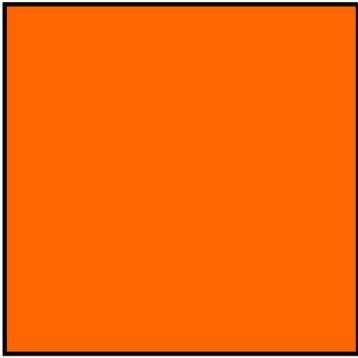
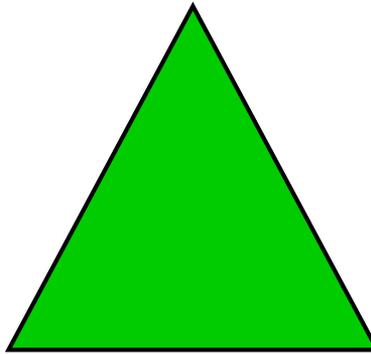


First shapes

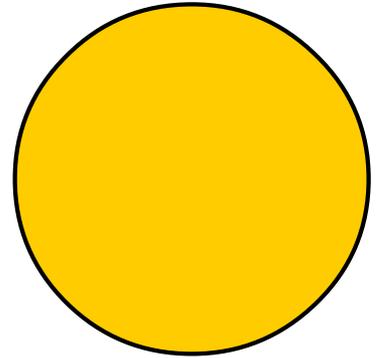
From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com



square



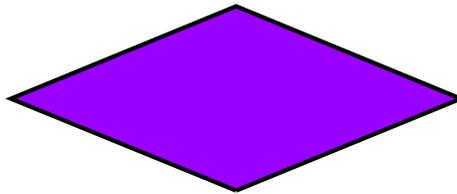
triangle



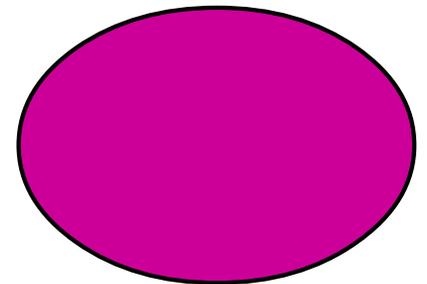
circle



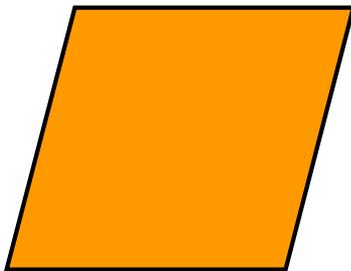
rectangle



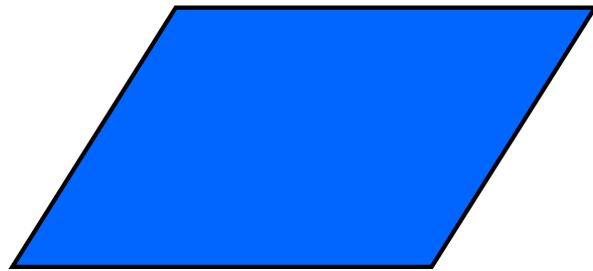
**diamond
(rhombus)**



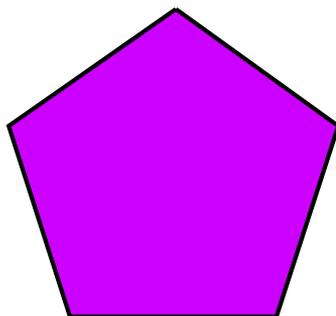
oval



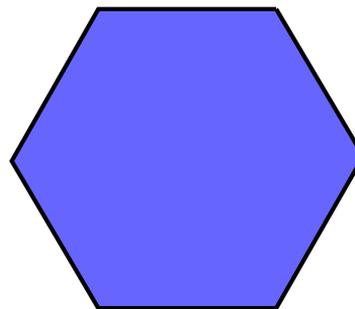
rhombus



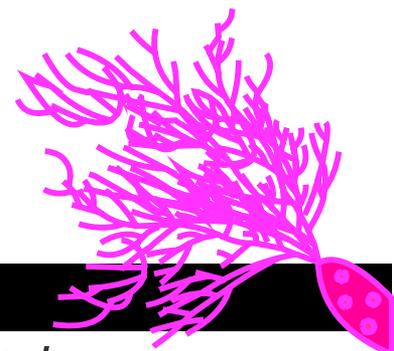
parallelogram



pentagon



hexagon

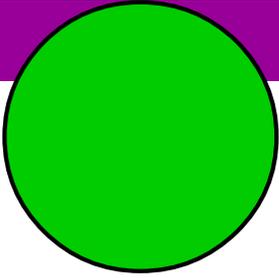


Basic shapes

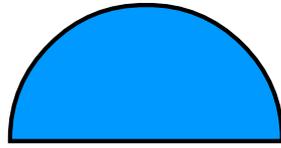
From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

Two-dimensional (2D) shapes are plane or flat shapes, having only the two dimensions of length and breadth (width).

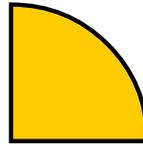
Examples



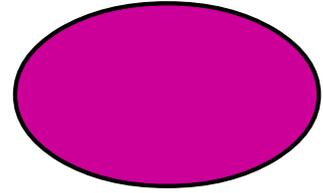
circle



semicircle



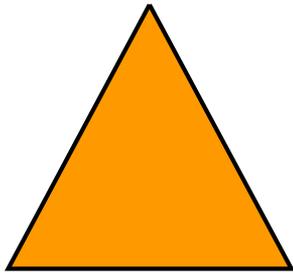
quadrant



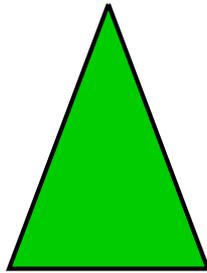
ellipse

Polygons - plane shapes having three or more straight sides.

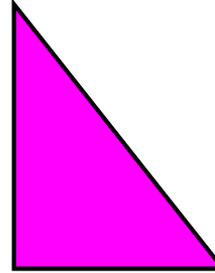
triangles - 3 sides



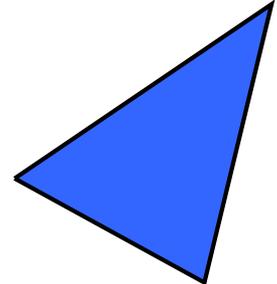
equilateral



isosceles

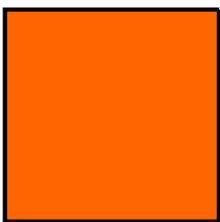


right-angled

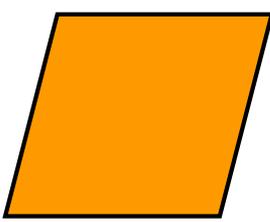


scalene

quadrilaterals - 4 sides



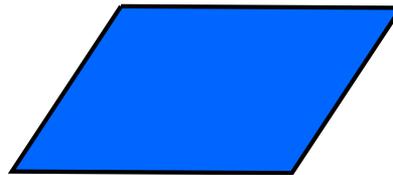
square



rhombus



rectangle



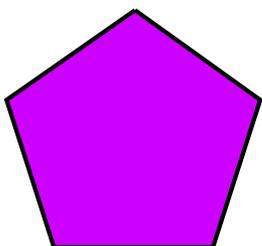
parallelogram



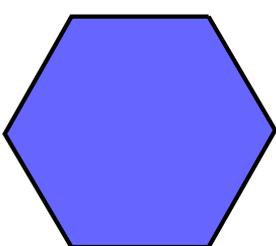
trapezoid (US)

trapezium (UK)

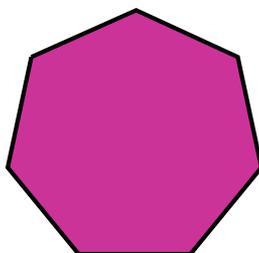
Regular polygons have all sides and angles equal.



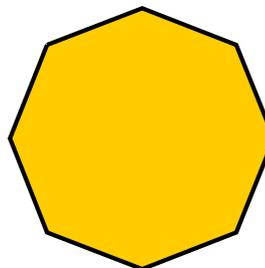
pentagon



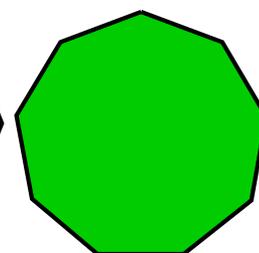
hexagon



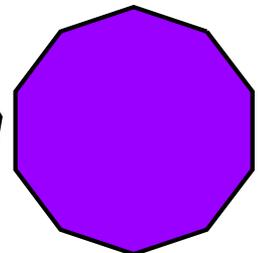
heptagon



octagon



nonagon



decagon

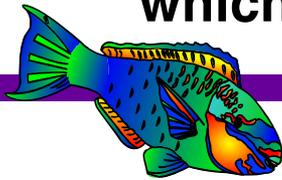
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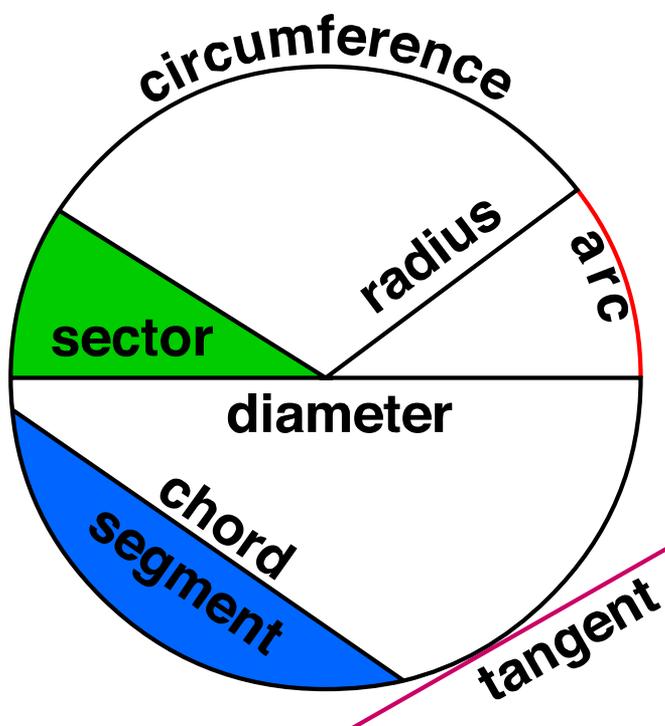
Circle

From: A Maths Dictionary for Kids by Jenny Eather at www.amathsdictionaryforkids.com

A circle is a plane shape bounded by a continuous line which is always the same distance from the centre.



Circle terminology



Circumference The distance around a circle.

Radius The distance from the centre of a circle to the circumference. Half the diameter.

Diameter A straight line passing through the centre of a circle to touch both sides of the circumference. Twice as long as the radius.

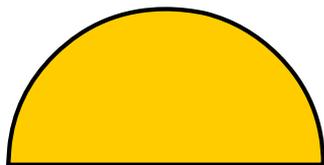
Chord A straight line joining two points on the circumference of a circle. The diameter is a special kind of chord.

Arc A section of the circumference.

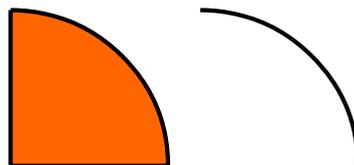
Sector A section of a circle, bounded by two radii and an arc.

Segment A section of a circle, bounded by a chord and an arc.

Tangent A straight line touching the circumference once at a given point.



A semicircle is half of a circle, bounded by the diameter and an arc.



A quadrant is a quarter of a circle or its circumference.

Circumference of a circle.

$$C = 2\pi r$$

(circumference = 2 x π x radius)

Area of a circle.

$$A = \pi r^2$$

(area = π x radius x radius)

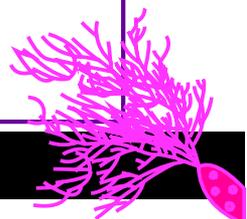
π

pi = ratio of the circumference of a circle to its diameter.

= $\frac{22}{7}$ or 3.14 to 2 decimal places.

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Square

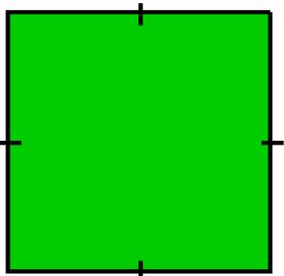
From: A Maths Dictionary for Kids by Jenny Eather at www.amathsdictionaryforkids.com

A square is a quadrilateral with:

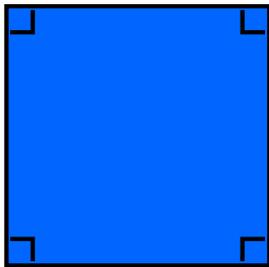
- four equal sides and four right angles
- opposite sides that are parallel
- two diagonals that bisect at right angles
- four lines of symmetry.



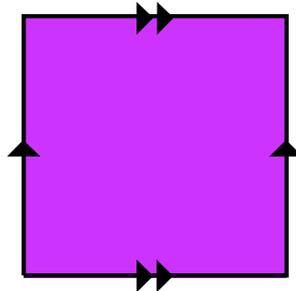
Attributes of a square



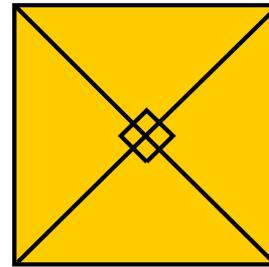
four equal sides



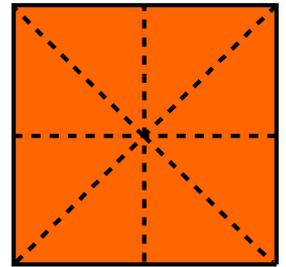
four right angles



opposite sides that are parallel

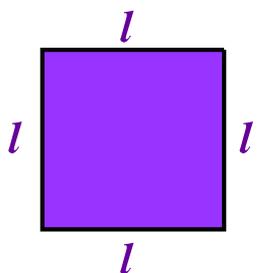


two diagonals that bisect at right angles



four lines of symmetry

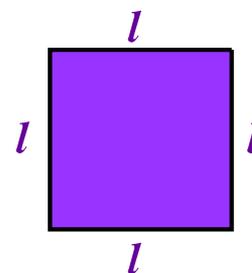
Perimeter of a square.



$$\begin{aligned} P &= l + l + l + l \\ &= 4 \times l \\ &= 4l \end{aligned}$$

l = length of side

Area of a square.



$$\begin{aligned} A &= l \times l \\ &= l^2 \end{aligned}$$

Classifying a square.



Depending on their definitions as quadrilaterals, a square can be a:

Rectangle:

- two pairs of opposite equal parallel sides and four right angles.

Parallelogram:

- two pairs of opposite equal parallel sides and opposite angles that are equal.

Rhombus:

- parallelogram with four equal sides and opposite angles that are equal.

Trapezium (UK) trapezoid (US):

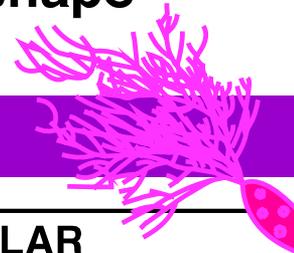
- quadrilateral with at least two sides parallel. (inclusive definition)



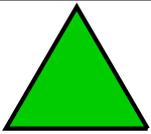
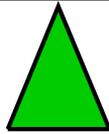
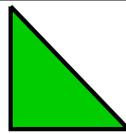
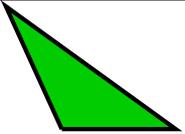
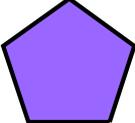
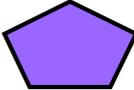
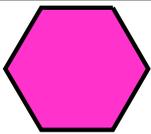
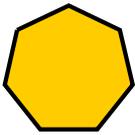
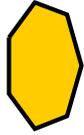
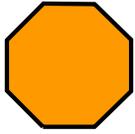
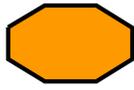
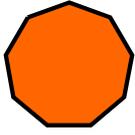
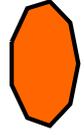
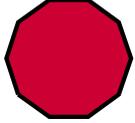
Polygons

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A polygon is a plane, two-dimensional or flat shape having three or more straight sides.



Examples

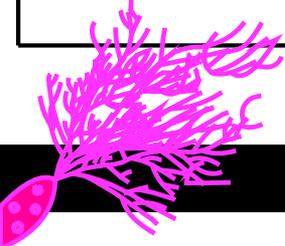
SOME SIMPLE POLYGON TYPES	Sides and vertices	Sum of internal angles	REGULAR All sides and angles equal.	IRREGULAR
triangles	3	180°	 equilateral triangle	 isosceles triangle  right-angle triangle  scalene triangle
quadrilaterals	4	360°	 square	 rhombus  parallelogram  rectangle  trapezoid (US) trapezium (UK)
pentagons	5	540°		 
hexagons	6	720°		  
heptagons	7	900°		  
octagons	8	1080°		  
nonagons	9	1260°		 
decagons	10	1440°		  

NOTE: A trapezium (UK), trapezoid (US) is a quadrilateral with one pair of parallel sides.



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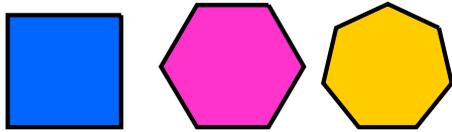
Classifying polygons

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

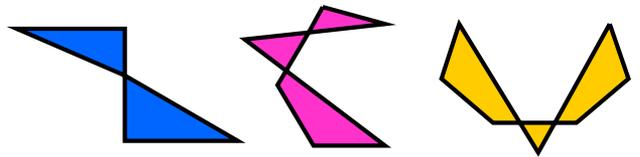
A polygon is a plane, two-dimensional or flat shape having three or more straight sides.

There are several ways polygons may be classified.

Simple

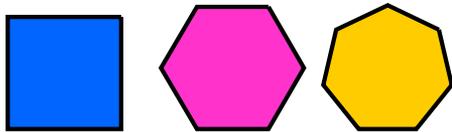


Complex

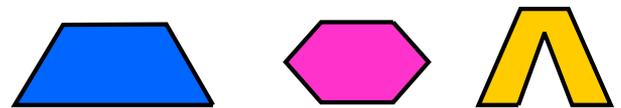


In a simple polygon the sides do not cross over each other. In a complex polygon the sides do cross over and the polygon is called self-intersecting.

Regular

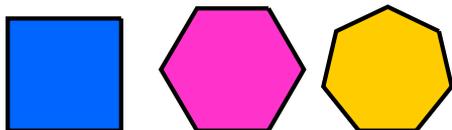


Irregular



A regular polygon has all sides equal and all angles equal. An irregular polygon is not regular.

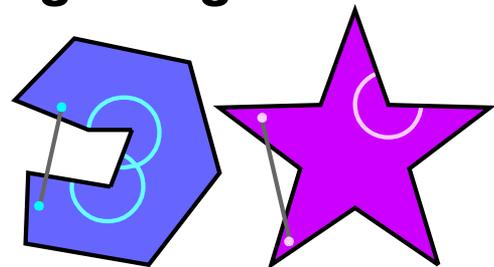
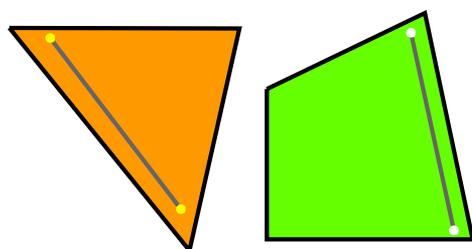
Convex



Concave



A convex polygon has no reflex angles. A concave polygon has at least one reflex angle (an angle larger than 180°).

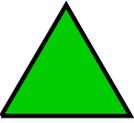
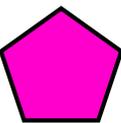
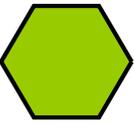
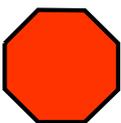
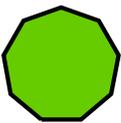
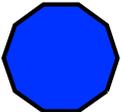


A geometric figure is concave if any line segment that joins two interior points goes outside the figure.



Regular polygons

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

Regular polygons	No. of sides and vertices	No. of angles	Size of interior angles	No. of lines of symmetry	Order of rotational symmetry	No. of diagonals
equilateral triangle 	3	3	60°	3	3	0
square 	4	4	90°	4	4	2
pentagon 	5	5	108°	5	5	5
hexagon 	6	6	120°	6	6	9
heptagon 	7	7	128.6°	7	7	14
octagon 	8	8	135°	8	8	20
nonagon 	9	9	140°	9	9	27
decagon 	10	10	144°	10	10	35

dodecagon - 12 sides

pentadecagon - 15 sides

icosagon - 20 sides

hectagon - 100 sides

A hectagon looks like a circle except at very high magnification.

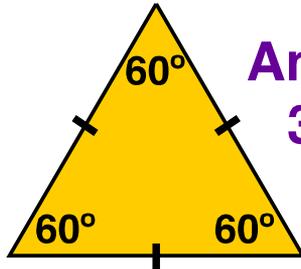
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Triangles

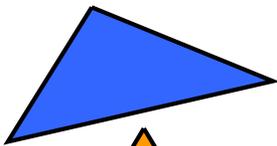
From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A triangle is a polygon with three sides and three angles.
The total of the angles in any triangle is 180° .



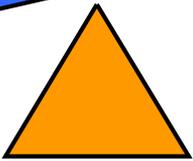
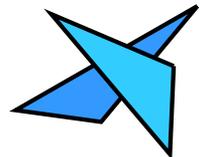
An equilateral triangle has 3 equal sides and three equal angles of 60° .

Types of triangles



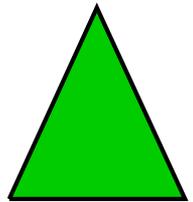
scalene triangles

- no equal angles or equal sides.



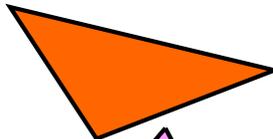
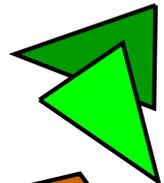
equilateral triangles

- 3 equal angles and 3 equal sides.



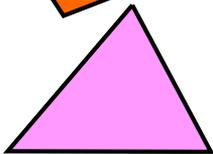
isosceles triangles

- 2 equal angles and 2 equal sides.



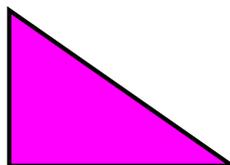
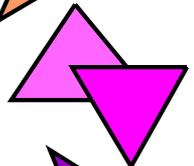
obtuse triangles

- one obtuse angle (more than 90°).



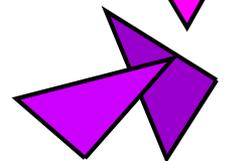
acute triangles

- three acute angles (less than 90°).



right-angled triangles

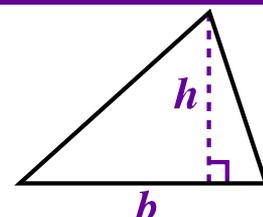
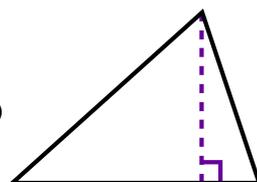
- one right angle of 90° .



Altitude of a triangle.

Area of a triangle.

The perpendicular distance from the vertex of a triangle to the opposite side.



$$A = \frac{1}{2} b \times h$$

half the base x height (altitude)

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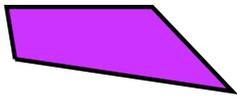
Quadrilaterals

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

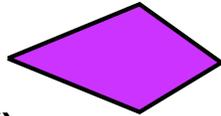
A quadrilateral is a polygon with four sides and four vertices or corners.

The total of the angles in any quadrilateral is 360° .

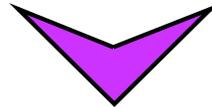
Having four sides and vertices



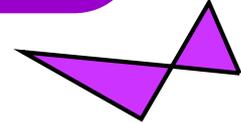
irregular quadrilateral (UK)
trapezium (US)



kite



concave
quadrilateral



complex
quadrilateral

PLUS at least one pair of parallel sides



trapezium (UK), trapezoid (US)

OR two pairs of parallel sides



parallelogram

PLUS four equal sides

AND diagonals that
bisect at right angles



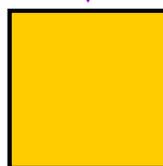
rhombus

PLUS four right angles



rectangle

A square shares attributes
with many of the
quadrilaterals above it.



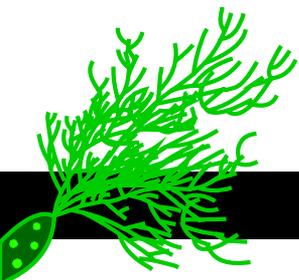
square

So a square may be
classified as a special type
of rhombus, rectangle,
parallelogram or
trapezium/trapezoid.

A square is the only regular quadrilateral.

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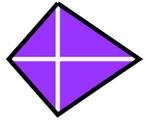


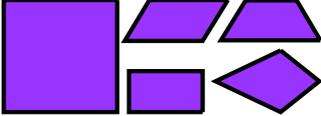
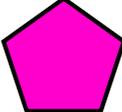
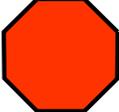
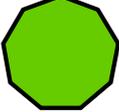
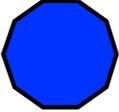
Diagonals

From: A Maths Dictionary for Kids by Jenny Eather at www.amathsdictionaryforkids.com



A diagonal is a line joining two non-adjacent vertices or corners of a polygon.



POLYGONS	No. of sides	No. of angles	No. of vertices	No. of diagonals
triangles 	3	3	3	0
quadrilaterals 	4	4	4	2
pentagon 	5	5	5	5
hexagon 	6	6	6	9
heptagon 	7	7	7	14
octagon 	8	8	8	20
nonagon 	9	9	9	27
decagon 	10	10	10	35

Formula for calculating diagonals.

$$d = \frac{n(n-3)}{2}$$

d = diagonals
n = number of vertices

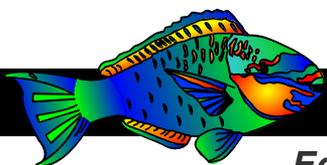
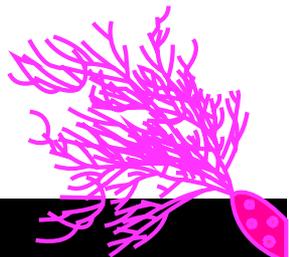
EXAMPLE: decagon with 10 vertices

$$d = 10 \times (10 - 3) \div 2$$

$$d = (10 \times 7) \div 2$$

$$d = 70 \div 2$$

$$d = 35$$



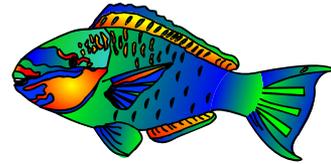
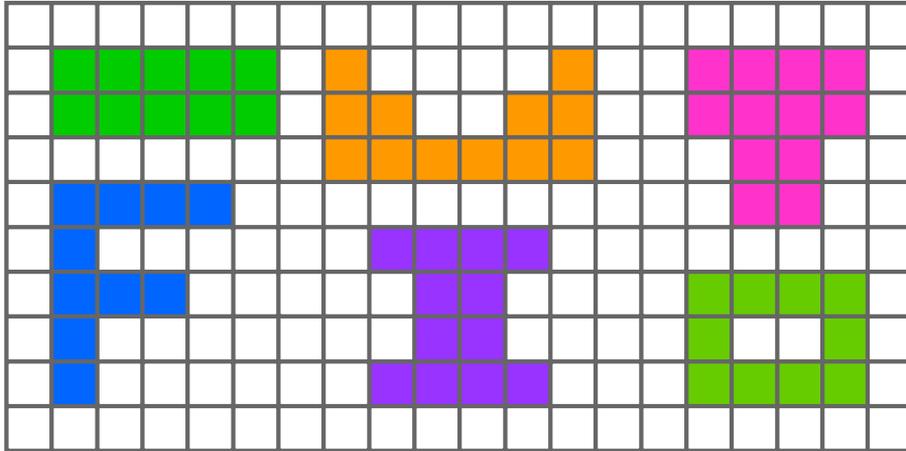
Area

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

Area is the size a surface takes up measured in square units. Area can be determined using a grid or a formula.

Using a grid

The squares are counted to find an area.

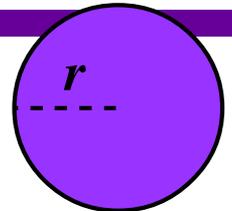


A = area
 l = length
 b = base
 h = height
 r = radius
 π = pi

Using a formula

Circle

$$A = \pi \times r^2$$



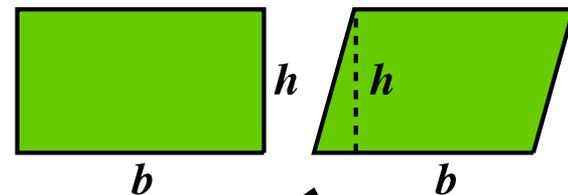
Square

$$A = l \times l$$



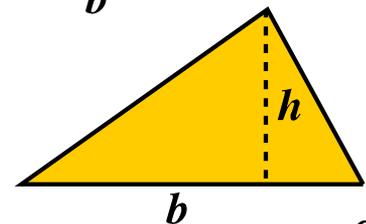
Rectangle
and
Parallelogram

$$A = b \times h$$



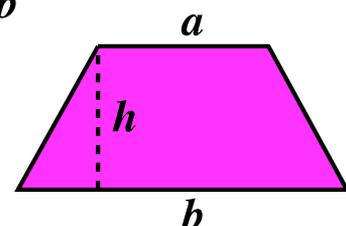
Triangle

$$A = \frac{1}{2} b \times h$$



Isosceles
Trapezium (UK),
Trapezoid (US)

$$A = \frac{(a + b) \times h}{2}$$



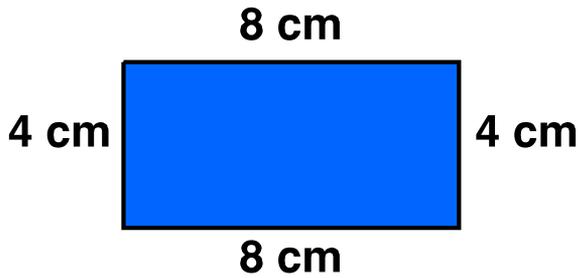
Perimeter

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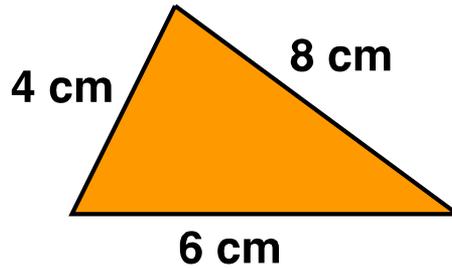
Perimeter is the distance around the outside of a shape.

Adding the length of sides

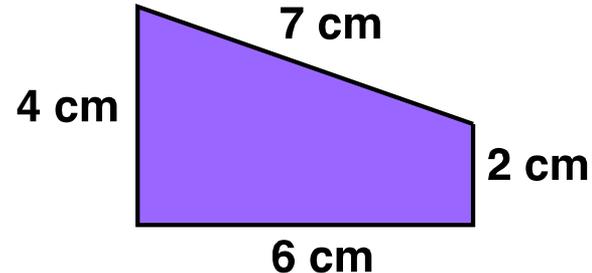
The perimeter of a polygon is the sum of the length of all its sides.



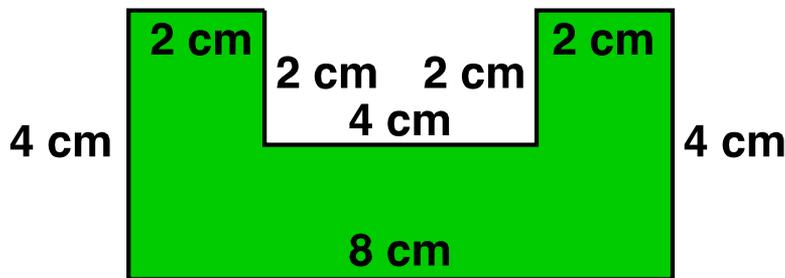
$$P = 4 + 8 + 4 + 8 \\ = 24 \text{ cm}$$



$$P = 4 + 8 + 6 \\ = 18 \text{ cm}$$



$$P = 4 + 7 + 2 + 6 \\ = 19 \text{ cm}$$



$$P = 4 + 2 + 2 + 4 + 2 + 2 + 4 + 8 = 28 \text{ cm}$$

Regular Polygons

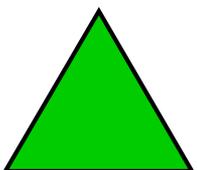
The perimeter of a regular polygon is the number of sides multiplied by the length of one side.

$$P = n \times l$$

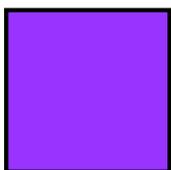
P = perimeter

n = number of sides

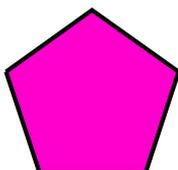
l = length of one side



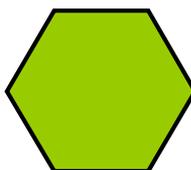
$$P = 3l$$



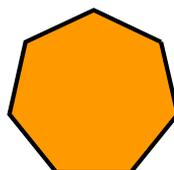
$$P = 4l$$



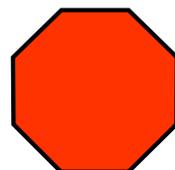
$$P = 5l$$



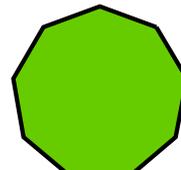
$$P = 6l$$



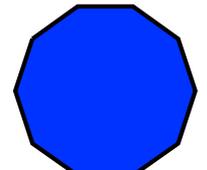
$$P = 7l$$



$$P = 8l$$



$$P = 9l$$



$$P = 10l$$

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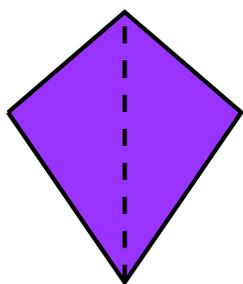
Symmetry

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

There are two types of symmetry, reflective symmetry and rotational symmetry.

Reflective Symmetry

A shape is symmetrical if one half is a mirror image of the other half when it is reflected across a line of symmetry.



S **H** **A** **P** **E**

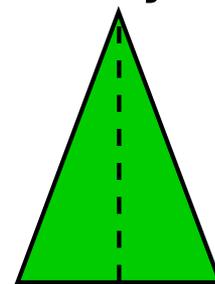
x

✓

✓

x

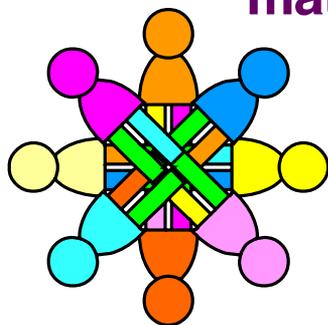
✓



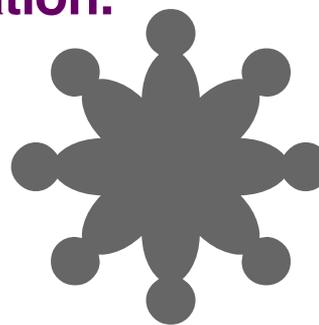
Rotational Symmetry

A shape has rotational symmetry if, when it is turned around its centre point, it matches its original outline more than once.

The order of rotational symmetry is the number of times it matches in one full rotation.

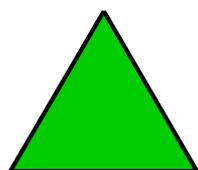


This shape has rotational symmetry of order 8.

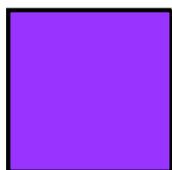


Regular Polygons

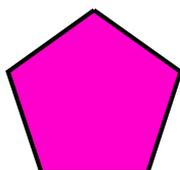
The number of lines of symmetry and the order of rotational symmetry of any regular polygon is equal to the number of sides.



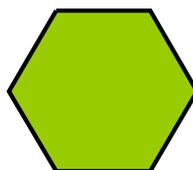
3



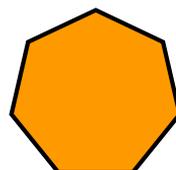
4



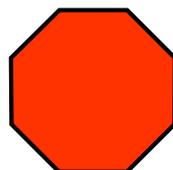
5



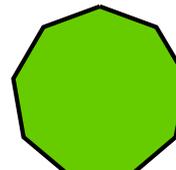
6



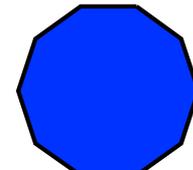
7



8



9



10

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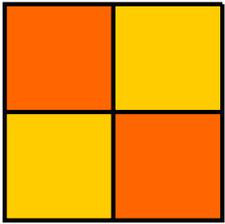
Tessellations, tilings

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

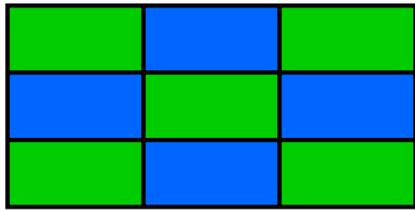
A tessellation or tiling is a pattern of shapes that fits together without any gaps.

Examples

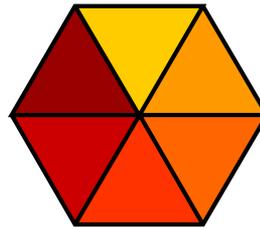
Congruent shapes are shapes of exactly the same shape and size. Congruent shapes that tessellate include:



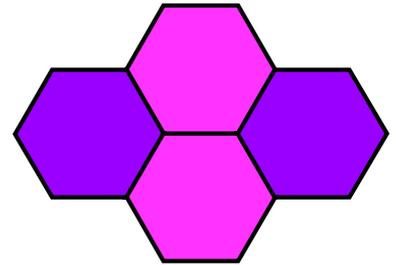
squares



rectangles

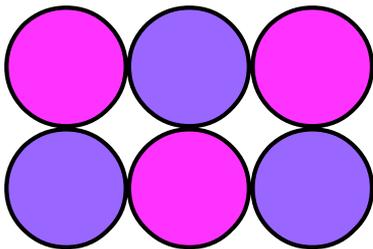


equilateral triangles

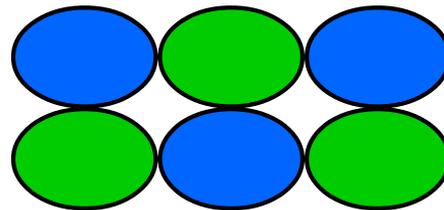


hexagons

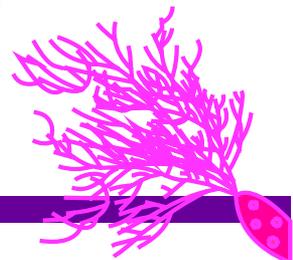
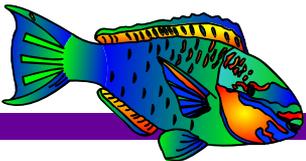
Shapes that will not tessellate



circles

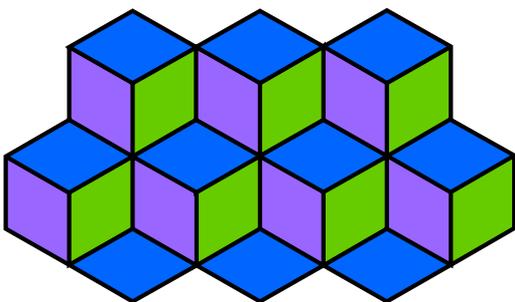


ellipses

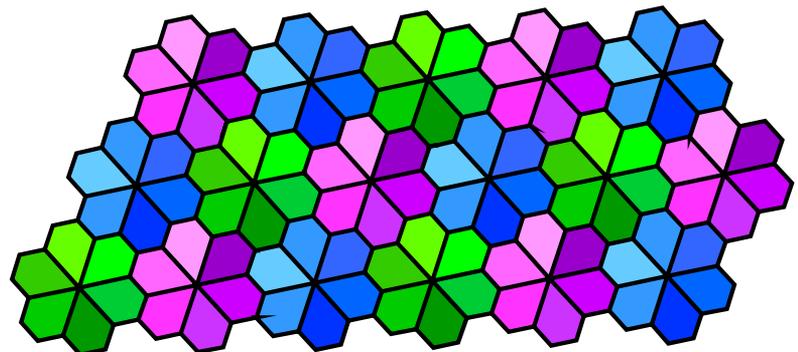


Interesting tilings

rhombille tiling



floret pentagonal tiling



Research Topic: The art of M. C. Escher.

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Transformations

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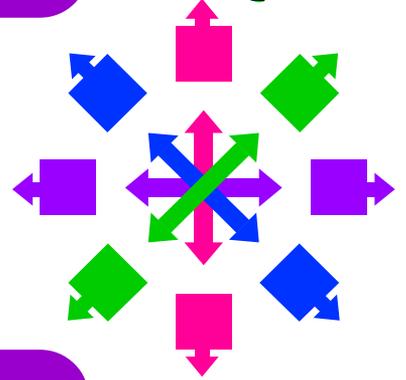
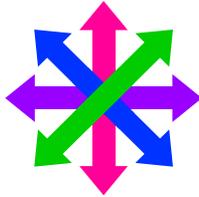
A transformation of a shape is a change in position without changing shape or size, except for a dilation, where the size but not the shape changes.



reflection ... flip

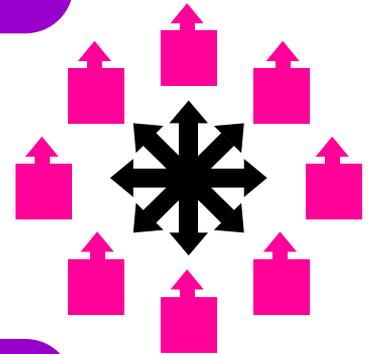
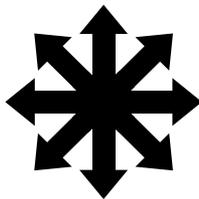


In a reflection a shape is flipped over a mirror line to face the opposite direction.



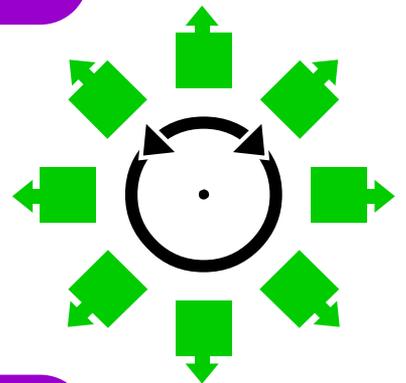
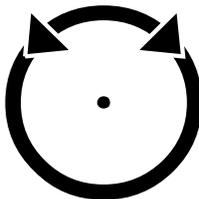
translation ... slide

In a translation or slide a shape is moved in any direction.



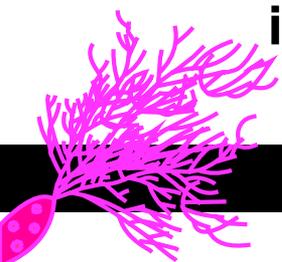
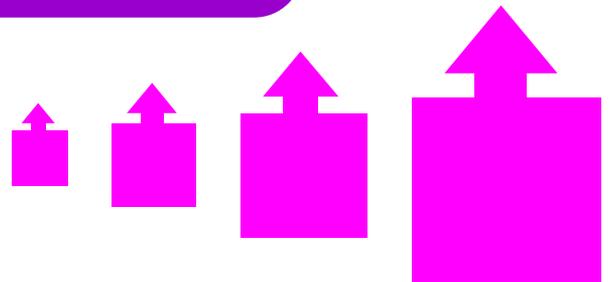
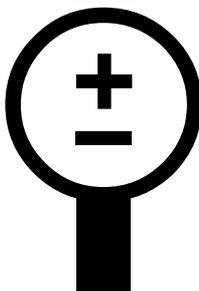
rotation ... turn

In a rotation a shape is turned around a centre point.



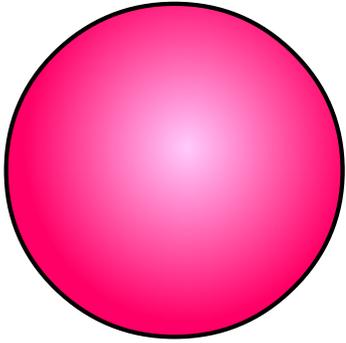
dilation ... zoom

In a dilation a shape is enlarged or reduced in size.



First solids

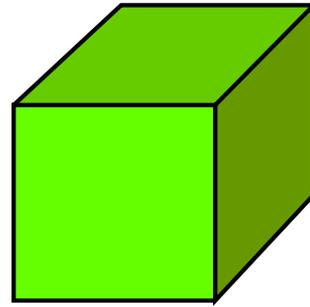
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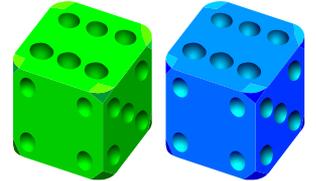
sphere



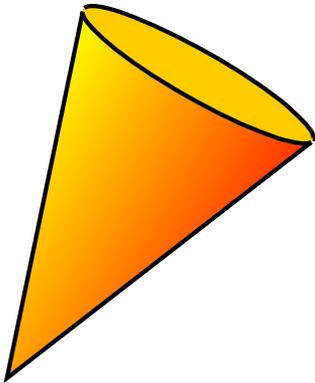
ball



cube



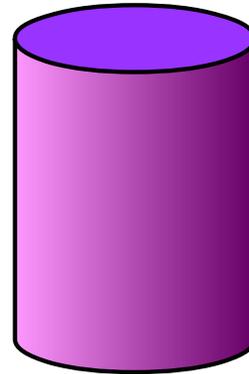
dice



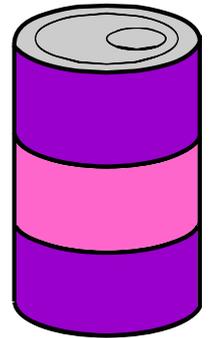
cone



double cone



cylinder



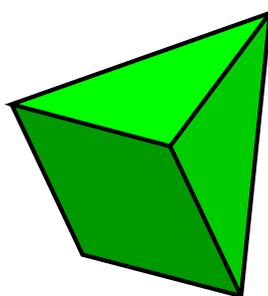
can



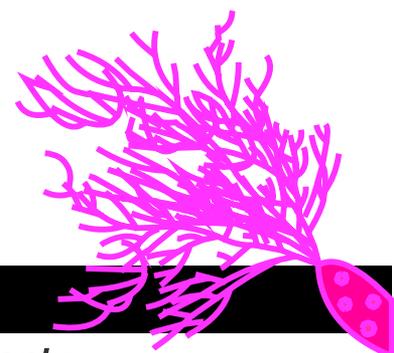
prism



box



pyramid

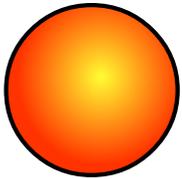


Basic solids

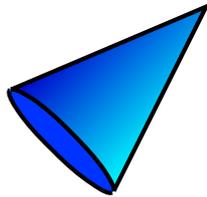
From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

Solid (3D) shapes are three-dimensional shapes having length, breadth and height.

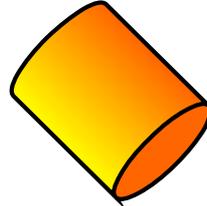
Examples



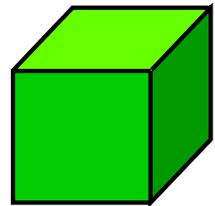
sphere



cone

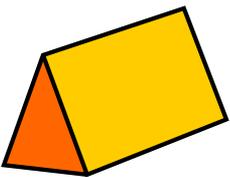


cylinder

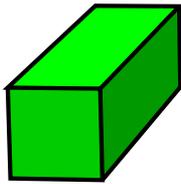


cube

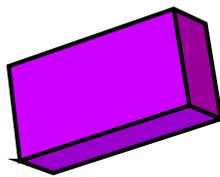
Prisms



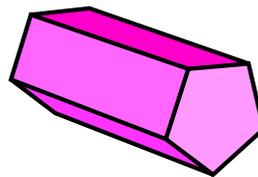
triangular prism



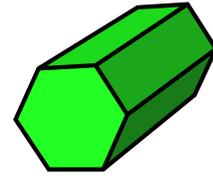
square prism



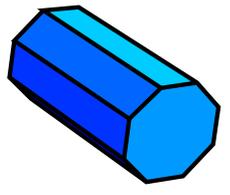
rectangular prism



pentagonal prism

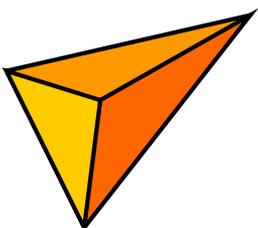


hexagonal prism

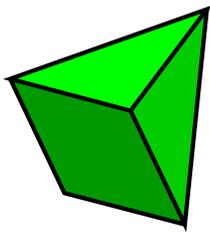


octagonal prism

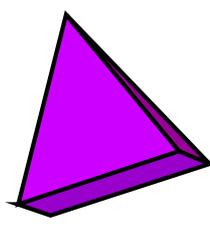
Pyramids



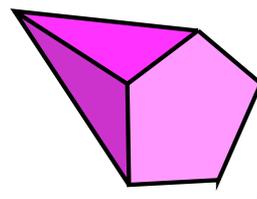
triangular pyramid



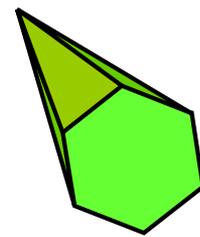
square pyramid



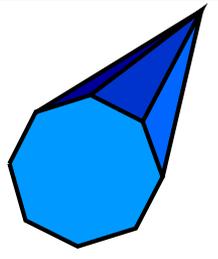
rectangular pyramid



pentagonal pyramid

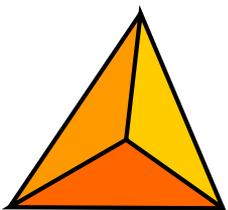


hexagonal pyramid

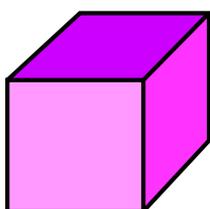


octagonal pyramid

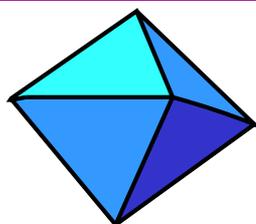
Platonic solids



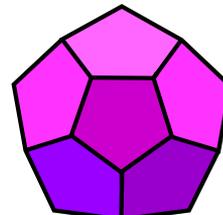
tetrahedron



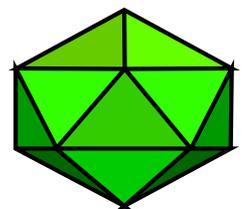
cube



octahedron



dodecahedron



icosahedron

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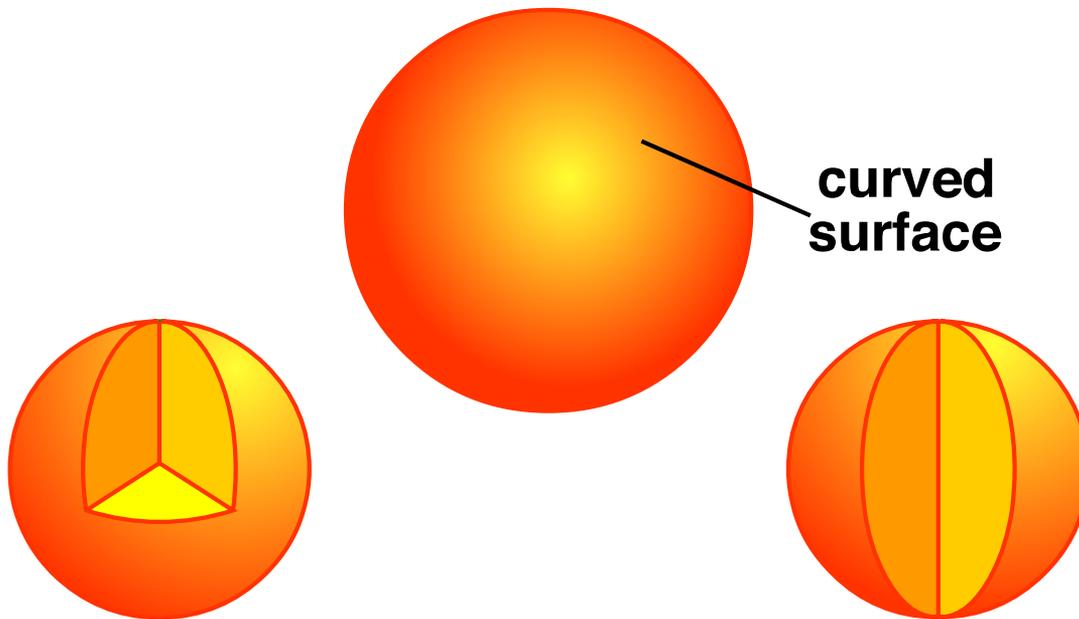
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Sphere

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A sphere is a three-dimensional solid that is perfectly round.

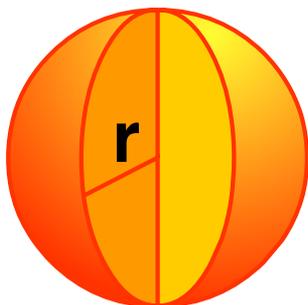
All points on the surface of a sphere are the same distance from its centre.



Sections cut out of a solid sphere.

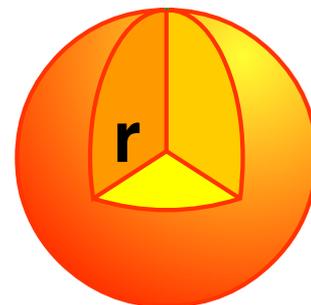
Surface area of a sphere

Volume of a sphere



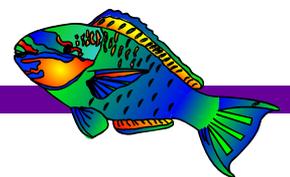
$$4\pi r^2$$

r = radius



$$\frac{4\pi r^3}{3}$$

Pi



π pi = ratio of the circumference of a circle to its diameter.
= $\frac{22}{7}$ or 3.14 to 2 decimal places.

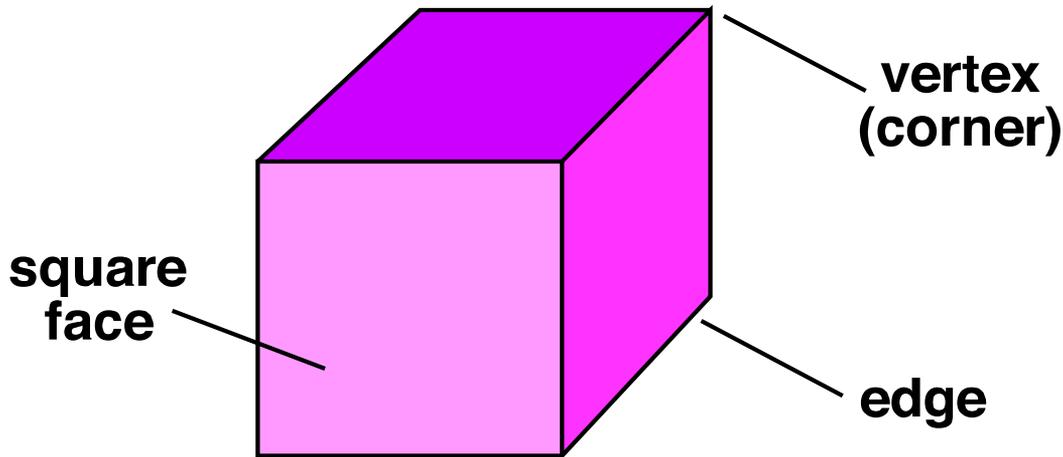
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Cube

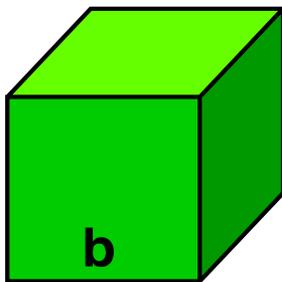
From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A cube is a three-dimensional solid that has six congruent square faces.



A cube has 6 square faces, 12 equal edges and 8 vertices.

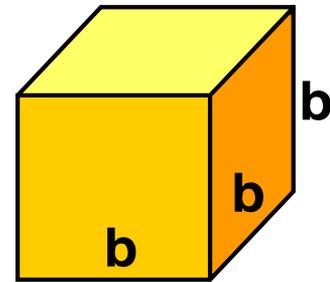
Surface area of a cube



$$6b^2 \text{ OR } 6 \times b^2$$

b = length of one edge

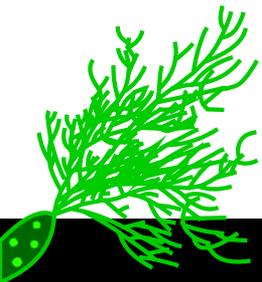
Volume of a cube



$$b^3 \text{ OR } b \times b \times b$$

Platonic solid

A cube is one of the five Platonic solids.



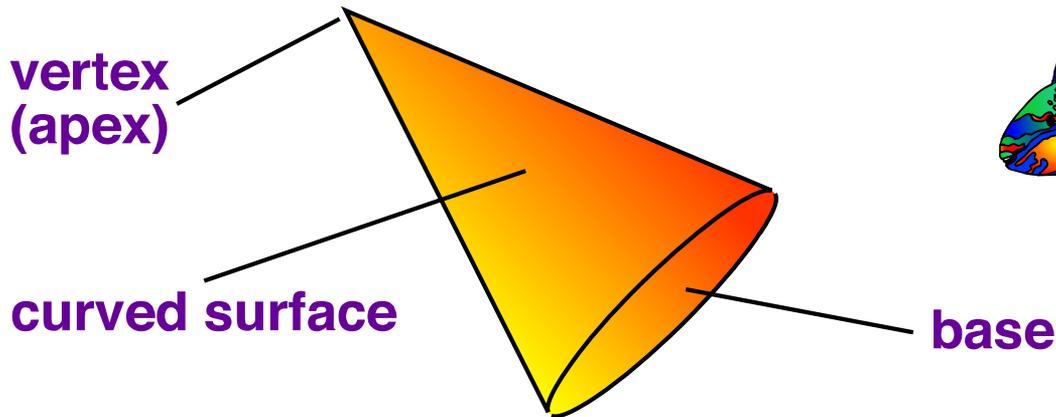
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Cone

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A cone is a three-dimensional solid with a circular base and a curved surface that tapers to a point (vertex or apex).



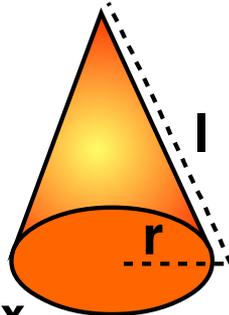
A cone may be right or oblique.



Surface area

$$\pi r l + \pi r^2$$

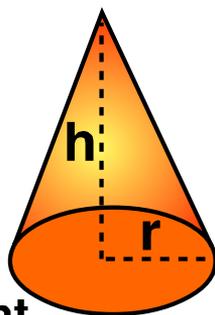
r = radius
 l = length base to vertex



Volume

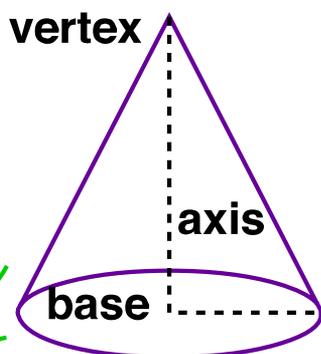
$$\frac{\pi r^2 h}{3}$$

r = radius
 h = perpendicular height

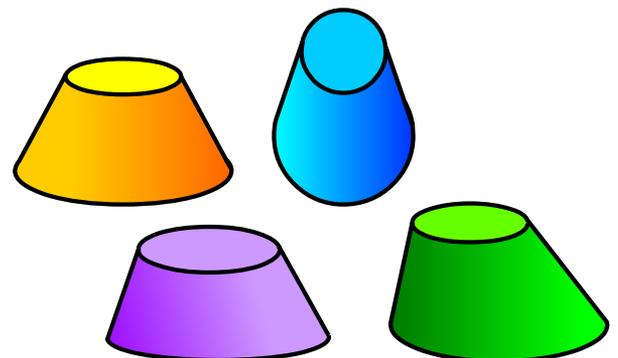


Right cone

A cone where the axis line from the vertex to the centre of the base is perpendicular (at right angles) to the base.



Frustum of a cone

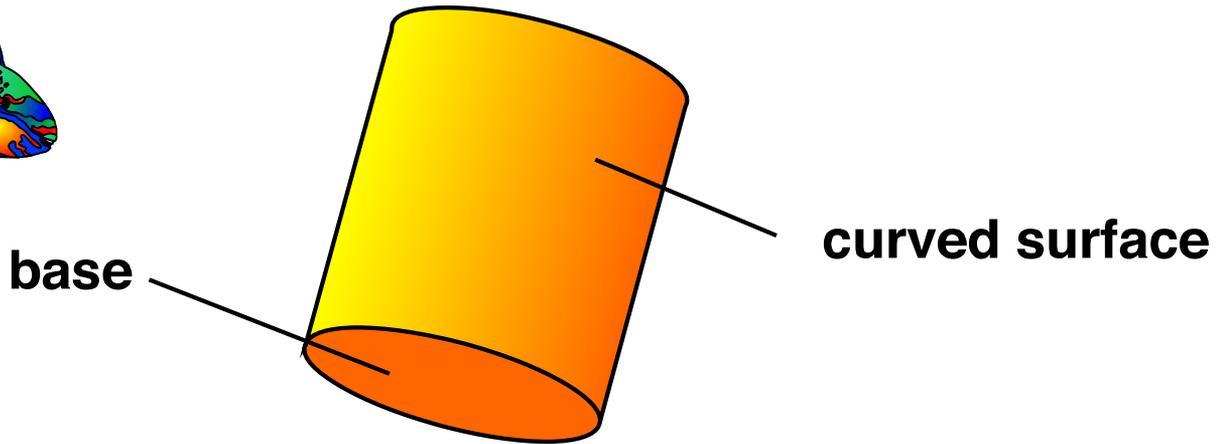
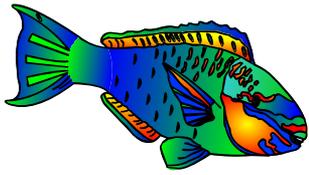


The solid that results from a cone having its top sliced off parallel to its base.

Cylinder

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A cylinder is a three-dimensional solid with one curved surface and two congruent circular or elliptical bases.



Surface area of a cylinder

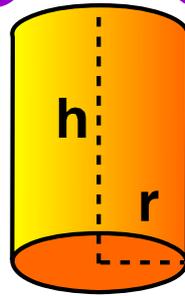
$$2\pi rh + 2\pi r^2$$

r = radius

Volume of a cylinder

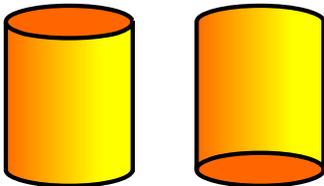
$$\pi r^2 h$$

h = height



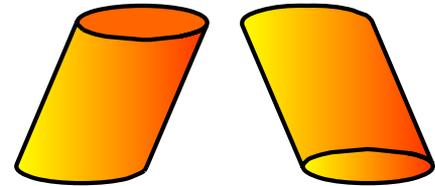
Right cylinders

- cylinders with bases aligned one directly above the other.



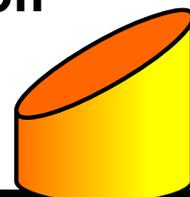
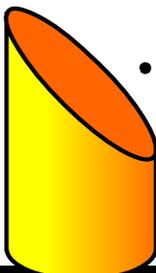
Oblique cylinders

- cylinders with bases that are not aligned one directly above the other.



Truncated cylinders

- cylinders with one base cut off by an intersecting plane.



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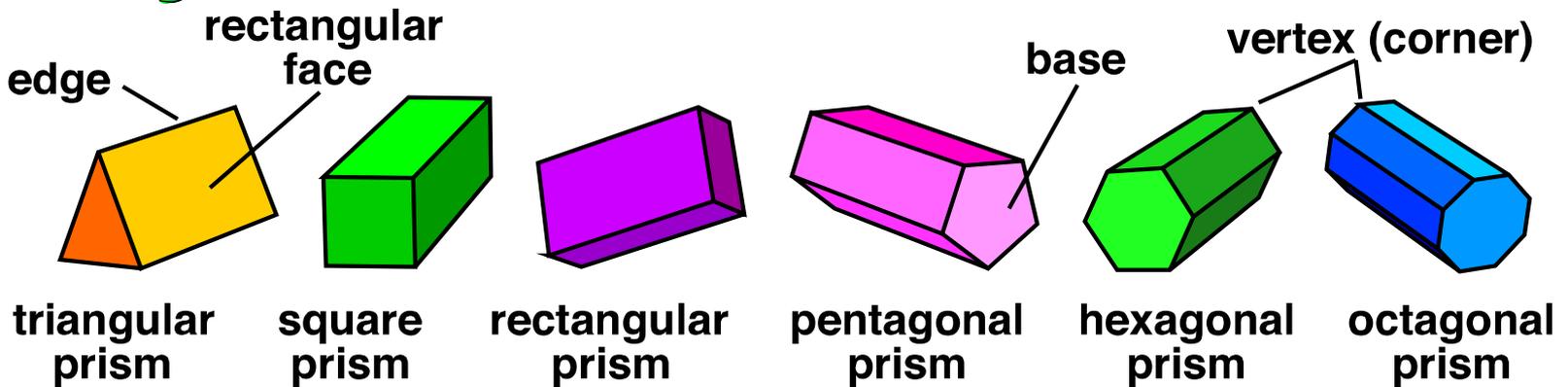
Prisms

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A prism is a three-dimensional solid with two identical, parallel bases. All lateral faces are parallelograms.



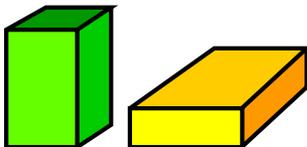
Examples



All cross-sections made parallel to the bases are the same.

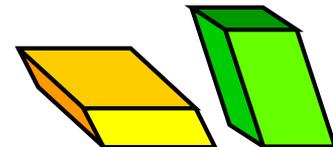
Right prisms

Right prisms have bases that are aligned one directly above the other.



Oblique prisms

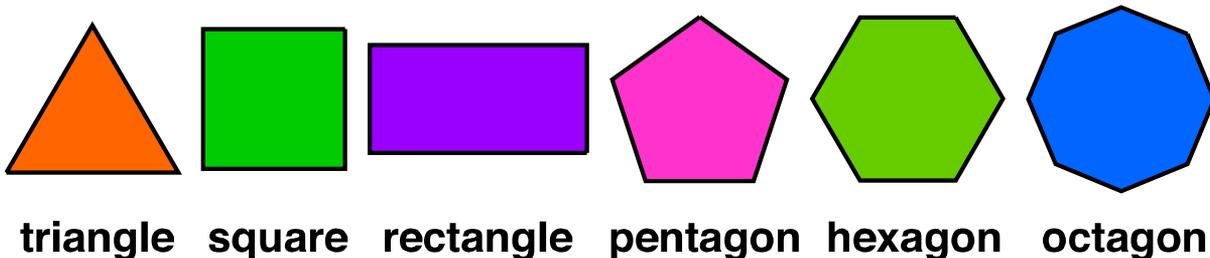
Oblique prisms have bases that are NOT aligned with one directly above the other.



In a right prism the lateral faces are rectangles.

Prism names

A prism takes its name from the shape of its base, e.g. square prism, triangular prism, hexagonal prism.



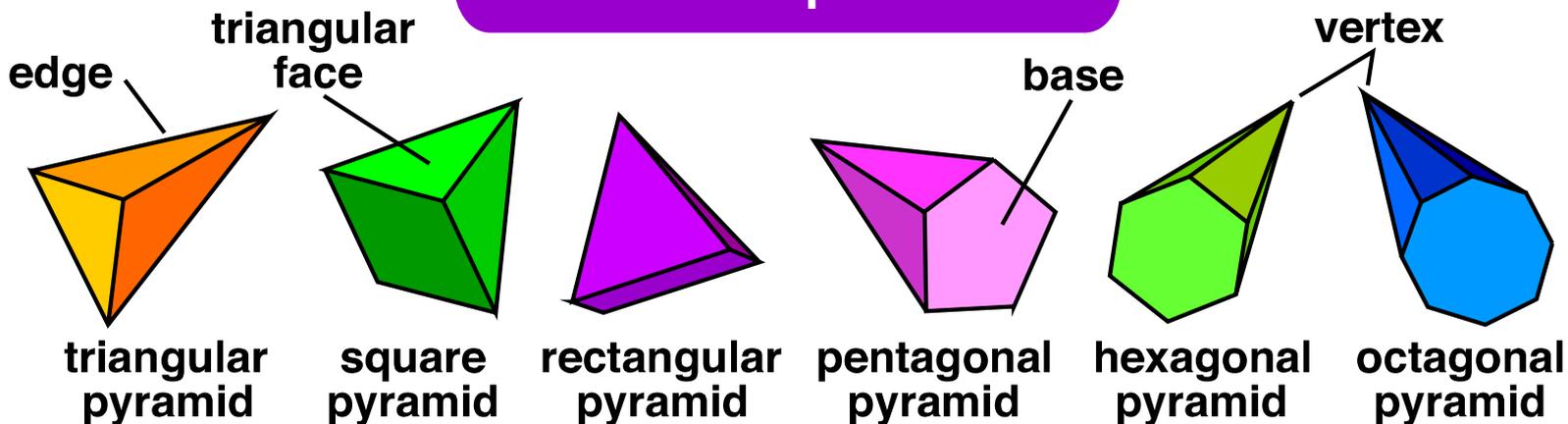
Pyramids

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

A pyramid is a three-dimensional solid with a polygon as a base and triangular faces that taper to a point (vertex).



Examples



Surface area

Volume

• of a square pyramid.

$$2bl + b^2$$

$$\frac{b^2h}{3}$$

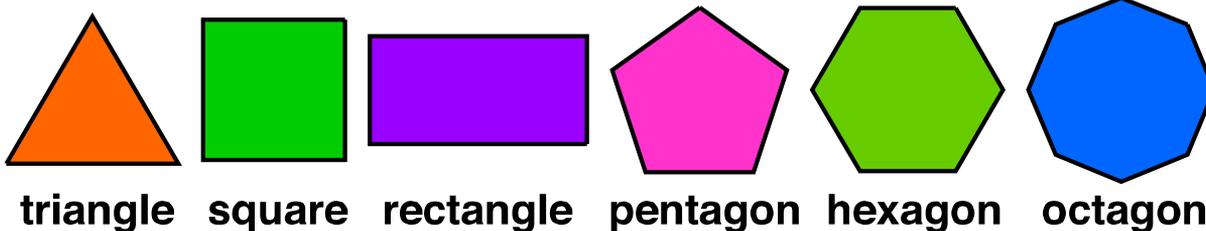
b = length base side
 l = length base to vertex
 h = perpendicular height

Frustum of a pyramid

The polyhedron that results from a pyramid having its top sliced off parallel to its base.

Pyramid names

A pyramid takes its name from the shape of its base, e.g. square pyramid, hexagonal pyramid.



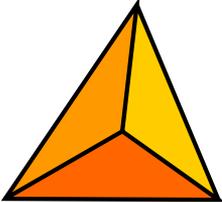
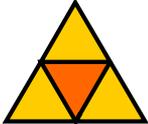
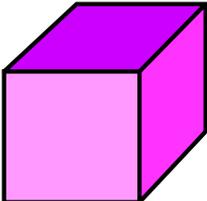
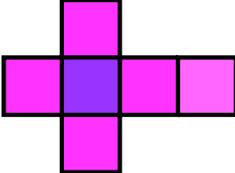
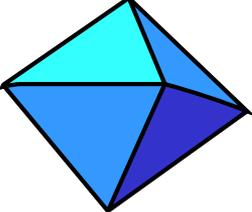
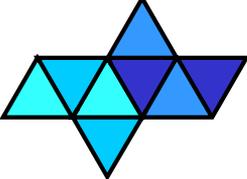
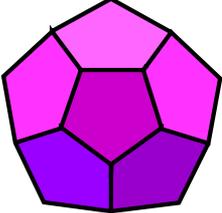
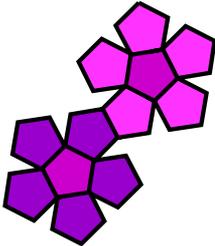
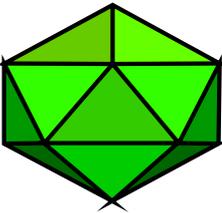
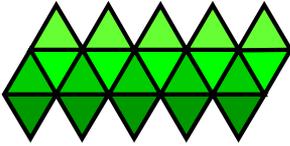
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Platonic solids

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

The Platonic solids are the five regular polyhedra with faces made from congruent regular polygons and the same number of edges meeting at each vertex.

Platonic solids	No. of faces	No. of vertices	No. of edges	Nets
tetrahedron 	4 	4	6	
cube 	6 	8	12	
octahedron 	8 	6	12	
dodecahedron 	12 	20	30	
icosahedron 	20 	12	30	

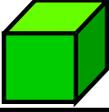
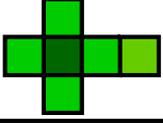
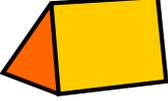
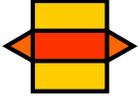
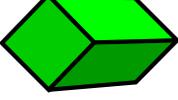
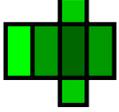
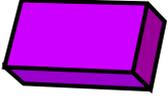
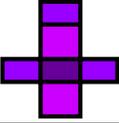
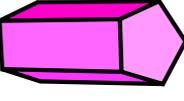
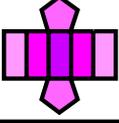
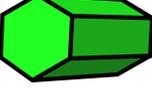
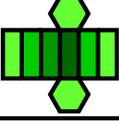
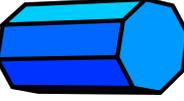
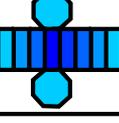
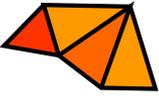
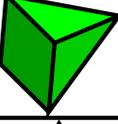
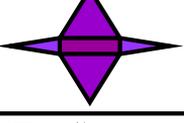
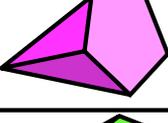
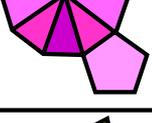
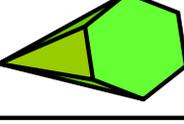
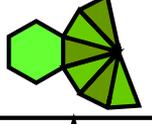
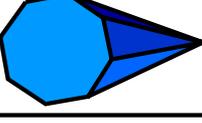
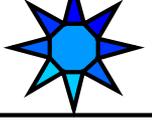
These five regular polyhedra were described by the ancient Greek philosopher and mathematician Plato in 350 BC.

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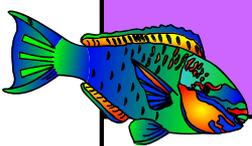
Faces, vertices, edges, nets

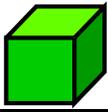
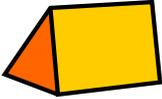
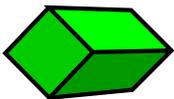
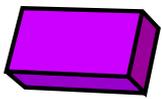
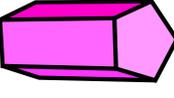
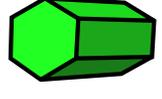
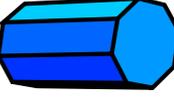
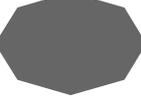
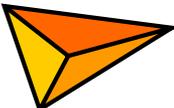
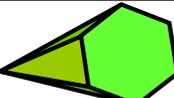
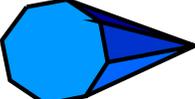
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Polyhedra	Base	No. of faces	No. of vertices	No. of edges	Nets
cube 		6	8	12	
triangular prism 		5	6	9	
square prism 		6	8	12	
rectangular prism 		6	8	12	
pentagonal prism 		7	10	15	
hexagonal prism 		8	12	18	
octagonal prism 		10	16	24	
triangular pyramid 		4	4	6	
square pyramid 		5	5	8	
rectangular pyramid 		5	5	8	
pentagonal pyramid 		6	6	10	
hexagonal pyramid 		7	7	12	
octagonal pyramid 		9	9	16	

Views, cross-sections

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com



Polyhedra		Views		Cross-sections	
		base or top	side or lateral	parallel to base	oblique
cube					
triangular prism					
square prism					
rectangular prism					
pentagonal prism					
hexagonal prism					
octagonal prism					
triangular pyramid					
square pyramid					
rectangular pyramid					
pentagonal pyramid					
hexagonal pyramid					
octagonal pyramid					

Uniform cross-sections are parallel to, and the same size and shape, as the base.

● Uniform
● Not uniform

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Surface area, volume

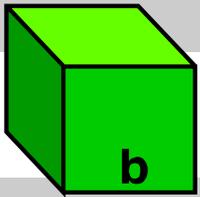
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Surface area

The total area of the surface of a three-dimensional object, measured in square units.

Volume

The amount of space occupied by a three-dimensional object, measured in cubic units.

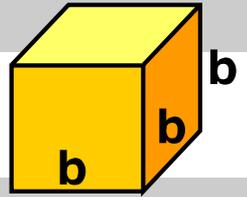


$$6b^2$$

Cube

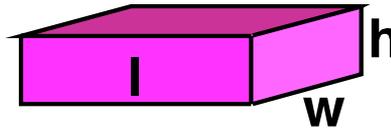
b = base length

$$b^3$$



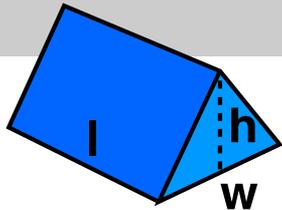
Rectangular prism

$$2lw + 2lh + 2wh$$



$$lwh$$

l = length
w = width
h = height

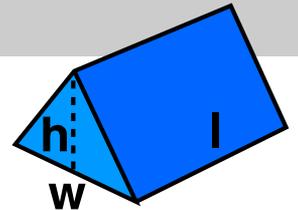


$$3lw + wh$$

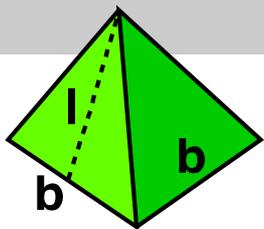
Triangular prism

l = length
w = width
h = height

$$\frac{lwh}{2}$$



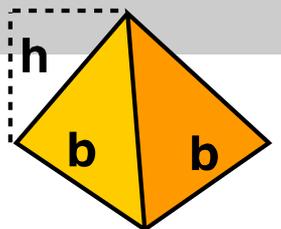
Square pyramid



$$2bl + b^2$$

b = length base side
l = length base to vertex
h = perpendicular height

$$\frac{b^2h}{3}$$



Sphere



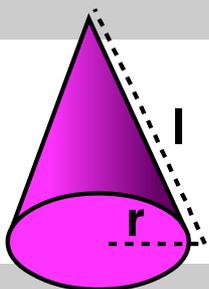
$$4\pi r^2$$

r = radius

$$\frac{4\pi r^3}{3}$$



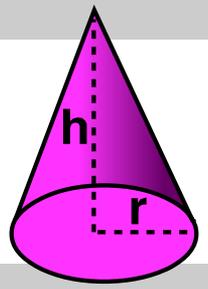
Right circular cone



$$\pi rl + \pi r^2$$

r = radius
l = length base to vertex
h = perpendicular height

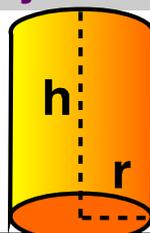
$$\frac{\pi r^2 h}{3}$$



Cylinder

$$2\pi rh + 2\pi r^2$$

r = radius



$$\pi r^2 h$$

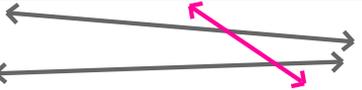
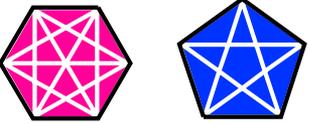
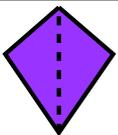
h = height

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Lines

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Types of lines	Name	Description
	line	A straight one-dimensional figure of infinite length.
	horizontal line	Line parallel to the horizon.
	vertical line	Line at right angles to the horizon.
	oblique line	Line at an angle to the horizon.
	parallel lines	Lines exactly the same distance apart.
	converging lines	Lines that head towards one point.
	intersecting lines	Lines that cross over one another.
	concurrent lines	Two or more lines that intersect at one point.
	transversal	A line that intersects at least two others.
	perpendicular lines	Lines that intersect at right angles to each other.
	diagonal lines	Lines that join non-adjacent corners of a polygon.
	line of symmetry	Line that divides an object in half so each side exactly mirrors the other.
	ray	A line of indefinite length extending from an end point in one direction.
	segment	Part of a line.
	interval	Distance between two points on a line.
	end point	Point marking the end of a line segment.

NOTE:

A line segment has two end points, a ray has one end point and a line has none.

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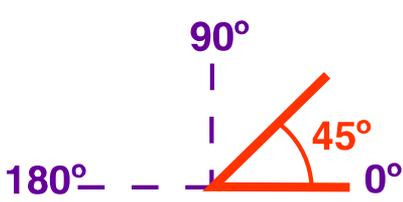
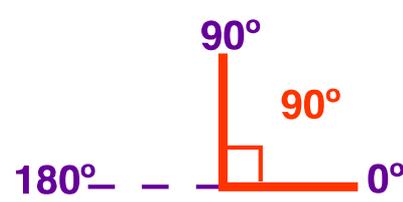
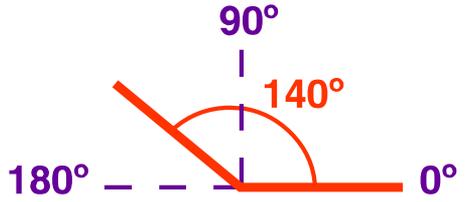
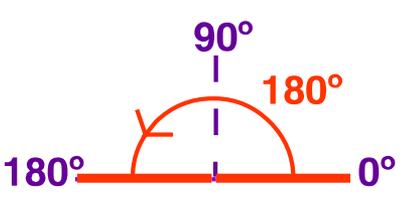
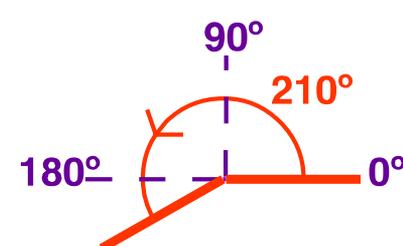
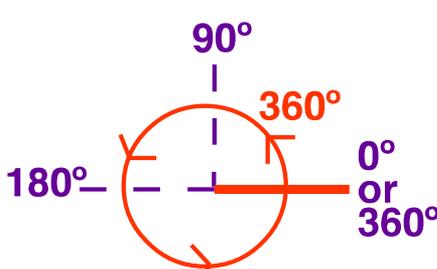
Angles

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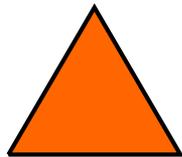
An angle is the amount of turning between two lines meeting at a common point.

The lines are called arms and the point is called a vertex.

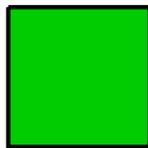
Names of angles

Acute angle	Right angle	Obtuse angle
less than 90° 	90° 	between 90° and 180° 
Straight angle	Reflex angle	A revolution
180° 	between 180° and 360° 	360° 

Regular polygons



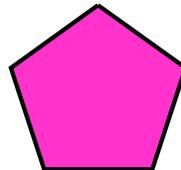
triangle



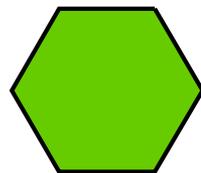
square



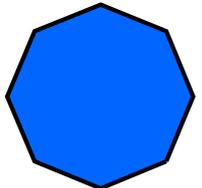
rectangle



pentagon



hexagon



octagon

Total angles	180°	360°	360°	540°	720°	1080°
Interior angles	60°	90°	90°	108°	120°	135°
Exterior angles	120°	90°	90°	72°	60°	45°

All angles in a triangle add up to 180° .
All angles in a quadrilateral add up to 360° .

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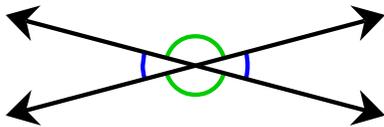
Angle pairs

From: *A Maths Dictionary for Kids* by Jenny Eather at www.amathsdictionaryforkids.com

Adjacent angles	Complementary angles	Supplementary angles
<p>Angles immediately next to each other.</p>	<p>Two angles whose sum is 90°.</p>	<p>Two angles whose sum is 180°.</p>

Vertically opposite angles

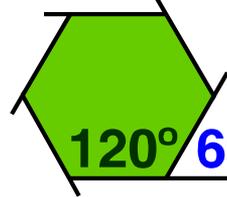
Opposite pairs of angles formed when two lines intersect.



Opposite angles are equal.

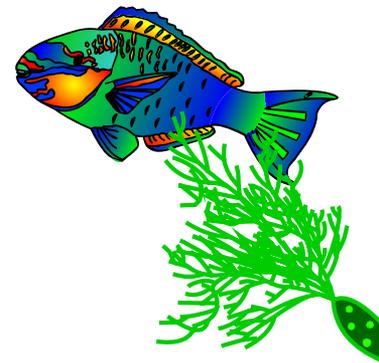
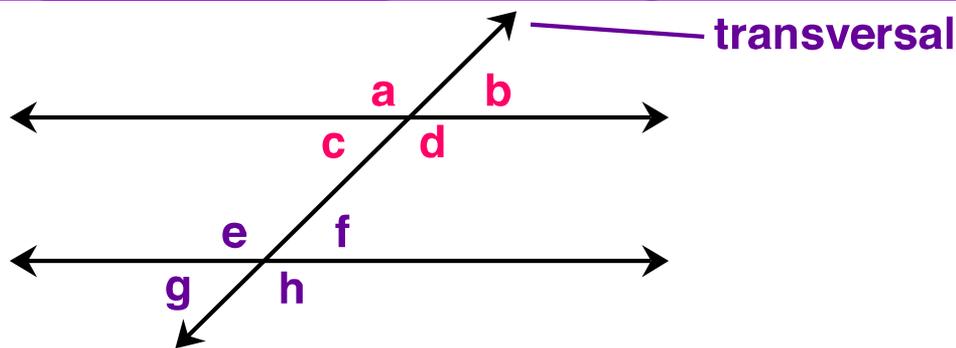
Interior, exterior angles

Angles inside or outside of polygons or parallel lines.



The exterior angles of a polygon total 360° .

Angles associated with parallel lines and transversals



Interior angles

c e , d f

Alternate interior angles

c f , d e

Exterior angles

a g , b h

Alternate exterior angles

a h , b g

Corresponding angles

a e , c g , b f , d h

- inside the parallel lines

- same side of the transversal

- inside the parallel lines

- opposite sides of the transversal

- outside the parallel lines

- same side of the transversal

- outside the parallel lines

- opposite sides of the transversal

- one inside, one outside of the parallel lines

- same side of the transversal

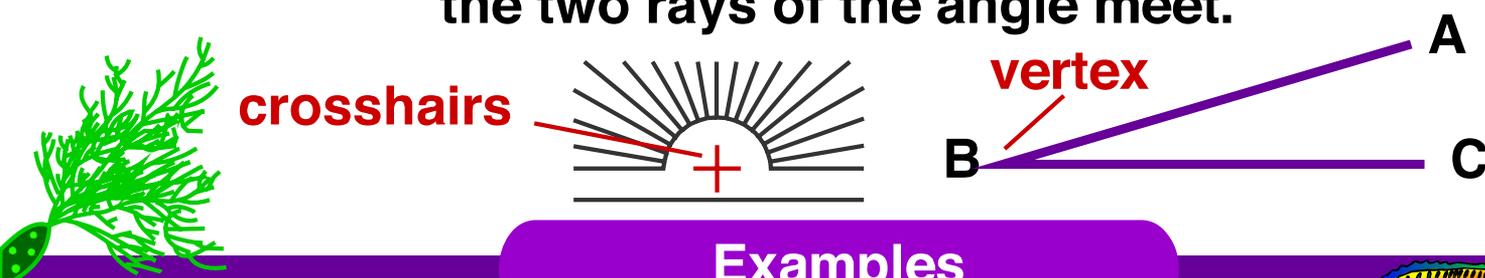
Measuring angles

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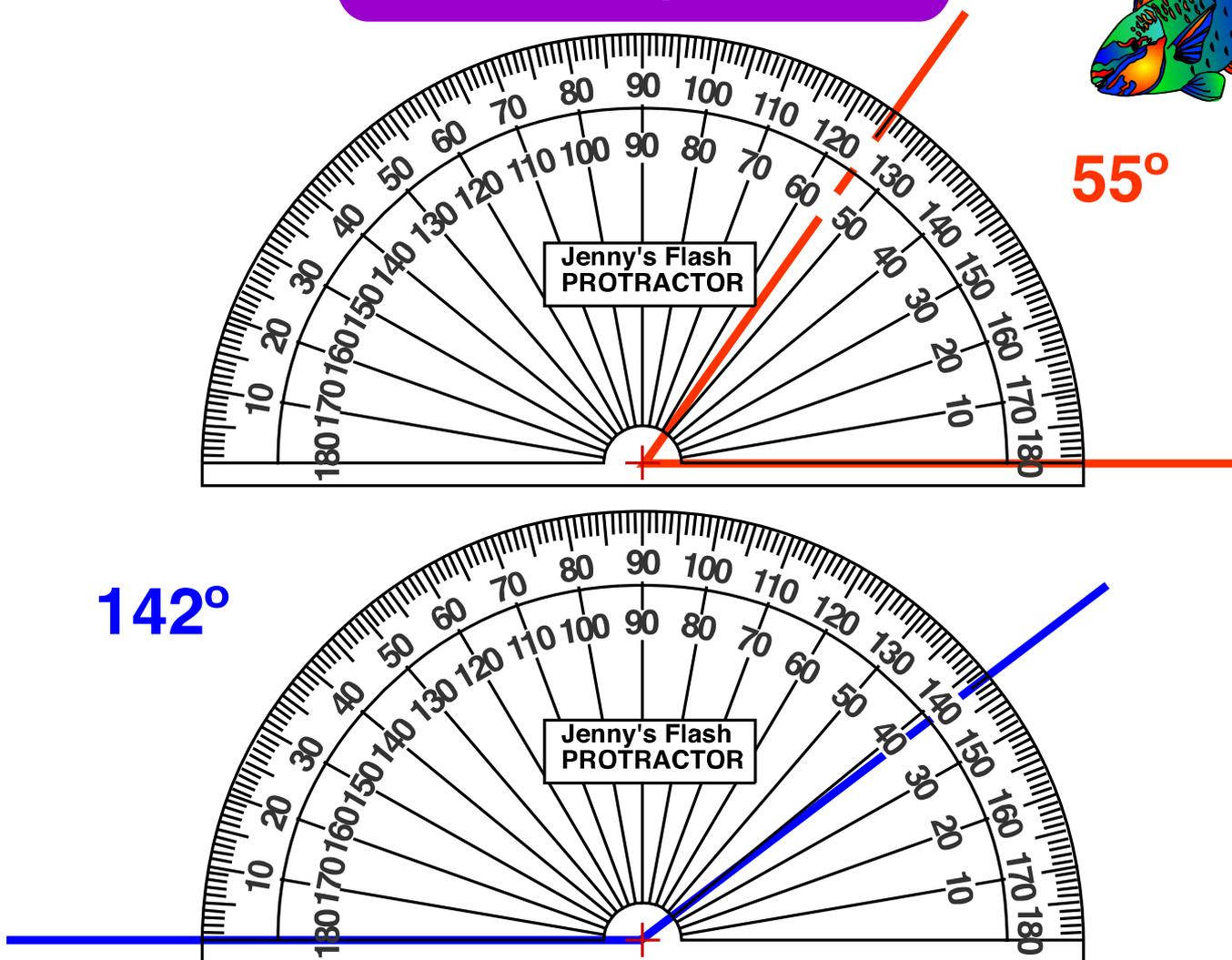
Angles are measured in degrees with an instrument called a protractor. Protractors may be circular, a full rotation of 360° , but many are a semi-circle of 180° .

Placement

The crosshairs of the protractor need to be exactly lined up with the vertex of the angle. The vertex is the point where the two rays of the angle meet.



Examples



The protractor has two scales from 0° to 180° . Which scale to use depends on whether the angle is acute (less than 90°) or obtuse (90° to 180°).

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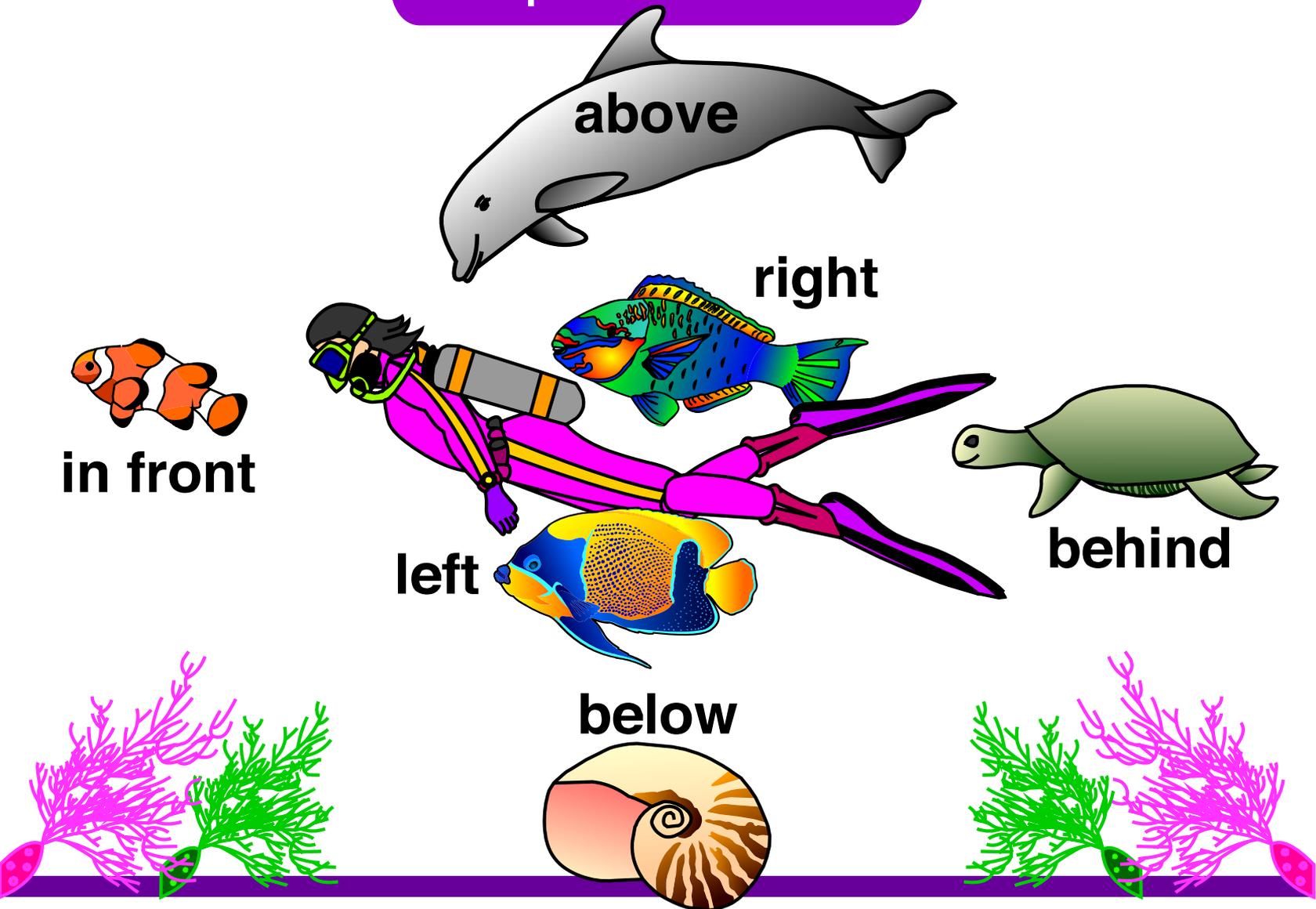
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First position words

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Position words describe where something or someone is compared to another object or their surroundings.

Compared to the diver



The dolphin is **above** the diver.

The shell is **below** the diver.

The clownfish is **in front** of the diver.

The turtle is **behind** the diver.

The angelfish is to the **left** of the diver.

The parrotfish is to the **right** of the diver.

The diver is **between** the fish.

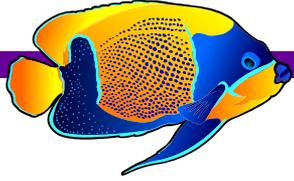
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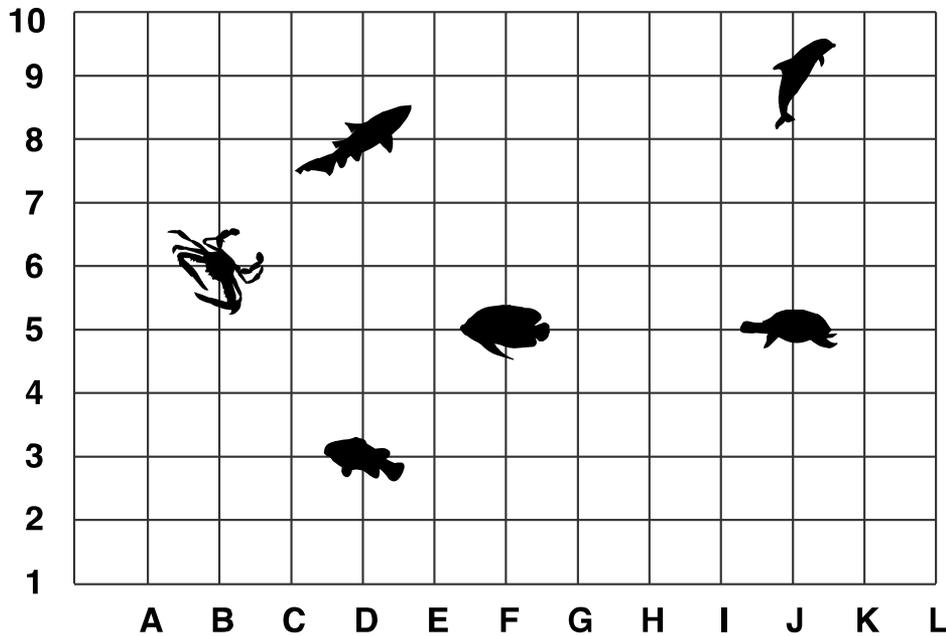
Coordinates

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Coordinates are used to show position on a grid, map or coordinate plane. They are shown as pairs of letters and numbers or pairs of numbers, for example, B4 or (2, 4).



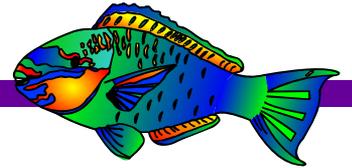
Grids and maps



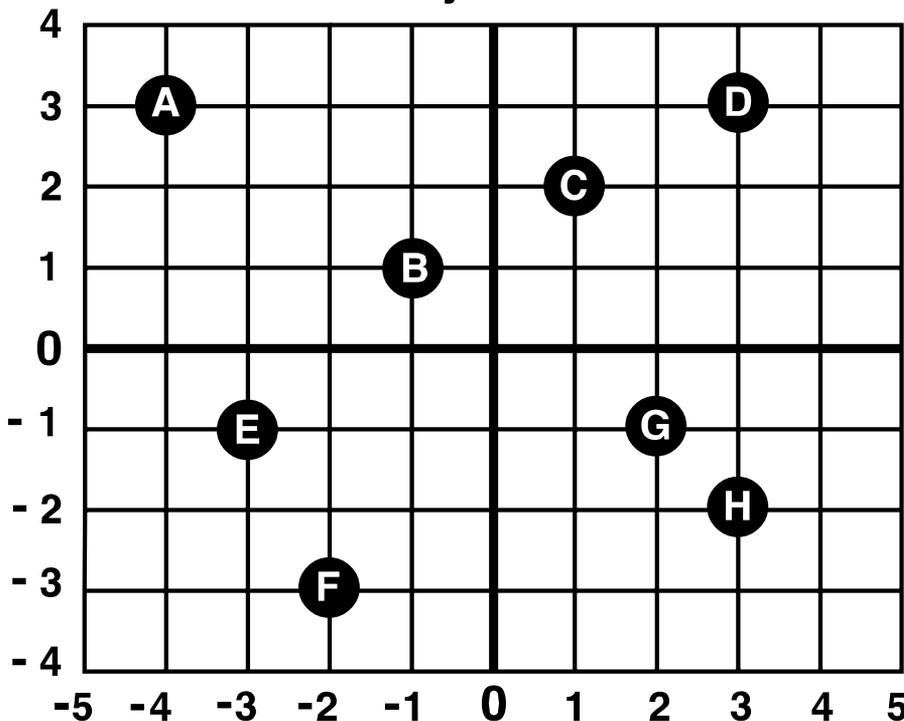
-  J9
-  D8
-  B6
-  J5
-  F5
-  D3



Coordinate plane



y axis



x axis

The first coordinate is the horizontal position on the x axis. The second coordinate is the vertical position on the y axis.

- A (-4, 3)
- B (-1, 1)
- C (1, 2)
- D (3, 3)
- E (-3, -1)
- F (-2, -3)
- G (2, -1)
- H (3, -2)

The order used to represent the coordinates is important so they are called ordered pairs.

Compass points

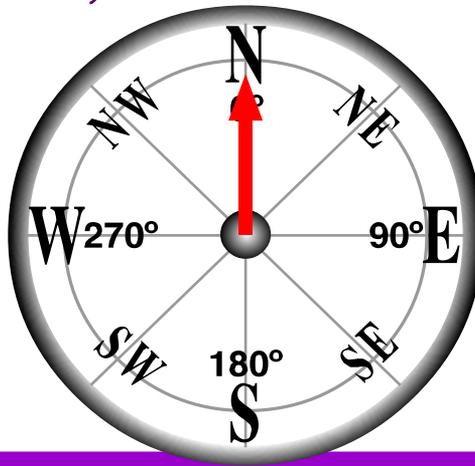
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Directions may be determined using a magnetic compass, an instrument containing a magnetized needle that points to earth's magnetic north.

Compass points

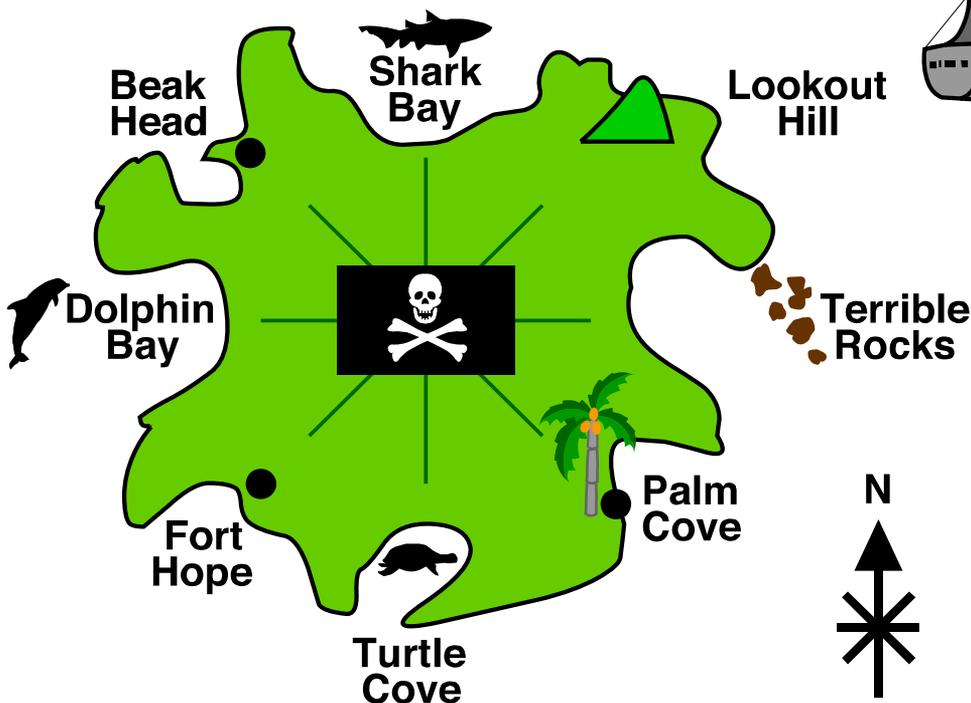
There are four main points of the compass: north (0°), east (90°), south (180°) and west (270°).

Directions halfway between these points are called north east, north west, south east and south west.



Example

Pirate Island



- Shark Bay is north of Turtle Cove.
- Dolphin Bay is west of Terrible Rocks
- Lookout Hill is north east of the pirate flag.
- Beak Head is north west of the pirate flag.
- Palm Cove is south east of the pirate flag.
- Fort Hope is south west of the pirate flag.

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