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Shape information

Information about quadrilaterals.

SHAPE

Shape Information

Shapes take their names from the number of sides that they have. The following table gives you the names of some two-dimensional shapes.

Number of sides	Name of shape	Internal angles
3	Triangle	180°
4	Quadrilateral	360°
5	Pentagon	540°
6	Hexagon	720°
7	Heptagon	900°
8	Octagon	1,080°
9	Nonagon	1,260°
10	Decagon	1,440°
11	Hendecagon or Undecagon	1,620°
12	Dodecagon	1,800°
13	Tridecagon	1,980°
14	Tetradecagon	2,160°
15	Pentadecagon	2,340°
20	Icosagon	3,240°
30	Triacontagon	5,040°
1000	Chiliagon	17,640°

The important ones for us to learn about are the up to ten sided shapes. In particular the triangles and quadrilaterals.

Features of shapes:

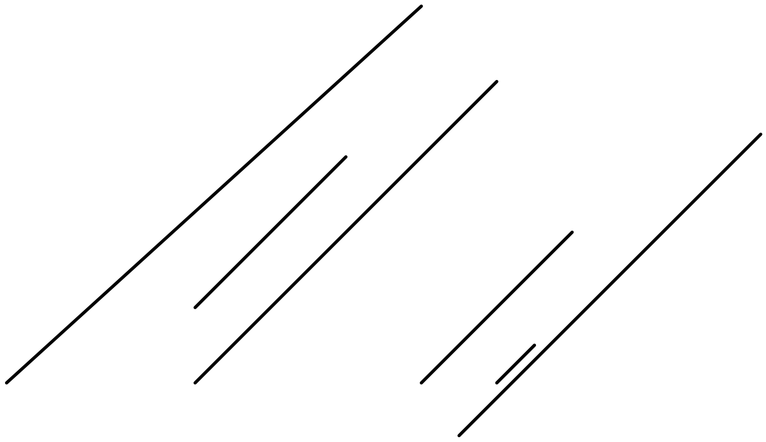
Shapes in two dimensional space have various features. These include:

- edges (or lines or sides);
- vertices (or corners);
- angles;
- surface area;
- orders of rotational symmetry;
- lines of symmetry (mirror lines).

The names of shapes are taken from either Latin or Greek or a combination of the two.

Things you need to know:

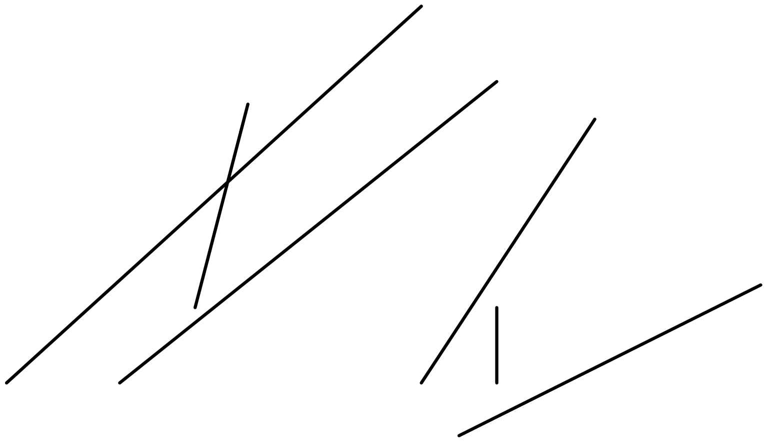
Parallel lines are lines that are the same distance apart all the way along their length.



All the lines in the above diagram are parallel. Whether a line is parallel or not has nothing whatsoever to do with the length of the line. Neither does the line have to be straight. Train tracks are parallel, even though they go round bends. As long as they are the same distance apart along their length, they are parallel.

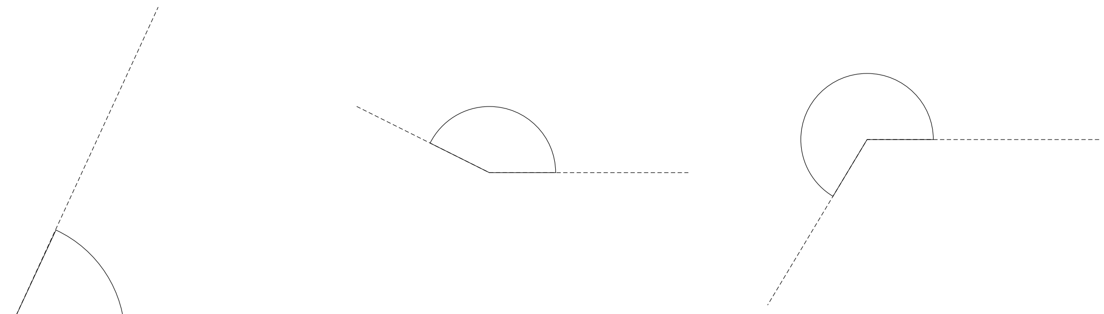
Parallel lines never meet. Even if you extended the lines to the sun, they would stay the same distance apart all the way.

Below are some lines that are not parallel, just so you can spot the difference.



Angles tell us the amount of turn something has. The size of the angle has nothing whatever to do with the length of the lines meeting at the angle.

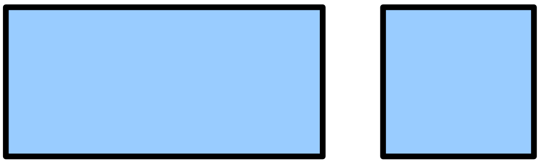
Obtuse angle is > 90° but <180°



Acute angle is < 90°

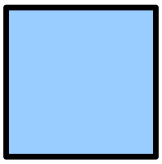
Reflex angle is > 180°

Quadrilaterals → Rectangle



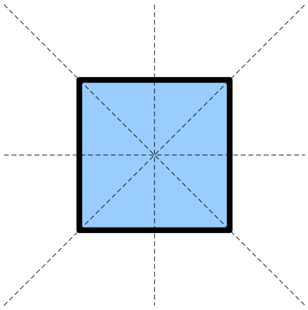
A rectangle is a four sided shape that has four angles that are all right angles.   There are two types of rectangle: the **oblong** and the **square**.

Quadrilaterals → Rectangle → Square

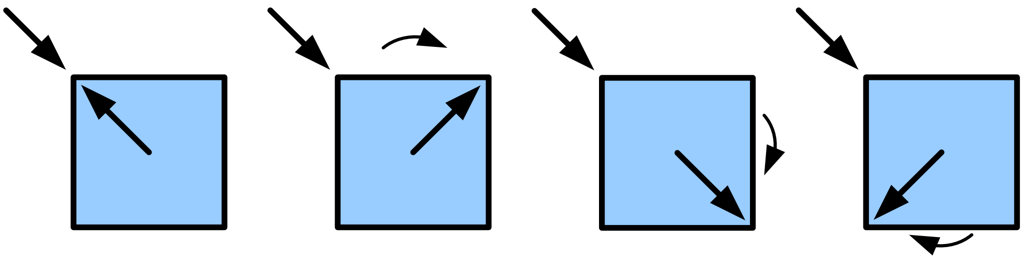


A square is a rectangle with four sides that are all the same length.

A square has four lines of symmetry shown below:



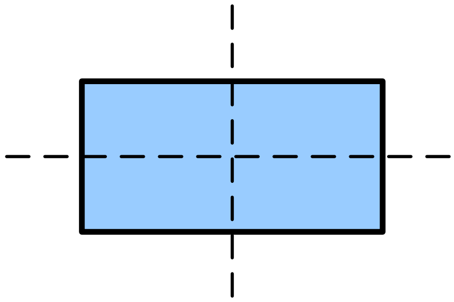
A square has four orders of rotational symmetry which means that if you cut it out of the paper, there are four ways that you can slot it back into the paper and it would fit.



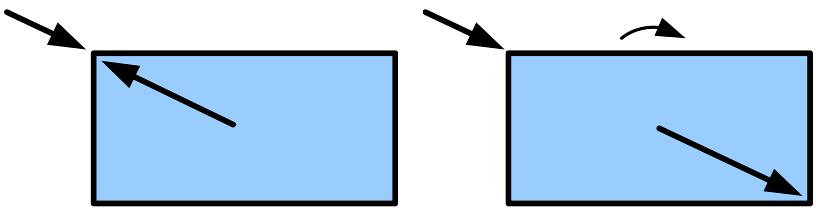
Quadrilaterals → Rectangle → Oblong

An oblong is a rectangle that has two long sides and two shorter sides. All the angles are right angles or 90°.

An oblong has two lines of symmetry. These do not run from corner to corner (vertex to vertex), but instead, bisect (cut exactly in half) the edges of the shape as shown below:



An oblong has two orders of rotational symmetry which are shown below:



As with all quadrilaterals, the internal angles of an oblong add up to 360°.

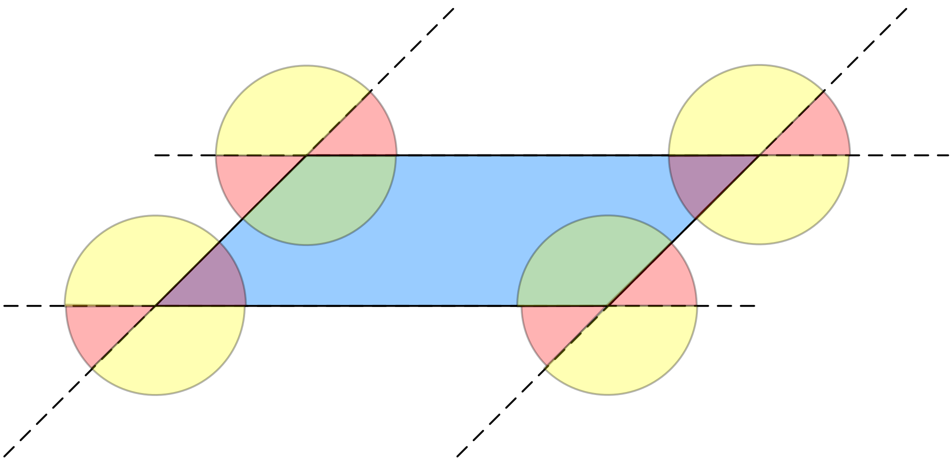
Quadrilaterals → Parallelogram → Rhomboid

A parallelogram has four sides and each opposite pair are parallel (which means that they are the same distance apart along their complete length (like railway tracks)).

The internal angles of a parallelogram, like all quadrilaterals add up to 360°.

Parallelograms do not have lines of symmetry unless their sides are all the same length. If their sides are all the same length, they are called rhombuses (or a rhombus).

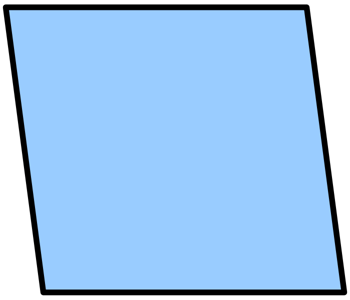
The interesting thing about parallelograms is their relationship to 180°. This angle pops up all over the place with them.



On this diagram, all the red angles are the same and all the yellow angles are the same. Also, because each red angle and each yellow angle are drawn along a straight line together, they add up to 180°.

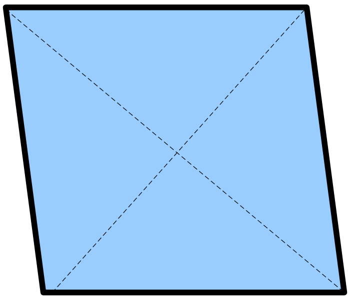
A rhomboid parallelogram has two orders of rotational symmetry.

Quadrilaterals → Parallelogram → Rhombus

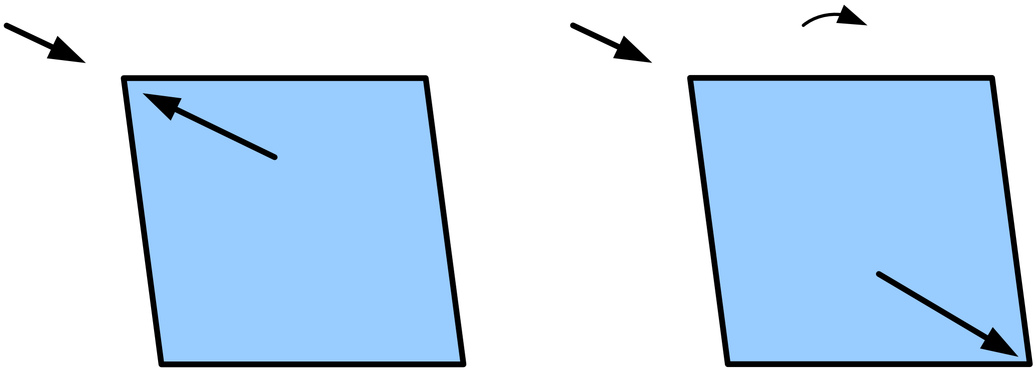


A rhombus is a rhomboid parallelogram with sides that are all the same length.

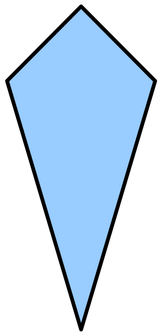
A rhombus has two lines of symmetry which run from vertex to vertex (corner to corner) as shown below:



A rhombus has two orders of rotation in the same way as other rhomboid parallelograms.

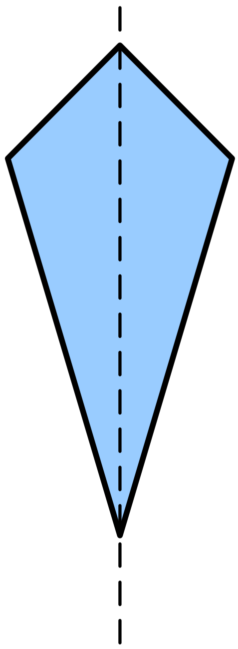


Quadrilaterals → Kite



Like all quadrilaterals, the internal angles of a kite add up to 360°. A kite has four sides which can be grouped into two pairs. Unlike the parallelograms, where opposite sides are the same length, with a kite, two sides next to each other (or adjacent sides) are the same length.

A kite has one axis of symmetry which forms a line between the middle vertices splitting the like sides as shown below:



A kite has one order of rotational symmetry which means you can only put it the original way round.

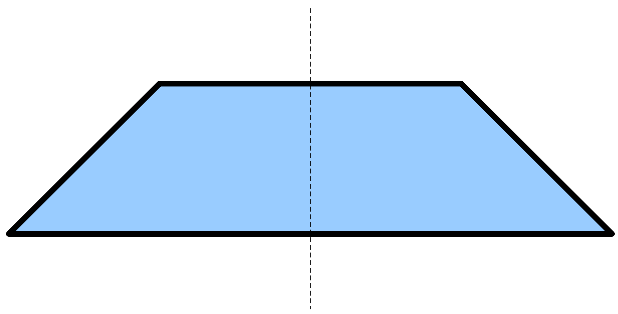
Quadrilaterals → Trapezium

All these are trapezoids. They have one pair of sides that are parallel and one pair of sides which are not.

These shapes have one order of rotational symmetry and no lines of reflectional symmetry.

Quadrilaterals → Trapezium → Isosceles Trapezium

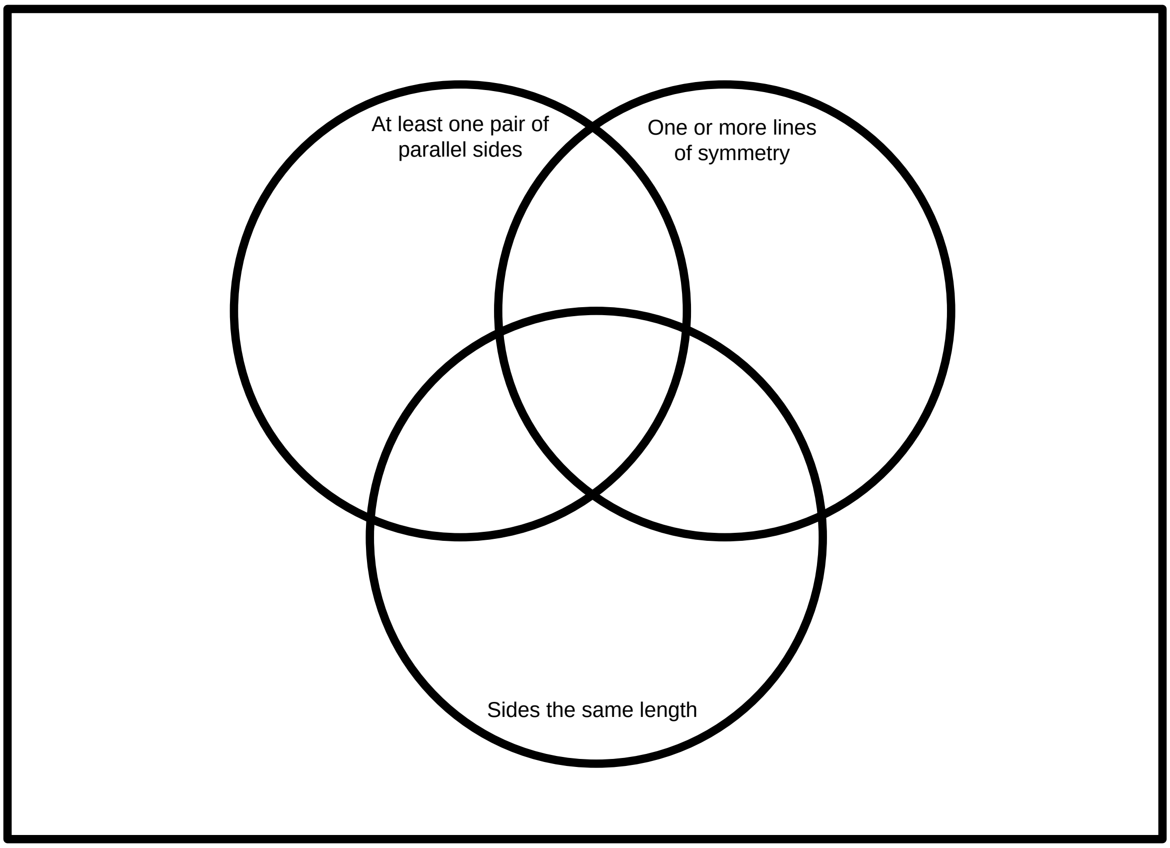
When we draw a picture of a trapezium, this is usually what people draw.



This is a special sort of trapezium because it has one axis of reflectional symmetry. On this type of trapezium, the top two angles are the same and the bottom two angles are the same.

Things to do:

1. Use a compass to draw yourself a Venn diagram and fill it in with the shapes mentioned in this booklet.



2. Make up some yes/no questions about each shape and then build a key diagram (like you might do in biology to identify different animals).

3. Draw each shape, cut it out and then fold it along the lines of symmetry.

4. Work out a formula in terms of the number of sides (call that n) to tell us how to work out the sum of the internal angles in a shape.