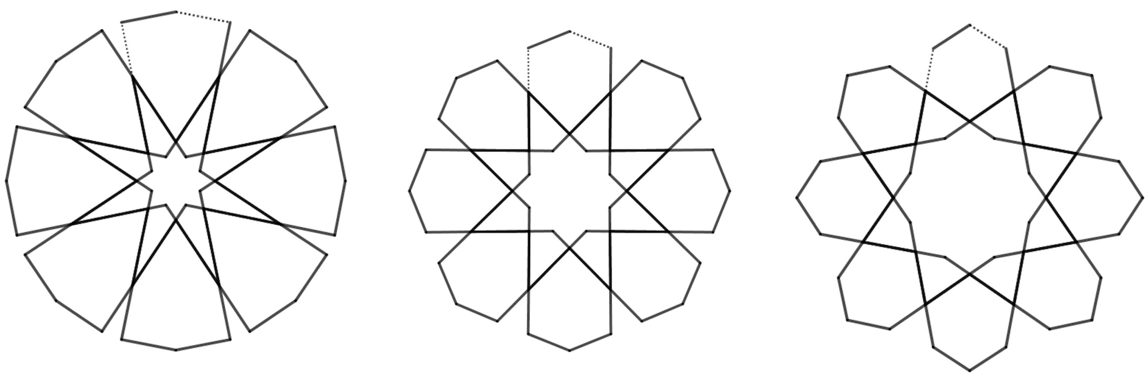
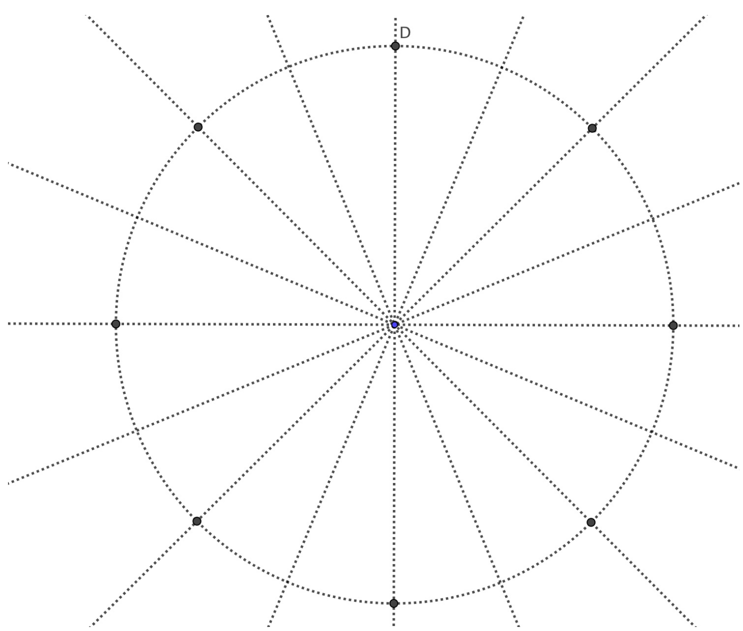
The Rosette is one of the most popular architectural designs. While this can be constructed using the PIC method, it will be helpful to illustrate the construction differently to emphasize specific characteristics of this design. While the PIC method can apply, the proportions do not easily lend themselves to traditional constructions, so we start with this different approach

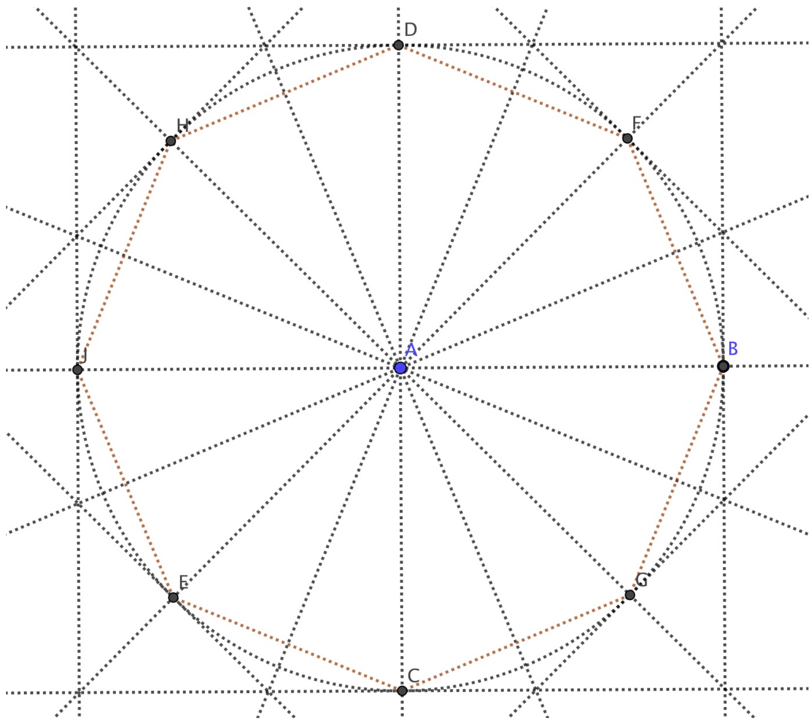
Rosettes naturally form a family as illustrated below. From the left, these patterns are typically referred to as divergent, parallel and convergent, based on the orientation of the sides of each petal.



An important esthetic component is that the upper segment and side segment (as illustrated by the dotted lines) be equal in length. The parallel case is simplest as we will see and so begin with that.
To construct the 8-petalled rosette, we begin with a circle divided into sixteenths.

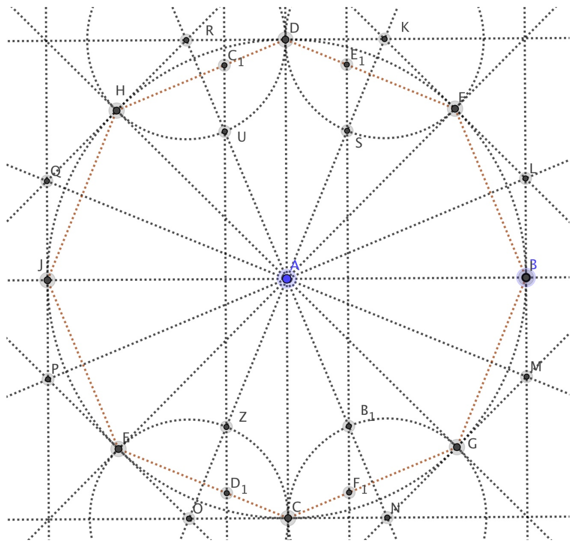


Then connect the 8 points shown to form an octagon and construct tangent lines at these 8 vertices as shown.

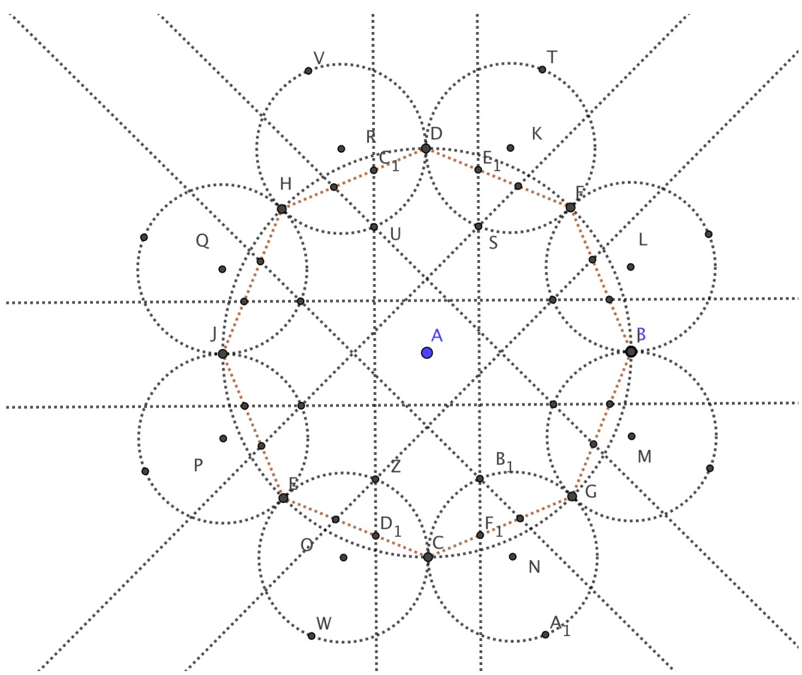


Identify the intersection points of these tangent lines and about each construct a circle of sufficient radius to tangent the 8 corner points of the octagon. The picture below illustrates 4 of these circles, centered at K,R,O and N.

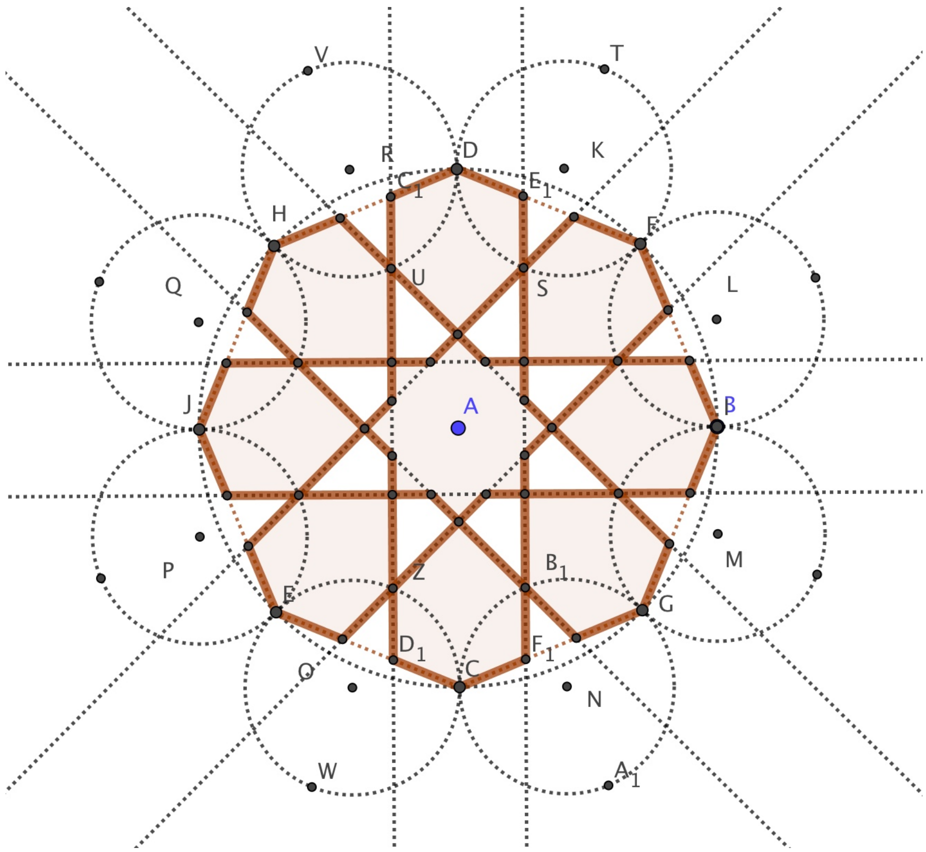
Each of these circles intersects with a diameter of the original circle at S,U,B,Z1. Now join U and Z, and extend in both directions to interest with the sides of the octagon DH (at C1) and EC (at D1). In this manner C1U is the left side of a petal and C1D is the top half of a petal. Not obvious yet is that they are of equal length, but we will prove that later.



Now repeat this same process three more times to create 3 more sets of parallel lines. This is done using circles at Q,P,M,L then K,L,O,P and then Q,R,M,N. Each of these sets of parallel lines intersects the octagon at points that are vertices of the petals. The picture below removes the diameters and tangent lines to better illustrate these sets of parallel lines.



All of the vertices of the petals are now identified and shown below.


V
T
R
D
K
C1
E1
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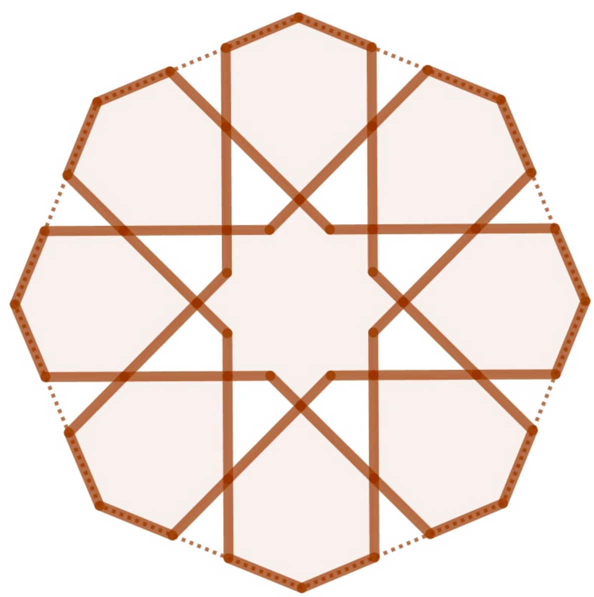
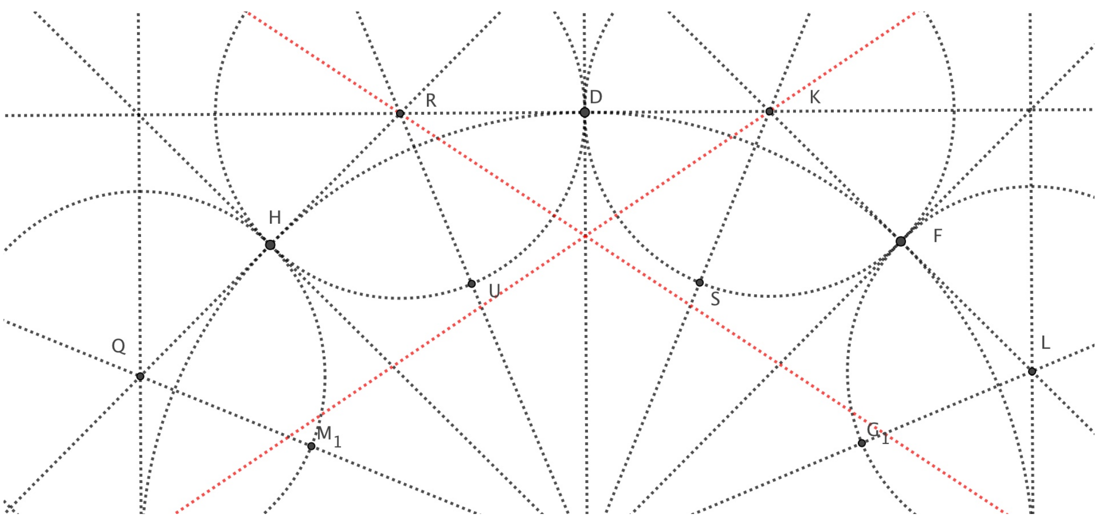
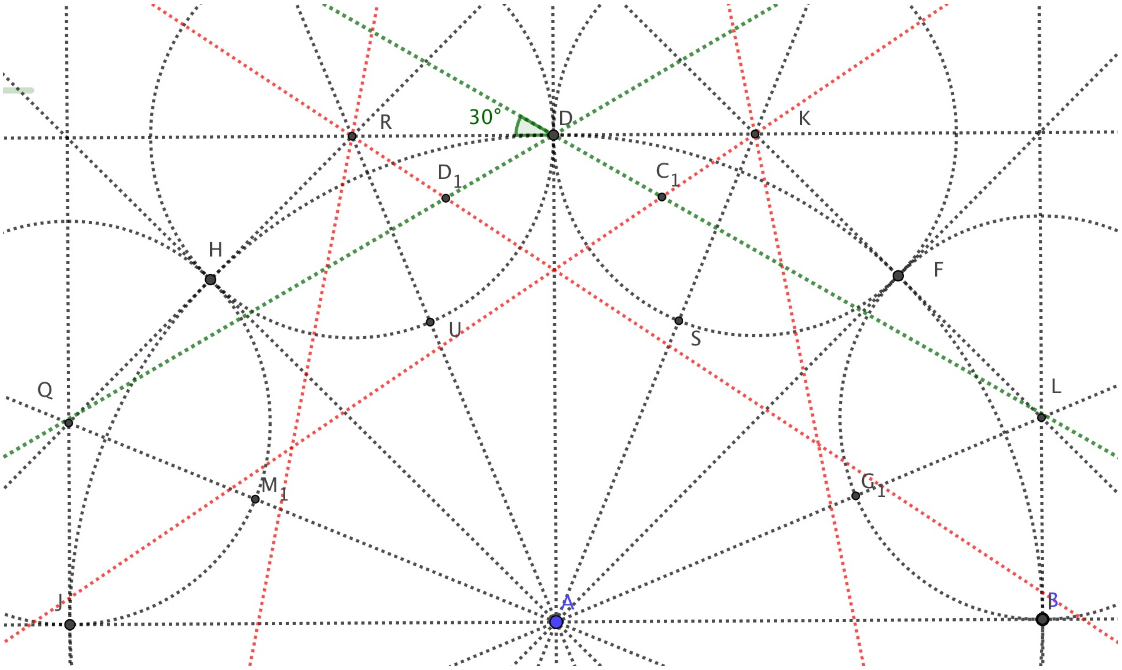


The construction of convergent and divergent rosettes requires some additional intermediate steps. This construction will make clear why the top and sides are equal in length, and how the parallel rosette is just an example of the more general construction. First, we will have to create some additional lines.

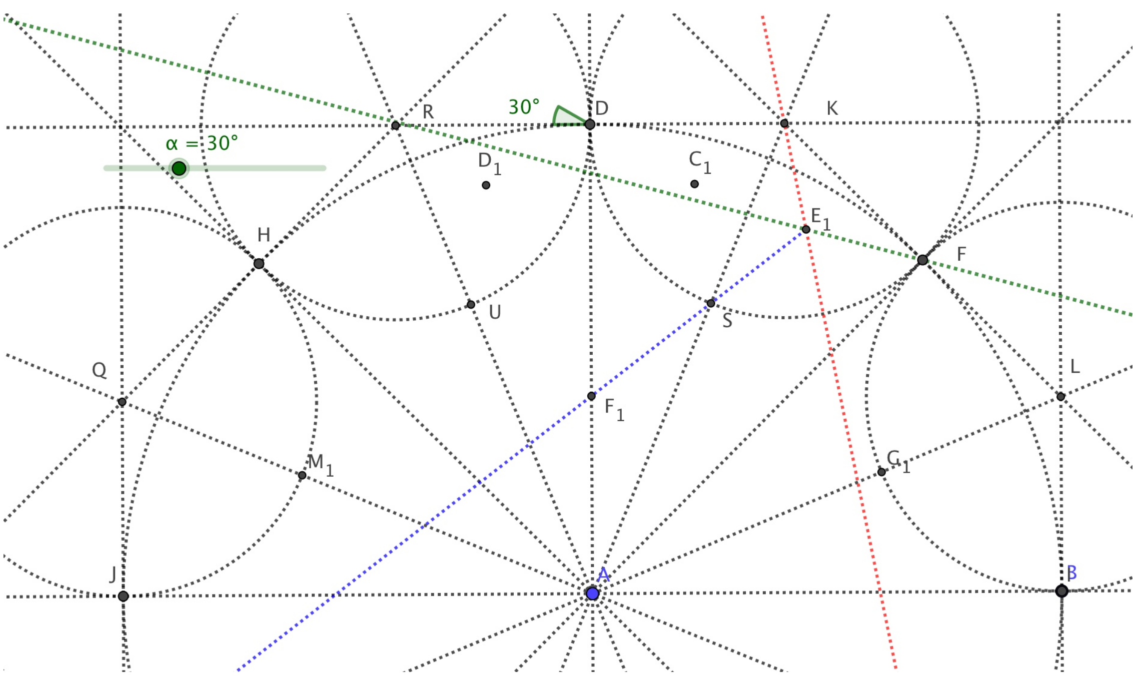
The main addition is in constructing a bisector of angle DKS as shown. Note that DK and KS have equal length, both being radii of the same circle.



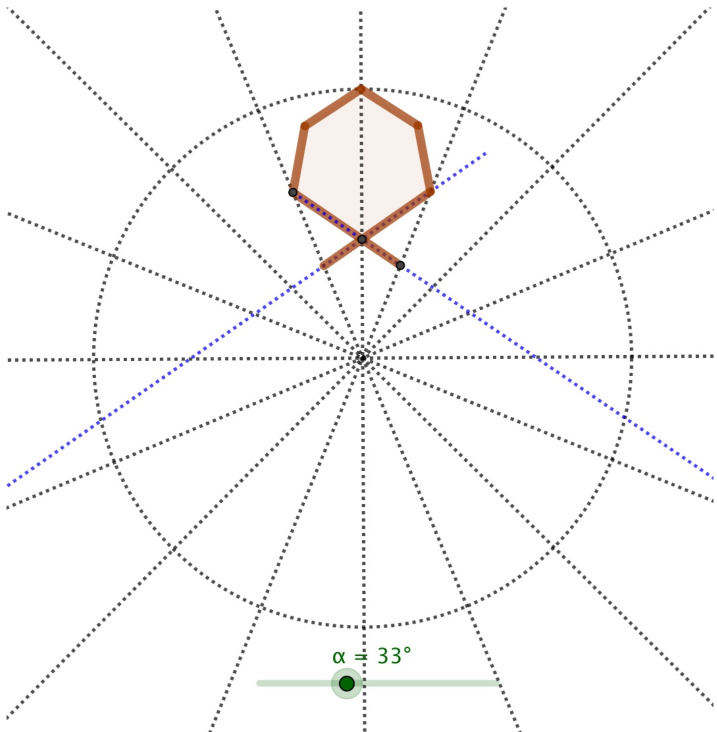
Now we can pick any point on the bisector to continue this construction. To do so, we arbitrarily draw a line through D at an angle to the tangent. If we choose 22.5 we will obtain the parallel rosette above, so to better illustrate what is happening, we will use a different value, approximately 30. The intersection of this line with the bisector (denoted by C_1 or D_1) form the upper corners of the petal. C_1S and D1U are the sides. That these are equal follows from the SAS congruence principle. DK and KS are equal because they are radii of the same circle. KC_1 is equal to itself, and angle DKC_1 is equal to C_1KS because they were found by bisecting the angle DKS.



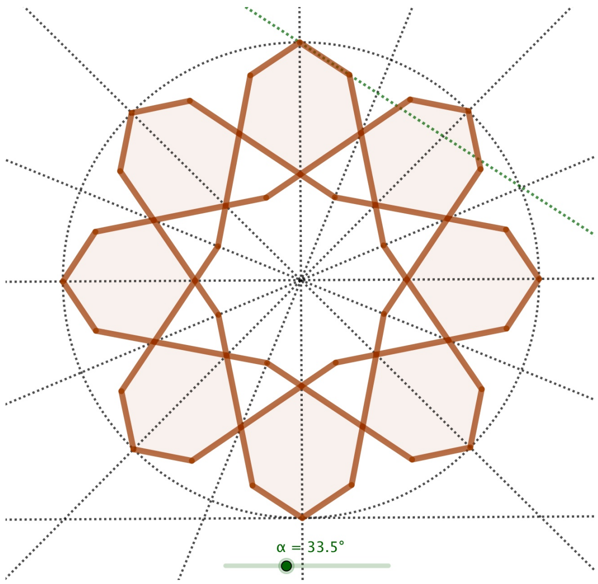
All that remains to be identified is the lower point of the petal. To find this we repeat the steps above about point F, by constructing a line at 30 to the tangent at F and by bisecting FKS. These two lines intersect at E_1. E_1 is a vertex of the next petal but is also needed to locate the bottom of the first petal as shown. Extending E_1S to the vertical diameter of the original circle identifies F_1 which is our remaining point.

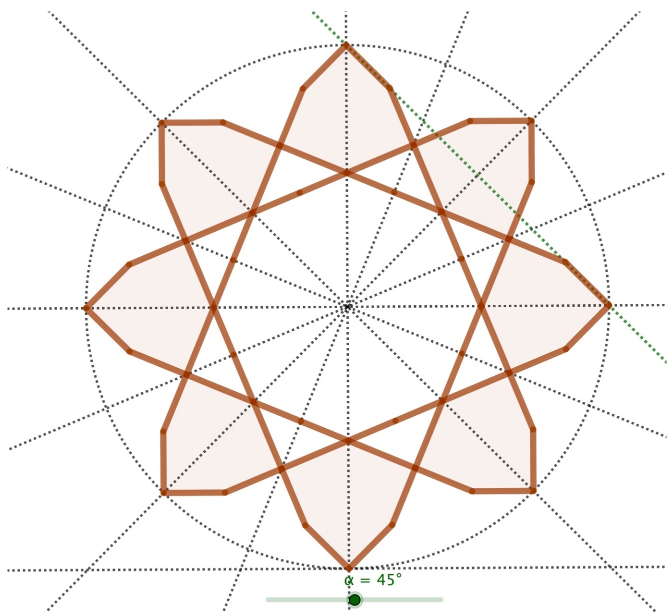


Now we can connect $DC_1SF_1UD_1$ to form the top petal. In addition note that the segment SF_1 and UF_1 are extended to the next radial lines. This will be helpful in forming the inside of the rosette.

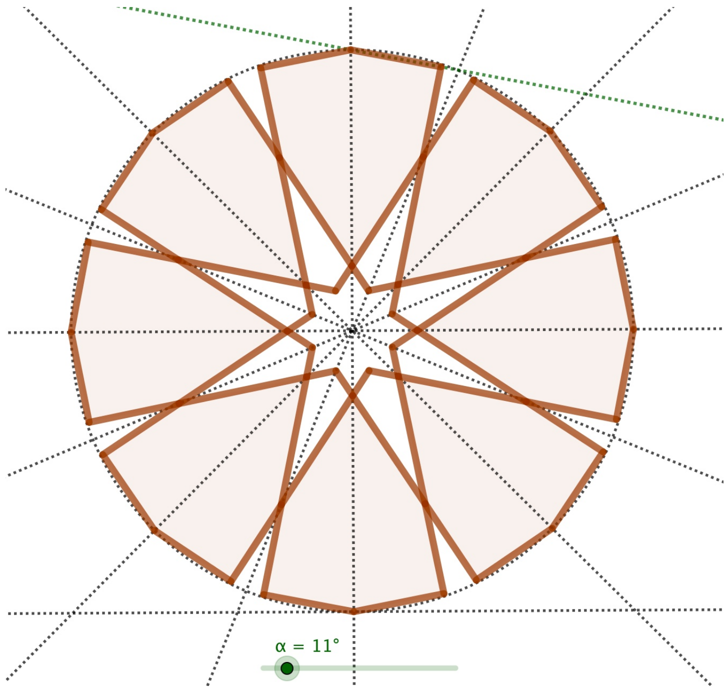


Now repeat this procedure around each of the 8 vertices of the original octagon to achieve the following. Note these typical convergent rosettes below are formed from an incident line obtained by connecting intersections of the original circle with various radii, thus not requiring the use of a protractor measure out a specific angle.





Divergent rosettes can also be formed by using similar points as well.



And finally, the parallel rosette which began by using an intersection point is shown here to be just another angle, namely 22.5 .