

YEAR 9 — REASONING WITH GEOMETRY... Deduction

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What do I need to be able to do?

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

- Identify angles in parallel lines
- Solve angle problems
- Make conjectures with angles
- Make conjectures with shapes

Keywords

- Parallel:** two straight lines that never meet with the same gradient
Perpendicular: two straight lines that meet at 90°
Transversal: a line that crosses at least two other lines.
Sum: the result of adding two or more numbers.
Conjecture: a statement that might be true but is not proven
Equation: a statement that says two things are equal
Polygon: a 2D shape made from straight edges.
Counterexample: an example that disproves a statement

Alternate angles

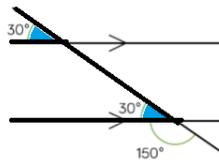
Because alternate angles are equal the highlighted angles are the same size



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Corresponding angles

Because corresponding angles are equal the highlighted angles are the same size

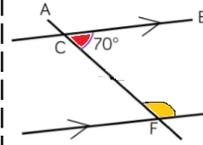


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Co-interior angles

Because co-interior angles have a sum of 180° the highlighted angle is 110°

As angles on a line add up to 180° co-interior angles can also be calculated from applying alternate/ corresponding rules first



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Solving angle problems

Link angle facts to algebra

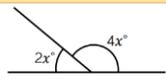
Form an equation

State the reason

Solve

Angles on a straight line

180°



$$2x + 4x = 180^\circ$$

The sum of angles on a straight line is 180°

$$2x + 4x = 180^\circ$$

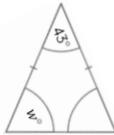
$$6x = 180^\circ$$

$$x = 30^\circ$$



Vertically opposite angles
Equal

Angles around a point
 360°

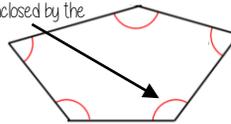


Triangles
Sum of angles is 180°

Isosceles have the same base angles

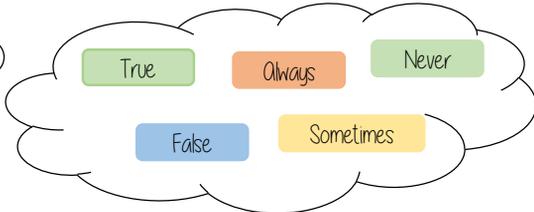
Interior Angles

The angles enclosed by the polygon



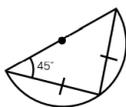
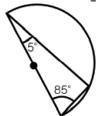
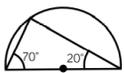
$$(\text{number of sides} - 2) \times 180$$

Making conjectures with angles



Proving a conjecture

A pattern is noticed for many cases



Disproving a conjecture

Only one counterexample is needed to disprove a conjecture

Apply the angle rules

The sum of angles in a triangle is 180°

$$180 - 70 - 20 = 90$$

$$180 - 85 - 5 = 90$$

$$180 - 45 - 45 = 90$$

Make conjecture

The angle that meets the circumference in a semi circle is 90°

Making conjectures with shapes

Keywords and facts to recall with shape

Area: the amount of space inside a shape
Perimeter: the length around a shape
Regular Polygons: All sides and angles are equal

Quadrilateral Facts



Square
All sides equal size
All angles 90°
Opposite sides are parallel



Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles



Rectangle
All angles 90°
Opposite sides are parallel



Rhombus
All sides equal size
Opposite angles are equal



Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles