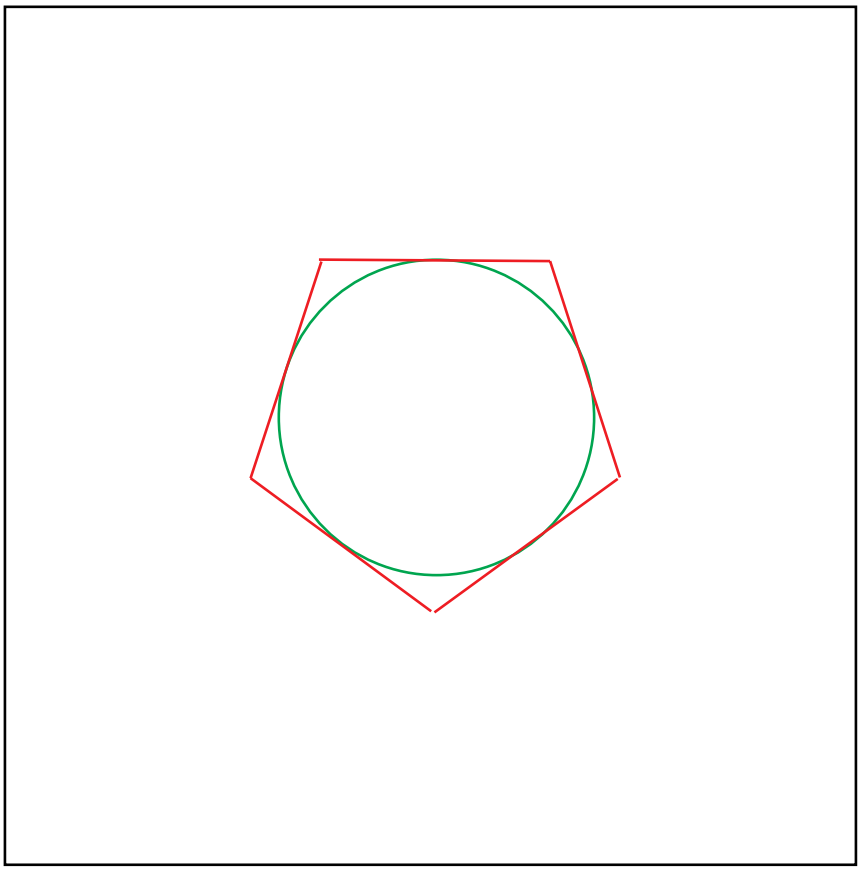
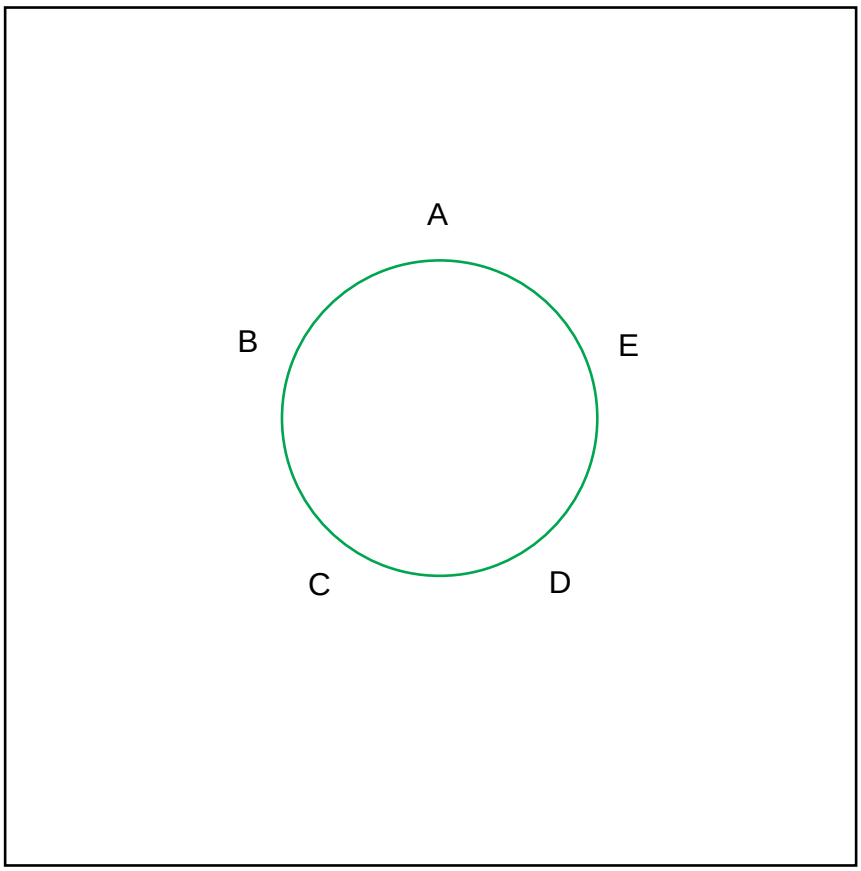
Construction 34: Book IV, Proposition 12

About a given circle to circumscribe an equilateral and equiangular pentagon.

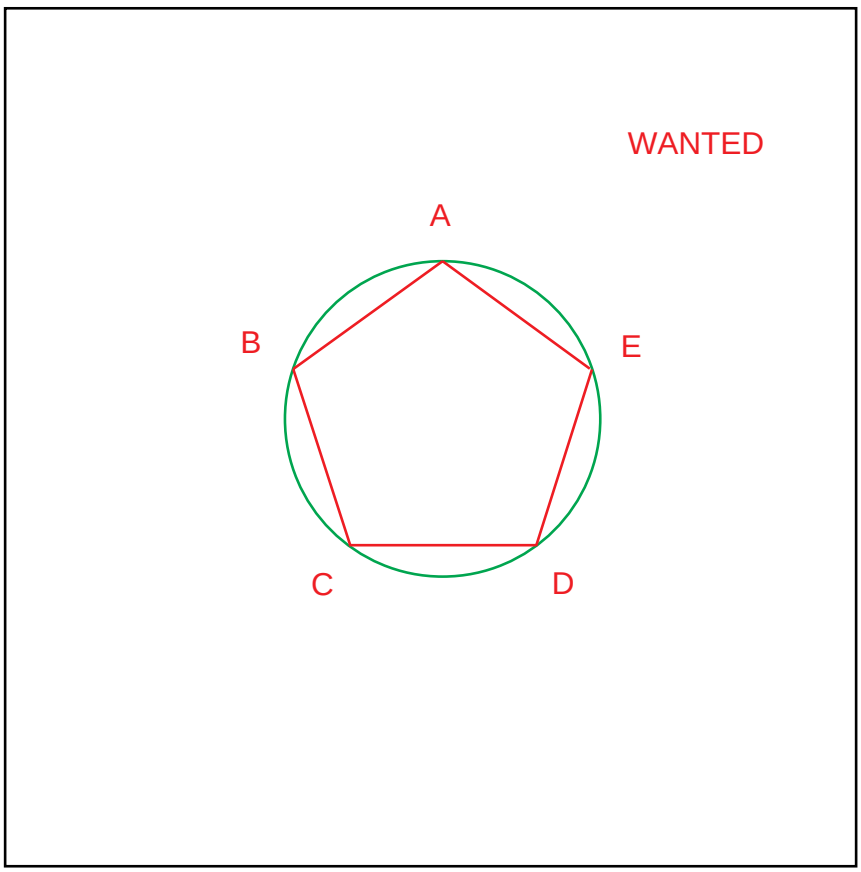


IV.12:3. Let ABCDE be the given circle;



IV.12:7. Let A, B, C, D, E be conceived to be the angular points of the inscribed pentagon, [IV.11]

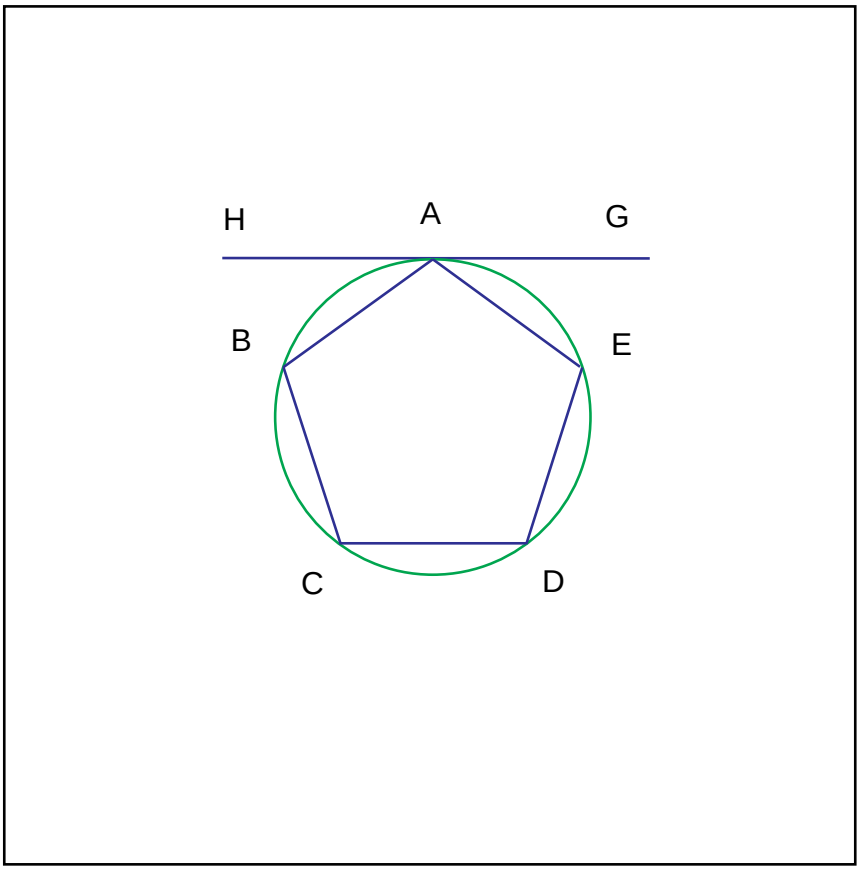
We are not going to GOSUB here, but assume the inscribed pentagon, via IV.11, C#33 (or the Taylor alternative.)



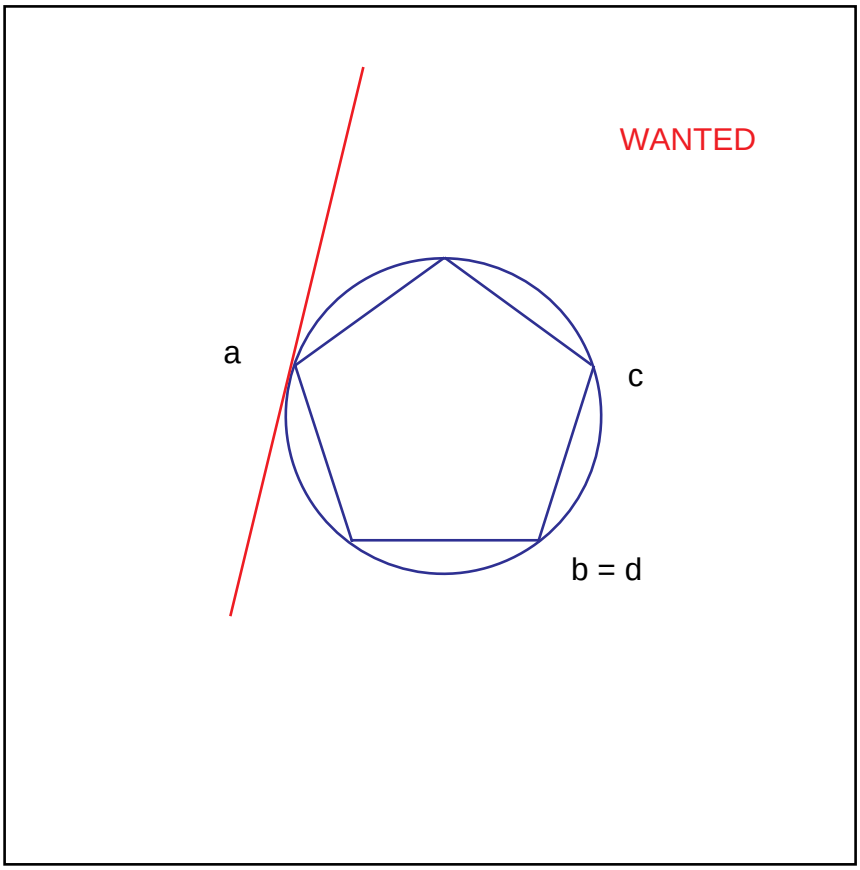
IV.12:12. Through A, B, C, D, E let GH, HK, KL, LM, MG be drawn touching the circle; [III.16, Por.]

For point A, we obtained the line HG in step 31 of C#33. Restore this line. Note that it is parallel to CD. We may use the parallel line construction, C#10, 10 steps, in place of the touching line construction C#18B, 14 steps. This is needed 4 times, at B, C, D, E. So if we follow C#33 to begin, we need 91 steps. If we follow Taylor for the inscribed pentagon, 21 steps, we need C#10 for A also, 5 times altogether, of 72 steps total. Or follow Taylor's method again! We will carry out one say at B.

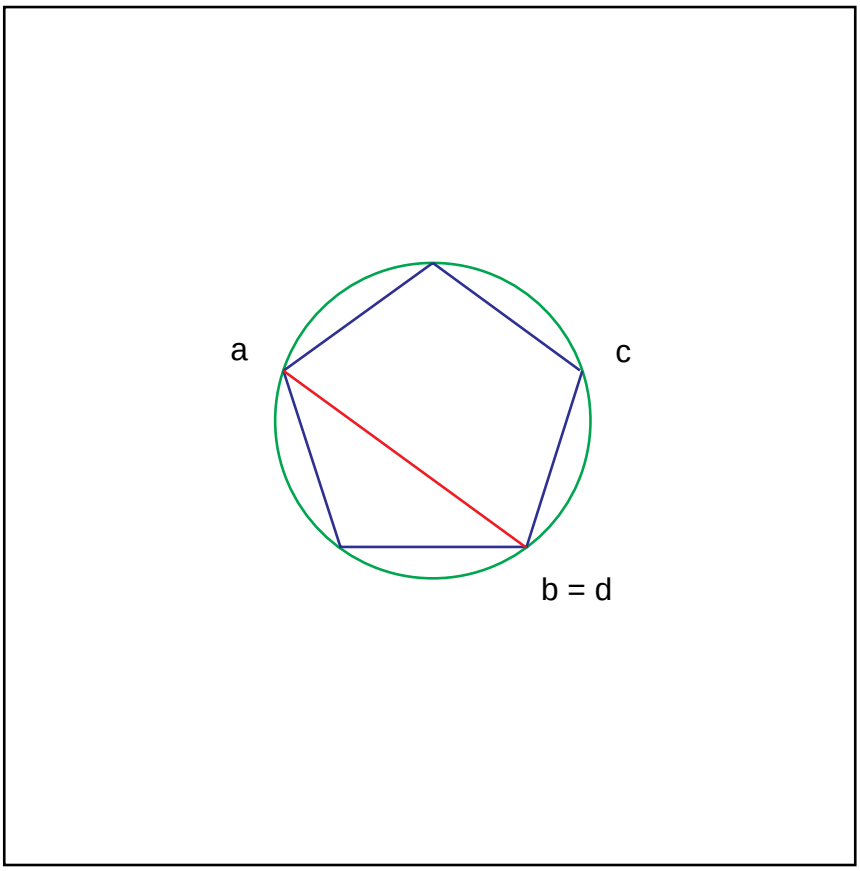
GOSUB C#10 (I.31) for point B, parallel to DE. Relabel.



I.31:7. Let a point d be taken at random on bc,
[Here we may take d = b].



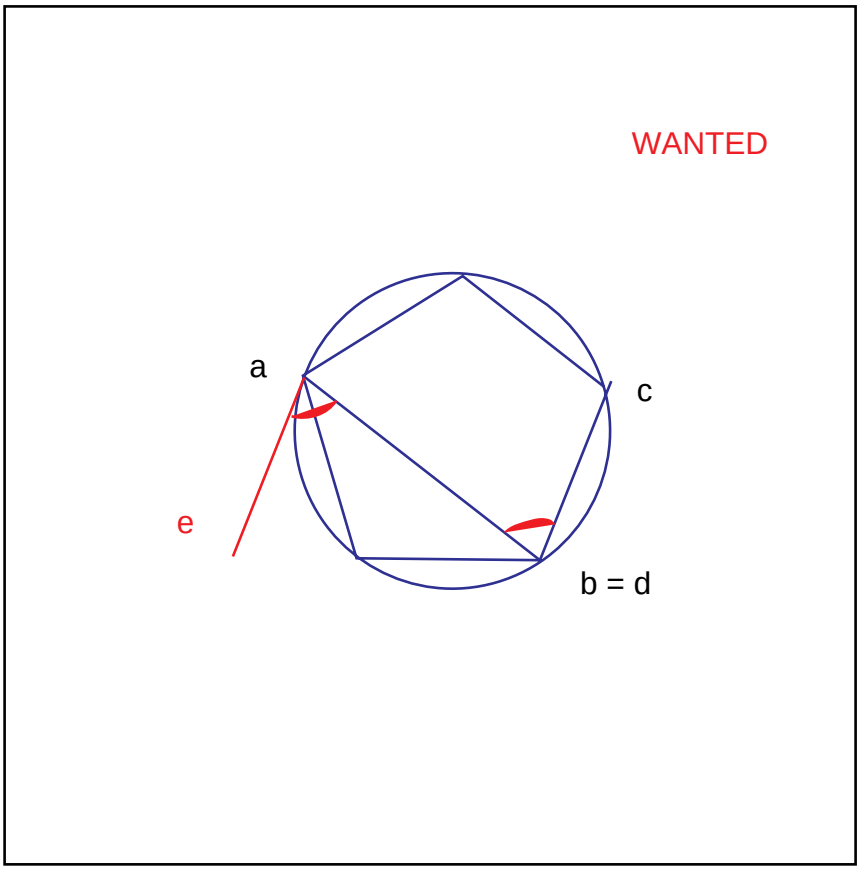
I.31:7. and let ad be joined;



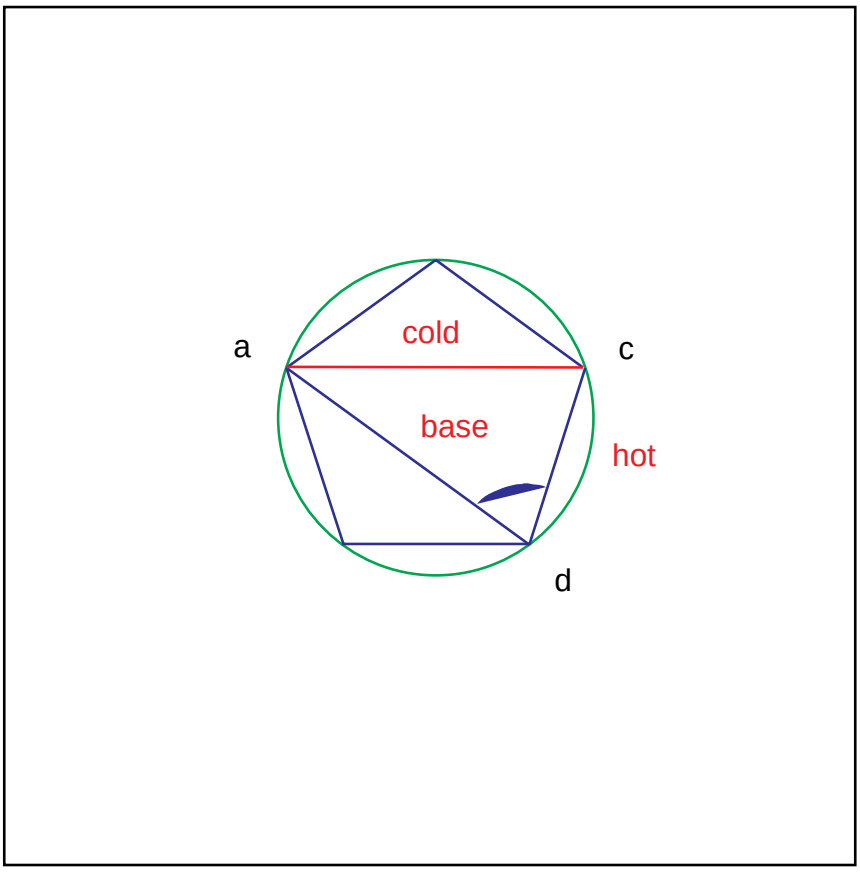
I.31:8. on the straight line da, and at the point a on it, let the angle dae be constructed equal to the angle adc [I;23]

GOSUB I.23.

We will keep these labels.

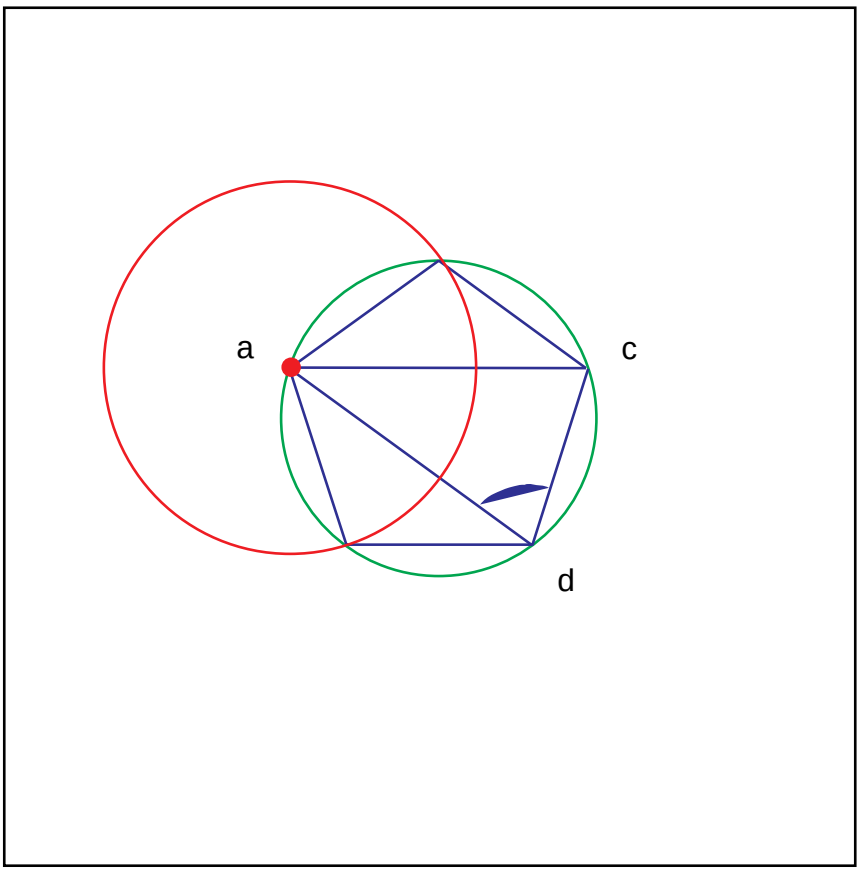


I.23:10. let ac be joined,

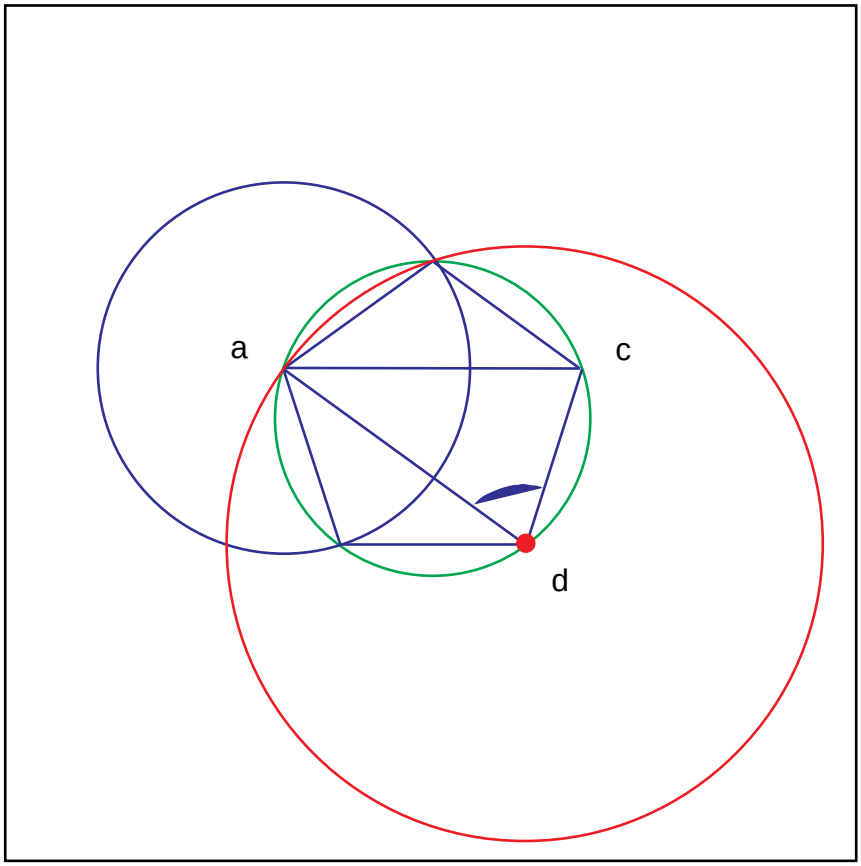


GOSUB I.22P.

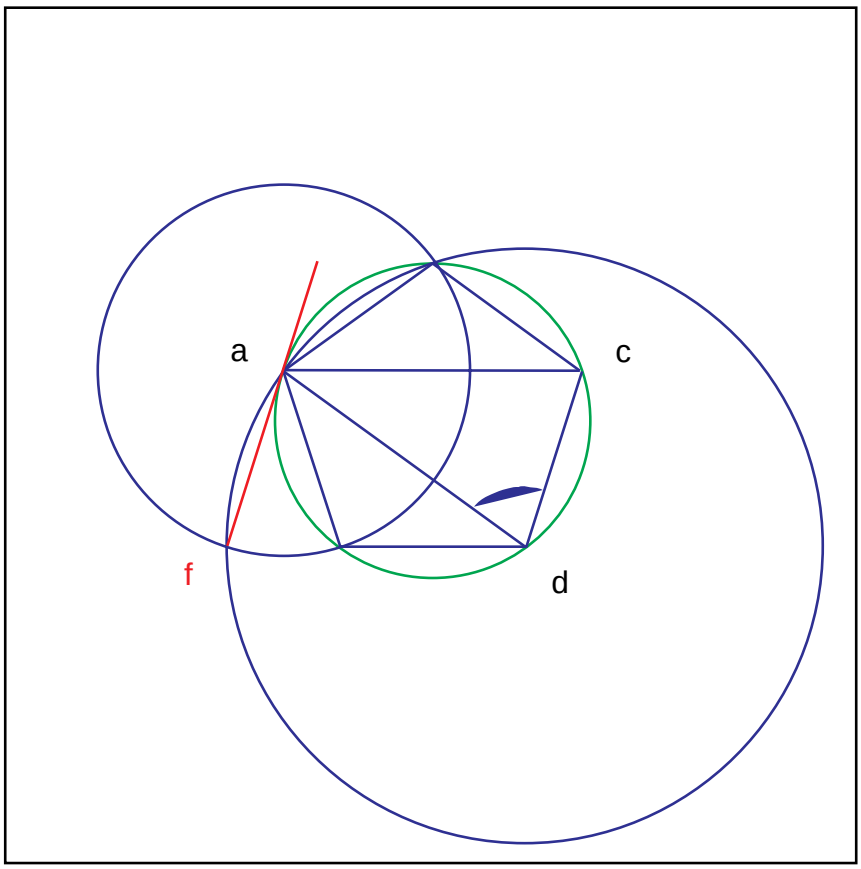
Swing the hot arm cd around the hot end a of the moved base ad.



Swing the cold arm ac around the cold end d of ad.



Connect the lower crossing point f to a. Extend.



Cleanup.
RETURN to I.23:10.

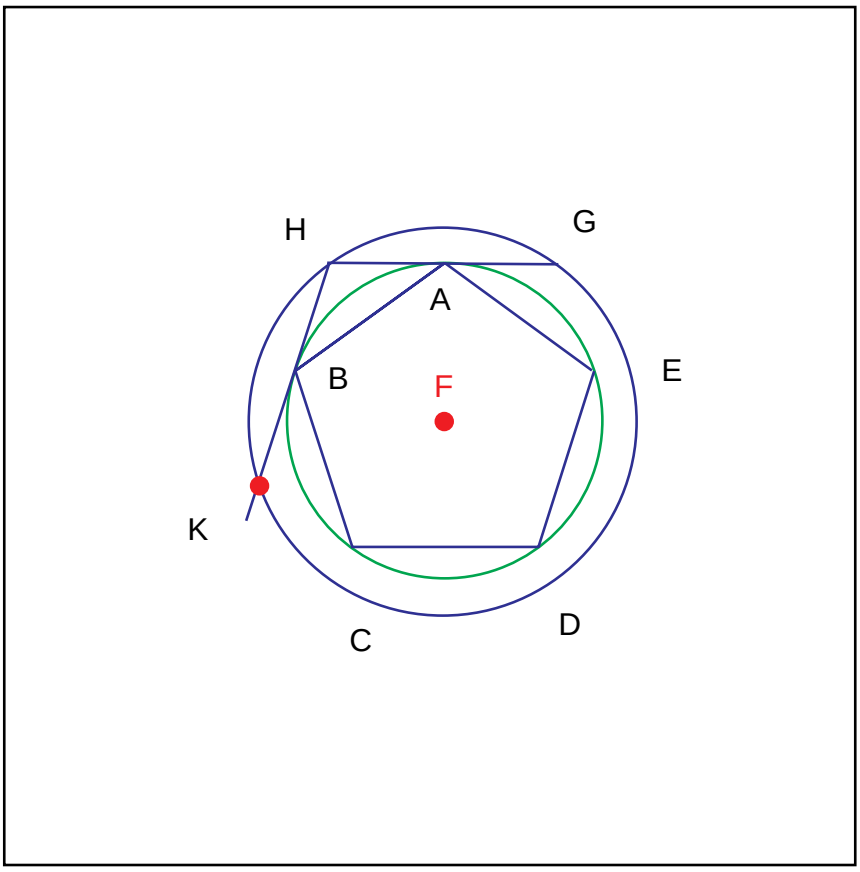
RETURN to IV.12:12.
Relabel.

Again restore HG. Let H be located at the intersection of HG and the new line touching B.

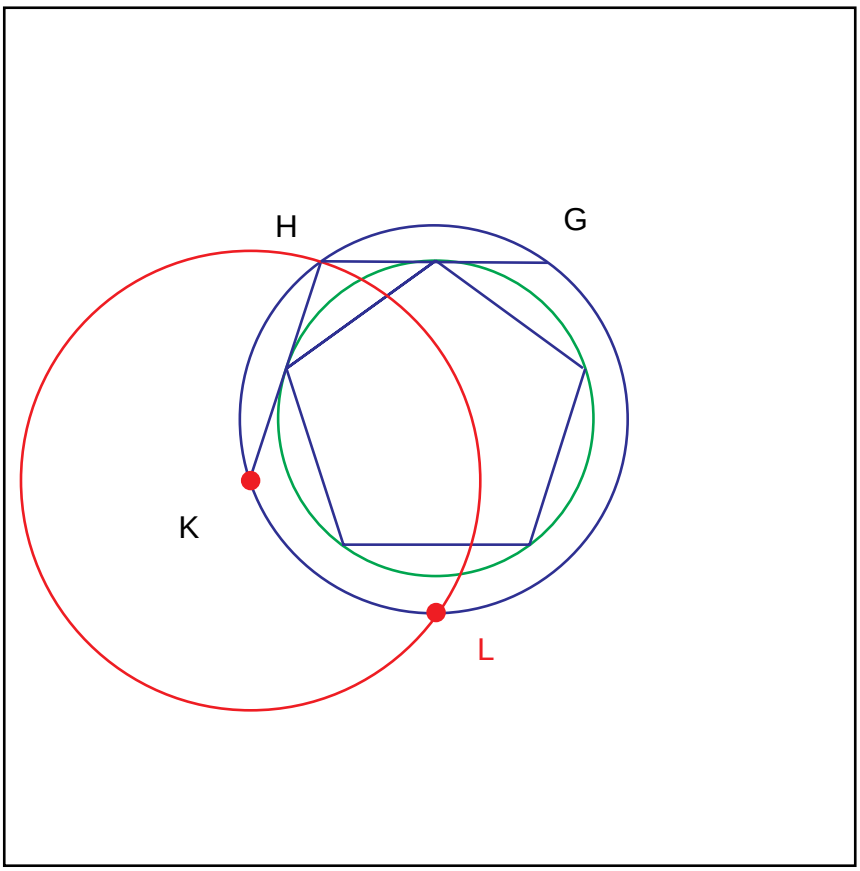
While Euclid, at IV.12:12, would repeat this 5-step construction at each of the remaining points, C, D, E, (15 steps), we will now follow the Taylor variation (4 steps).

Restore the center, F, of the circle, from step 25.

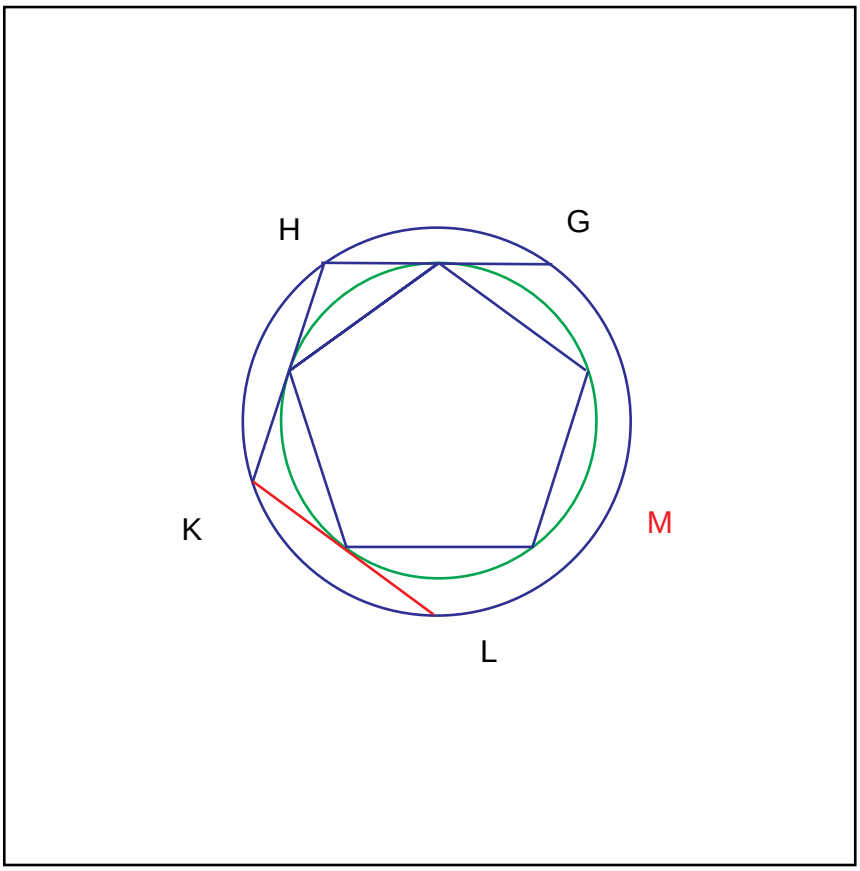
With centre F and distance FH let the circle HKL be constructed. Let K be the point at which this circle crosses the new line HK.



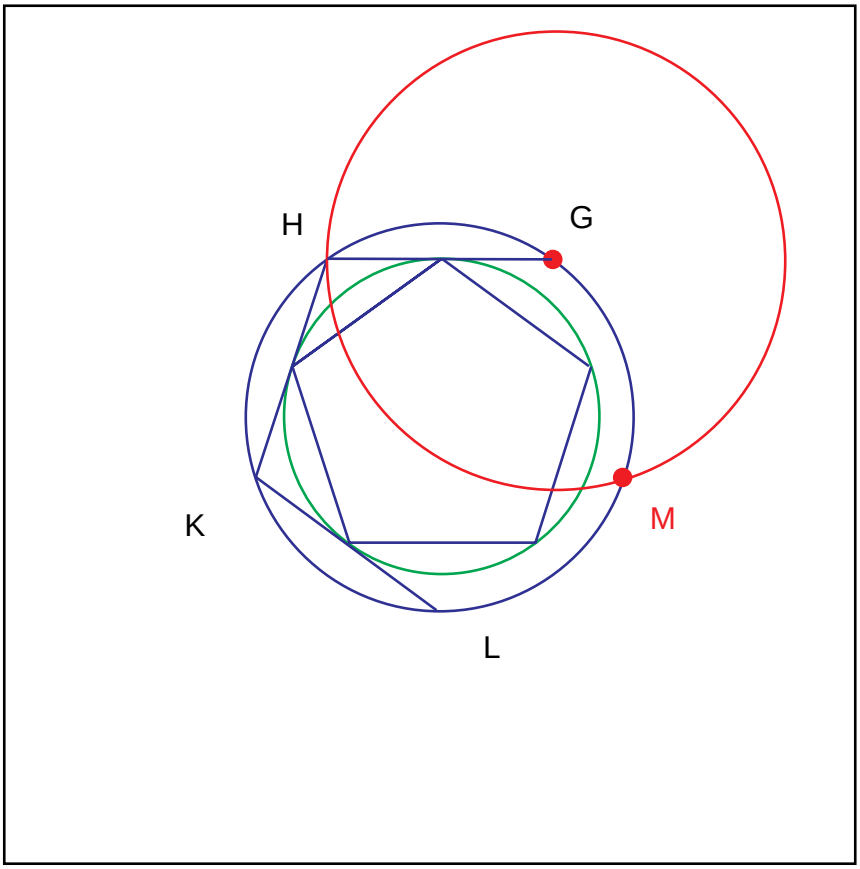
Locate the point L by measuring distance HK around the larger circle, from K.



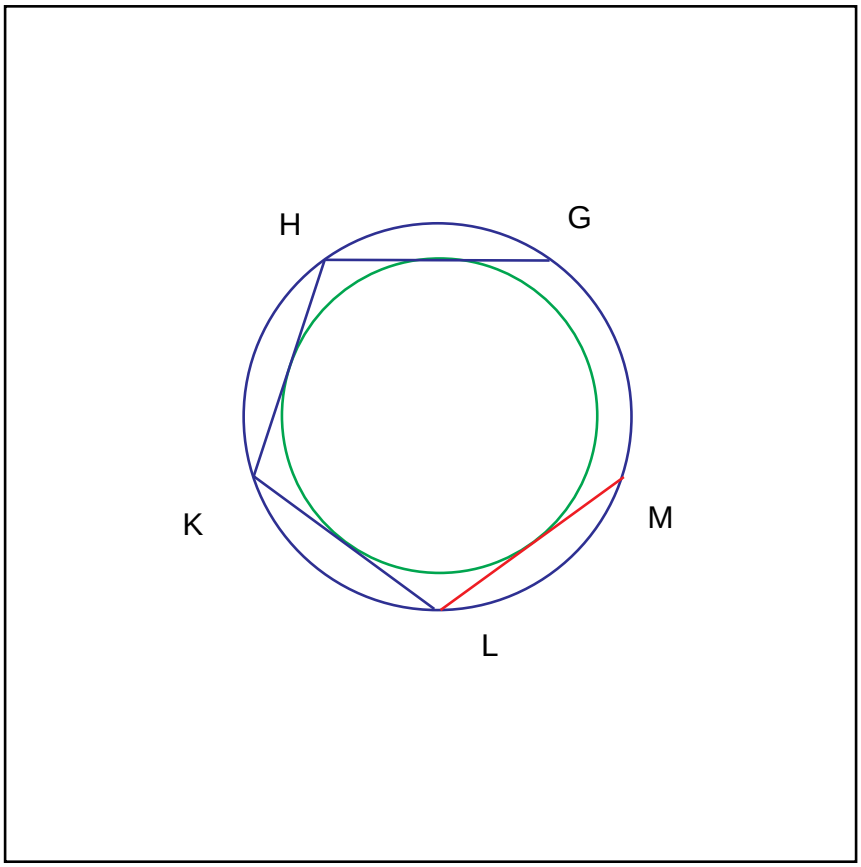
Join KL.



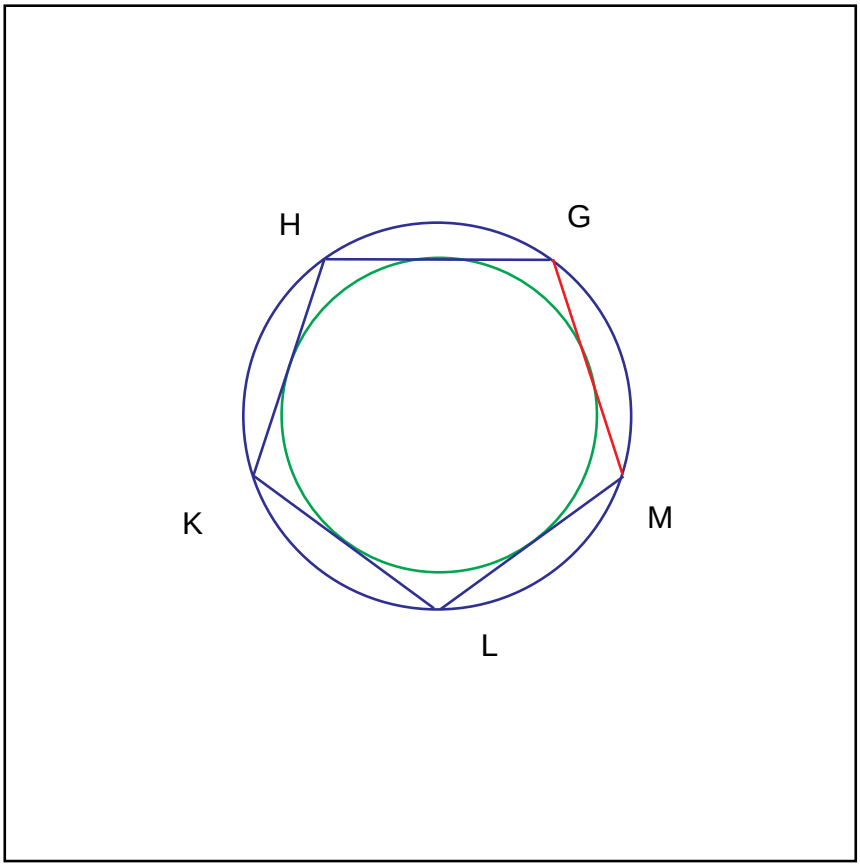
Locate the point M by measuring distance HK from G.



Join LM.



Join MG.



Cleanup.

DONE.