Anila Quayyum Agha is a Pakistani-American artist that creates awe-inspiring spaces from intricate patterns of light and shadow, evoking the sacred, while also raising questions of exclusion and belonging.

This resource was created in collaboration with a teacher professional development workshop designed for K-12 art and math educators. It provides educators with tools and teaching strategies for cross-curricular and arts-integrated learning.
Art & Geometry

Geometric Designs in Islamic Art

Unlike Christian art, Islamic art isn’t restricted to religious work, but includes all the artistic traditions in Muslim cultures. Common features in Islamic art give it a notable coherence, regardless of the country or the time in which it was created. Strong regional characteristics and influences from other cultures are also visible.

Meaning and design

The art of the Islamic world reflects its cultural values and reveals the way Muslims view the spiritual realm and the universe. For Muslims, Allah is at the heart of worship, aspirations, and is the focus of their lives. Islamic art focuses on the spiritual representation of objects and beings rather than their physical qualities. The goal of the Muslim artist is not to attempt to replicate nature as it is, but rather to convey what it represents.

Muslim artists use three forms of decoration:

1. Geometric
2. Arabesque
3. Islamic Calligraphy

Geometry

A common feature of Islamic art is the use of elaborate geometric patterns. This geometry is thought to reflect the language of the universe and help the believer to reflect on both life and the infinite nature of Allah.

How is geometry seen to represent infinity?

• Circles have no end; they are infinite.
• Complex geometric designs create the impression of unending repetition.
• The repeating patterns demonstrate that in the small you can find the infinite...
  a single, finite element of the pattern implies the infinite total.

The use of patterns is part of the way that Islamic art represents nature and objects by their spiritual qualities, not their physical and material qualities.
Arabesques

Arabesques, sometimes called Islimi, are biomorphic, floral patterns which represent the underlying order and unity of nature.

Key elements of arabesque compositions:

- Behind most designs there is a spiral from which the motifs and leaves sprout. The movement of nature inspires the unbroken flow of the spiral; it has no hard corners and the curves are sweeping and gentle.
- Symmetry is fundamental to a harmonious design; it exemplifies completeness and perfection and the desire for unity.
- Arabesque designs repeat across the surface with an even rhythm and texture.

Islamic Calligraphy

The Qur’an, written in elegant scripts, represents Allah’s divine word, which Muhammad received directly from Allah during his visions. Qur’anic verses, executed in calligraphy, are found on many different forms of art and architecture. Likewise, poetry can be found on everything from ceramic bowls to the walls of houses. Calligraphy’s omnipresence underscores the value that is placed on language, specifically Arabic.

The remainder of this resource will provide you tools and lesson plans for introducing Geometric and Arabesque patterns in your classroom.

Goal

The goal of this lesson is for students to learn how Islamic artists use geometric and arabesque patterns, and explore mathematical principals through creating Islamic inspired design.
Ohio Learning Standards Addressed

Geometry is found throughout Ohio’s Learning Standards for Mathematics. Here are a few examples of standards for various grade levels which can be addressed with this lesson:

K-8 Standards:

**K.G.6** Combine simple shapes to form larger shapes.

**2.G.3** Partition circles and rectangles into two, three, or four equal shares; describe the shares using the words *halves, thirds, or fourths* and *quarters*, and use the phrases *half of, third of, or fourth of* and *quarter of*. Describe the whole as two halves, three thirds, or four fourths in real-world contexts. Recognize that equal shares of identical wholes need not have the same shape.

**4.G.1** Draw points, lines, line segments, rays, angles (right, acute, and obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

**7.G.2** Draw (freehand, with ruler and protractor, and with technology) geometric figures with given conditions.

High School Standards:

**G.CO.3** Identify the symmetries of a figure, which are the rotations and reflections that carry it onto itself.

- **a.** Identify figures that have line symmetry; draw and use lines of symmetry to analyze properties of shapes.
- **b.** Identify figures that have rotational symmetry; determine the angle of rotation and use rotational symmetry to analyze properties of shapes.

**G.CO.12** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).
Keywords

Geometric
Something associated with geometry, or the use of straight lines and shapes

Arabesque
A complex and elaborate decorative design of intertwined lines suggesting flowers, foliage, animals, and geometric patterns

Line of Symmetry
The axis or imaginary line that passes through the center of the shape or object and divides it into identical halves

Balance
Sense of distribution of perceived visual weights that offset one another

Harmony
The quality of how the visual elements are working together in a composition

Negative Space
In art, is the space around and between the subject(s) of an image; the background

Positive Space
In art, the main focus of a picture, opposite of negative space

Classroom Activities for Exploring Geometric Patterns in Islamic Art

Supplies:
- White Drawing Paper
- Pen and Pencil
- Compass
- Ruler
- Crayons or Markers
- 12 x 12” Card stock multi-colored
- 8 ½ x 11” Cardstock multi-colored
- 8 ½ x 11” Copy paper multi-colored
- Glue Sticks
- Scissors
- Hole Punch
- Clear Tape

Additional Resources

Videos on Islamic Art
https://www.youtube.com/watch?v=pg1NpMmPv48
https://www.youtube.com/watch?v=lj0TnkAqsts

Research Articles on the evolution of Islamic Geometric patterns
https://blog.interface.com/geometry-in-design/

Photo Archive of Islamic art images
https://patterninislamicart.com/

Children’s Books about Art & Geometry
https://theartofeducation.edu/2013/08/29/10-books-every-art-teacher-needs/
**Activity 1: Six Petal Design**

**Step 1**
With the paper placed horizontally, use a ruler to draw a horizontal line across the center of the paper.

![Horizontal line](image)

**Step 2**
With a compass, create a circle near the center of the line.

![Circle](image)

**Step 3**
Placing the compass point at the left and right intersections of the circle and the line, create two more circles.

![Two circles](image)

**Step 4**
Next, create two additional circles by placing the compass point on the place where the two side circles overlap the center circle.

![Additional circles](image)

**Step 5**
Finally, add two more circles by placing the compass point on the top intersection points.

![Final circles](image)

**Step 6**
Have the students chose 2, 3 or 4 colors to color in the pattern. We recommend using complementary colors.

![Colorful pattern](image)

Adapted from: http://www.classic-play.com/art-school-geometric-design-with-islamic-art/.
Activity 2: Four-Fold Octagram Design

Step 1
Have the students use a compass and straight edge to create an underlying grid or use the attached template (see diagram 1).

Step 2
Using a ruler and a pencil, connect the points between the intersection of the diagonal lines and the circle and the left and right center point (see diagram 2); this will create overlapping < and > shapes and a central diamond.

Step 3
Connect the same four intersection points with the top and bottom center points (see diagram 3); this will create overlapping \( \vee \) and \( \wedge \) shapes and the central shape of an eight-pointed star.

Step 4
Using a pen, pick out the overlying pattern (see diagram 4).

Step 5
Using a pen, pick out the overlying pattern (see diagram 5).

Step 6 (optional)
Erase the undergrid pencil marks (see diagram 6).

Step 7
For an added challenge, ask the students to predict what will happen when the pattern is tessellated. What patterns will emerge. You can use the attached 3x3 template to find out.
Activity 3: Paper Shadow Boxes

Step 1
Create two folds using the chosen template created by artist Mary Gaynier.

Step 2
Once the paper is folded into sections, cut your chosen design and add the hole punch pattern of your choosing.

Step 3
Once the paper is cut, assemble into your chosen size of shadow box using a glue stick.

Step 4 (optional)
For an added challenge: After completing Shadow Boxes, students can use flashlights and a wall projector to explore Light and Shadow with their creations.
Activity 2: Four-Fold Octagram Design
Activity 2: Four-Fold Octagram Design
Activity 3: Paper Shadow Boxes

1st fold

2nd fold

3rd fold

Source: Mary Gaynier (local artist)
Activity 3: Paper Shadow Boxes

Source: Mary Gaynier (local artist)