

**Title:** Exploring Math Through *Opening Violet and Green*

**Teacher-in-Residence:** Andrea Sisk

**Grades:** 7–12

**Subject:** Math

**Goals:**

- Students will make mathematical connections with the painting *Opening Violet and Green*.
- Students will create an artwork that can be duplicated using math.
- Students will use mathematical vocabulary to communicate with a partner effectively.

**Objectives:**

- Students will be able to analyze the painting *Opening Violet and Green* both artistically and mathematically.
- Using equations and mathematical ideas, students will be able to create a work of art.
- Students will be able to write mathematical directions so that a partner can recreate their original work.

**Standards:**

**PA Standards:**

- [Math CC.2.3.7.A.2](#)
- [Math CC.2.3.7.A.1](#)
- [Math CC.2.2.7.B.3](#)
- [Math CC.2.3.8.A.2](#)
- [Math CC.2.2.HS.C.2](#)
- [Math CC.2.2.HS.C.3](#)
- [Math CC.2.2.HS.C.4](#)
- [Math CC.2.2.HS.D.7](#)
- [Math CC.2.2.HS.D.10](#)
- [Math CC.2.3.HS.A.10](#)
- [Math CC.2.3.HS.A.1](#)
- [Math CC.2.3.HS.A.2](#)
- [Math CC.2.3.HS.A.5](#)
- [Math CC.2.3.HS.A.9](#)
- [Math CC.2.3.HS.A.11](#)
- [Arts & Humanities 9.1.8.B.](#)
- [Arts & Humanities 9.2.8.H.](#)

**Common Core Standards:**

- [CCSS.MATH.CONTENT.7.G.A.2](#)
- [CCSS.MATH.CONTENT.7.G.B.4](#)
- [CCSS.MATH.CONTENT.7.G.B.5](#)

- [CCSS.MATH.CONTENT.7.G.B.6](#)
- [CCSS.MATH.CONTENT.8.EE.C.8.B](#)
- [CCSS.MATH.CONTENT.8.F.A.3](#)
- [CCSS.MATH.CONTENT.8.F.B.4](#)
- [CCSS.MATH.CONTENT.8.F.B.5](#)
- [CCSS.MATH.CONTENT.8.G.A.1](#)
- [CCSS.MATH.CONTENT.8.G.A.2](#)
- [CCSS.MATH.CONTENT.8.G.A.3](#)
- [CCSS.MATH.CONTENT.8.G.A.4](#)
- [CCSS.MATH.CONTENT.8.G.A.5](#)
- [CCSS.MATH.CONTENT.HSA.CED.A.2](#)
- [CCSS.MATH.CONTENT.HSA.CED.A.3](#)
- [CCSS.MATH.CONTENT.HSA.REI.D.10](#)
- [CCSS.MATH.CONTENT.HSF.LE.A.2](#)
- [CCSS.MATH.CONTENT.HSF.LE.A.3](#)
- [CCSS.MATH.CONTENT.HSF.LE.B.5](#)
- [CCSS.MATH.CONTENT.HSF.IF.C.7.A](#)
- [CCSS.MATH.CONTENT.HSF.IF.C.7.B](#)
- [CCSS.MATH.CONTENT.HSF.IF.C.7.C](#)
- [CCSS.MATH.CONTENT.HSF.IF.C.7.D](#)
- [CCSS.MATH.CONTENT.HSF.IF.C.7.E](#)
- [CCSS.MATH.CONTENT.HSF.IF.C.9](#)
- [CCSS.MATH.CONTENT.HSG.CO.A.1](#)
- [CCSS.MATH.CONTENT.HSG.CO.A.2](#)
- [CCSS.MATH.CONTENT.HSG.CO.A.4](#)
- [CCSS.MATH.CONTENT.HSG.CO.A.5](#)
- [CCSS.MATH.CONTENT.HSG.CO.B.6](#)
- [CCSS.MATH.CONTENT.HSG.CO.D.13](#)
- [CCSS.MATH.CONTENT.HSG.SRT.A.1](#)
- [CCSS.MATH.CONTENT.HSG.C.A.2](#)
- [CCSS.MATH.CONTENT.HSG.G.A.3](#)
- [CCSS.MATH.CONTENT.HSG.C.A.4](#)
- [CCSS.MATH.CONTENT.HSG.GPE.B.7](#)
- [CCSS.MATH.CONTENT.HSG.MG.A.1](#)
- [CCSS.MATH.CONTENT.HSG.MG.A.3](#)

**National Core Arts Standards:**

- [Anchor Standard 1:](#) Generate and conceptualize artistic ideas and work.
- [Anchor Standard 2:](#) Organize and develop artistic ideas and work.
- [Anchor Standard 8:](#) Interpret intent and meaning in artistic work.

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- [Anchor Standard 10](#): Synthesize and relate knowledge and personal experiences to make art.

**Vocabulary:**

**Use all applicable vocabulary from current mathematics unit. For example, in a geometry unit, vocabulary could include:**

- obtuse
- right
- acute
- scalene
- isosceles
- equilateral
- circle
- arc
- parallelogram
- rhombus (etc.)

**In an Algebra 2 unit, vocabulary could include:**

- quadratic
- rational
- exponential
- maxima
- minima
- zeros
- asymptotes
- piecewise functions (etc.)

**Art vocabulary includes:**

- shape
- line
- color
- value
- contrast
- unity (etc.)

**Artworks Used:**

Sarah Crowner, *Opening Violet and Green*, 2018

<https://collection.cmoa.org/objects/d08fa8d6-d07f-4708-a20f-786163f90aab>

**Materials Needed:**

- graph paper
- lined paper
- ruler
- compass
- patty paper (if applicable)
- colored pencils
- crayons or markers

**Steps:**

This lesson is designed to take at least two days.

**Introduction:**

Help students to analyze art using art engagement methodology. Review art and math vocabulary while showing students *Opening Violet and Green*. Ask students, “What do you see going on in this picture? What do you see that makes you say that?” Analyze the work both artistically and mathematically, based on students’ prior knowledge.

**Main Activity:**

Students will individually create an artwork similar to the piece analyzed in the introduction, with the understanding that each line, curve, and shape on the piece will have to be created using a mathematical equation or idea (e.g., the equations of various quadratic functions, or using rigid transformations on a triangle or quadrilateral). Students should create the art and write out their mathematical directions simultaneously. Teachers should communicate expectations (e.g., “Your work must contain at least three different quadratic functions with different (h, k) values and four lines with different slopes.”). Students will keep their own art, but trade mathematical directions with another student. Now each student will use someone else’s directions to create a new artwork.

**Questions:**

After each student has created both their artwork and artwork based on a partner’s directions, students should reflect upon the experience.

- Did the art created from the directions match the original piece?
- If not, was the error in the written directions or with the artist? (Did the directions allow for multiple possibilities?)
- What was difficult about this activity?
- What would you do differently if we were to do this activity again?

**Assessment:**

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Students can be assessed on the accuracy of their written mathematical directions and on their accuracy in following the directions to create the second artwork.

**Lesson Extensions/Modifications:**

- **IEP Modifications:** Students with special needs may use different criteria, including a reduced number of expectations and/or more basic figures. Students may also use Desmos instead of graphing on paper.
- **Artistic Extension:** Students should choose a color scheme (achromatic, monochromatic, complementary, split complementary, triadic, or analogous) to complete their artwork and explain why they chose that scheme.
- **Mathematical Extension:** “Change one thing” in the written directions and describe how changing one value changes the artwork.



Sarah Crowner, *Opening Violet and Green*, 2018