MTH1W Grade 9 Mathematics

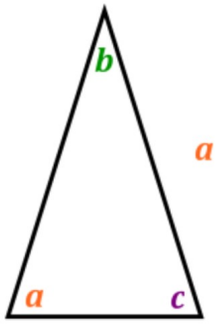
6.3 Angle Relationships

Goal(s) - To determine the sum of the interior angles of various polygons

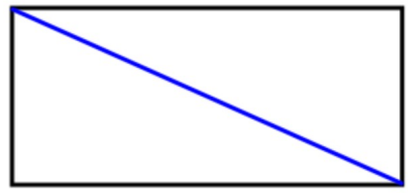
- To determine the value of unknown angles in various polygons

- To determine unknown angles involving parallel lines intersected by a transversal

The sum of the interior angles of any triangle add to 180°. The sum of the interior angles of any polygon can be found by determining how many triangles can be found in the shape.

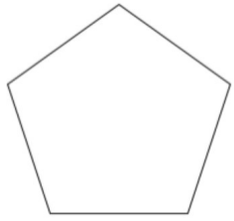


$a + b + c = 180^{o}$

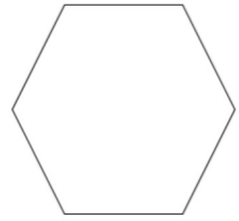


2 triangles, therefore the sum of the interior angles of a quadrilateral is: $2 \times 180^{o} = 360^{o}$

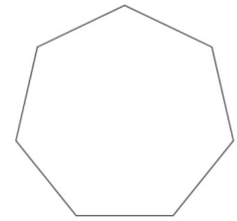
Determine the sum of the interior angles of each of the shapes by drawing lines from one vertex to the other vertices, then complete the chart.



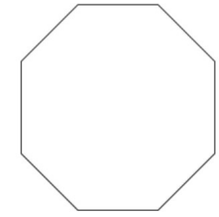
Pentagon



Hexagon



Heptagon



Octagon

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Polygon	# of sides	# of diagonals	# of triangles	Sum of Interior Angles
triangle	3	0	1	180°
quadrilateral	4	1	2	360°
pentagon	5	2	3	540°
hexagon	6	3	4	720°
heptagon	7	4	5	900°
octagon	8	5	6	1080°

What is the relationship between the number of sides a shape has and the number of triangles that can be created inside the shape?

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For a polygon with n sides, the **sum** of the *interior angles*, in degrees can be found by multiplying 180^o times the ***number of sides*** **minus** 2.

Sum of the interior angles of a polygon = $180^o(n - 2)$

pentagon, 5 sides

$n = 5$

Sum of Interior Angles = $180^o(5 - 2)$

$= 180^o(3)$

$= 540^o$

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Calculate the sum of the interior angles of a regular decagon. Determine the measure of one of those angles.

Decagon has 10 sides

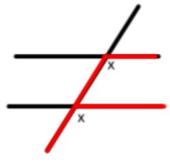
$\Rightarrow$ Sum of interior angles $= (10-2) \times 180$

$= 8 \times 180$

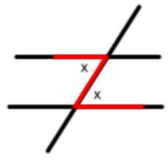
$= 1440^\circ$

A **transversal** is a line that intersects two or more lines at different points.

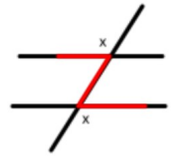
When **parallel lines** *are cut by a transversal*, the following types of angles are **CONGRUENT** (*equal*):



Corresponding Angles

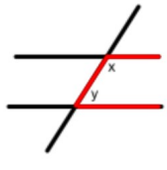


Alternate Interior Angles

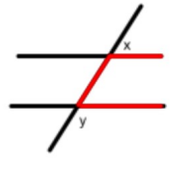


Alternate Exterior Angles

When **parallel lines** *are cut by a transversal*, the following types of angles are **SUPPLEMENTARY** (*add to* 180^{o}):

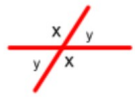


Co-Interior Angles

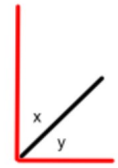


Co-Exterior Angles

Other important angle relationships:

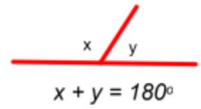


Opposite Angles are CONGRUENT



$x + y = 90^o$

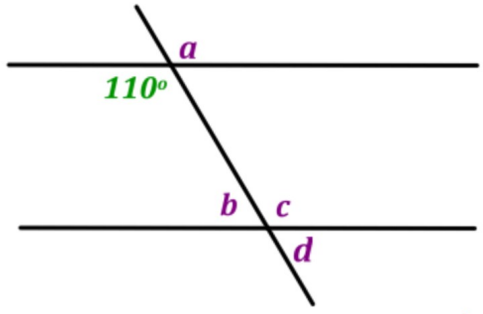
Complementary Angles add to 90^o



$x + y = 180^o$

Supplementary Angles add to 180^o

Determine the measure of each unknown angle in the diagram. Give a reason to support your answer.



$a = 110^\circ$ (opposite angles are equal)

$b = 70^\circ$ (co-interior angles total 180°)

$c = 110^\circ$ (supplementary angles total 180°)

$d = 70^\circ$ (opposite angles are equal)