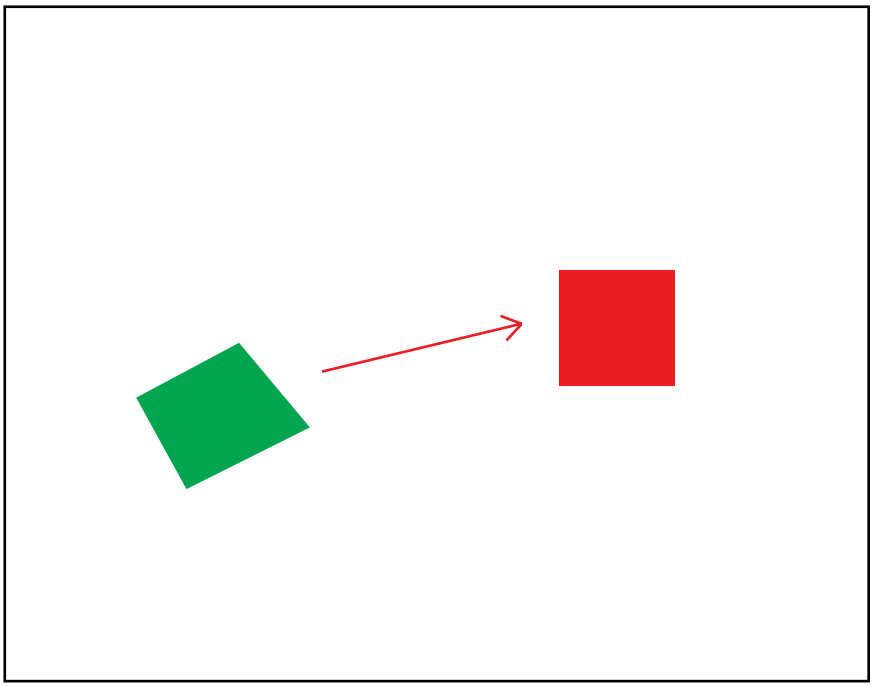
Construction 16: Book II, Proposition 14

To construct a square equal to a given rectilineal figure.

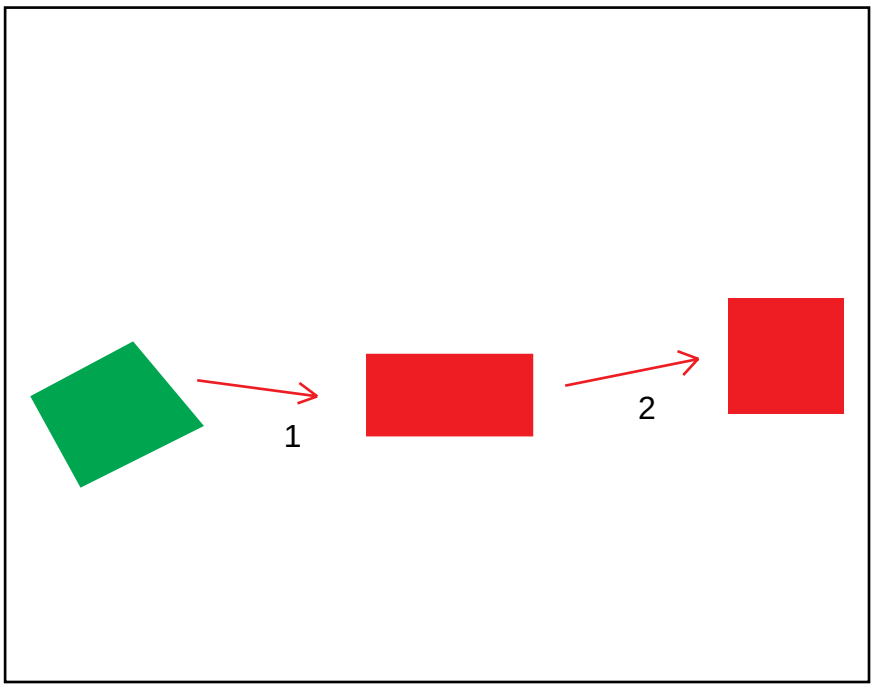


Note: Like C#14 from I.45, this is a compound construction. Euclid proceeds in two steps.

1. To construct a rectangle equal to a given rectilineal figure.

This is a special case of C#14, in which the given rectilineal angle is a right angle (54 steps!)

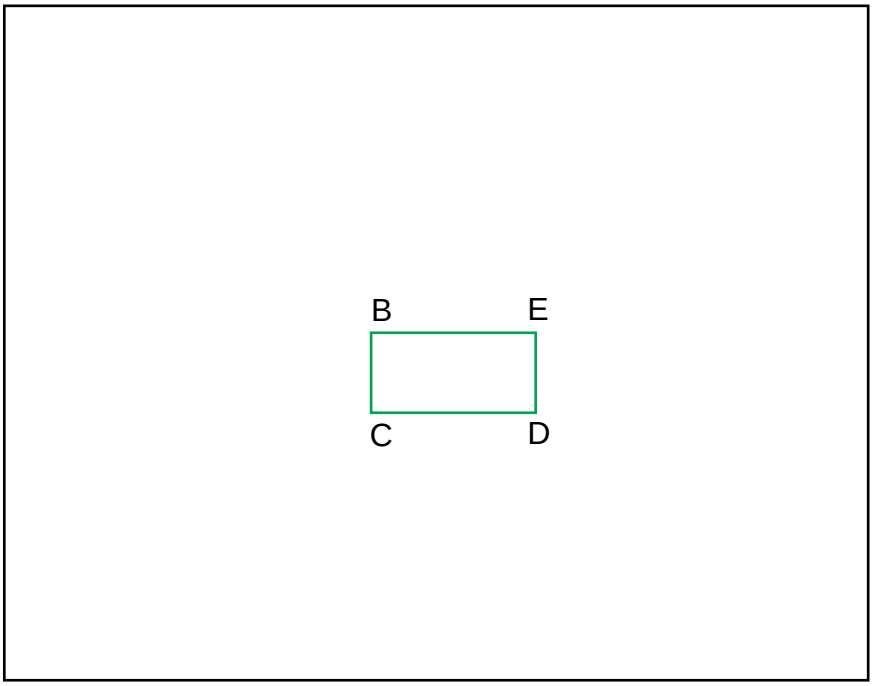
2. To construct a square equal to a given rectangle. (10 steps.)



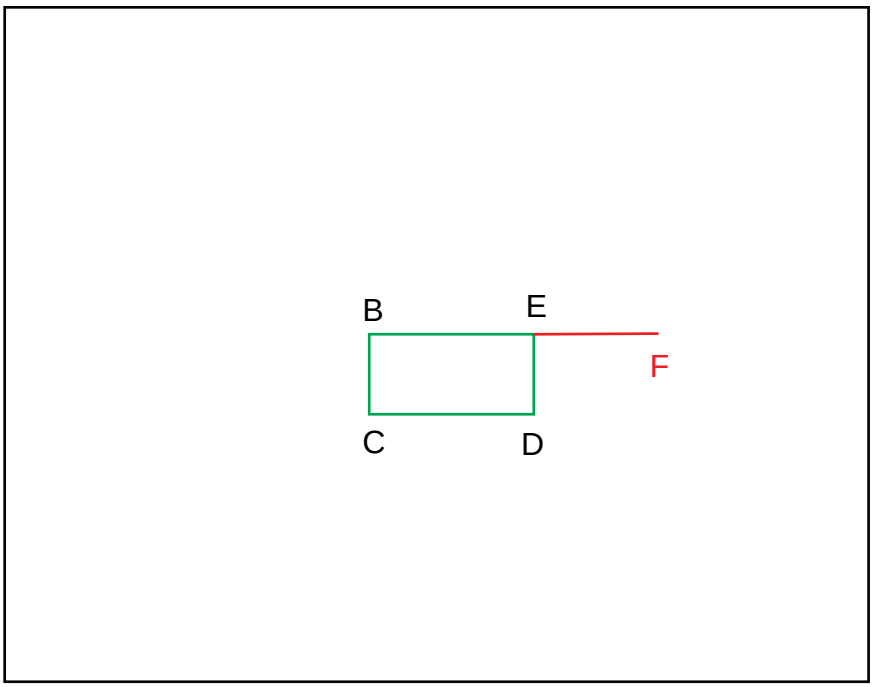
We are going to carry out step 2 only. This is the essential construction here, as far as geometric algebra is concerned. See Heath v.1, p. 40.

GOSUB II.14.

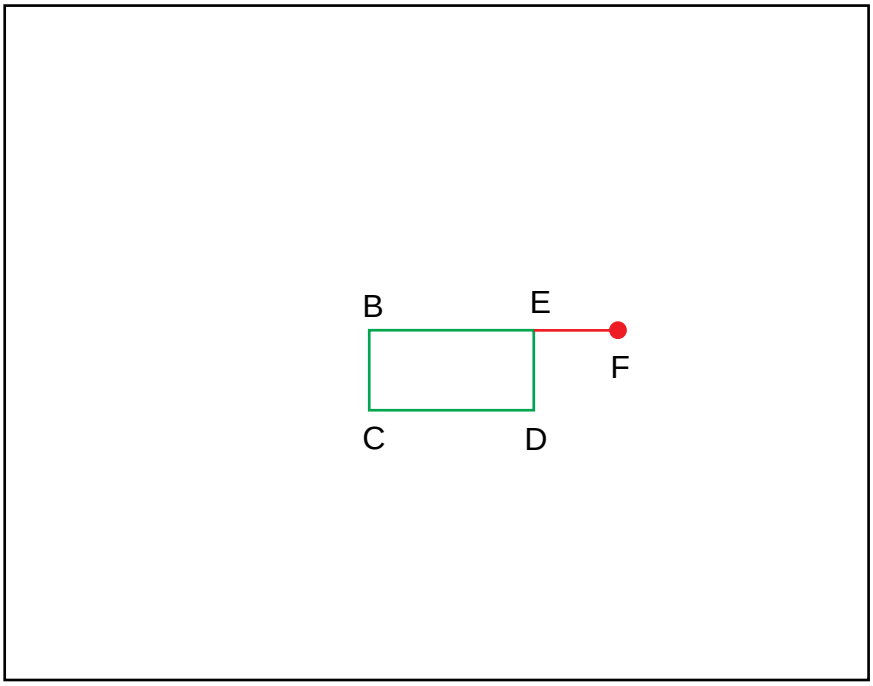
II.14:5. The rectangular parallel-ogram BD...
I.14:10. one of the straight lines BE, ED is greater. Let BE be greater,



II.14:11. and let it be produced to F; (F is not yet fixed)

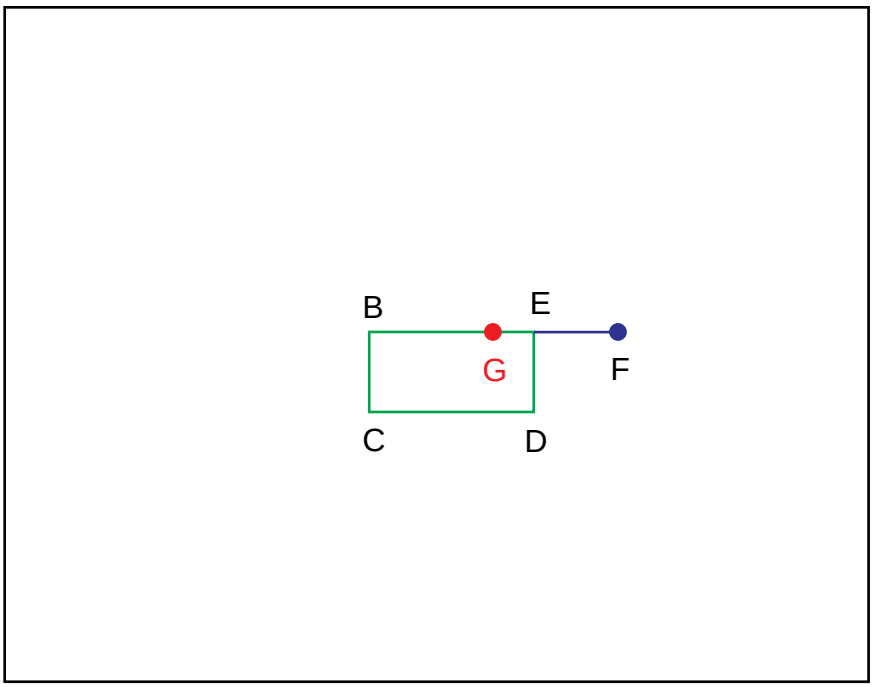


II.14:12. let EF be made equal to ED, (I.3, rope trick, or dividers)

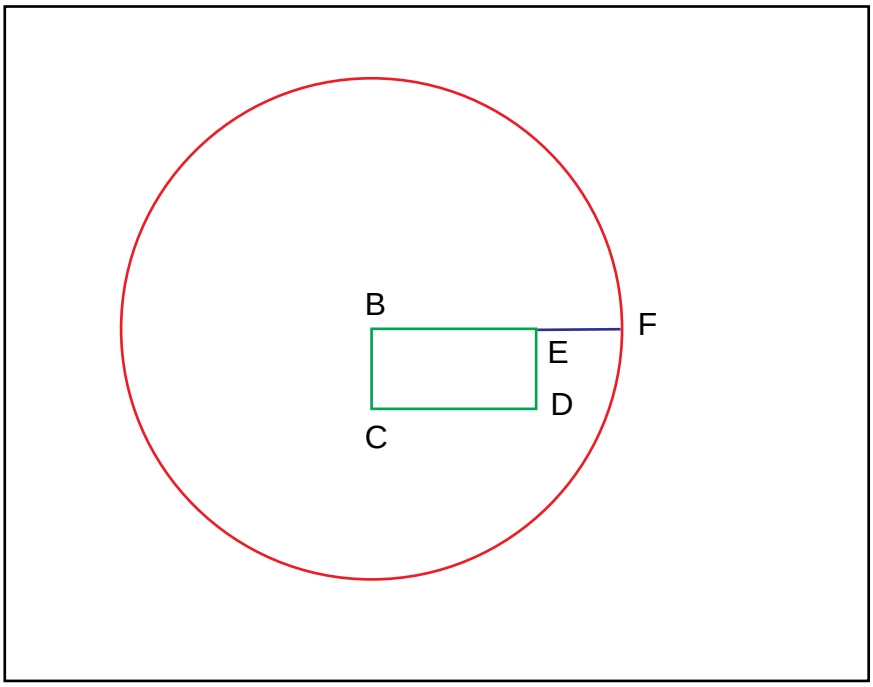


II.14:12. and let BF be bisected at G. ([I.10])

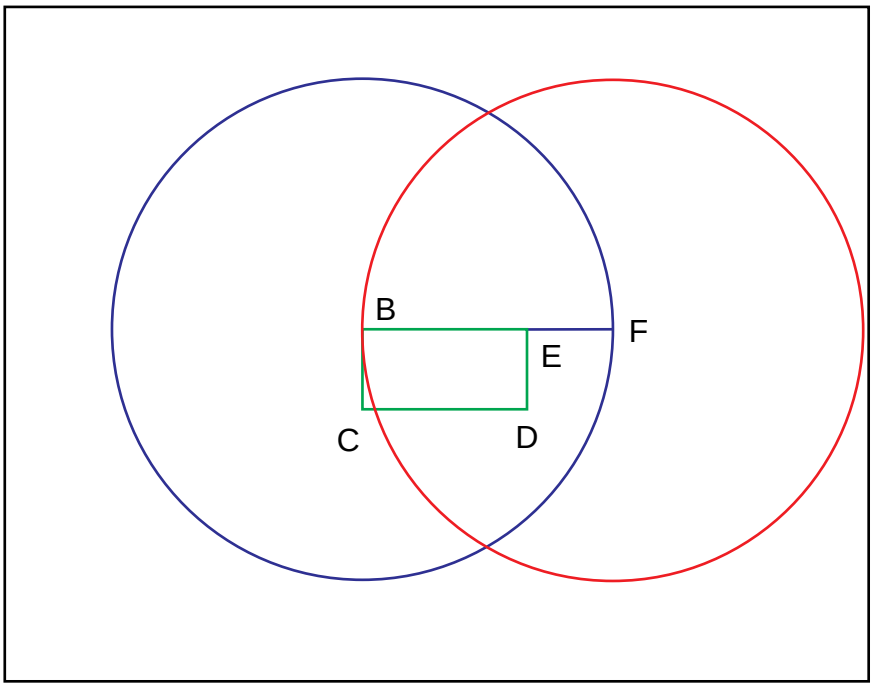
GOSUB I.10.
Actually, we will use the shortcut, C#5B.



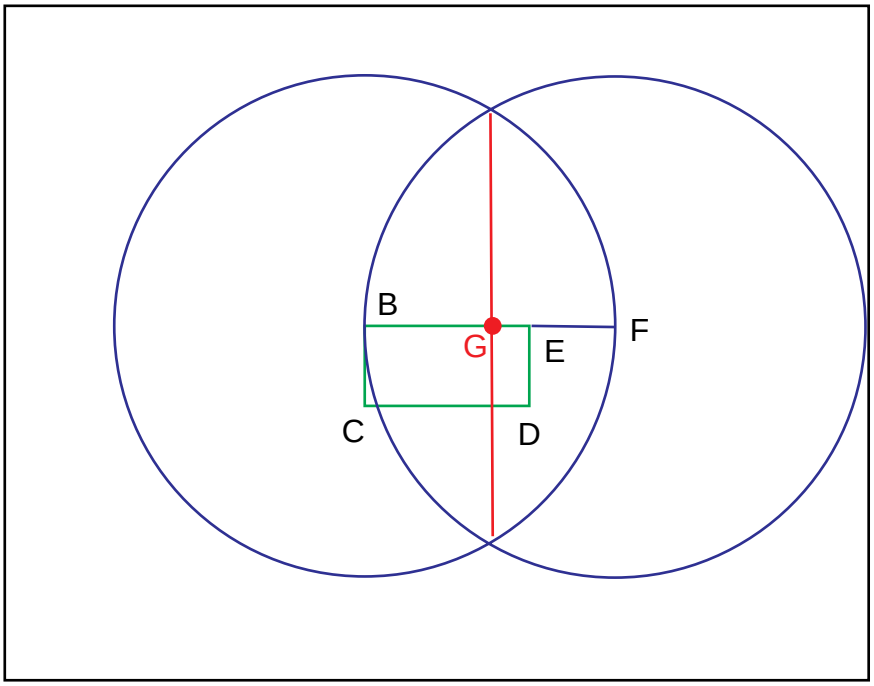
With centre B and distance BF...



With centre F and distance FB...

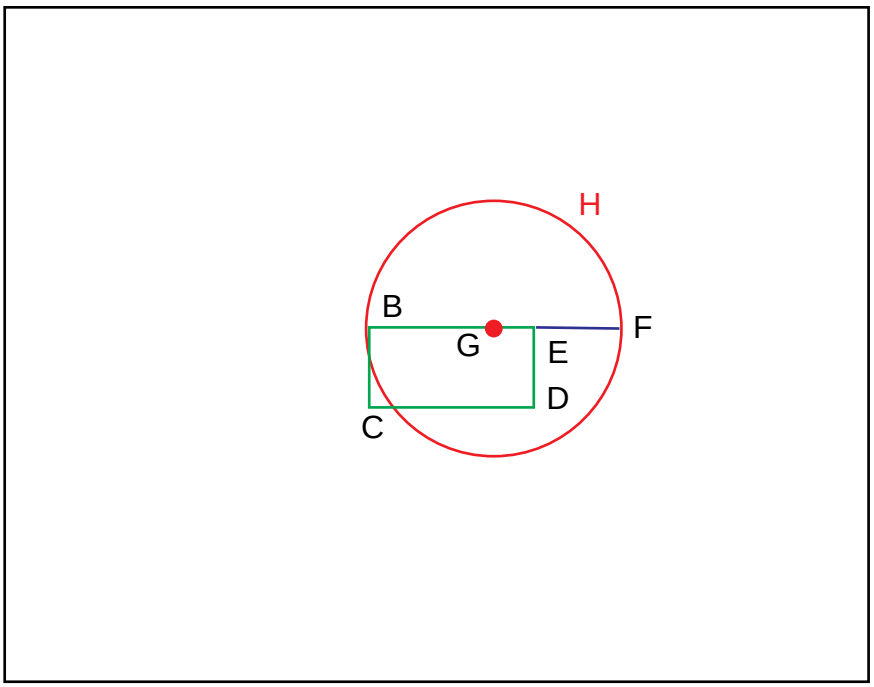


Connect crossings, mark the bisection point.

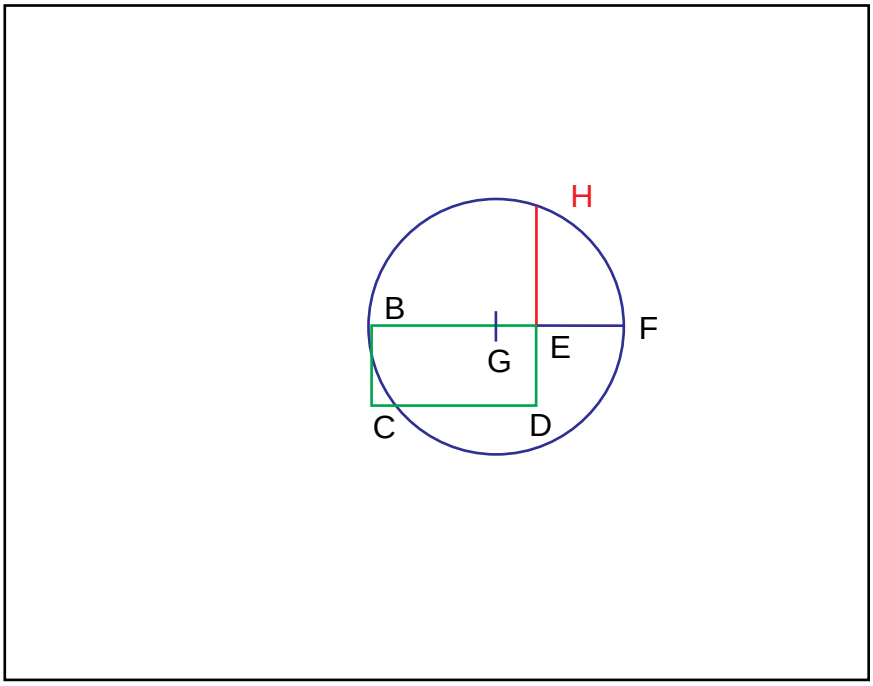


Cleanup.
RETURN to II.14 at line 12.

II.14:13.. With centre G and distance one of the straight lines GB, GF, let the semicircle BHF be described;
(H is not exactly located yet.)

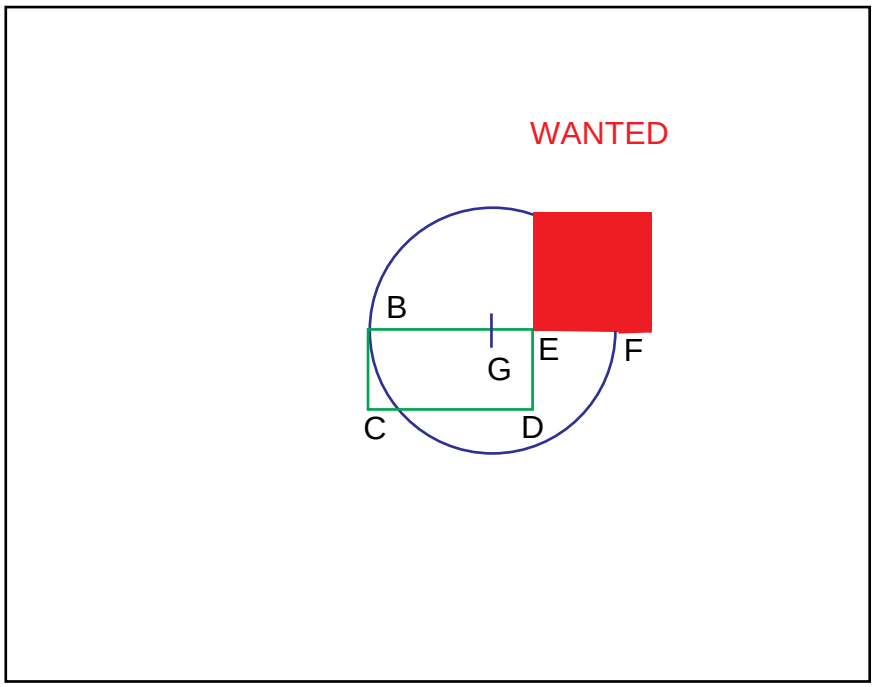


II.14:14. let DE be produced to H,

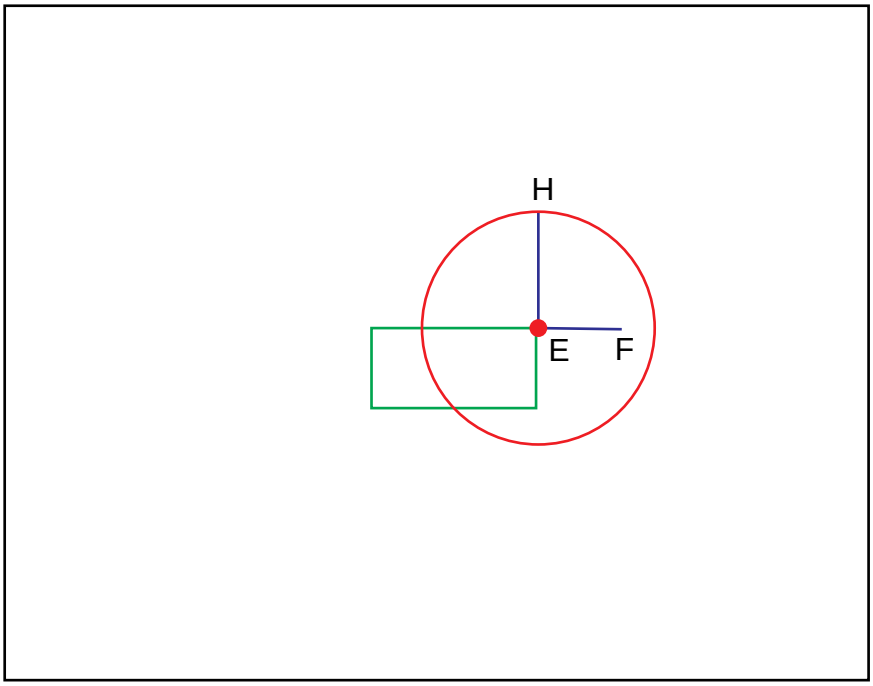


II.14:28. The rectangle contained by BE, EF which remains is equal to the square on EH.

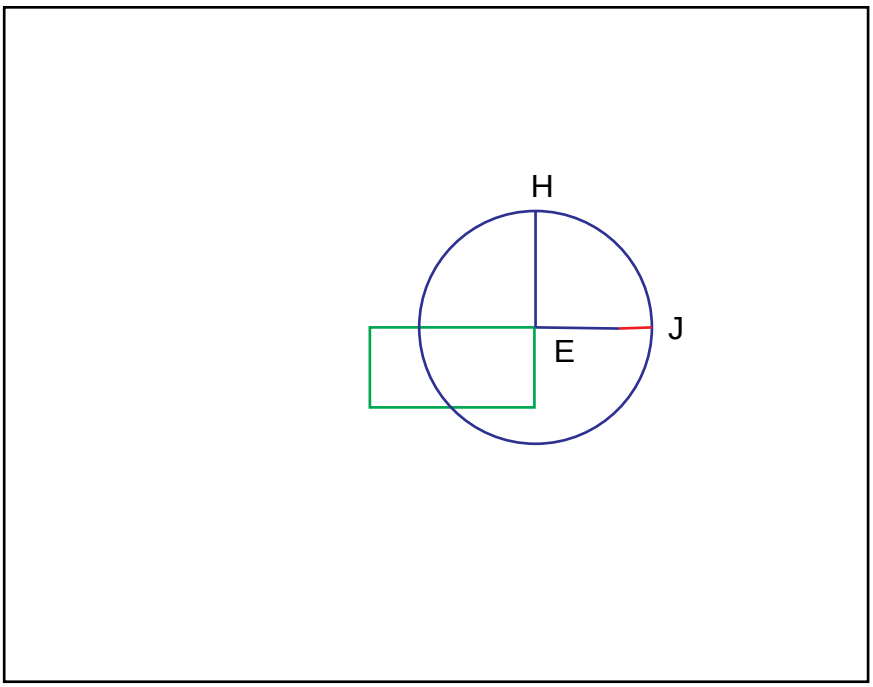
GOSUB C#14B, three circle method.



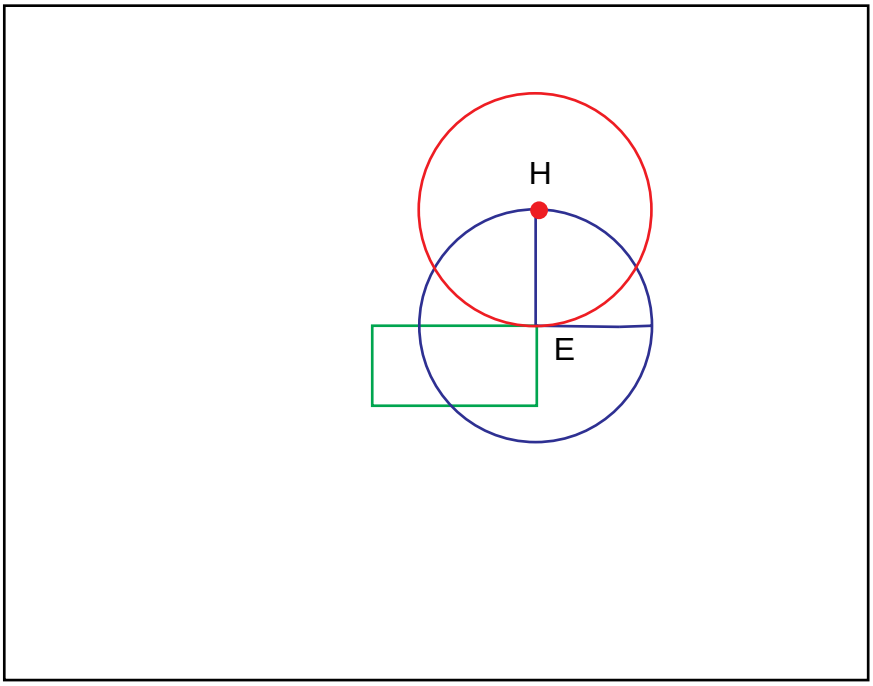
Set the compass to the distance EH. Swing the first circle around the corner, E.



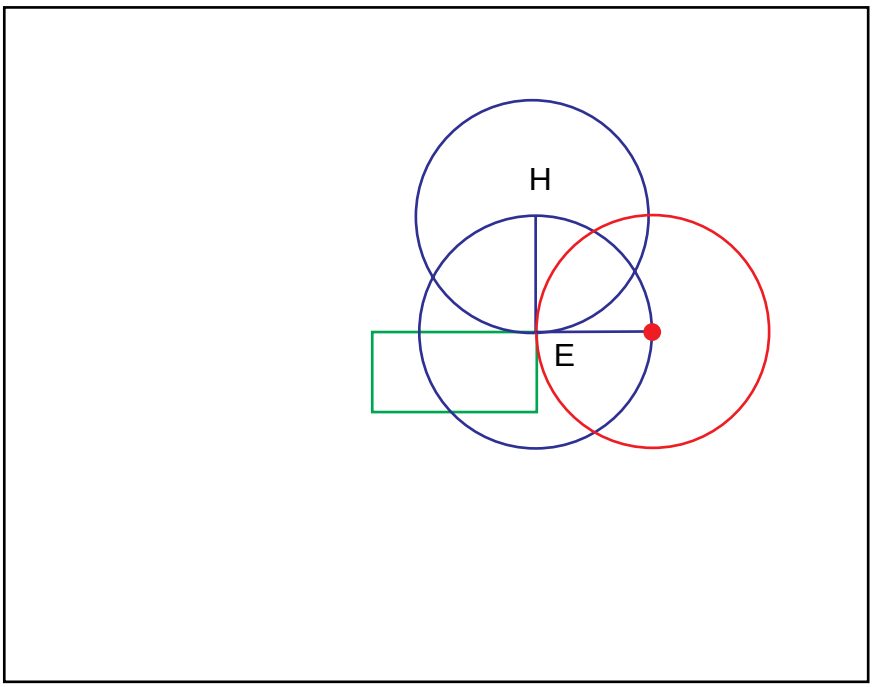
Extend EF to meet the circle at the new end, J



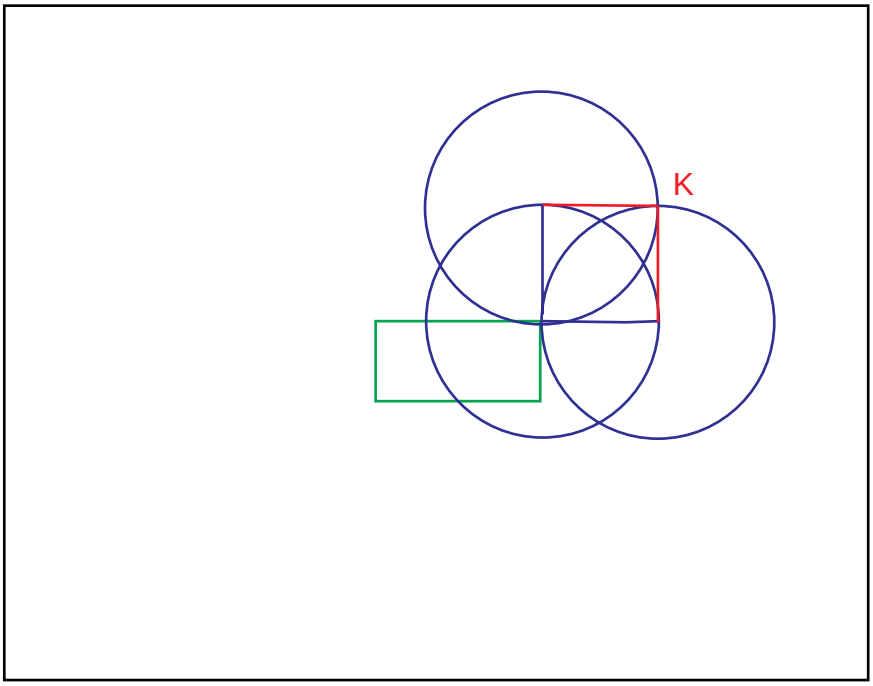
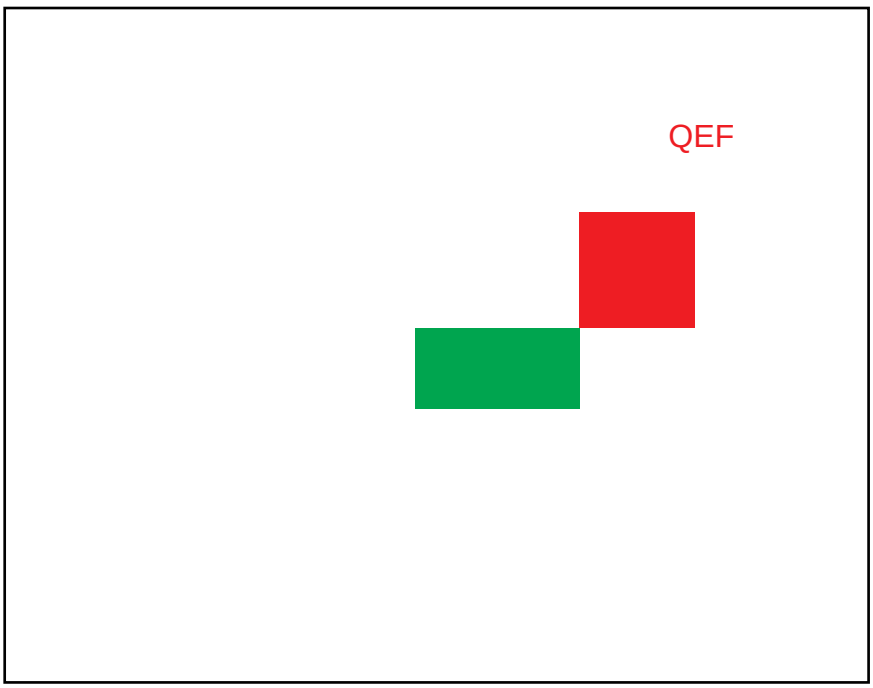
Swing the second circle around the old end, H.



Swing the third circle around the new end, J.



Connect the crossing of the circles around the ends, K, to the ends, H, J.



Cleanup. We are done.