



Longwood Center for the Visual Arts
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Professional Development Teacher Workshop
Paper Making with Mackenzie Lenhart
March 3, 2023

Lesson: Making Patterns with Paper
Grade level: 5th, 7th, or 8th
Time to complete: one period + homework or two

Description:

Over 2,200 years ago the ancient Greeks used to decorate their homes using tessellations. A tessellation is “any pattern made of repeating shapes that covers a surface completely without overlapping or leaving any gaps.” Tessellations can be done with one shape, two shapes, and even three shapes. These can be used in many places such as churches, flooring, and even walls.

Accommodations:

The activity can be modified for any age based on how complex the shape is. For students with visual disabilities possibilities could be to cut multiple pieces of a thicker material and do the activity as a puzzle or create contrast between paper and tracer.

Goals	Virginia Standards of Learning
Math	<p>5.14 The student will...</p> <ul style="list-style-type: none"> a) Recognize and apply transformations, such as translation, reflection <p>7.7 The student will apply translations and reflections of right triangles or rectangles in the coordinate plane.</p> <p>8.7 The student will...</p> <ul style="list-style-type: none"> a) Given a polygon, apply transformations, to include translations, reflections, and dilations, in the coordinate plane; and b) Identify practical applications of transformations.
Visual Arts	<p>5.1 The student will apply creative thinking to artmaking.</p>

	<p>a) Express personal ideas, images, and themes through artistic choices of media, techniques, and subject matter.</p> <p>b) Demonstrate resilience and resourcefulness in solving art challenges.</p> <p>7.1 The student will apply creative thinking to communicate ideas, experiences, and narratives in work of art.</p> <p>8.1 The student will apply creative thinking to artmaking</p> <p>a) Communicate ideas, experiences, and narratives through the creation of original works of art, using self-selected media.</p> <p>b) Synthesize prior knowledge and experience to develop a personal investigation by creating a series of works of art.</p>
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Supplies and Materials:

- Card stock (cut in 3"x3" squares)
- Scissors
- Clear tape
- Markers
- White office paper
- Pencil

Key Terms:

Tessellate- to form a checkered or mosaic pattern from repeated shapes, with no gaps.

Tessellation- The completed mosaic pattern from shapes put together with no gaps.

Rotation- to turn a shape, sometimes on an axis.

Reflection- the transformation of a shape where one point is replaced by a symmetrical point; like a mirror.

Translation- Think of sliding a shape along a plane; new axes are parallel to old axes.

Coordinate plain- two-dimensional plane using two number lines one on the y-axis and one on the x-axis.

Teaching Procedure:

Introduction:

Every shape is different, and most look different no matter what way you turn them, slide them, or flip them. Shapes can have three sides, four sides, five sides, six sides, and so many more.

These shapes are called equilaterals. This means all the sides are the same length.

1. Practice by showing examples of different squares, triangles, and other age-appropriate shapes. Measure each side of the shapes and show that all sides are equal.

2. Describe how tessellations are formed and what they are used for:

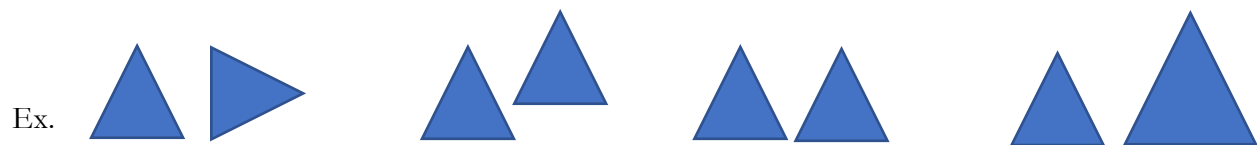
Tessellations are a completed mosaic pattern from shapes repeated with no gaps. Tessellations can be used in walls, floors, and even windows.

3. Show example of tessellations attached in this packet or find your own relevant examples.

4. Show how different transformations effect shapes:

- Draw a coordinate plane either on a smart board or a white board.
- Draw a triangle and show how it might look if we rotated it 90° . Do all the sides still have the same length? Is it still the same shape?
- Now try and slide it, this is called translation. The shape is still the same size, is still an equilateral, and still the same shape. Translation means everything stays the same, but the axes have new coordinates.
- Now try and reflect it, this means flip it left and right or up and down. The shape is still the same size, and it is still the same shape, it is just backwards.
- The last challenge is to dilate it. The shape is now bigger, but it is still the same shape, and it is still an equilateral.

You can do these things with an age-appropriate shapes.



5. Practice different shapes and even have students come up to the board to practice transformations.

6. Introduce the idea of tessellation activity and how students are expected to create an original design. This activity can be used for homework or for a second day of instruction.

Examples of Tessellations in the Real World:



“Real Life Applications of Tessellations.” *Oxford*,
www2.gvsu.edu/oxfordj/angie.html#:~:text=Tessellations%20can%20be%20found%20in,Escher
. Ylgarris. “Tessellations in the Real World!” *Ylgarris*, 25 July 2013,
ylgarris.wordpress.com/2013/07/24/tessellations-in-the-real-world/.

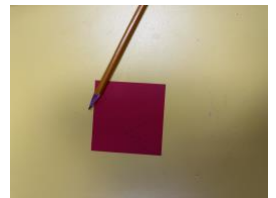
Activity Tessellation Creation

Materials:

- Cardstock (cut in 3x3 squares)
- Tape
- Pencil
- Markers
- White office paper
- Scissors

1. First collect material and have students start with only the piece of 3x3 cardstock. Explain that since all four sides are equal the pattern will continue forever in the coordinate plane.
2. Have students then draw a squiggle on two perpendicular or side by side sides.
3. Have student cut those two pieces out and tapes them to the opposite flat side.
4. Students will then be given a piece of white office paper or any white paper, and they will trace their shape over and over again with pencil, making sure there are no gaps until all of the space is filled.
5. Have student color their shapes in, in whatever pattern they want. For younger grades practice patterns like ABAB or ABBA in multiple colors. For older grades challenge them to make their shape into something and make multiple of those things.

Artwork can be displayed on bulletined boards or graded for correctness. This activity could also be given as homework to enforce the lesson above.



Conclusion:

What are the four different transformations?

What does reflection, translation, rotation, and dilation mean?

Where can tessellations be found?

References:

About Meredith Meredith Anderson is a STEM education enthusiast and former homeschooling parent. A mechanical engineer by training. "Create a Simple Tessellation." *STEM Activities for Kids*, 29 Mar. 2022, stemactivitiesforkids.com/2019/10/08/create-a-simple-tessellation/.

"Exploring Tessellations - Exploratorium." *Geometry Playground*, annex.exploratorium.edu/geometryplayground/Activities/GP_Activities_3-5/ExploringTessellations_3-5_v4.pdf.

"Mathematics Standards of Learning for Virginia Public Schools K-12." *Virginia Department of Education*, www.doe.virginia.gov/home/showpublisheddocument/3038/637982465171900000.

"Real Life Applications of Tessellations." *Oxford*, www2.gvsu.edu/oxfordj/angie.html#:~:text=Tessellations%20can%20be%20found%20in,Escher.

Ylgarris. "Tessellations in the Real World!" *YIGarris*, 25 July 2013, ylgarris.wordpress.com/2013/07/24/tessellations-in-the-real-world/.