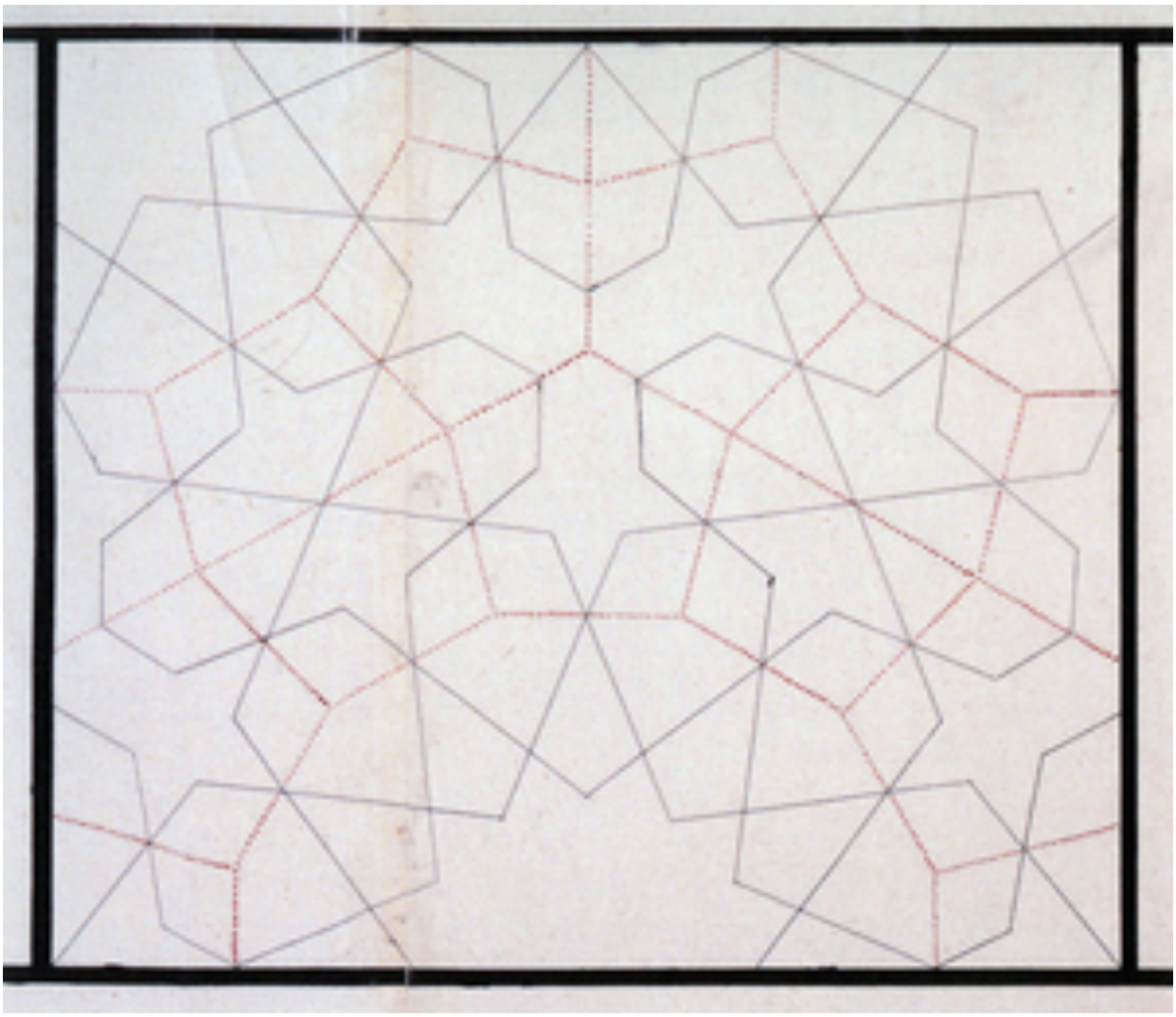
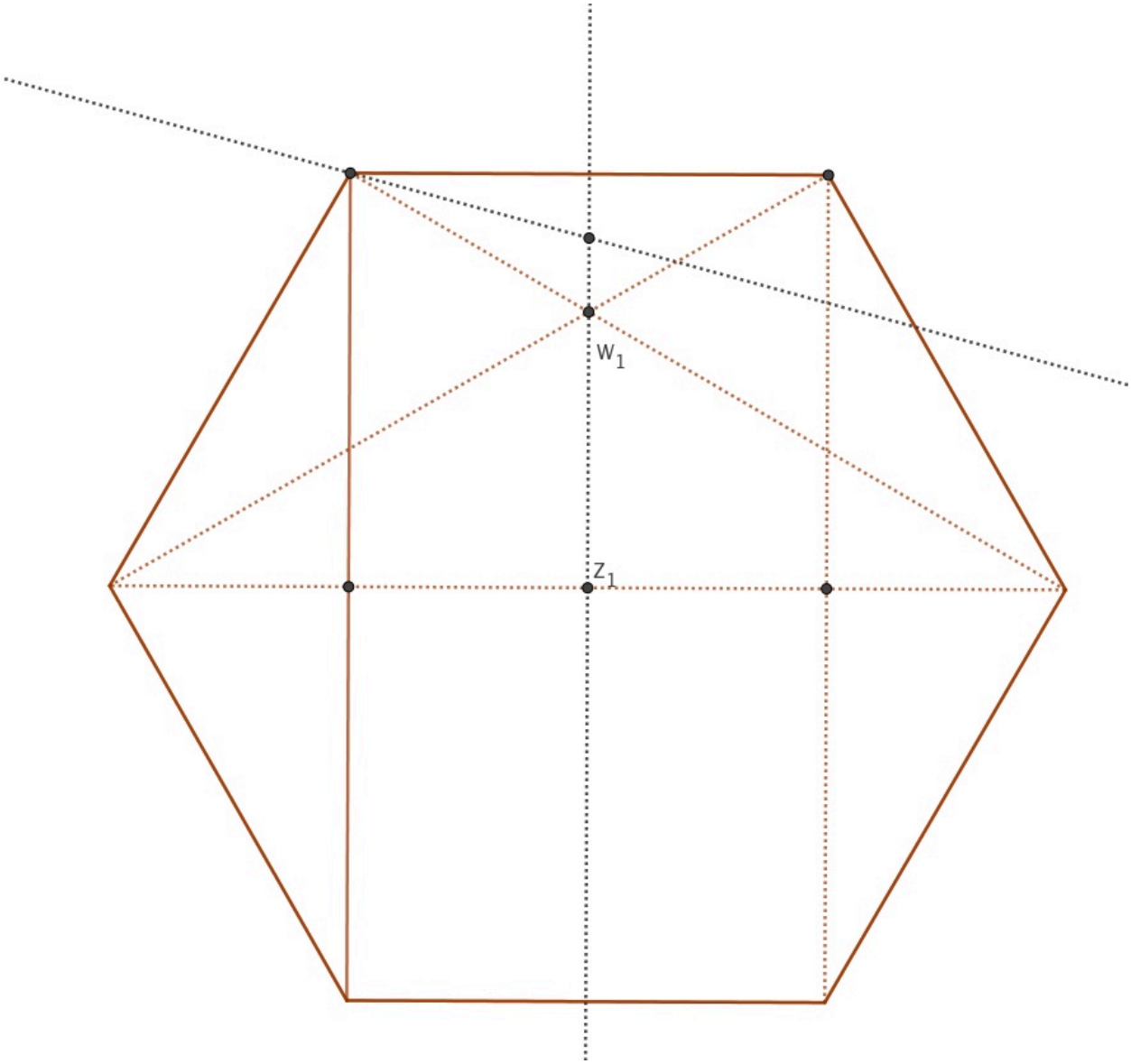
Topkapi Scroll

One of the oldest (15th C.) and most famous patterns is preserved in the Topkapi Scrolls. An example below illustrates an underlying grid in red and the overlay pattern in black.

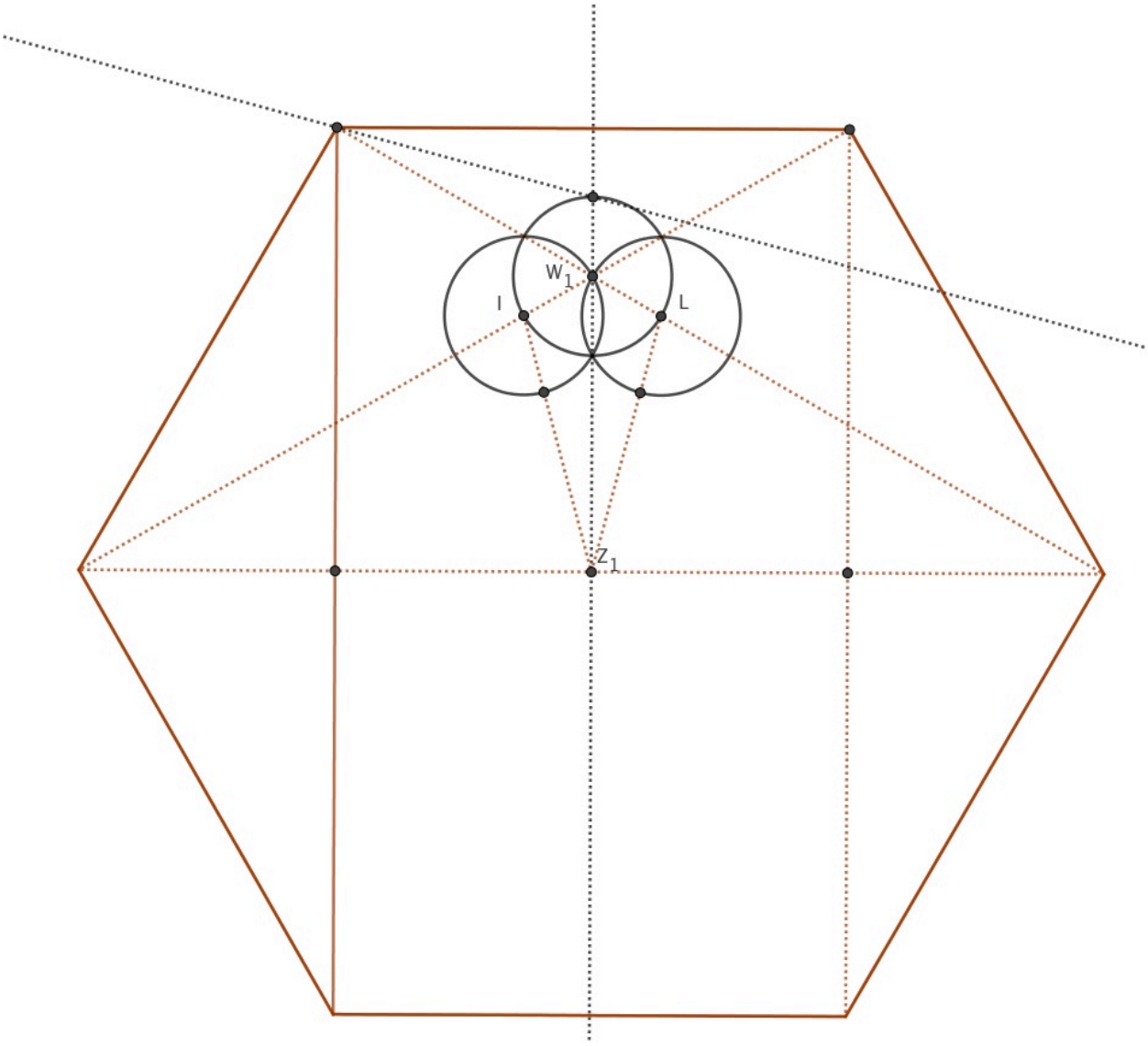


This grid is comprised of pentagons, dodecagons, and trapezoids, but we begin with a hexagon; the corners and center of which center the dodecagons. It is interesting to note that what appear to be regular hexagons, are not; but slightly different. Careful measurement of the sides reveals they are not equal. Where the three meet, the interior angle would have to be 120, but regular hexagons have an interior angle of 108. Nevertheless, the pattern is esthetic and of historical importance. The topkapi scrolls are some of the historical evidence for the polygon method.

The inner radius is found through a combination of several steps. The first is to construct the two diagonals shown and observe their intersection. Then bisect the corner angle and observe the intersection of the bisector with the vertical as shown.

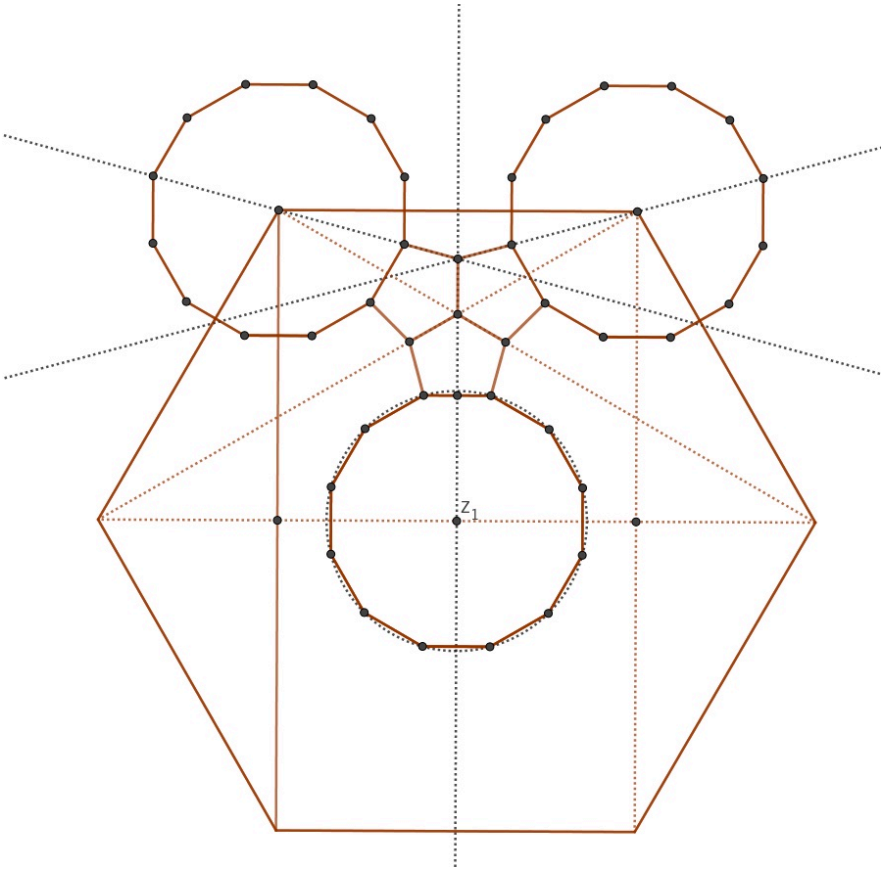


Now draw 3 circles, the first around W1, then two others of equal radius about the points I and L, where the first circle intersected the diagonals. Then connect I and L with the center of the hexagon and observe the intersection of these segments with the two circles. These two points lie on the circumference of the center circle. The usage of these circle is to force some of the edges of the pentagons to be equal in length.

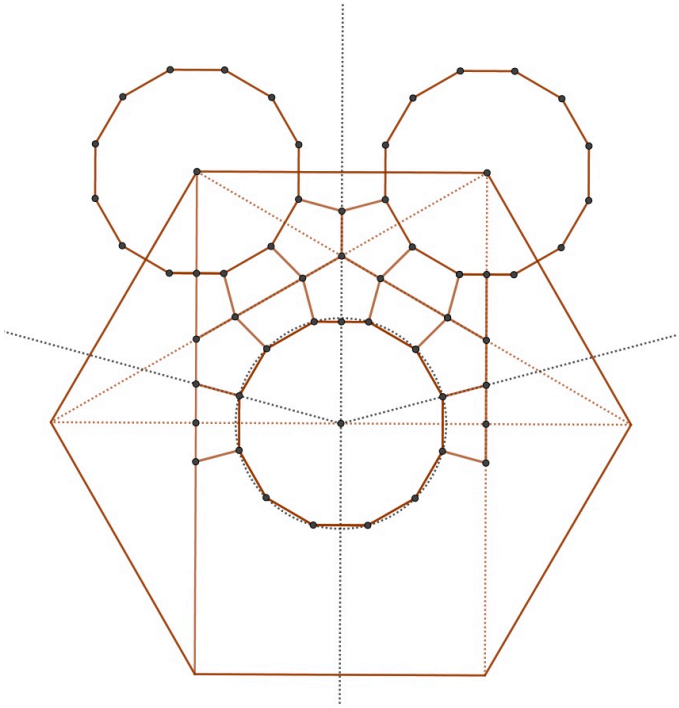


The center dodecagon is inscribed within this circle. Dodecagons in the corners intersect the angle bisectors at the remaining points of the hexagons.

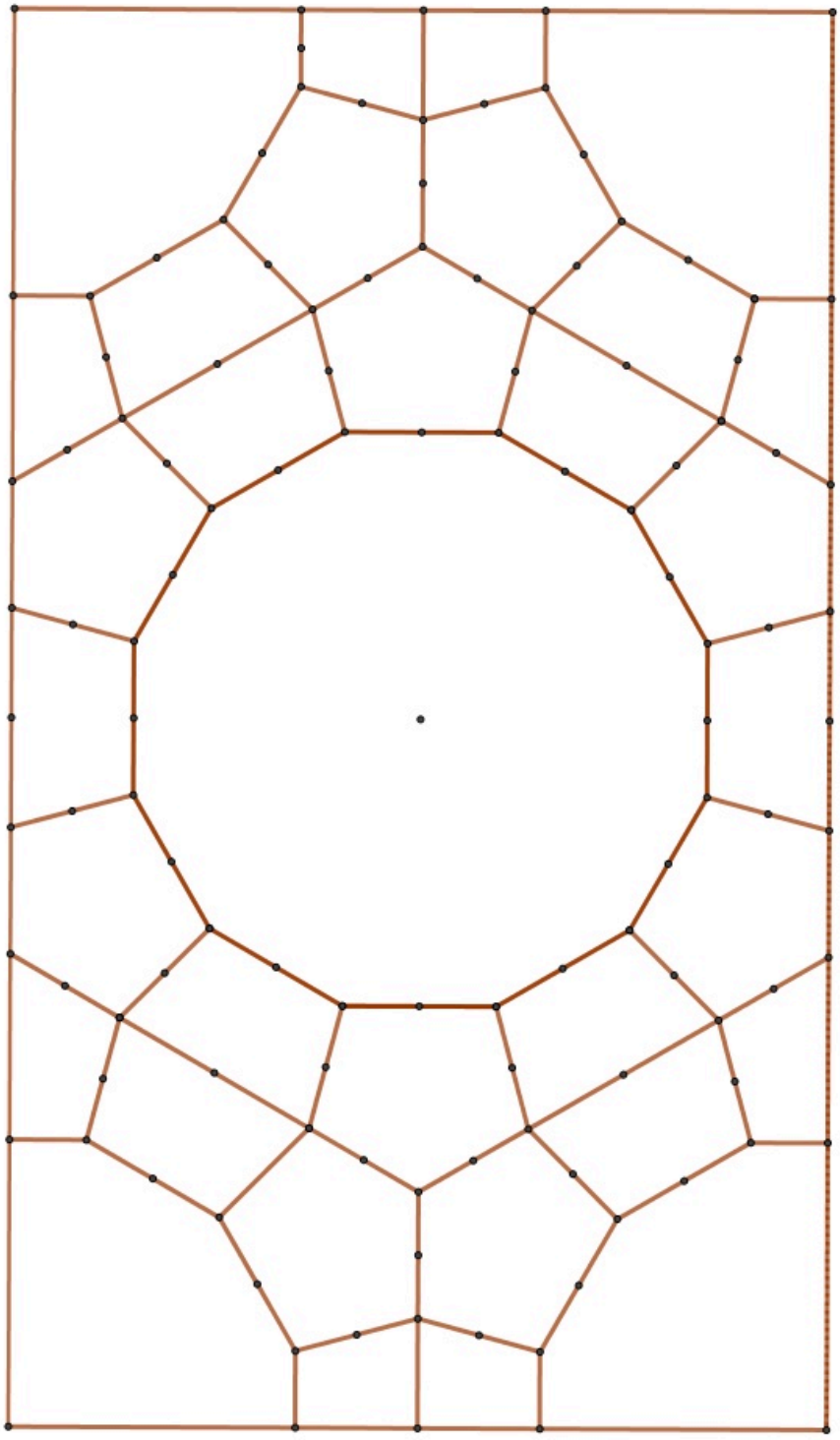
Some additional line segments begin to realize the underlying grid.



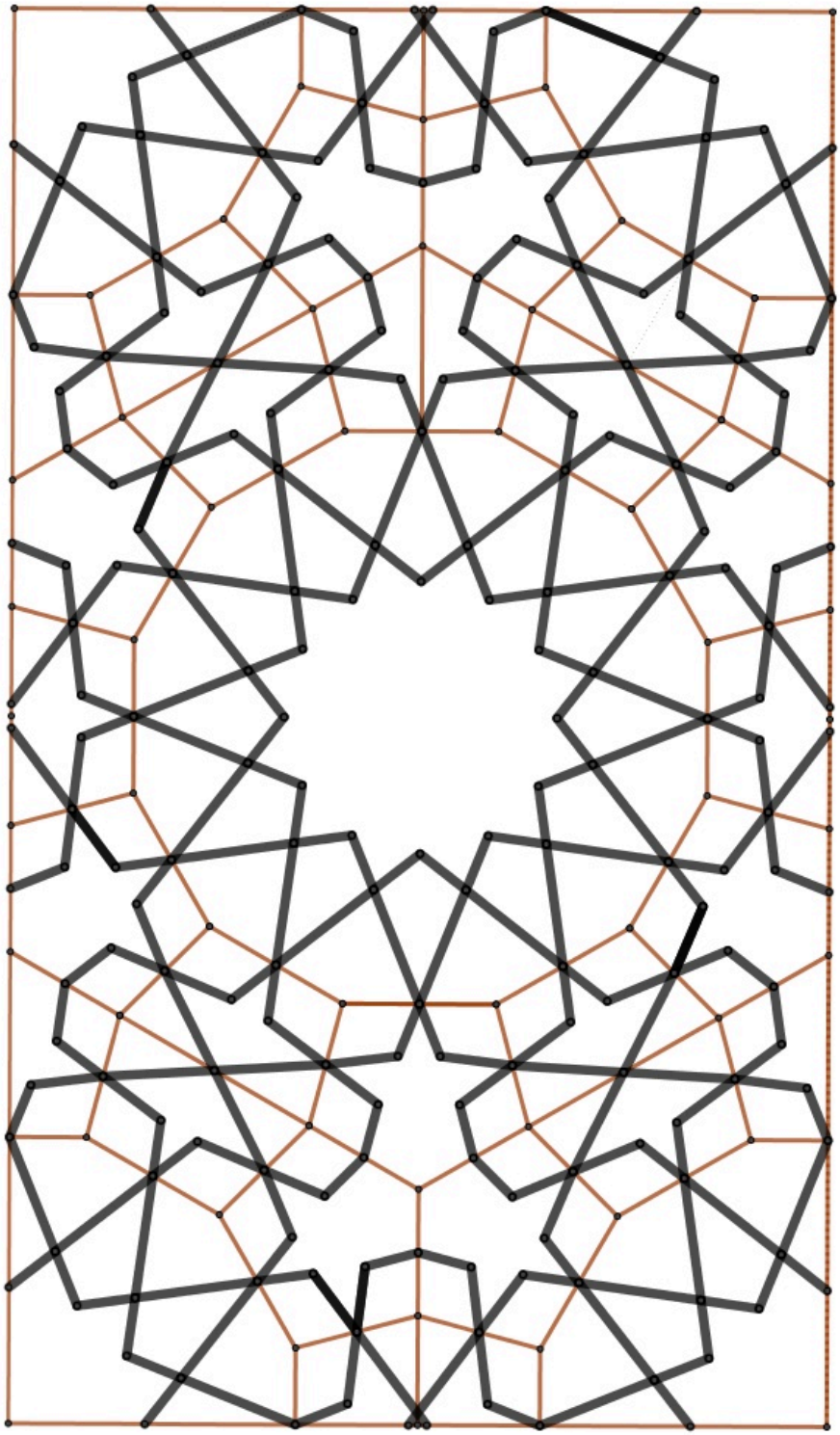
Additional diagonals of the initial hexagon fill out the grid as follows.



The complete grid is shown below with the segment midpoints identified.



The traditional design uses an incidence angle of approximately 65-69, and produces slightly convergent petals on the rosettes.



The following two illustrations display respectively 54, which is more convergent, and 75 which produces parallel rosettes.