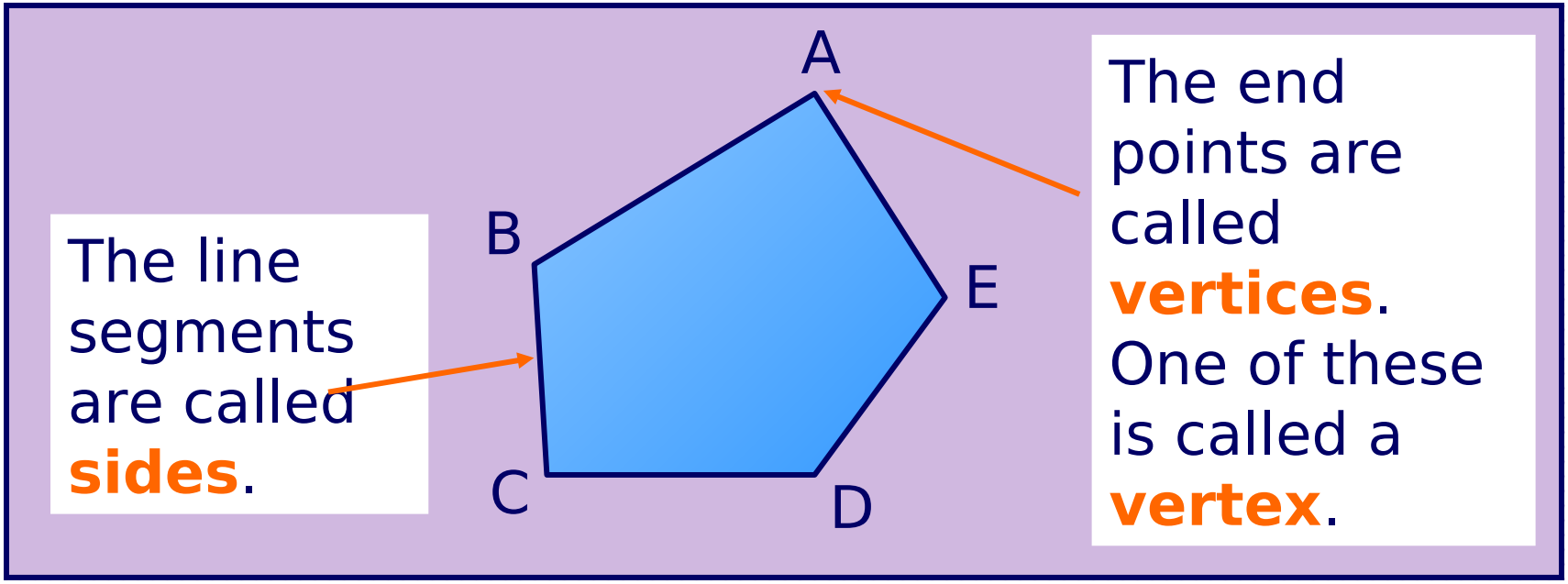
Polygons

A **polygon** is a **2-D** shape made when **line segments** enclose a **region**.

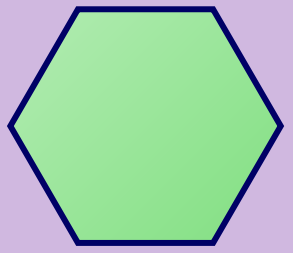


2-D stands for **two-dimensional**.These two dimensions are length and width. A polygon has no height.

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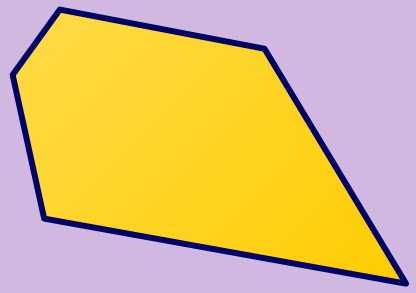
Polygons

A **regular polygon** has equal sides and equal angles.

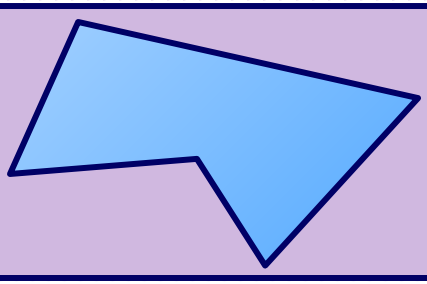


In a **convex polygon** all of the interior angles are less than

All regular polygons are convex.



In a **concave polygon** some of the interior angles are more than 180°.



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Naming polygons

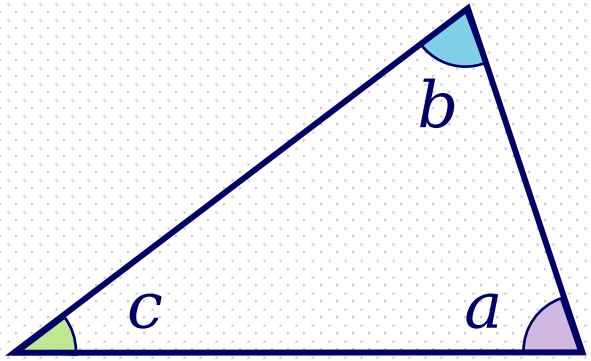
Polygons are named according to their number of sides.

Number of sides	Name of polygon
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon

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Interior angles in polygons

The angles inside a polygon are called **interior angles**.

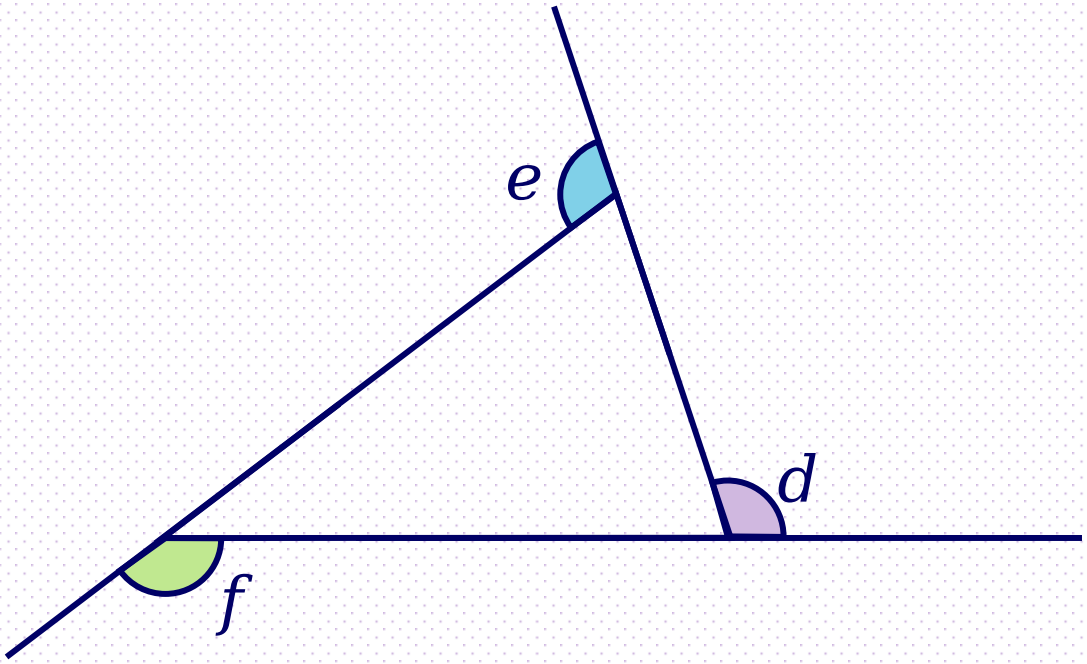


The sum of the **interior angles** of a triangle is 180°.

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Exterior angles in polygons

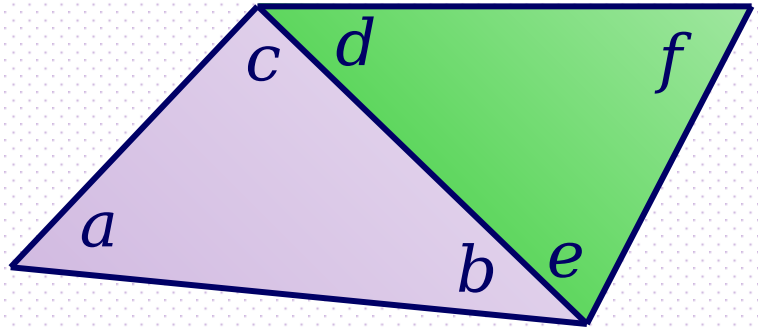
When we extend the sides of a polygon outside the shape, **exterior angles** are formed.



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Sum of the interior angles in a quadrilateral

What is the sum of the interior angles in a quadrilateral?



We can work this out by dividing the quadrilateral into two triangles.

$a + b + c = 180°$ and $d + e + f = 180°$

So, $(a + b + c) + (d + e + f) = 360°$

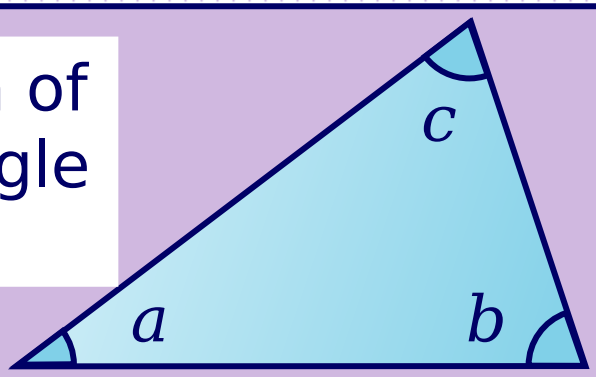
The sum of the interior angles in a quadrilateral is 360°.

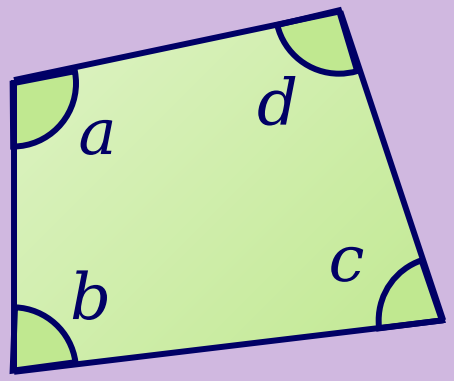
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Sum of interior angles in a polygon

We already know that the sum of the interior angles in any triangle is 180°.

$a + b + c = 180°$





We have just shown that the sum of the interior angles in any quadrilateral is 360°.

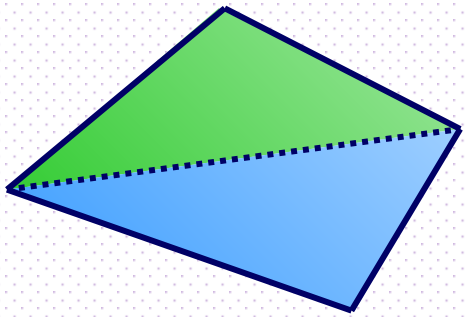
$a + b + c + d = 360°$

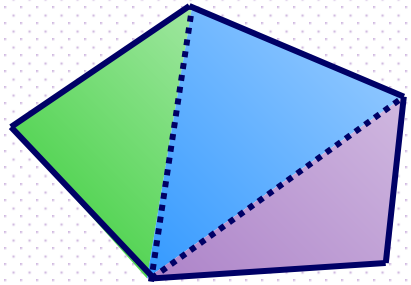
Do you know the sum of the interior angles for any other polygons?

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Sum of the interior angles in a polygon

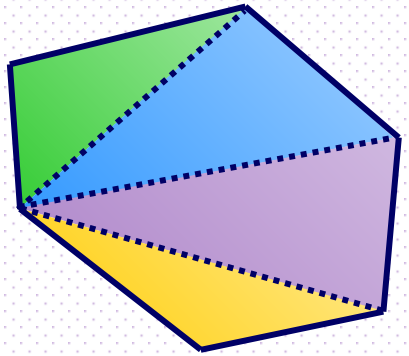
We've seen that a **quadrilateral** can be divided into **two** triangles ...





... a **pentagon** can be divided into **three** triangles ...

... and a **hexagon** can be divided into **four** triangles.



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Sum of the interior angles in a polygon

The number of triangles that a polygon can be divided into is always two less than the number of sides.

We can say that:

A polygon with n sides can be divided into $(n - 2)$ triangles.

The sum of the interior angles in a triangle is 180°.

So,

The sum of the interior angles in an n-sided polygon is $(n - 2) \times 180°$.

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Interior angles in regular polygons

A regular polygon has equal sides and equal angles.

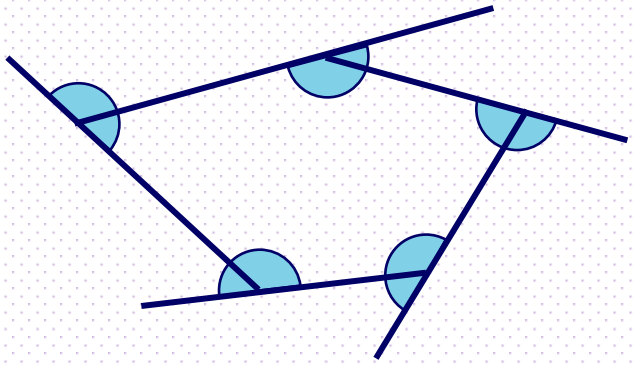
We can work out the size of the interior angles in a regular polygon as follows:

Name of regular polygon	Sum of the interior angles	Size of each interior angle
Equilateral triangle	180°	180° ÷ 3 = 60°
Square	2 × 180° = 360°	360° ÷ 4 = 90°
Regular pentagon	3 × 180° = 540°	540° ÷ 5 = 108°
Regular hexagon	4 × 180° = 720°	720° ÷ 6 = 120°

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The sum of exterior angles in a polygon

For any polygon, the sum of the interior and exterior angles at each vertex is 180°.



For n vertices, the sum of n interior and n exterior angles is $n \times 180°$ or $180n°$.

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

We can write this algebraically as $180(n - 2)° = 180n° - 360°$.

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The sum of exterior angles in a polygon

If the sum of both the interior and the exterior angles is $180n°$

nd the sum of the interior angles is $180n° - 360°$,

the sum of the exterior angles is the difference between these two.

he sum of the exterior angles $= 180n° - (180n° - 360°)$

$= 180n° - 180n° + 360°$

$= 360°$

The sum of the exterior angles in a polygon is 360°.

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Find the number of sides

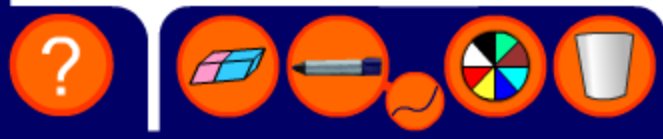
The exterior angle in a regular polygon is 30°. How many sides does the polygon have?

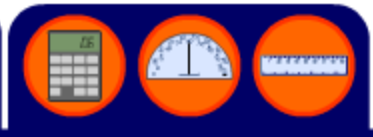
3 sides

9 sides

12 sides

15 sides







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