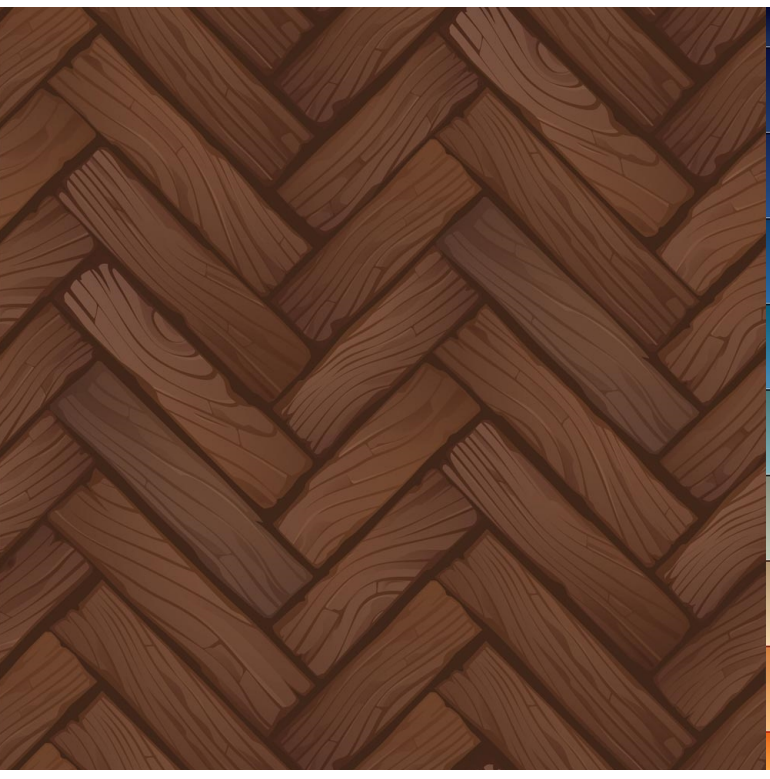
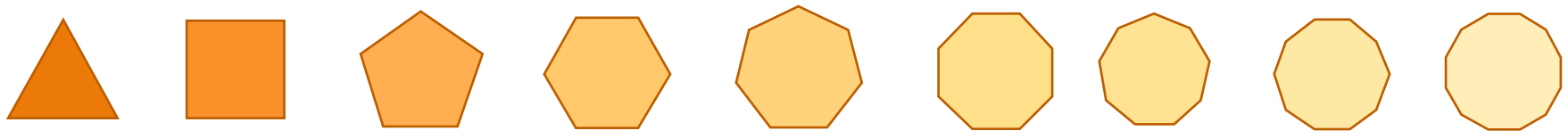
Aesthetically pleasing to the eye

Tessellations and symmetry of regular polygons are found in and around many buildings through the construction of patios outside to tiling within a building.



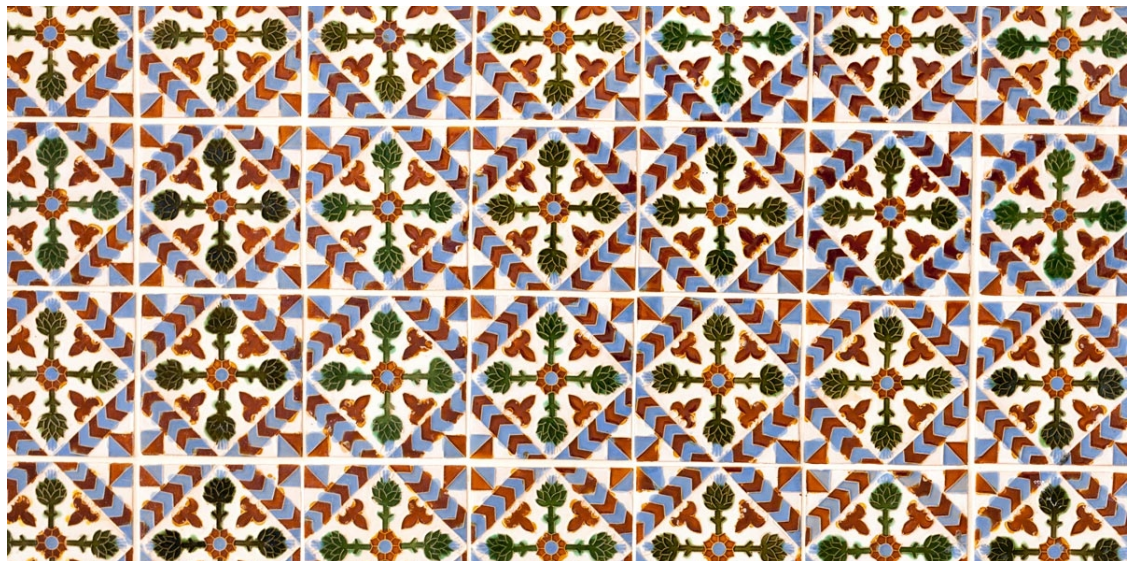
Context

A regular polygon is a shape where each side is the same length and each angle the same size.



Tessellations are where regular polygons interact with each other; this is called tiling the plane. It's the way to cover a surface with a repeating pattern of flat shapes so there are no overlaps or gaps.

The term plane means a two dimensional flat surface that extends in all directions.



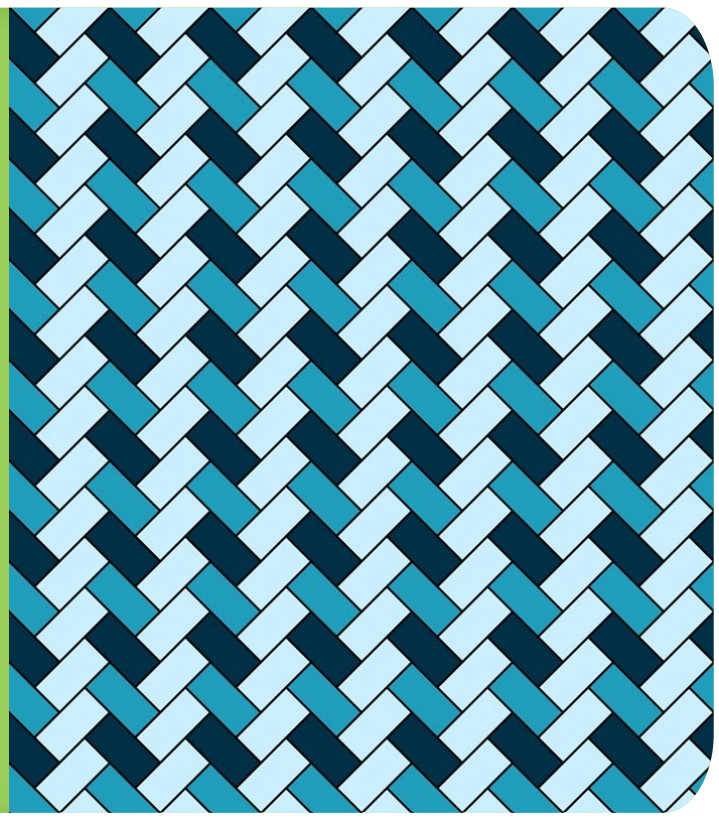
Have you ever thought...

Do all polygons tessellate?

How many different polygons is it possible to have in one pattern?

Is it helpful to know the interior angle of a regular polygon to construct tessellation? Why?

Why do bees use hexagons for honeycombs?



Take a look

At tiling or patio patterns around you. Identify the polygons used. Take a photo.

A **regular tessellation** is a pattern made only using one polygon repeatedly; it is where all the shapes meet at each vertex following the same pattern of shapes.

Investigate...

All the shapes that form a regular tessellation.

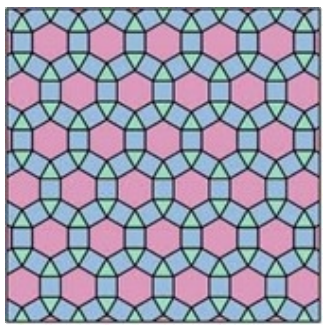
*(**Hint**: Try triangle, Square, pentagon, hexagon, octagon and dodecagon)*

What do you notice where all the shapes meet at the Vertex?

A semi-regular tessellation uses two or more regular polygons.

Find the possible semi-regular tessellation combinations.

*(**Hint**: the polygons do not have to be congruent in size.)*

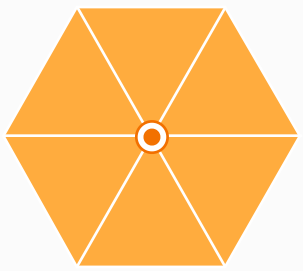


Squares, triangles and hexagons are in this example of semi-regular tessellations.

Which regular polygon is not involved in any of the tessellations?

Investigate further

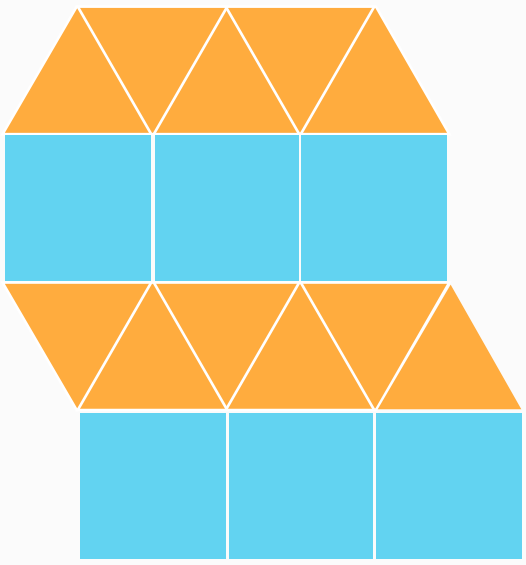
Tessellations can be classified by the pattern of shapes that appear around each vertex within the tiling. Take a look at the tessellations you have made. You can record this in a table (see below). Decide whether they are regular or semi-regular tessellations. Draw a diagram of the tessellation around the vertex and record the size of the angle.

Regular Tessellation	
Tessellation	**Size of the angle**
Triangles  Six 3-sided shapes	60°, 60°, 60°, 60°, 60°, 60° ↓ TOTALS 360°

Semi-regular Tessellation

Tessellation

Triangles and Squares



Three 3-sided shapes
and
two 4-sided shapes

Size of the angle

60°, 60°, 60°, 90°, 90°

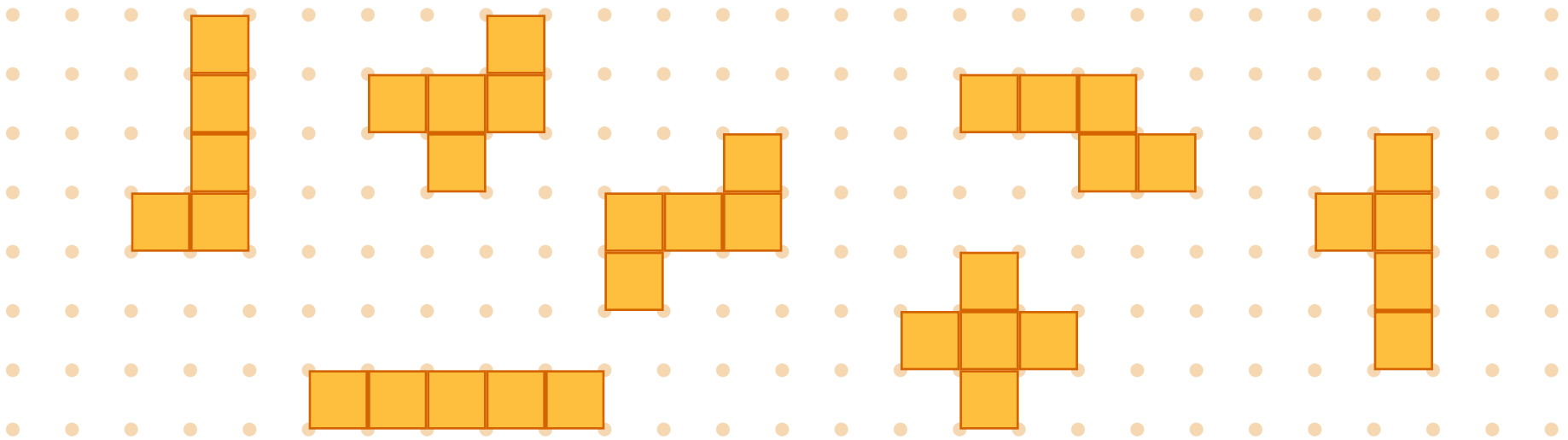
↓

TOTALS
360°

What do you notice about the size of the angles for each tessellation?

Explore

A **pentomino** is a shape made up of five squares.
Choose two of the following pentominoes and try to make a tessellation with each one.
Do each of your pentominoes make a tessellation?
Explain why or why not.

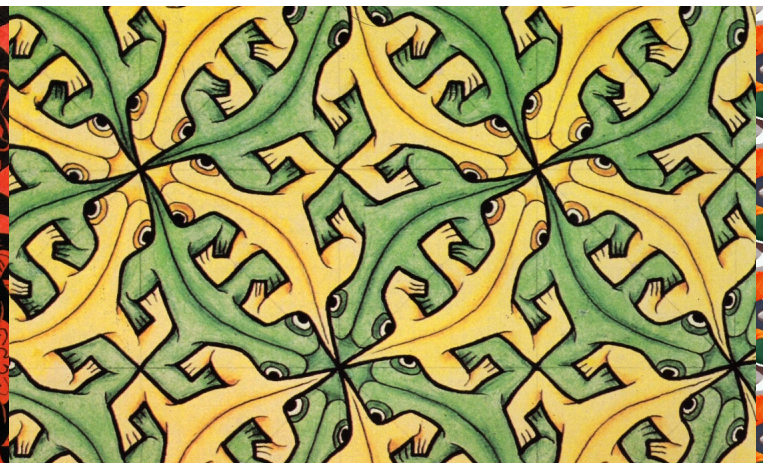


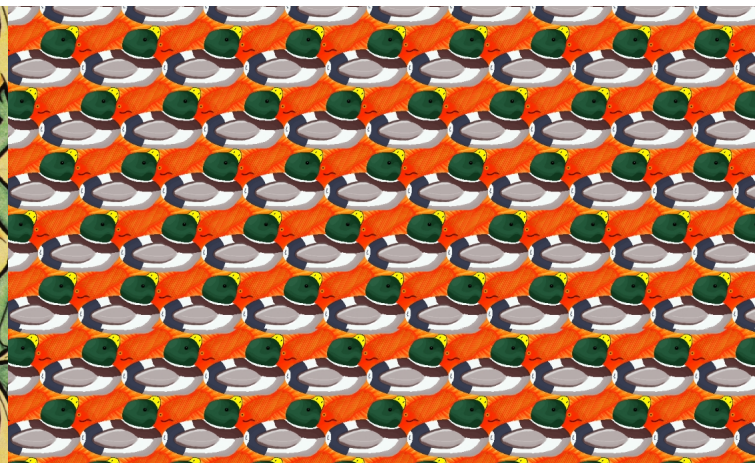
Challenge

Can irregular polygons form tessellations? Prove it!

Did you know?

Artwork of M.C,Escher inspired by geometric figures covering walls and floors. Have a look at some of his **work**.





Also, many Islamic artists make very intricate geometric decorations and are experts at tessellation art.

Further Challenge

Create your own tessellation drawing like MC Escher using geometric figures.

The mathematics

The activities involve geometric problems, recording, justifying and proving. The students will deepen their knowledge of the properties of polygons, interior angles and spatial awareness.