

A Angles in Polygons

- 6 Find the exterior angle of a regular polygon with 15 sides.

$$\frac{360}{15} = 24$$

..... 24° [2]

- 2 A regular polygon has 24 sides.

Find the size of each interior angle of the polygon.

exterior angle: $\frac{360}{24} = 15^\circ$

interior angle: $180 - 15 = 165^\circ$

..... 165° [3]

- 7 The interior angle of a regular polygon is 140° .

Find the number of sides of this polygon.

exterior angle: $180 - 140 = 40^\circ$

sides: $\frac{360}{40} = 9$

..... 9 sides [3]

- 9 The size of one exterior angle of a regular polygon is 24° .

Find the number of sides of this polygon.

$$\frac{360}{24} = 15$$

..... 15 sides [2]

- 6 A regular polygon has 30 sides.

Find the size of one exterior angle.

$$\frac{360}{30} = 12$$

..... 12 sides [2]

- 7 Find the size of one interior angle of a regular polygon with 20 sides.

exterior angle: $\frac{360}{20} = 18^\circ$

interior angle: $180 - 18 = 162^\circ$

..... 162° [3]

- 10 A regular polygon has an interior angle of 174° .

Find the number of sides of this polygon.

exterior angle: $180 - 174 = 6^\circ$

sides: $\frac{360}{6} = 60$

..... 60 sides [2]

- 9 The interior angle of a regular polygon is 150° .

Find the number of sides of this polygon.

exterior angle: $180 - 150 = 30^\circ$

sides: $\frac{360}{30} = 12$

12 sides [3]

- 13 Find the number of sides of a regular polygon with interior angle 162° .

exterior angle: $180 - 162 = 18^\circ$

sides: $\frac{360}{18} = 20$

20 sides [2]

- 8 Calculate the size of one interior angle of a regular polygon with 40 sides.

exterior angle: $\frac{360}{40} = 9^\circ$

interior angle: $180 - 9 = 171^\circ$

171° [2]

17 Each interior angle of a regular polygon is 178.5° .

Calculate the number of sides of this polygon.

exterior angle: $180 - 178.5 = 1.5^\circ$

sides: $\frac{360}{1.5} = 240$

240 sides [2]

8 (a) A regular polygon has 12 sides.

Work out the sum of the interior angles of the polygon.

$$\begin{aligned} & (n - 2) \times 180 \\ &= (12 - 2) \times 180 \\ &= 10 \times 180 \end{aligned}$$

1800° [2]

(b) The interior angle of a regular polygon is x° .

Find an expression, in terms of x , for the number of sides of this polygon.

exterior angle: $180 - x$

sides: $\frac{360}{180 - x}$

$\frac{360}{180 - x}$ [2]

- 12 In a regular polygon, the interior angle and the exterior angle are in the ratio interior : exterior = 11 : 1.

Find the number of sides of this regular polygon.

Sum of parts: $11 + 1 = 12$

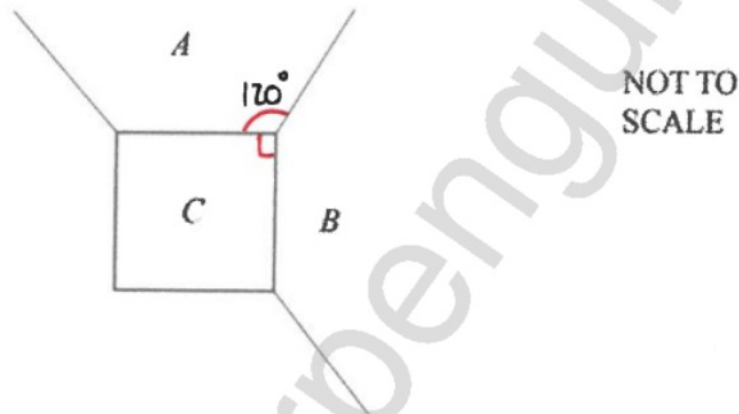
interior + exterior = 180: $180 \div 12 = 15$

$11 : 1$
 $\times 15 \rightarrow 165 : 15 \leftarrow \text{exterior angle}$

sides: $\frac{360}{15} = 24$

24 sides [3]

6



The diagram shows part of a regular hexagon, A, and part of a regular polygon, B. C is a square.

Find the number of sides of the regular polygon, B.

Interior angle of hexagon:

$(n-2) \times 180$
 $= (6-2) \times 180$
 $= 720$ ← sum

One interior angle:

$\frac{720}{6} = 120^\circ$

Angles around a point sum to 360°:

$360 - 120 - 90 = 150^\circ$

← interior angle of B

Exterior angle: $180 - 150 = 30^\circ$

Sides: $\frac{360}{30} = 12$

12 sides [4]

- 12 The interior angles of a pentagon are in the ratio $4 : 5 : 5 : 7 : 9$.

Find the size of the largest angle.

Sum of interior angles of pentagon:

$$(5 - 2) \times 180 = \underline{540}$$

Add parts of ratio:

$$4 + 5 + 5 + 7 + 9 = \underline{30}$$

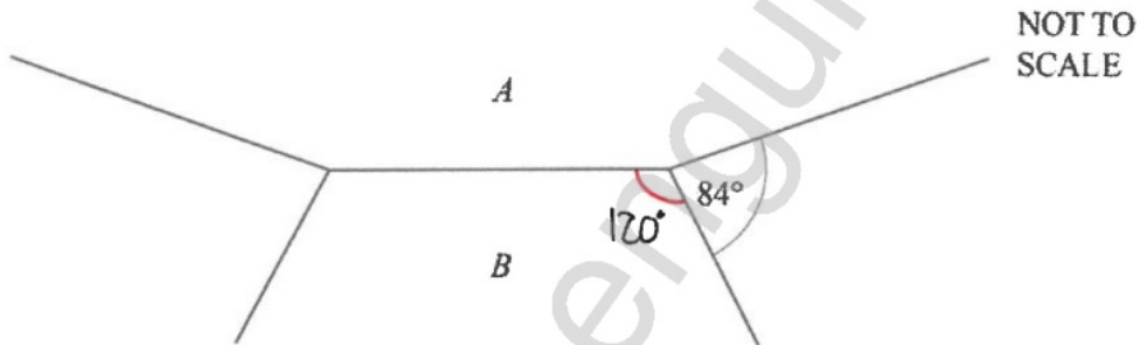
Find one part: $\frac{540}{30} = 18$

$$4 : 5 : 5 : 7 : 9$$

$$\times 18 \rightarrow 72 : 90 : 90 : 126 : 162$$

$\underline{162^\circ}$ [3]

9



The diagram shows part of polygon A and part of polygon B.
A is a regular polygon with n sides.
B is a regular hexagon.

Find the value of n .

Sum of int. angles of hexagon:

$$(6 - 2) \times 180 = 720$$

One interior angle:

$$\frac{720}{6} = \underline{120^\circ}$$

Angles around a point:

$$360 - 120 - 84 = 156^\circ$$

← int. angle of A

exterior angle:

$$180 - 156 = 24^\circ$$

sides: $\frac{360}{24} = 15$

$n = \underline{15}$ [3]

- (c) A regular pentagon has an exterior angle, d .
A regular hexagon has an interior angle, h .

Find the fraction $\frac{d}{h}$.

Give your answer in its simplest form.

Ext. angle of pentagon:

$$\frac{360}{5} = \underline{\underline{72}}$$

Sum of int. angles of hexagon:

$$(6-2) \times 180 = 720$$

One int. angle:

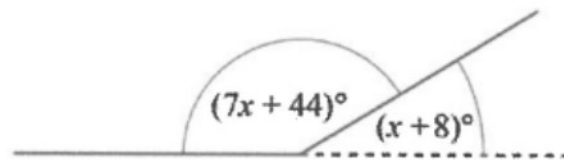
$$\frac{720}{6} = \underline{\underline{120}}$$

$$\frac{d}{h} = \frac{72}{120}$$

$$= \frac{3}{5}$$

$$\frac{3}{5}$$

[4]



NOT TO
SCALE

The diagram shows two sides of a regular polygon.

The interior angle of the polygon is $(7x + 44)^\circ$ and the exterior angle is $(x + 8)^\circ$.

Find the number of sides of this polygon.

Angles on a straight line sum to 180:

$$7x + 44 + x + 8 = 180$$

$$8x + 52 = 180$$

$$8x = 128$$

$$x = 16$$

Exterior angle:

$$x + 8$$

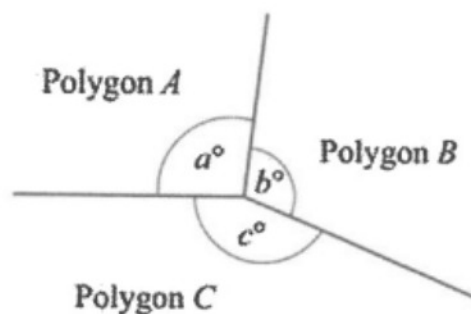
$$= 16 + 8$$

$$= \underline{24^\circ}$$

15 sides [4]

Number of sides:

$$\frac{360}{24} = \underline{15}$$

NOT TO
SCALE

Three regular polygons A , B and C meet at a point.
The interior angles of the polygons are in the ratio $a : b : c = 3 : 4 : 5$.

Show that polygon C has twice the number of sides as polygon B .

ratio: $3 + 4 + 5 = 12$

$$\frac{360}{12} = 30 \quad (\text{angles around a point sum to } 360)$$

$$3 : 4 : 5$$

$$\rightarrow 90 : 120 : 150$$

$$a : b : c$$

Polygon c exterior angle:

$$180 - 150 = 30^\circ$$

Sides: $\frac{360}{30} = \underline{12 \text{ sides}}$

Polygon b exterior angle:

$$180 - 120 = 60^\circ$$

Sides: $\frac{360}{60} = \underline{6 \text{ sides}}$

[5]

$6 \times 2 = 12$, so c has
twice as many sides as b .