

Directions for Creating Geometric Art

Geometry

Presenters: Please read the *Rubrics for Geometric Art – Presenters ONLY*, reference this handout, and meet with Mrs. Osterloh in order to determine what is expected of you during your presentation.

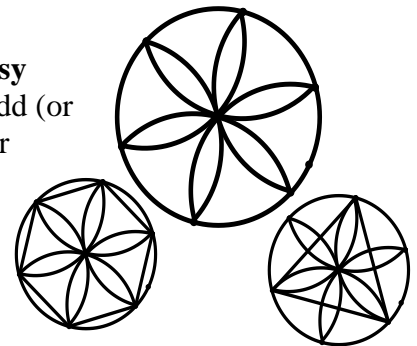
Entire class: After a group presents a project, each individual student is expected to follow the directions given by the presenters and on this handout to create the intended geometric art. Reference the *Rubrics for Geometric Art – All Students* in order to know how to meet the expectations for completing each project successfully. [Note: The directions on this handout are only partial directions. The presenters will give you the full directions.]

Vocabulary: Please read and make sure you understand the following geometry vocabulary before beginning any presentation or geometric art project.

- If asked to sketch an object, you may simply draw it freehand, adding marks to show intended angle measures and lengths of segments.
- If asked to draw an object, you need to use a ruler and/or protractor to measure and make the object fairly accurate.
- If asked to construct an object, you must use a straightedge and compass to create the object.

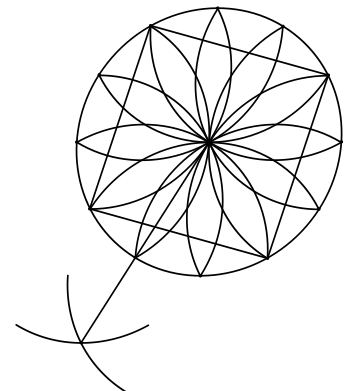
Directions:

1. Each student is responsible for **constructing** and decorating **one daisy** (with a minimum diameter of 5 inches). Each student may choose to add (or not to add) a **regular hexagon** and/or an **equilateral triangle** to his/her daisy as part of the geometric art, but all students are responsible for knowing how to construct a regular hexagon and an equilateral triangle.

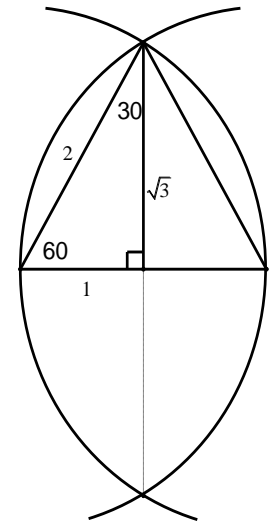


2. Each student is responsible for **constructing** and decorating **one twelve-pointed daisy** (with a minimum diameter of 5 inches). Each student may choose to add (or not to add) a **square** to his/her daisy as part of the geometric art, but all students are responsible for knowing how to construct a square.

Note: The construction steps that lead from the first 6-point daisy to the second 6-point daisy must be clearly identifiable by Mrs. Osterloh. Do not allow the presence of these construction marks to detract from the rest of the decorated Geometric Art.



3. Each student is responsible for **constructing** and decorating **one equilateral triangle** – without using the daisy method, but with using the method presented. Each student must display the measure of the angles of half of an equilateral triangle and the use of the Pythagorean Theorem to show the mathematical relationship between the sides of half of an equilateral triangle in their geometric art.

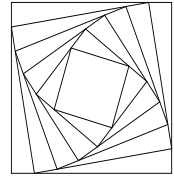


$$a^2 + b^2 = c^2$$

$$(1)^2 + (\sqrt{3})^2 = (2)^2$$

$$\vdots$$

4. Each student is responsible for **constructing** and decorating **one disappearing square** (with the original square having sides at least 5 inches in length). At least 5 inner squares are required. More inner squares will result in a more visible optical illusion of spirals.

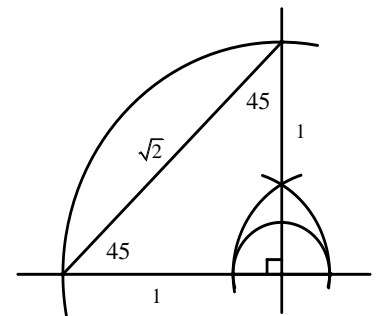


5. Each student is responsible for **constructing** and decorating **one isosceles right triangle** – without using the daisy method, but with using the method presented. Each student must emphasize the measure of the angles of half of an isosceles right triangle and the use of the Pythagorean Theorem to show the mathematical relationship between the sides of half of an isosceles right triangle in their geometric art.

$$a^2 + b^2 = c^2$$

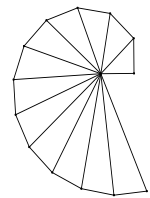
$$(1)^2 + (1)^2 = (\sqrt{2})^2$$

$$\vdots$$



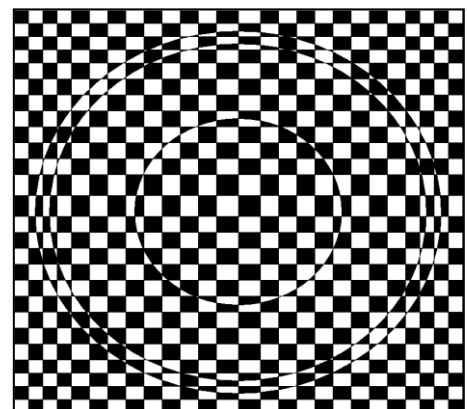
6. Each student is responsible for **constructing** and decorating a right triangle shell illusion.

Note: The original triangle is an isosceles right triangle. The rest of the right triangles are constructed with one leg congruent to the legs of the original isosceles right triangle.



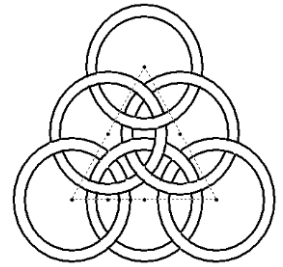
7. Each student is responsible for **drawing** and decorating **one hidden picture** involving a hidden letter, name, animal, or object of his/her choice. A computer may be used to draw the line segments, but the object and coloring must be done without the aid of a computer.

Note: Excel (or any other spreadsheet program) works wonderful for creating the horizontal and vertical line segments quickly! Just use the border feature. A computer spreadsheet, such as Excel, allows you to quickly experiment with what effects are created by changing the size of the spacing between line segments.



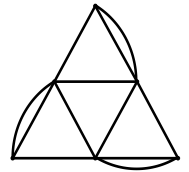
8. Each student is responsible for **constructing** and decorating **one circular knot design**.

Note: Start by constructing an equilateral triangle and the midpoints of all three sides. Construct circles centered at the vertices and midpoints of the equilateral triangle. Then, interlock the circles by erasing appropriately.



9. Each student is responsible for using the pattern provided to build and decorate **one (or two) regular polyhedron** that has a string securely attached for hanging the polyhedron up for display.

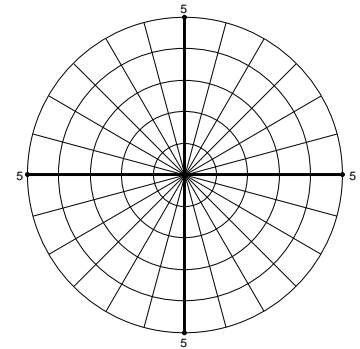
Note: The group responsible for presenting this must ask Mrs. Osterloh at least one week in advance for her to copy the patterns for the polyhedra or their grade will reflect the group's lack of planning and preparation.



10. Each student is responsible for creating and decorating a **Polar Connect-The-Dot** design, along with directions. The group responsible for presenting this will be teaching the class about the polar coordinate system:

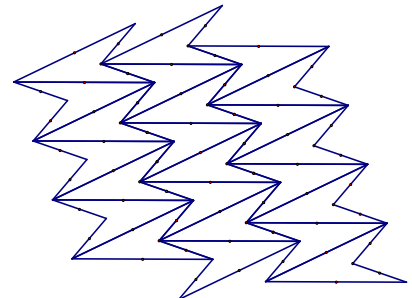
* Up to this point, the types of graphs you have studied have all been based on the **Cartesian, or rectangular, coordinate system**, which was created in 1637 by Rene Descartes (hence the name 'Cartesian'). This familiar system allows (x, y) points to be plotted based on their position from the origin.

* The **polar coordinate system** was created to make it possible to plot a point based on its distance from the **pole** (similar to 'origin' in the Cartesian coordinate system) and based on its measure of an angle formed by rotating a certain number of degrees from the **polar axis** (or 'positive x -axis' in the Cartesian coordinate system). Points in the polar coordinate system are written in **polar coordinates** as (r, θ) . Note that if theta, θ , is positive, the rotation is counterclockwise.



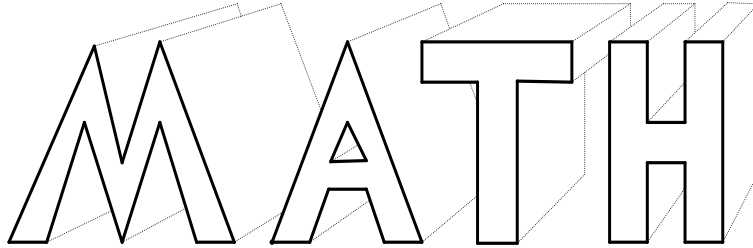
11. Each student is responsible for **tessellating a quadrilateral** (convex or concave) that has no right angles, no parallel sides, no congruent sides on **one half sheet of paper**. The tessellation shall meet decoration requirements. (Note: The group responsible for presenting this must ask Mrs. Osterloh at least one week in advance to bring in cardboard – cereal boxes work nicely – or provide the cardboard themselves for this presentation or their grade will reflect the group's lack of planning and preparation.)

Note: A tessellation is defined as an arrangement of closed congruent shapes that completely covers the plane without overlapping and without leaving gaps. Thus, there should be no "blank" space left on the plane/paper once the tessellation is complete.

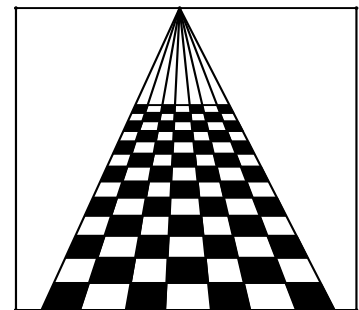
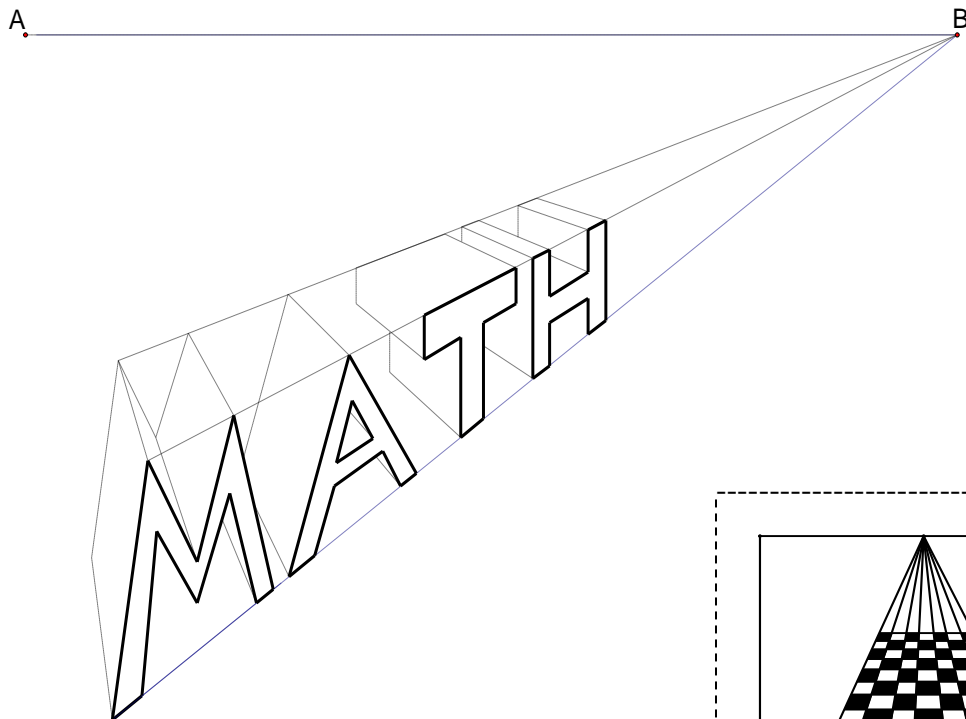


12. Each student is responsible for **drawing** and decorating **one word (containing four or more letters) using one-point perspective.**

Note: Make sure to find the back of the letters correctly! This can be tricky!!!



13. Each student is responsible for **drawing** and decorating **one box** using two-point perspective. If the student chooses, he/she may draw **a word using two-point perspective** instead... much more fun!



14. Each student is responsible for **drawing** and decorating **one tiled floor** (although when decorated, the art does NOT have to represent a floor! What can you create?).

15. Each student is responsible for **drawing** and decorating **one optical illusion.**

Note: When decorating this, it may be necessary to only outline the object, not color the interior, in order to avoid losing the effect of optical illusion. Ask about requirements for decorating.