Angles in Polygons

Foundation / Higher tier | Written solutions

INTERIOR ANGLES

Question 1

This is a pentagon. Its interior angles total $(5 - 2) \times 180° = 540°$.

$x = 540° - (140° + 125° + 110° + 115°) = 540° - 490° = 50°$.

Question 2

There are eight vertices, including the two indented (reflex) ones. An octagon has interior-angle sum $(8 - 2) \times 180° = 1080°$.

The seven given interior angles total $190° + 85° + 200° + 45° + 125° + 95° + 260° = 1000°$. Hence $x = 80°$.

Question 3

a) A regular hexagon has interior angle $[(6 - 2) \times 180°] \div 6 = x = 120°$.

b) The diagonal forms a triangle with two sides of the regular hexagon, so it is isosceles. Its apex angle is $x = 120°$; the two base angles are $(180° - 120°) \div 2 = y = 30°$.

Question 4

The hexagon has interior angle 120°. The pentagon has interior angle $[(5 - 2) \times 180°] \div 5 = 108°$.

The angles around the shared vertex total 360°, so $x = 360° - 120° - 108° = 132°$.

Question 5

The sum of the interior angles is $(15 - 2) \times 180° = 2340°$.

The polygon is regular, so each interior angle is $2340° \div 15 = 156°$.

Question 6

Let angle CDE = d°. Then angle ABC = 2d°. A hexagon has interior-angle sum $(6 - 2) \times 180° = 720°$.

The other four angles total $140° + 135° + 110° + 125° = 510°$. Thus $d + 2d + 510° = 720°$, so $3d = 210°$.

Angle CDE = 70°.

Question 7

A pentagon has interior-angle sum 540°. By symmetry, angle D = angle B = 3x°, and angle E = angle A = 95°.

x + 3x + 3x + 95° + 95° = 540°. Hence 7x = 350° and angle BCD = x = 50°.

REGULAR POLYGONS AND EXTERIOR ANGLES

Question 8

Exterior angles of a regular polygon total 360°. Number of sides = 360° ÷ 24° = 15.

Question 9

Each exterior angle is 180° − 150° = 30°. Number of sides = 360° ÷ 30° = 12.

Question 10

Exterior angles of a regular polygon total 360°. Each angle is 360° ÷ 18 = 20°.

Question 11

Each exterior angle is supplementary to the 160° interior angle: 180° − 160° = 20°.

Number of sides = 360° ÷ 20° = 18.

Question 12

At the shared point, the regular hexagon contributes 120° and the square contributes 90°. The unknown polygon has interior angle 360° − 120° − 90° = 150°.

Its exterior angle is 180° − 150° = 30°, so it has 360° ÷ 30° = 12 sides.

Question 13

The regular hexagon has exterior angle 360° ÷ 6 = 60°. “Three times smaller” means one third as large, so the new exterior angle is 60° ÷ 3 = 20°.

The polygon has 360° ÷ 20° = 18 sides.

Question 14

Let an exterior angle be e°. The interior angle is 5e°. Together they form a straight line, so e + 5e = 180°, giving e = 30°.

The polygon has 360° ÷ 30° = 12 sides.