

Amalgamation from Transformations

Big Ideas

Unit of Instruction

Amalgamation from Transformations

Geometry Concept

- Rotation, translation dilation and reflection (transformation)

Rationale

This project can be used as a means of introducing transformations to your students. After a basic introduction to the concepts of rotation, translation dilation, and reflection, the concepts will become firmly entrenched as students either practice compass and straightedge transformations or develop skills with measurement and copying figures as they translate their figures throughout the project using a ruler and protractor. Either way, this project provides a solid basis for students understanding of and further work with transformations.

NCTM 9-12 Standards

- Apply transformations and use symmetry to analyze mathematical situations.
- Use visualization, spatial reasoning, and geometric modeling to solve problems.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.

Idaho Content Standards

- G.4.3.1 Understand and represent translations, reflections, dilations, and rotations of objects in the plane.
- G.4.4.1 Draw and construct representations of two-dimensional geometric objects using a variety of tools.
- 9-12.VA.1.2.1 Compare art forms that share common characteristics (e.g. form, line, space).
- 9-12.VA.3.1.3 Demonstrate how (elements and principles) can be used to solve specific visual arts problems.
- 9-12.VA.3.3.2 Apply various symbols, subjects, and ideas in one's artwork.
- 9-12/VA.3.3.1 Plan and produce a work of art applying media, techniques, and processes with skill, confidence, and sensitivity.

Background

Vocabulary

Amalgamation

Positive and Negative Space

Cell

Reflections

Clockwise vs. Counterclockwise

Rotations

Column

Row

Color

Scale

Color Scheme

Shapes

Degree

Transformations

Dilations

Translations

Matrix

Value

Pattern

Math Instruction (pre- or post-project)

- A kinesthetic activity involving rotations, translations, and reflections.

Driving Question

Project Objective

- Students will transform an object using rotations, translations, and reflections.
- Students will translate this shape into an amalgamation.
- Students will learn the rule to amalgamate.

Questions to be Answered

- What is an amalgamation?
- What is a grid?
- What is value?
- What is pattern?
- What is a shape?
- What is a transformation?
- What is positive space?
- What is negative space?
- What is a color scheme?

Materials

Materials Required

- White drawing paper cut 12" X 12" (option: large enough to accommodate a 10" x10" square)
- Colored pencils
- Permanent markers (ultra fine and fine tip)
- Rulers
- Number 2 pencil
- Protractor

References

www.math.nus.edu.sg/aslaksen/gem-projects/maa/0304-2-01-Beyond_the_Facade.pdf
Dr. Karl Schaffer and Erik Stern. *Math Dance*. (for examples on how one can use geometric patterns with the body)

Lesson Outline

Description of Activity

- Math Rules:
 - a. The shapes in the top row must be transformations. These transformations can be a combination of three different transformations (rotation, dilation, translation, or reflection) or a single type of transformation done in three different ways, e.g., three different angles of rotation.
 - b. The shapes in the left column are also transformed similarly.
- Art Rules:

The first square, top left corner, remains EMPTY.

 - a. The shapes in the top row are copied vertically down the column exactly as they were originally drawn.
 - b. The shapes drawn in the squares on the left column of the grid will be drawn exactly the same all the way horizontally across the grid.
 - c. Each shape must fill the square so that the negative space is equal to or at least balanced with the positive space.
 - d. The shapes in the top row are colored.
 - e. The shapes on the left column are colored.
 - f. The remaining amalgamated shapes must demonstrate not only a combination of the two original shapes but a combination of the color scheme that the student has chosen. How the students combine the colors, patterns, etc., is part of the visual problem. For example. If shape B-1 and shape A-2 involve two different colors students may choose to solve the visual problem by mixing/blending colors or they may choose to present each color separately in square B-2. The objective, however, is that both colors are present in order for the design to be a true amalgamation.

The Amalgamation is created by combining the transformations from the rows and columns. The color schemes are also combined. Failure to combine both the transformation shapes and color schemes will not provide a true amalgamation.

- Students will create a grid on white 12" X 12" drawing paper. The grid will be 10" X 10". The students will grid every two inches. Allow a one inch border on each side of the grid (15 min.)
- Important! Remember that the first square on the top left remains empty.
- The shapes will be transparent and will overlap each other. By doing so the combination of the two shapes will create several new shapes. In addition, the negative (unused) space now also becomes a new shape. The instructor will demonstrate the process and show student examples. (20 min.)
- Students will color each of the shapes in the top row of shapes as well as each shape in the left column of shapes. The negative space will be colored as well as the positive space. Students will be encouraged to use patterns and experiment with color. The color scheme must be repeated throughout the amalgamation following the same rules listed above (see example). (2-3 days/120-180 min.)
- The student work will be displayed.

Day One

- Define amalgamation.
- Define transformations.
- Create the grid for the amalgamations.
- Draw the shapes for the amalgamations.

Day Two

- Select colors for the amalgamations. Students may create patterns and experiment with color.
- Begin by coloring the shapes in across the top row and down the left column.
- The remaining shapes are combinations of not only shapes but of the colors/values/patterns selected.

Day Three

- Students will finish coloring their amalgamations.
- Students will present their amalgamations to teacher/class.
- Student amalgamations will be displayed in classroom.

Assessment

Rubric

Creativity: 20 pts.

- Pattern, design, color choices, values, patterns, and materials to enhance design.

Neatness: 20 pts.

- Clean and clearly defined shapes.
- No smudges.
- Defined edges for pattern work.

Accuracy: 60 pts.

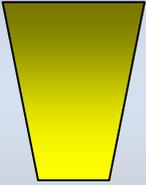
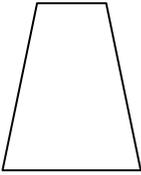
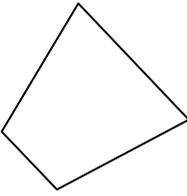
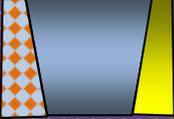
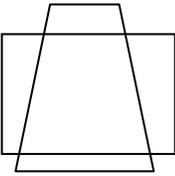
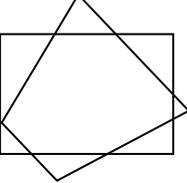
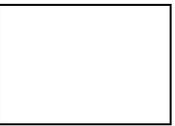
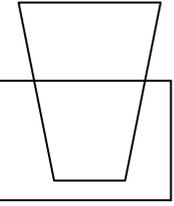
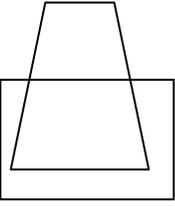
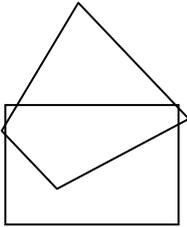
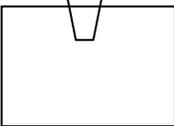
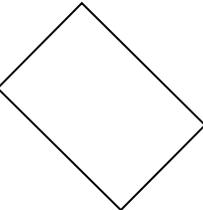
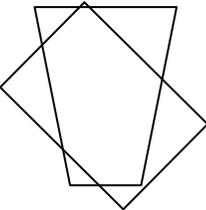
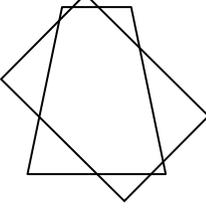
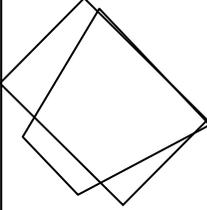
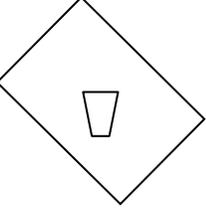
- The amalgamation rule is followed. Both shapes and color schemes are properly combined/presented.
- Transformations are accurate.

Ideas for Further Independent Student Project

- Enlarge one square of the amalgamation and recreate in another medium such as paint.
- Enlarge one square of the amalgamation by creating a three-dimensional relief sculpture (clay, paper, cardboard, styrofoam, etc.).
- Create more than one type of transformation/amalgamation.

Amalgamation Example

1. Draw a shape in A2.
2. Copy the shape in A2 in each cell of column 2.
3. Transform the shape in A2, and draw the result in the next square to the right (A3).
4. Copy the shape in A3 in each cell of column 3.
5. Continue this process for the remaining columns with different transformations.
6. Begin with a new shape in B1, and use the same process for the rows.

	1	2	3	4	5
A	Empty				
B					
C					
D					
E		