

ACTIVITY: ISLAMIC MOSAICS

Materials

- Printed template(s)
- Compass or 'bull's eye'
- Straight edge
- Colour pencils

Skills

Motor

- Drawing a circle with a compass
- Tracing a straight line

Affective/metacognitive

- Persevering
- Focusing on a task
- Adapting
- Problem solving

Cognitive

- Seeing angles
- Focusing on parts of a drawing
- Seeing symmetries
- Matching orientation
- Recognising similarity/congruence
- Estimating short distances
- Making aesthetic choices

Outcomes (Nova Scotia Curriculum)

Grade 4-6 Visual Art

Outcome 1: Students will explore the creative process, individually and collaboratively, using a range of materials and technologies, to create with respect and sensitivity a variety of artworks that express feelings, ideas, and understandings

Indicators:

- Create artworks with emphasis on [the elements and principles of design](#)
- Create artworks for a variety of purposes, recognizing influences from personal, social, cultural, community, physical environment(s)
- Use variety of materials, technologies, and tools to create art in many forms, referencing examples from diverse cultures for inspiration

Outcome 2: Students will talk about art using their own words, incorporating vocabulary from the language of art to examine a range of past and contemporary artworks and aesthetic conventions from diverse cultures and communities, including Acadians, African Nova Scotians, Gaels, and Mi'kmaq, with respect and sensitivity

Indicators:

- Examine and discuss the elements and principles of design in artworks from various cultures
- Describe some of the diverse range of designs in the natural and human-made environments to find and identify the elements and principles of design e.g. beadwork design
- Explore and describe the function and purpose of art across a variety of cultures, including personal artwork
- Examine art images throughout history and from various cultures to compare how artists create art to communicate ideas, feelings, and understandings

Grade 5 Mathematics

SCO PR01 Students will be expected to determine the pattern rule to make predictions about subsequent terms

Performance Indicators

- PR01.01** Extend a given increasing or decreasing pattern, with and without concrete materials, and explain how each term differs from the preceding one
- PR01.02** Describe, orally or in written form, a given pattern using mathematical language such as **one more**, **one less**, or **five more**
- PR01.03** Write a mathematical expression to represent a given pattern, such as $r + 1$, $r - 1$, $r + 5$

Grade 6 Mathematics

SCO G04 Students will be expected to perform a combination of successive transformations of 2-D shapes to create a design and identify and describe the transformations

Performance Indicators

- G04.01** Analyze a given design created by transforming one or more 2-D shapes, and identify the original shape and the transformations used to create the design
- G04.02** Create a design using one or more 2-D shapes and describe the transformations used
- G04.03** Describe why a shape may or may not tessellate
- G04.04** Create a tessellation and describe how tessellations are used in the real world

Essential Graduation Competencies

COMMUNICATION (Com)

- listen and interact purposefully and respectfully in a variety of contexts
- express ideas, information, learnings, feelings and perspectives through various media, considering purpose and audience
- engage in constructive and critical dialogue

CREATIVITY AND INNOVATION (CI)

- gather information through senses to imagine, create, and innovate
- develop and apply creative abilities to communicate ideas, perceptions, and feelings
- take responsible risk and accept constructive critical feedback
- reflect and learn from trial and error

CRITICAL THINKING (CT):

- demonstrate curiosity, inquisitiveness, creativity, flexibility, and persistence

TECHNOLOGICAL FLUENCY (TF)

- recognize technology encompasses a range of learning tools and contexts
- apply technology effectively and productively
- begin to consider how technology and society impact and advance one another

Big Idea

Islamic art is non-figurative. It only uses geometric shapes and scripts to make intricate motifs. It is found in drawings, paintings, fabric (especially rugs), ceramics, metalwork and architecture. In some cases, such as architecture, the designs make elaborate use of light and shadow on the interior of buildings. It often, but does always, tessellate. Traditionally, it is generated with two common tools: a compass and a straight edge (a ruler without measurement markings).

Activity

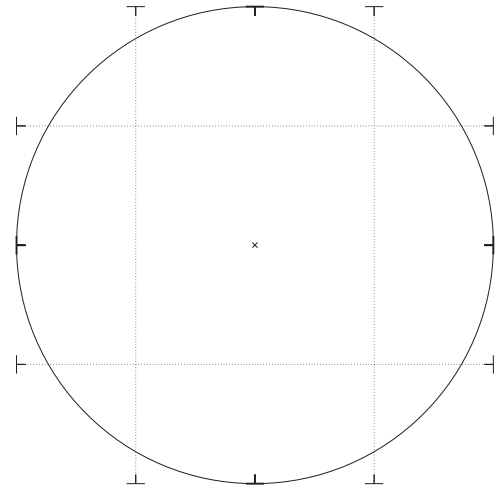
The activity here introduces students to the two tools of this kind of making.

Activity 1: the straight edge

Use template A.

Using a ruler, line up the T marks that are across from one another, either horizontally or vertically and make a point where the ruler crosses the circle.

You will end up with this:



Number the marks on the outside of the circle. This isn't essential but students may find it helpful. The numbering poses an interesting decision. Should you start at 0 or 1? Maybe you want to start at 12 and mimic the hands of a clock. The numbering may not affect the final result but may change the algorithm. You may want to choose for the class.

Now comes the experimenting. Invite the students to draw from point to point. They can make good point to point lines (like connect the dots). What shape do they get? They can skip points, go by threes, fours, fives around the circle again and again. Invite students to see that they can also pick a number pattern in advance (e.g. 1, 2, 4, 8).

They can also draw lines to the centre and out.

Students can do more than one pattern on the circle and add complexity each time. If they do, suggest that they use different colours for each pattern. This will make it easier to keep track of and easier to compare patterns.

They will generate both simple and complex shapes that can be identified but the continual crossing of shapes will generate new polygons that can be identified and sorted.

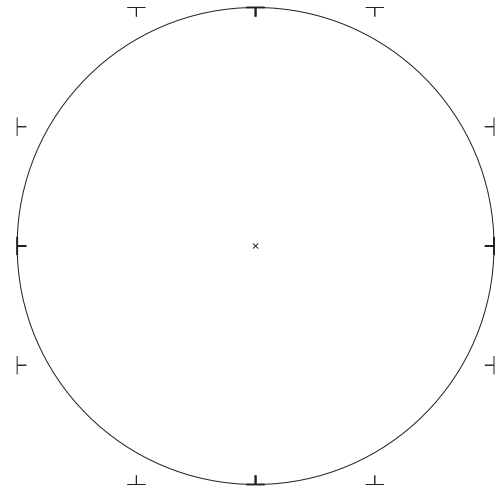
Students can write down the number patterns they use to create a specific shape so that others can create it or so that they can recreate it- an algorithm. If there patterns are colour coded, they can keep track of designs they like and reproduce them.

At some point, they can colour in the different shapes, physically lay their work next to others and make even more complex designs.

Activity 2: the straight edge and the compass

Use template B

Using a compass, find the radius of a circle. Students go from the centre of the circle to the edge (marked with small t shapes). Students can do this but will need practice to ensure that the one end of the compass is in the centre of the circle. This takes some practice and some students find it easier to work with a partner to make the circle- one to hold the pencil in the centre, the other to draw the circle.



When this is done the circle will touch four of the T junctions.

However, if it does not, the activity can still work.

Again using the T marks as guidelines, students use a straight edge to line up each T mark with the centre of the circle and make a small mark at each point on the perimeter of the circle where the ruler crosses the circle. Students might just end up with a smaller (or larger) circle.

Now you are at the same point you were at in the previous activity and continue in the same way.

Questions/Discussion/Analysis/Making with Rigour

Add more points.

The simplest way to add complexity to the designs is to add to the number of points around the grid. You can invite students to problem solve how to add more points to the circle.

Using the more elaborate grid, many more points are possible around the circle and thus many more combinations and designs are possible.

Using tracing paper

In this extension, students can trace some of the designs and shapes they find most appealing. This allows for further conversation about polygons and symmetry.

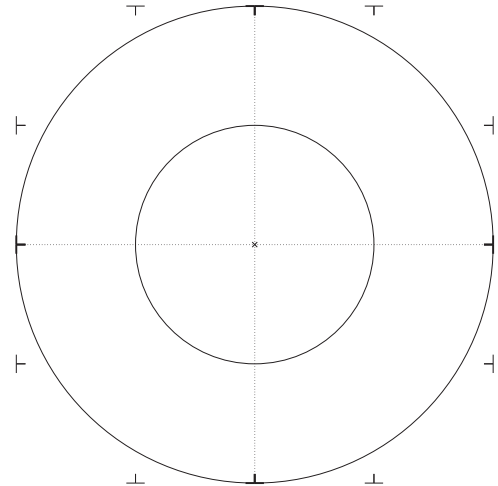
Interlocking circles that generate points.

Islamic art actually generates the points that are used to line things up with concentric circles. This is well described in the resource list below.

Use template C. If students use a straight edge, they can make marks on the inner circle at four points from the midpoint of the whole drawing to the T marks on the outer circle.

These marks can become the centres of four more circles that go from a T mark to the centre of the whole circle.

Students will end up with five circles altogether. There are many new possibilities for drawing here. Again, students can use the points where the circles intersect (cross) with each other to make new points- and these points can make new lines and new shapes.



Investigate Islamic art in a research project

- <http://scruss.com/blog/2016/07/21/nerrrdy-bourgoin-mini-zine/> (a small pdf file with pre-made templates. Good for ideas and good for those who just want and need to colour templates)
- http://www.metmuseum.org/-/media/Files/Learn/For%20Educators/Publications%20for%20Educators/Islamic_Art_and_Geometric_Design.pdf (an exceptional resource that for download with many templates and activities that are accessible for most students in upper elementary and beyond. These activities point you in directions that go much further)
- <http://www.vam.ac.uk/content/articles/t/teachers-resource-maths-and-islamic-art-and-design/> (another excellent with templates and activities and information for teachers to use)
- <https://www.youtube.com/watch?v=pg1NpMmPv48> (a TED-ED education talk about Islamic design suitable for schools. It shows excellent examples of Islamic art and design. It ends up with a demonstration of how to use compass and ruler to make Islamic art designs from scratch)
- Want to go really far? Go to Eric Broug's website, who has done much to make this form of design accessible to many. There are links to books, online courses and he has his own youtube channel and Facebook page. <http://www.broug.com>
- <https://www.khanacademy.org/humanities/art-islam/beginners-guide-islamic/a/arts-of-the-islamic-world> (for student research)
- <https://www.youtube.com/watch?v=t-n03ano-Ak> (how Islamic tiles are manufactured)