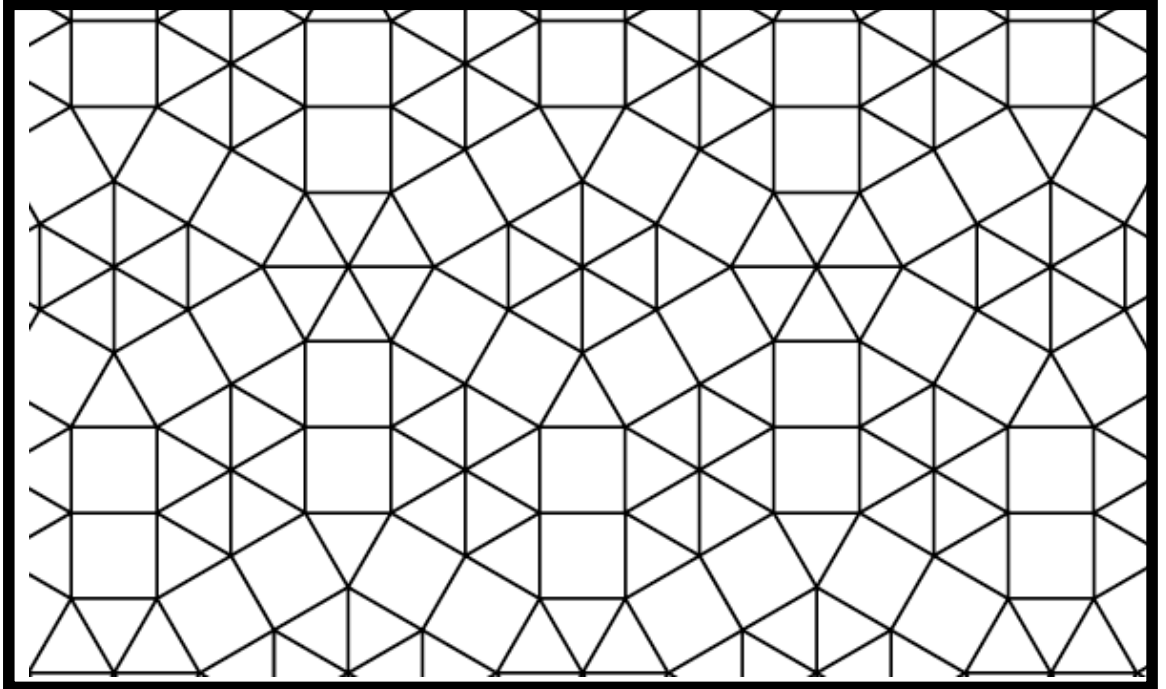


Look at this section of an Islamic pattern



Have a good look at the pattern, what do you notice about it and the shapes within it?

Identify these polygons by colouring:

a parallelogram, colour it green

a rhombus, colour it red

a square, colour it blue

a trapezium, colour it yellow

a rectangle, colour it brown

a regular hexagon, colour it red

an irregular hexagon with two lines of symmetry, colour it blue

an irregular hexagon with one line of symmetry, colour it blue

a pentagon with one line of symmetry colour it green

an equilateral triangle, colour it yellow

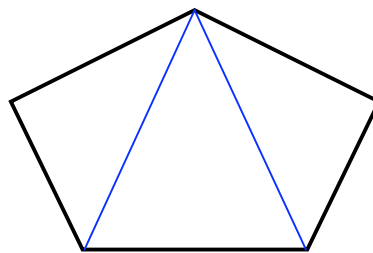
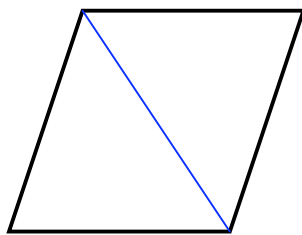
Investigation

The sum of internal angles of all pentagons equal 540 degrees.

The sum of the internal angles of all triangles equals 180 degrees

The sum of the internal angles of all quadrilaterals equal 360 degrees

Given that the statement, "The sum of the internal angles of all triangles equals 180 degrees", is correct can you find out by triangulating polygons the sum of their internal angles. E.g.



It may help you to record your information on a chart

Shape	No. of sides	No. of vertices	No. of triangles	sum of degrees
Rhombus	4	4	2	360
Pentagon	5	5	3	540

Continue your table by drawing and triangulating polygons with more sides. Do you see a pattern developing? Can you find a rule to explain what happens each time any polygon is triangulated.

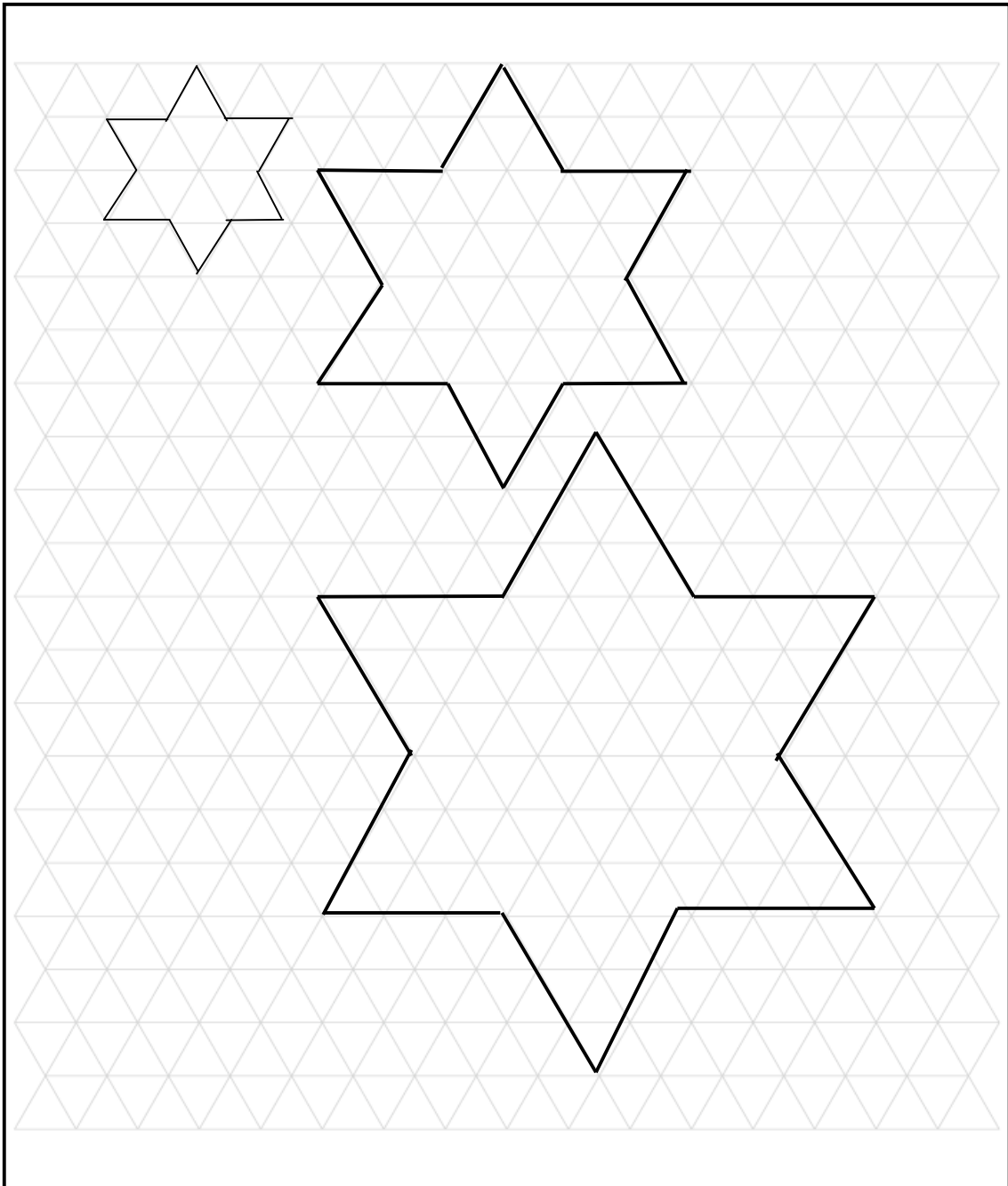
- Extensions :
- (i) Write a formula to give the angles of a polygon with 'n' sides
 - (ii) Find the external angles of a polygon - what is the relationship between the internal and the external angles of polygon?

Investigation 14

Islamic Pattern

Stars:

How are the stars growing?



Investigate this and find a rule to explain this growth.

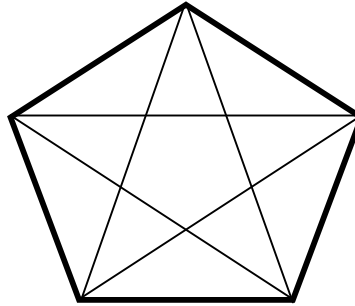
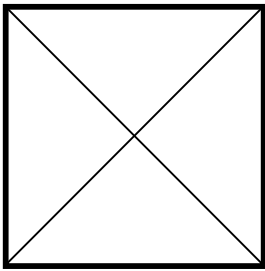
Find the area of the first star and use your rule to predict the area of the other stars in the sequence.

- What would be the area of the 5th star, the 10th star in the sequence?
- What would be the area of the 'n' star in the pattern?
- Write an equation to show this.

Investigation: Diagonals

Investigate whether there is a connection between the number of sides of a regular polygon and its diagonals.

Start with polygons with up to 10 sides.



You will need to draw lines from each vertex to the opposite vertices. Notice that as the polygon gets more complex, the number of lines coming from each vertex increases.

Why is this so?

Is there a pattern related to this growth?

Can you find a rule to explain this?

It will be helpful if you draw a chart to help you see the pattern

Name of shape	number of sides	Diagonals from each vertex	number of diagonals
Square	4	1	2
Pentagon	5	2	5

Do your results form a pattern?

- Can you predict from your results how many diagonals a 20 sided polygon would have?
- Now, what if you would like to find out how many diagonals a 100 sided polygon has?
- What if you had a polygon with 'n' sides. Could you write an equation to show your rule?