



# artsNOW

Integrated learning solutions

## A PERFECT SACRED CIRCLE Grade Band: 4-5 Content Focus: Visual Arts & Math



### LEARNING DESCRIPTION

In this lesson, students will use angles, geometric shapes and symmetry to analyze and create mandalas, an ancient type of visual art originating in India.

### LEARNING TARGETS

Essential Questions	"I Can" Statements
How is math used to create visual art? What are angles?	I can use a protractor to make angles. I can use line, shape, and color to create an interesting mandala design that demonstrates symmetry and pattern. I can explain how math can be used to create visual art.



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## GEORGIA STANDARDS

Curriculum Standards	Arts Standards
<p><b>Grade 4:</b> 4.GSR.7: Investigate the concepts of angles and angle measurement to estimate and measure angles.</p> <p>4.GSR.8: Identify and draw geometric objects, classify polygons based on properties, and solve problems involving area and perimeter of rectangular figures.</p> <p><b>Grade 5:</b> 5.GSR.8: Examine properties of polygons and rectangular prisms, classify polygons by their properties, and discover volume of right rectangular prisms.</p>	<p><b>Grade 4:</b> VA4.CR.1 Engage in the creative process to generate and visualize ideas by using subject matter and symbols to communicate meaning.</p> <p>VA4.CR.2 Create works of art based on selected themes.</p> <p>VA4.CR.3 Understand and apply media, techniques, processes, and concepts of two dimensional art.</p> <p>VA4.CN.2 Integrate information from other disciplines to enhance the understanding and production of works of art.</p> <p><b>Grade 5:</b> VA5.CR.1 Engage in the creative process to generate and visualize ideas by using subject matter and symbols to communicate meaning.</p> <p>VA5.CR.2 Create works of art based on selected themes.</p> <p>VA5.CR.3 Understand and apply media, techniques, processes, and concepts of two dimensional art.</p> <p>VA5.CN.2 Integrate information from other disciplines to enhance the understanding and production of works of art.</p>

## SOUTH CAROLINA STANDARDS

Curriculum Standards	Arts Standards
<p><b>Grade 4:</b> 4.G.1 Draw points, lines, line segments, rays, angles (i.e., right, acute, obtuse), and parallel and perpendicular lines. Identify these in two-dimensional figures.</p> <p>4.G.2 Classify quadrilaterals based on the presence or absence of parallel or perpendicular lines.</p>	<p><b>Anchor Standard 1:</b> I can use the elements and principles of art to create artwork.</p> <p><b>Anchor Standard 2:</b> I can use different materials, techniques, and processes to make art.</p>



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4.G.3 Recognize right triangles as a category, and identify right triangles.

4.G.4 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line symmetric figures and draw lines of symmetry.

**Anchor Standard 7:** I can relate visual arts ideas to other arts disciplines, content areas, and careers.

## KEY VOCABULARY

Content Vocabulary	Arts Vocabulary
<ul style="list-style-type: none"><li>● <u>Symmetry</u> - The quality of being made up of exactly similar parts facing each other or around an axis</li><li>● <u>Protractor</u> - An instrument for measuring angles, typically in the form of a flat semicircle marked with degrees along the curved edge</li><li>● <u>Geometric shapes</u> - Figures or forms that have a specific form and structure, defined by a set of points and lines</li><li>● <u>Angles</u> - A measure of the amount of turn or rotation between two intersecting lines, line segments, or rays</li></ul>	<ul style="list-style-type: none"><li>● <u>Mandala</u> - A geometric figure representing the universe in Hindu and Buddhist symbolism; the artform originated in India</li><li>● <u>Symmetrical balance</u> - The quality of being made up of exactly similar parts facing each other or around an axis</li><li>● <u>Analogous colors</u> - Colors that are next to each other on the color wheel</li><li>● <u>Complementary colors</u> - Two colors across from each other on the color wheel</li><li>● <u>Primary colors</u> - Colors from which all other colors are made: Red, yellow and blue</li><li>● <u>Secondary colors</u> - Colors made by combining two primary colors: Orange, violet and green</li><li>● <u>Neutral colors</u> - Brown, tan, black, gray and white</li></ul>

## MATERIALS

- Mandala examples
- Protractors
- Pencils and erasers
- Square paper



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- Rulers
- Colored pencils or markers
- Digital image of a [Color Wheel](#)

## INSTRUCTIONAL DESIGN

### Opening/Activating Strategy

*\*This strategy can be in partner and individual work.*

- Project an [image of Tibetan monks creating a sand mandala](#).
  - First, students will identify what they see in the image. Emphasize that they should make objective observations about the mandala.
  - Next, ask students to share their observations with a partner.
  - Project, write or say several mathematical terms such as geometric shapes, angles, fractions and symmetry. Ask students to now describe the image in these terms.
  - Next, ask students to share their observations with a partner.
- Facilitate a class-wide discussion around students' observations, inferences, and questions. Draw students' attention to how the artist uses line and shape to make the mandala (observations could include circles within circles, repeating designs, etc.).
- Explain to students that mandala art is an art form that dates back to 500 BCE in India.
- Tell students that they will be creating their own mandalas using mathematical concepts.

### Work Session

#### USING A PROTRACTOR TO CREATE A MANDALA

- Provide students with a blank sheet of paper. Teach students how to use a protractor including the degrees, and increments shown on it.
- Pass out a printed copy of a mandala to students (one per every two students).
  - With a partner, have students measure and label the angles that they see in the mandala.
  - Allow students to check their work by projecting a key on the board after students have finished labeling image.
- Tell students that they will practice using what they learned about using a protractor to create their own mandala.
- Pass out square paper to students.
- Demonstrate how to find the center by folding the paper into fourths.
- Tell students to use their rulers to draw a horizontal line through the center point of their paper. This will be the reference point for their angles.
  - Ask students what angle this makes—students should respond with  $180^\circ$ .
- Provide students with requirements for the angles that they should include in their mandalas, such as at least four  $45^\circ$  angles, 20  $1^\circ$  angles.

#### INCORPORATING PATTERN, SHAPE AND SYMMETRY:

- Once students have finished, return to the image of mandala. Ask students to describe the lines and shapes that they see. Students should notice the use of geometric shapes and that the lines and shapes create patterns.
- Ask students to describe how symmetry is used in the design.



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- Students should then fill their mandalas with lines and shapes to create patterns (this can be an additional set of requirements—types of polygons students should use to create patterns).
  - Remind students that their mandalas should demonstrate symmetry.

#### **ADDING COLOR:**

- Return to the image of the mandala one last time. Ask students to make observations about the colors.
- Show students an image of a [Color Wheel](#) and discuss types of color schemes: Complementary, analogous, primary, secondary and neutral.
- Students should then add color to their mandalas using colored pencils or markers.

#### **Closing/Reflection**

- Students should present their mandalas to a partner explaining how they used pattern, shape, and angles to create it.
- Conduct a gallery walk so that students can see how their classmates used math to create their artwork.
- Facilitate a discussion around the process of creating mandalas and how math is used in visual art.

## **ASSESSMENTS**

### **Formative**

Teachers will assess students by observing students' responses during mandala analysis and students' use of a protractor during the practice session.

### **Summative**

#### **CHECKLIST:**

- Students can use a protractor accurately to make angles.
- Students can use line, shape, and color to create an interesting mandala design that demonstrates symmetry and pattern.
- Students can explain how they used math to create their mandala.

## **DIFFERENTIATION**

#### **Acceleration:**

- Incorporate numerical patterns to generate designs for mandalas.
- Have students conduct an independent study on the history of mandalas focusing on how math is used in the design.
- Challenge students to use fractions to create concentric squares in their design.

#### **Remediation:**

- Allow students to create mandalas with a partner.
- Instead of having students draw their own angles for the mandala, provide a template of a mandala and have students measure and record the pre-drawn angles.



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## ADDITIONAL RESOURCES

- [History of the Mandala](#)
- [Image of Tibetan monks creating a sand mandala](#)
- [Color Wheel](#)

*\*This integrated lesson provides differentiated ideas and activities for educators that are aligned to a sampling of standards. Standards referenced at the time of publishing may differ based on each state's adoption of new standards.*

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