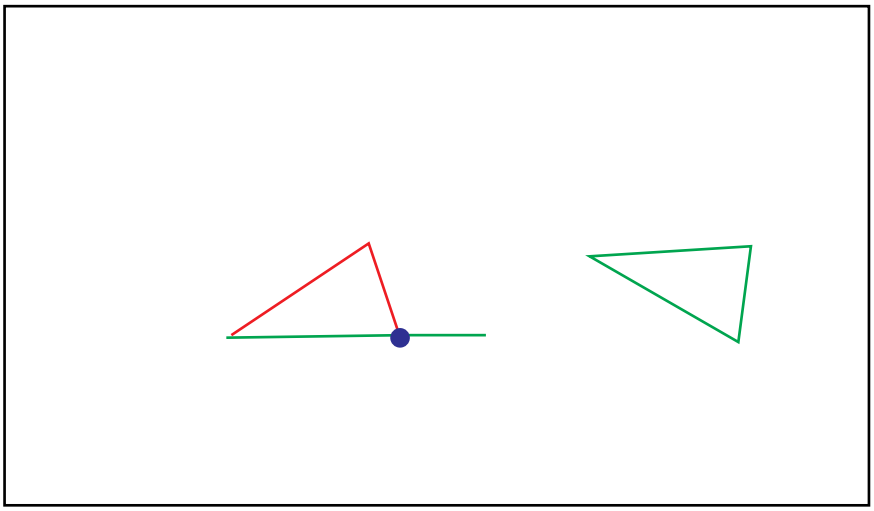
Construction 8B: Book I, Proposition 22

Alternate Construction

We call this I.22P, The Proclus Variation. (See Heath v.1 p. 295, Notes to I.23.)

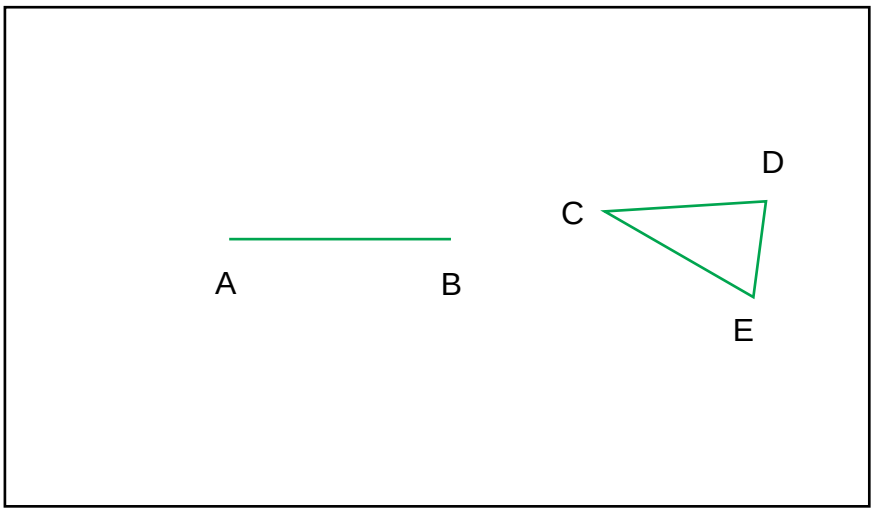
On a given straight line and at a point on it, to construct a triangle out of three straight lines which are the sides of a given triangle, with the first line along the given line, first end to first end.

Thus it is required to construct the triangle AFG with AG along AB, AF equal to CD, FG equal to DE, and AG equal to CE.



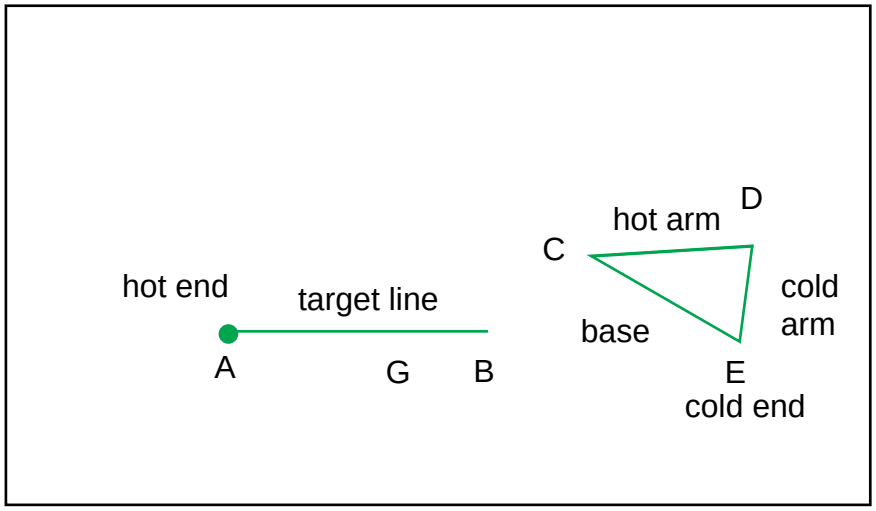
Let AB be the given straight line, and CDE the given triangle;

Note. In our drawings, we show only the case CE less than AB. If CE were longer, then AB should be extended. Also, two triangles fit the requirements, we choose one of them.



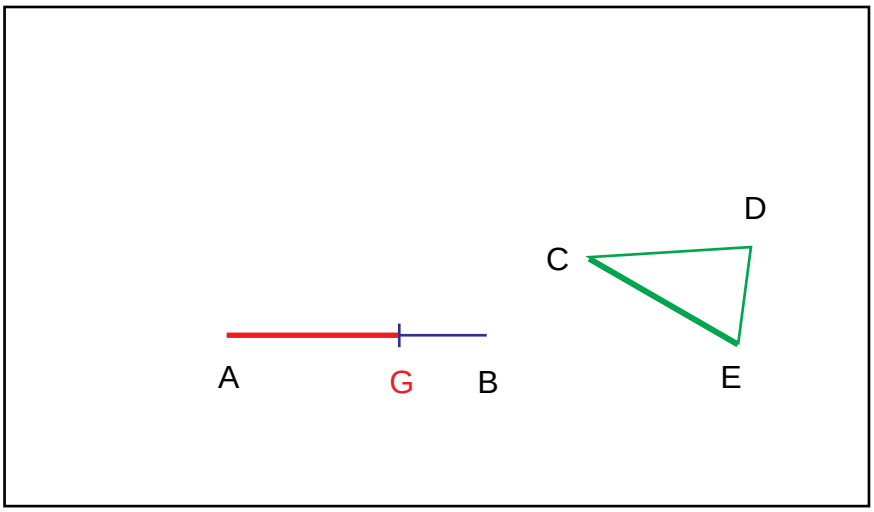
Like I.1, Vesica Pisces, this construction, which moves a triangle to a new location and orientation, is frequently called as a subroutine. It will be convenient later to introduce names in place of labels as follows:

AB: the target line
A: the hot end of the target line
CE: the base
C: the hot end of the base
CD: the hot side or hot arm
DE: the cold side or arm
AG: the moved base
G: the cold end of the moved base

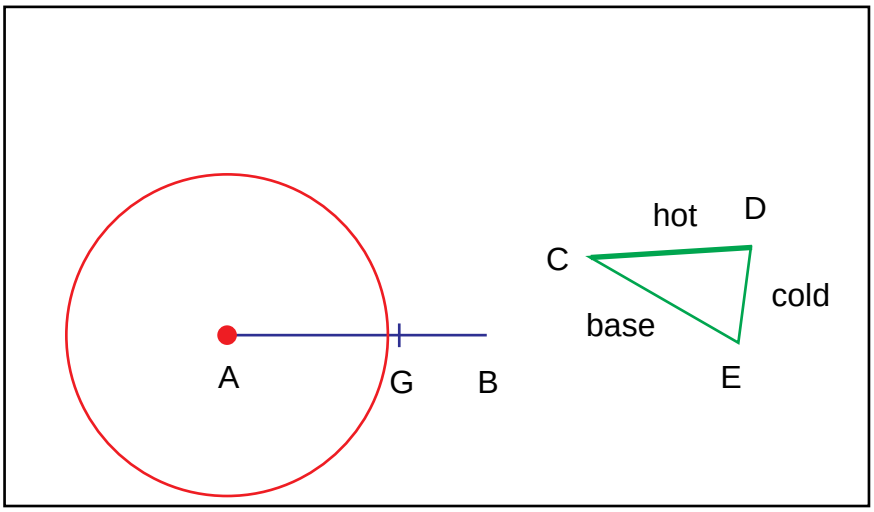


Thus our assignment is to move the triangle to the target line, moving the base onto the target line, hot end to hot end.

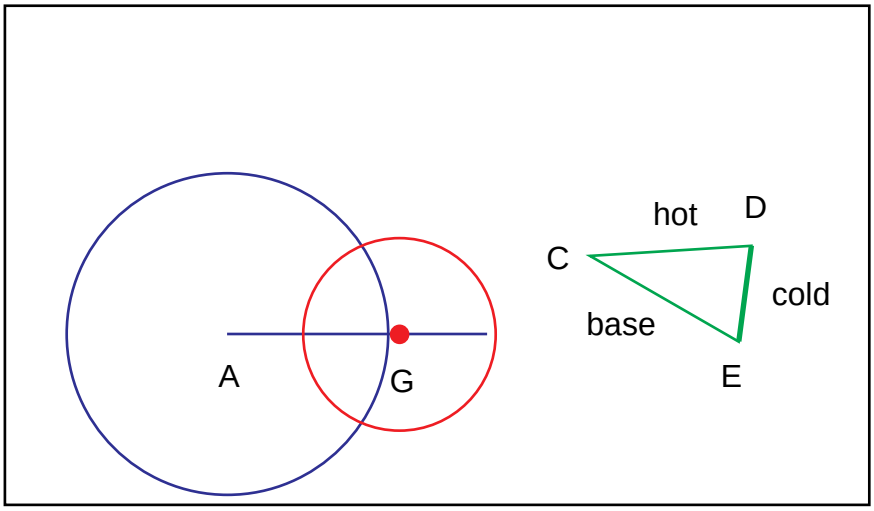
Move the base:
Locate G along AB so that AG is equal to the base, CE.



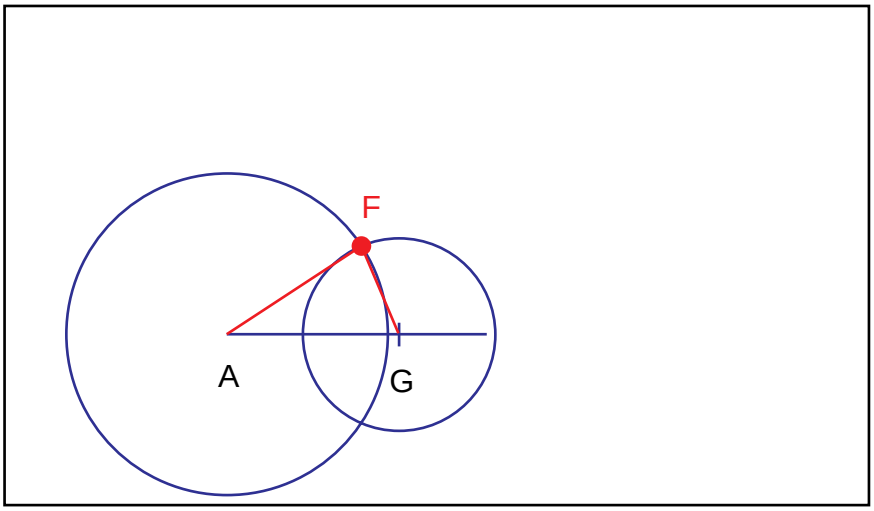
Swing the hot arm around the hot end of the moved base: with centre A and distance CE draw a circle.

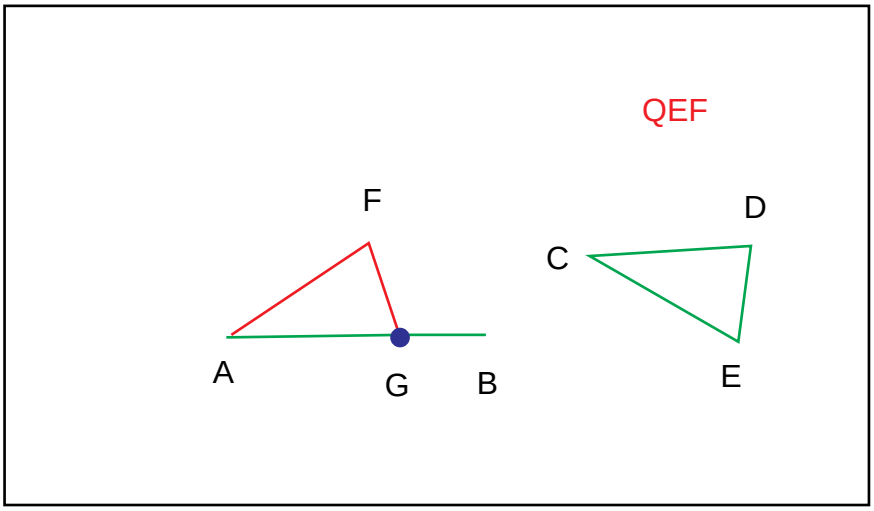


Swing the cold arm around the cold end of the moved base: with centre G and distance DE draw a circle.



Choose one of the two points in which the two circles meet, F. Join this point to both ends of the moved base.



Cleanup. We are done.

Q.E.F.