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[www.artnc.org](http://www.artnc.org)

**Transformations in Math and Art**

**Writer:** Tonya Buff
**Grade Level:** 8
**Big Picture Concepts:** Movement, Reflection

**Subject Areas:** Math and Art
**Essential Questions:**
How can I use math concepts in art making?
**Abstract:**
Students will observe and describe examples of rotations, translations, and reflections in various works of art.  Students will then create a work of art using these mathematical concepts.  Finally, students will describe the transformations from their artwork using ordered pairs.
**Duration:** 2-3 50 minute periods
**Focus Works of Art:**


John Beerman
American
born 1958
***Three Trees, Two Clouds***
1990
Oil on linen
77 x 77 in. (195.6 x 195.6 cm)
<http://artnc.org/node/338>

Devorah Sperber
American
born 1961
**After the Mona Lisa 2**
2005
5,184 spools of thread provided by Coats & Clark, stainless steel hanging apparatus, aluminum ball chain, acrylic sphere, and metal stand
Image (spools of thread): 85 x 87 in. (215.9 x 221 cm)
<http://artnc.org/node/383>

[Auguste Rodin](http://collection.ncartmuseum.org/collection11/view/people/asitem/items%240040%3A457/0?t:state:flow=9e73030e-dd88-4a60-8035-a8907df1114f)

French

1840-1917

***The Cathedral***
Modeled 1908, Musée Rodin cast 1955
Bronze

25 1/4 x 12 3/4 x 13 1/2 in. (64.1 x 32.4 x 34.3 cm)

**Math Standard Correlation:**
8.G.1 Verify experimentally the properties of rotations, reflections and translations.
8.G.2 Understand that a two-dimensional figure is congruent to another if the second can  be obtained from the first by a sequence of rotations, reflections and translations; given two congruent figures, describe a sequence that exhibits congruence between them.
8.G.3 Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.

**Visual Art Correlation:**
8.CR.1.2 Critique personal art based on identified criteria
8.V.1.2 Apply the Elements of Art and Principles of Design in the planning and creation of personal art.

**Student Learning Objectives:**

* Create a symmetrical design using only squares, rectangles, and triangles in one quadrant of the coordinate plane.
* Transform the shapes to the other quadrants to form a symmetrical design.

**Prerequisites:**
Students should understand the coordinate plane and how to plot ordered pairs.

**Activities:**

1. Students view various works of art from the museum that are examples of the transformations (Power Point).  For each work of art, teacher asks the following:
	* *What do you see?*
	* *What does this work of art make you wonder?*

Teacher then asks students if the work of art contains an example of slide, flip, or turn, as directed in the powerpoint presentation.

After the presentation, the teacher reviews the [elements of art and principles of design](http://www.johnlovett.com/test.htm) and asks the following:

* + How have the artists applied the principles of design in these works of art?
	+ Why might the artists have created works of art that feature symmetry?
	+ What might the artists need to know about math to create these works of art?
	+ How might you use the principles of design in creating your own work of art that features slide, flip, or turn?
1. Students are given a description of the project and examples (Power Point)
2. Students find the center of their graph paper and create a coordinate plane
3. Students draw a diagonal line through quadrants to form an X
4. Students plan then construct their design in one half of one quadrant then transform the design to the other half
5. Students replicate the design to the other quadrants
6. Students color the design using symmetrical color scheme
7. Students record the original coordinates of at least 5 shapes, describe the transformation, and then record the new coordinates of the figures.
8. Students complete a self assessment of their work using a rubric
9. Teacher assesses the work using a rubric

**Assessments:**

* Student handout will be used to assess student’s ability to describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.
* Rubric will be used to assess student planning and creation of a work of art that demonstrates understanding of transformation and congruence.
* Student self-assessment will be used to assess student’s ability to critique art based on personal criteria.

**Resources:**

Vocabulary:

Coordinate plane
Ordered pair
x-coordinate
y- coordinate
Quadrant
Symmetry
Transformation
Translation (slide)
Rotation (turn)
Reflection (flip)

Materials:

Slides of artworks
Graph paper
Pencils
Rulers
Crayons or colored pencils
Notebook paper
rubric

**Transformations in Art: Student Handout**

**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |
| --- | --- | --- | --- |
| **Shape****(include color)** | **Original Coordinates** | **Transformation** | **New****Coordinates** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Self Assessment**

**Strongly Disagree-1………………..Very much agree-5**

***I took my time and had a plan.                                         1   2   3   4   5***

***I understand transformations.                                         1   2   3   4   5***

***I created a work of art that used 3 types of transformations.***

***1   2   3   4   5***

***My work of art is precise and symmetrical.                    1   2   3   4   5***

***I applied the principles of design in my work of art***
***in a way that reflects my own voice and personality. 1   2   3   4   5***

***The information I provided in the chart is accurate.      1   2   3   4   5***

**Rubric for Teacher Scoring**

**Student Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Strongly Disagree-1………………..Very much agree-5**

***The student took their time and had a plan.                    1   2   3   4   5***

***The student understands transformations.                      1   2   3   4   5***

***The student created artwork that used***
***the three basic transformations                                       1   2   3   4   5***

***The artwork is precise and symmetrical.                         1   2   3   4   5***

***The work of art applies the principles of design in a way that reflects the student’s voice and personality.      1   2   3   4   5***

***The information provided in the chart is accurate.          1   2   3   4   5***

**Total \_\_\_\_\_\_\_\_\_\_ / 25**