

Math 5 - Act. 20: Tessellation Quilt Squares

Summary

Each student will design a "quilt block" that has a tessellating pattern to help create a class tessellation quilt.

Group Size

Individual

Materials

1"x 1" square of heavy cardstock paper

6"x 6" square of white art paper

Lead pencil

Scissors

Colored pencils

Tape

Quilts, quilt books and/or art by Escher

Additional Resources

Eight Hands Round: A Patchwork Alphabet by Ann Whitford Paul

Sam Johnson and the Blue Ribbon Quilt by Lisa Cambell Ernst

Quilting Now and Then by Karen B Willing

The Quilt Block History of Pioneer Days with Projects Kids Can Make by Mary Cobb

Sweet Clara and the Freedom Quilt by Deborah Hopkinson

The Keeping Quilt by Patricia Polacco

The Magic of M.C. Escher by M.C. Escher

Quilts and Quilters, Artists, Craftsmen, Choreographers, Musicians

Background for Teachers

Shapes are used in patterns and designs all around us. Symmetries help us classify and organize these patterns. A change in position is called a *transformation*. When the object moves up, down, or over it is called a *slide* or *translation*. Every translation has a direction and distance. When a mirror image of the object occurs, it is called a *flip* or *reflection*. Every reflection has a mirror line. A turn or rotation rotates the object around a set point. Every rotation has a center and an angle.

Tessellations occur when a surface is completely covered with one or more shape. The pattern has no gaps or holes or any overlapping sections. Typically, tessellations use standard geometric shapes, but as long as the original area is maintained, alterations can provide interesting and creative alternatives in pattern design.

Intended Learning Outcomes

5. Make mathematical connections.
6. Represent mathematical situations.

Instructional Procedures

Invitation to Learn

Write the letters ATOYOTA and ask the students if they can see a line of symmetry. (If you draw a line through the middle of the "Y" and then reflect the entire phrase across the line, the left side becomes the right and vice versa.

Have the students brainstorm other words or letter patterns that can reflect across a line ("NAN" "ITI").

Instructional Procedures

Make a symmetrical pattern by taking an asymmetrical letter and repeating a single translation over and over. Decide on a direction and a distance, for example 3 cm to the right. Then translate your letter 3 cm to the right, then again 3 more cm to the right. Keep repeating the translation until you run off the paper. Also translate the letter 3 cm to the left, and repeat. Did you get any other types of symmetries such as reflections or rotations in the process? Show examples of quilts, quilt books, and art by Escher and point out the symmetry and transformations.

Explain tessellations using irregular patterns (see background information above).

Distribute a 1" square and 6" square to each student. Have them lightly shade one side of their 1" square (so they can tell front from back).

Draw and then cut an irregular design on one side of the small square. The cut should go from corner to corner on the same side of the square.

Slide the cut across the square to the opposite side and then, with a partner, tape it to the cube. Make sure that there are no spaces and that the cube or the cut did not get turned over to the colored (back) side. In order to tessellate, the new irregular shape must maintain the same area as the original square. There can be no extra cuts or spaces and they need to make sure that the edges are flush before they tape them. (There is no overlapping.) This small cardstock piece is now "the pattern."

Starting in one corner of the 6" piece of art paper, lightly trace the pattern with a pencil. Slide the pattern and trace, repeating until the entire paper is covered (tessellated). Make sure that there is no space between the original pattern and the new pattern to be traced.

Using red, white, and blue colored pencils, artistically color in the "quilt blocks" to create a pleasing pattern.

Mount all student quilt blocks on a large piece of colored paper to create a class quilt.

Curriculum Integration

Art, Social Studies—Quilts in American History, Underground Railroad Quilts

Extensions

Possible Extensions/Adaptations

As the students become experts in tessellations using translations, they could create a second quilt square using rotation. Cut one side of the cardstock square and rotate it around a set point and then tape it down. As before, they trace the square on the art paper, but this time, the student rotates it before tracing subsequent patterns. Again, when the paper is completely tessellated, they color it using the predetermined color scheme (red, white, and blue) and then mount their squares with their classmates to create a large class quilt.

Explore additional shapes which will tessellate a plane and find the common features (Hint: measure inside angles).

Home/Family Connections

Identify patterns in their home (wallpaper, upholstery fabrics, etc.) that have some type of translations. Identify which type of pattern movement is used and the overall pattern that was created.

Assessment Plan

Have the student attach a paragraph to their quilt square describing the transformation used and how they created the pattern for their square. Have them identify the initial pattern and then, using the terms translation, reflection or rotation, describe the location and position of at least two other parts of the pattern.

Authors

