

PROJECT: ART DESIGN WITH GEOMETRIC PATTERNS

Grade 11

There are many ways to create art out of sequences or series. Now you have the opportunity to create your own art project. The project will be graded according to the rubric. Follow the instructions for the project to create a visual representation of a sequence/series.

Sketch out rough drafts to make sure you're on the right track. Once you are ready, take your time in creating a final product that incorporates color and creativity. While I do not expect all of you to be supreme artists, your product will be graded on accuracy and execution. Please create a product that you are proud of and will enjoy showing the class.

You may work with others but you are all responsible for turning your math in with your project.

Instruction

1. Each project must include a piece of art created by yourself and must be at least 50×70 poster board in size. And divide your poster board in three parts.
2. Chose a title as creative as possible for your project name.
3. In this project you should create three different geometric design which must include each of pentagon, hexagon, and octagon shapes by a rotation, a fractal and a star design/ flower design. That is, for example, you may choose rotation to design pentagon, fractal to design hexagon and you may choose either a star design or flower design for octagon.
4. You should use Geometer's Sketchpad and compass but you should use Geometer's Sketchpad for at least one geometric shape. That is, for example, you may construct pentagon with Geometer's Sketchpad and for hexagon and octagon you may use compass.
5. **For rotation:**
 - Decide the geometric shape that you are going to rotate. It may be pentagon, hexagon, or octagon.
 - Construct a regular pentagon, or hexagon, or octagon.
 - Construct the midpoint of each side, dividing it into two congruent segments.

- Then construct the midpoint of each of these smaller segments, dividing each side into four congruent segments. (If you are using the Geometer's Sketchpad, you will need to construct the segments before you and construct their midpoints.)
- Connect the midpoints and new pentagons or hexagons, or octagons and repeat these steps.
- Continue this process, creating a spiral of pentagons or hexagons, or octagons.
- Color to create an interesting design.

6. For fraction:

- Decide the geometric shape that you are going to rotate. It may be pentagon, hexagon, or octagon.
- Construct a regular pentagon, or hexagon, or octagon.
- Construct the midpoints of the sides and connect the midpoints to form a smaller pentagon, or hexagon, or octagon.
- Construct the midpoints of the sides of the new pentagon, or hexagon, or octagon and connect them to form another pentagon, or hexagon, or octagon.
- Repeat the process as many times as you wish and then color the design. The design is composed of "self-similar" shapes, as in all fractals.
- Complete the following table. And answer the questions below the table.

n	1	2	3	4	5	6
Side Length of nth pentagon/hexagon/octagon (L_n)						
Side Length of nth pentagon/hexagon/octagon divided by 2 (L_n/2)						
Perimeter of nth pentagon/hexagon/octagon (P_n)						
nth partial sum of perimeters(S_n)						

- a) Write a recursive formula for the perimeter of the nth pentagon/hexagon/octagon.
- b) Write an explicit formula for the perimeter of the nth pentagon/hexagon/octagon.
- c) Find the formula for the nth partial sum of the perimeters (S_n)
- d) If the series for the perimeters of the square continues forever, what is the sum of the perimeters of all pentagon/hexagon/octagon (S)?

7. For star design:

- Decide the geometric shape that you are going to rotate. It may be pentagon, hexagon, or octagon.
- Construct a regular pentagon, or hexagon, or octagon and all of its diagonals.
- Are there any equilateral triangles? How many? Can you find some similar right triangles that are of different sizes?
- Color the design.

8. Or for flower design:

- Decide the geometric shape that you are going to rotate. It may be pentagon, hexagon, or octagon.
- Construct a regular pentagon, or hexagon, or octagon and all of its diagonals.
- Construct a circle, with radius equal to the side length, centered at each vertex. (If you are using a compass, simply construct full circles rather than arcs, when you are constructing the pentagon, or hexagon, or octagon.)
- Color the construction as you wish.

9. Write a reflection paragraph about why you choose that shape for each rotation, fraction and star/flower design. And also explain the reasons that you choose compass or Geometer's Sketchpad. Evaluate yourself and express your ideas or feelings what you learned while doing this project?

10. Follow the rubric since you will be graded according to the rubric below.

GRADING RUBRIC

POINTS:	1	2	3	4	5
Poster board (1 point only)	Student chose the correct size of board				
Title	Student had name of project on poster	Student had a creative name of project on poster			
The usage of Geometer's sketchpad and compass	Student used only compass	Student used both Geometer's sketchpad and compass			
Geometri shapes and type of rotation/fraction/ star design/ flower design	Student created only one type geometric design and used one of the rotation/fraction/ star design/ flower design.	Student created two different types geometric design but used one of the rotation/fraction/ star design/ flower design.	Student created three types geometric design but used one of the rotation/fraction/ star design/ flower design.	Student created one or two types geometric design but used one of the rotation/fraction/ star design/ flower design.	Student created three different geometric design which must include each of pentagon, hexagon, and octagon shapes by a rotation, a fractal and a star design/ flower design.
Rotation/ Fraction	Student constructed a regular pentagon, or hexagon, or octagon.	Student constructed a regular pentagon, or hexagon, or octagon and constructed the midpoint of each side, dividing it into two congruent segments.	Student constructed a regular pentagon, or hexagon, or octagon and constructed the midpoint of each side, dividing it into two congruent segments and repeated the process as possible as.	Student constructed a regular pentagon, or hexagon, or octagon and constructed the midpoint of each side, dividing it into two congruent segments and repeated the process not as possible as but colored the shape	Student constructed a regular pentagon, or hexagon, or octagon and constructed the midpoint of each side, dividing it into two congruent segments and repeated the process as possible as. And colored the shape
Star/Flower design	Student constructed a regular pentagon, or hexagon, or octagon.	Student constructed a regular pentagon, or hexagon, or octagon and answered the questions properly or constructed the circles properly	Student constructed a regular pentagon, or hexagon, or octagon and answered the questions properly or constructed the circles properly and repeated the process as possible as.	Student constructed a regular pentagon, or hexagon, or octagon and answered the questions properly or constructed the circles properly repeated the process not as possible as but colored the shape	Student constructed a regular pentagon, or hexagon, or octagon and answered the questions properly or constructed the circles properly repeated the process as possible as but colored the shape

Table of Fraction	Student completed some parts of the table but did not answered the questions	Student completed some parts of the table but not answered some of the questions properly	Student completed some parts of the table and answered some of the questions properly	Student completed all parts of the table but answered some questions wrongly	Student completed all parts of the table and answered all the questions correctly
Reflection	Student wrote a reflection paragraph but not respond the questions	Student wrote a reflection paragraph explained the reasons that s/he chose compass or Geometer's Sketchpad. But not evaluate himself/herself and not express his/her ideas or feelings what s/he learned while doing this project	Student wrote a reflection paragraph explained the reasons that s/he chose compass or Geometer's Sketchpad and evaluated himself/herself but not express his/her ideas or feelings what s/he learned while doing this project	Student wrote a reflection paragraph explained the reasons that s/he chose compass or Geometer's Sketchpad and evaluated himself/herself and express his/her ideas or feelings what s/he learned while doing this project. But some parts were not clear	Student wrote a reflection paragraph explained the reasons that s/he chose compass or Geometer's Sketchpad. But not evaluate himself/herself and express his/her ideas or feelings what s/he learned while doing this project and all parts were clear