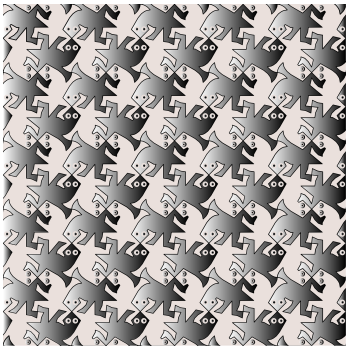
CEMC at Home

Grade 4/5/6 - Friday, April 3, 2020

Dotty Tessellations

A tessellation (or tiling) is an arrangement of one or more shapes in a repeated pattern without overlaps or gaps. Tessellations occur in nature, as illustrated by the honeycomb of bees (a tessellation of hexagons), in masonry (in the walls and floors of buildings), and in artwork.



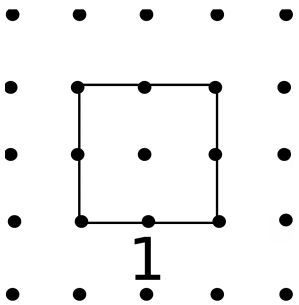
In this activity, we will explore how to make our own tessellations using dot paper.

You Will Need:

- Dot paper (which can be found on the last page)
- A pencil
- An eraser
- A ruler
- Something to colour with (coloured pencils, paints, etc.)

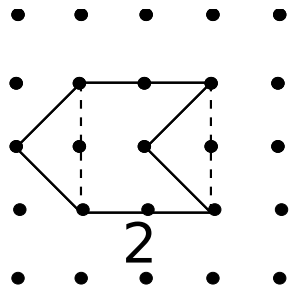
Step 1: Start by drawing a single square, rectangle, or parallelogram on the dot paper using a pencil.

Make sure that it is at least two units long and two units wide, but not so large that it covers too much of the dot paper. An example is shown in image 1.



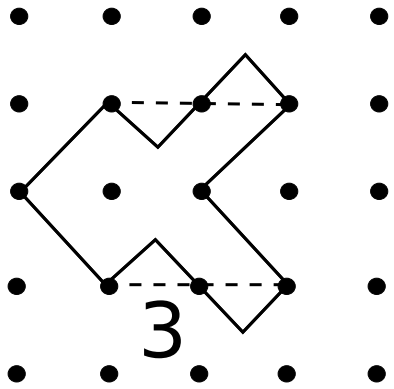
Step 2: "Add" a simple shape to one of the sides of your shape from from Step 1, and then "remove" an identical shape from the opposite side. Erase any lines that are no longer used to form the perimeter of the shape.

In image 2, a triangle is added to the left side of the square by drawing two diagonal lines. An identical triangle is removed from the right side of the square, also by drawing two diagonal lines. The dashed lines in the image show the two vertical edges of the original shape that can now be erased as they are no longer on the perimeter of the shape.



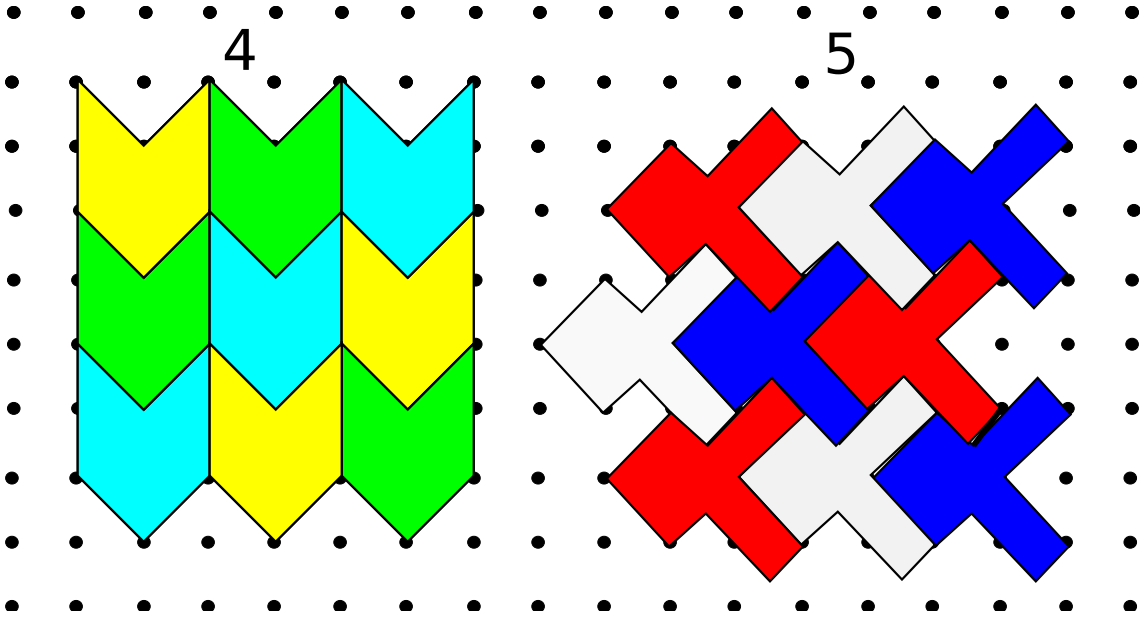
Step 3 (Optional): Go further, if you wish, by now making alterations to the other pair of opposite sides. You can try and use a similar idea as Step 2 (by adding and removing an identical shape) or explore a more complicated alteration.

In image 3, we have altered the shape using four identical triangles, with two triangles being "added" and two triangles being "removed". It turns out that this final shape can be used in a tessellation but it might not be immediately clear how to do it! If you choose to do Step 3, and use a more imaginative alteration, then you may want to think about exactly what changes you can and can't make if your goal is to produce a shape that can be used in a tessellation.



Step 4: Draw identical copies of the final shape created in either Step 2 or Step 3 throughout the dot paper. Make sure that your shapes do not overlap and there are no gaps between your shapes. Once you have your tessellation, colour it as imaginatively as you can!

Image 4 shows the final shape from Step 2 tessellated, and image 5 shows the final shape from Step 3 tessellated.



On the next page, you will find some dot paper to work on. You will also find some shapes that have been created for you and can be used in a tessellation. It is easiest if you make your first few shapes by only making alterations that involve straight lines between two dots, but once you get the hang of it, try and make some more complex shapes. Can you make shapes with a mix of straight edges and curved edges that can be used in a tessellation?

More info:

Many works of art are inspired by mathematics! To see some exceptional tessellations, check out the work of the world famous Dutch graphic artist M. C. Escher.

If you would like to explore tessellations further, check out this Math Circles lesson.

Dot Paper for Tessellations