

Camden County HS Honors Math II Summer Tessellation Project 2018



Maurits Cornelis Escher, born in Leeuwarden, Holland in 1898 created unique and fascinating works of art that explore and exhibit an array of mathematical ideas. Among his greatest admirers were mathematicians, who recognized in Escher's work an extraordinary visualization of mathematical principles. This was quite remarkable as Escher had no formal mathematical training beyond secondary school.

Tessellations, or regular divisions of the plane, are arrangements of closed shapes that completely cover the plane without overlapping and without leaving gaps. For shapes to fill the plane without overlaps or gaps, their angles, when arranged around a point, must have measures that add up to exactly 360° . Typically, the shapes making up a tessellation are polygons or similar regular shapes (like square tiles used on floors). Escher exploited these basic patterns in his tessellations, applying reflections, translations, and rotations to obtain a greater variety of patterns. He also distorted these shapes to form animals, birds, and other figures.

Project Objective: Students will create a tessellation that demonstrates their knowledge of the properties of geometric transformations, such as translations, rotations, and reflections. This project has two parts the template and product which is worth 80 points, and the written response which must be typed is worth 20 points.

Procedure: Tessellation: Use one or more transformations to create an original tessellation on standard computer copy paper; since it is original you may not use letters or numbers. There are complexity points for your tessellation. You get more points for attempting a more difficult tessellation. You may not simply take a polygon and slide, rotate, or reflect it over and over again to create your tessellation. You must create a template to trace based on one of the methods in this packet. The tessellation if on paper or a stain glass piece it must be placed in a picture frame and the template must be taped to the back of frame. Other options include painting on canvas, wood puzzle, or quilt. You may use a computer to create your template. Use the Project Planning Worksheet to generate ideas and help focus your project on a specific theme. Remember you are creating an original piece of work no copies will be accepted. Rubric is attached. Projects are worth two test grades.

Written Response: Type your responses to the questions below, they must be in complete sentences and placed in a report folder. Each question is worth 4 points, the more thorough your responses the better your grade; do not forget to add pictures.

1. What is the idea/theme behind your tessellation?
2. What polygon(s) did you start with and how did you alter it?
3. What transformations did you use?
4. In your opinion, are tessellations math or pieces of art? Justify your answer.
5. Provide some examples of where tessellations are found in the world around us. For example, look for examples in nature, art, architecture, business, or advertising. Include five photos or a printout to support your claim.

TESSELLATION RUBRIC

CATEGORY	20	18	16	14
Organization	Tessellations are presented in an organized manner. Their construction is complete and accurate.	Tessellations are presented in a somewhat organized manner. Their construction is fairly complete.	Tessellations are organized, but not well constructed.	There is no organization to the tessellation.
Complexity of Design	Tessellation was created with non-polygon shapes that connect to create an intricate and complex pattern.	Tessellation was created with complex polygon shapes that connect to create an intricate and complex pattern.	Tessellation was created with simple shapes that connect to create a pattern.	Tessellation is simple and pattern is not complex or interesting.
Completeness of Tessellation	All areas of the tessellation are covered by the complex pattern to completely fit together.	All areas of the tessellation are covered by the simple pattern with few or small holes in the pattern.	Most areas of the tessellation are covered by the simple pattern with some holes in the pattern.	There are major holes in the tessellation and it does not fit together.
Creativity	Tessellation uses unique design and patterns of unusual shapes to form a complex and interesting design.	Tessellation uses a mixture of polygons and interesting shapes to create a nice design.	Tessellation uses some shapes that fit together to form a simple pattern.	There is no creativity to the design.

Tessellations Project → Planning Worksheet

You must create a template based on one of the methods below and it must be taped on the back of your picture frame, product, or questions.

Consider the following when planning your tessellation:

- Do you want to use one polygon or more than one?
- How complex do you want to make your original figure?
- Do you want to use one transformation or a combination to tessellate your figure?
- How are you going to use color to alter your tessellation and create more patterns?
- What is the idea or theme that you want to express in your piece?
- What is the title of your piece?

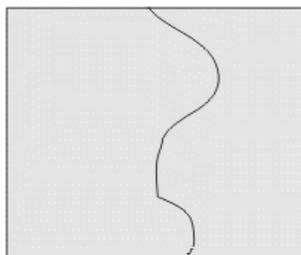
**A Simple Method For Creating Tessellations From Rectangles (There are other methods so please research!!
The more complex the better your grade, pay attention to color and be creative)**

In this assignment we will see one more method for finding tessellations. This method works with any rectangle, and is quite simple to use.

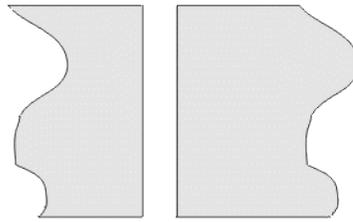
1. Cut out a rectangle out of an index card or poster board. You can make it any size, but to be able to see the resulting tessellation, you might want to make it no larger than 2 inches by 2 inches.



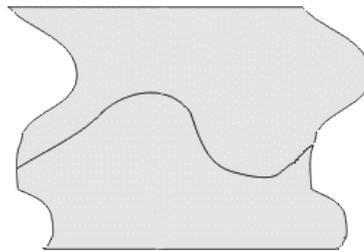
2. Draw a line from one side to the opposite side. Make it as simple or as complicated as you wish.



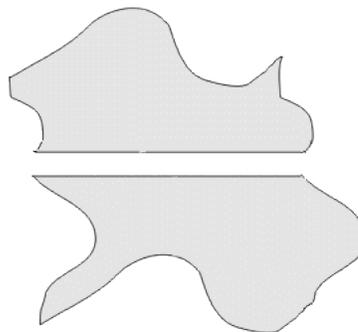
3. Cut along the line you drew and interchange the pieces. Tape them together.

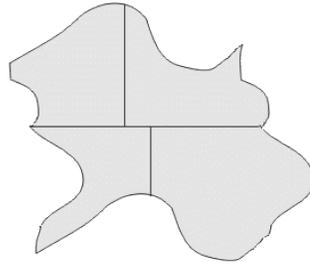


4. Draw another line on the resulting figure in a perpendicular direction to the first line.

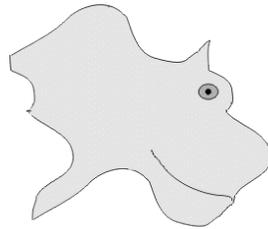


5. Cut along the line you just drew and interchange the pieces. Tape them together.





6. The resulting shape will tessellate the plane.



Take a piece of paper, and trace repeatedly your figure in order to tessellate part of the plane. You can form a pattern of four figures by rotating one about a point three times to get a pattern like the one below.

