

Crafting with Geometry

GRADES:

4th through 12th (refer to suggested modifications in the outline, younger children may need more assistance in completing the activities)

DURATION:

It will vary depending on the age of the child.

LEARNING OBJECTIVES:

Children grades 4-8

- They will be encouraged to be curious and creative;
- They will understand how objects can be used by historians to understand the past.
- They will understand types of symmetry and use these basic principles of geometry to design patterns.

Children grades 9-12

- They will be encouraged to be curious and creative;
- They will understand types of symmetry and use these basic principles of geometry to design patterns.

MATERIALS:

- Printed copies of worksheets
- Colored pencils, Sharpies, markers, etc.

BACKGROUND INFORMATION:

Quilts are made of two layers of cloth filled with padding (such as down or batting) held in place by ties or stitched designs. In many cases the top is pieced from a patchwork of smaller fabric pieces, and the pattern and color of these pieces are important to the design.

Quilts have been made for centuries by people around the world from different cultures, but they are particularly prominent in the United States. The making of quilts (or quilting) was often a communal activity, involving many people in a family or larger community. Part of why quilts are so interesting is because they tell a lot about the people who made them.

Check out [this digital collection of quilts on Ohio Memory](#) or the [National Museum of American History's online quilt collection](#) for beautiful examples of this type of art. Both collections have received the majority



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of their quilts as contributions from the makers' families. The collections show a variety of materials, sewing techniques, and styles. What do they say about the people who made them? What would be your choices if you were making one? Why?

Watch [this video](#) about some of the quilts in our collection to learn more about the history of quilts and what historians can learn from quilts.

ACTIVITY 1 – UNDERSTANDING SYMMETRY:

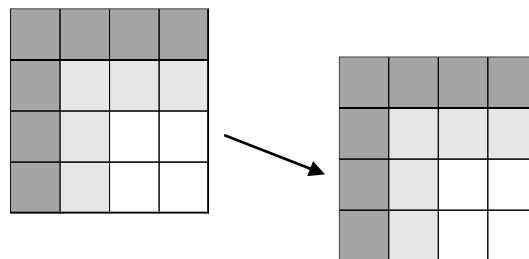
Cover this introductory content together. Then, print the worksheets for Activity 1 and have your child follow the instructions to learn about these types of symmetry found in quilt squares.

Quilters use different design methods that rely on the basic geometry principle of symmetry and movement to create the patterns for their works of art. The three types of symmetry are rotational, reflective and translational. Rotational symmetry is when a pattern is rotated around a point and makes the same pattern or shape in a different position about the point. Reflective symmetry is when a pattern is repeated over an axis, or an imaginary line, in the center of the pattern. Translational is when a pattern is moved to a different place but with the same orientation.

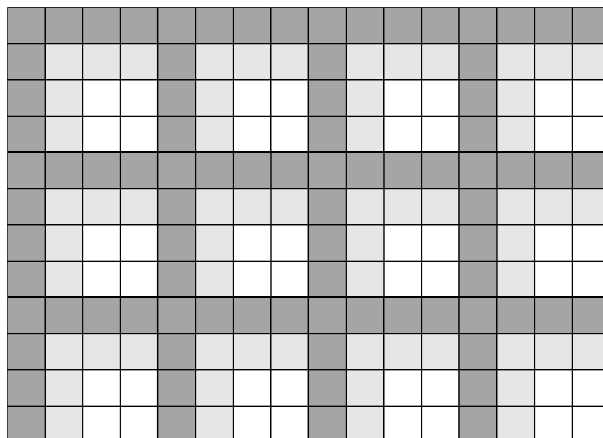
Note: A basic understanding of these concepts is necessary to complete Activity 2.

Translational Symmetry

Consider the block below. The arrow indicates movement and shows translational symmetry. Yes, it's that simple! Translational symmetry is when something is moved, but not reoriented or changed.

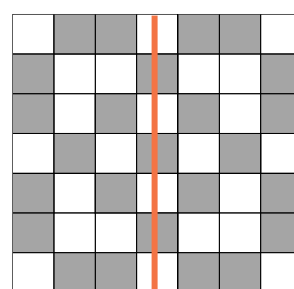
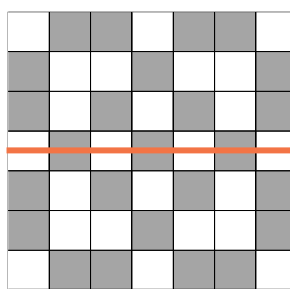
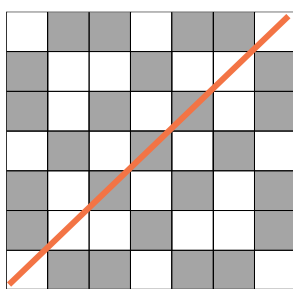
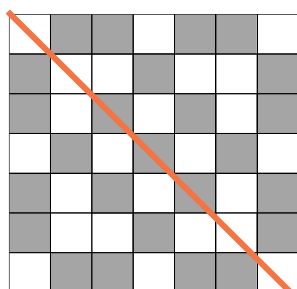
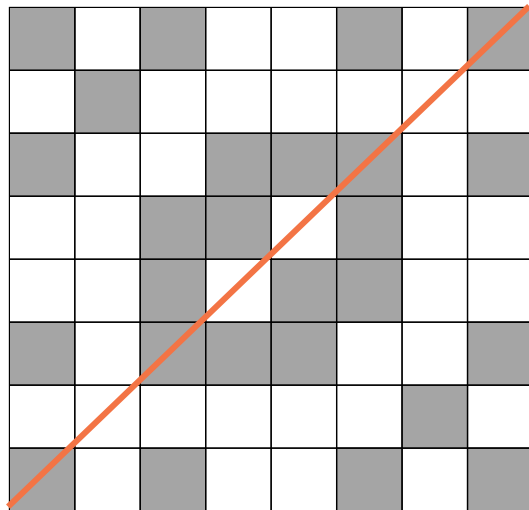
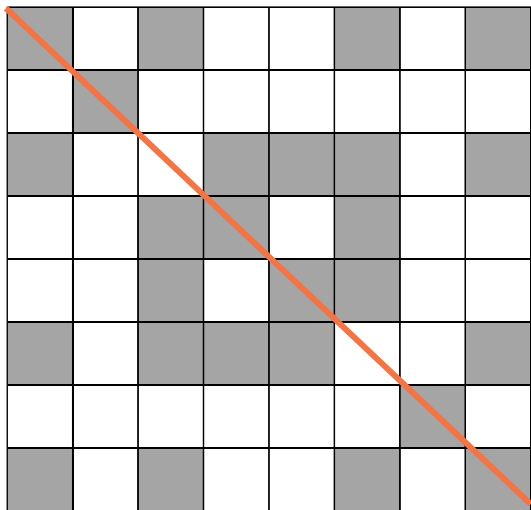


These blocks can be combined into a large quilt that shows translational symmetry!



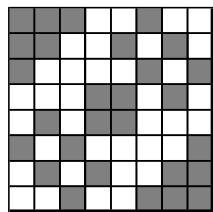
Reflective Symmetry

Consider the blocks below. The lines indicate the axes over which the pattern is reflected. If you were to fold the pattern in half over that line, each half would be identical. Reflective symmetry can be vertical, horizontal or diagonal.

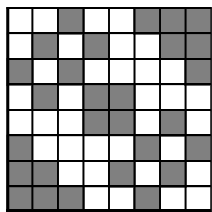


Rotational Symmetry

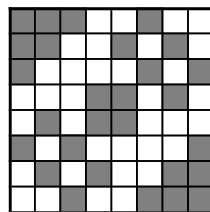
Consider this quilt block. If you rotate this block, you will see that it makes the same pattern when rotated 180° around its center point. Figures 2-4 show the rotational symmetry of this pattern.



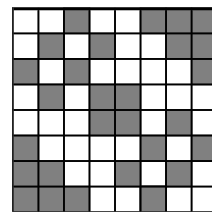
1. (original)



2. 90° rotation

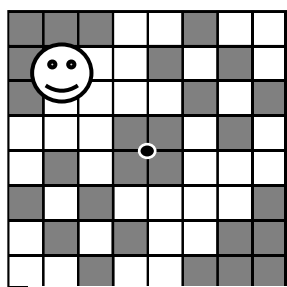


3. 180° rotation

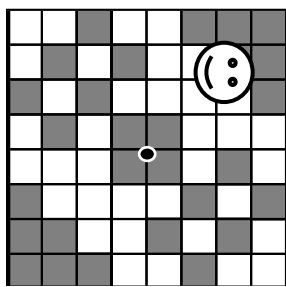


4. 270° rotation

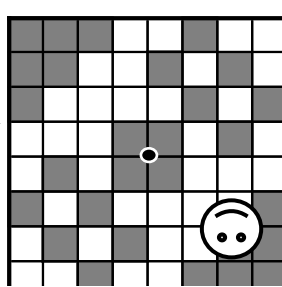
Hard time following? Watch the smiley face in the orange square and picture block turning with the arrows around the point in the center.



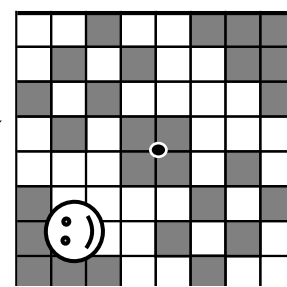
1. (original)



2. 90° rotation

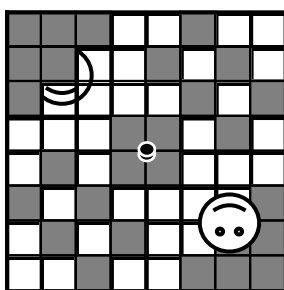


3. 180° rotation



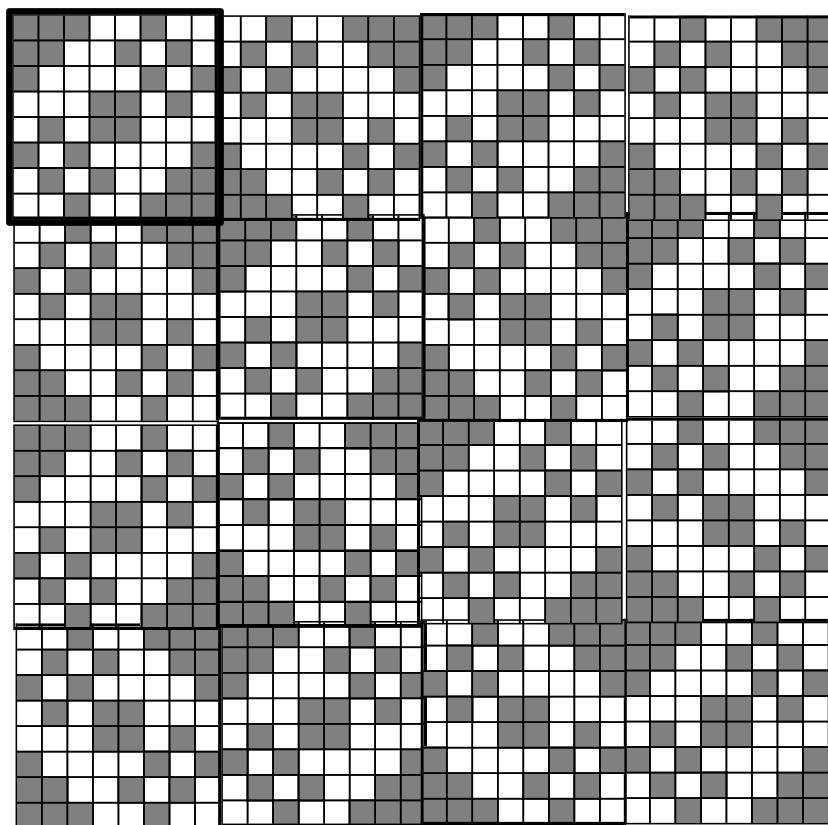
4. 270° rotation

If we lined up figure 1, the original pattern, with figure 3, the pattern after rotating it 180° , we can see that it is the same pattern! That means that this figure has rotational symmetry at 180° .



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You could put these rotated blocks in a larger quilt to make interesting larger patterns!



To learn more about symmetry and for a deeper explanation, watch [this video](#).

ACTIVITY 2 – DESIGNING WITH SYMMETRY:

Print the worksheets for activity 2. Using the symmetry concepts learned in activity 1, children should design and color the quilt graphics. Students should design at least one quilt with a color scheme/pattern that exhibits rotational symmetry and one quilt to exhibit reflective symmetry. Ask your child to explain the concepts and how they used them in their design!

ONE MORE THING:

Let us know how it went! Tag us on social media or email us at education@ohiohistory.org.

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Activity 1: Understanding Symmetry

Instructions: Look at each block in the following quilts and note if the blocks show translational, reflective or rotational or reflective symmetry. If it is reflective, draw the axis over which the pattern is reflected. If it is rotational, put a dot where the point of rotation is. If it is translational, draw an arrow to show its movement. TIP: There might be blocks that aren't symmetrical in any way, and there might be blocks that have more than one axis!



The pieced tulips are appliquéd on 16 ½-inch blocks, which are set diagonally. They alternate with plain white blocks of the same dimensions. The tulips are quilted with close parallel lines, filling the shape and following the outlines. The background is 3/8-inch straight grid quilting. To learn more about this quilt, visit https://americanhistory.si.edu/collections/search/object/nmah_556326.

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Twenty-five 17 $\frac{1}{4}$ -inch blocks were appliquéd with red and green flowers and leaves in sprays, wreaths, and vases. Embroidery enhances a few of the stems. Two blocks have appliquéd star designs and one has appliquéd pineapples. Plain-weave cottons in plain colors were used. The 8 $\frac{1}{4}$ -inch border is appliquéd with a meandering vine bearing leaves and buds. The blocks were joined after 1840. The color scheme, red-and-green, and standard designs are typical for many mid-nineteenth-century quilts. For more information on this quilt, visit https://americanhistory.si.edu/collections/search/object/nmah_556494.



Dated 1886, this quilt is composed of 72 Calico blocks, each block in a different pattern, one block embroidered '1886'. It is bound in blue and backed with muslin. For more information, visit <https://ohiomemory.org/digital/collection/p267401coll32/id/5990>.

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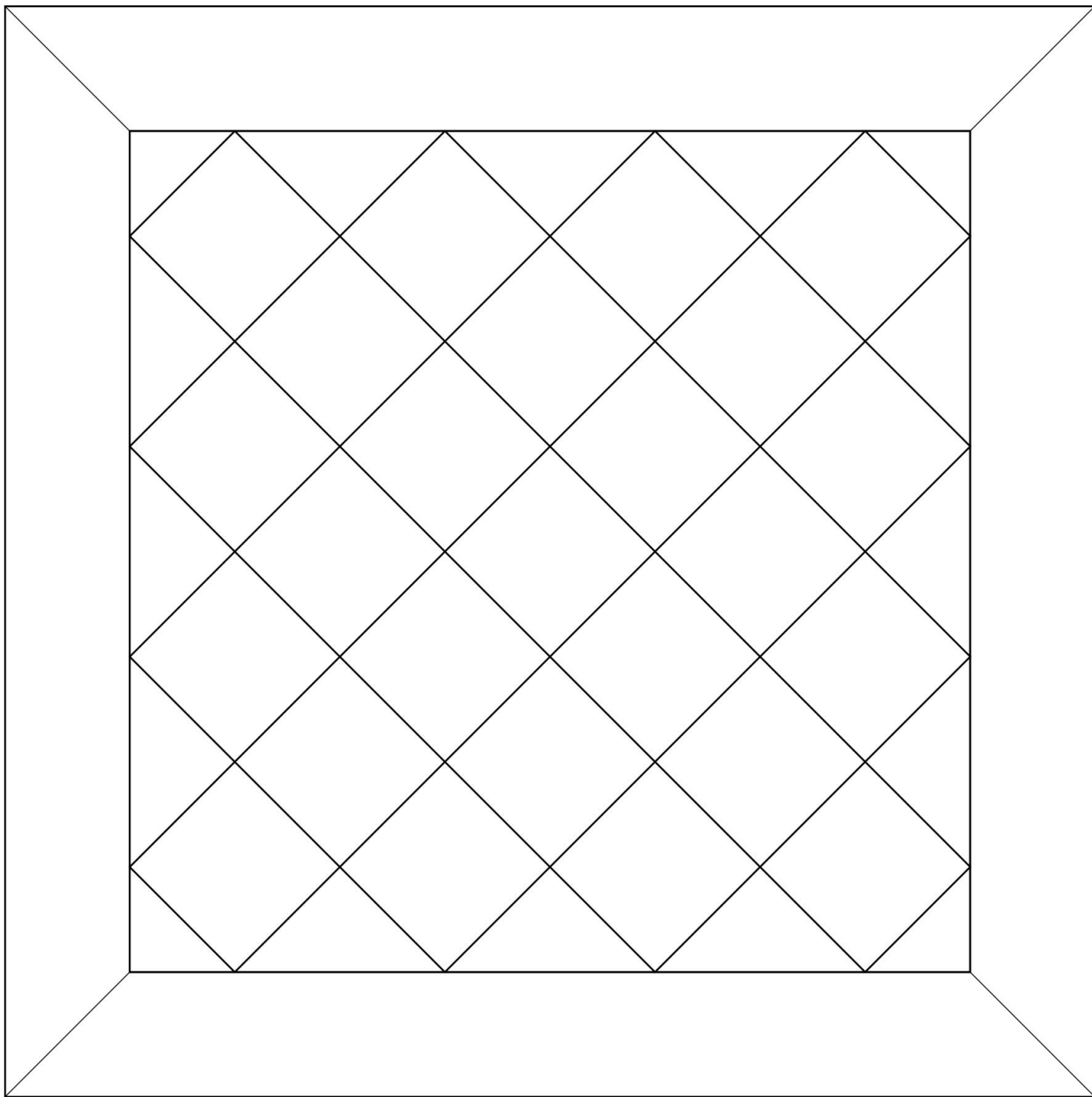
Activity 2: Designing with Symmetry

Using the symmetry concepts you learned in Activity 1, design and color the following quilt graphics. Be sure to include at least one example of each type of symmetry!

TIP: Each of the following quilt patterns are based on a quilt in our collection! Click the link by each graphic for design inspiration and to learn more about the quilt.

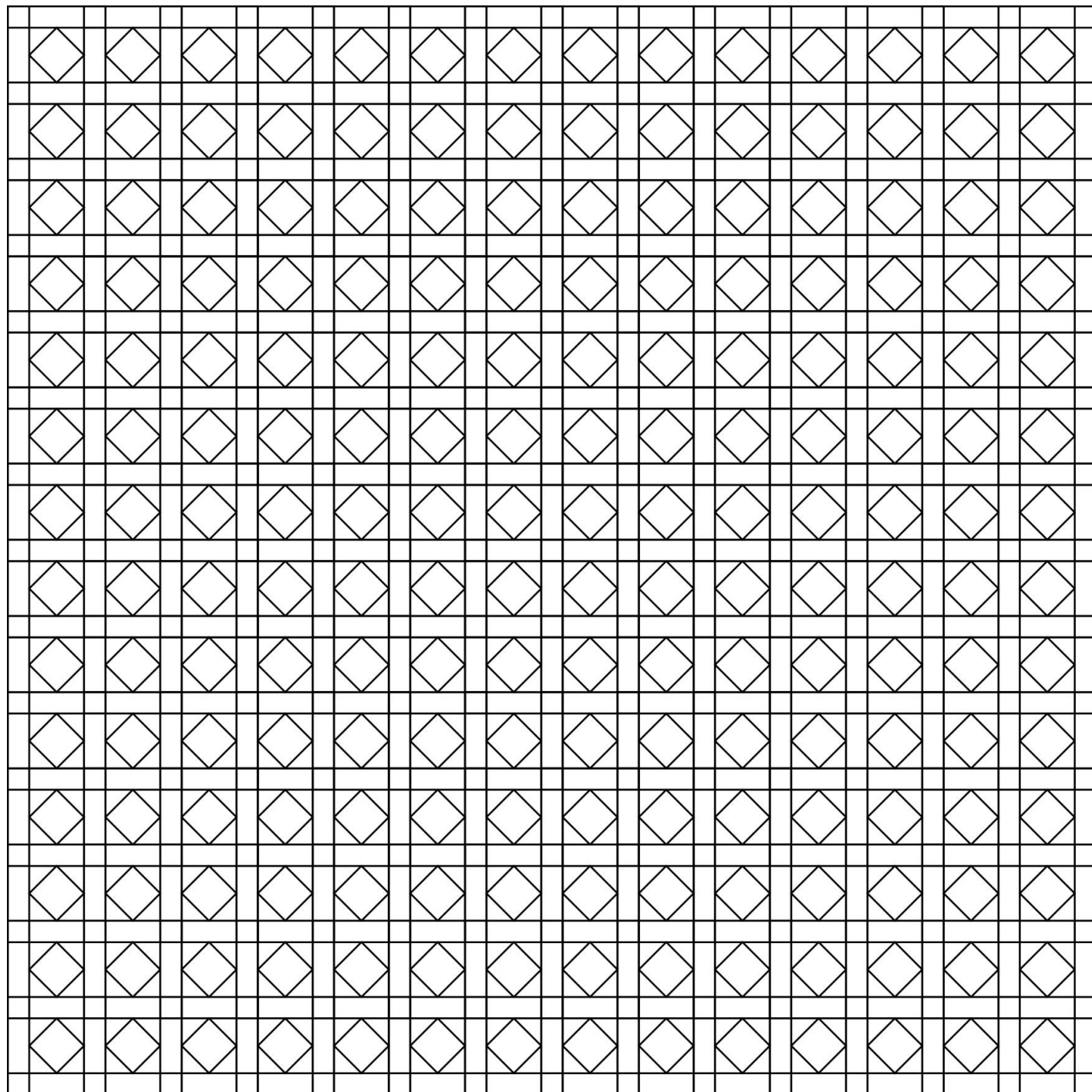
Remember to share your creations with us! Tag @OhioHistory on Twitter, @OhioHistoryConnection on Facebook, or email us at education@ohiohistory.org.

Quilt 1



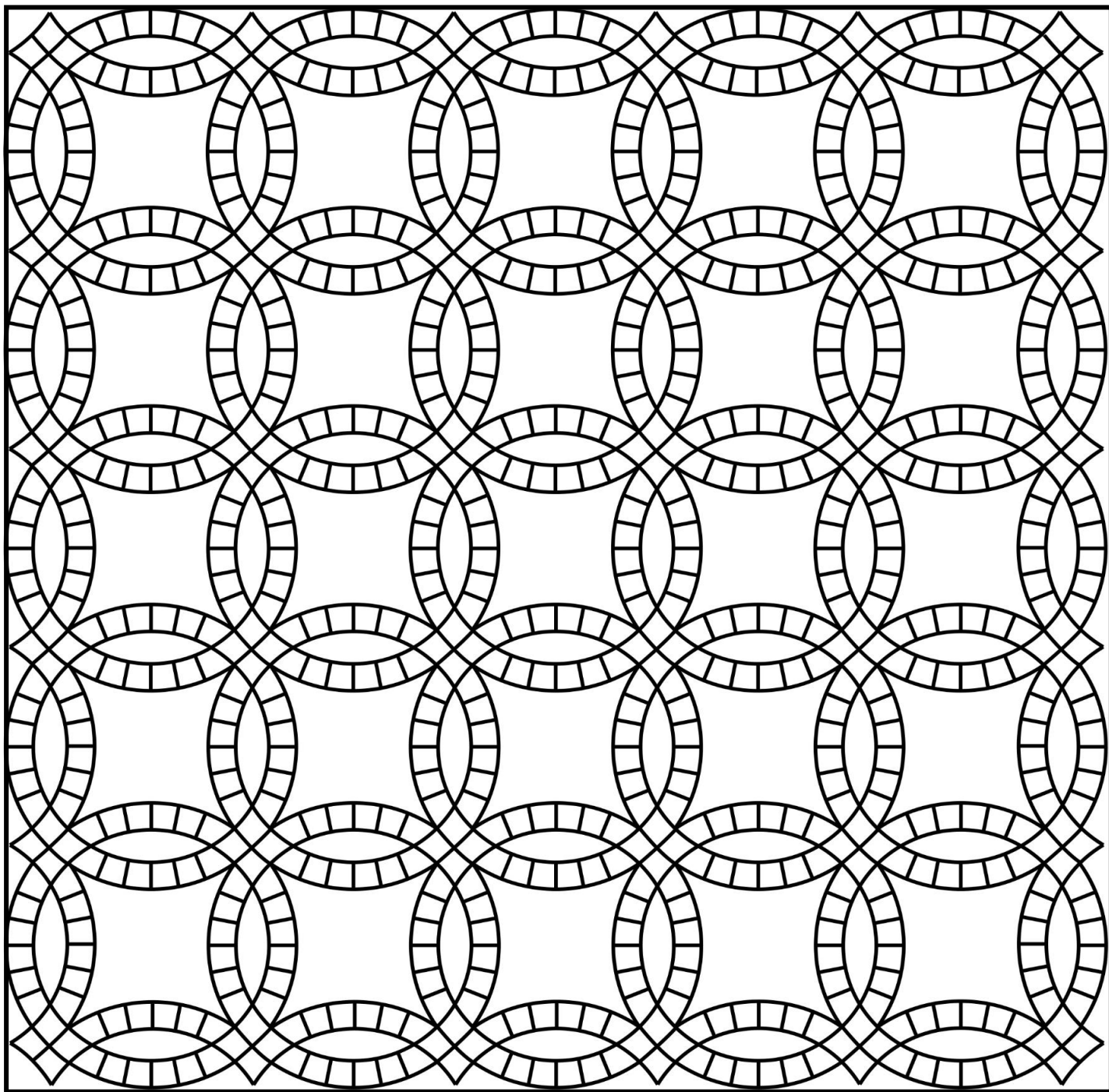
Find out more about the quilt in our collection that uses this pattern by visiting <https://ohiomemory.org/digital/collection/p267401coll32/id/5960>.

Quilt 2



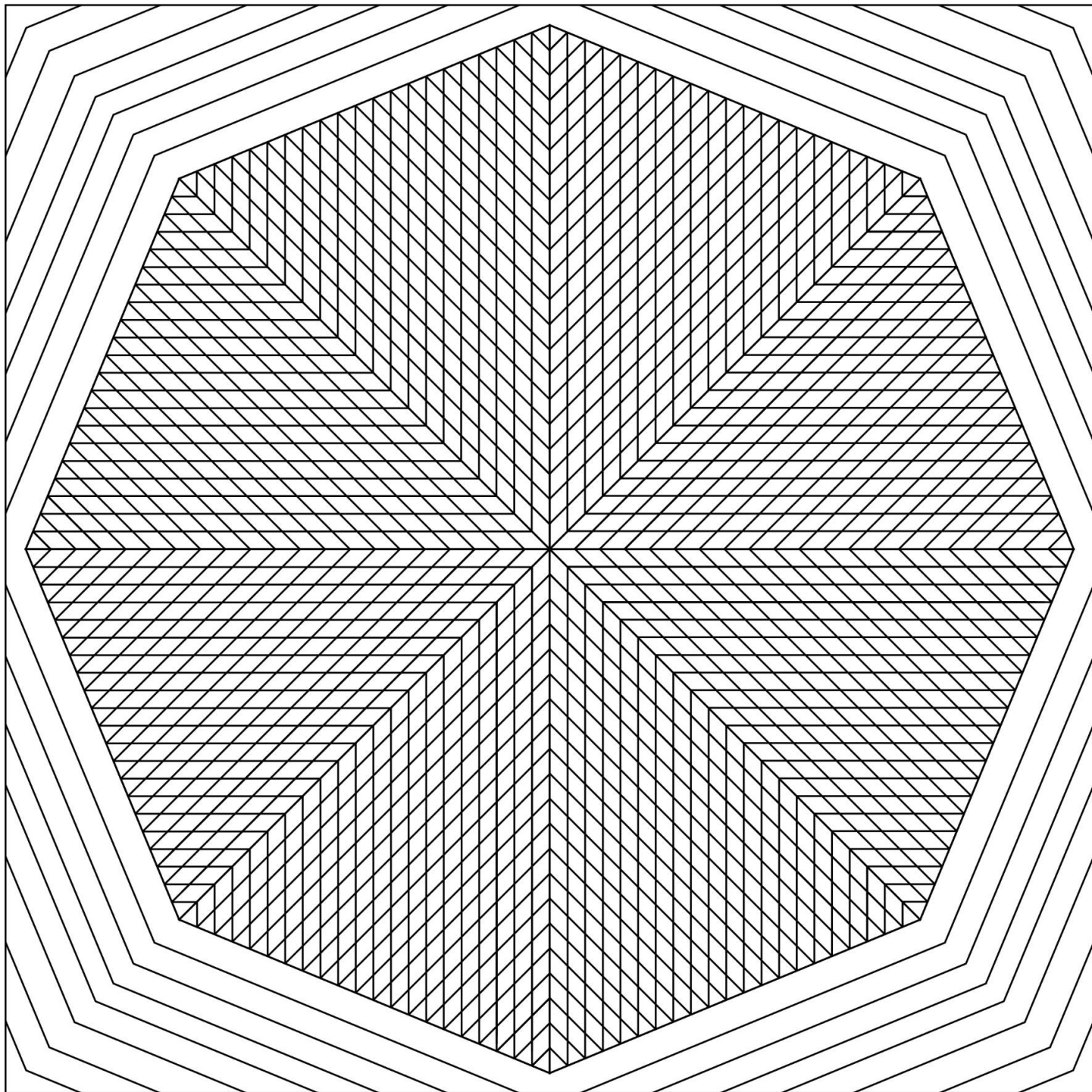
Find out more about the quilt in our collection that uses this pattern by visiting <https://ohiomemory.org/digital/collection/p267401coll32/id/5963>.

Quilt 3



Find out more about the quilt in our collection that uses this pattern by visiting <https://ohiomemory.org/digital/collection/p267401coll32/id/5957>.

Quilt 4



Find out more about the quilt in our collection that uses this pattern by visiting <https://ohiomemory.org/digital/collection/p267401coll32/id/5954>.