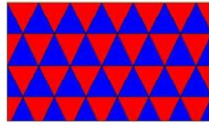


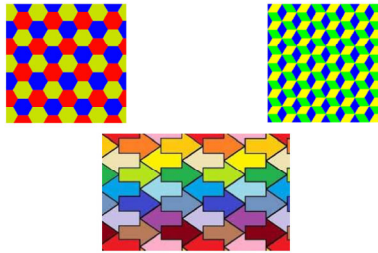
Tessellations

A tessellation is a **repeating pattern of polygons** that covers a plane with **no gaps or overlaps**.

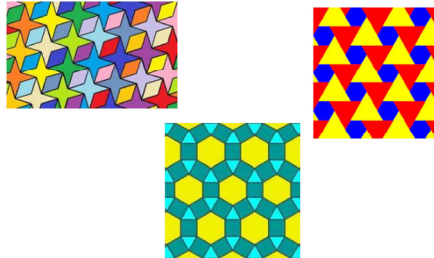


What transformations do you see?

Typically the shapes making up a tessellation are polygons or similar regular shapes.



Tessellations can be formed from more than one shape.



Tessellations can be formed from irregular shapes, too.

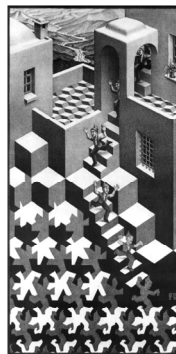


Real Life Tessellations



M.C. Escher

Maurits Cornelis Escher (1898-1972), a Dutch artist, created unique works of art that explore and exhibit many mathematical ideas. He used translations, reflections, rotations, and glide reflections in many of his works.



Tessellation Project

Tessellations, or regular divisions of the plane, are arrangements of closed shapes that completely cover the plane without overlapping and without leaving gaps.

Project Objective: Students are to create a tessellation that demonstrates their knowledge of transformations, such as translations, rotations, and reflections.

Expectations:

- The appearance of your tessellation should be neat
- Your tessellation (pattern) should cover the ENTIRE page (no gaps or unintentional white spaces)
- Coloring should be in between the lines and no wrinkled or torn projects
- Turn in your image with the final product
- Turn your project in on time! (Due date _____)
- You must use one of the "nibbling" techniques shown below

Procedure:

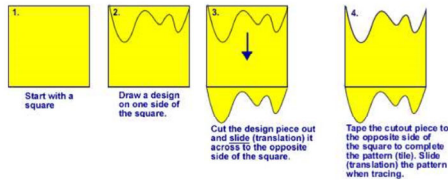
"Nibbling" technique #1

For a simple **translation tessellation**, polygons should have opposite sides that are parallel and congruent.

Step 1 & 2: Begin with a square and design from one corner of the square to an adjacent corner (do not draw diagonally). Do not stop halfway!

Step 3 & 4: Cut the design piece out, being sure to have 2 pieces – the nibble and the rest of the sheet. There should be no other pieces laying around – **very important!** Slide the nibble across the sheet to the opposite side and tape the straight edges together. The corners of the nibble and the sheet should match perfectly, no overlapping.

Step 5: This tessellation will require translating (sliding) the image when tracing.



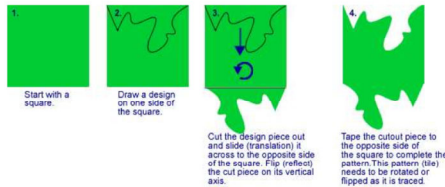
"Nibbling" Technique #2

For **glide reflection tessellations**, polygons should have opposite sides that are parallel and congruent.

Step 1 & 2: Begin with a square and design from one corner of the square to an adjacent corner (do not draw diagonally). Do not stop halfway!

Step 3 & 4: Cut the design piece out, being sure to have 2 pieces – the nibble and the rest of the sheet. There should be no other pieces laying around – **very important!** Slide the nibble across the sheet to the opposite side and flip (reflect) the cut piece on its vertical axis. Tape the straight edges together. The corners of the nibble and the sheet should match perfectly.

Step 5: This tessellation will require being rotated or flipped as it is traced.



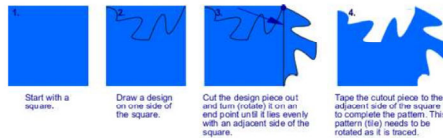
"Nibbling" Technique #3

For a **rotational tessellation**, polygons should have adjacent sides that are congruent.

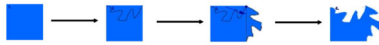
Step 1 & 2: Begin with a square and design from one corner of the square to an adjacent corner (do not draw diagonally). Do not stop halfway!

Step 3 & 4: Cut the design piece out, being sure to have 2 pieces – the nibble and the rest of the sheet. There should be no other pieces laying around – **very important!** Rotate the image on an endpoint until it lies evenly with an adjacent side of the square. Tape the "nibble" to the adjacent side, being sure to have no overlap.

Step 5: This tessellation will require being rotated as it is traced.



Rotation Tessellation



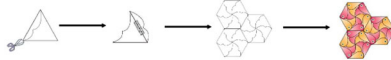
1. Start with a square.
 2. Draw a design on one side of the square.
 3. Cut the design piece out and rotate (turn) it on an end point until it lies evenly with the adjacent side of the square.
 4. Secure the piece with tape to the adjacent side of the square.
- **This pattern needs to be rotated as it is traced.**

Translation Tessellation with Rectangles



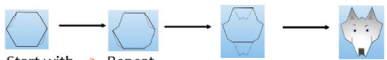
1. Start with a rectangle. Draw a design and cut it out.
2. Translate it to the opposite side and secure.
3. Draw a second design and cut. Translate to the opposite side and secure.
4. Add colors and designs.


Rotation Tessellation with Triangles



1. Start with a triangle. Draw a design and cut it out.
2. Rotate it to another side and secure.
3. This pattern needs to be rotated as it is traced.
4. Add colors and designs.

Translation Tessellation with Hexagons

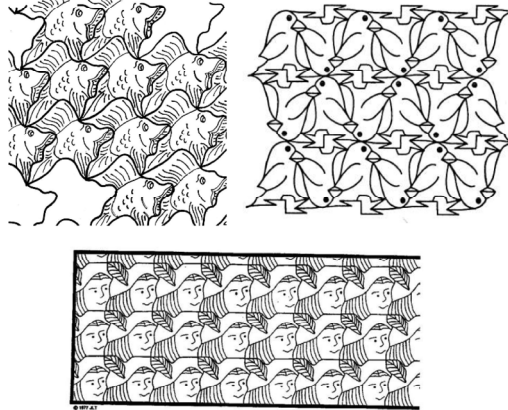


1. Start with a hexagon. Draw a design and cut it out. Translate it to the opposite side and secure.
 2. Repeat Step #1 from another side. (optional)
 3. Repeat Step #1 from another side (optional).
 4. Add colors and designs.
- 

Creating your Tessellation:

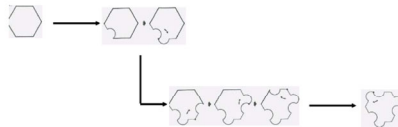
1. Begin by creating a template using at least 1 of the nibbling methods above. Try a variety of methods and designs until you are satisfied. You must turn in your template.
2. Your image needs to represent something, it can not just be an abstract shape.
3. Once the template has been created, place your template at any of the four corners of your paper and trace your first figure. To avoid gaps, have the corner of the paper align with the original square you started with (Your first template may hang off the edge of the paper)
4. Once your figure has been traced slide it, reflect it, or rotate it (based on the "nibbling" method chosen above) and trace your next figure.
5. Continue step 4 until the entire page is covered. All your figures on the paper should fit together like a puzzle. Figures at the edge will only be partial images.
6. Once you have the page covered with your tessellation, begin to add a design and color in the figure. I recommend using colored pencils (not markers).
7. Have fun!

Examples of Tessellations:



Tessellation Project 2016

Rotation Tessellation with Hexagons



1. Start with a hexagon. Draw a design and cut it out.
2. Rotate it to another side and secure.
3. Repeat Steps 1 & 2 as desired.
4. This pattern needs to be **rotated** as it is traced.