

A **regular** polygon has all equal lengths and all its angles are equal.



# Angles in parallel lines and polygons



An **irregular** polygon has sides and angles of different sizes.

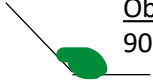
## Basic angle rules



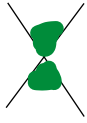
**Acute angle**  
 $0^\circ < \text{angle} < 90^\circ$



**Angles on a straight line sum to  $180^\circ$**



**Obtuse angle**  
 $90^\circ < \text{angle} < 180^\circ$



**Vertically opposite angles are equal**



**Reflex angle**  
 $180^\circ < \text{angle} < 360^\circ$



**Right angle**  
is  $90^\circ$



**Angles around a point sum to  $360^\circ$**

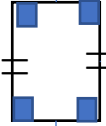
## Properties of Quadrilaterals



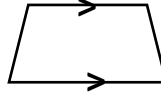
**Square**  
All sides equal  
All angles  $90^\circ$   
Opposite sides are parallel



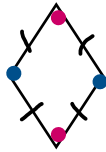
**Parallelogram**  
Opposite sides are parallel.  
Opposite angles are equal.  
Has co-interior angles



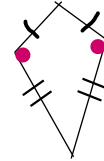
**Rectangle**  
All angles  $90^\circ$   
Two pairs equal sides.  
Opposite sides parallel.



**Trapezium**  
One pair of parallel lines

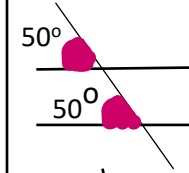


**Rhombus**  
All sides equal  
Opposite angles are equal.

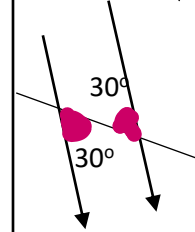


**Kite**  
No parallel lines.  
Two pairs of equal lengths  
One pair of equal opposite angles.

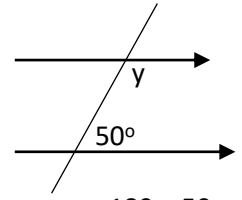
## Parallel Lines



**Corresponding angles are equal**



**Alternate angles are equal**



**Co-Interior angles sum to  $180^\circ$**   
Also known as 'Allied angles'

$$y = 180 - 50 = 130^\circ$$

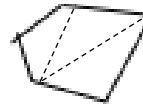
Common polygons	Number of sides	Name
	5	Pentagon
	6	Hexagon
	7	Heptagon
	8	Octagon
	9	Nonagon
	10	Decagon

## Sum of Interior angles = (number of sides - 2) x 180



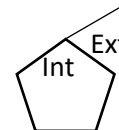
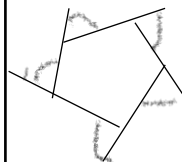
Interior angles are enclosed by the polygon

$$\text{Sum of interior angles} = (5 - 2) \times 180 = 540^\circ$$



This irregular pentagon can be split up into 3 triangles and each triangle has an angle sum of  $180^\circ$   
Hence  $3 \times 180 = 540^\circ$

## Sum of exterior angles



An interior angle is adjacent to an exterior angle in all polygons.  
Therefore  
**Interior + exterior =  $180^\circ$**

**Exterior angles all add up to  $360^\circ$**

## Missing angles in regular polygons

### Exterior angle in regular polygons

$$= 360^\circ \div \text{number of sides}$$

### Interior angle in regular polygons

$$= \frac{(\text{number of sides} - 2) \times 180^\circ}{\text{number of sides}}$$