

Tessellation

Overview

Have you ever noticed some patterns that repeat in all directions and could go on forever? Look at the tiles on your bathroom floor, or the shape of a honeycomb, or some wallpapers, or the amazing drawings by MC Escher. When you stand far away it looks like a pattern, and when you look up close, you will see that it's actually just one shape or a few shapes. These are special because their edges fit together perfectly, so that they can repeat forever, in every direction.

These aren't just beautiful (for art and wallpaper) and they aren't just useful (for bathrooms or honey bees) – they're also important for mathematics! In geometry, we say that these shapes are special because they “tessellate.” That means they fit together perfectly (“tiling”) without any gaps, so that they can repeat forever, in every direction. A whole pattern is called a “tessellation.” For this activity we take a closer look at how they fit together, and even learn how to make our own designs.

Tessellation

Activity 1: Coloring a pattern

Setting Up

Set up at a table, clear of clutter

Print off coloring sheets from **Tessellation Templates PDF**

- colored pencils or markers

Steps A

1. Simply color the coloring sheet, any way that the child would like. Relax and enjoy!

Steps B

1. Take a look at the coloring sheet. *What patterns do you observe? Does the pattern repeat? Can you describe how it repeats?*

2. *Can we use color to show how this is repeating?*

(For example, maybe all of the squares we will color yellow; and all of the triangles we will color blue.)

Tessellation

Activity 2: Tiling

Setting Up

Set up at a table, clear of clutter

Print off shape templates from **Tessellation Templates PDF**

OR use this as a guide to measure and cut your own

- scissors
- scraps of thin cardboard, or paper

Steps

1. Together, or ahead of time, cut out shapes from the **Tessellation Templates PDF**, specifically the shape templates.
2. With paper or card stock, or scraps of thin cardboard (cereal boxes work really well) or old magazines cut out several pieces of each shape, at least 10 of each: triangle, square, hexagon.



3. Lay out all of the pieces. Take the squares. Demonstrate how we can place the squares together, like we are tiling a floor. Their edges touch, without spaces in between.

Invite the child to tile the squares (placing them side-by-side and touching) and observe together. *See how they fit together? They fit perfectly together, without spaces in between.*

4. Take the hexagons. *Can you do the same with these shapes? How many sides does this shape have? (6) Can you fit them together like a puzzle? Assist the child where needed, and show how we can build these hexagon pieces together so that it expands in all directions.*

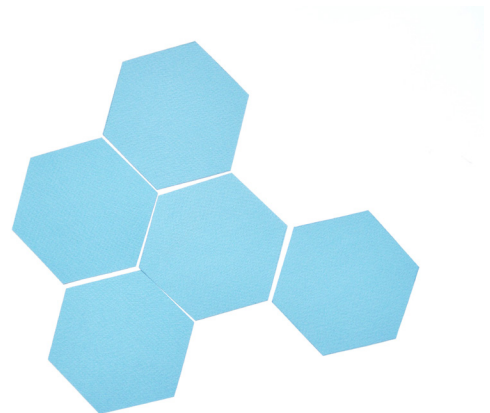
This is called tiling. Just like tiles on the floor! When we place tiles on the floor, like the kitchen or the bathroom, we want them to touch so that there are no gaps on the floor.

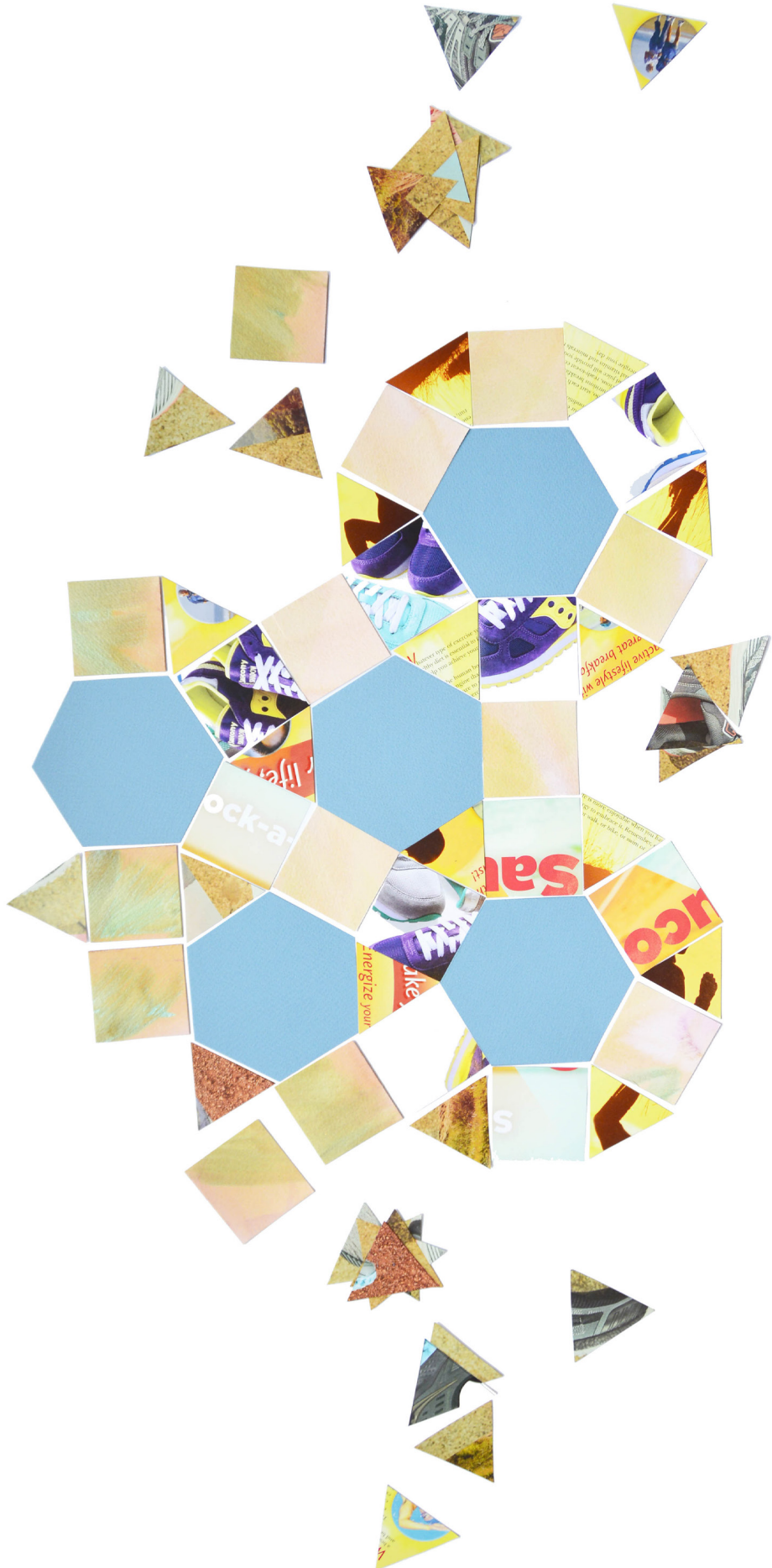
5. Take the triangles. *Can you do the same with the triangles? Can you lay them down like a puzzle, so that the pieces are touching and there is no extra space in between them.*

The triangle is a little bit trickier because we need to rotate it in order for the pieces to fit together (tessellation). Show the child how we can rotate the pieces so that they fit together. Depending on the age of the child, assist where needed, and explore how the pieces can fit together.

6. Now experiment with all 3 of the shapes. Can you create a tiling pattern with all of the shapes? What is a pattern? How do these 3 shapes fit together? Allow the child to experiment, and assist where needed.

7. Glue the pieces down on to poster board or a larger piece of paper / cardboard.





Tessellation

Unique Tessellating Shapes

Setting Up

Set up at a table, clear of clutter

Cut a piece of paper to a 4 inch square (thicker paper or thin cardboard works well)

- scissors
- pencil
- paper
- crayons or colored pencils

Steps

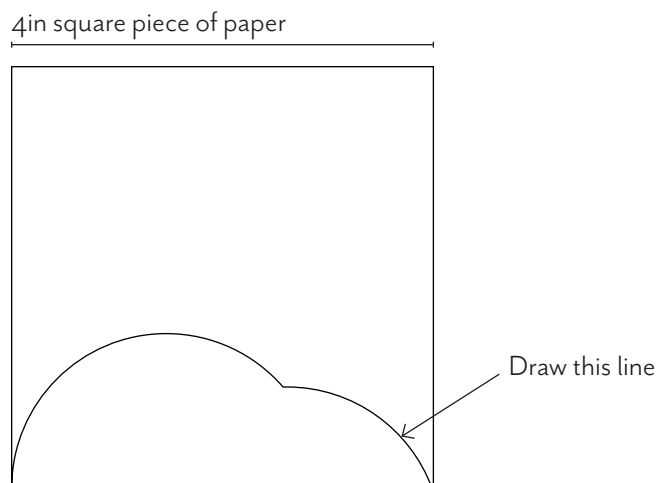
1. Now that we have created tessellating patterns from regular shapes such as squares, triangles, and hexagons - could we also create tessellating patterns with unique shapes?

Yes! And even with shapes that you design yourself!

If you have ever seen the artwork of M.C. Escher, then you may have seen how shapes can appear as birds or fish that interlock together. With this activity, we will design our own unique shapes, and create our own Escher-like designs.

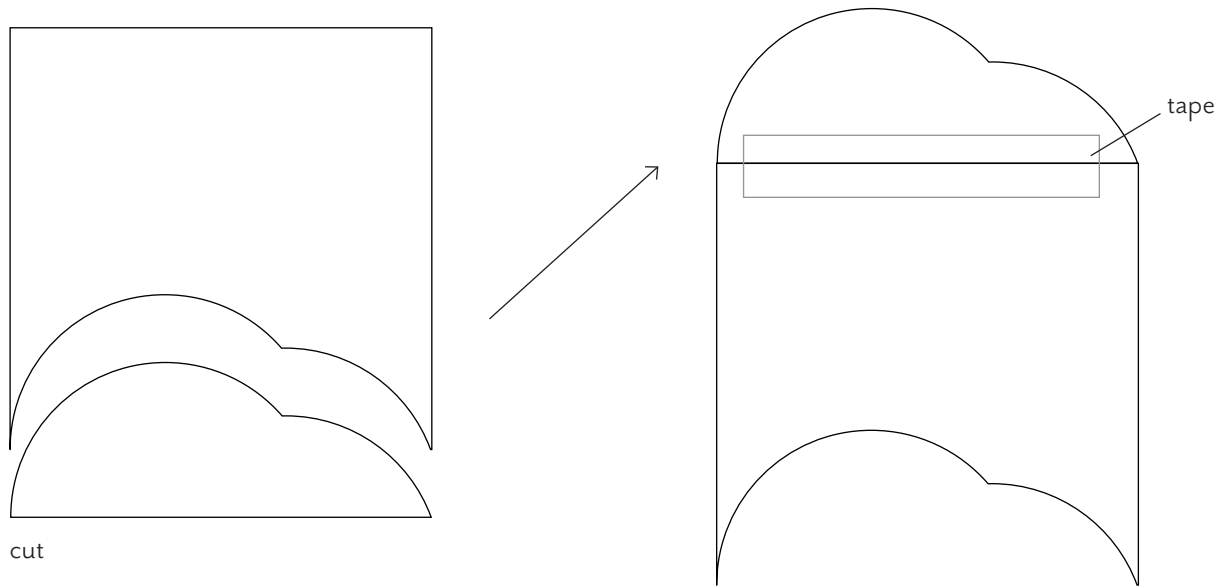
2. Take the 4-inch square piece of paper, or card stock. Note that the square is already a tessellating shape - meaning that we can tile many together and this pattern will go on indefinitely. So we are going to adjust and alter the square, tweak it a bit, so that we maintain the same area, but reconfigure it. Here's how it works...

3. On one side of the square, create a line that intersects the side, and creates a shape. Like this:



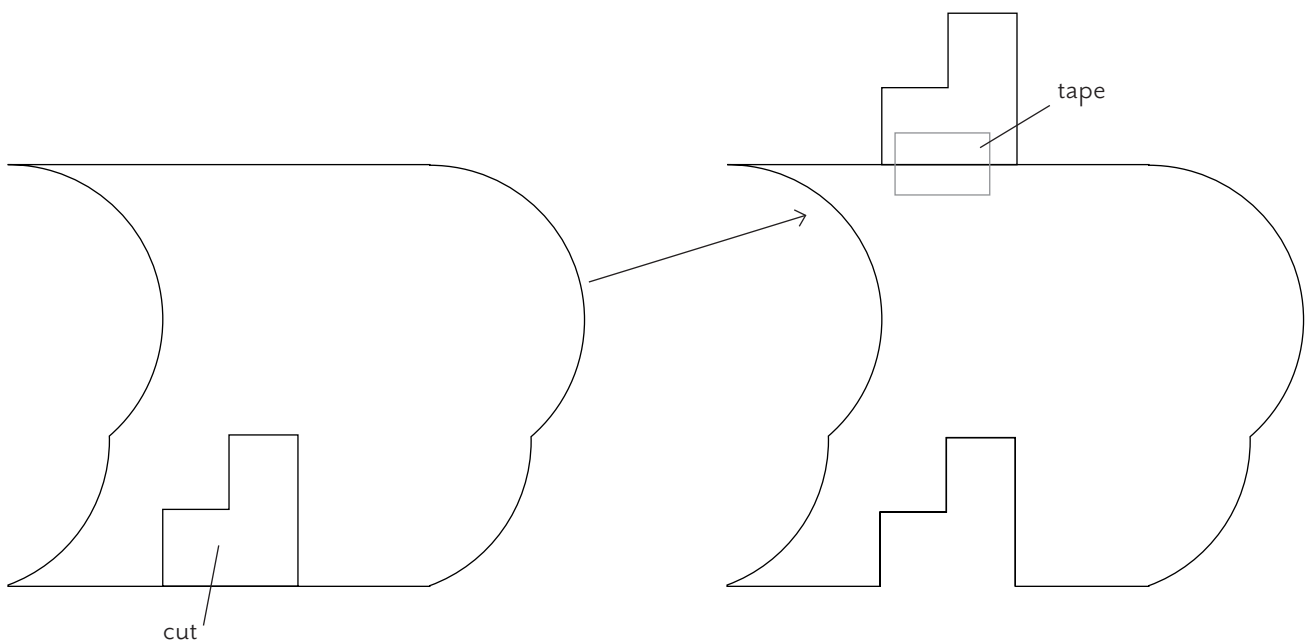
4. Now cut out that shape with scissors.

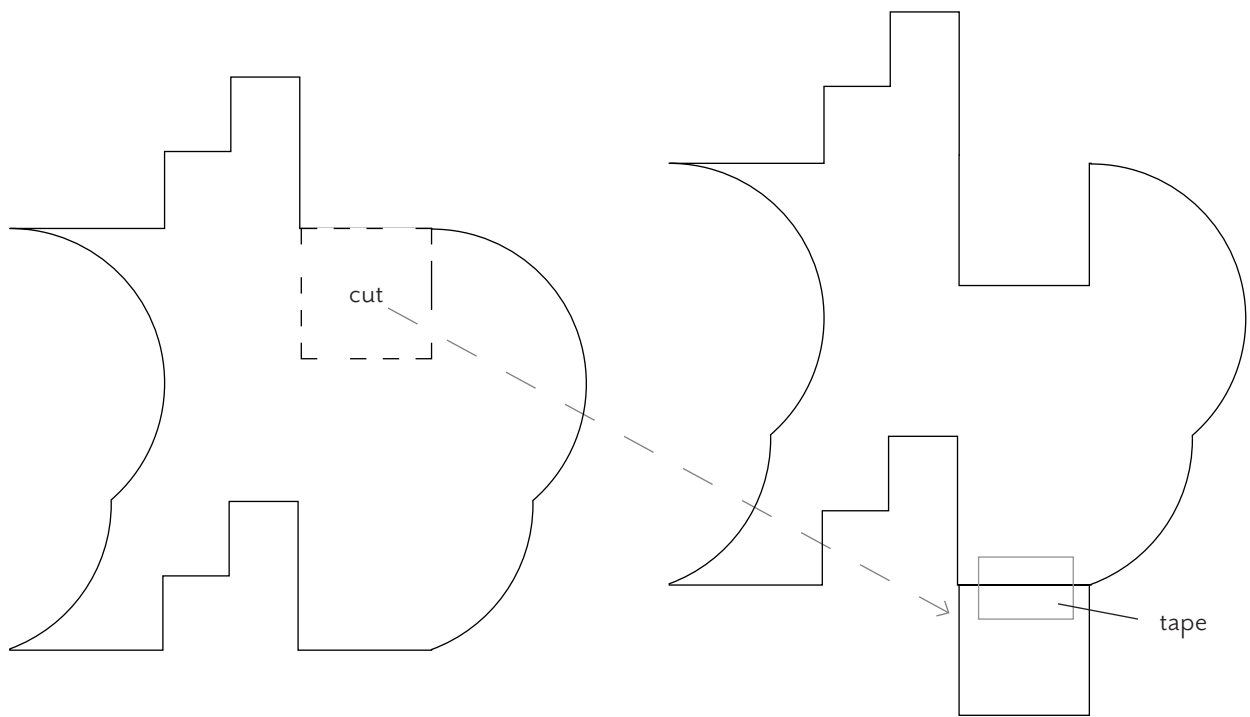
5. You will now move it up, to the parallel side, and tape it to the top edge, like this:



6. Now you have a new tessellating shape! But if you would like to go further, you can - simply do the same thing for the other sides. Note that when you cut away a shape from one side, you will then be moving it to the parallel side, and taping it to the edge. It also needs to stay on the same position along the edge, just shifted up to the other edge.

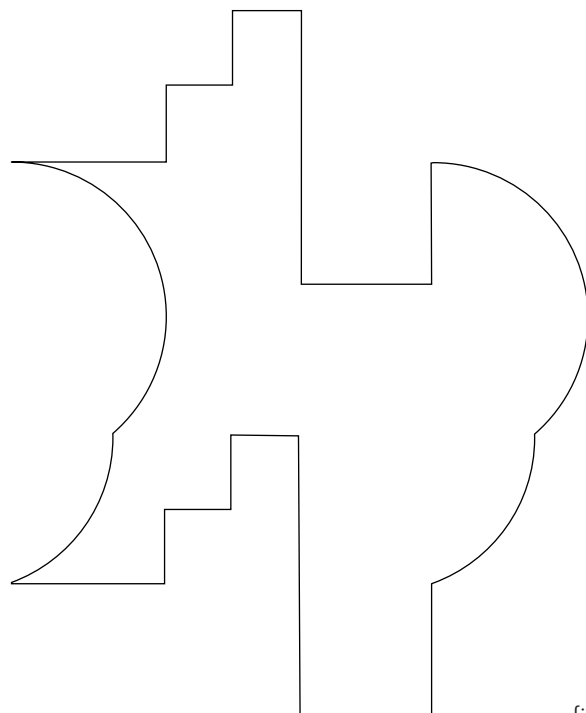
It looks like this:





7. Now you have a stencil template to trace your shape on a piece of paper. Try tracing the shape on the paper, and then lining the shape up again, so that you are creating a tessellating design out of this shape.

8. Then you can color your unique pattern!



finished tessellating shape,
to use as a stencil

