

# YEAR 7 — LINES AND ANGLES

## Geometric reasoning

### What do I need to be able to do?

By the end of this unit you should be able to:

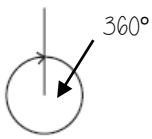
- Understand/use the sum of angles at a point
- Understand/use the sum of angles on a straight line
- Understand/use equality of vertically opposite angles
- Know and apply the sum of angles in a triangle
- Know and apply the sum of angles in a quadrilateral

### Keywords

- Vertically Opposite:** angles formed when two or more straight lines cross at a point
- Interior Angles:** angles inside the shape
- Sum:** total, add all the interior angles together
- Convex Quadrilateral:** a four-sided polygon where every interior angle is less than  $180^\circ$
- Concave Quadrilateral:** a four-sided polygon where one interior angle exceeds  $180^\circ$
- Polygon:** A 2D shape made with straight lines
- Scalene triangle:** a triangle with all different sides and angles
- Isoceles triangle:** a triangle with two angles the same size and two angles the same size
- Right-angled triangle:** a triangle with a right angle

### Sum of angles at a point

The sum of angles around a point is  $360^\circ$



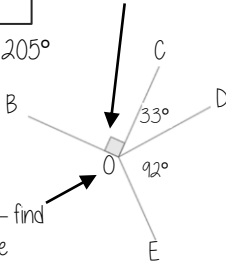
Find angle BOE

$$90^\circ + 33^\circ + 92^\circ = 205^\circ$$

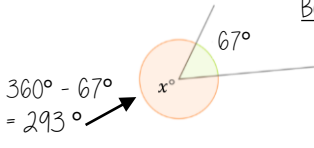
$$360^\circ - 205^\circ$$

$$BOE = 155^\circ$$

Angle notation —  $90^\circ$

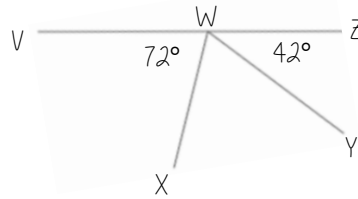


Angle notation — find this missing angle



### Sum of angles on a straight line

Adjacent angles that share a common point on a line add up to  $180^\circ$

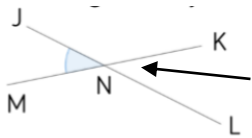


Find angle XWY

$$72^\circ + 42^\circ = 114^\circ$$

$$180^\circ - 114^\circ = 66^\circ$$

### Vertically opposite angles

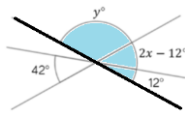


Angle JNM is vertically opposite to angle KNL

$$JNM = KNL$$

Vertically opposite angles are the same

Other angle rules still apply  
Look for straight line sums and angles around a point

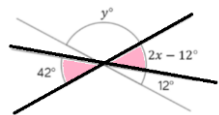


Form equations with information from diagrams

$$2x - 12 = 42$$

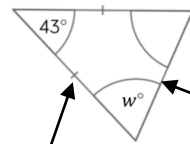
$$2x = 54$$

$$x = 27^\circ$$



### Sum of angles in triangles

Sum of interior angles in a triangle =  $180^\circ$



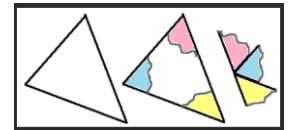
The two base angles will be the same size

Look at triangle notation  
This indicates an isosceles triangle

$$\therefore 180 - 43 = 137$$

$$137 \div 2 = 68.5^\circ$$

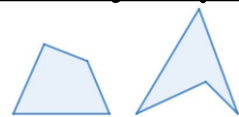
A triangle can only have ONE right angle



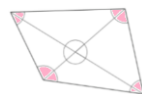
Have a go!  
Tearing the corners from triangles forms a straight line which is therefore  $180^\circ$

### Sum of angles in quadrilaterals

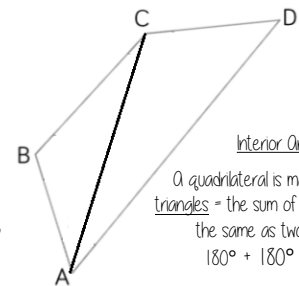
Sum of interior angles in a quadrilateral =  $360^\circ$



Convex Quadrilateral  
Concave Quadrilateral



Interior angles are those that make up the perimeter (outline) of the shape

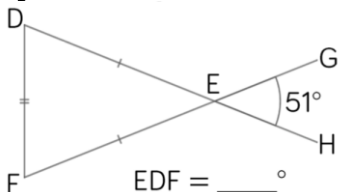


Interior Angles

A quadrilateral is made up of two triangles = the sum of interior angles is the same as two triangles  
 $180^\circ + 180^\circ = 360^\circ$

### Angle Problems

Split up the problem into chunks and explain your reasoning at each point using angle notation



1. Angle DEF =  $51^\circ$  because it is a vertically opposite angle DEF = GEH
2. Triangle DEF is isosceles (triangle notation)  $\therefore$  EDF = EFD and the sum of interior angles is  $180^\circ$   
 $180^\circ - 51^\circ = 129^\circ$        $129^\circ \div 2 = 64.5^\circ$
3. Angle EDF =  $64.5^\circ$

Keep working out clear and notes together