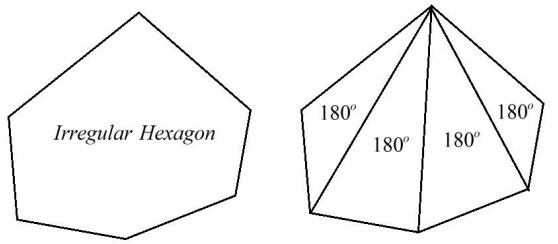
Interior and Exterior Angles in Polygons **www.m4ths.com** **Name**_____

Help Sheet!

Irregular polygons – Sum of Interior Angles



Here are two ways of finding the **sum** of the **interior** angles of an irregular polygon.

(1) Draw lines from one of the corners to create triangles and then add 180º to the total for each triangle drawn.

$4 \times 180^o = 720^o$ for the hexagon show above.

(2) Use the formula $180(n-2)$ where n is the number of sides. $180^o(4) = 720^o$ for the hexagon.

The hexagon above sums to 720^o either way.

Irregular polygons – Sum of Exterior Angles

This will always equal 360º

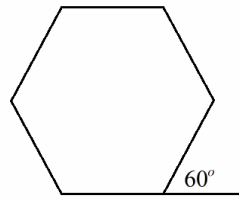
Regular Polygons – Finding all angle facts!

Before I go any further…You can use the method above with regular polygons too. Alternatively you can use the following approach to find both the exterior and interior angles of regular polygons and then their sum.

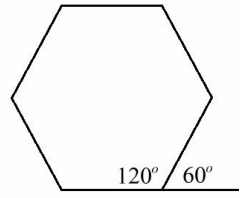
An example using a **REGULAR** hexagon!

(1) Divide 360º by the number of sides. (6 sides)

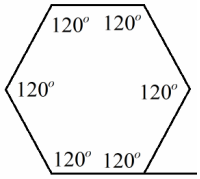
(2) This gives you the size of each exterior angle



(3) Use the angle property that angles on a straight line sum to 180º to find the size of each interior angle by subtracting 60^o from 180^o to give 120^o.



(4) To find the sum of the interior angles just multiply the number of sides by the interior angle.



The exterior angle is 60^o and the interior is 120^o

Questions

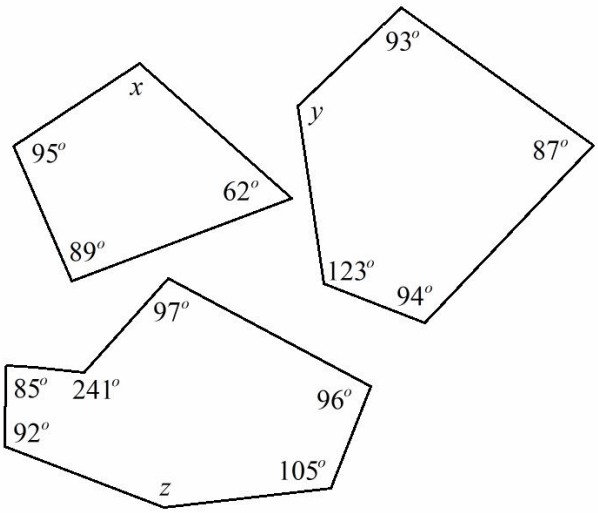
(1) Fill out the table for **IRREGULAR** polygons.

Shape	Number of sides	Sum of Exterior angles	Sum of Interior angles
Triangle			
Quadrilateral			
Pentagon			
Hexagon			
Heptagon			
Octagon			
Nonagon			
Decagon			

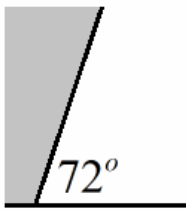
(2) Fill out the table for **REGULAR** polygons.

Shape	Number of sides	Sum of Exterior angles	Size of one Exterior Angle	Size of one Interior Angle	Sum of Interior angles
Triangle					
Quadrilateral					
Pentagon					
Hexagon					
Heptagon					
Octagon					
Nonagon					
Decagon					

(3) Find the value of x, y and z in the polygons below;



(4) The shaded area shown in the diagram below is part of a **regular** polygon. Name the polygon.

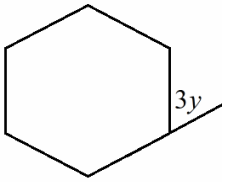


(5) Fill in the blanks below:
(a) The interior angles of a hexagon sum to___°
(b) The interior angles of a decagon sum to___°
(c) The exterior angles of a pentagon sum to___°
(d) Each exterior angle of a regular Nonagon is___°
(e) The interior angles of a 14 sided shape sum to___°

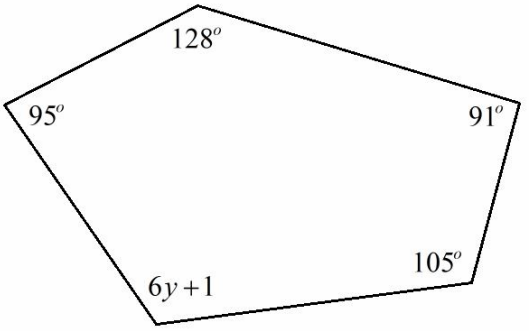
(6) Freda has a diagram of an irregular pentagon. She says to her maths teacher that she can find the size of each interior angle without any information or a protractor. Is she right?

(7) Fill in the blanks below:
(a) A_____sided shape will have interior angles that sum to 720^o .
(b) A_____sided shape will have interior angles that sum to 3600^o .
(c) A regular polygons with interior angles each measuring 140^o is called a _____.

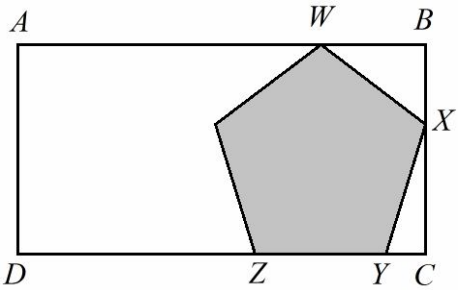
(8) In the diagram below the regular shape has an exterior angle of $3y$. Find the value of y .



(9) Find the value of y in the diagram below.

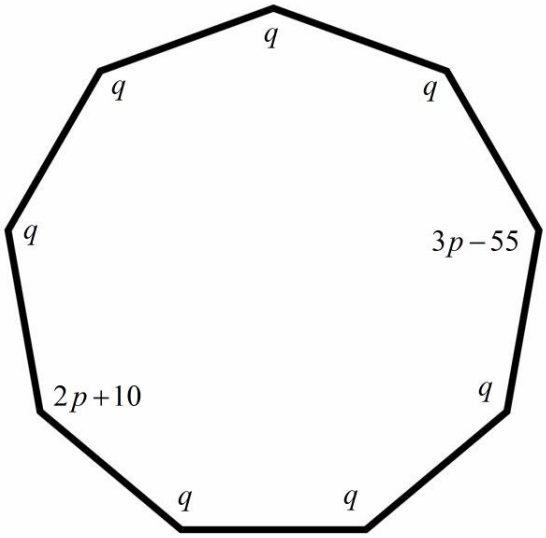


(10) The rectangle $ABCD$ shown below has a regular pentagon drawn inside such that ZY lies on the line DC and the pentagon also touches the rectangle at the points W and X .

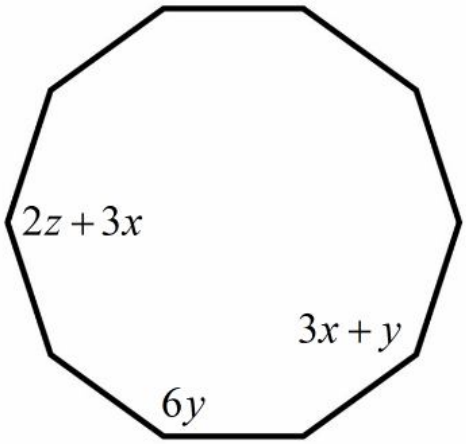


(a) Find the size of the angle CXY
Given that XY is 4cm
(b) Find the length of CX

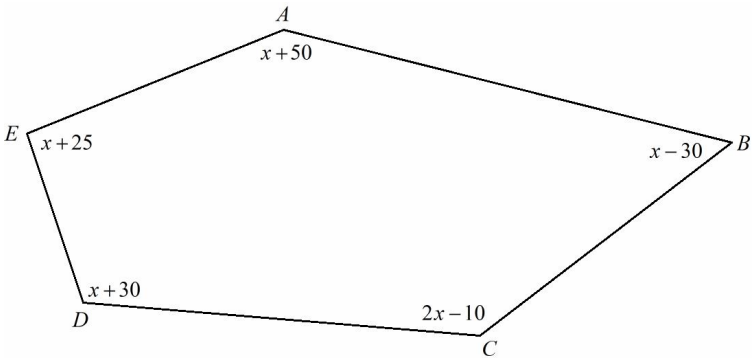
(11) Bill is doing a maths question his teacher has set him. He has to prove that the shape below is a regular nonagon. Bill has shown his teacher his answer for q and has been told that it is correct.
Explain to Bill how he can prove to his teacher that the diagram does represent a regular nonagon.



(12) Given that three of the interior angles of a regular shape are shown in the diagram below, find the value $z^{0.5}$.



(13) Given that AE is 6.1km and AB is 8.3km in the diagram of the polygon below, find the length of BE giving your answer to one decimal place.



(Not drawn accurately)