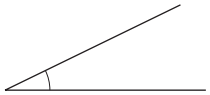
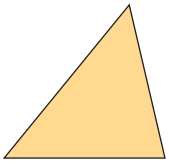
Extended Glossary

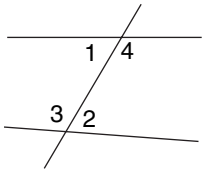
acute angle: an angle whose measure is less than 90°



acute triangle: a triangle with all angles less than 90°



alternate angles: two angles that are between two lines, but are on opposite sides of a transversal that intersects the two lines



Angles 1 and 2 are alternate angles.
Angles 3 and 4 are alternate angles.

approximation: a number close to the exact value of a quantity or an expression; the symbol $\doteq$ means "is approximately equal to"

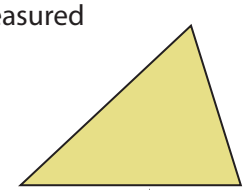
area: the number of square units needed to cover a surface; common units used to measure area include square centimetres and square metres

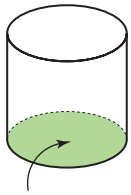
average speed: the speed that, if the object travelled at that speed constantly, would result in the same total distance being travelled in the same total time; to calculate average speed, the total distance travelled during the given time period is divided by the total time

In 4 h, a car travels 285 km.
Determine the average speed of the car.

$$\text{Average speed} = \frac{\text{Distance}}{\text{Time}} = \frac{285\text{ km}}{4\text{ h}} = 71.25\text{ km/h}$$

base: the side of a polygon, or the face of a solid or object, from which the height is measured



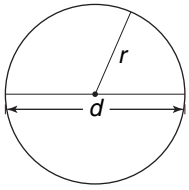


binomial: a polynomial with two terms

$3x + 8$ and $4x^3 - 7$ are binomials.

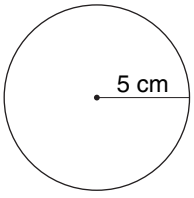
capacity: the amount a container can hold; common units used to measure capacity include millilitres and litres

circle: the set of points in a plane that are a given distance (the radius) from a fixed point (the centre)



The area of a circle is:
$A = \pi r^2$, where r is the radius
The circumference of a circle is:
$C = 2\pi r$, where r is the radius,
or $C = \pi d$, where d is the diameter
The circumference of a circle is also the perimeter of the circle.
The area of a circle with radius 5 cm is:

$$A = \pi(5)^2 = \pi(25) \doteq 79$$

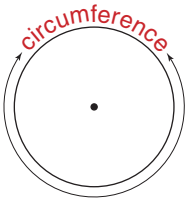


The area is approximately 79 cm².
The circumference of a circle with radius 5 cm is:

$$C = 2\pi(5) \doteq 31$$

The circumference is approximately 31 cm.

circumference: the distance around a circle

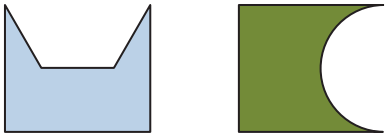


coefficient: the numerical factor of a term

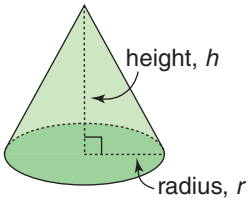
common factor: a number that is a factor of each of the given numbers

3 is a common factor of 9, 12, and 30.

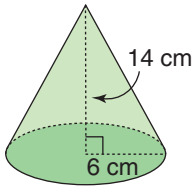
composite figure: a figure that is made up of other, simpler figures



cone: a solid that is formed by a region (the *base* of the cone) and all the line segments joining points in the base to a point not in the base

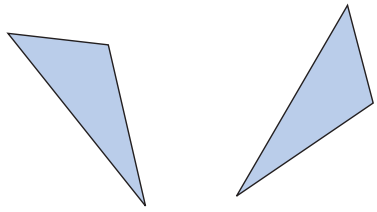


The volume of a cone is one-third the volume of the related cylinder and can be found using the formula:
$V = \frac{1}{3}$**(Base area)(Height)**
When the circular base has radius r, and the height of the cone is h, this formula becomes:
$V = \frac{1}{3}(\pi r^2)(h)$
The volume of a cone whose circular base has radius 6 cm and with height 14 cm is:
$V = \frac{1}{3} \times \pi \times (6)^2 \times (14)$
$\doteq 528$



The volume is approximately 528 cm³.

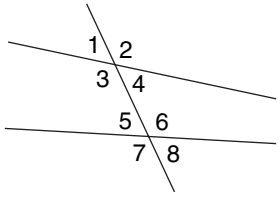
congruent: figures that have the same size and shape, but not necessarily the same orientation



constant term: a number

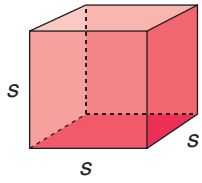
coordinates: the numbers in an ordered pair that locate a point on a grid

corresponding angles: two angles that are on the same side of a transversal that intersects two lines and on the same side of each line

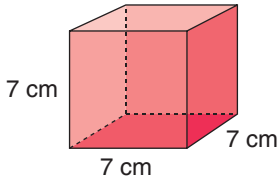


Angles 1 and 5 are corresponding angles.
Angles 2 and 6 are corresponding angles.
Angles 3 and 7 are corresponding angles.
Angles 4 and 8 are corresponding angles.

cube: a rectangular solid whose length, width, and height are all equal

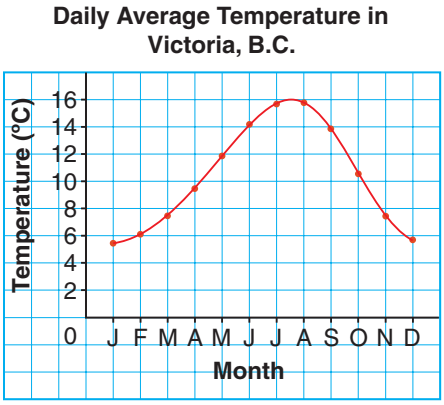


The volume of a cube is:
$V = s^3$**, where s is the edge length**
The volume of a cube with edge length 7 cm is:
$V = (7)^3$
$= 343$

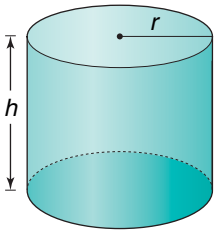


The volume is 343 cm³.

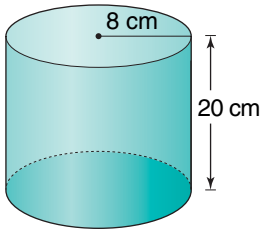
curve of best fit: a curve that passes as close as possible to a set of plotted points



cylinder: a solid with two parallel, congruent, circular bases

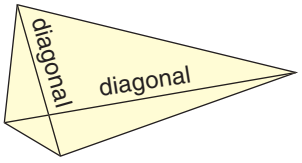


The volume of a cylinder can be found using the formula:
V **= (Base area)(Height)**
$V = (\pi r^2)(h)$,
where the circular base has radius r**, and the height of the cylinder is** h
The volume of a cylinder whose circular base has radius 8 cm and with height 20 cm is:
$V = \pi \times (8)^2 \times 20$
$\doteq 4021$

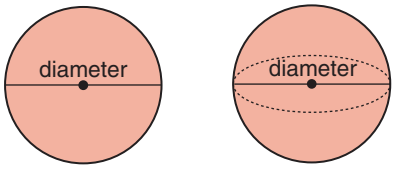


The volume is approximately 4021 cm³.

diagonal: a line segment that joins two vertices of a figure, but is not a side



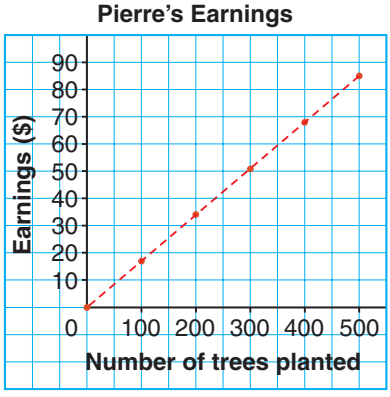
diameter: a line segment that joins two points on a circle (or surface of a sphere) and passes through its centre; the diameter of a circle (or sphere) is twice the length of the radius



direct variation: when one quantity is a constant multiple of another quantity; that is, the quantities are proportional; the graph that represents direct variation is a straight line that passes through the origin

Pierre has a summer job planting trees. He earns 17¢ for each tree he plants. This situation represents direct variation. To determine Pierre's earnings in dollars, we multiply the number of trees planted by 0.17.
A table and graph for this relation are shown.

Trees planted	Earnings ($)
0	0
100	17.00
200	34.00
300	51.00
400	68.00
500	85.00



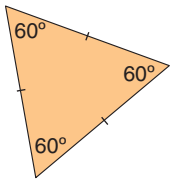
distributive law: the property stating that a product can be written as a sum or difference of two products; for example:

$a(b + c) = ab + ac$ **and**
$a(b - c) = ab - ac$

equation: a mathematical statement indicating that two expressions are equal

equation of a line: an equation for the relationship between the coordinates of every point on a line

equilateral triangle: a triangle with three equal sides; each angle is 60°



equivalent: having the same value

$\frac{2}{3}$ and $\frac{6}{9}$ are equivalent fractions.
2 : 3 and 6 : 9 are equivalent ratios.

equivalent expressions: numerical expressions that have the same value; if the expressions contain variables, expressions that result in the same value for all possible values of the variable

$3(2x + 3)$ and $6x + 9$ are equivalent expressions.

estimate: a reasoned guess that is close to the actual value, without calculating it exactly

evaluate an expression: substitute a number for each variable in the expression, then work out the resulting arithmetic expression applying the order of operations rules

Evaluate $2x^2 + 3x - 5$, when $x = -2$.
Replace each x with -2, placing each number in brackets to prevent errors with signs.

$$\begin{aligned} 2x^2 + 3x - 5 &= 2(-2)^2 + 3(-2) - 5 \\ &= 2(4) + 3(-2) - 5 \\ &= 8 - 6 - 5 \\ &= -3 \end{aligned}$$

expand an expression: use the distributive law to multiply parts of an expression

Expand $2(3x^2 - 2x + 7)$.
Use the distributive law, using brackets to prevent errors with signs.

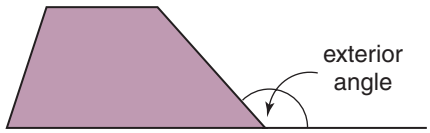
$$\begin{aligned} &2(3x^2 - 2x + 7) \\ &= 2(3x^2) + 2(-2x) + 2(7) \\ &= 6x^2 - 4x + 14 \end{aligned}$$

exponent: a number, placed at the right of and above another number or expression, that tells how many times the number or expression before it is used as a factor

3 is the exponent in 6^3.
6^3 means $6 \times 6 \times 6$.
2 is the exponent in x^2.
x^2 means $(x)(x)$.

expression: a mathematical phrase made up of numbers and/or variables connected by operations

exterior angle: the angle between one side of a polygon and the extension of an adjacent side of the polygon



factor: any integer that divides exactly into a given integer; to factor an integer means to write it as a product of integers

The factors of 20 are 1, 2, 4, 5, 10, and 20, because $1 \times 20 = 2 \times 10 = 4 \times 5 = 20$.

first differences: when data are arranged in a table, with the data in the first column increasing in constant steps, the first differences are found by subtracting consecutive numbers in the second column; if all the first differences are equal, then the relationship is linear

Consider the relationship between the time worked and the money earned.

Time worked (h)	Money earned ($)	Change in money earned ($)
0	0	
		$9 - 0 = 9$
1	9	
		$18 - 9 = 9$
2	18	
		$27 - 18 = 9$
3	27	
		$36 - 27 = 9$
4	36	

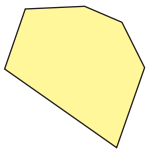
All the first differences are 9.
Since they are constant, we know the relationship is linear.

fixed cost: a cost that remains constant

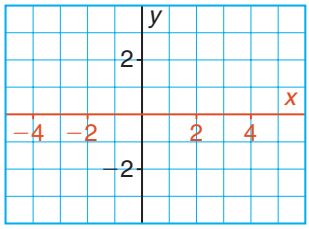
formula: an equation that describes the relationship between two or more quantities

The formula that describes how the area, A, of a rectangle is related to its length, ℓ, and width, w, is
$A = \ell \times w$, or
$A = \ell w$

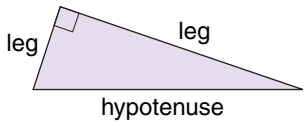
hexagon: a polygon with six sides



horizontal axis: the horizontal number line on a coordinate grid



hypotenuse: the side opposite the right angle in a right triangle



integers: the set of numbers
$\ldots -3, -2, -1, 0, 1, 2, 3 \ldots$

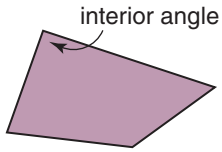
interest (simple): money paid for the use of money, usually at a predetermined percent. When P is the amount invested or borrowed, r the annual rate of interest written as a decimal, and t the time in years, then I, the interest, is given by the formula $I = Prt$

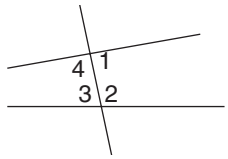
Juanita purchased a \$500 bond at an annual interest rate of 6%. After 6 months, she received the following interest:

$$\begin{aligned} I &= Prt \\ &= 500 \times 0.06 \times \frac{6}{12} \\ &= 500 \times 0.06 \times 0.5 \\ &= 15 \end{aligned}$$

The interest is \$15.

interior angles: angles inside a polygon; angles that are between two lines and are on the same side of a transversal that intersects the lines





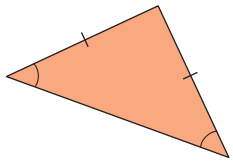
1 and 2 are interior angles.
3 and 4 are interior angles.

intersecting lines: lines that meet or cross; lines that have one point in common

inverse operation: an operation that reverses another operation

Subtraction is the inverse of addition and division is the inverse of multiplication.

isosceles triangle: a triangle with two equal sides; the angles opposite the equal sides are also equal

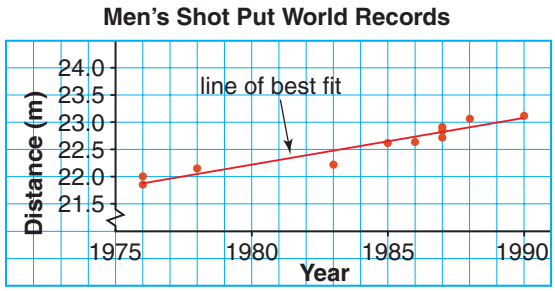


legs: the two shorter sides in a right triangle; see *hypotenuse*

like terms: terms that have the same variables with the same exponent

$4x$ and $-3x$ are like terms.
$4x$ and $-3x^2$ are not like terms.

line of best fit: a line that passes as close as possible to a set of plotted points



line segment: the part of a line between two points on the line, including the two points

linear relation (relationship): a relation (relationship) that can be represented by a straight line graph

mass: a measure of the amount of material in an object; common units used to measure mass are grams and kilograms

mean: one measure of the average of a set of numbers; to find the mean, add the numbers in the set then divide their sum by the number of terms in the set

One week Nora walked these distances:
4 km, 5 km, 3 km, 4 km, 5 km, 4 km, 3 km.
The total distance she walked is
4 km + 5 km + 3 km + 4 km + 5 km + 4 km + 3 km = 28 km
There are 7 terms.
So, the mean distance Nora walked each day is:

$$\frac{28\text{ km}}{7} = 4\text{ km}$$

median: one measure of average of a set of numbers; it is the middle number of a set of numbers arranged in numerical order; if there are two middle numbers, their mean is the median of the data set

In the last 6 basketball games, Zack has scored these points:
12, 10, 14, 12, 9, 10
Arrange from least to greatest:
9, 10, 10, 12, 12, 14
There are 6 numbers in the set, so the median is the mean of the 3rd and 4th numbers.

$$\frac{10 + 12}{2} = \frac{22}{2} = 11$$

The median number of points Zack scored is 11.

monomial: a polynomial with one term

14 and $5x^2$ are monomials.

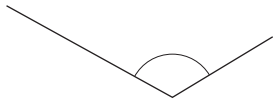
multiple: the product of a given number and an integer

Some multiples of 8 are 8, 16, 24, 32, …

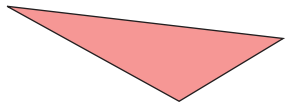
natural numbers: the set of numbers 1, 2, 3, …

non-linear relation (relationship): a relation (relationship) that cannot be represented by a straight line graph

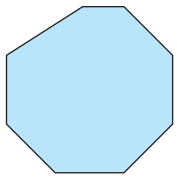
obtuse angle: an angle greater than 90° and less than 180°



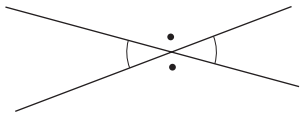
obtuse triangle: a triangle with one obtuse angle



octagon: a polygon with eight sides



opposite angles: the equal angles that are formed by two intersecting lines



opposite integers: two integers with a sum of 0

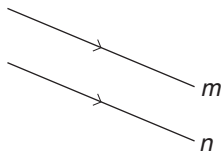
+3 and −3 are opposite integers.

opposite polynomials: two polynomials with a sum of 0

$2x^2 - 5x + 7$ and $-2x^2 + 5x - 7$ are opposite polynomials.

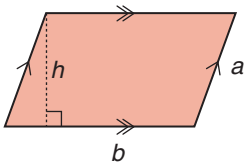
origin: the point (0, 0) on a graph; this is the point where the axes intersect

parallel lines: lines in the same plane that do not intersect

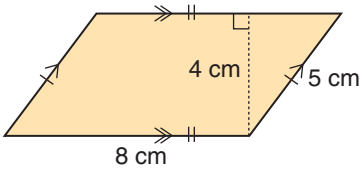


Lines *m* and *n* are parallel. To show this, we draw a matching arrowhead on each line.

parallelogram: a quadrilateral with opposite sides parallel; the opposite sides are also equal



The perimeter of a parallelogram is:
$P = 2a + 2b$
The area is: $A = bh$
For the parallelogram below,

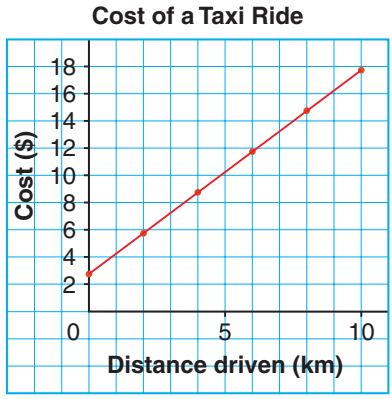


$P = 2 \times 8 + 2 \times 5$
$= 16 + 10$
$= 26$
The perimeter is 26 cm.
$A = 8 \times 4$
$= 32$
The area is 32 cm².

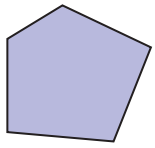
partial variation: when one quantity equals a fixed value plus a constant multiple of another quantity; the graph that represents partial variation is a straight line that does *not* pass through the origin

A taxi company charges a fixed cost of \$2.75 plus \$1.50 per kilometre.
To determine the total cost of a trip, we multiply the distance in kilometres by \$1.50 and add the result to \$2.75. A table and graph for this relation are shown.

Distance driven (km)	Cost ($)
0	2.75
2	5.75
4	8.75
6	11.75
8	14.75
10	17.75



pentagon: a polygon with five sides

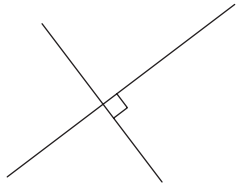


percent: means "out of 100"; it is a ratio that compares a number to 100

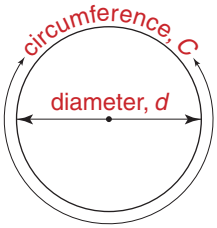
A percent can be written as a fraction with denominator 100, or as a decimal.
$45\% = \frac{45}{100} = 0.45$
A CD that sells for \$17.99 is on sale for 25% off. What is the sale price?
The sale price is 100% − 25% = 75% of the original price, or 75% of \$17.99.
Let b dollars represent the sale price.
$b : 17.99 = 75 : 100$
Write this proportion in fraction form.
$\frac{b}{17.99} = \frac{75}{100}$
To isolate b, multiply each side of the equation by 17.99.
$\frac{b}{17.99} \times 17.99 = 0.75 \times 17.99$
$b = 13.4925$
Since prices are given in dollars and cents, the value of b is rounded to 2 decimal places. The sale price is \$13.49.

perimeter: the distance around a closed figure; see *circle, parallelogram, rectangle, semicircle, square, trapezoid,* and *triangle*

perpendicular lines: lines that intersect at right angles (90°)



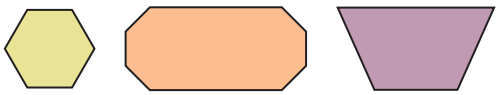
pi (π): the ratio of the circumference of a circle to its diameter



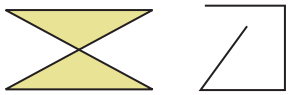
$C : d = \pi : 1$

polygon: a closed figure that consists of line segments that only intersect at their endpoints

These figures are polygons.



These figures are not polygons.



polynomial: a mathematical expression with one or more algebraic terms

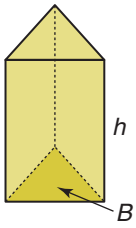
$2x$, $3 - 5x$, and $x^2 + 2x - 8$ are polynomials.

power: a number with an exponent; see *exponent*

5^3 is a power of 5

prediction: a statement of what you think will happen

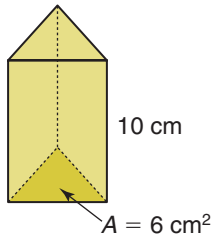
prism: a solid with two congruent and parallel faces (the *bases*); all other faces are parallelograms



The volume of a prism can be found using the formula:

$V = (\text{Base area})(\text{Height})$
$= B \times h$, or Bh

For the prism below,



$V = 6 \times 10$
$= 60$

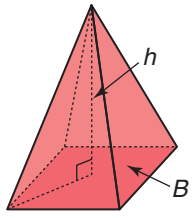
The volume is 60 cm³.

proportion: a statement that two ratios are equal; for example, $x : 12 = 2 : 5$

To solve for an unknown term in a proportion, write the ratios in fraction form, then multiply to isolate the term that contains x.

$$\frac{x}{12} = \frac{2}{5}$$
$$12 \times \frac{x}{12} = 12 \times \frac{2}{5}$$
$$x = \frac{12 \times 2}{5}$$
$$x = 4.8$$

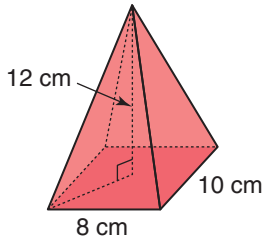
pyramid: a solid with one face that is a polygon (*base*) and other faces that are triangles with a common vertex



The volume of a pyramid is one-third the volume of the related prism and can be found using the formula:

$V = \frac{1}{3}(\text{Base area})(\text{Height})$

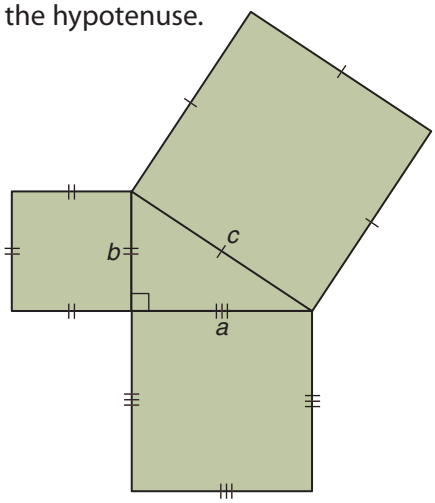
For the pyramid below,



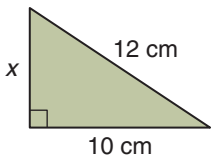
$V = \frac{1}{3}(8 \times 10)(12)$
$= 320$

The volume is 320 cm³.

Pythagorean Theorem: in any right triangle, the sum of the areas of the squares on the two shorter sides is equal to the area of the square on the hypotenuse.



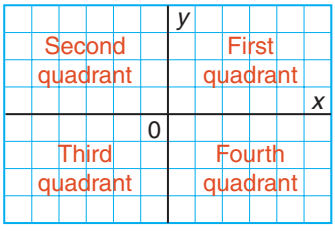
In a right triangle: $a^2 + b^2 = c^2$
For the right triangle below,



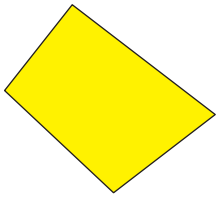
$10^2 + x^2 = 12^2$	**Simplify each side.**
$100 + x^2 = 144$	**Isolate the variable.**
$100 + x^2 - 100 = 144 - 100$	
$x^2 = 44$	**To determine x, take the square root of each side.**
$x = \sqrt{44}$	
$x \doteq 6.6$	

The third side measures approximately 6.6 cm.

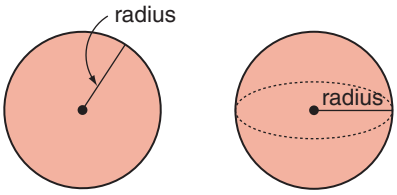
quadrant: one of the four regions into which the coordinate axes divide a grid



quadrilateral: a polygon with four sides



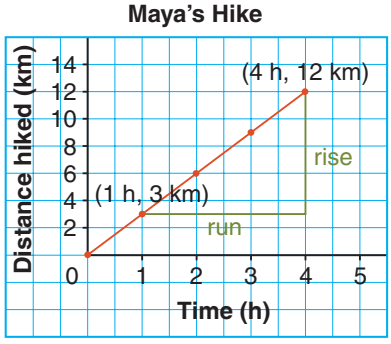
radius (*plural,* radii): the distance from the centre of a circle to any point on the circumference; also, the distance from the centre of a sphere to any point on the surface of the sphere



rate: a certain quantity considered in relation to another quantity

Speed is the rate at which distance changes in relation to time.

rate of change: a measure of how one quantity changes with respect to another; it can be determined by calculating $\frac{\text{rise}}{\text{run}}$



Choose 2 points on the line:
(1, 3) and (4, 12)
rise = 12 km − 3 km = 9 km
run = 4 h − 1 h = 3 h

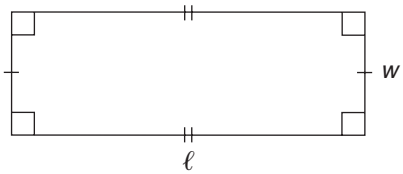
$$\text{Rate of change} = \frac{\text{rise}}{\text{run}} = \frac{9\text{ km}}{3\text{ h}} = 3\text{ km/h}$$

The rate of change is 3 km/h.
This is Maya's average hiking speed.

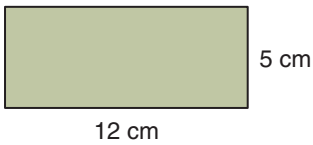
ratio: a comparison of two quantities

Andrew is making orange punch for a party. He uses 2 cups of soda water for every 3 cups of orange juice. The ratio of soda water to orange juice is 2 : 3.

rectangle: a quadrilateral with four right angles

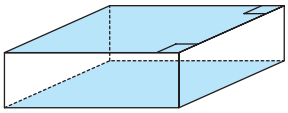


The perimeter of a rectangle is:
$P = 2\ell + 2w$
The area is: $A = \ell w$
For the rectangle below,

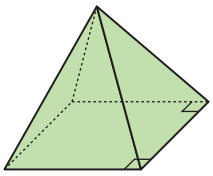


$P = 2 \times 12 + 2 \times 5$
$= 24 + 10$
$= 34$
The perimeter of the rectangle is 34 cm.
$A = 12 \times 5$
$= 60$
The area is 60 cm^2.

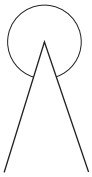
rectangular prism: a prism with rectangular faces



rectangular pyramid: a pyramid with a rectangular base

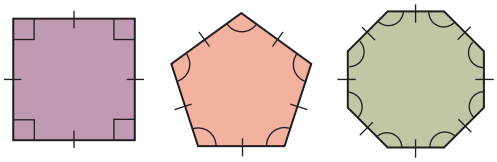


reflex angle: an angle greater than 180° and less than 360°



regular polygon: a polygon with all sides equal and all angles equal

The polygons below are regular polygons.

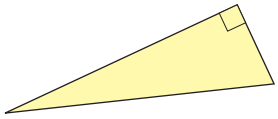


relation (relationship): a rule that explains how two quantities or measures are related

Nikhil enjoys cycling long distances. His distance travelled in kilometres is related to the cycling time by the rule: multiply the time in hours by 16. The relation can be represented by the equation $d = 16t$, where d is the distance in kilometres and t is the time in hours.

right angle: a 90° angle

right triangle: a triangle with one right angle



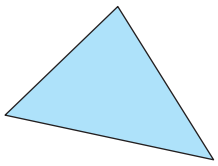
rise: the vertical distance between two points; see *rate of change*

run: the horizontal distance between two points; see *rate of change*

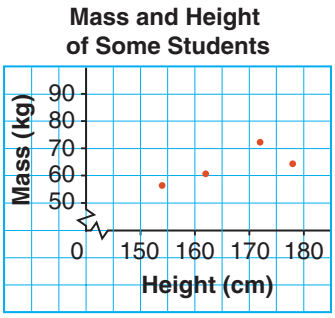
scale: the ratio of the distance between two points on a map, model, or diagram to the actual distance; also, the numbers labelling the coordinate axes on a grid

scale drawing: a drawing in which the lengths are an enlargement or a reduction of actual lengths

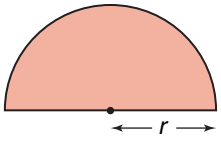
scalene triangle: a triangle with no equal sides



scatter plot: a graph of data that are a set of points

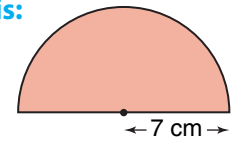


semicircle: half a circle



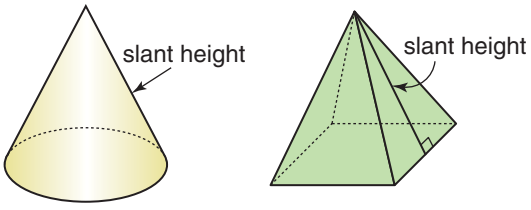
The area of a semicircle is:
$A = \frac{1}{2}\pi r^2$, **where** r **is the radius**
The perimeter of a semicircle is:
$P = \pi r + 2r$, **where** r **is the radius**

The area of a semicircle with radius 7 cm is:



$A = \frac{1}{2} \times \pi \times 7^2$
$= \frac{1}{2} \times \pi \times 49$
$\doteq 77$
The area is approximately 77 cm^2.
The perimeter of a semicircle with radius 7 cm is:
$P = \pi \times 7 + 2 \times 7$
$\doteq 36$
The perimeter is approximately 36 cm.

slant height: the distance from the top of a cone or pyramid to its base, measured along its sloped surface

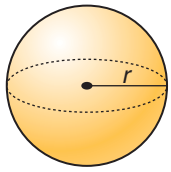


solving an equation: determining the value of the variable that makes the equation a true statement

Solve the equation $5x + 7 = 11 + 3x$.
Use inverse operations to collect like terms on one side of the equation.
Subtract $3x$ from each side, then simplify.
$5x + 7 - 3x = 11 + 3x - 3x$
$2x + 7 = 11$
Subtract 7 from each side, then simplify.
$2x + 7 - 7 = 11 - 7$
$2x = 4$
Divide each side by 2.
$\frac{2x}{2} = \frac{4}{2}$
$x = 2$

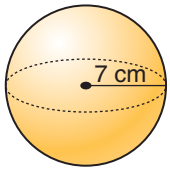
speed: see *average speed*

sphere: the set of points in space that are a given distance (the *radius*) from a fixed point (the centre)



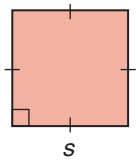
The volume of a sphere is:
$V = \frac{4}{3}\pi r^3$, **where** r **is the radius**

The volume of a sphere with radius 7 cm is:



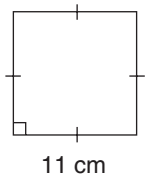
$V = \frac{4}{3} \times \pi \times (7)^3$
$= \frac{4}{3} \times \pi \times 343$
$\doteq 1437$
The volume of the sphere is approximately 1437 cm^3.

square: a rectangle with four equal sides



The perimeter of a square is: $P = 4s$
The area is: $A = s^2$

For the square below,



$P = 4 \times 11$
$= 44$

The perimeter is 44 cm.

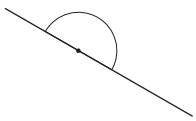
$A = 11^2$
$= 121$

The area is 121 cm^2.

square root: a number which, when multiplied by itself, results in a given number

5 and -5 are the square roots of 25, since $5^2 = 25$ and $(-5)^2 = 25$. The notation $\sqrt{25}$ represents the positive square root only.

straight angle: a 180° angle



substituting into an equation: in an equation, replacing a variable with a number then solving the equation for the remaining variable

Annie's earnings, E dollars, are given by the equation $E = 8.5n$, where n is the time in hours she works.
To find the time Annie would have to work to earn \$150, substitute $E = 150$ then solve the equation for n.

$150 = 8.5n$ **Divide each side by 8.5.**

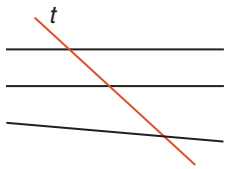
$\frac{150}{8.5} = \frac{8.5\,n}{8.5}$

$17.647 \doteq n$

Annie would have to work about 18 h to earn \$150.

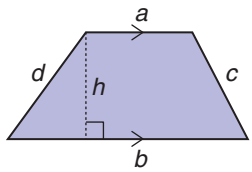
term: when an algebraic expression is written as the sum of several quantities, each quantity is a term of the expression

transversal: a line that intersects two or more lines

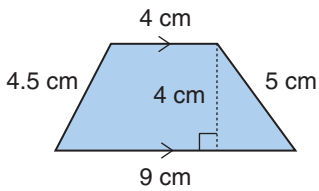


Line t is a transversal.

trapezoid: a quadrilateral with one pair of parallel sides



The perimeter of a trapezoid is:
$P = a + b + c + d$
The area of a trapezoid is:
$A = \frac{1}{2}(a + b)h$
For the trapezoid below,



$P = 4 + 5 + 9 + 4.5$
$= 22.5$

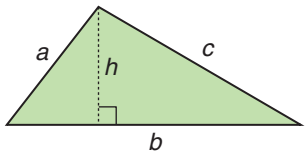
The perimeter is 22.5 cm.

$A = \frac{1}{2}(4 + 9)(4)$
$= \frac{1}{2}(52)$
$= 26$

The area is 26 cm^2.

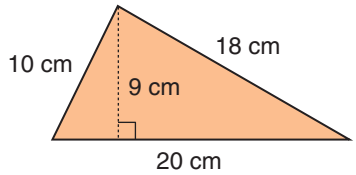
trend: a relationship between measures that is shown by a graph of data

triangle: a polygon with three sides



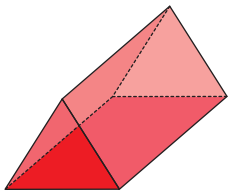
The perimeter of a triangle is:
$P = a + b + c$
The area of a triangle is:
Area $= \frac{1}{2}$(Base)(Height)
$A = \frac{1}{2}bh$

For the triangle shown below,

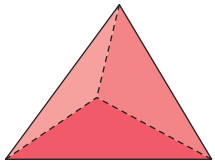


$P = 10 + 18 + 20$
$= 48$
The perimeter is 48 cm.
$A = \frac{1}{2}(20 \times 9)$
$= 90$
The area is 90 cm².

triangular prism: a prism with triangular bases



triangular pyramid: a pyramid with a triangular base



unit price: the price of one item or the price of a particular mass or volume of an item

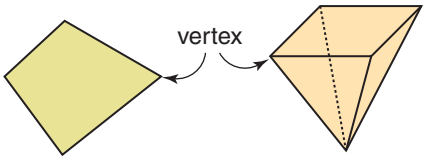
$1.15 per litre is a unit price.
It is written as $1.15/L.

unit rate: the quantity associated with a single unit of another quantity

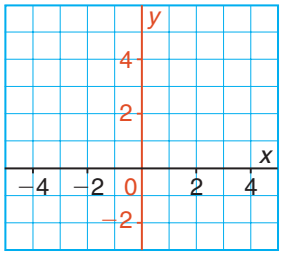
6 m in 1 s is a unit rate.
It is written as 6 m/s.

variable: a letter or symbol used to represent a quantity that varies

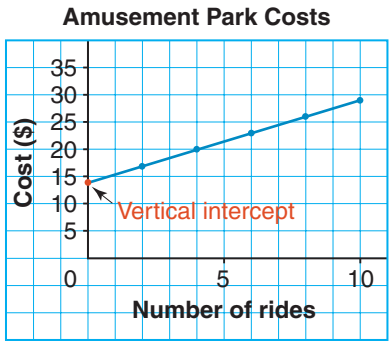
vertex (*plural,* vertices): the corner of a figure or solid



vertical axis: the vertical number line on a coordinate grid



vertical intercept: the vertical coordinate of the point at which the graph of a line intersects the vertical axis



volume: the amount of space occupied by an object; common units used to measure volume include cubic metres and cubic centimetres

whole numbers: the set of numbers 0, 1, 2, 3, …

zero pair: two opposite integers whose sum is 0; two opposite algebra tiles whose sum is 0