

Polygons

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Name: _____

Date: _____

At a glance

Angle facts, parallel lines, angles in polygons, and how to write geometric reasons.

1. Basic angle facts
2. Angles and parallel lines
3. Angles in polygons
4. Giving reasons

1. Basic angle facts

☐ I revised this

- Angles on a straight line add to 180° . Angles at a point add to 360° .
- Vertically opposite angles are equal.
- Angles in a triangle add to 180° ; in a quadrilateral, 360° .
- Isosceles triangle: two equal sides and the two base angles equal. Equilateral: all angles 60° .
- The exterior angle of a triangle equals the sum of the two opposite interior angles.

Worked example

Three angles on a straight line are $2x$, $3x$ and $4x$. Find x .

1. $2x + 3x + 4x = 180$.

2. $9x = 180$.

$x = 20$

2. Angles and parallel lines

☐ I revised this

- **Alternate** angles (Z-shape) are equal.
- **Corresponding** angles (F-shape) are equal.
- **Co-interior** angles (C-shape) add to 180° .
- Write the reason in words: 'alternate angles are equal' — not 'Z angles'.

Pair	Shape	Rule
Alternate	Z	equal
Corresponding	F	equal
Co-interior	C / U	add to 180°
Vertically opposite	X	equal

Worked example

Two parallel lines are crossed by a transversal. One co-interior angle is 115° . Find the other.

1. Co-interior angles add to 180° .

2. $180 - 115$.

65°

3. Angles in polygons

☐ I revised this

- Sum of interior angles of an n -sided polygon = $(n - 2) \times 180^\circ$.
- Exterior angles of any polygon add to 360° .
- Regular polygon: exterior angle = $360^\circ \div n$; interior = $180^\circ - \text{exterior}$.
- Number of sides of a regular polygon = $360^\circ \div \text{exterior angle}$.

Polygon	Sides	Angle sum	Regular interior
Triangle	3	180°	60°
Quadrilateral	4	360°	90°
Pentagon	5	540°	108°
Hexagon	6	720°	120°
Octagon	8	1080°	135°
Decagon	10	1440°	144°

Formulas

$(n - 2) \times 180^\circ$	interior angle sum
$360^\circ \div n$	exterior angle of a regular polygon
interior + exterior = 180°	

Worked example

The interior angle of a regular polygon is 5 times its exterior angle. How many sides does it have?

1. Interior + exterior = 180 , so $6 \times \text{exterior} = 180$.
2. Exterior = 30° .
3. $n = 360 \div 30$.

12 sides

4. Giving reasons

☐ I revised this

- Use three-letter notation: angle ABC is the angle at B.
- Each step: the angle, then its reason. For example: 'angle ABD = 40° (alternate angles are equal)'.
- Common reasons: angles on a straight line, angles in a triangle, isosceles triangle, alternate / corresponding / co-interior angles, angles in a polygon.

Worked example

In triangle ABC, AB = AC and angle BAC = 40° . Find angle ABC, giving a reason.

1. Base angles of an isosceles triangle are equal.
2. $(180 - 40) \div 2 = 70$.

70° (base angles of an isosceles triangle are equal; angles in a triangle add to 180°)

Common mistakes

Don't write	Write instead
$\times$ Regular hexagon interior angle = $360 \div 6 = 60^\circ$	$\checkmark$ That's the exterior angle; interior = 120°
$\times$ Using $n \times 180$ for the angle sum	$\checkmark$ $(n - 2) \times 180$
$\times$ Writing 'Z angles' as a reason	$\checkmark$ Write 'alternate angles are equal'
$\times$ Saying co-interior angles are equal	$\checkmark$ They add to 180°

In the exam

- Mark angles on the diagram as you find them.
- 'Give reasons' questions lose marks without the words — write every reason.
- Diagrams are not drawn to scale: never measure; calculate.

My notes
