

4.1 Angles and polygons

Name: _____ Class: _____ Date: _____

Total: 21 marks

KEY WORDS regular polygon • line of symmetry

Angles, polygons and symmetry

Objective

Classify angles, use angle facts for lines, points, parallel lines and triangles, work with polygon interior/exterior sums and the special quadrilaterals, and identify lines and orders of rotational symmetry (objectives Foundation 4.1–4.3).

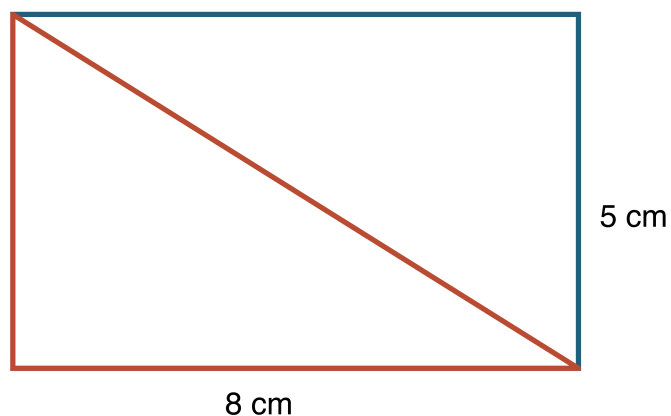
1 Key knowledge and worked examples

Angle facts. Straight line 180° , point 360° , vertically opposite equal; parallel lines give equal corresponding and alternate angles (allied sum to 180°). Triangle sum 180° ; the exterior angle equals the sum of the two remote interior angles. Polygons sum to $(n - 2) \times 180^\circ$; a regular n -gon has exterior angle $360^\circ/n$ and interior $180^\circ - 360^\circ/n$.

Symmetry. A line of symmetry reflects the shape onto itself; the order of rotational symmetry counts self-matches in one full turn. A rectangle has 2 lines and order 2; a regular hexagon has 6 lines and order 6. Congruent shapes match exactly (SSS, SAS, ASA, RHS); similar shapes have equal angles and proportional sides.

Same base and height, half the area

Rectangle: 40 cm^2 ; triangle: 20 cm^2



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

2 Practice

2.1 Two angles on a straight line are $3x$ and x . Find x . [2]

2.2 Find the interior angle of a regular pentagon. [2]

2.3 Find the exterior angle of a regular octagon. [2]

2.4 Find the sum of the interior angles of a decagon. [2]

2.5 Write down the number of lines of symmetry and the order of rotational symmetry of a rectangle. [2]

3 Exam-style questions

3.1 (*Original.*) In triangle ABC , $\angle A = 47^\circ$ and $\angle B = 71^\circ$. The exterior angle at C is extended. (a) Find $\angle C$. (b) Explain how the exterior angle at C relates to $\angle A$ and $\angle B$. [3]

3.2 (*Original.*) A regular polygon has an interior angle of 150° . (a) Find its exterior angle. (b) Hence find the number of sides. (c) Name the polygon. [4]

3.3 (*Original.*) In parallelogram $PQRS$, $\angle P = 2x + 30^\circ$ and $\angle Q = 3x - 10^\circ$. Find all four angles, with reasons. [4]

Solutions

2.1 $4x = 180$, so $x = 45$ (angles 135° and 45°).

2.2 Exterior $= 360/5 = 72^\circ$, so interior $= 180 - 72 = 108^\circ$.

2.3 $360/8 = 45^\circ$.

2.4 $(10 - 2) \times 180 = 1440^\circ$.

2.5 2 lines of symmetry; order 2.

3.1 (a) $\angle C = 180 - 47 - 71 = 62^\circ$. (b) The exterior angle equals the sum of the two remote interior angles: $47 + 71 = 118^\circ$, and $62 + 118 = 180$ (angles on a line).

3.2 (a) $180 - 150 = 30^\circ$. (b) $360/30 = 12$ sides. (c) A regular dodecagon.

3.3 Adjacent angles of a parallelogram are supplementary (co-interior between parallels): $(2x + 30) + (3x - 10) = 180$, so $5x = 160$, $x = 32$. $\angle P = 94^\circ$, $\angle Q = 86^\circ$; opposite angles equal: $\angle R = 94^\circ$, $\angle S = 86^\circ$.

Local review guidance: the correct angle fact named before use; exact values; reasons in words, not just arithmetic. This is authored classroom guidance.