**acute angle:** an angle whose measure is less than $90^\circ$

**acute triangle:** a triangle with all angles less than $90^\circ$

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

**approximation:** a number close to the exact value of a quantity or an expression; the symbol $\approx$ 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

**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:

$$C = 2\pi r$$

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:

$$A = \pi (5)^2$$

$$= \pi (25)$$

$$\approx 79$$

The area is approximately 79 cm$^2$.

The circumference of a circle with radius 5 cm is:

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

$$\approx 31$$

The circumference is approximately 31 cm.
**circumference:** the distance around a circle

![Circumference](image)

**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

![Composite Figure](image)

**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

![Cone](image)

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

\[ V = \frac{1}{3} \text{ (Base area)} \times \text{ (Height)} \]

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:

\[ V = \frac{1}{3} \pi \times (6)^2 \times (14) = 528 \]

The volume is approximately 528 cm³.

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

![Congruent](image)

**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

![Cube](image)

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

Daily Average Temperature in Victoria, B.C.

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>16</td>
</tr>
<tr>
<td>Feb</td>
<td>14</td>
</tr>
<tr>
<td>Mar</td>
<td>12</td>
</tr>
<tr>
<td>Apr</td>
<td>10</td>
</tr>
<tr>
<td>May</td>
<td>8</td>
</tr>
<tr>
<td>Jun</td>
<td>6</td>
</tr>
<tr>
<td>Jul</td>
<td>4</td>
</tr>
<tr>
<td>Aug</td>
<td>2</td>
</tr>
<tr>
<td>Sep</td>
<td>8</td>
</tr>
<tr>
<td>Oct</td>
<td>10</td>
</tr>
<tr>
<td>Nov</td>
<td>12</td>
</tr>
<tr>
<td>Dec</td>
<td>16</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Trees planted</th>
<th>Earnings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>17.00</td>
</tr>
<tr>
<td>200</td>
<td>34.00</td>
</tr>
<tr>
<td>300</td>
<td>51.00</td>
</tr>
<tr>
<td>400</td>
<td>68.00</td>
</tr>
<tr>
<td>500</td>
<td>85.00</td>
</tr>
</tbody>
</table>

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

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

\[ a(b + c) = ab + ac \text{ and } a(b - c) = ab - ac \]
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

\[ \frac{2}{3} \text{ and } \frac{6}{9} \text{ are equivalent fractions.} \]

\[ 2 : 3 \text{ and } 6 : 9 \text{ are equivalent ratios.} \]

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

\[ 3(2x + 3) \text{ and } 6x + 9 \text{ are equivalent expressions.} \]

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.

\[
2x^2 + 3x - 5 = 2(-2)^2 + 3(-2) - 5
= 2(4) + 3(-2) - 5
= 8 - 6 - 5
= -3
\]

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.

\[
2(3x^2 - 2x + 7)
= 2(3x^2) + 2(-2x) + 2(7)
= 6x^2 - 4x + 14
\]

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

\[ 3 \text{ is the exponent in } 6^3. \]

\[ 6^3 \text{ means } 6 \times 6 \times 6. \]

\[ 2 \text{ is the exponent in } x^2. \]

\[ x^2 \text{ means } (x)(x). \]

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.

<table>
<thead>
<tr>
<th>Time worked (h)</th>
<th>Money earned ($)</th>
<th>Change in money earned ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>36</td>
</tr>
</tbody>
</table>

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, \( \ell \), and width, \( w \), is
\[
A = \ell \times w, \text{ or } A = \ell w
\]

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

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

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

\[
I = Prt
= 500 \times 0.06 \times \frac{6}{12}
= 500 \times 0.06 \times 0.5
= 15
\]
The interest is $15.
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 5x² 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
2x² − 5x + 7 and −2x² + 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.

<table>
<thead>
<tr>
<th>Distance driven (km)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.75</td>
</tr>
<tr>
<td>2</td>
<td>5.75</td>
</tr>
<tr>
<td>4</td>
<td>8.75</td>
</tr>
<tr>
<td>6</td>
<td>11.75</td>
</tr>
<tr>
<td>8</td>
<td>14.75</td>
</tr>
<tr>
<td>10</td>
<td>17.75</td>
</tr>
</tbody>
</table>

**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 ($\pi$): 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:

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

For the prism below,

$$V = 6 \times 10$$

$$V = 60$$

The volume is 60 cm$^3$.

**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,

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

$$V = 320$$

The volume is 320 cm$^3$. 
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,

\[
\begin{align*}
10^2 + x^2 &= 12^2 & \text{Simplify each side.} \\
100 + x^2 &= 144 & \text{Isolate the variable.} \\
x^2 &= 44 & \text{To determine } x, \text{ take the square root of each side.} \\
x &= \sqrt{44} \\
x &\approx 6.6
\end{align*}
\]

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)

\[
\begin{align*}
\text{rise} &= 12 \text{ km} - 3 \text{ km} = 9 \text{ km} \\
\text{run} &= 4 \text{ h} - 1 \text{ h} = 3 \text{ h} \\
\text{Rate of change} &= \frac{\text{rise}}{\text{run}} \\
&= \frac{9 \text{ km}}{3 \text{ h}} \\
&= 3 \text{ km/h}
\end{align*}
\]

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: \[ A = \ell \times w \]
For the rectangle below,

\[
\begin{align*}
P &= 2 \times 12 + 2 \times 5 \\
 &= 24 + 10 \\
 &= 34
\end{align*}
\]
The perimeter of the rectangle is 34 cm.
\[
\begin{align*}
A &= 12 \times 5 \\
 &= 60
\end{align*}
\]
The area is 60 cm².

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:
\[
A = \frac{1}{2} \pi r^2, \text{ where } r \text{ is the radius}
\]

The perimeter of a semicircle is:
\[
P = \pi r + 2r, \text{ where } r \text{ is the radius}
\]

The area of a semicircle with radius 7 cm is:
\[
A = \frac{1}{2} \pi \times 7^2 = \frac{1}{2} \pi \times 49 \\
\approx 77
\]

The area is approximately 77 cm\(^2\).

The perimeter of a semicircle with radius 7 cm is:
\[
P = \pi \times 7 + 2 \times 7 \\
\approx 36
\]

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:
\[
V = \frac{4}{3} \pi r^3, \text{ where } r \text{ is the radius}
\]

The volume of a sphere with radius 7 cm is:
\[
V = \frac{4}{3} \pi \times (7)^3 \\
= \frac{4}{3} \pi \times 343 \\
\approx 1437
\]

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 cm².

**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 \( n \).

\[
150 = 8.5n \\
150 \div 8.5 = n \\
17.647 \div n \\
Annie would have to work about 18 h to earn $150.
\]

**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 cm².

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

**Amusement Park Costs**

<table>
<thead>
<tr>
<th>Number of rides</th>
<th>Vertical intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

**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