4.1 Angles, parallel lines and polygons

Name: _____ Class: _____ Date: _____ **Total: 23 marks**

KEY WORDS corresponding angles • regular polygon

Angles, parallel lines and polygons

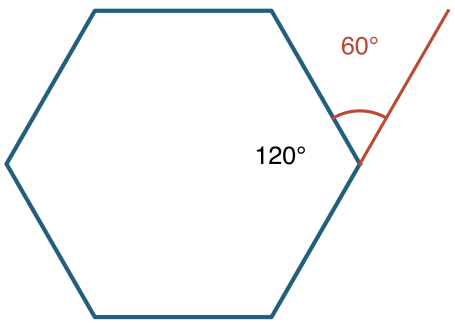
Objective

Use angle facts at a point, on a line and between parallel lines with stated reasons, and derive and use polygon angle sums, including regular polygons (rows G1–G3).

1 Key knowledge and worked examples

Angle facts and polygons. Angles at a point sum to 360°, on a line 180°; vertically opposite angles are equal; with parallel lines, corresponding and alternate angles are equal and co-interior angles sum to 180°. A triangle sums to 180°; an n-sided polygon splits into $n-2$ triangles, so its interior sum is $(n-2)\times 180°$ and each exterior turn of a regular polygon is $\frac{360°}{n}$.

Regular hexagon: interior 120°, exterior 60°



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 Two angles on a straight line: one is 112°. Find the other, and state the size of the angle vertically opposite the 112° one. [2]

2.2 With parallel lines, one corresponding angle is 68°. Write down the other, naming the angle fact used. [2]

2.3 Show that the interior angle sum of a pentagon is 540°. [2]

2.4 Find the interior angle of a regular hexagon. [2]

2.5 A regular polygon has an exterior angle of 45°. How many sides has it? [3]

2.6 A triangle has angles 54° and 61°. Find the third angle. [2]

3 Exam-style questions

3.1 *(Original.)* Two parallel lines are cut by a transversal; one angle is 74°. Find the other three angles at the crossing, giving a reason for each. [4]

3.2 *(Original.)* The interior angle of a regular polygon is 156°. Work out the number of sides. [3]

3.3 *(Original.)* Three angles around a point are in the ratio 2 : 3 : 4. Find the size of the largest angle. [3]

Solutions

2.1 $180 - 112 = 68°$; the vertically opposite angle is $112°$.

2.2 $68°$ – corresponding angles are equal.

2.3 A pentagon splits into $5 - 2 = 3$ triangles, each $180°$: $3 \times 180 = 540°$.

2.4 Interior sum $= 4 \times 180 = 720°$; each angle $= 720 \div 6 = 120°$.

2.5 $360 \div 45 = 8$ sides.

2.6 $180 - 54 - 61 = 65°$.

3.1 $74°$ (vertically opposite); $106°$ (angles on a line with the $74°$); $74°$ and $106°$ at the second crossing by alternate and corresponding equality.

3.2 Exterior angle $= 180 - 156 = 24°$; sides $= 360 \div 24 = 15$.

3.3 Parts total $2 + 3 + 4 = 9$; largest $= \frac{4}{9} \times 360 = 160°$.

Local review guidance: each value with its named reason – "Z-angles" scores nothing; the $n - 2$ triangle split or the exterior-angle route before the answer; exact degree values. This is authored classroom guidance.