 10.0 cm

8. 25 coins

9. B

10. the cylinder 10 cm in diameter and 7 cm high

11. a) 4.5 cm **b)** chicken soup can

12. Alike: you use the formula $V =$ area of base $\times$ height to calculate the volume. Different: you calculate the area of the base differently, depending on whether it is a rectangle, a triangle, or a circle.

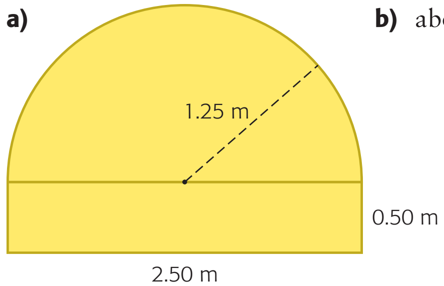
5.7 Solve Problems Using Models, p. 231

1. arrangement B

2. a) e.g., box A: 32 cm by 24 cm by 16 cm (4 cans by 3 cans by 2 cans); box B: 48 cm by 32 cm by 8 cm (6 cans by 4 cans by 1 can).

b) box A; it uses less material.

3. a)



b) about 3.7 m^2

4. a) 24

b) e.g., box A: 18 cm by 24 cm by 12 cm, surface area of 1872 cm^2; box B: 12 cm by 36 cm by 12 cm, surface area of 2016 cm^2; use box A as it has less surface area.

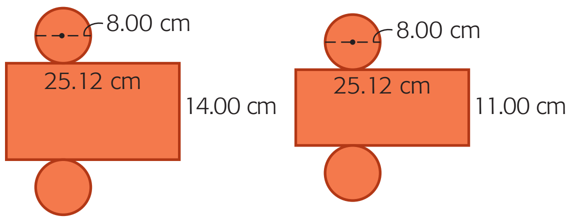
5. Assuming the pizza is 3 cm thick, it occupies 37% of the box and does not occupy 63% of the box.

6. yes, when the objects involved are simple

Chapter Self-Test, pp. 233–234

1. a) 354.3 cm^2 **b)** 1350 cm^2 **c)** 553.0 cm^2

2.



3. statement a)

4. a) 133.8 cm^2 **b)** 282.0 cm^2 **c)** 227.0 cm^2

5. a) 140 cm^3 **b)** 3780 cm^3

6. A

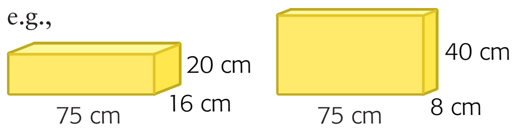
7. a) surface area 420.4 cm^2, volume 652.2 cm^3

b) surface area 466 cm^2, volume 760 cm^3

8. No, the volume is 31 500 cm^3.

9. a) 20

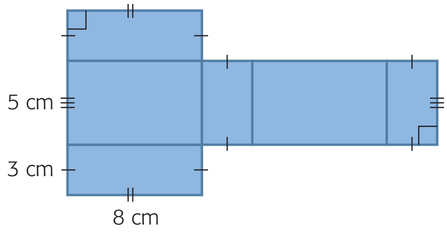
b) e.g.,



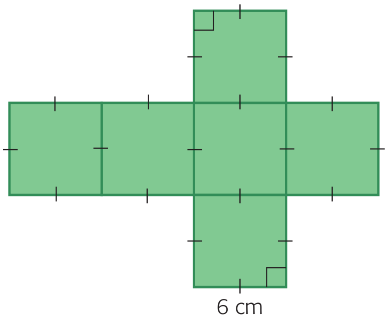
I would use box A, as it uses less material.

Chapter Review, pp. 236–238

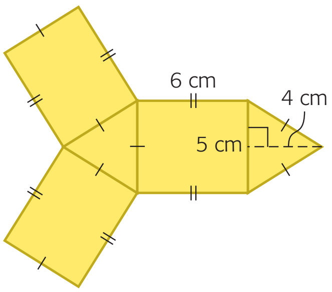
1. a)



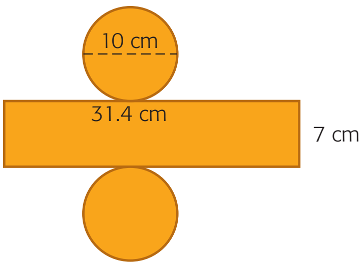
b)



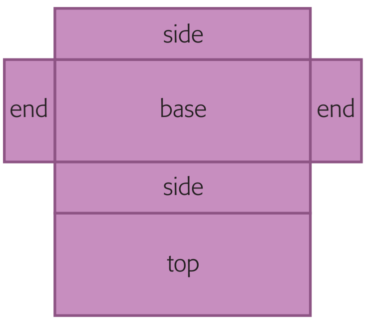
c)



d)



2. e.g., Draw the base of the prism, the two sides, the top part, and the two ends. The top and the base are congruent, the sides are congruent, and the ends are congruent. Calculate the area of each part and then calculate the total of the areas to determine the surface area of the prism.



3. a) A: B's base and top are too small.
b) B: A's base is an equilateral triangle.
c) A: B's base is too large.
d) B: A is a rectangular prism.

4. a) 888 cm^2 **b)** 1334.5 cm^2 **c)** 1012.5 cm^2

5. 15 120 cm^2, or about 1.5 m^2

6. about 980 cm^2

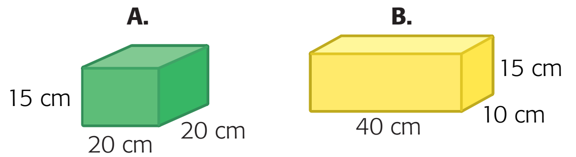
7. B, because it has the greater volume.

8. 729 000 cm^3

9. e.g., about 15 cm high and a radius of 4 cm

10. 127 562.5 cm^3

11. a) e.g.,



1 case × 1 case × 10 cases   1 case × 2 cases × 5 cases

b) e.g., box A, because it requires less material.

Chapter 6, p. 240

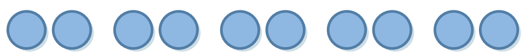
6.1 Integer Multiplication, pp. 248–250

1. a) e.g., $-3(4)$ **c)** e.g., $2(7)$
b) e.g., $3(-1)$ **d)** e.g., $5(4)$

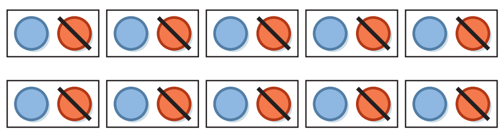
2. a) -10 **b)** 12 **c)** -12

3. a) -12 **b)** -8 **c)** 25 **d)** -16

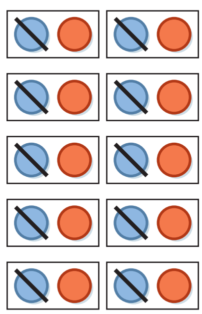
4. a)



b)



c)



5. a) $4 \times (-2) = -8$ **c)** $-4 \times (-2) = 8$
b) $-2 \times 4 = -8$ **d)** $2 \times 4 = 8$

6. a) -20 b) 20 c) -16 d) 16 e) -30 f) -30

7. a) e.g., $-2, -7$ b) e.g., $-8, 4$ c) $-8, 9$

8. a) -2 b) e.g., $-5, 3$ c) e.g., $-6, 4$ d) e.g., $9, 3$

9. e.g., If you multiply two negative integers, the product is positive, and if you multiply two positive integers the product is positive (e.g., $3 \times 6 = 18$ and $-3 \times -6 = 18$). If one integer is negative and the other is positive, then the product is negative. It doesn't matter which integer is negative and which one is positive (e.g., $-3 \times 6 = -18$ and $3 \times -6 = -18$).

10. a) 5 and 5 or -5 and -5, product of 25
    b) -5 and 5 or 5 and -5, product of -25

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

12. a) -1×16, 1×-16, -2×8, 2×-8, -4×4
    b) -1×-16, 1×16, -2×-8, 2×8, -4×-4, 4×4

13. e.g., 2, 3, -4; -2, -3, -4; 1, 2, -12; 1, -3, 8; -1, 4, 6

14. a) e.g., $3 \times (-10)$ c) e.g., -1×1
    b) e.g., -25×2 d) e.g., -4×10

15. $50 \times (-2) = -100$

16. a) In A, each product is -14. In B, each product is 14.
    b) e.g., If a golfer scores 2 under par for 7 holes, she is 14 under par. If you spent \$7 each day for 2 days, you would have 14 fewer dollars, or $-$\$14. If you had 2 parking tickets for \$7 cancelled, you would get your \$14 back. If you bought 2 packs of 7 stickers, you would have 14 stickers.

17. a) The product of $-3 \times (-2)$ is positive. The product of a positive number and 4 is also positive.
    b) $4 \times (-5)$ is negative. The product of a negative number and 6 is also negative.

18. a) -243, 729, -2187. Multiply the previous term by -3.
    b) 24, -48, 96. Multiply the previous term by -2.

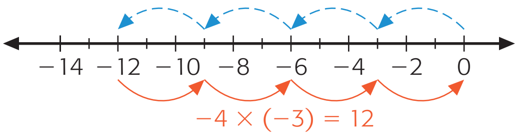
19. Either there were three positive integers and one negative integer or there were three negative integers and one positive integer.

6.2 Using Number Lines to Model Integer Multiplication, pp. 255–257

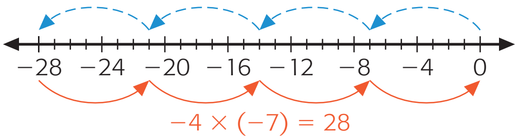
1. a) $-2 \times 9 = -18$ b) $3 \times (-5) = -15$

2. a) 10 h ago b) 12 h ago c) 20 h ago

3.



4.



5. a) $5 \times 4 = 20$ b) $-2 \times 5 = -10$

6. a) $5(-6) = -30$, $-5 \times 6 = -30$
   b) because $5(-6) = -5(6)$

7. a) $4 \times (-100) = -400$
   b) $3 \times 5 = 15$
   c) $6 \times (-2) = -12$

8. a) 0 c) 80 e) 180
   b) -140 d) -60 f) 1000

9. a) $200 = -20 \times (-10)$
   b) e.g., A negative speed value, in km/h, represents riding a bicycle west, and a positive speed value represents riding east. A positive number tells for how long in hours someone rides, and a negative number tells how long ago they started riding. If Ted started riding 10 hours ago at 20 km/h west, where is he now?

10. e.g., -6×4, -4×6, -3×7, -7×3, -11×2

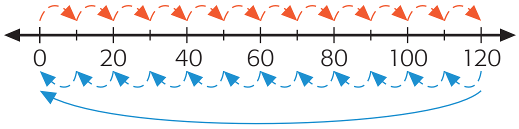
11. Draw a blue arrow from 108 to 0. Make 9 equal jumps from 108 to 0 and determine the length of each section. Each section is 12 units long. Since the arrows point left, each represents -12.

12. a) 2500, $-12\,500$, 62 500. Multiply the previous term by -5.
    b) -6655, 73 205, $-805\,255$. Multiply the previous term by -11.

13. a) 120 b) -600

14. a) -20 b) 16 c) yes

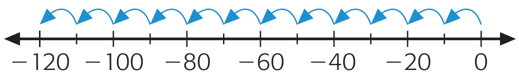
15. a) -12×10



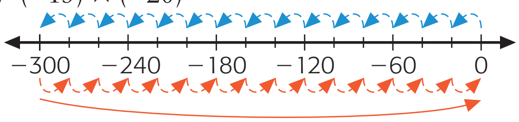
$-12 \times 10 = -120$

$12 \times (-10)$

$12 \times (-10) = -120$



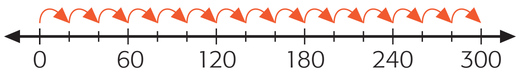
b) $(-15) \times (-20)$



$-15 \times (-20) = 300$

15×20

$15 \times 20 = 300$

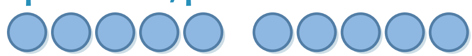


16. a) For (+) × (−), show a chain of equal left-pointing blue arrows starting at 0. For (−) × (+), show a chain of red arrows of the same length as the blue one, but ending at 0. Both arrows show the same negative number on the left.

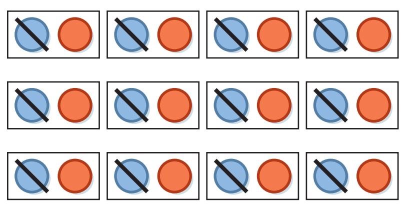
b) For (−) × (−), show a chain of equal left-pointing blue arrows ending at 0. The starting point of the chain should show the positive product of the negative integers.

Mid-Chapter Review, p. 259

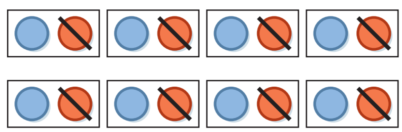
1. a)



b)



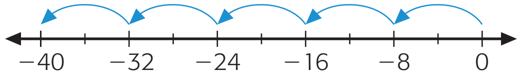
c)



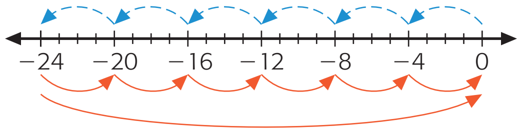
2. a) −12 **b)** −18 **c)** 20 **d)** 8 **e)** 0 **f)** 56

3. a) > **b)** = **c)** > **d)** < **e)** > **f)** <

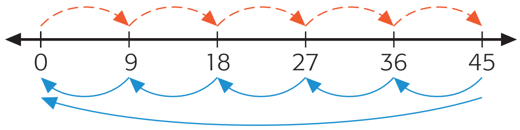
4. a)



b)



c)



5. $3 \times (-8) = -24$

6. $-30 \times 15 = -450$

7. e.g., Marc took $10 out of his bank account eight weeks in a row. Express the amount of money that came out of the account as an integer.

6.4 Integer Division, pp. 264–267

1. a) 9 **b)** 0 **c)** −9 **d)** −8

2. a) B, 2 **b)** C, 2 **c)** D, −2 **d)** A, −2

3. a) $15 \div 3 = 5$ **b)** $-10 \div 5 = -2$

4. a) $8 \times (-9) = -72$; $-72 \div (-9) = 8$
b) $12 \times 7 = 84$; $84 \div 7 = 12$
c) $-6 \times (-11) = -66$; $66 \div (-11) = -6$
d) $-40 \times 20 = -800$; $-800 \div 20 = -40$

5. a) −8 **b)** −4 **c)** 8 **d)** 11 **e)** 0 **f)** 6

6. Agree; the mean represents the total score change divided by the number of score changes recorded. The number of score changes recorded must be a positive number.

7. e.g., **a)** −200 **b)** 30 **c)** −14 **d)** −20 **e)** −7 **f)** 24

8. a) −4 **b)** −4 **c)** 3 **d)** −16 **e)** −8 **f)** 27

9. a)

a	*b*	*a* × *b*	Example
+	+	+	$2 \times 3 = 6$
+	−	−	$2 \times (-3) = -6$
−	+	−	$-2 \times 3 = -6$
−	−	+	$-2 \times (-3) = 6$

a	*b*	*a* ÷ *b*	Example
+	+	+	$6 \div 2 = 3$
+	−	−	$6 \div (-2) = -3$
−	+	−	$-6 \div 2 = -3$
−	−	+	$-6 \div (-2) = 3$

b) e.g., Division can be related to a multiplication operation. You can then use the multiplication rules.

10. **a)** -20 **b)** 12 **c)** 100 **d)** -8

11. e.g., Modelling these divisions on a number line shows jumps in opposite directions, so the quotients are opposites.

12. $4 \div (-2) = (-2)$, since $(-) \times (-) = (+)$.
$-4 \div 2 = (-2)$, since $(-) \times (+) = (-)$.
These expressions are equal. $(-4) \div (-2) = 2$, since $(+) \times (-) = (-)$. $4 \div 2 = 2$.
These expressions are equal.

13. $+1$

14. **a)** -2¢ **b)** 22¢ **c)** 11¢

15. **a)** -6 **b)** 9 **c)** -1 **d)** 4 **e)** 2 **f)** -3

16. e.g., How many times as deep as Lake Superior is the Marianas Trench?
$-10\,962$ m $\div$ -406 m $= 27$ times

17. **a)** negative, since $(-) \div (+) = (-)$
b) negative, since $(+) \div (-) = (-)$
c) positive, since $(-) \div (-) = (-)$

6.5 Order of Operations, pp. 270–273

1. **a)** -8 **b)** -27 **c)** 22 **d)** 1

2. **a)** $(-6) \times (-8)$ **b)** $-9 \times (-3)$

3. **a)** 10 **b)** 35 **c)** -28 **d)** -30 **e)** 60 **f)** 666

4. **a)** $(-2 - 4)$ was not performed first.
b) $$\begin{aligned} 3 \times (-8) \div (-2 - 4) &= 3 \times (-8) \div (-6) \\ &= -24 \div (-6) \\ &= 4 \end{aligned}$$

5. **a)** 2 **b)** -1 **c)** -1 **d)** 6 **e)** -1 **f)** -8

6. **a)** -213
b) Yes; otherwise it would have done the operations from left to right and given the answer -26.85.

7. $(40 \times 6 - 3) \times (4 - 5) = -237$

8. -40 °C

9. $\dfrac{-4 + (-4) + 0 + 1 + (-1) + (-2) + (-4)}{7}$; -2 °C

10. **a)** $36 \div (4 - 1) \times 2 = 24$
b) $-12 + 4 \times (-3) = -24$
c) $-15 + (-12) \div 6 \times 16 = -47$

11. $10 \times (39 - 42) + 100 \times (4 - 5) + 50 \times (42 - 38) + 30 \times (21 - 19) = 130$

12. **a)**

Day	Starting price ($)	Final price ($)	Change in price ($)
Mon.	675	673	−2
Tues.	673	671	−2
Wed.	671	669	−2
Thurs.	669	677	+8
Fri.	677	685	+8

b) $675 **c)** +$2

13. e.g., I have 2 soft drinks and bought 2 more packs, each pack containing 6 soft drinks.
$2 + 2 \times 6 = 14$. If calculated from left to right, the result is 24.

14. e.g., Same: the order of operations. Different: with whole numbers you have to consider only the number value, but with integers you have to consider the sign too.

6.6 Communicate about Problem Solutions, p. 277

1. **a)** e.g., **i)** Multiply by -2. Add 4. Subtract 14.
ii) Subtract 2. Multiply by -3. Subtract 26.
iii) Add 4. Divide by -2. Add 7.
b) Do the opposite operation, in reverse order.
e.g., **i)** Add 14. Subtract 4. Divide by -2.
ii) Add 26. Divide by -3. Add 2.
iii) Subtract 7. Multiply by -2. Subtract 4.

2. 3

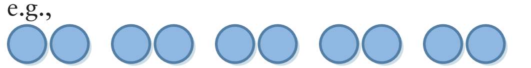
3. -28

4. 2 km west

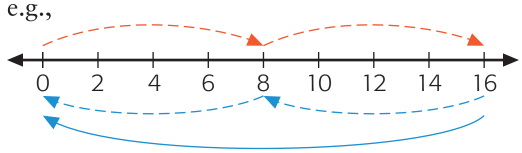
5. **a)** e.g., These were Guy's last three cards before he landed on -5 on the game board, but maybe not in the order shown: Subtract 2. Add 2. Divide by -3. Where was he three turns ago?
b) e.g., Try the reverse operations in all the different possible orders. He might have been on 7, 15, or 23.

Chapter Self-Test, p. 280

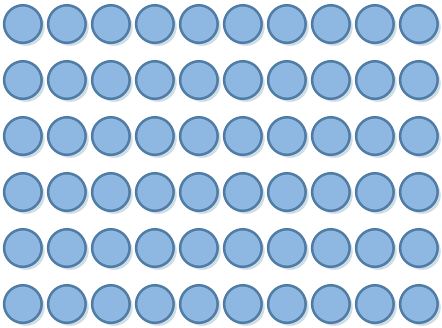
1. **a)** e.g.,



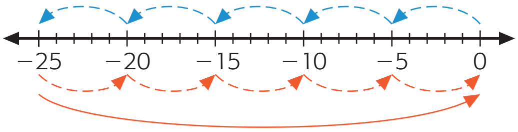
b) e.g.,



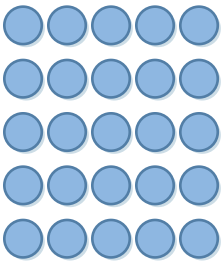
c) e.g.,



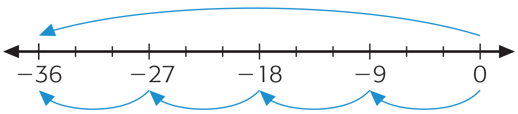
d) e.g.,



e) e.g.,



f) e.g.,



2. a) −6 **b)** −27 **c)** 144 **d)** 6 **e)** −7 **f)** −8

3. a) −9 **b)** −12 **c)** −56 **d)** −414

4. lost $250

5. −12 and 10

6. 39 greater

7. a) 10 **b)** 33 **c)** 666 **d)** −9

8. e.g., $-10 \times 10 - (-4) \times (4 - 3)$

Chapter Review, p. 282

1. a) −16 **b)** 16 **c)** 0 **d)** −20

2. a) positive; $(-) \times (-) = (+)$, then $(+) \times (+) = (+)$
b) negative; $(+) \times (-) = (-)$, then $(-) \times (+) = (-)$

3. a) 80 **b)** −80 **c)** −72 **d)** 231

4. e.g., $1 \times (-1) \times (-3) \times 4 \times (-2)$ and $1 \times (-1) \times (-6) \times 2 \times (-2)$

5. a) −4 **b)** −4 **c)** 9 **d)** −3

6. a) −5 **b)** −6

7. a) $-58 - (-36) + (-15) = -37$
b) $-4 \times (-3) + 28 = 40$

8. a) e.g., −35 **b)** e.g., 10

9. wrong, e.g., for $2 - 3 \times 4$, using order of operations: $2 - 3 \times 4 = 2 - 12 = -10$, from left to right: $2 - 3 \times 4 = -1 \times 4 = -4$

Chapter 7, p. 284

7.2 Tessellating with Regular Polygons, p. 292

1. A regular hexagon tessellates. e.g., Its interior angles are 120°, and so three regular hexagons fit around a vertex.

2. No, two octagons would cover 270°. Three octagons would cover 405°. The third octagon would overlap.

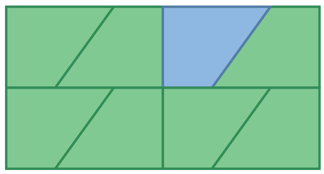
3. a) No, two dodecagons would cover 300°. A third would overlap.
b) No, because the interior angles would not change.

4. e.g., No, Jordan is wrong, because he used the wrong division. He divided by the number of sides instead of by the size of the interior angles.

5. e.g., The size of the interior angles must be a factor of 360°.

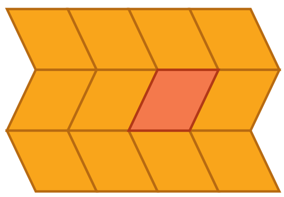
7.3 Tessellating with Quadrilaterals, p. 296

1. a) b) e.g., I reflected a rhombus along one of its sides. I reflected the second rhombus the same way.

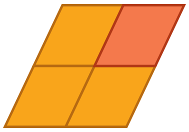


c) e.g., I rotated the quadrilateral about the middle of the slanted side to form a rectangle. I copied and translated the rectangle to form a tessellation.

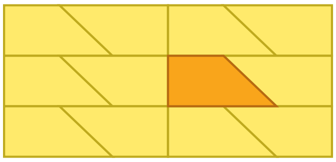
2. a) e.g., I translated the two rhombuses to the right the width of one rhombus. I continued the translation.



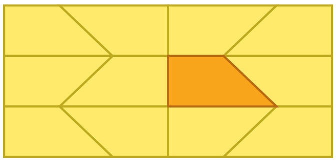
b) e.g., All the figures in this tessellation have the same orientation.



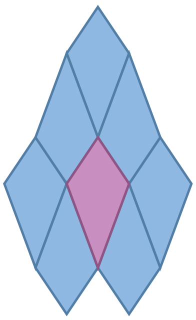
3. e.g., I rotated the trapezoid about the slanted side to form a rectangle. I copied and translated the rectangle to form a tessellation.



I rotated the trapezoid about the midpoint of the slanted side to form a rectangle. I reflected the rectangle along its sides to form a tessellation.

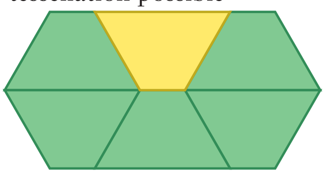


4. e.g., **a) – c)** I rotated the kite about the midpoints of its sides and continued this tessellation.



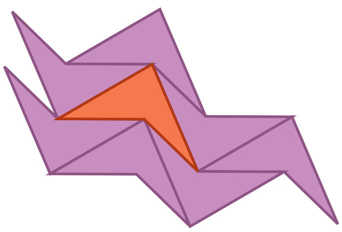
5. a), **b)** no tessellation possible

c) e.g.,



6. rotate a quadrilateral about the midpoint of a side

7. a) b) e.g.,



c) No; all quadrilaterals must tessellate.

7.4 Tessellating with Triangles, p. 302

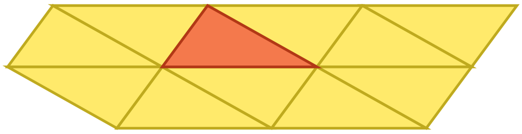
1. a) e.g., a square

b) e.g., Yes, all squares tessellate.

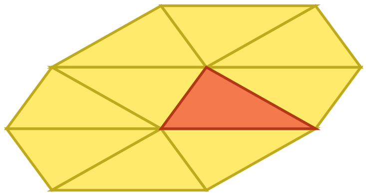
2. a) a right triangle

b) Yes, I can reflect the new triangle along its hypotenuse to make a square, which I know will tessellate.

3. b) e.g., I tessellated by rotating 180° about the midpoint of the longest side to make a parallelogram.



c) e.g., I tessellated by reflecting along the longest side to make a kite on its side.



d) e.g., I was tessellating a quadrilateral both times, but the tessellations looked different because one was a kite and the other was a parallelogram.

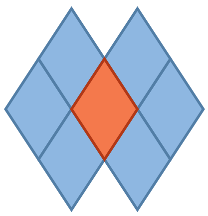
4. e.g., I reflected over one of the equal sides to create a kite and I rotated 180° around the midpoint of one of the equal sides to create a parallelogram.

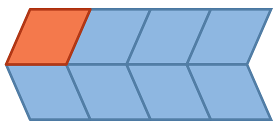
5. e.g., Yes, except for equilateral triangles, which always form the same tessellation.

Mid-Chapter Review, p. 305

1. No, because copies of the loonie cannot be arranged so the angles at each vertex add up to 360°.

2. e.g., I translated in the first tessellation and reflected and translated in the second.

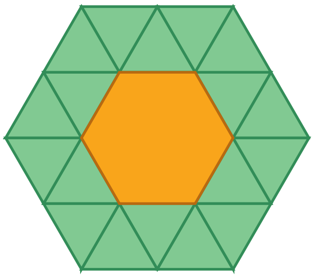




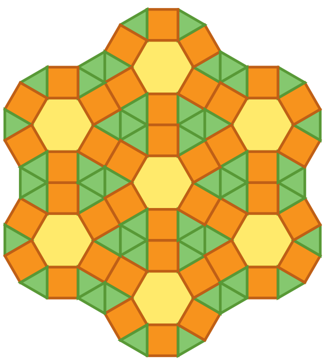
3. e.g., Using the lower right quadrilateral, he can rotate the top side and left side 180° about their midpoints and translate up to the left.
4. the same

7.5 Tessellating by Combining Shapes, p. 309

1. No; no combination of interior angles for hexagons and squares adds up to 360°.
2. No; no combination of interior angles for pentagons and equilateral triangles adds up to 360°.
3. **a)** e.g., I think hexagons and triangles will tessellate because combinations of their interior angles, 60° and 120°, add up to 360°.
   b) e.g.,

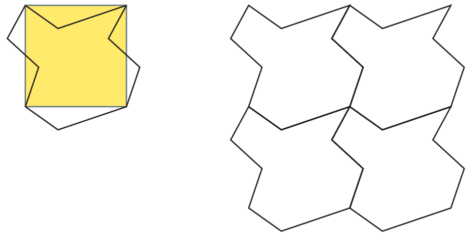


   c) e.g., I placed 4 triangles and 1 hexagon at one vertex, and their angle sum was 360°. Once I had my first vertex with my 5 shapes, I continued this combination for the other vertices. This pattern of one hexagon and 18 equilateral triangles can continue forever by translation.
4. A dodecagon and an equilateral triangle; the angle sum at the vertex would be 150° + 60° + 150° = 360°.
5. Yes; the angle sum at the vertex is 360°, and 120° + 90° + 60° + 90° = 360°. The angle of the gap where the hexagon meets the square is 150°. I can fit a square and a triangle into the gap. I can keep repeating that combination at every vertex.

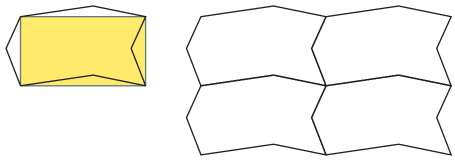


7.6 Tessellating Designs, p. 315

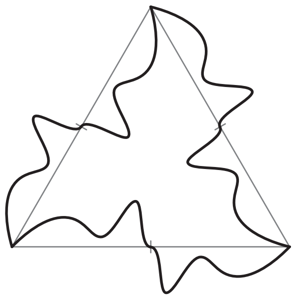
1. **a)**



   b) Yes, because it is based on a square, and squares tessellate.
2. **a)** e.g.,



   b) e.g., I changed the left side and translated it to the right side. I changed the top and translated it to the bottom.
   c) Yes, because it is based on a rectangle, and rectangles tessellate.
3. **a)** e.g.,



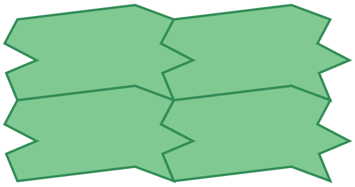
   b) It will tessellate because it is based on a triangle, and triangles tessellate.
   c) e.g.,

4. **a)** a rectangle
   b) translations, reflections, and rotations
   c) e.g., He probably cut out a section from one half of one side and added it to the other half of the same side.

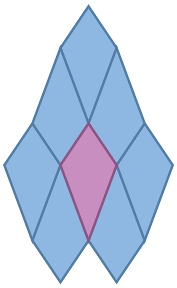
5. e.g., No, because if the same change does not happen on the opposite side, or if half a side is not changed and rotated, then the tiles will not fit together.

7.8 Communicate about Tessellations, p. 320

1. e.g., Translate the hexagon to the left, right, and up and down.
2. e.g., Pentagons do not tessellate because they have no combination in which the interior angles at a vertex add up to 360°.
3. e.g., The artist changed the left and top sides of a rectangle and translated the changes to the right and bottom sides.

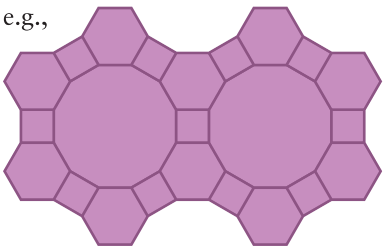


4. **a)** e.g., 1) Reflect the kite horizontally and translate the image alongside the kite to create a six-sided figure. This figure will tessellate.
   2) Rotate the kite 180° cw about its midpoint and translate the image alongside the kite to create a six-sided figure. This figure will tessellate.
   b) The result is the same for both methods.

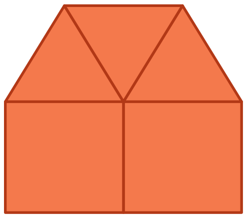


Chapter Self-Test, p. 322

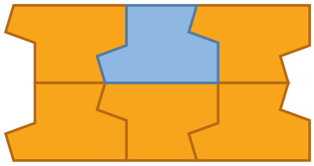
1. **a)** Yes, it is a triangle, and all triangles tessellate.
   b) Yes, it is a quadrilateral, and all quadrilaterals tessellate.
2. **a)** e.g.,



   b) e.g., I added a hexagon along the top side of the dodecagon and a square along an adjacent side of the dodecagon. I used translations to add hexagons and rotations to add squares to the dodecagon.
3. The two patterns will be the same.
4. **a)**

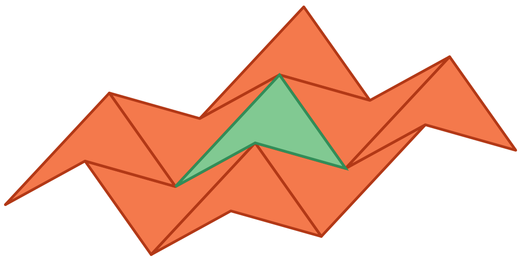


   c) No, it is not possible, because no arrangement works.
5. **a) b)** e.g., Change the left side, then rotate the change 180° about its midpoint and apply it to the right side.

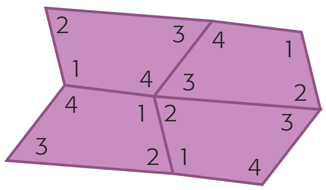


Chapter Review, p. 324

1. The interior angles of a nonagon are 140°, so putting two nonagons together at a vertex gives a centre angle sum of 280°, which will leave a gap of 80°, while putting three nonagons together gives a centre angle sum of 420°, which will cause overlap.
2. **a)**



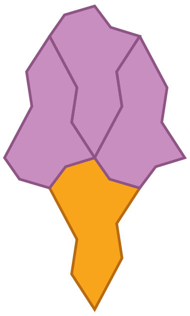
   b) No, it is not possible to tessellate the quadrilateral in any other way so that all the sides match and the angle sum is 360°.
3. No, all quadrilaterals tessellate, e.g.,



4. Yifan rotated the triangle about the midpoints of its sides until he made a hexagon. Patrick rotated the triangle about the midpoints of its sides until he made a trapezoid. Then he reflected the trapezoid along its base.

5. square and hexagon; e.g., The interior angle of the dodecagon is 150°. That leaves 210° to fill at the vertex. A square has angles of 90° and a regular hexagon has angles of 120°. 150° + 90° + 120° = 360°. There was no way to combine 60° or 108° with 150° and one other shape to total 360°.

6. e.g., I changed the top left (short) side and made the same change to the top right side. I then changed the bottom left (long) side and made the same change to the bottom right side.



Cumulative Review: Chapters 4–7, pp. 326–327

1. B	**4.** D	**7.** D	**10.** C
2. A	**5.** C	**8.** D	**11.** A
3. B	**6.** C	**9.** B	

Chapter 8, p. 328

8.2 Changing the Format of a Graph, pp. 337–338

1. a) Same: they display the same data. Different: the way the data are displayed.

b) e.g., In the pictograph, dogs appear to be just a little more popular than cats. The bar graph and circle graph show dogs as much more popular.

c) e.g., the bar graph, because it is easier to compare the categories.

2. a) e.g., What is the approximate time needed for most students to get to school?

b) e.g., How many students need less than 2 minutes to get to school?

3. a) e.g., the double-bar graph; yes

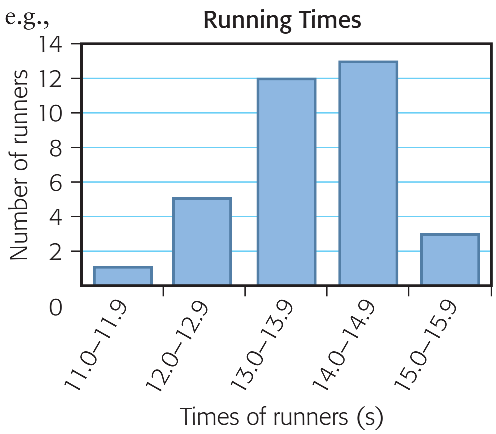
b) e.g., the mean temperature for each month

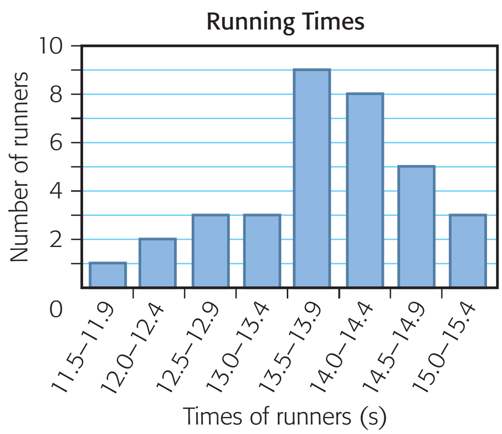
4. a) e.g., yes, by reading the running times from the bar graph

b) because Juan's graph would show how many movies are in each group, not the actual running times

5. a) e.g., group by whole seconds and group by half seconds

b) e.g.,





c) e.g., Graph 1 shows that most runners had a time in the 14.0–14.9 group and Graph 2 shows that most runners had a time in the 13.5–13.9 group.

6. The height of each bar may change.

8.3 Communicate about Choosing a Graph, p. 341

1. e.g., A circle graph would be best for displaying topics in which the data can be grouped into categories that can be compared to the whole, such as budgeting money, time spent on different activities in a day, or comparing the number of copies sold in one year of three different magazines. The values of the categories within these topics may not be as important as the size of the category in relation to the whole.

2. e.g., A track and field team may want to have information about their total number of wins and losses in each event. They could use a bar graph or pictograph to display the frequency of wins and losses for each event and to compare them.

3. a) e.g., Endangered species in Canada include plants and animals. More animals are endangered than plants, but plants make up the largest single group.

b) e.g., Yes, a bar graph could show numbers instead of percents.

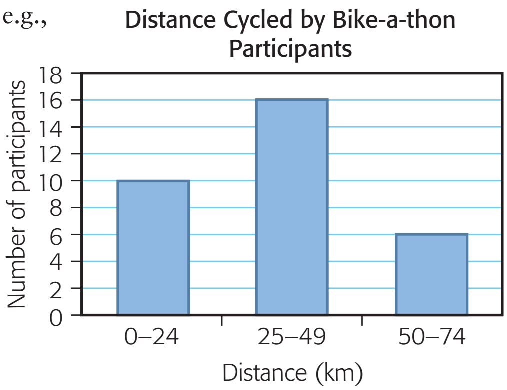
4. e.g., Include the source of the data. Suggest how to lower the number of endangered species. Would another type of graph be better to present the data?

5. e.g., Use a line graph when the data describe a trend, a pictograph or bar graph to describe frequency, and a circle graph to describe parts of a whole.

Mid-Chapter Review, p. 343

1. a) between 10 and 19 km

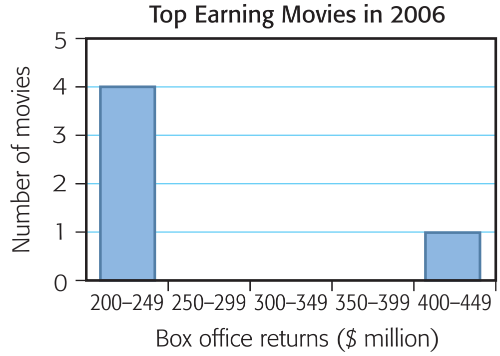
b) e.g.,



Most rode from 25 to 49 km.

c) e.g., Yes, the second graph makes it appear that most participants rode a greater distance.

2. a) e.g., I chose a bar graph so that I could compare the data quickly.



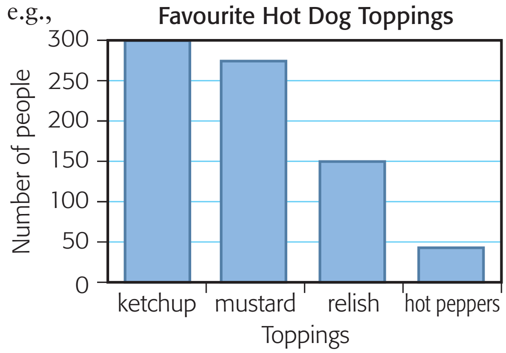
b) e.g., My classmate used a pictograph. Both graphs showed a big difference between the top earning movie and the others, but I thought the bar graph showed this better.

c) e.g., *Pirates of the Caribbean: Dead Man's Chest* was the most popular movie, so order more copies of this movie to rent.

8.4 Changing the Scale of a Graph, pp. 347–349

1. a) Ketchup is the most popular, followed by mustard. Relish is much less popular, and hot peppers are not popular at all.

b) e.g.,

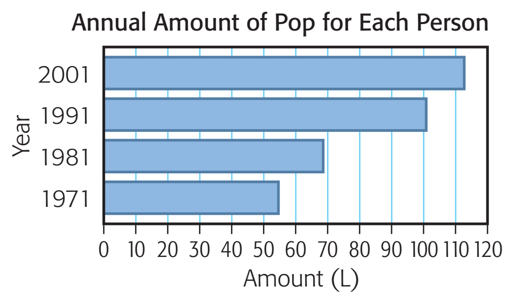


2. a) Graph 1

b) Yes, the data points are identical.

c) Graph 1; it shows a greater increase in attendance.

3. a)

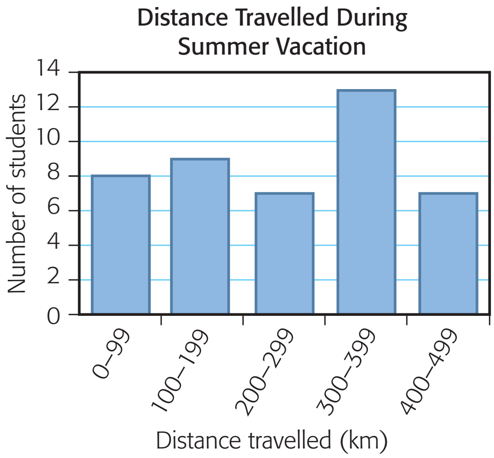


b) e.g., My scale is from 0 to 120 in increments of 10.

4. a) no

b) Draw the number scale from 0 to 29.

5.



6. e.g., To make the differences appear less than they are, start the graph at 0. To make them appear greater, start it at 41.

8.5 Recognizing Misleading Graphs, pp. 352–353

1. a) Graph 1

b) The width of the bars makes the differences appear greater than they are.

2. a) e.g., Same: both show increase in profit. Different: Graph 2 is steeper.

b) Graph 2, because the profits appear to increase more quickly

c) about $5800, assuming profits continue to increase at the same rate

3. a) The second one is $\frac{1}{4}$ times the first.

b) The buying power is $\frac{1}{2}$, not $\frac{1}{4}$.

c) Draw the same graph, but with bars the same width.

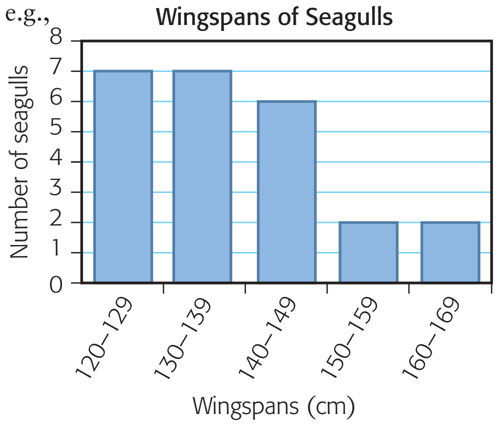
4. No; it is possible that no single cause in "Other" is greater than 27.2%.

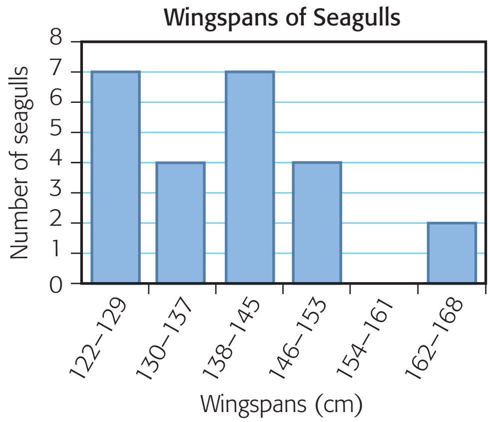
5. e.g., In a bar graph, the scales are evenly spaced and the bars are the same width.

Chapter Self-Test, pp. 356–357

1. e.g., bar graph, to make comparison easier

2. a) e.g.,





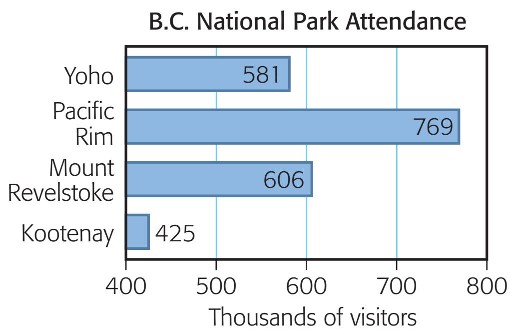
b) e.g., Yes, Graph 1 makes the first groups look similar while Graph 2 makes them look quite different.

3. a) e.g., a line graph to show change over time

b) Even though the 2006 price is less than the 2001 price, there was a large increase from 2002 to 2006.

c) e.g., a bar graph, with the cost for each year as a bar

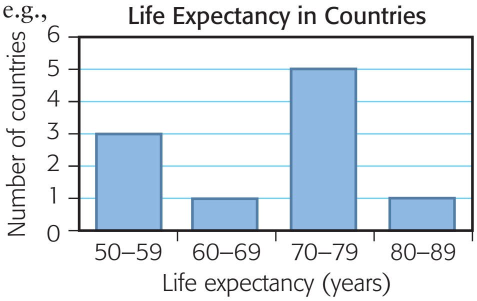
4. e.g., Start the horizontal scale at 400.



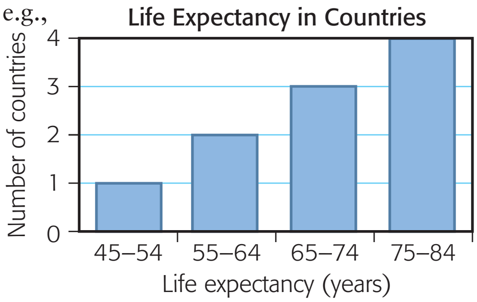
5. a) e.g., They show the same data.
   b) The scales are different.
   c) e.g., Students like pepperoni the best and onions the least.
   d) Each graph is misleading. In the first graph, the bars have different widths, and the scale of the second graph starts at 25, not 0.

Chapter Review. pp. 359–360

1. a) e.g.,



   b) e.g.,



   The first bar graph shows a rise and fall in life expectancy, while the second shows a steady rise.

2. a) It is easy to compare the data.
   b) e.g., A pictograph can display the same data using the name of the country.
3. a) You can compare the different groups to the whole.
   b) e.g., the number of 13-year-olds surveyed; how the survey was conducted; where the survey was conducted
   c) The two largest sectors are for 20–29 and 30–39. That means more than 60% of 13-year-olds listen to at least 20 hours of music per week.
4. a) The scales are different.
   b) Kaycee's graph shows the polar bear's life is 1.7 times that of the wolf's. Melissa's graph shows the polar bear's life is 3 times that of the wolf's.
   c) It would look as if the white-tailed deer, wolf, caribou, and lynx have no lifespan.
5. a) 1995: 1; 2000: 8; 2005: 27.
   b) No, the sales in 2000 should be double the sales in 1995, not 8 times greater, and sales in 2005 should be triple the sales in 1995, not 27 times greater.
   c) e.g., Draw a bar graph with a scale from 0 to 400, with each square 50.
6. e.g., Use scales that do not exaggerate the data and do not enlarge bars in bar graphs or sectors in circle graphs to create a false impression.

Chapter 9, p. 362

9.1 Making a Table of Values, pp. 368–369

1. a)

n	$c = 4(n + 3)$
1	16
2	20
3	24
4	28
5	32
6	36

   b)

n	$t = \frac{n}{2} + 7$
1	7.5
2	8
3	8.5
4	9
5	9.5
6	10

2. e.g., a) $k = \frac{n}{2} + 4n$, $t = 5(4 + n)$
   b)

n	$k = \frac{n}{2} + 4n$
4	18
6	27
8	36

n	$t = 5(4 + n)$
4	40
6	50
8	60

3. a) $c = 35n$ b) $c = \frac{n}{2}$ c) $c = 27t - 15$
4. e.g.,
   a)

n	$c = 35n$
1	35
2	70
3	105
4	140
5	175

5. a) $8n + 24 = c$

b)

n	$c = 8n + 24$
5	64
6	72
7	80
8	88
9	96
10	104

6. a) e.g.,

s	$L = 16s + 80$
15	320
20	400
25	480

b) e.g., The tables are the same because $16s + 80$ and $16(s + 5)$ are equal.

7. a) e.g., $e = \frac{t}{4} - 10$ **b)** $70

8. a) e.g., $w = l - 2$ **b)** e.g., $p = 4l - 4$

c)

Length, l (cm)	Perimeter, p (cm)
10	36
12	44
14	52
16	60
18	68
20	76

d) 140 cm

9. a) e.g., A table shows many solutions at one time and helps me determine a pattern rule.

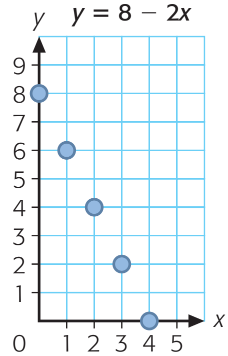
b) e.g., An equation lets me calculate any value in a relation.

9.2 Graphing Linear Relations, pp. 374–376

1. a) e.g.,

x	y
0	8
1	6
2	4
3	2
4	0

b) e.g.,



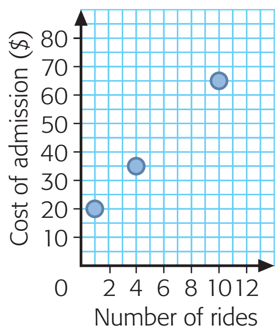
c) no

2. a)

r	c
1	20
4	35
10	65

b) 7 rides cost $50.

Admission to Fairgrounds

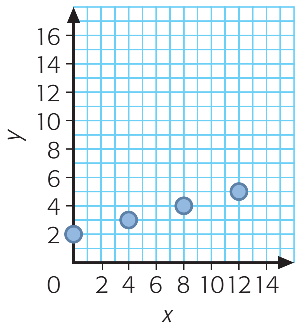


c) 12 rides

3. a) e.g.,

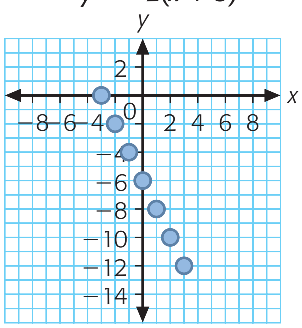
x	y
0	2
4	3
8	4
12	5

b) $y = \frac{x}{4} + 2$



c) no **d)** e.g., about 4.5

4. a) $y = -2(x + 3)$



b) y decreases by 2.

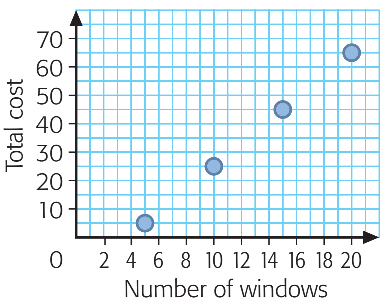
c) negative

d) $(0, -6)$

5. Graph 2

6. a) The cost increases by \$20.

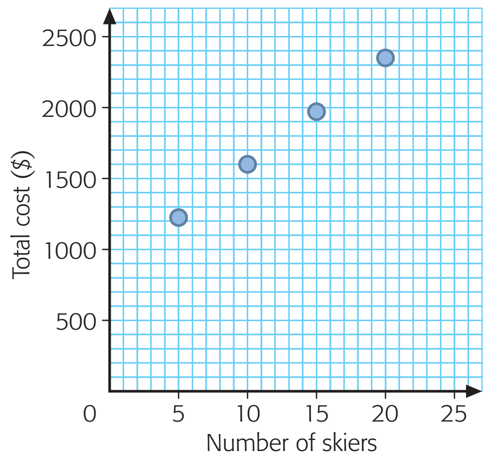
Window Cost



b) e.g., about \$55 **c)** e.g., 11 windows

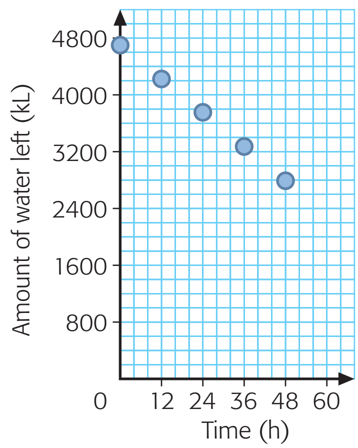
d) e.g., The company would lose money.

7. a) Total Cost of Ski Trip



b) \$2200 **c)** about \$135

8. a) Draining the Pool



b) 2300 kL **c)** e.g., about 120 h

9. a) Graph 3 **b)** Graph 2 **c)** Graph 1

10. e.g., how quickly or how slowly the situation is increasing or decreasing

9.4 Drawing Diagrams to Represent Equations, pp. 381–382

1. a) $n = 5$ **b)** $x = -9$

2. a) $x = 54$ **b)** $x = 9$

3. a) e.g., $5(r + 3) = 25$ **b)** e.g., $\frac{x}{2} + 4 = -6$

4. a) e.g., $r = 2$ **b)** e.g., $x = -20$

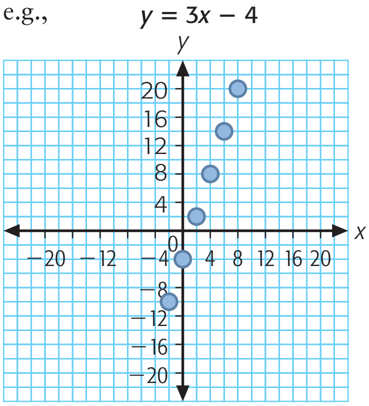
5. a) $x = 6$ **c)** $x = -44$

b) $x = 12$ **d)** $x = -2$

6. a) e.g.,

x	y
−2	−10
0	−4
2	2
4	8
6	14
8	20

b) e.g.,



c) $x = 5, x = -4$

d) e.g., A graph displays many solutions.

7. a) e.g., $c = 4g + 2$ **b)** 7

8. e.g., D, because a diagram would make the solution clearer.

Mid-Chapter Review, p. 385

1.

n	c
3	**125**
7	225
15	**425**
20	550

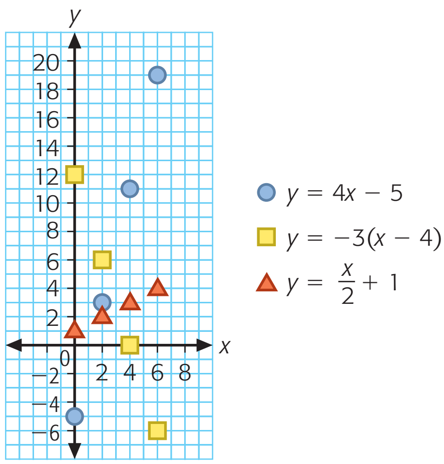
2. a) $c = 2t + 30$

b)

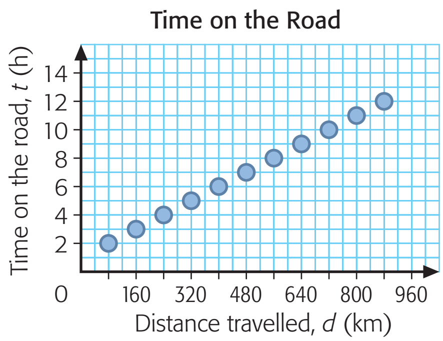
Number of theme groups	Total cost ($)
0	$30
2	$34
4	$38
6	$42
8	$46
10	$50

c) $44 **d)** 11

3.



4.



5. a) 6 h **b)** 9 h **c)** 12 h

6. a) 320 km **b)** 560 km **c)** 720 km

7. a) $x = 5$ **c)** $x = 20$

b) $x = -9$ **d)** $x = 36$

9.5 Solve Equations with Counter Models, pp. 391–392

1. a) $z = 4$ c) $x = -2$
   b) $k = 11$ d) $d = -3$
2. a) $x = 7$
   b) e.g., The model helped me to see what counters to remove on the left side to isolate $3x$.
3. a) $2x + 5 = -15, x = -10$
   b) $2x - 6 = 24, x = 15$
4. a) $x = 1\frac{3}{4}$
   b) The equation simplifies to $4x = 7$, and you cannot divide 7 counters into 4 equal groups.
5. a) $g = -6$ c) $m = 7$ e) $f = -\frac{3}{2}$
   b) $h = 8$ d) $a = 2\frac{3}{5}$ f) $y = -6$
6. a) $5x + 7 = 22, x = 3$
   b) $4x - 3 = 21, x = 6$
   c) $4(x + 2) = 32, x = 6$
7. a) $d = 3$ b) $x = -1$ c) $z = 7$
8. a) $x = 60$
   b) e.g., You cannot divide a cube representing a variable into parts.
9. a) 9 b) 48, 19 c) 6
10. e.g., Solve $4x + 3 = 11$. There would be 4 bags and 3 counters on the left side and 11 counters on the right. The value of x is 2.
11. The value of the variable can change but the mass of a cube cannot.
12. e.g., To solve an equation, you need to get a variable alone on one side and a number on the other side. That's how you can tell how much the variable represents. If you can't tell which part is the variable, then you can't get it alone on one side.

9.6 Solve Equations Symbolically, pp. 397–399

1. a) $a = 48$ c) $s = 18$ e) $n = 7$
   b) $b = 52$ d) $a = 3$ f) $w = 100$
2. a) $q = -14$ c) $z = -30$ e) $n = -2$
   b) $s = 13$ d) $d = 11$ f) $t = 68$
3. $c = -4$
4. $r = \frac{2}{3}$
5. $x = 9$
6. a) $x = 3$ c) $z = -35$ e) $x = \frac{3}{2}$
   b) $m = -11$ d) $z = 6$ f) $x = 3$
7. $\frac{x}{8} - 12 = 14;\ x = 208$
8. a) $3(2 + s) = 18$ b) $s = \$4$
9. a) $t = \frac{3}{4}$ c) $f = -1$
   b) $k = 36$ d) $m = -24$
10. $42
11. 11 people
12. $39 per person
13. e.g., Yes, because thinking of the pan balance reminds you to balance the equation.

9.7 Correcting Errors in Solutions, pp. 402–403

1. a) incorrect, $x = 6$
   b) incorrect, $x = -1$ c) correct
2. a) $x = 7$ b) $x = -27$ c) $x = 7$
3. a) incorrect, $x = 3$
   b) incorrect, $x = 7$
   c) incorrect, $x = 2$
4. In each case, variables and constants were added together, which is incorrect.
5. a) $d = 7$ b) $k = 6$ c) $s = 4$
6. a) incorrect, $x = 4$ b) correct
   c) incorrect, $s = 48$ d) incorrect, $d = 1$
7. $1
8. e.g., so you can check for errors

9.8 Solve Problems Using Logical Reasoning, p. 408

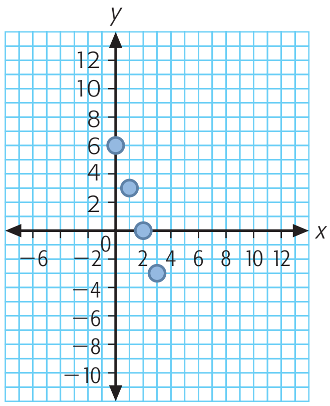
1. $42
2. Airline B $444, bus $399
3. black gear 12 cm, blue gear 6 cm
4. e.g., If you double the cost of the Yukon trip and add $50, the result is the cost of the B.C. trip. The B.C. trip costs $300. How much is the Yukon trip?
5. 39 years old
6. e.g., An equation helps you see what information you have, what information you need, and how to get from what you have to what you need.

Chapter Self-Test, p. 410

1. a) e.g.,

x	y
0	6
1	3
2	0
3	−3

b) e.g.,



x	y
−2	12
5	−9
−1	9
4	−6

2. a) $a = 7$ **c)** $c = 2.5$ **e)** $t = -8$
b) $x = -24$ **d)** $z = -4$ **f)** $z = -3$

3. $45

4. a) incorrect, $a = 17$ **b)** incorrect, $x = -40$

5. $1150

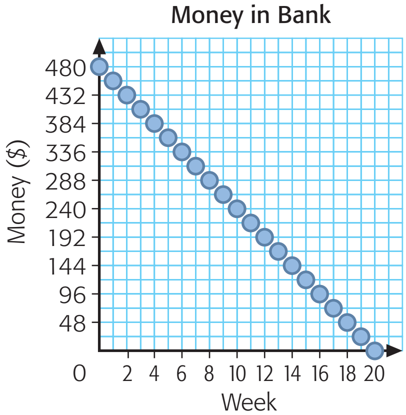
Chapter Review, pp. 413–414

1. a) e.g., $w = 120t + 4000$

b) e.g.,

Time, t (min)	Water, w (L)
15	5 800
30	7 600
45	9 400
60	11 200

2. a)



b) $312 **c)** 9 weeks

3. a) $x = 5$ **b)** $x = 27$

4. a) $t = 4$ **b)** $z = \frac{6}{8}$ **c)** $x = -7$

5. a) $a = -16$ **b)** $t = 384$ **c)** $x = \frac{-2}{5}$

6. incorrect, $x = 3$

7. a) correct **b)** incorrect, $p = -1$

8. beginner's tour $55, intermediate tour $72

Chapter 10, p. 416

10.2 Probability of Independent Events, pp. 426–427

1. a)

		Second counter					
		orange	orange	green	green	purple	purple
First counter	orange	OO	OO	OG	OG	OP	OP
	orange	OO	OO	OG	OG	OP	OP
	green	GO	GO	GG	GG	GP	GP
	green	GO	GO	GG	GG	GP	GP
	purple	PO	PO	PG	PG	PP	PP
	purple	PO	PO	PG	PG	PP	PP

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

2. not independent

3. e.g.,

		Spin of spinner			
		green	yellow	orange	purple
Roll of die	1	1G	1Y	1O	1P
	2	2G	2Y	2O	2P
	3	3G	3Y	3O	3P
	4	4G	4Y	4O	4P
	5	5G	5Y	5O	5P
	6	6G	6Y	6O	6P

b) $\frac{1}{24}$ **c)** $\frac{1}{8}$

4. a) e.g.,

		Second spin			
		\$1000	\$200	\$100	\$50
First spin	\$1000	\$2000	\$1200	\$1100	\$1050
	\$200	\$1200	\$400	\$300	\$250
	\$100	\$1100	\$300	\$200	\$150
	\$50	\$1050	\$250	\$150	\$100

b) $\frac{15}{16}$ **c)** $\frac{9}{16}$

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

e) e.g., An outcome table and a tree diagram give the same results.

6. e.g., with a tree diagram,

a) $\frac{1}{48}$ **b)** $\frac{7}{48}$ **c)** $\frac{1}{16}$ **d)** $\frac{11}{48}$

e) e.g., An outcome table and a tree diagram give the same results.

7. a) Selecting the second tile does not depend on the result of selecting the first tile.

b) $\frac{9}{25}$ **c)** $\frac{4}{25}$ **d)** $\frac{6}{25}$

e) e.g., An outcome table and a tree diagram give the same results.

8. a) The denominator is equal to all possible outcomes in a tree diagram or outcome table.

b) They list all the possible outcomes in the probability experiment.

10.3 Using a Formula to Calculate Probability, pp. 432–433

1. a) $\frac{1}{48}$ **b)** $\frac{1}{4}$ **c)** $\frac{1}{16}$

2. a) The second event does not depend on the first event.

b) $\frac{4}{49}$ **c)** $\frac{9}{49}$ **d)** $\frac{1}{49}$

3. a) The second event does not depend on the first event.

b) $\frac{1}{30}$ **c)** $\frac{1}{6}$ **d)** $\frac{1}{10}$

4. a) $\frac{3}{8}$ **b)** $\frac{3}{20}$ **c)** $\frac{1}{4}$ **d)** $\frac{9}{40}$

5. a) $\frac{21}{40}$

b) The two events are not independent.

6. a) $\frac{1}{400}$ **b)** $\frac{4}{25}$ **c)** $\frac{1}{25}$

d) e.g., The events are independent because one does not depend on the other.

7. $\frac{1}{1600}$

8. a) $\frac{2}{5}$ **b)** $\frac{3}{25}$

c) Probabilities of the team losing are not included.

9. a) The two events are independent.

b) The two events are not independent.

10.4 Communicate about Probability, pp. 437–438

1. e.g., Lam could get a hit in his second at-bat. The probability is 0.250.

2. e.g., How do you know that the events are independent? Should you schedule the picnic for Saturday only, since the chance of rain then is much less likely? Have you shown why your conclusion is reasonable?

3. a) Multiply $P(\text{Y})$ by $P(\text{Y})$: $P(\text{YY}) = \frac{1}{4}$

b) e.g., Use an outcome table. There are 4 favourable (YY) outcomes in 16 possible outcomes. $P(\text{YY}) = \frac{1}{4}$.

4. a) Multiply $P(\text{heads}) \times P(\text{even})$.
$P(\text{heads, even}) = \frac{1}{4}$

b) e.g., List the possible outcomes: H1, H2, H3, H4, H5, H6, H7, H8, H9, H10, H11, H12, T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12. Six of the 24 outcomes are favourable, so $P(\text{H, even}) = \frac{1}{4}$.

5. These events are not independent.

6. a) $\frac{9}{100}$

b) e.g., I made a spinner with 10 equal sections, 3 marked "Catch" and 7 marked "No catch." I did 50 trials of spinning the spinner twice. I got two "catches" in a row 4 times. The experimental probability is $\frac{4}{50}$ or 8%.

c) e.g., Yes, if there are lots of trout in the lake.

7. $P(\text{B}) = \frac{3}{5}$

8. a) You need to know because you can only multiply the probabilities of independent events.

b) e.g., It is a good way to check your answer.

Chapter Self-Test, p. 440

1. a)

		Second spin				
		1	2	3	4	5
First spin	1	1, 1	1, 2	1, 3	1, 4	1, 5
	2	2, 1	2, 2	2, 3	2, 4	2, 5
	3	3, 1	3, 2	3, 3	3, 4	3, 5
	4	4, 1	4, 2	4, 3	4, 4	4, 5
	5	5, 1	5, 2	5, 3	5, 4	5, 5

b) $\frac{4}{25}$, $\frac{9}{25}$

c) There are more outcomes in which both are odd than in which both are even.

2. a) The probability of guessing the second answer correctly is not affected by the first guess.

b) $\frac{1}{25}$

c) e.g.,

		Guess to second question				
		A	B	C	D	E
Guess to first question	A	AA	AB	AC	AD	AE
	B	BA	BB	BC	BD	BE
	C	CA	CB	CC	CD	CE
	D	DA	DB	DC	DD	DE
	E	EA	EB	EC	ED	EE

There are 25 outcomes and only AC is favourable so $P(\text{both correct}) = \frac{1}{25}$.

3. a) $\frac{32}{100}$ or 32% b) $\frac{6}{100}$ or 6%

c) e.g., A tree diagram with 8 branches for rain and 2 branches for sun, each one ending with 10 game-outcome branches, gives the same results.

4. a) $\frac{1}{4}$ b) $\frac{7}{20}$ c) $\frac{16}{25}$

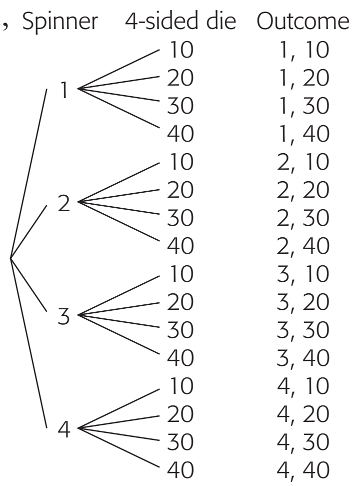
Chapter Review, p. 442

1. a)

		Spinner			
		10	20	30	40
Die	1	1, 10	1, 20	1, 30	1, 40
	2	2, 10	2, 20	2, 30	2, 40
	3	3, 10	3, 20	3, 30	3, 40
	4	4, 10	4, 20	4, 30	4, 40

b) $\frac{1}{16}$ c) $\frac{6}{16}$ or $\frac{3}{8}$

d) e.g.,



$P(1, 20) = \frac{1}{16}$ and $P(\text{toss} > 1, \text{spin} < 30)$
$= \frac{6}{16}$ or $\frac{3}{8}$

2. a) e.g.,

		Second marble					
		blue	blue	blue	red	red	red
First marble	blue	BB	BB	BB	BR	BR	BR
	blue	BB	BB	BB	BR	BR	BR
	blue	BB	BB	BB	BR	BR	BR
	red	RB	RB	RB	RR	RR	RR
	red	RB	RB	RB	RR	RR	RR
	red	RB	RB	RB	RR	RR	RR

b) $\frac{1}{2}$ **c)** no

3. a) $\frac{1}{36}$

b) e.g., An outcome table and a tree diagram both give the same result.

4. a) 0.105 **b)** 0.0225 **c)** 0.7225

d) e.g., That seeing moose and seeing loons are independent events.

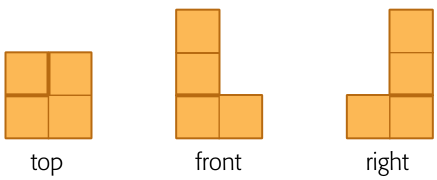
5. $\frac{1}{4}$

Chapter 11, p. 444

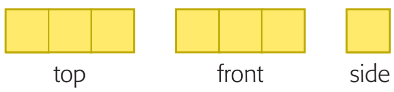
11.1 Drawing Views of Cube Structures, pp. 450–451

1. a) top **b)** right **c)** front

2. c)

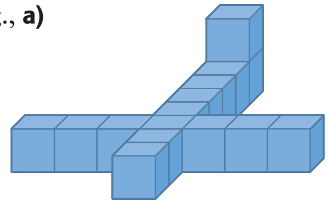


3. e.g.,

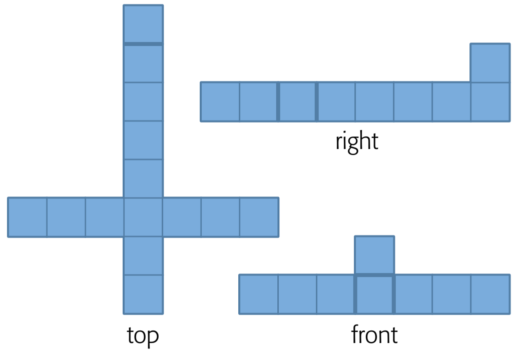


4. The top view would be a 7 cm by 5 cm rectangle. The front view would be a 10 cm by 7 cm rectangle. The side views would each be a 10 cm by 5 cm rectangle.

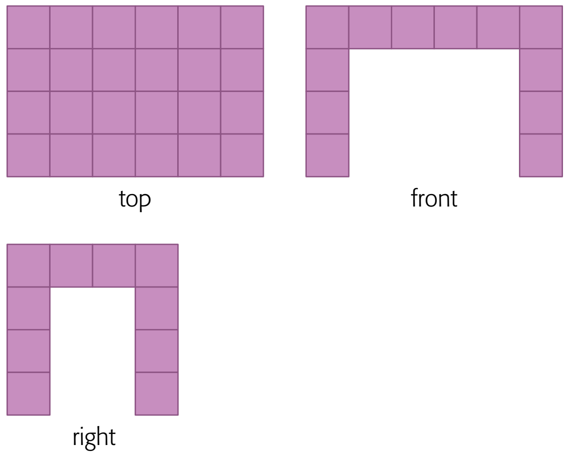
5. e.g., **a)**



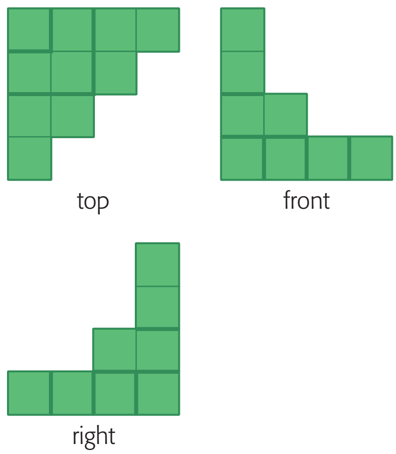
b)



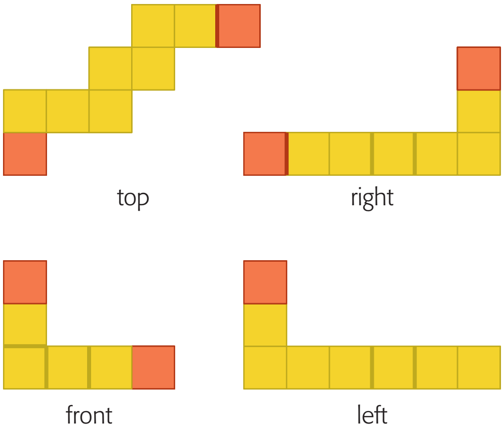
6.



7. c)



8. b)



c) All of the views would look different. In the top view, the upper red cube would be yellow and the lower red cube would be missing. In the right view, the upper red cube would be missing and the lower red cube would be yellow with no depth change. In the front view, both red cubes would be missing. In the left view, the red cube would be missing.

9. a) e.g., Add a cube on top of the red cube in the tower.

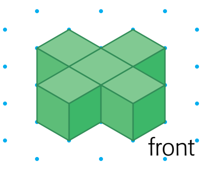
b) e.g., Add a cube to the left of the front two.

10. They are all rectangles.

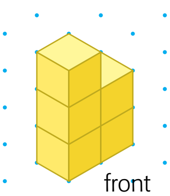
11. No, you would need to see the left view in a case where some cubes cannot be seen on the top view or the right view.

11.3 Creating Isometric Drawings, pp. 456–457

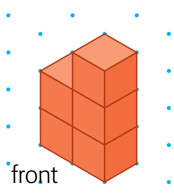
1.



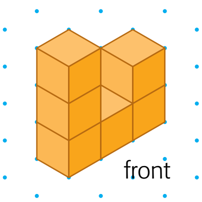
2. e.g., **b)**

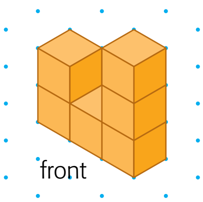


c)

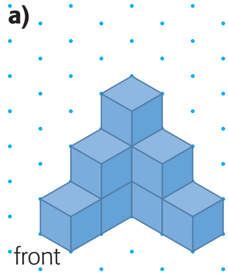


3. b) e.g.,

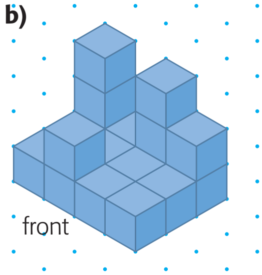




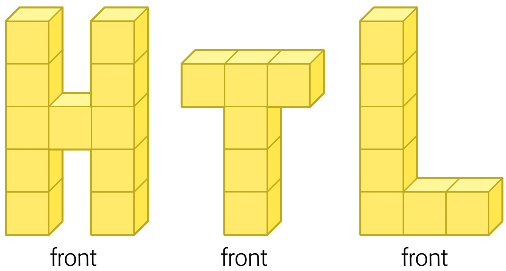
4. e.g., **a)**



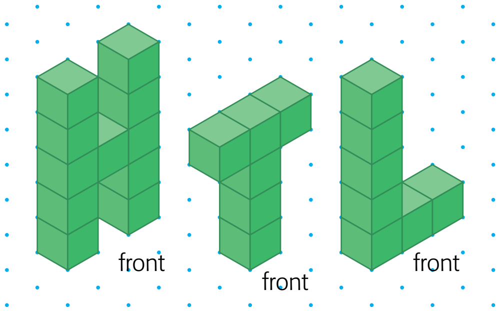
b)



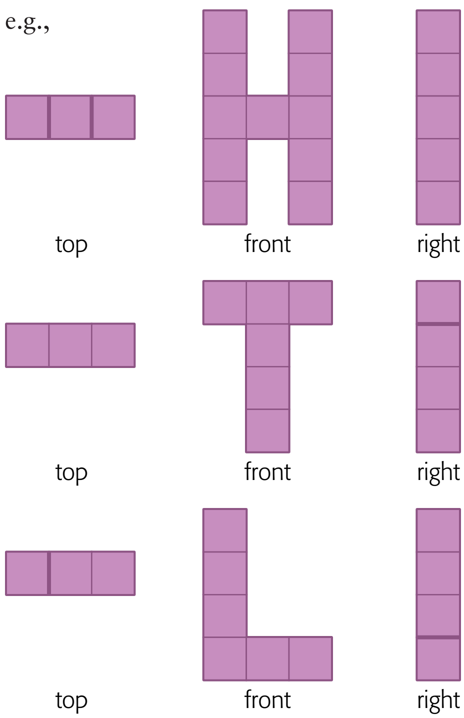
5. a)



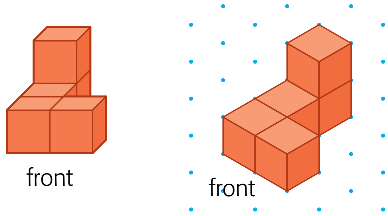
b) e.g.,



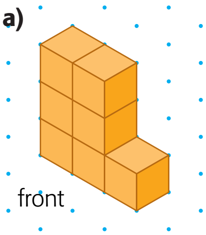
c) e.g.,



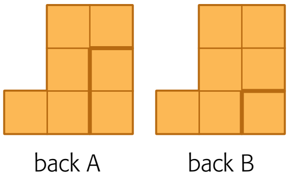
6.



7. e.g., **a)**



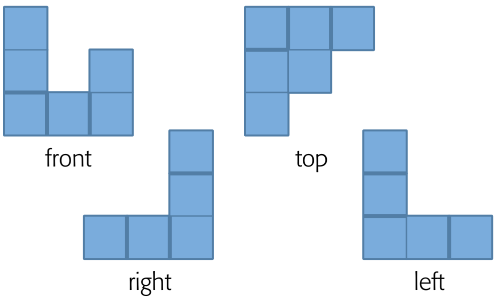
b)



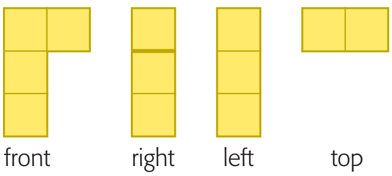
8. e.g., to show what the building will look like when it is built. The isometric drawing makes the 2-D picture look 3-D.

Mid-Chapter Review, p. 459

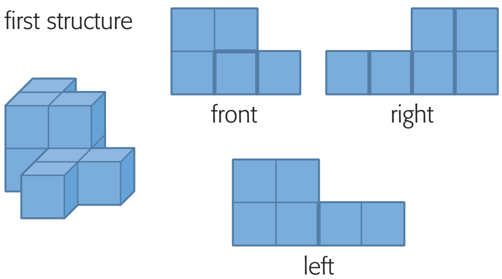
1. a)

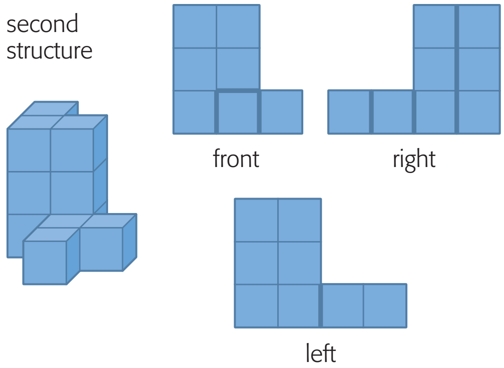


b)

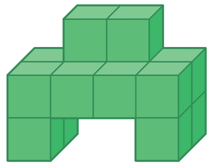


2. e.g., **a), b)**

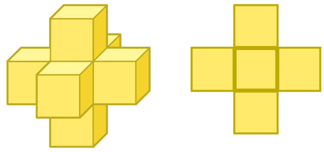




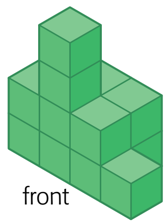
3.



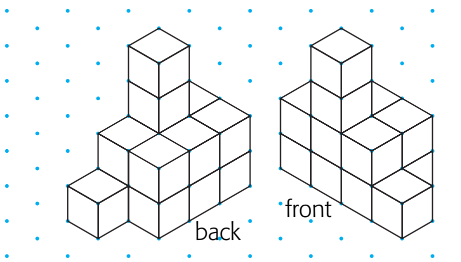
4.



5. a) e.g.,



b) e.g.,

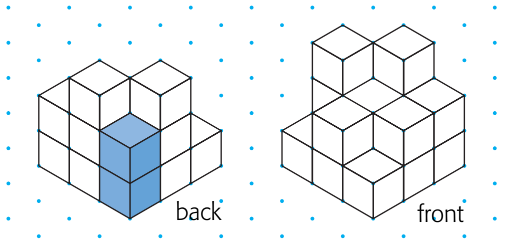


6. c) e.g., Yes, my structure did match, because the drawings were clear.

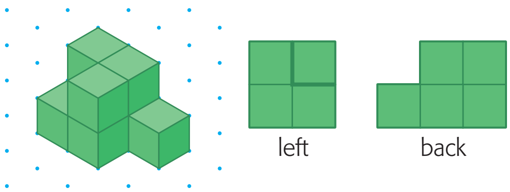
11.4 Creating Cube Structures from Isometric Drawings, p. 462

1. a) 12 cubes

b), c) You can use 13, 14, or 15 cubes, depending on how many cubes are not visible in the isometric drawing of the structure; e.g., in the structure on the left, 2 cubes have been added to the back of the structure; in the structure on the right, 1 cube has been added to the middle of the second tier.



2. e.g.,

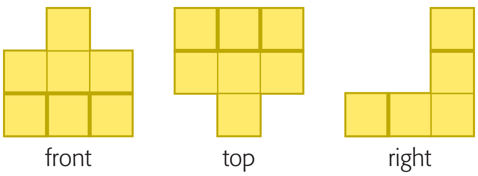


3. A and D are the same

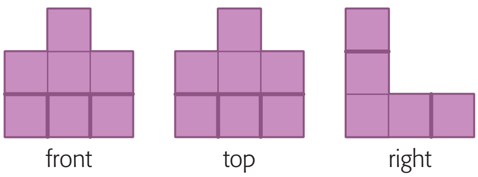
4. e.g., I would choose the drawings in set A. The isometric drawing provides a good representation of the 3-D object.

11.5 Rotating Cube Structures, pp. 469–470

1. a)



b)

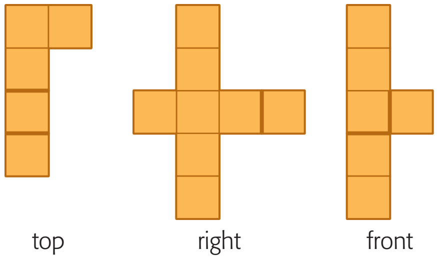


2. The structure was horizontally rotated 270° ccw.

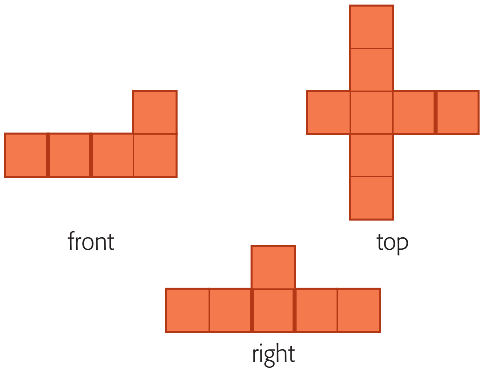
3. Naghma is correct. Ruiz's structure is the same as hers after a vertical rotation of 90° cw.

4. Objects B and C match the blue object.

5. a)



b)



c) e.g., Either rotation could occur in real life, but I think a horizontal rotation is more common. Airplanes bank to the right and the left when making turns. An airplane would only rotate vertically if it were doing aerobatics.

6. a) T, F, and L

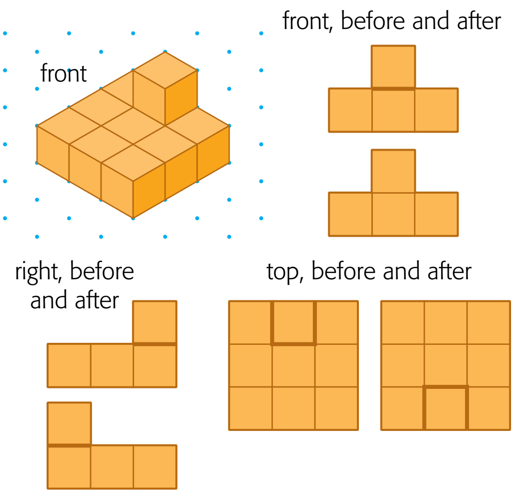
b) e.g., They are simple constructions and we use them every day, which makes them easy to recognize.

c) No, because you would only see the side view, which would be a vertical stack of cubes.

7. a) horizontal rotations of 90° cw and 270° ccw

b) Horizontal rotations of 90° cw, 180° cw, and 270° cw all match this view.

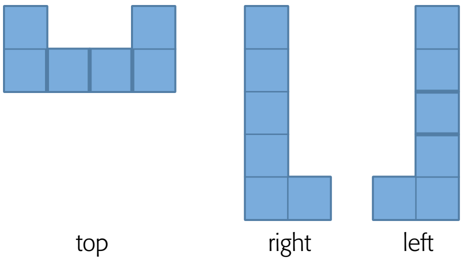
8. e.g.,



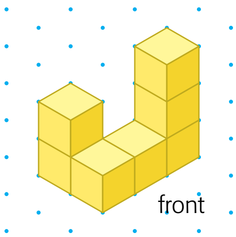
9. e.g., Looking at different views of a structure shows you how you would see the structure as you would if you walked around it. If a structure is not identical on all sides, it gives you information about what features the different sides have.

11.6 Communicate about Views, p. 475

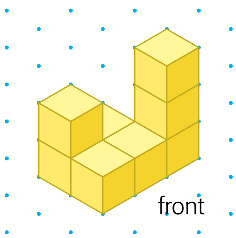
1. e.g., The structure has 12 visible cubes. The top view and side views show cubes behind that are not visible from the front.



2. a) First, I used 7 cubes to build a structure that matches the front view.



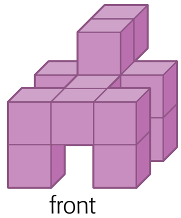
Then I turned my structure so the left face is showing. I did not need to add any cubes to match the left view.



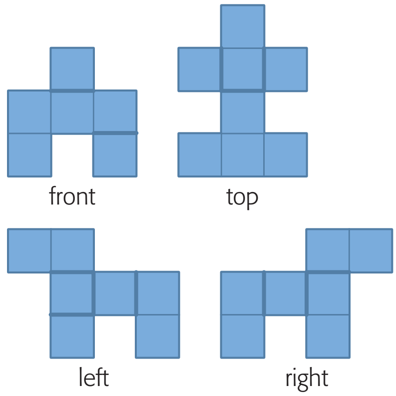
Finally, I looked down on my structure and added 1 more cube so the top view of my structure matched the top view shown.

b) My description is good because I sketched isometric drawings to represent what I did at each step. I also told the number of cubes needed each time and used appropriate mathematical language. I could improve my description by including isometric drawings of the back of the structure.

3. a)



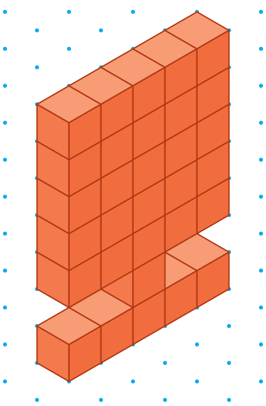
b) The structure is made with 12 cubes.

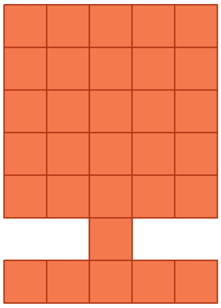


e.g.,

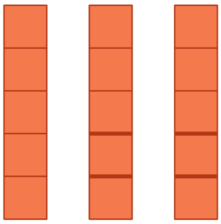
The structure is made with 12 cubes. It looks a bit like a dog that is missing its left front leg.

4. a) e.g., I made a model of the computer monitor at home. The model is made with 31 linking cubes. The screen is 5 cubes long by 5 cubes high by 1 cube deep. One cube links the centre of the bottom of the screen with the middle of the base. The base is made up of a row of 5 cubes.





front



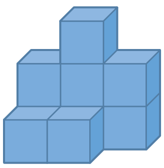
top left right

5. Different views give you information about how the pieces are assembled. If you have only one view, you might not know how the parts that are not visible go together.

Chapter Self-Test, p. 476

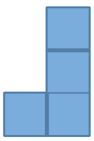
1. B

2. a)



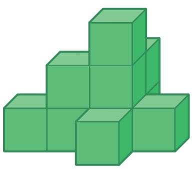
front

b)

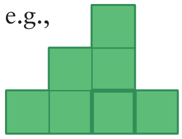


right

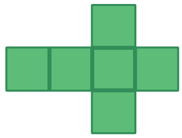
3. a) e.g.,



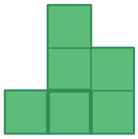
b) e.g.,



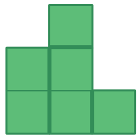
front



top

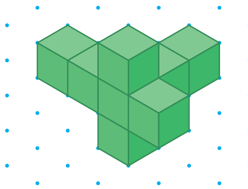


right



left

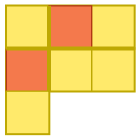
c) e.g.,



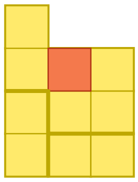
4. They represent the same structure. I made the first structure with linking cubes and rotated it 180° cw.

Chapter Review, p. 478

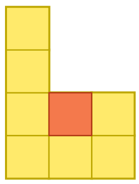
1. b)



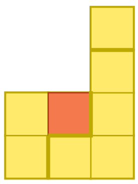
top



front

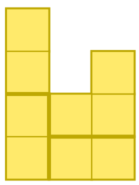


left

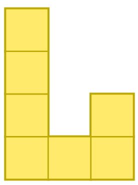


right

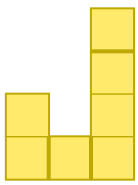
c) All views would look different, as shown.



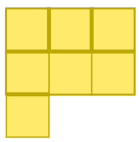
front



left

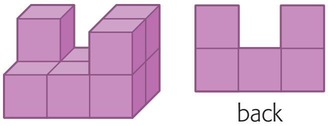


right

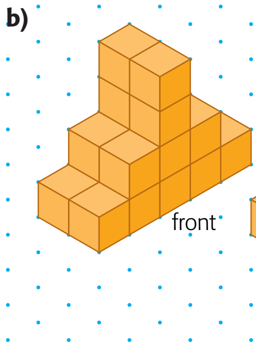


top

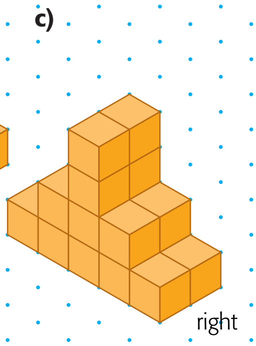
2.



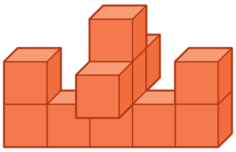
3. e.g., **b)**



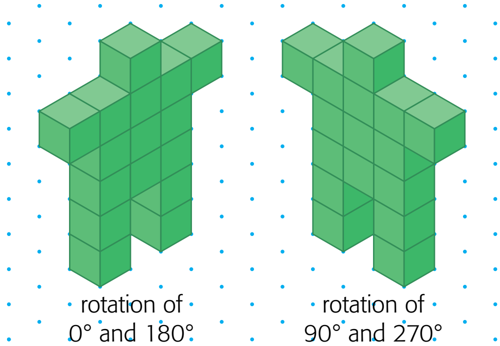
c)



4.



5. b)



6. e.g., Start with the body. Put nine linking cubes together to form a rectangle that is 3 cubes wide and 3 cubes high. Make each leg by connecting two linking cubes. Stick each leg onto the lower part of the body. To make the arms, stick one linking cube to each side of the body, at shoulder level. Then put one cube on top for the head.

Chapters 8–11

Cumulative Review, pp. 480–481

1. C
2. A
3. B
4. D
5. B
6. A
7. B

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O

P

R

Credits

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