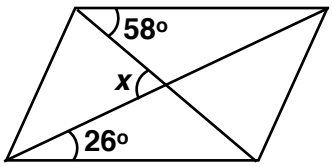
Angles in Polygons

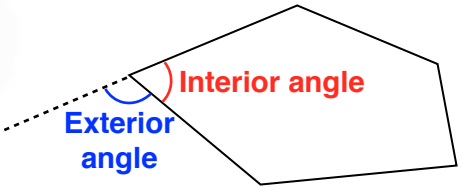
Starter

1. **(Review of last lesson)**
Find the value of x, which is the angle between the diagonals of the parallelogram. Give reasons for each step



N.B. A polygon is a 2-D shape with straight sides.

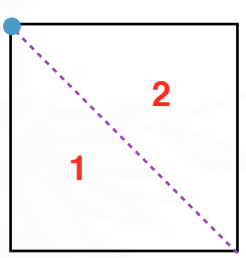
2. **(Review of previous material)**
Using the diagram write down a relationship between the interior and exterior of a polygon.

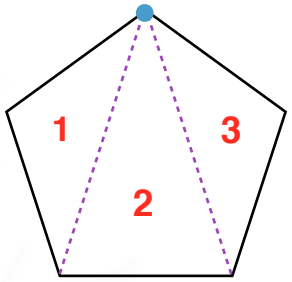


3. **(Review of previous material)**
Consider the square and the pentagon. Starting from one **vertex** of the shape, we can draw **lines** to the other vertices.

The **line(s)** drawn splitting the shape into triangles cannot cross.

For a square this creates **2 triangles**.
For a pentagon this creates **3 triangles**.





Copy and complete the table below. Draw the shapes and split into triangles if you need to.

Shape	Number of sides	Number of triangles	Sum of interior angles
Square	4	2	$2 \times 180^\circ = 360^\circ$
Pentagon	5	3	
Hexagon			
Octagon			
$n-$sided polygon			

Notes

From the starter, we can see that:

$$\text{Exterior angle} + \text{Interior angle} = 180^\circ$$
$$\text{Sum of interior angles of an } n\text{−sided polygon} = 180^\circ(n-2)$$

A regular polygon is one whose sides are all equal in length and whose angles are all equal.

E.g. 1 Using the formula "Sum of interior angles of an n−sided polygon $= 180^\circ(n-2)$", state the formula for the size of one interior angle of an n−sided regular polygon.

Working: There are n equal angles in the n−sided regular polygon.
The sum of the interior angles is $180^\circ(n-2)$
So size of one interior angle of an n−sided regular polygon is $\dfrac{180^\circ(n-2)}{n}$.

E.g. 2 Find the sum of the interior angles of:
(a) a decagon (b) a 13−sided polygon.

Working: (a) $n = 13$.

$$\begin{aligned}\text{Sum of interior angles} &= 180^\circ(n-2)\\ &= 180^\circ(13-2)\\ &= 1980^\circ\end{aligned}$$

E.g. 3 Find the size of one interior angle of:
(a) a regular 16−sided polygon. (b) a regular 23−sided polygon.

Working: (a) $n = 16$.

$$\begin{aligned}\text{Size of one interior angles} &= \frac{180^\circ(n-2)}{n}\\ &= \frac{180^\circ(16-2)}{16}\\ &= 157.5^\circ\end{aligned}$$

E.g. 4 A nonagon has 8 interior angles each measuring 130°. Find the size of the ninth angle.

Video: Angles in polygons

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p66 M3.3 Qu 4-12 even, 13, 14
A*-G class textbook:	p59 M3.3 Qu 4-12 even, 13, 14
9-1 homework book:	p21 M3.3 Qu 1-9
A*-G homework book:	p16 M3.3 Qu 1-8

Summary

Exterior angle $+$ Interior angle $= 180^\circ$
Sum of interior angles of an n−sided polygon $= 180^\circ(n-2)$
Size of one interior angle of an n−sided regular polygon is $\dfrac{180^\circ(n-2)}{n}$