Tiling and Tessellation

Aims

To understand tessellation (triangles, squares, hexagons and irregular shapes) by experimenting with creating coloured shapes and patterns.

Note: This works well as a follow-up activity from the **Making Coloured Squares: Following and Giving Instructions** lesson plan. It may be more suitable for older pupils or those with a good grounding in basic geometry.

Use the **Blanket Knitting Campaign: Class or Assembly Script**, and/or the **Better Healthcare for Mothers and Babies: Understanding the Problem** lesson ideas to set the scene for this lesson.

Curriculum Links

England	Scotland	Wales
Mathematics – Understanding shape; Measuring.	Mathematics – Patterns, shape and number; Properties of shapes and movement (measuring, range of shapes, symmetry, angle); Shape puzzles; Tessellation.	Mathematics – Shape, space and measures.

What you will need

Coloured paper, protractor, scissors, pencils for each table of pupils.
(You can print out protractors on transparencies here: www.ossmann.com/protractor)

What to do

Introduce, or remind pupils about, the blanket knitting campaign going on to help get better healthcare for mums and babies around the world. The knitters are knitting squares to be sewn together to make the blanket. Squares are simple shapes to stitch together. Ask the children why they think that is. They should identify that all its sides are the same length so they fit together easily, and there are only four sides, so only four stitched joins are needed for each square.

Can they think of other places where they see similar patterns of shapes? They might think of bricks in a wall, bathroom or kitchen tiles, or paving slabs. Ask them to think about other shapes they have seen that make patterns that fit together like this. Have they ever seen circles that fit together like this? Why not?

Tell pupils that there are many shapes that fit together easily together without leaving any spaces. This is called 'tessellation' – where shapes are put side by side to cover an area without leaving spaces.

Activity 1

1. Ask pupils to each measure and draw two triangles on a piece of paper. One should have the same length on each side (suggest 5 cm), and the same angle at each corner (60 degrees) i.e. an equilateral triangle. The other triangle can be any size and shape they choose.
2. They should carefully cut both their triangles out.
3. Ask them to try to create a tessellating pattern on their table with all their triangles (equilateral and otherwise)? Why can't they? Which triangles will fit together? (The equilateral ones.) Why? If they had more equilateral triangles, how big could they make their pattern?
4. You might want to bring all the equilateral triangles made by the class together to demonstrate that it could keep growing for as long as you have enough triangles and enough space. These are the two key things to know about tessellation, or tiling: there must be no gaps between the shapes, and the pattern must be able to go on forever.

Activity 2

1. They may think the other triangles won't tessellate. They won't fit into a pattern alongside other pupils' because they are different triangles – but if they create more of the same triangle (drawing around the original one they cut out), they should find that it is possible to create tessellating patterns with them too.
2. Let them experiment and check this is true.

NB. They will be able to make them tessellate by rotating them around a mid-point.

Activity 3

1. If pupils have access to computers or an interactive whiteboard, you might wish to use the following link to help them understand more about tessellation (www.mathcats.com/explore/tessellationtown.html). Simple shapes are easy to fit together – like equilateral triangles, squares and regular hexagons. But there are also different types of shapes that fit together, creating endless tessellating patterns. Pupils can play with some of these shapes online on the Tessellation Town website.
2. They should then experiment and try to construct their own tessellating shape. For older pupils, you could explain that any shape with interior angles of 360 degrees will tessellate, so they should find that any quadrilateral will tessellate. For less able or

younger pupils, you could prompt them to try shapes with 4 straight sides (any quadrilateral). If they are able to construct more complex tessellating shapes, that's great.

Plenary

Come together to close the lesson by checking what the class have learned about tessellation. You might also wish to create a colourful 'blanket' display of the children's work.

Extension

If you wish, with older pupils you could take this further and look at why regular hexagons tessellate but regular pentagons do not. Remind pupils that 'regular' means that all sides are the same length, and interior angles are the same. This will bring in issues about the importance of the number of degrees that make up the angles in a shape. Regular shapes will tessellate if their combined angles are a multiple of 360, or 180 can be added to their combined angles to make 360 (like triangles). You could create a table of regular shapes and make predictions about which will tessellate based on this rule, before confirming the predictions by experiment.