

Going Geometric: Math in Pattern and Design



- Grade level 7th, 8th grades
- Subject area/s Math, Visual Art
- GPS/Common Core Standards
 - **Mathematics Georgia Performance Standards**
MMIP4.
MMIG3.
 - **Georgia Performance Standards for Visual Arts**
VA7CU.2
VA8CU.1
- Objective
 - The student will create a tessellated pattern using repeating geometric shapes.
 - The student will understand the significance of geometric patterns in works of art, particularly from the Middle East
- Materials
 - ✓ Geometric shapes (blocks or paper cutouts)
 - ✓ Visual examples of geometric patterns in art – online or on paper
 - ✓ Graph paper
 - ✓ Pencils
 - ✓ Rulers
 - ✓ Materials for tessellations (teacher’s choice)
 - ✓ Handout (optional)
- Instructions
 - Have students experiment with the concept of shapes and tessellation. Have students work with patterned blocks or cutout shapes, if possible. Afterwards discuss which shapes will tessellate (like squares, hexagons) and ones that don’t (circles).
 - Show examples of geometric designs in Islamic patterns (particularly tile and some wood carving) that range from simple to complex. [See the resources section for suggestions.] Use the handout, below, if desired.
 - Discuss the significance of the use of geometry in Islamic artwork as well as typical styles of decoration. (Simply put, early Islamic craftsmen considered geometry and mathematics to be complex and infinite, and therefore a reflection of the divine. Employing these types of patterns would both be a reflection of, and a way to honor, God.)
 - As a group, discuss similar tendencies students notice in the examples. (Note that the shapes tend to have decoration inside as well as creating an overall pattern.)

- Based on the visual information they've seen, have students create their own tessellating patterns, with materials of your choice. They could be as complex as clay/ceramic or as simple as drawings or paper collage.
 - Encourage students to plan out their patterns with graph paper before beginning their final composition.
 - Ask students to explain their artwork, what it would adorn, and why they decorated it the way they did.
 - Put the artwork on display.

- Evaluation Ask students to identify the shapes they have used and why they tessellate. See also Extensions.

- Accommodations
 - Assist students who may need physical help by providing pre-cut materials or prepared materials
 - For visually impaired students, provide 3D shapes or blocks

- Extensions
 - For a more in-depth geometric study, ask students to further examine their finished pieces – determining the angles or surface area of particular shapes. Or have them determine how many of each shape they would need to cover a certain area or larger object.
 - Use these tessellated patterns to adorn a real object – a box, a notebook, or even a school hallway

- Resources

<http://www.discoverislamicart.org/exhibitions/ISL/geometric/?lng=en>
 [The Museum With No Frontiers (MWNF) is a totally online museum with a database of thousands of images and information. This exhibition focuses on geometry in Islamic art.]

<http://www.vam.ac.uk/content/articles/t/teachers-resource-maths-and-islamic-art-and-design/> [The V&A offers a wealth of information regarding Islamic art and geometric patterns. There are numerous illustrated examples of mathematical concepts as well as corresponding artwork and even printable templates of shapes and patterns.]

PATTERNS IN PRACTICE

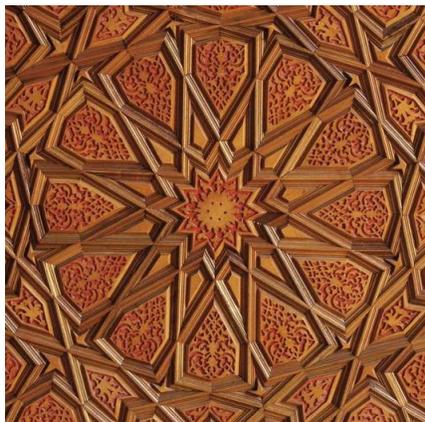
We see patterns every day. **Tessellations** are planes that are covered (or tiled) with shapes without gaps or overlaps. You can find them all around—think of soccer balls or bathroom tiles.

Islamic art is especially full of geometric patterns. Not only did Muslims scholars develop complex mathematical concepts, but creating beautiful patterns was thought to glorify God (like Him, they are both infinite and beautiful).

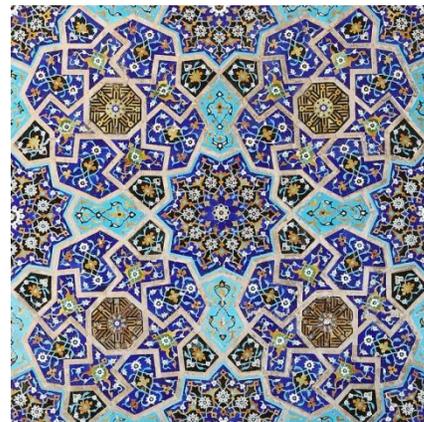
Some are fairly simple, using common shapes. Others are more complicated, with irregular shapes that we don't have names for.



Tiles, fritware with lustre decoration, Kashan, Iran, 13th-14th century, Museum no. 1074-1875 © Victoria & Albert



Wooden minbar, Fatih Cami, Istanbul, Turkey, c. 1771.



Tiles, Jameh Masjid, Isfahan, Iran, 16th-17th century, Thomas Detangase, Flickr.

YOUR TASK

Explore the idea of geometric patterns in art. Many examples of Islamic art and architecture are decorated with geometric patterns. Once you've explored them, create your own.

- ◆ Decide what object your pattern would adorn.
- ◆ What is the significance of your pattern? Choose a design that is meaningful to you.
- ◆ Make detailed plans – use graph paper (or computer software), sketch, make calculations.
- ◆ Once your teacher has approved your design, create your pattern. This could be done in a variety of media – see what your options are.



Table, ebonized wood and ivory, Damascus, Syria, late 19th c. Gift of Drs. Joseph and Omayma Touma, Huntington Museum of Art.

TAKE IT FURTHER

- ◆ Use your pattern to actually decorate a real object - from the cover of your notebook to a box or maybe even a table!
- ◆ As a class, design a tessellated pattern to decorate a wall of the room or stretch of hallway. Each person can create his/her own design within their tile/s.