

Angles in polygons with...

Ratio

A regular polygon has interior and exterior angles in the ratio

5 : 1

How many sides does it have?

Simultaneous Equations

A regular polygon's interior angles are 120° bigger than its exterior angles.

How many sides does it have?

Percentages

A regular polygon has exterior angles that are 2.5% of the size of the sum of its interior angles.

How many sides does it have?

Averages

A polygon has one right angle. The mean of its other angles is 150° .

How many sides does it have?

Bounds

A regular polygon has interior angles that round to 150° to 2 significant figures.

How many sides could it have?

Sequences

A polygon has angles that form an arithmetic sequence. Its smallest angle is 135° and its largest angle is 177° .

How many sides does it have?

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How many sides does it have?

<u>Int.</u>	<u>Ext.</u>	<u>Total</u>
5	1	6
$\times 30^\circ$	150°	30°
		180°

$$n = \frac{360^\circ}{30^\circ} = 12$$

Percentages

A regular polygon has exterior angles that are 2.5% of the size of the sum of its interior angles.

How many sides does it have?

If the polygon has n sides:

$$\text{Exterior angle} = \frac{360}{n}$$

$$\text{Sum of interior angles} = 180(n - 2)$$

$$\text{So, } \frac{360}{n} = 0.025(180n - 360)$$

$$360 = 4.5n^2 - 9n$$

$$0 = n^2 - 2n - 80$$

$$0 = (n - 10)(n + 8)$$

$$n = 10$$

Bounds

A regular polygon has interior angles that round to 150° to 2 significant figures.

How many sides could it have?

$$145^\circ \leq \text{int.} < 155^\circ$$

$$35^\circ < \text{ext.} \leq 25^\circ$$

$$\frac{360}{35} < n \leq \frac{360}{25}$$

$$10.3 < n \leq 14.4$$

n is 11, 12, 13 or 14

Angles in polygons with...

Simultaneous Equations

A regular polygon's interior angles are 120° bigger than its exterior angles.

How many sides does it have?

$$I + E = 180^\circ$$

$$I - E = 120^\circ$$

$$\text{So, } 2I = 300^\circ$$

$$I = 150^\circ \text{ and } E = 30^\circ$$

$$n = \frac{360}{30} = 12 \text{ sides}$$

Averages

A polygon has one right angle. The mean of its other angles is 150° .

How many sides does it have?

If the polygon has n sides:

$$\text{Sum of interior angles} = 180(n - 2).$$

$$\text{Sum of 'other angles'} = 150(n - 1).$$

$$\text{So, } 90 + 150(n - 1) = 180(n - 2)$$

$$150n - 60 = 180n - 360$$

$$300 = 30n$$

$$n = 10$$

Sequences

A polygon has angles that form an arithmetic sequence. Its smallest angle is 135° and its largest angle is 177° .

How many sides does it have?

Exterior angles have sequence:

$$3^\circ, \dots, 45^\circ$$

So, the mean exterior angle is

$$\frac{3 + 45}{2} = 24^\circ$$

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