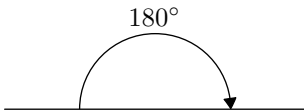


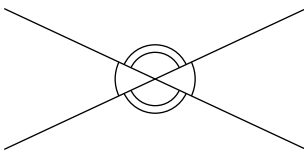
10 Geometry

Basic facts about fundamental geometrical figures and here below given for reference.

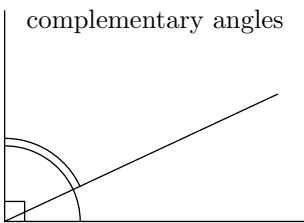
10.1 Angles



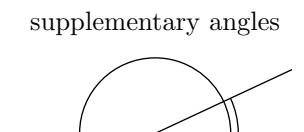
A *straight angle* is 180°



Vertically opposite angles are equal.

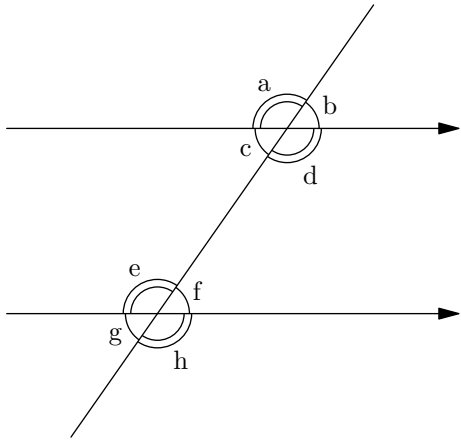


Two angles whose sum is 90° are called *complementary* angles.



Two angles whose sum is 180° are called *supplementary* angles.

10.2 Parallel Lines



Angles marked by the same symbol are equal.

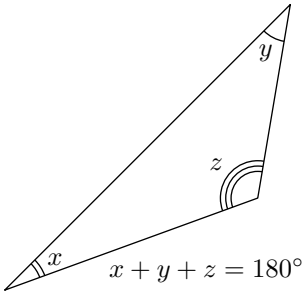
Vertically opposite angles: $a = d$, $b = c$, $e = h$, $f = g$

Alternate angles $c = f$, $d = e$

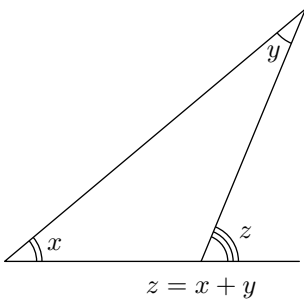
Corresponding angles $a = e$, $c = g$, $b = f$, $d = h$

Co-interior angles: $\underbrace{c + e}_{\text{supplementary}} = \underbrace{d + f}_{\text{supplementary}} = 180^\circ$

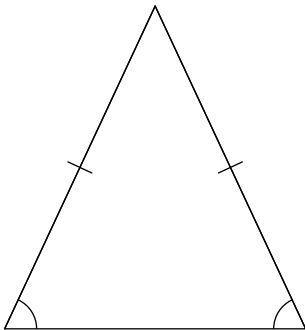
10.3 Triangles



Sum of the angles of **any** triangle is 180° ,
 $x + y + z = 180^\circ$

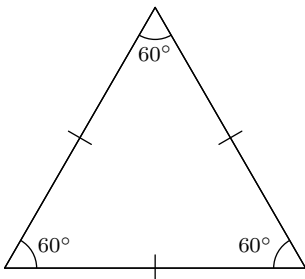


Exterior angle = sum of interior opposite angles, $z = x + y$



Isosceles Triangle

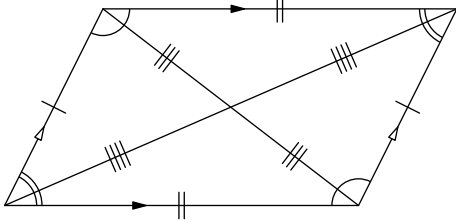
{ Base angles are equal and
Opposite sides equal



Equilateral Triangle

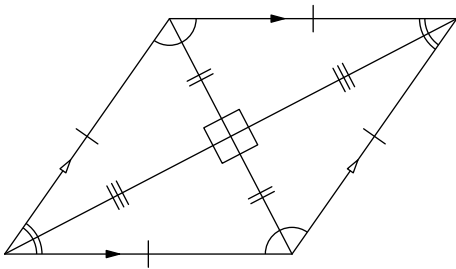
{ All angles = 60°
All sides equal in length

10.4 Quadrilaterals



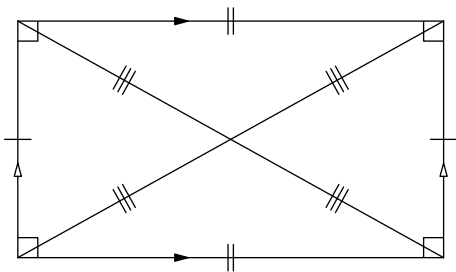
Parallelogram { Opposite sides equal and parallel
Diagonals bisect each other

In a parallelogram
{ there is no axis of symmetry
opposite angles are equal
adjacent angles are supplementary

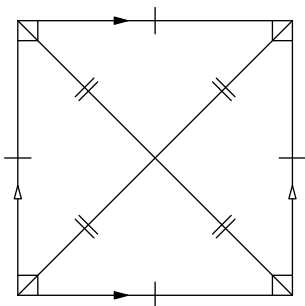


Rhombus { Parallelogram with all sides equal
Diagonals bisect each other at *right angles*

A rhombus has no axis of symmetry

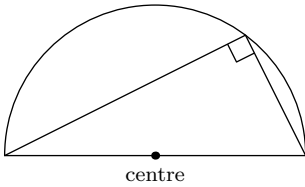


Rectangle

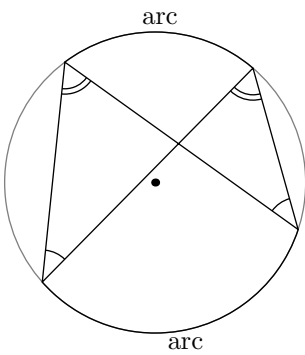


Square

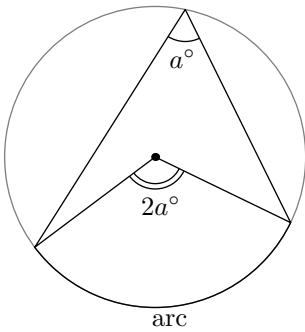
10.5 Circles



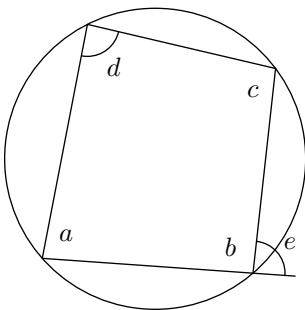
Angle in a semi-circle is a right angle



Angles on the same arc are equal



Angle at the centre is twice angle at circumference standing on the same arc



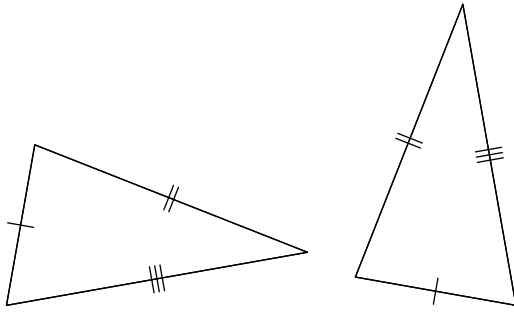
In a *cyclic* quadrilateral (i.e., a 4-sided figure with the vertices on a circle),

$$\begin{cases} a + c = 180^\circ \\ b + d = 180^\circ \\ e = d \end{cases}$$

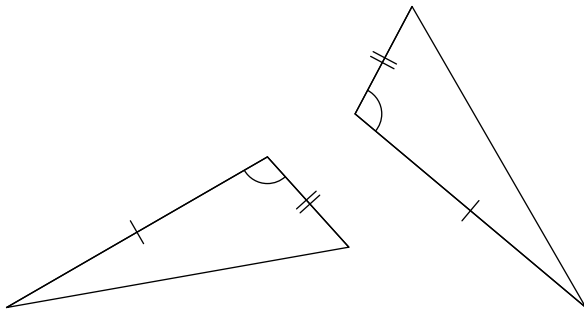
10.6 Congruent Triangles

Two triangles are *congruent* if they have the same shape and the same size.

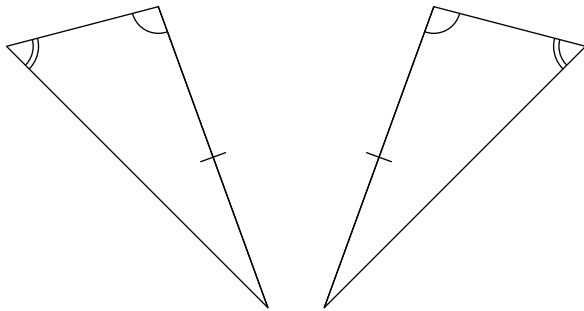
For this to happen, one of the following sets A, B, C of 3 criteria



A. Three pairs of sides are equal.



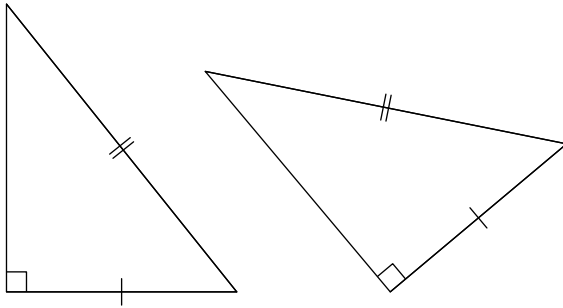
B. Two pairs of sides and the angles between them are equal.



C. One pair of corresponding sides, and two pairs of angles are equal.

When this happens (for A, B or C) we have a total of 6 pieces of information about equality (3 about equal sides and 3 about equal angles), and so the areas of the two congruent triangles are equal.

If the triangles are **right-angled**, then the 3 criteria of D must be fulfilled.



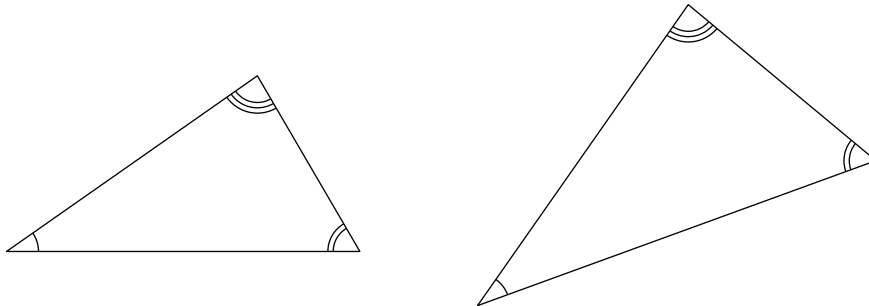
D. The hypotenuses, one pair of corresponding sides, and the pair of right angles are equal.

Congruent triangles are thus equal in all respects.

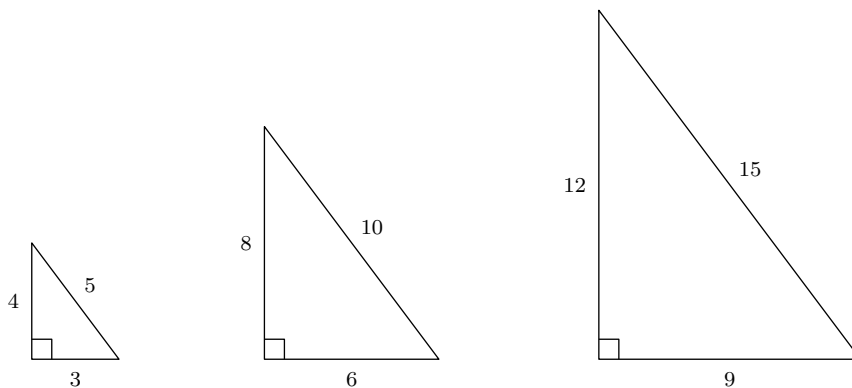
The symbol \equiv means “is congruent to”.

10.7 Similar Triangles

Two triangles are *similar* if they have the same shape.



Two similar triangles are **equiangular**, i.e., angles which correspond are equal.



Consider the similar right-angled triangles drawn, then

$$\frac{4}{5} = \frac{8}{10} = \frac{12}{15} = \dots$$

and similarly for the other ratios of sides (see Topic 12, Section 2).

The symbol \sim is sometimes used for the phrase ‘is similar to’.

Clearly, congruence is a special case of similarity, i.e., all congruent triangles are similar, but only some similar triangles are congruent.