Exploring Proportions: The Mathematics of Leonardo da Vinci's Art

Subject: Mathematics
Grade Level: Middle School
Duration: 2-3 class periods (40-60 minutes each)
Standards: MA.6.AR.3.1, MA.7.AR.3.2, MA.7.GR.1.3

Mathematics:

- MA.6.AR.3.1: Given a real-world context, write and interpret ratios to show the relative sizes of two quantities using appropriate notation: a to b, or a:b where b is 0.
- MA.7.AR.3.2: Apply previous understanding of ratios to solve real-world problems involving proportions.
- MA.7.GR.1.3: Explore the proportional relationship between circumferences and diameters of circles. Apply a formula for the circumference of a circle to solve mathematical and real-world problems.

Objectives

- Students will explore the concept of proportions and how they are used in art and real life.
- Students will analyze the use of proportions in Leonardo da Vinci's works, specifically "The Vitruvian Man".
- Students will create their own art piece using learned proportions and mathematical principles.

Materials

- Copies of Leonardo da Vinci's "The Vitruvian Man"

- Rulers and compasses
- Graph paper
- Art supplies (pencils, erasers, colored pencils)
- Calculators

Day 1: Introduction

Begin with a brief discussion about Leonardo da Vinci, emphasizing his role as both an artist and a scientist. Introduce the concept of proportions and how da Vinci used them to bring balance and beauty to his art.

Activity 1: Exploring "The Vitruvian Man" (40 minutes):
- Hand out copies of "The Vitruvian Man" and discuss its significance, focusing on the use of proportions.
- Divide students into small groups and provide them with rulers and calculators.
- Ask students to measure various parts of the body in the drawing and calculate the ratios between different body parts, discussing the concept of the golden ratio.
- Facilitate a discussion on how these proportions relate to the human body and the concept of symmetry in nature.

Activity 2: Creating Proportional Art (60 minutes):
- Have students use graph paper to create a simple outline of a human figure or another subject of their choice.
- Instruct students to apply the proportions they learned from "The Vitruvian Man" to their own drawings.
- Encourage creativity in how they apply these proportions, allowing for individual expression.

- Once the outlines are complete, students can refine their art with pencils and colored pencils.

Conclusion and Reflection (15 minutes):
- Host a gallery walk where students display their art and explain how they applied mathematical proportions.
- Discuss how understanding proportions can improve not only art but also perception and representation of the world around us.
- Reflect on how interdisciplinary learning between mathematics and art can enhance both subjects.

Assessment

- Participation in discussions and activities.
- Completion of the proportional art piece, with a short-written explanation of the mathematical concepts applied.

Extension Activity

- Explore other artists who used mathematics in their work.
- Research and present on different cultures' use of proportions in art and architecture.
- Students create proportion/ratio questions for their classmates to answer. For example: Richmond Middle School employs teachers to number of children in the ratio 1:23. If the school has 900 children, how many teachers does it need?