CCAArchitecture Department

Course Title:	Advanced Geometry
Course Number:	SCIMA-308-02
Instructors:	Marc Syp (Instructor), Dave Namaky (Assistant)
Semester:	Spring 2014

Assignment_04

NOTE: See attached for reference material, specifically the portion on the special properties required to tessellate an irregular hexagon. Please name all Grasshopper definitions as shown (substituting your last name) before uploading to the appropriate Drive folder.

04_YOURNAME.gh: Irregular Hexagon Tiling

This exercise will demonstrate your understanding of tessellation, rotational and translational transformations, and trigonometry. Create a Grasshopper definition that has the following functionality:

- Use 3 Rhino points to create a closed, irregular triangle.
- Using this triangle as the base, create an irregular hexagonal shape that can be tessellated indefinitely with no overlap between shapes.
- Tile this shape on a grid of arbitrary dimensions, controllable by sliders.

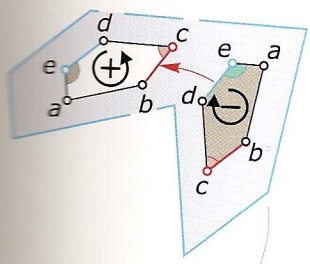
Hints:

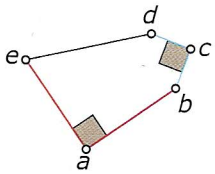
- See attached reference material that shows how to generate a hexagon that can be tiled from an irregular triangle.
- In order to create an isosceles triangle, you can divide it in to two symmetrical right triangles, and use trigonometric functions to find the correct vertex point. Remember “SOH CAH TOA”! Google it if you have forgotten how to use these functions.
- Once you have created your hexagonal shape, Lecture 5 on tiling patterns and 10-SYP-Tiling.gh in the class folder will give you a lot of guidance on the process of rotation and translation.

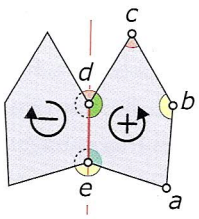
Extra credit:

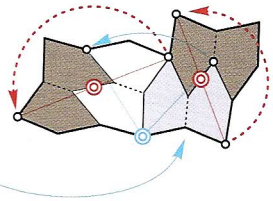
1. Within your irregular hexagon, generate a 3-dimensional surface contained within the boundary of the hexagon and include this surface in the tessellation pattern. Make it something more interesting than a simple extrusion. Perhaps a sweep 2 rails or a lofted surface.

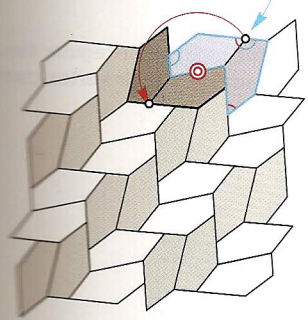
irregular pentagonal tilings



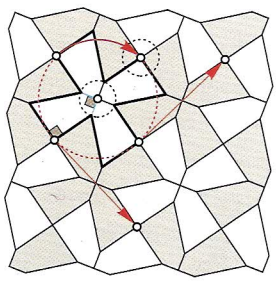








bc=ed
∢e+∢c=180°



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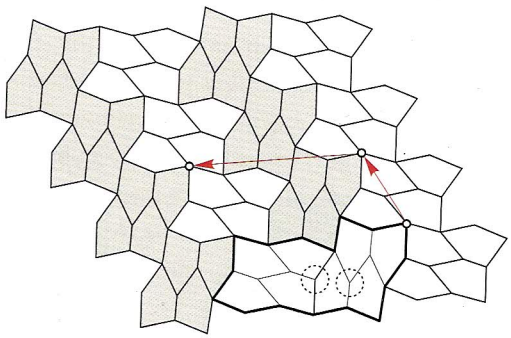
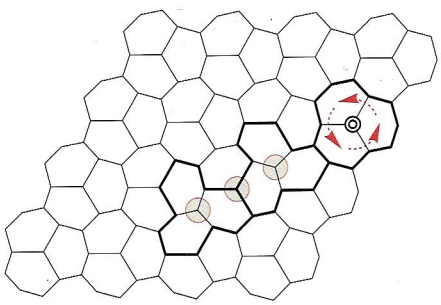
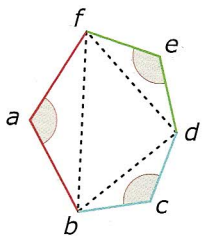
∢a=∢c=90°



ab=bc=cd=ea
∢b+2∢e=360°
∢c+2∢d=360°

irregular hexagonal tilings





fa=ab, bc=cd, de=ef
∢a = ∢ c = ∢ e = 120°

examples of tilings with irregular pentagonal and hexagonal tiles. The lengths of the tiles are determined by specified lengths and angles.

There exist only three regular tessellations with regular triangles, squares, and hexagons.