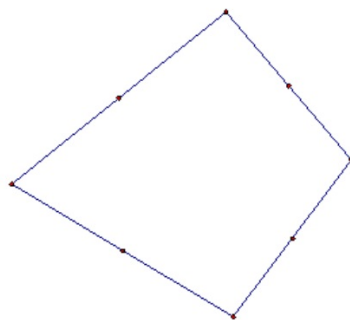


1938 Fish

# How to Build an Escher (rotational) Tessellation in Sketchpad

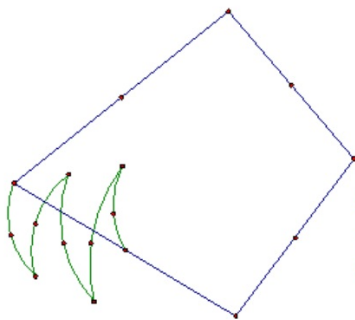
**To make an Escher-style Tessellation in Sketchpad:**

Start with a quadrilateral of any shape -- regular or irregular, doesn't matter.  
(We will talk about why this works for ANY quadrilateral next week after you've made your tessellation, so be thinking about that as you work.)



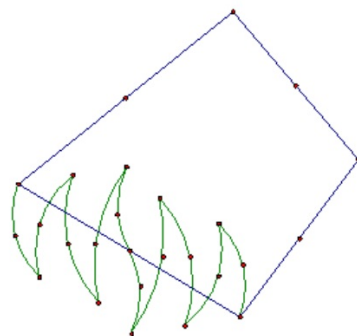
Construct the midpoint for all four sides as shown.

Starting in one corner, create an unbroken series of lines or curves that join the corner to the midpoint. Be careful to **ONLY** cross the line whose endpoint and midpoint you're joining (i.e. don't cross any other lines in the quadrilateral).

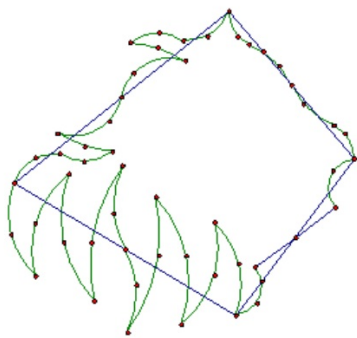


Activate all of the points, lines, and curves on your new constructions. Order of activation doesn't matter. THEN double-click on the midpoint while everything is activated.

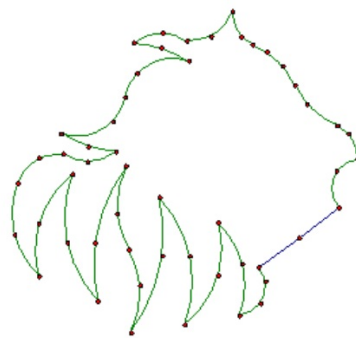
Go to Transform > Rotate and type **180°** in the dialog box.



Do this again for the other 3 sides, being careful when you make your constructions not to cross any of your previously constructed lines. (Crossing the quadrilateral lines is OK, but crossing your new lines will cause gaps in your tessellation.)

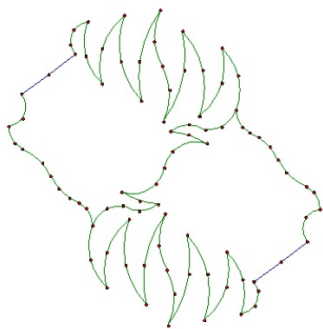


Then select your original quadrilateral lines  
and Display > Hide Segments

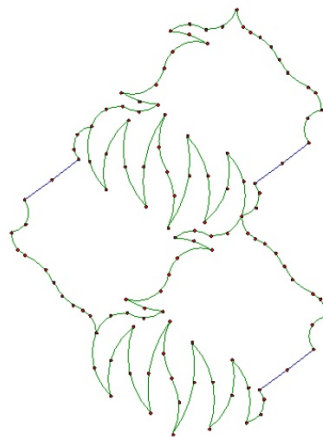


Look! It's a fish!

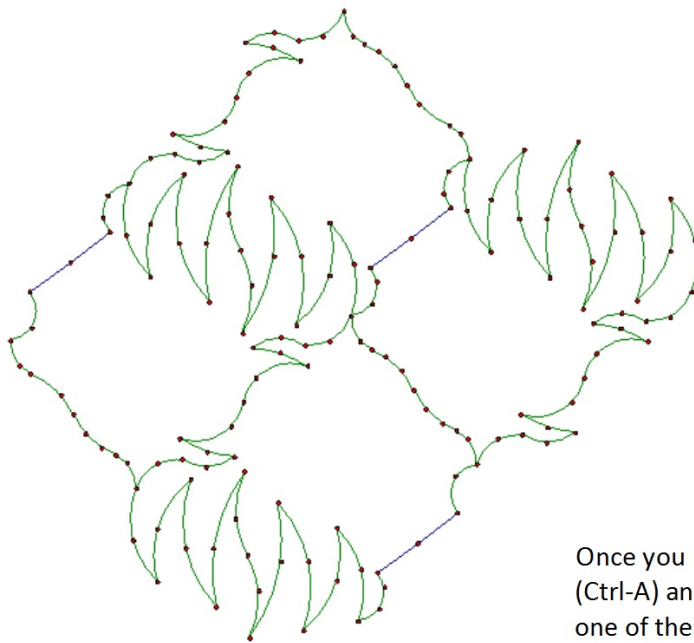
Making it tessellate is really simple. Select ALL (Ctrl-A) to activate everything. Then double-click on any one of your midpoints. With everything still active, go to Transform > Rotate and type **180°** into the dialog box.



Double-click on an adjacent midpoint in your newly-rotated shape and rotate 180° again.

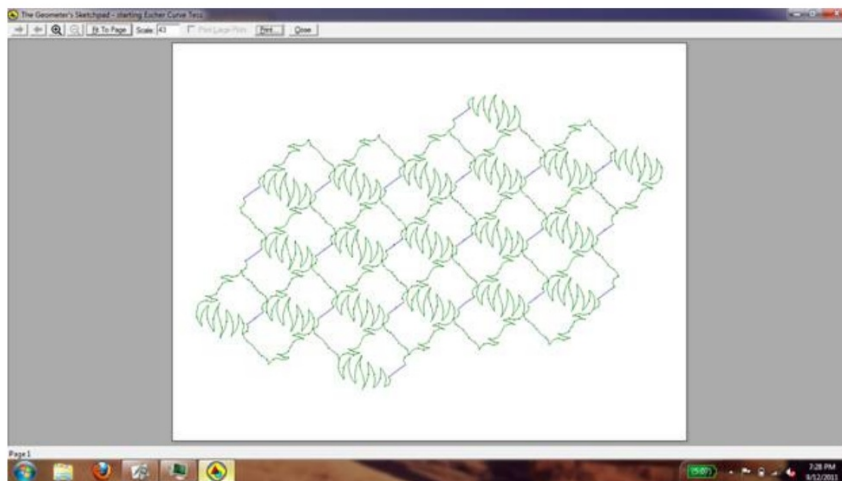


And again...



Once you have a group of four, select ALL of them (Ctrl-A) and then rotate the whole group around one of the outer midpoints, working your way around. Keep selecting and rotating around new midpoints until you have filled the GSP file and it won't let you do any more rotations.

When you print your tessellation, go to **Page Setup** and select **Landscape**. Then go to **Print Preview** and select **Fit to Page**. Your tessellation should cover at least as much of the page as the one below, with at least 32 shapes visible. Print when you are satisfied with your Tessellation. **SAVE your file to Mrs. Poplin's B-Block DropBox on the Server. (I'll show you how.)**



You don't have to color it in unless you really want to, but do try to make a shape that looks like a recognizable object or animal. **The filename should include your name and what your tessellation is** (I'd name the above tessellation **PoplinFish**, for example).

You must have a printed copy AND a copy in the DropBox to pass this assignment. Late assignments will not be accepted.

**Questions to think about as you work on this project:**

- Would any irregular shape tessellate the way a quadrilateral does? Why or why not?
- Why does it work for ANY quadrilateral but not for other shapes?
- What would have to be true for it to work for other shapes?
- See if you can do a rotational tessellation for another shape

Clickable Escher Links for your amusement: <http://www.mcescher.com/>  
go to the symmetry gallery in particular  
<http://www.mathacademy.com/pr/minitext/escher/>  
<http://www.worldofescher.com/gallery/>

(and there are lots and lots more if you just Google...)



**We will look at everyone's  
Escher Tessellation next week  
at the beginning of class, so  
MAKE SURE IT IS IN THE  
DROPBOX BEFORE B-LAB  
ON WEDNESDAY.**