M1 Maths

G2-4 Geometric Vocabulary

- common words used in geometry

Summary Learn Revise

Summary

To complete this module you will need to know the meanings of 75 words commonly used in geometry.

Learn

After completing this module you will know the meanings of 75 words commonly used in geometry. Many of these you will have already met (especially if you do the Geometry modules in order). Others haven't been mentioned in earlier modules, so might be new. The new words are written in bold red type, those you should have met before in bold blue type.

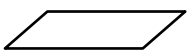
In the Learn section of this module, the meaning of each word is given. Read through this a few times until you think you know them all. Then do Q1.

Dimensions

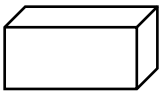
Something that is **zero-dimensional** (0D) has no size. It is just a point in space, like the corner of a square.

Something that is **one-dimensional** (1D) has a length which can be measured in metres or millimetres or whatever, but it has no size in any other direction. A line or a curve is an example.

Something that is **two-dimensional** (2D) has a length, but also a width at right angles to the length. A rectangle is an example. So is a triangle or a circle. And so is a face of a 3D shape. The size of a 2D shape is called its area and can be measured in square metres, square kilometres or whatever.



Something that is **three-dimensional** (3D) has size in three directions at right angles. It has a length, a width perpendicular to the length and a height or thickness perpendicular to both. A box is a 3D object, so is a sphere and a person. The size of a 3D shape is called its volume and can be measured in cubic metres, cubic centimetres, litres or whatever.



Real dimensions and practical dimensions

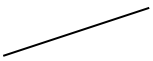
As explained in Module M1-1 (Dimensions, Size and Mass), every physical object is strictly-speaking 3-dimensional. But in practice we might only be interested in one or two of those dimensions. For instance, with a piece of string, we might be interested only in its length and so treat it as 1D, and with a sheet of wrapping paper we might be interested only in the area it will cover, so treat it as 2D.

Points, curves, lines, rays, lines segments, surfaces and planes

A **point** is a position in space without any size. It is 0-dimensional.

A **curve** is a 1-dimensional shape with a length, but no width or thickness. On a curve you can only move forwards and backwards, not left, right, up or down. It can be curved or straight. In this sense, the word 'curve' is used slightly differently in maths than in everyday English where a curve is always curved.

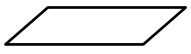
A straight curve is called a **line segment**. A **line** is a straight curve that goes for ever in both directions: it has no ends. A **ray** is a straight curve which has one end, but goes for ever in one direction. A line segment is a straight curve that has two ends and therefore a length.



Note that in everyday English a line segment is usually called a line. Even mathematicians often refer to line segments as lines using the everyday meaning of the word. And in other Black Star modules the word 'line' is sometimes used in the everyday sense. A maths teacher might well ask her class to make a line outside the door, even though there aren't an infinite number of students in the class!

The 2D equivalent of a curve is a **surface**. A surface is a space where you can move forwards and backwards like on a curve, but also left and right, though not up and down. If you move in the third dimension you would leave the surface. Examples of surfaces are: the outside of a sphere or box, the surface of a pond or ocean, or the surface of your body. Like a curve, a surface can be curved or flat.

A flat surface is called a **plane**. The surface of a tennis court would be a plane (as long as we ignore the roughness of the ground).

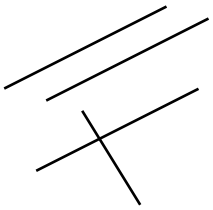


Unlike with lines, we use the word 'plane' for planes which have edges and planes that go on for ever in all directions.

Parallel and perpendicular lines

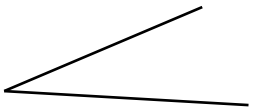
Two lines (or rays or line segments) can be **parallel**, perpendicular or neither.

Parallel lines point in the same direction. As you move along them, they stay the same distance apart. They will never meet or separate.



Perpendicular lines are at 90° to one another. If they cross each other they make a right angle.

Angles



The word **angle** is used for the meeting of two lines (rays or line segments) and for the difference in direction of the two lines. It is usually measured in **degrees**. A degree is $^1/_{360}$ of a **revolution**. A revolution is a turn right around and back to the starting direction.

There are a few words used to describe angles:

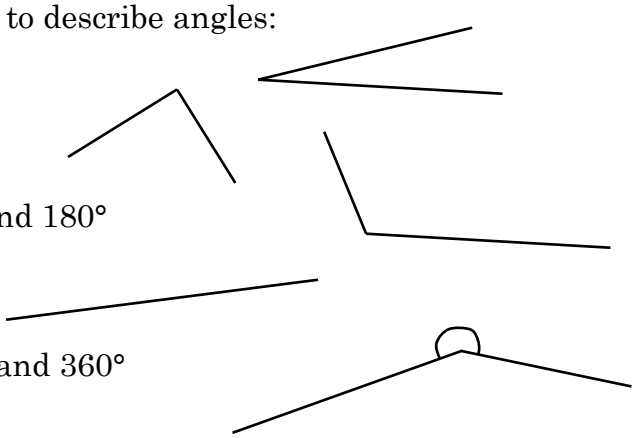
Acute: Less than 90°

Right: 90°

Obtuse: Between 90° and 180°

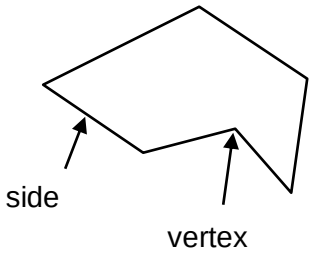
Straight: 180°

Reflex: Between 180° and 360°



2-dimensional Shapes

A **polygon** is a 2-dimensional shape with all its sides straight.



The sides of a polygon are called **sides**, the corners are called vertices (plural of **vertex**).

Polygons have different names depending on the number of side:

3: **Triangle**

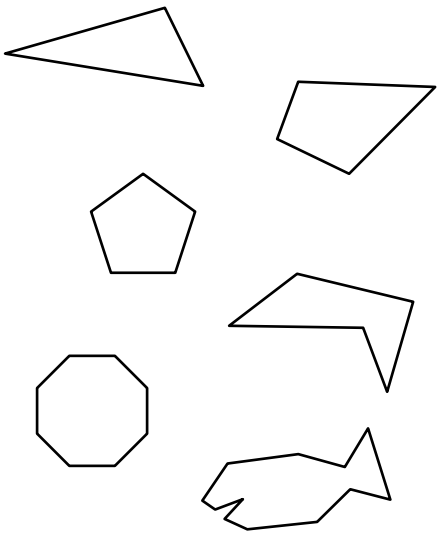
4: **Quadrilateral**

5: **Pentagon**

6: **Hexagon**

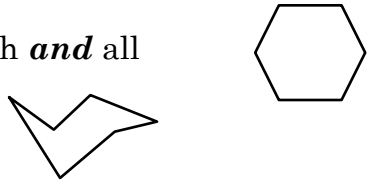
8: **Octagon**

12: **Dodecagon**



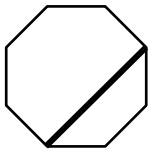
There are names for other numbers of sides (e.g. 10 is a decagon), but they aren't used very much and probably aren't worth learning.

A polygon is **regular** if all the sides are the same length ***and*** all its angles are equal.



Otherwise it is **irregular**.

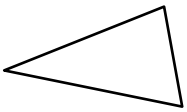
A **diagonal** is a line segment that joins two vertices of a polygon as long as it is not a side.



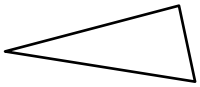
Types of Triangles

There are names for different types of triangles. They can be named according to the size of their largest angle:

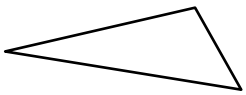
If the largest angle is acute, then it is an **acute triangle**



If the largest angle s right, then the triangle is a **right triangle** or **right-angle triangle**

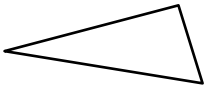


If the largest angle is obtuse, then it is an **obtuse triangle**

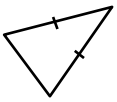


Triangles are also named according to whether any of their sides are equal in length: [The diagrams below use the normal convention that line segments with the same number of dashes are equal in length; line segments with the same number of arrow heads are parallel.]

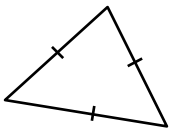
No sides equal (all different): **Scalene**



2 sides equal: **Isosceles**



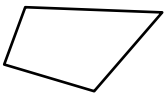
3 sides equal: **Equilateral**



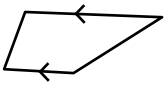
Types of Quadrilateral

There are also names for different types of quadrilaterals.

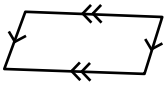
Scalene quadrilateral: Nothing special



Trapezium: One pair of sides is parallel

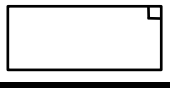


Parallelogram: Two pairs of parallel sides

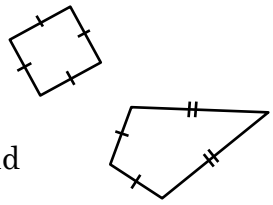


Rhombus: A parallelogram with all its sides the same length

Rectangle: A parallelogram with right angles

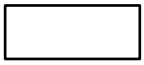


Square: A rectangle with all sides the same length (or a rhombus with right angles)



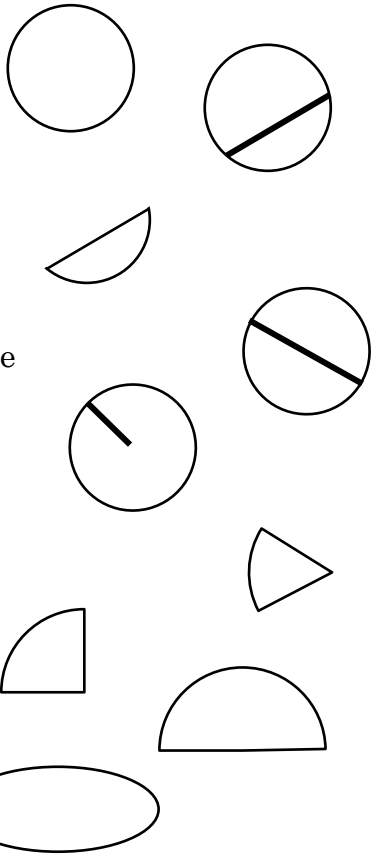
Kite: Two adjacent sides the same length as each other and the other two sides the same length as each other

Note that a square is a type of rectangle. A rectangle that is not a square is called an **oblong**.



Circles

A circle is a round 2D shape. There are a few words associated with circles.



Circumference: The edge of the circle

Chord: A line segment running from one point on the circumference to another

Segment: The part of a circle between a chord and the circumference

Diameter: A chord that passes through the centre of the circle

Radius: A line segment from the centre of the circle to the circumference

Sector: The part of a circle between two radii (plural of radius) and the circumference

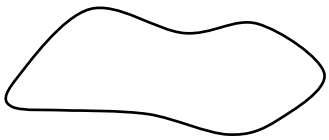
Quadrant: A sector which is a quarter of the circle.

Semicircle: A sector which is half the circle

Ellipse: Like a circle but squashed in one direction.

Amorphous 2-dimensional Shapes

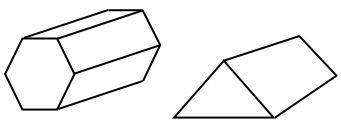
A 2D shape that isn't a polygon, a circle or any other easily described shape is said to be **amorphous**. Amorphous means 'without shape', though strictly speaking it still has a shape. Sometimes amorphous shapes are called blobs.



3-dimensional Shapes

Commonly used words for 3-d shapes are:

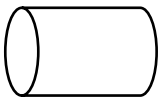
Prism: A shape which can be sliced such that all slices are the same shape and size. Prisms can be further named according to the shape of their



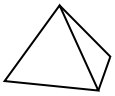
cross-section or end, e.g. rectangular prism, triangular prism, hexagonal prism etc.

Cube: A prism with six square faces.

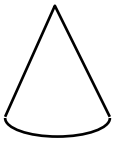
Cylinder: A circular prism.



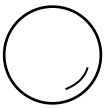
Pyramid: Like a prism, but going to a point at the top so slices get progressively smaller. Like prisms, pyramids can be further named according to the shape of their base, e.g. square pyramid, octagonal pyramid etc.



Cone: A pyramid with a round base.



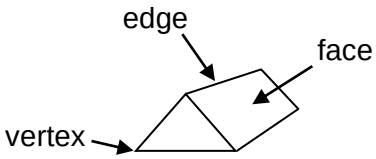
Sphere: Round 3D shape like a round ball or a bubble floating in the air.



Face: A flat part of the surface of a 3D shape

Edge: The line segment where two faces meet

Vertex: The point where edges meet.



Polyhedron: 3D shape in which every face is a polygon

There are names for polyhedra (plural of polyhedron) with different numbers of faces. These ones are worth knowing:

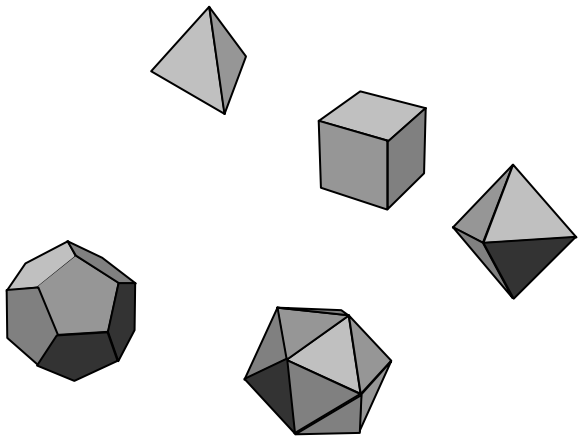
4: **Tetrahedron** (4 faces)

6: **Hexahedron** (6 faces)

8: **Octahedron** (8 faces)

12: **Dodecahedron** (12 faces)

20: **Icosahedron** (20 faces)



A polyhedron is **regular** if all its faces are identical regular polygons and all faces make the same angles with surrounding faces. There are only 5 regular polyhedra: they are the five shown above. They are sometimes called ***platonic solids***, named after the Greek philosopher, Plato.

Q1 Below is a table with the 75 words on the left and their meanings on the right. Use this to check your knowledge. Using the Word version of this module, delete the right column, then type it back in using the words on the left. Then do the same with the left column, typing it back in using the definitions on the right. Alternatively, print the table, then take a sheet of blank paper, cover over the right-hand side of the table and write the meaning on the blank paper beside each word. Then take another blank sheet, cover the left-hand side of the table and write the word on the blank paper beside each meaning. Focus on learning those that you don't get right. Then do it again until you get them all.

Even after you get them all right, come back and do it again every few weeks while you are working on Level 2 to make sure you maintain the knowledge.

1. 0D	a place with no size; a point
2. 1D	something with size in only one direction
3. 2D	something with size in two directions at right angles
4. 3D	something with size in three directions at right angles
5. point	a position in space without any size
6. curve	a 1-dimensional shape with a length, but no width or thickness
7. line segment	a straight curve with two ends (note that in everyday usage, we often call this a line)
8. ray	a straight curve with one end, but continuing for ever in the other direction
9. line	a straight curve continuing for ever in both directions
10. surface	2D equivalent of a curve – a 2-dimensional space
11. plane	a flat surface
12. parallel	lines which stay the same distance apart
13. perpendicular	lines at 90° to each other
14. angle	2 lines with different directions meeting at a point
15. revolution	a turn right round and back to the starting direction
16. degree	one 360^{th} of a revolution
17. acute angle	an angle less than 90°
18. right angle	a 90° angle
19. obtuse angle	an angle between 90° and 180°
20. straight angle	a 180° angle

21. reflex angle	an angle between 180° and 360°
22. polygon	2-dimensional shape with all its sides straight
23. side	one of the line segments that make up a polygon
24. vertex	(of a polygon) a corner
25. triangle	3-sided polygon
26. quadrilateral	4-sided polygon
27. pentagon	5-sided polygon
28. hexagon	6-sided polygon
29. octagon	8-sided polygon
30. dodecagon	12-sided polygon
31. regular	(of a polygon) all sides the same length and all angles equal
32. irregular	not regular
33. diagonal	a line segment that joins two vertices of a polygon but which is not a side
34. acute triangle	a triangle whose largest angle is acute
35. right-angle triangle	a triangle whose largest angle is a right angle
36. obtuse triangle	a triangle whose largest angle is obtuse
37. scalene triangle	(of a triangle) all sides different in length
38. isosceles	(of a triangle) two equal sides
39. equilateral	(of a triangle) all sides equal
40. scalene	(of a quadrilateral) no special features
41. trapezium	a quadrilateral with one pair of parallel sides
42. parallelogram	a quadrilateral with two pairs of parallel sides
43. rhombus	a parallelogram with all its sides the same length
44. rectangle	a parallelogram with right angles
45. square	a rectangle with all sides the same length
46. oblong	a rectangle that is not a square
47. kite	a quadrilateral with two adjacent sides the same length and the other two sides the same length
48. oblong	a rectangle that is not a square

49. circle	round 2d shape
50. circumference	the edge of a circle
51. chord	a line segment running from one point on the circumference of a circle to another
52. segment	the part of a circle between a chord and the circumference
53. diameter	a chord that passes through the centre of the circle
54. radius	a line segment from the centre of the circle to the circumference
55. sector	the part of a circle between two radii and the circumference
56. quadrant	a sector which is a quarter of the circle.
57. semicircle	a sector which is half the circle
58. ellipse	like a circle but squashed in one direction
59. amorphous shape	blob
60. prism	a 3D shape which can be sliced such that all slices are the same shape and size
61. cube	a prism with six square faces
62. cylinder	a circular prism
63. pyramid	like a prism, but going to a point at the top so slices get progressively smaller
64. cone	a prism with a circular base
65. sphere	round 3-d shape like a bubble floating in the air
66. face	a flat part of the surface of a 3-d shape
67. edge	the line segment where two faces meet
68. vertex	(of a 3D shape) the point where edges meet
69. polyhedron	3-d shape in which every face is a polygon
70. tetrahedron	polyhedron with 4 faces
71. hexahedron	polyhedron with 6 faces
72. octahedron	polyhedron with 8 faces
73. dodecahedron	polyhedron with 12 faces
74. icosahedron	polyhedron with 20 faces
75. regular	(of a polyhedron) all faces are identical regular polygons

Revise

Revision Set 1

Q61 Redo Q1