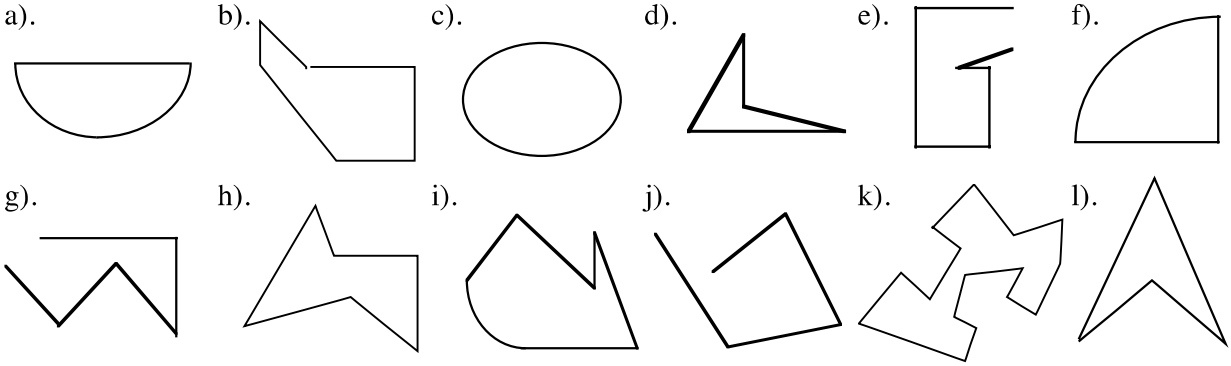
Polygons 1.

1). Copy each of the following shapes.
Write underneath each one "**polygon**" or "**not a polygon**".

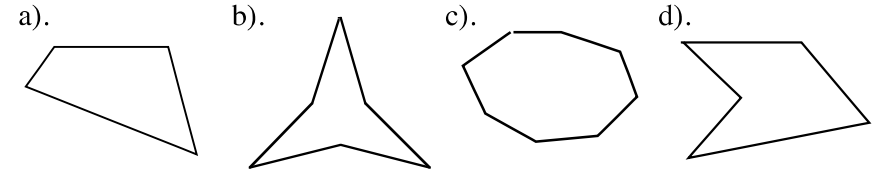
a). b). c). d). e). f).



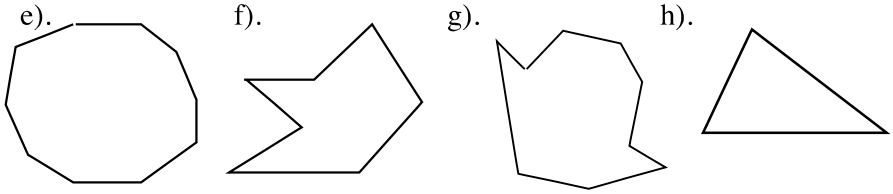
g). h). i). j). k). l).

2). Draw out the following shapes. Match them up with the words in the box.

a). b). c). d).



e). f). g). h).

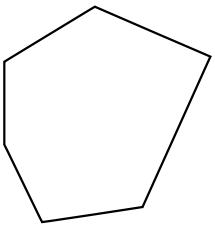


Heptagon
Quadrilateral
Triangle
Hexagon
Decagon
Pentagon
Octagon
Nonagon

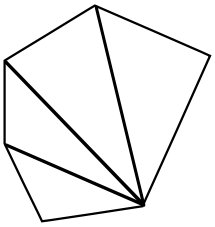
Interior Angles.

You are going to draw a series of polygons.
Make sure they are big enough so you can measure the angles with a protractor.

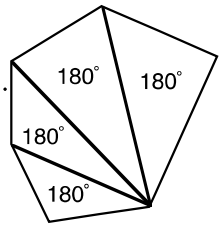
1). Draw any 3 **triangles**. Measure each angle carefully. Add up the angles to find the **sum of the angles** for each triangle. (You should know this already !). Write this in each shape.
2). Draw any 3 **quadrilaterals**. Measure each angle carefully. Add up the angles to find the **sum of the angles** for each quadrilateral. Write this in each shape.
3). Draw any 3 **pentagons**. Measure each angle carefully. Add up the angles to find the **sum of the angles** for each pentagon. Write this in each shape.
4). Draw any 3 **hexagons**. Measure each angle carefully. Add up the angles to find the **sum of the angles** for each hexagon. Write this in each shape.
5). Draw any 3 **heptagons**. Measure each angle carefully. Add up the angles to find the **sum of the angles** for each heptagon. Write this in each shape.
6). a). Write down any pattern that you notice.
b). Predict the sum of the angles for a i). octagon ii). nonagon
iii). decagon iv). dodecagon (12 sides)
c). Now do the next section to see if you were right.



Draw any polygon.
Draw a line from any vertex to the other vertices on the polygon.

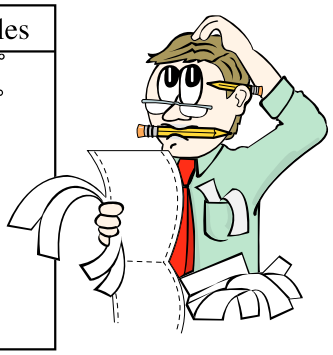


This forms a series of triangles.
The angle sum of each triangle is 180˚.
We can now find the angle sum of each polygon.



7). Copy and fill in the table below.

Polygon	No. of sides	No. of triangles	Sum of all angles
Triangle	3	1	1 x 180 = 180˚
Quadrilateral	4	2	2 x 180 = 360˚
Pentagon			
Hexagon			
Heptagon			
Octagon			
Nonagon			
Decagon			



8). Find a formula that links the number of sides of a polygon,**n**, with the angle sum of the polygon.

9). Use the formula you have just found to find the angle sum of a polygon with

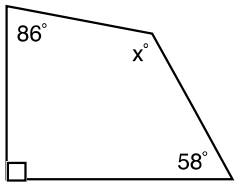
a). 11 sides b). 14 sides c). 19 sides d). 23 sides e). 33 sides
f). 38 sides g). 47 sides h). 51 sides i). 120 sides j). 152 sides.

10). Find the number of sides of a polygon if the sum of the angles is

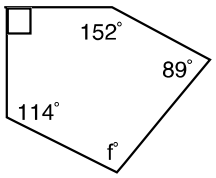
a). 1980˚ b). 2700˚ c). 3600˚ d). 9180˚ e). 4680˚
f). 7920˚ g). 4860˚ h). 18720˚ i). 13500˚ j). 24480˚

11). For each of the following polygons find the missing angle (diagrams not drawn to scale).

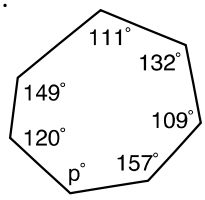
a).



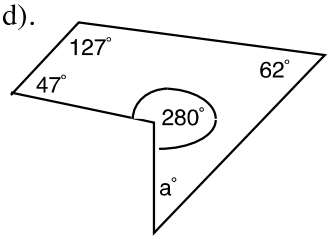
b).



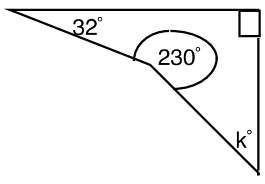
c).



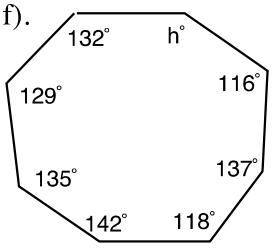
d).



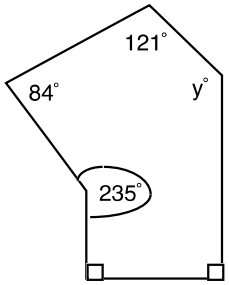
e).



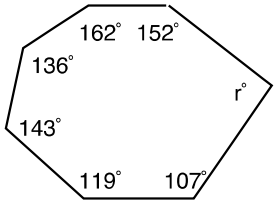
f).



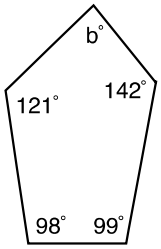
g).



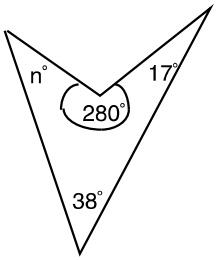
h).



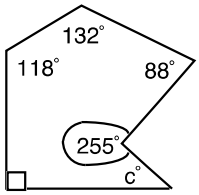
i).



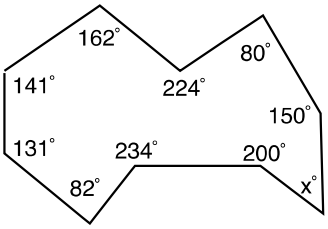
j).



k).



l).



Polygons 2.

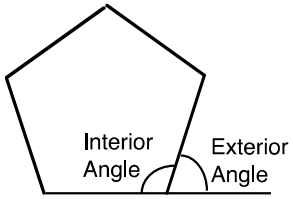
Regular Polygons.

A **regular polygon** has all its **angles the same size** and all its **sides the same length**.

From now on we will only be looking at regular polygons.

Exterior Angles.

When we produce a side of a polygon we create an exterior angle.



1). Using your knowledge from the last section, copy and fill in the following table.

Regular Polygon	Number of sides	Sum of all interior angles	Size of one interior angle	Size of one exterior angle	Sum of all exterior angles
Triangle	3	180˚	60˚		
Quadrilateral	4				
Pentagon					
Hexagon					
Heptagon					
Octagon					
Nonagon					
Decagon					

2). a). Find a formula that links the number of sides of a regular polygon, n with the size of one interior angle.
b). What do you notice about the sum of the exterior angles for any regular polygon ?
c). Find **two** formulae to find the exterior angle of a regular n-sided polygon.

3). Find the **size of each exterior angle** in a regular polygon which has

a).	8 sides	b).	18 sides	c).	12 sides	d).	24 sides	e).	40 sides
f).	36 sides	g).	75 sides	h).	25 sides	i).	80 sides	j).	32 sides.

4). Find the **number of sides** in a regular polygon that has an **exterior angle** of

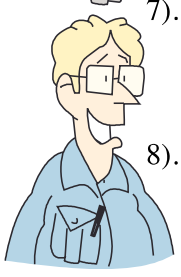
a).	72˚	b).	40˚	c).	18˚	d).	24˚	e).	12˚
f).	5˚	g).	8˚	h).	22.5˚	i).	7.5˚	j).	14.4˚.

5). Calculate the **sum of the interior angles** of a regular polygon with

a).	7 sides	b).	13 sides	c).	11 sides	d).	21 sides	e).	22 sides
f).	26 sides	g).	33 sides	h).	29 sides	i).	46 sides	j).	52 sides.

6). Find the **number of sides** of a regular polygon if the **sum of the interior angles** is

a).	1260˚	b).	2160˚	c).	3960˚	d).	4500˚	e).	2700˚
f).	6660˚	g).	8820˚	h).	6300˚	i).	10440˚	j).	9180˚.



7). Find the **size of one interior angle** in a regular polygon with

a).	9 sides	b).	15 sides	c).	24 sides	d).	10 sides	e).	36 sides
f).	40 sides	g).	80 sides	h).	48 sides	i).	50 sides	j).	32 sides.

8). Find the **number of sides** in a regular polygon that has an **interior angle** of

a).	135˚	b).	150˚	c).	162˚	d).	156˚	e).	168˚
f).	165˚	g).	172˚	h).	157.5˚	i).	165.6˚	j).	175.2˚.

LOGO.

1). Write the instructions to draw out the following **regular polygons**, each having a side length 200, **without** using the REPEAT command,

a). Equilateral triangle b). Square c). Pentagon d). Hexagon
e). Octagon f). Nonagon g). Decagon h). Dodecagon .

2). Write the instructions to draw out the following **regular polygons**, each having a side length 200, **using** the REPEAT command

a). Equilateral triangle b). Square c). Pentagon d). Hexagon
e). Octagon f). Nonagon g). Decagon h). Dodecagon .

Regular Polygons and Tessellations.

1). There are 3 regular polygons that will tessellate with themselves. Find which **3 polygons** and **how many of each** polygon are required. Show your working out.

2). Using **2 different regular polygons**, we also can make a tessellating pattern. Find **which other polygon** tessellates with each of the following, and **how many of each** polygon are required of each type. Show your working out.

a). Dodecagon (12 sides), b). Square, c). Equilateral triangle.

3). Using **3 different regular polygons**, we also can make a tessellating pattern. Find **which other polygon** tessellates with the 2 given, and **how many of each** polygon are required of each type. Show your working out.

a). Dodecagon (12 sides) and a triangle, b). Dodecagon and a hexagon,

LOGO and Tessellations.

1). Here is a procedure to draw an equilateral triangle, side length 200.

```
TO TRIANGLE
REPEAT 3(FD 200 RT 120)
END
```

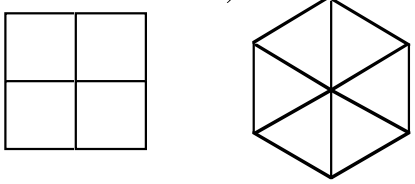
To run the procedure just type TRIANGLE .

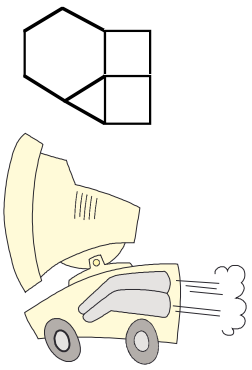
Write a procedure to form these **regular polygons,** each having a side length 200

a). Square b). Hexagon c). Dodecagon.

2). Using the above procedures, write a series of instructions, or a procedure, which will draw the following diagrams. These diagrams show different combinations of regular polygons tessellating.

a). b). c). d). e).





3). Make up another set of instructions for a diagram of tessellating regular polygons that is not shown above.

Constructions.

1). Using mathematical construction equipment draw **all the regular polygons** up to the decagon, each having a **side of length 5 cm**.