Saffron Threads

Grades 4 to 6 | Mathematics and Arts Education

Activity Plan: Finding the Math in Art

SOUTH ASIAN CANADIAN LEGACY PROJECT

SOUTH ASIAN STUDIES INSTITUTE
University *of the* Fraser Valley

UNIVERSITY OF THE FRASER VALLEY

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Overview

Big question

How does math help me understand and connect with different art forms?

Activity description

Students will explore geometric and art elements and examine them within different art forms before creating their own artwork.

Grades and curricular area(s)

- Grades 4 to 6
- Mathematics and Arts Education

Big Ideas

	Arts Education	Mathematics
Grade 4	Exploring works of art exposes us to diverse values, knowledge, and perspectives.	Polygons are closed shapes with similar attributes that can be described, measured, and compared.
Grade 5	Works of art influence and are influenced by the world around us.	Closed shapes have area and perimeter that can be described, measured, and compared.
Grade 6	Experiencing art is a means to develop empathy for others' perspectives and experiences.	Properties of objects and shapes can be described, measured, and compared using volume, area, perimeter, and angles.

Curricular Competencies

	Arts Education	Mathematics
Grade 4	Interpret and communicate ideas using symbolism to express meaning through the arts	Use reasoning to explore and make connections
	Choose artistic elements, processes, materials, movements, technologies, tools, techniques, and environments using combinations and selections for specific purposes in art making	Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
	Develop and refine ideas, processes, and technical skills in a variety of art forms to improve the quality of artistic creations	Communicate mathematical thinking in many ways

Grade 5	Interpret and communicate ideas using symbols and elements to express meaning through the arts	Model mathematics in contextualized experiences
	Intentionally select artistic elements, processes, materials, movements, technologies, tools, techniques, and environments to express meaning in their work	Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
	Develop and refine ideas, processes, and technical skills in a variety of art forms to improve the quality of artistic creations	Communicate mathematical thinking in many ways
Grade 6	Interpret and communicate ideas using symbols and elements to express meaning through the arts	Model mathematics in contextualized experiences
	Intentionally select, apply, combine, and arrange artistic elements, processes, materials, movements, technologies, tools, techniques, and environments in art making	Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
	Develop and refine ideas, processes, and technical skills in a variety of art forms to improve the quality of artistic creations	Communicate mathematical thinking in many ways

Materials/Resources

- Video of Rangoli art, such as Beautiful Diya Rangoli #46
- Examples of Rangoli art (such as from Wikipedia)
- Printout or projection of Composition 8 by Wassily Kandinsky

Templates

- Defining Lines worksheet
- Line Up worksheet
- Parallel Segments worksheet

Kick Off and Connect

Step 1

Share a video of Rangoli art being created. Pause when the art is complete, and ask students to look at the art and share their responses to these questions with the class:

- What do they see?
- Where do they think the art originated from?
- Do they notice anything interesting about the art (e.g., patterns)?

Explain to students that Rangoli is a cultural art form originating in India. Have students brainstorm questions about Rangoli, which may include what it is used for, how it's created, and so on.

Step 2

Have students partner up (or form small groups) and spend some time researching Rangoli art. Each partnership/group should report back on one of their questions and what they learned.

Step 3

Provide images of paintings by Wassily Kandinsky (Russian abstract artist) and the example of Rangoli art (from Step 1). Have students study the images individually before dividing into small groups to answer the following questions:

- What do you see when you look at Kandinsky's painting and the Rangoli art?
- Why do you think this style of art is called abstract?
- Why do you think some people say that mathematics influenced abstract art?
- What is one question you still have?

Step 4

Explain that both abstract art (like Kandinsky's) and Rangoli art use rays, line segments and lines to form the design. Divide students into groups and have them complete the Defining Lines worksheet.

Step 5

Review the Defining Lines worksheet answers/definitions as a class:

- A line is a set of points that extends forever in two directions. Two points define a specific line, such as *line MN* on your worksheet.
- Sometimes, rather than using two points to name a line, lines are named using a single letter, such as *line q* on your worksheet.
- A *ray* is a part of a line that has a fixed starting point and extends forever in the other direction, such as *ray AB* on your worksheet.
- A *line segment* or (just *segment*) is a part of a line that has two fixed endpoints, such as *segment GH* on your worksheet.

Explore and Engage

Step 1

Have students create small drawings made up of lines, rays and line segments. Each drawing should have at least one example of each. Have students exchange drawings and label the elements. After they have finished, they can discuss and check their accuracy.

Step 2

Hand out the Line Up worksheet and have students complete it individually. After they've completed the worksheet, form students into small groups to compare answers and check their understanding.
Then discuss the activity as a whole class, with questions such as:

- Why did you choose to match …… text with …… picture?
- How did you know that your picture is an example of an expressive line?
- Why would this picture not be an example of that text?

ANSWER KEY: Line=ocean; Vertical line=forest; Expressive lines=mandala (flower); Diagonal lines=lightning storm; Constructive or directional lines=line pattern

Step 3

Begin a Think-Pair-Share discussion, where students will first think about the questions individually (for a few minutes), then pair up with a classmate to finalize answers before sharing with the class. In pairs, have them answer the following questions:

- Where do you see a point, line, line segment, and slash or ray in Kandinsky's painting *Composition VIII* and Rangoli art?
- For those elements that you could not find, how would Kandinsky's work and the Rangoli art need to be changed in order for you to see them?
- How do you think that would affect the overall impact of the work?

Step 4

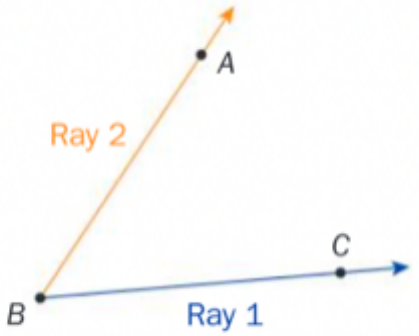
Explain parallel lines/segments to the class: Parallel lines are lines that never meet. Two lines are parallel if they never intersect each other at any point. Parallel lines are indicated using the notation "II."
Ask students to look around the room. What parallel lines do they see?
Have students form parallel lines by lining up. What makes them parallel? How do they know?

Step 5

Have students complete the Parallel Segments worksheet.

Step 6

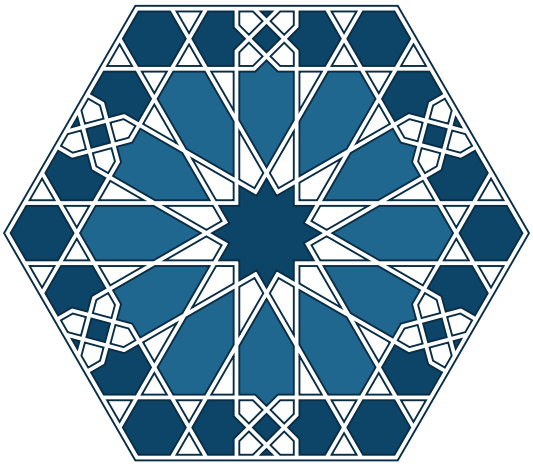
Explain angles to the class: Two *rays* with a common endpoint form what is called an *angle*. The rays are the sides or arms of the *angle* in the middle. For example, this angle could be called *angle ABC* or *angle CBA.* Because there can be no confusion with other angles, this angle could also be called angle *B*. Angles can be classified as *acute*, *obtuse*, *right* or *straight.*

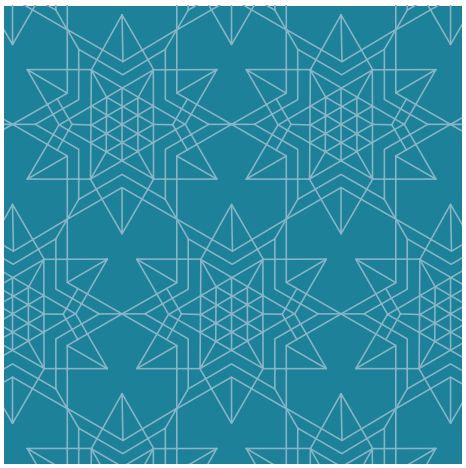


Step 7

Discuss in pairs:

- In the Rangoli designs, identify examples of acute, obtuse and straight angles.
- How do you think the use of angles improved the design? What do the angles contribute to the overall design?
- Do acute angles and obtuse angles serve different purposes in the artwork? Explain.





Wrap Up and Assess

Wrap-up

Step 1

To wrap up the lesson, students will create their own work of art that includes the elements that they learned and practised in this unit. They may express their learning in the form of a painting, drawing, sculpture, mosaic or any other type of art.
Students will make a draft sketch or blueprint that will demonstrate the required mathematics, and a final product that will be the art piece or a full-colour image – for example, a painting or mosaic.

The following elements must be clearly indicated in the draft and listed on a separate sheet of paper, including proper mathematical names; they must also be visible in the final products, but without the labels:

- Two rays
- Two segments
- Two lines, not including the ones that are parallel
- Two sets of parallel lines
- Two acute angles, not including the ones in triangles
- Two obtuse angles, not including the ones in triangles
- Two right angles

The final product must have a title and a brief written description of what the artwork represents. In the description, students must explain how at least three of the geometric elements relate to what is being represented in the artwork.

Step 2

Have students complete a gallery walk of all the final projects, using Two Stars and a Wish – writing two stars (things they like) and a wish (what could be improved) on sticky notes for three of the projects.

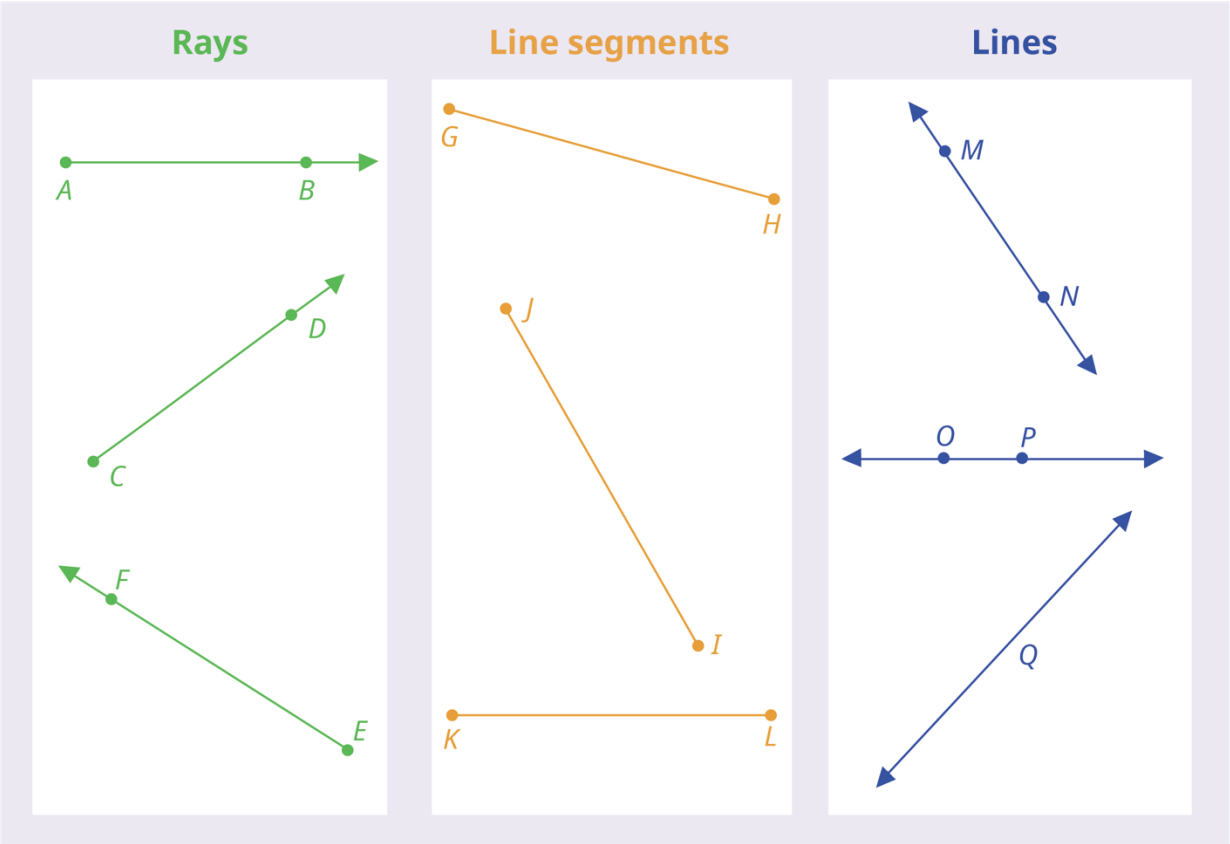
Assessment

Formative: Students can be assessed on their knowledge of the mathematical concepts on each of the worksheets. You may choose to include a reflection after each assignment to further align with the competencies.
Summative: Co-create a rubric with the class to evaluate their final project. This may include things like “including all of the required elements” but should also link to the competencies.

Extend and Transform

- Research other South Asian art forms. What math do you see in other art?
- Students who need extra support may focus on simpler shapes, like triangles, squares or rectangles. This could also be done to adapt this activity for lower grades.
- Extend the activity to look more at triangles and their angles. Find and measure angles around the classroom.
- Create a Rangoli colouring sheet to do with buddies in a younger grade or with elderly members of the community. Students can explain how it was created and what they have learned about Rangoli art.
- To simplify the designs, students may create smaller designs and/or use dot templates and rulers. The larger the pattern gets, the more complex it will be.

Defining Lines

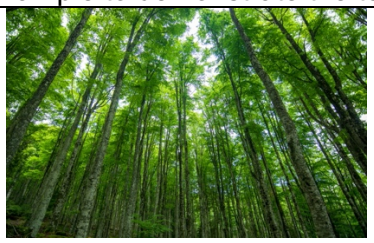
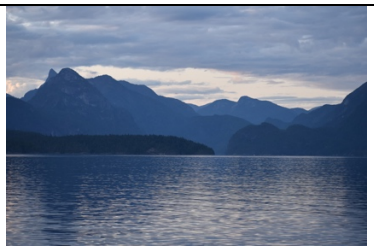
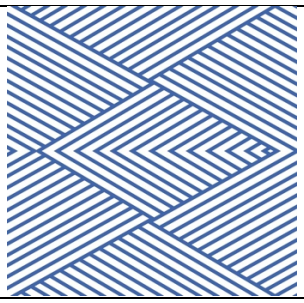
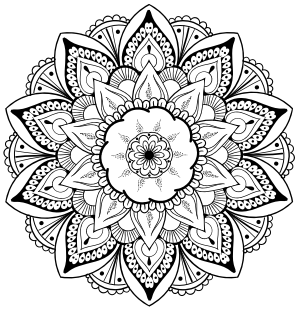


Discuss in small groups and use papers and markers to write the definitions.

1. What are the similarities between rays, line segments and lines?
2. What are the differences between them?
3. Based on your observations, write a definition of:
   A. a ray
   B. a line segment
   C. a line

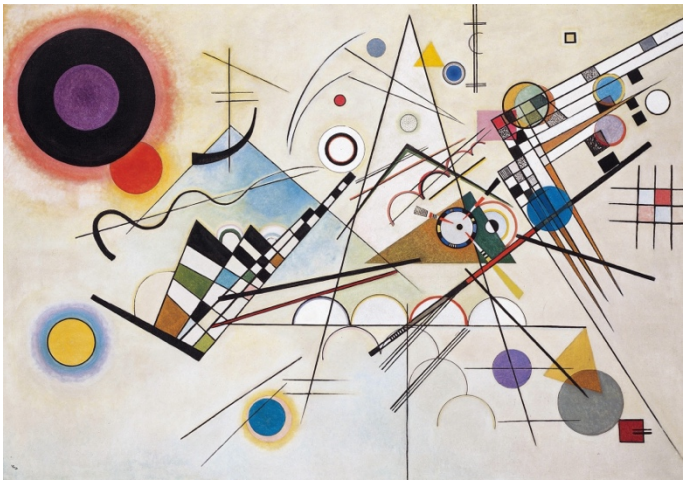
Name: _____

Line Up

Read the text carefully and draw lines to match the picture with the text. In the last column, draw an example to demonstrate the text.		
A **line** is a path that a point takes through space. Lines can be thick, thin, dotted or solid. They can make straight movements, zigzags, waves or curls. They may be horizontal, vertical or diagonal.		
Vertical lines seem to be reaching, so they may seem inspirational, like tall, majestic trees or church steeples.		
Lines can convey emotion as well. They may show excitement, anger, calmness, tension, happiness and many other feelings. Because of this, some lines are said to be expressive. **Expressive lines** tend to be found in nature and are very organic.		
Diagonal lines tend to be disturbing. They suggest decay or chaos, like lightning or falling trees		
Lines that are very measured, geometric, directional and angular are called **constructive or directional lines.** They tend to appear to be manmade because of their precision.		

Name: _____

Parallel Segments



Wassily Kandinsky, *Composition VIII, 1923*

Rangoli art

1. In Kandinsky's *Composition VIII* and the Rangoli art shown above, there are many pairs of parallel segments. Find as many pairs of parallel segments as you can.

   Number of pairs in the Kandinsky painting (left):

   Number of pairs in the Rangoli art (right):

2. How can you tell if they are parallel?

3. Describe how the distance between two lines can be used to determine whether or not they are parallel.

4. Can lines be described as parallel just because they look parallel? Explain.

Research parallel lines and the symbol mathematicians use to indicate lines that are parallel.