**Geometrical Design – Mandala & Symmetry**

5th Grade (60 min)

Math & Visual Art

**Math Objectives:**

Students will recognize symmetry in art and nature.

Students will review geometric shapes.

Students will use measurement tools to draw Mandalas with radial symmetry.

**Visual Art Objectives:**

Students will apply concepts of symmetry to create a radial design.

Students will use measurement tools to complete their design.

Students will incorporate contrasting colors to make their designs vivid.

Students will design a pattern and repeat it several times.

**Standards/Benchmarks**

**VISUAL ART (National Visual Arts Standards)**

Anchor Standard #2. Organize and develop artistic ideas and work.

Anchor Standard # 3. Refine and complete artistic work.

Anchor Standard # 9. Apply criteria to evaluate artistic work.

**MATH (Common Core Math Standards)**

CCSS.MATH.CONTENT.5.MD.B.2 Represent and interpret data

CCSS.MATH.CONTENT.5.G.B.4 Graph points on a coordinate plane to solve real-world and mathematical problems

**Vocabulary:** symmetry, radial symmetry, circle, equal, organic shape, geometric shapes, complimentary colors

**ANTICIPATORY SET** (10 min)

TTW show students works of art that have radial symmetry (George Dunbar, Frank Stella, mandalas, rose windows) along with examples of symmetry in nature (butterflies, leaves, flowers, snowflakes). Lead a discussion with the following questions:

* What do you notice about these things?
* What do they have in common?
* What shapes can you identify?
* Why do you think the artists were interested in symmetry?
* What are some other examples of symmetry in nature?

**GROUP PRACTICE** (10 min)

Project a digital image of a mandala and hand out a printed version to groups of students.

Explain that the word mandala comes from the classical Indian language, Sanskrit. Loosely translated, the word means circle, but a mandala has symbolic meaning as well. The shape of a mandala is circular and has a pattern. Similar designs are seen in cultures in India and Tibet as well as Native American and Early Christian art.

Circles may represent celestial bodies, the whole universe, inclusiveness, or a group of friends or family. Nature is an inspiration for mandalas. Remind students of examples of symmetry in nature.

Dissect the mandala. Look for shapes and patterns. Ask students to work in small groups to see how many different shapes they can find.

**INDIVIDUAL PRACTICE** (30 min)

Students will individually design and color a mandala. See below for suggestions to simplify or extend the lesson.

**PROCEDURES**

1. Each student should have a square piece of paper (8” x 8”), a pencil, a compass, and a ruler.
2. Find the middle of the paper by measuring and marking on the horizontal and vertical axis. Mark with a light pencil mark.
3. Place the compass on the mark and use it to draw a large circle on the white paper with a pencil.
4. Use the compass to draw two smaller circles within the bigger circle with a pencil.
5. Fold the paper in half and then in half again so that you have a small square.
6. Fold the small square of paper diagonally in half.
7. Unfold the paper and use a ruler to draw over the folded lines vertically, horizontally and diagonally through the circle. This will result in 8 equal “pie” pieces.
8. Draw a design in each segment of one pie piece using organic and geometric shapes.
9. Repeat the same pattern in each of the remaining 7 pie shapes.
10. Use a black marker to outline the pencil drawing.
11. Use pastels, markers, or colored pencils to color in the design. Make sure to use complimentary colors in at least one circular section. (Students may need a mini-lesson on complimentary colors).
12. Cut out the finished mandala and glue it to a black, square piece of paper.

**CLOSURE** (10 min)

Ask students to find a partner and dissect each other’s design. Look for the following: radial design, at least 3 circles, contrasting colors. Ask for 3 - 4 student volunteers to give short reviews of a partner’s mandala.

**MATERIALS**

Images of art from NOMA

Images of symmetry in nature (butterflies, snowflakes, leaves, etc)

Printed examples of mandalas

Black paper cut in 12” squares

White paper cut in 12” squares

Pencils

Compasses (or circle templates)

Rulers

Protractors

White glue

Markers, colored pencils, or pastels

**ASSESSMENT**

Use a rubric or checklist to assess for the following:

Did the student use radial symmetry?

Did the student successfully use the tools of measurement provided?

Did the student include contrasting colors?

Did the student participate in class discussion?

Did the student complete the project?

**ACCOMODATIONS and LESSON EXTENSIONS**

1. Prepare a handout ahead of time with circles already drawn.
2. Cut templates of circles in three different sizes. Place a hole in the center of each to assist students in lining up the centers.
3. Cut templates of other shapes for inclusion in the design.
4. Use only a ruler and plot dots to draw circles.
5. Create the design on black paper and after completing the drawing, outline the lines in glue. When the glue dries, it will provide a textured surface. Use oil pastels to provide vivid colors.
6. Display all mandalas from the class in a class quilt on a bulletin board or large piece of paper.