

Geometry (Mathematics)

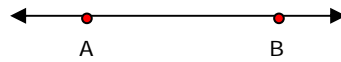
Point

A point on a plane; it has position only and is infinitely small; no dimensions



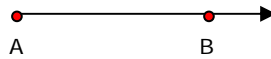
Line

A line continues infinitely in both directions; has one dimension; made up of infinite points



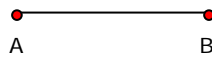
Ray

One endpoint



Line segment/Interval

Two endpoints

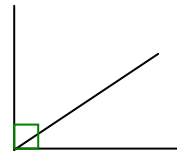


Angles

Type of Angle	Size of Angle
Straight Angle	180°
Right Angle	90°
Acute Angle	Between 0° and 90°
Obtuse Angle	Between 90° and 180°
Reflex Angle	Between 180° and 360°
Revolution	360°

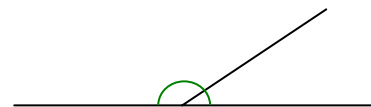
Adjacent complementary angles

Adjacent complementary angles form a **right angle**.
 Complementary angles are two angles that add to **90°**.



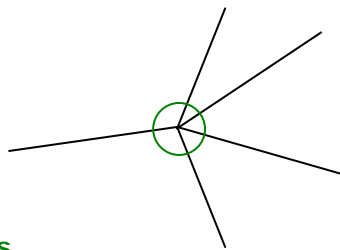
Adjacent supplementary angles

Adjacent supplementary angles form a **straight line**.
 Supplementary angles are two angles that add to **180°**.



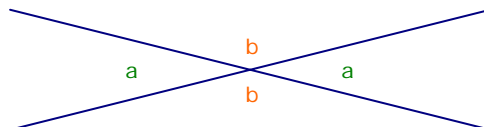
Angles about a Point

These angles add to **360°**.



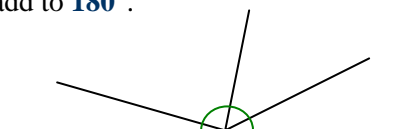
Vertically opposite angles

If two straight lines intersect, the vertically opposite angles are **equal**.
 A **bisector** is a line that divides an angle into two equal parts.



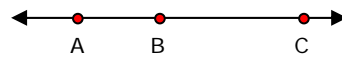
Angles on a Straight Line

Angles on a straight line add to **180°**.



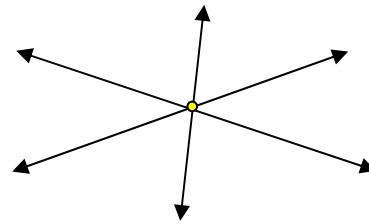
Collinear points

Collinear points lie on the same line (refers to three or more points).



Concurrent lines

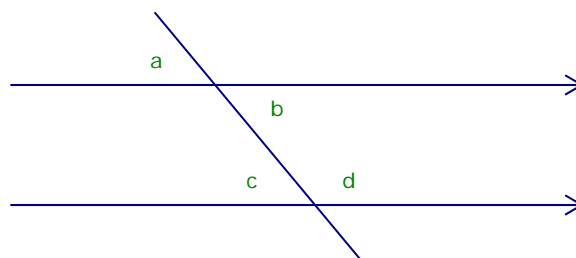
Concurrent lines intersect at the same point.



Parallel Line Theorems

Parallel lines have the same gradient and never intersect.

- **Corresponding angles** are equal. (a and c)
- **Alternate Angles** are equal. (b and c)
- **Co-interior angles** are supplementary. (b and d)



Angle Properties of a Triangle

- Angle sum of a triangle is **180°**.
- The exterior angle of a triangle is equal to the sum of the two opposite interior angles.

Quadrilaterals

- Angle sum of a quadrilateral is **360° (4 right angles)**.

Angles of a Polygon

- In general, the sum of the angles of an n-sided polygon is:
 $(2n - 4)$ right angles = $180 \times (n - 2)$.
- The sum of all the exterior angles of any convex polygon is **360°**.
- A **polygon** (many sides) is a closed figure bounded by straight lines; all angles and all sides of a regular pentagon are equal.

Types of Quadrilaterals

Quadrilateral	Properties	Tests
Parallelogram	<ul style="list-style-type: none"> ▪ Opposite sides are equal ▪ Opposite angles are equal ▪ Diagonals bisect each other ▪ Each diagonal bisects the parallelogram into two congruent triangles 	<ul style="list-style-type: none"> ▪ Both pairs of opposite sides parallel ▪ Both pairs of opposite sides equal ▪ One pair of opposite sides is both equal and parallel ▪ Both pairs of opposite angles are equal ▪ The diagonals bisect each other
Rectangle	A parallelogram with all angles 90°. <ul style="list-style-type: none"> ▪ Same properties for parallelogram, plus ▪ Diagonals are equal 	<ul style="list-style-type: none"> ▪ It is a parallelogram with one vertex angle a right angle ▪ It is a parallelogram with equal diagonals
Rhombus	A parallelogram with all sides equal <ul style="list-style-type: none"> ▪ Same properties for parallelogram, plus ▪ Diagonals bisect at right angles ▪ Diagonals bisect the angle of the rhombus 	<ul style="list-style-type: none"> ▪ It is a parallelogram with one pair of adjacent sides equal ▪ All four sides are equal ▪ The diagonals bisect each other at right angles

Quadrilateral	Properties	Tests
Square	A square is a rectangle with all sides equal; a rhombus with all angles 90° <ul style="list-style-type: none"> ▪ Same properties as a rectangle, plus ▪ Diagonals are perpendicular ▪ Diagonals make angles of 45° with the sides 	<ul style="list-style-type: none"> ▪ It is a rectangle with one pair of adjacent sides equal ▪ It is a rhombus with one vertex angle a right angle ▪ It is a rhombus with equal diagonals
Trapezium	A quadrilateral with one pair of sides parallel	
Kite	A quadrilateral with two pairs of adjacent sides equal	

Test for Congruent Triangles

SAS (Side Angle Side)

Two sides and the included angle of one are respectively equal to two sides and the included angle of the other

SSS (Side Side Side)

Three sides of one are respectively equal to three sides of the other

AAS (Angle Angle Side)

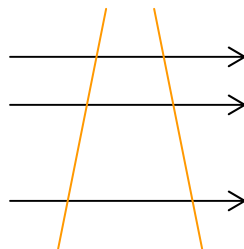
Two angles and a side of one are respectively equal to two angles and a corresponding side of the other

RHS (Right-Angle Hypotenuse Side)

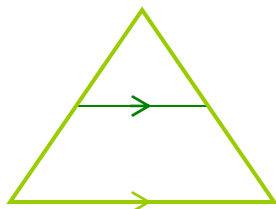
The triangles must be right-angled; then, hypotenuse and a side of one are respectively equal to the hypotenuse and a side of the other

Intercept Properties

- When two or more transversals cut a family of parallel lines, the ratios of the intercepts are equal.

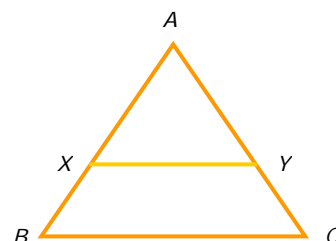


- The line joining the midpoints of two sides of a triangle is parallel to the third side and is half its length.

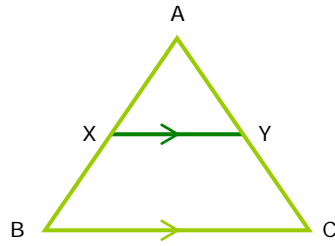


Useful results that follow include:

- A line parallel to one side of a triangle divides the other sides in proportion.
 $AX : XB = AY : YC$



- A line through the midpoint of one side of a triangle and parallel to another side bisects the third side



If $AX = XB$ and $XY \parallel BC$,
then $AY = YC$

Similar Triangles

Similar triangles are triangles with the same shape but not necessarily the same size. One triangle is an enlargement of the other. Corresponding angles are equal and corresponding sides in proportion.

Two triangles are similar if:

- The angles of one triangle respectively equal the angles of the other (**equiangular**); *OR*
Two angles of one triangle respectively equal two angles of the other
- Three pairs of corresponding sides are in proportion
- Two pairs of corresponding sides are in proportion and the included angles are equal

Theorem of Pythagoras

The square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the other two sides.

$$a^2 + b^2 = c^2$$

Converse of the Theorem of Pythagoras

If the square on the side of a triangle is equal to the sum of the square on the other two sides, the angle contained by these sides must be a right angle.