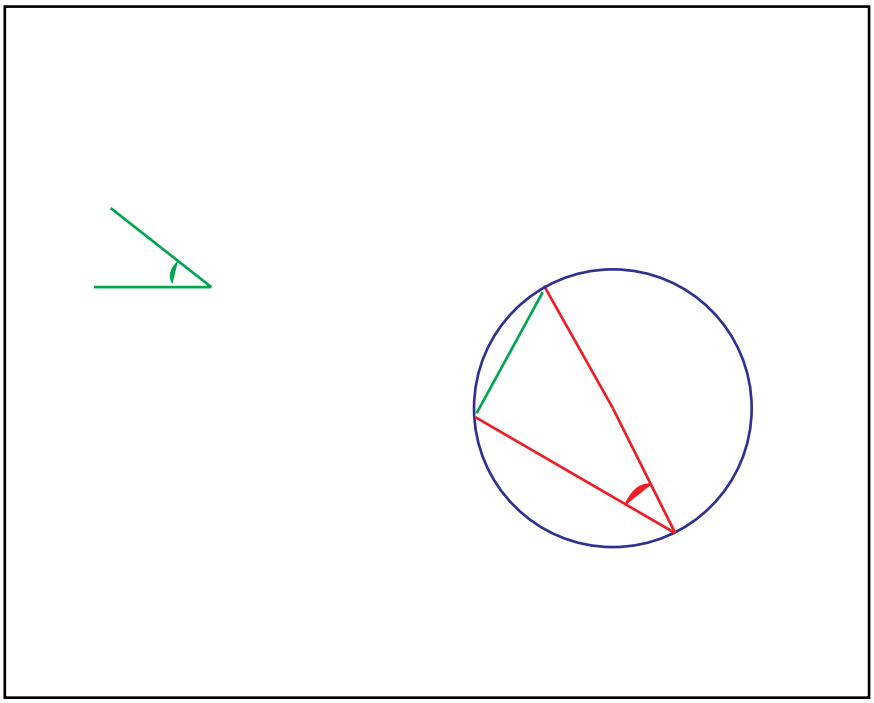
Construction 21: Book III, Proposition 33

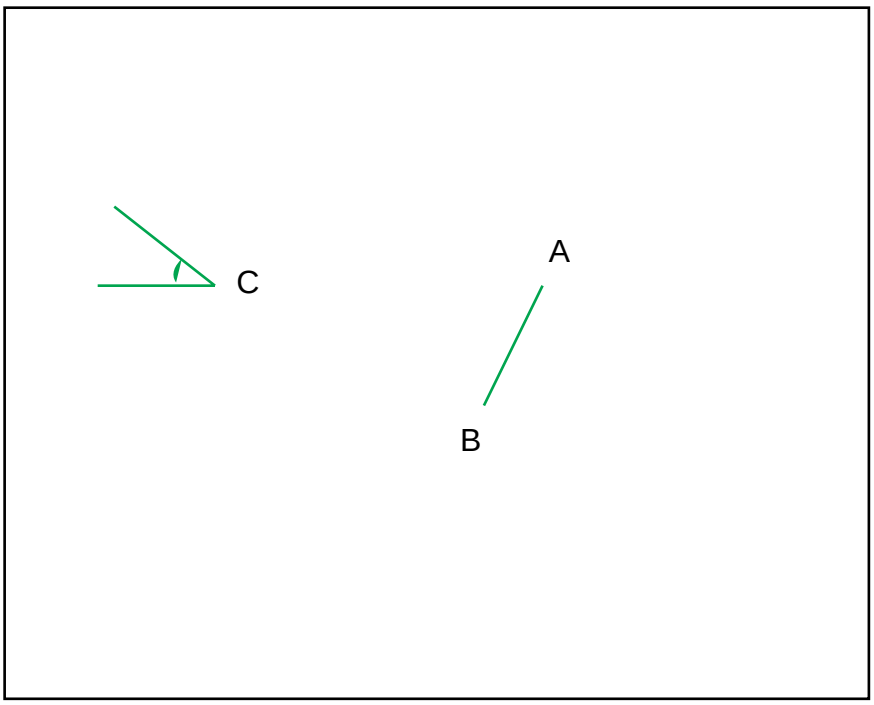
On a given straight line to describe a segment of a circle admitting an angle equal to a given rectilineal angle.



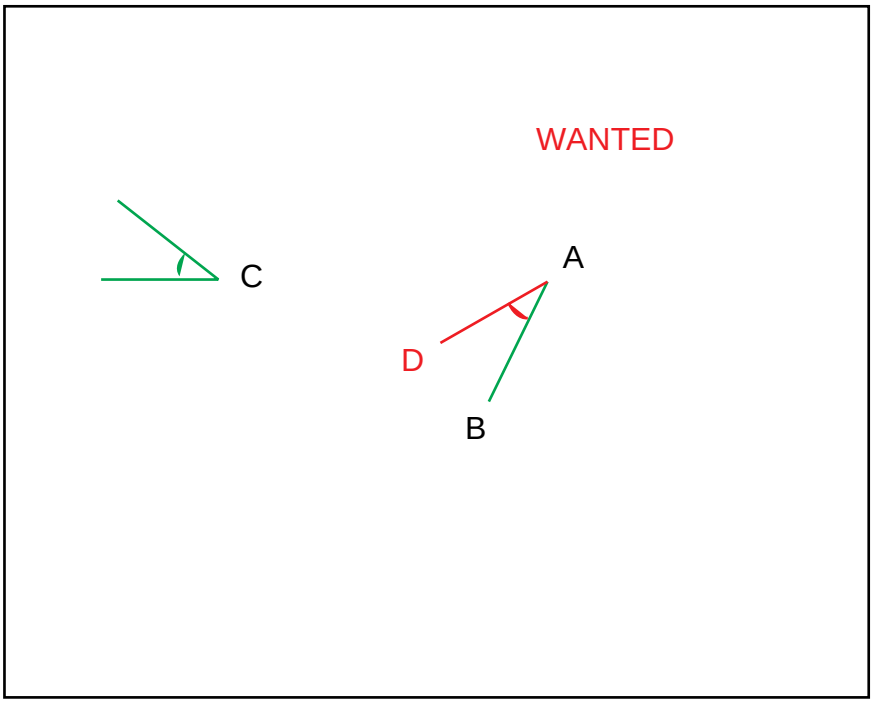
III.33.3. Let AB be the given straight line, and the angle at C the given rectilineal angle;

III.33:10. The angle at C is then acute, or right, or obtuse.

First let it be acute, (we will treat only this case.)

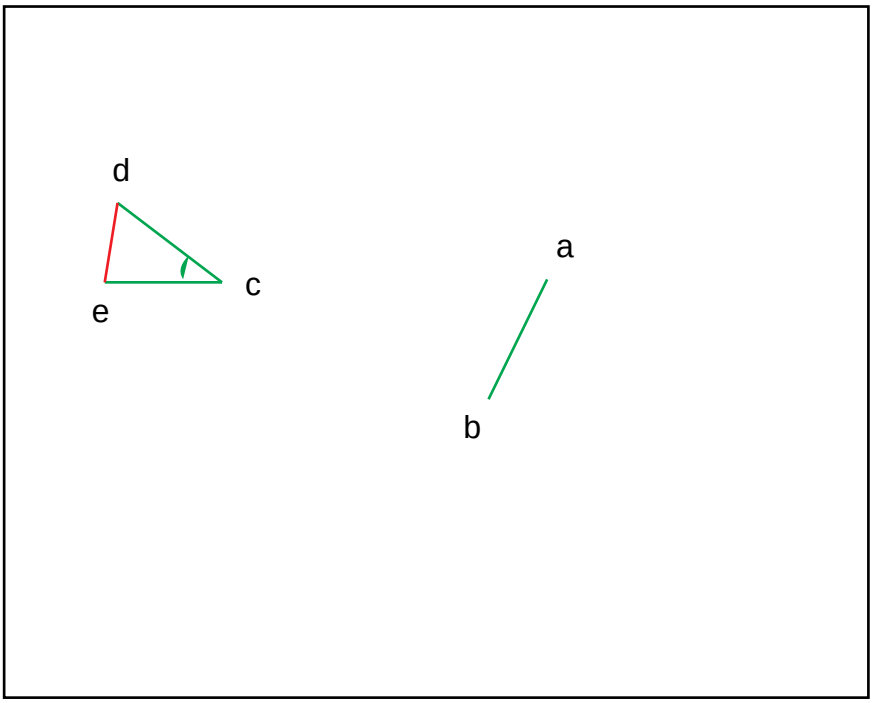


III.33:13. on the straight line AB, and at the point A, let the angle BAD be constructed equal to the angle at C; ([I.23])

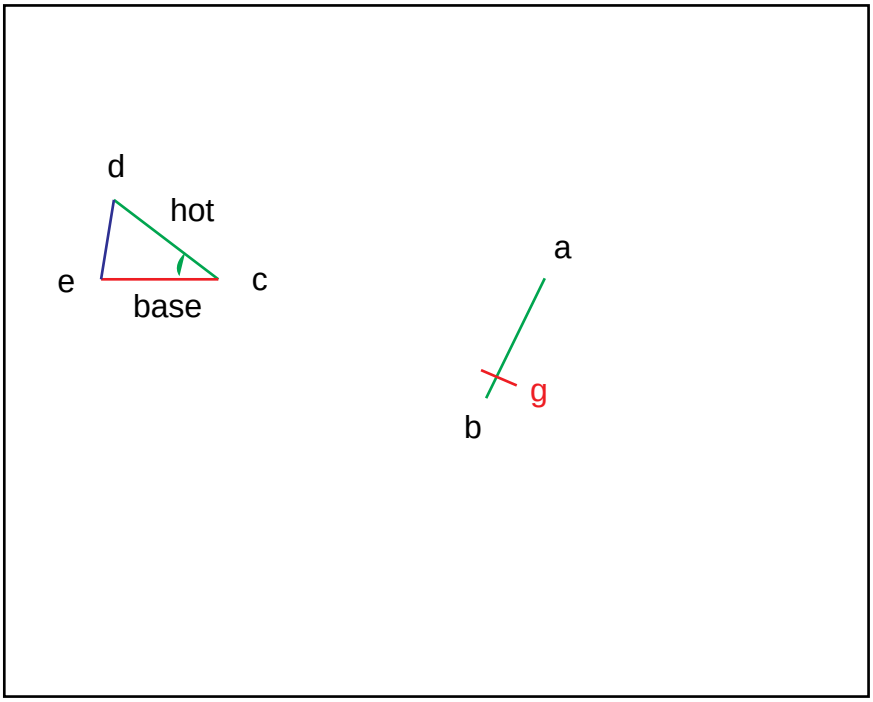


GOSUB I.23.
Relabel.

I.23:8. On the straight lines ed, ce respectively let the points d, e be taken at random;let de be joined,



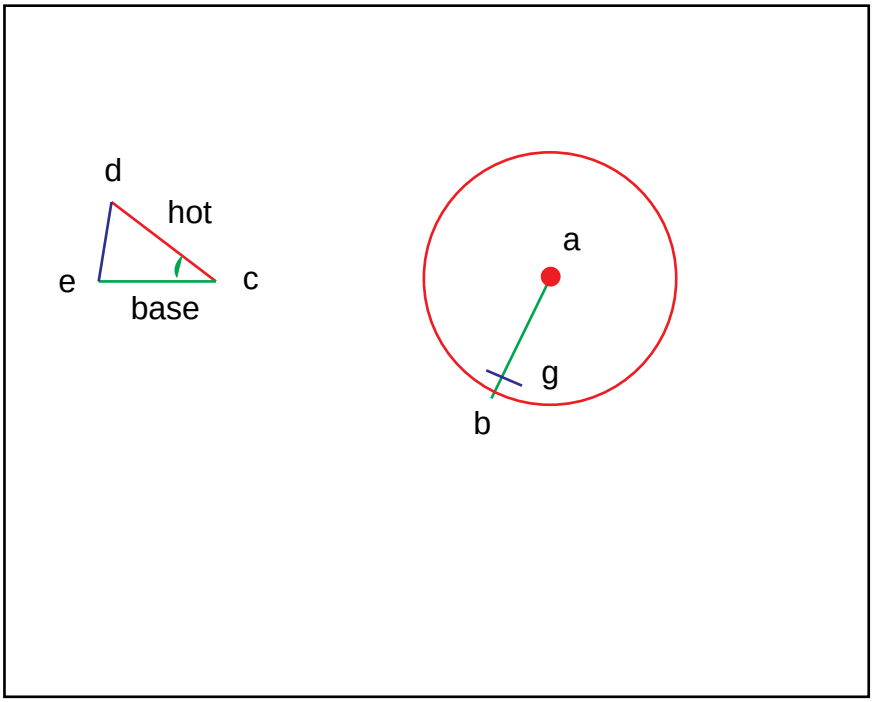
I.23:11. (paraphrase)
Move the triangle cde so the base ce moves onto the target line ab, with c moving to a. ([I.22])



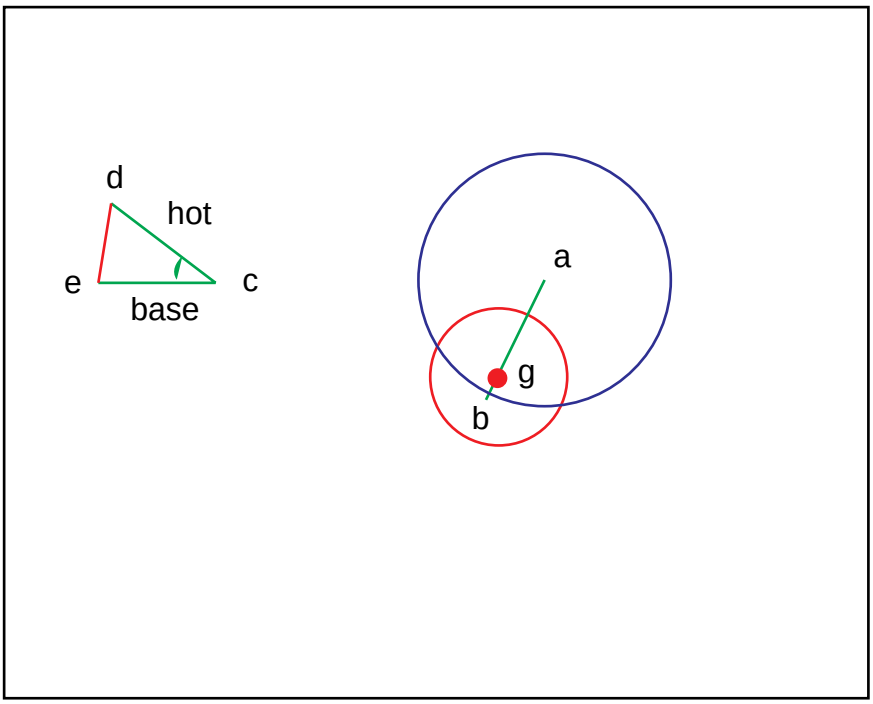
GOSUB I.22.
We will use C#8B, the Proclus Variation.

Move the base.

Swing the hot arm, cd, around a.



Swing the cold arm, de, around g.

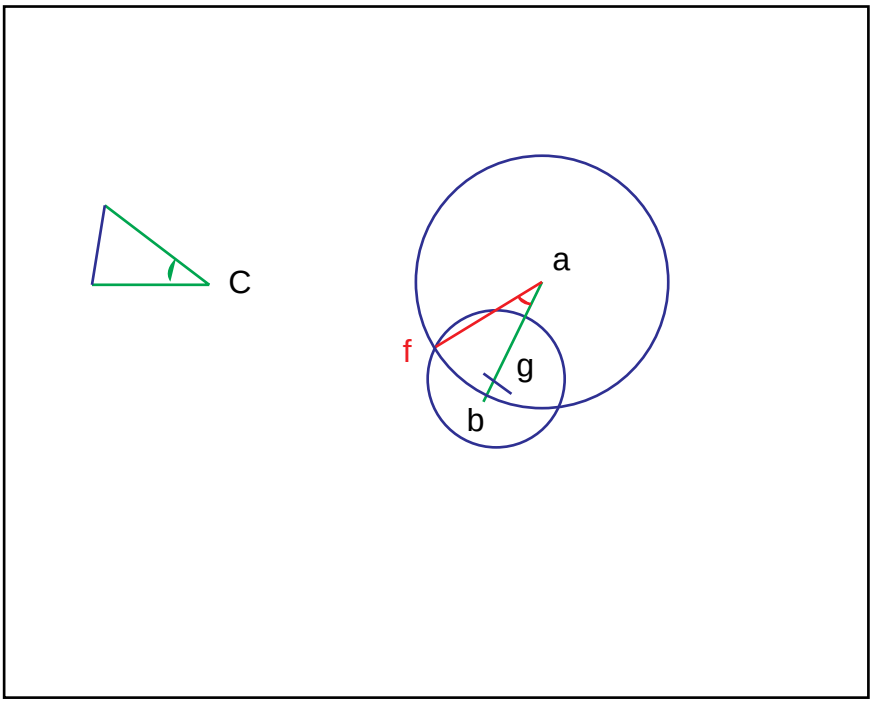


Connect the upper crossing, f, to both ends of the base (only one connection is needed, af.)

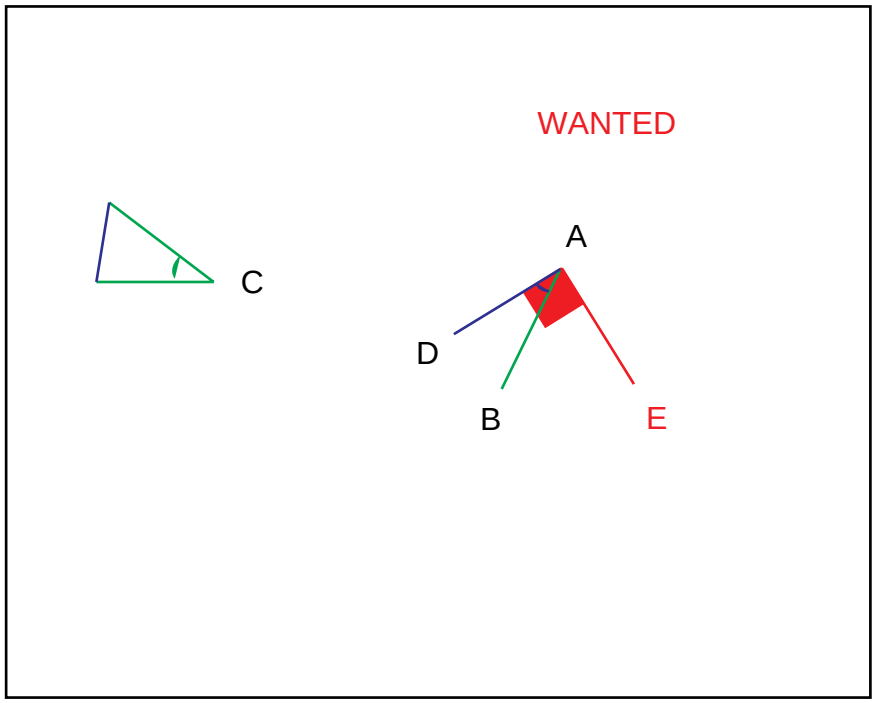
Cleanup.

RETURN to I.23.

RETURN to III.33 at line 13. Relabel.

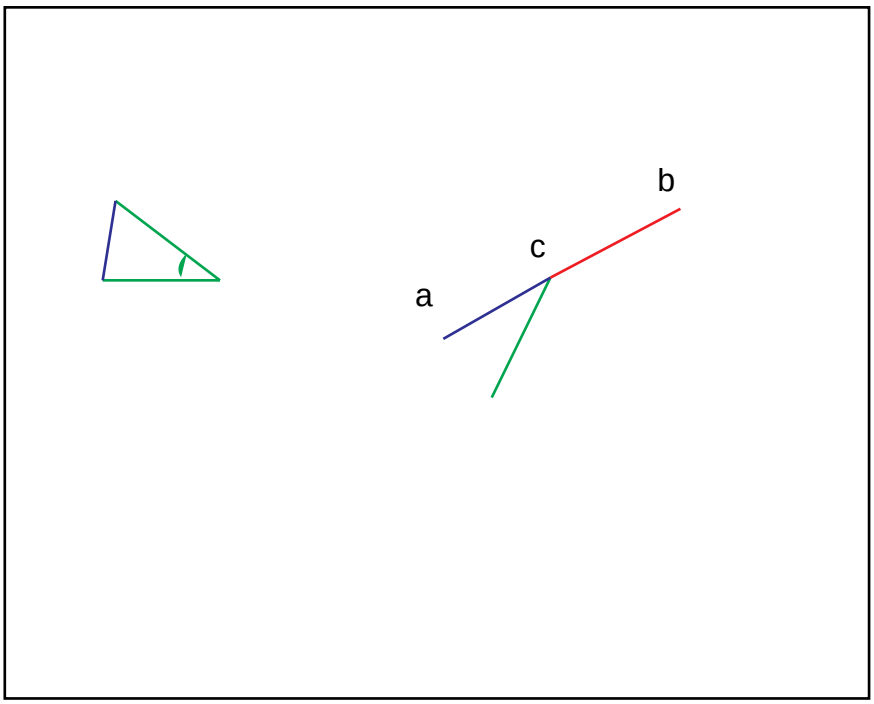


III.33:17. Let AE be drawn at right angles to DA, ([I.11])

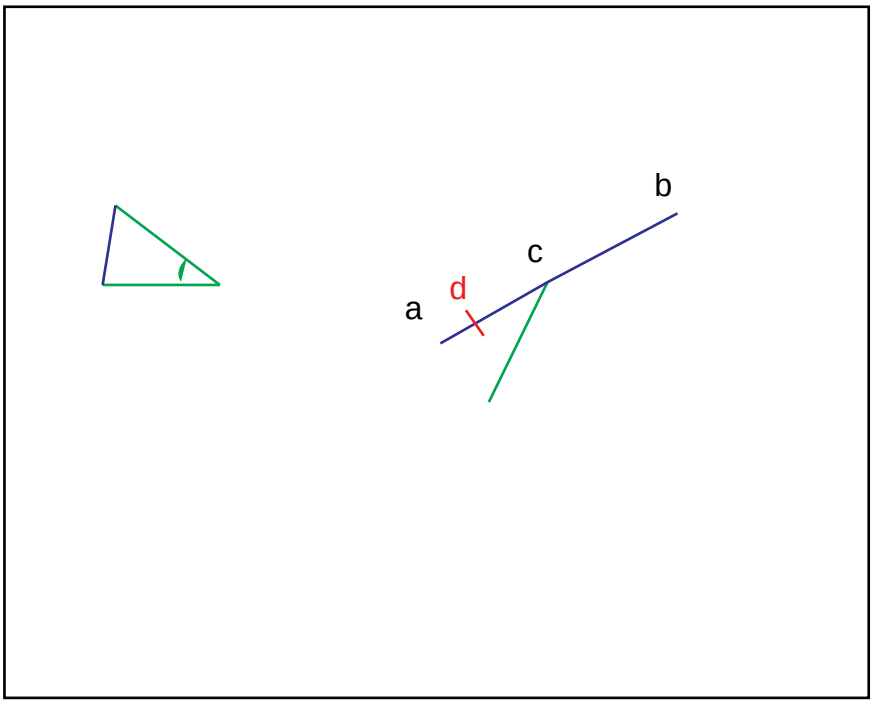


GOSUB I.11

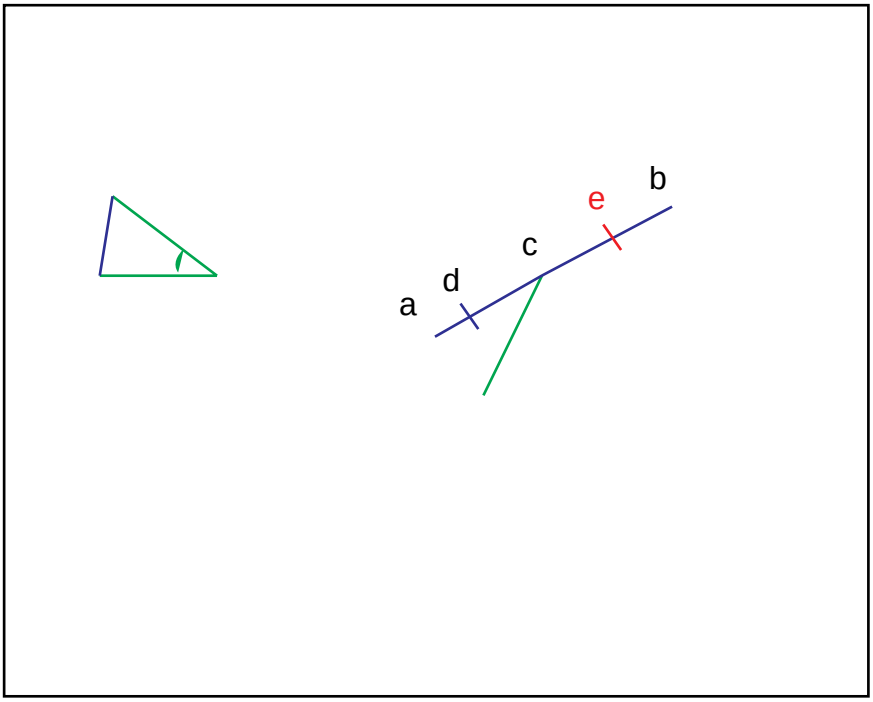
Extend the line DA.
Relabel.



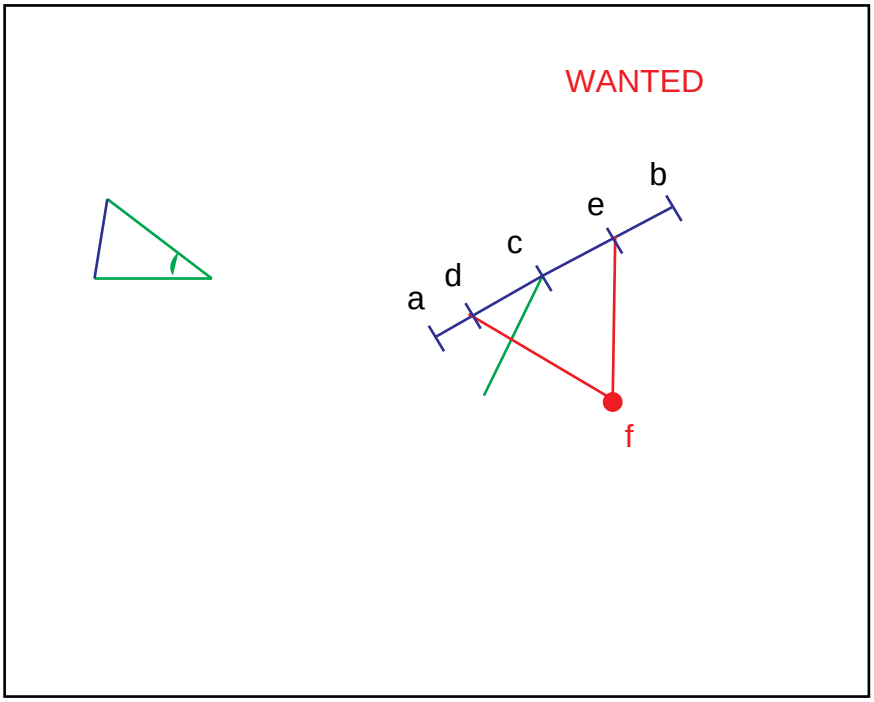
I.11:8. Let a point d be taken at random on ac;



I.11:10. let ce be made equal to cd; [I.3] (the rope)

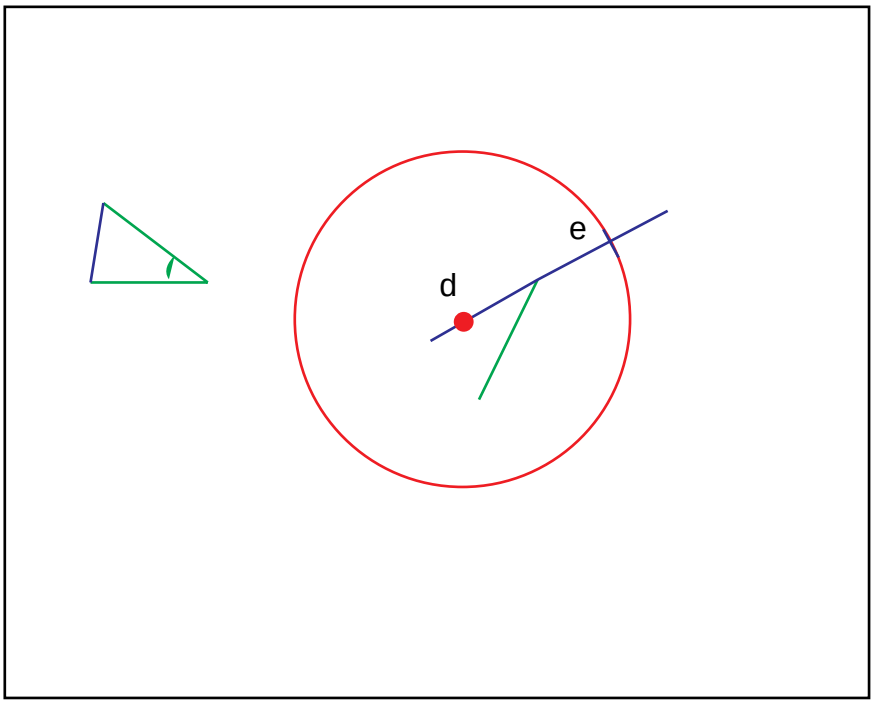


I.11:11. on de let the equilateral triangle fde be constructed; [I.1] (Actually, we need only the point f.)

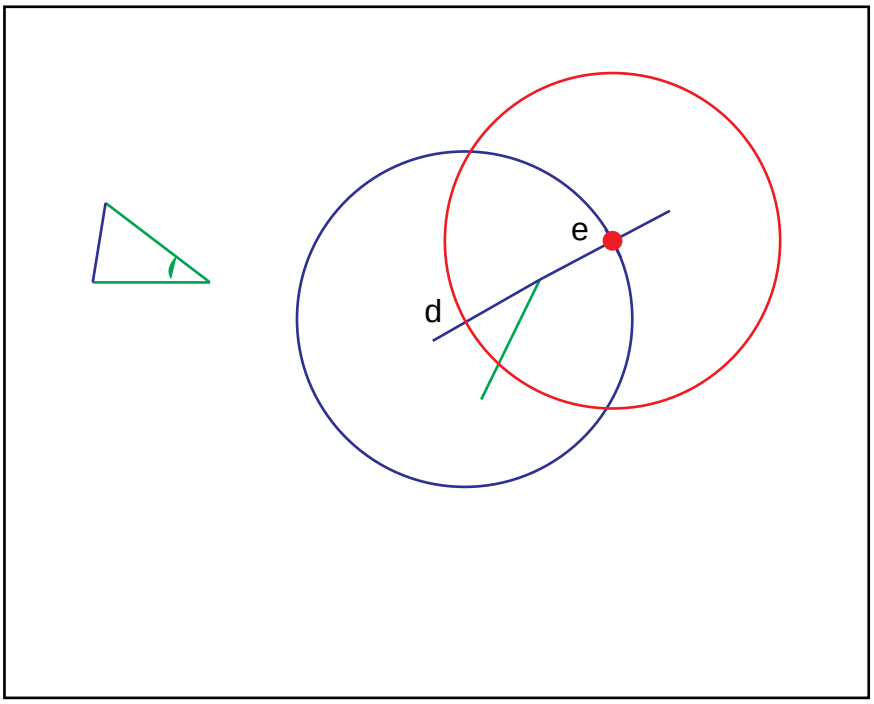


GOSUB I.1.

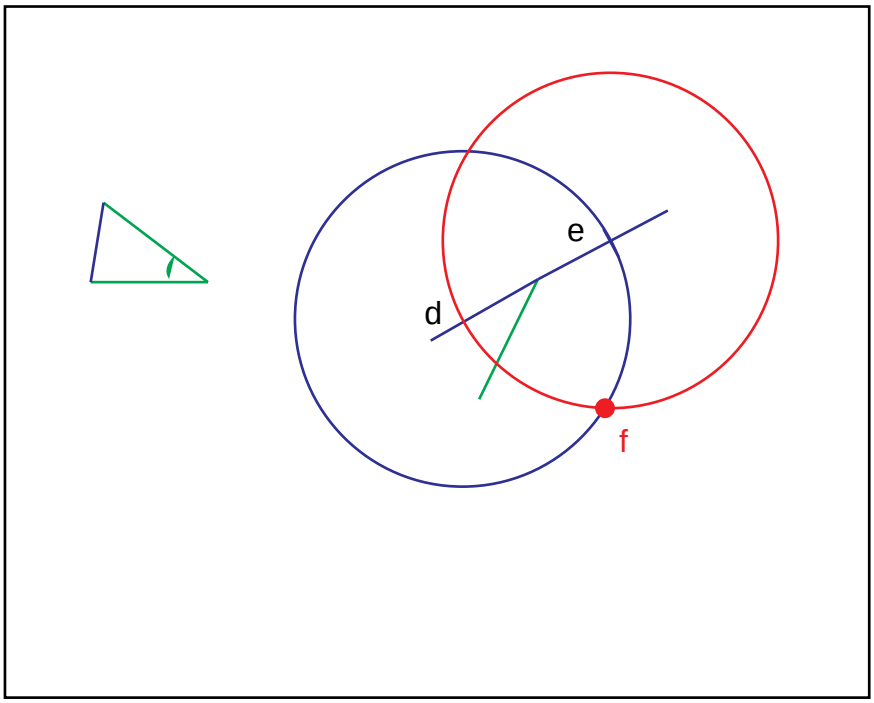
Swing de around d.



Swing ed around e.

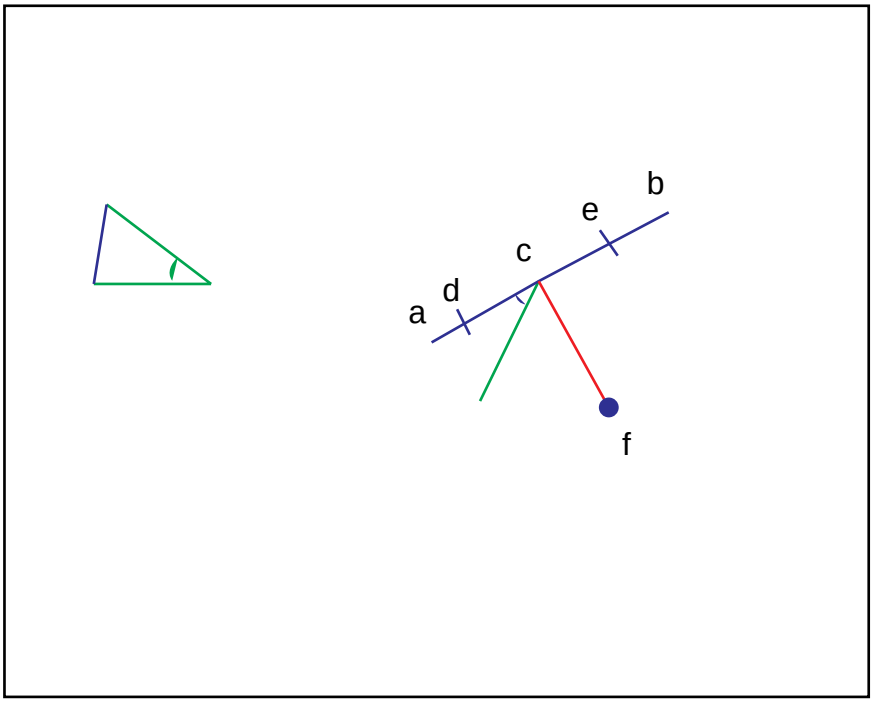


Locate the lower crossing point, f.



Cleanup.
RETURN to I.11 at line 11.

I.11:13. and let fc be joined;

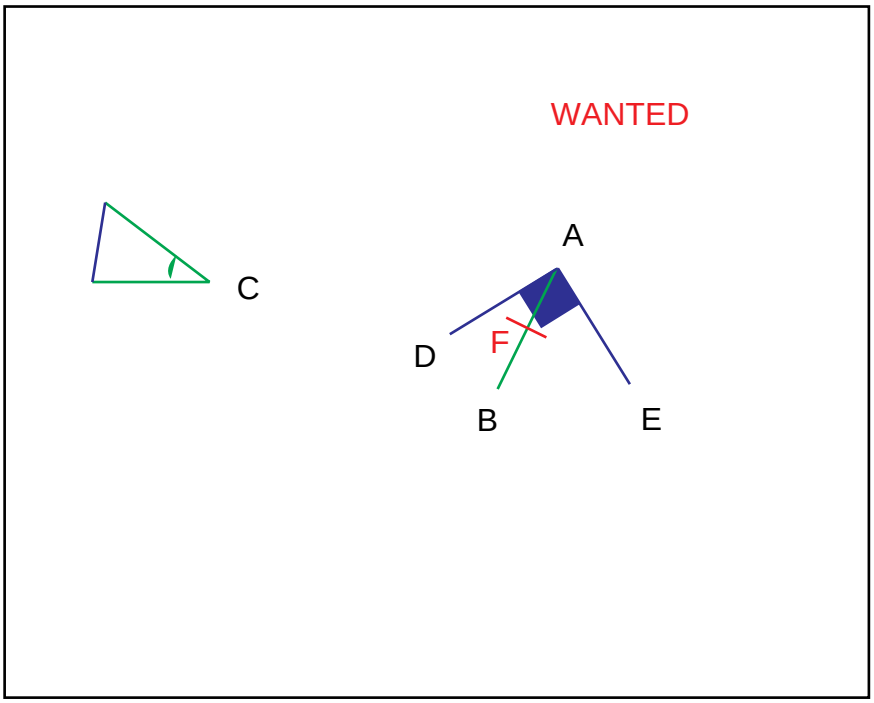


Cleanup.

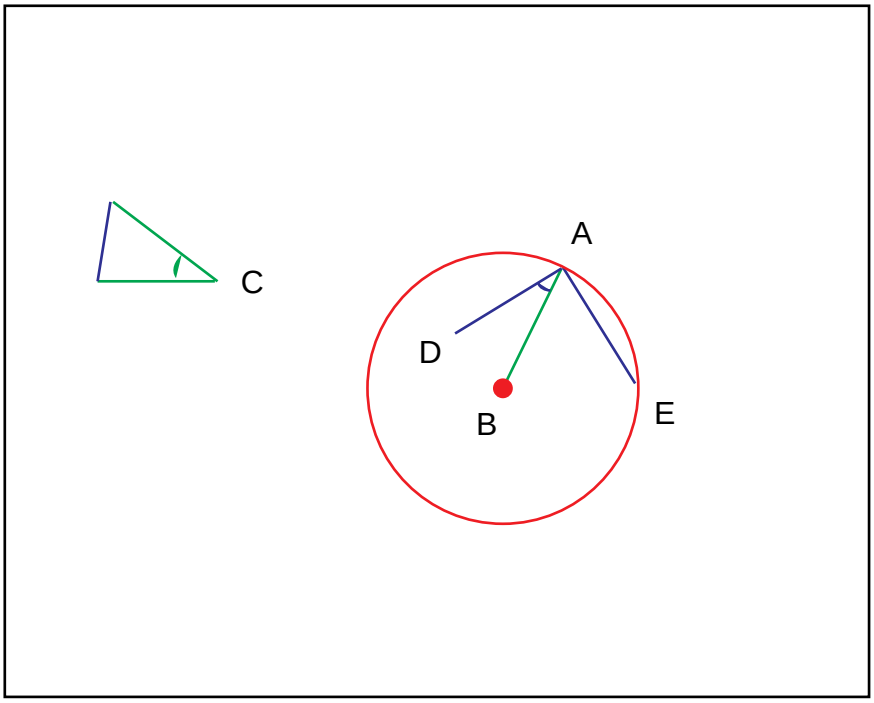
RETURN to III.33 at line 17.
Relabel.

III.33:17. let AB be bisected at F, ([I.10])

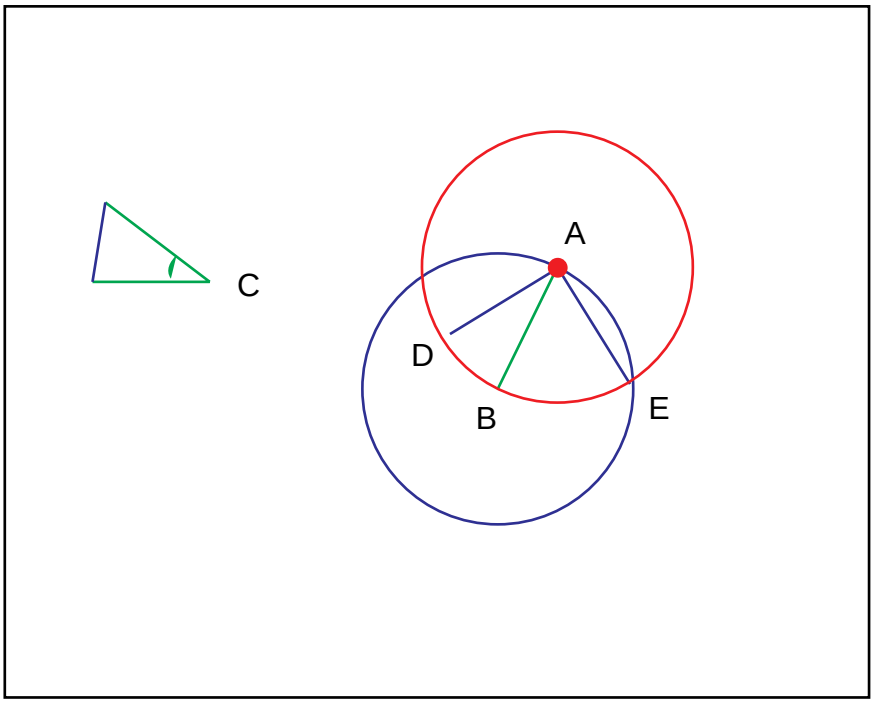
GOSUB I.10.
We will use C#5B.



Swing BA around B.



Swing AB around A.

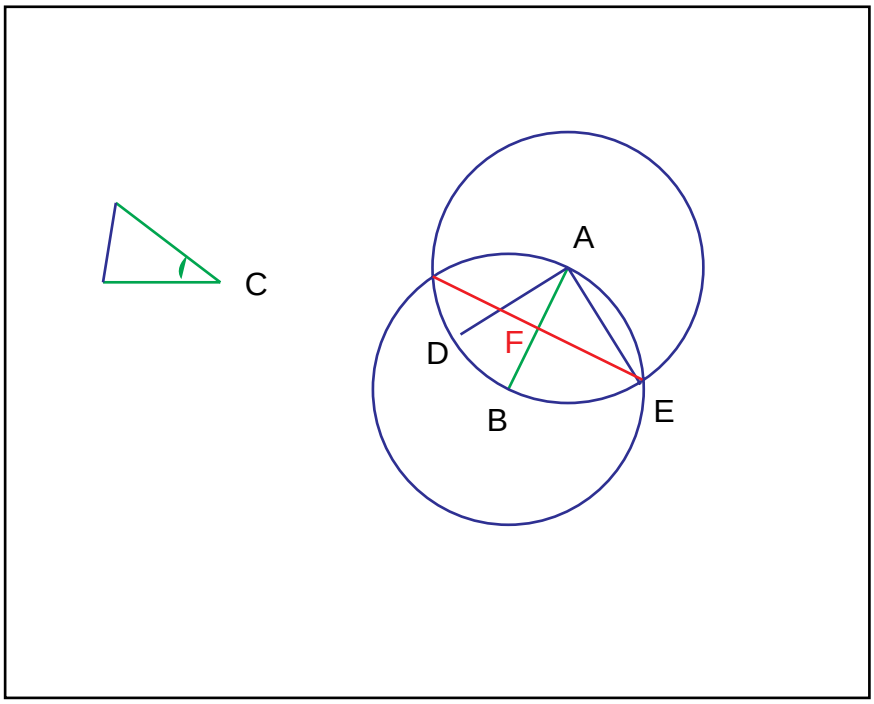


Connect the two crossing points.

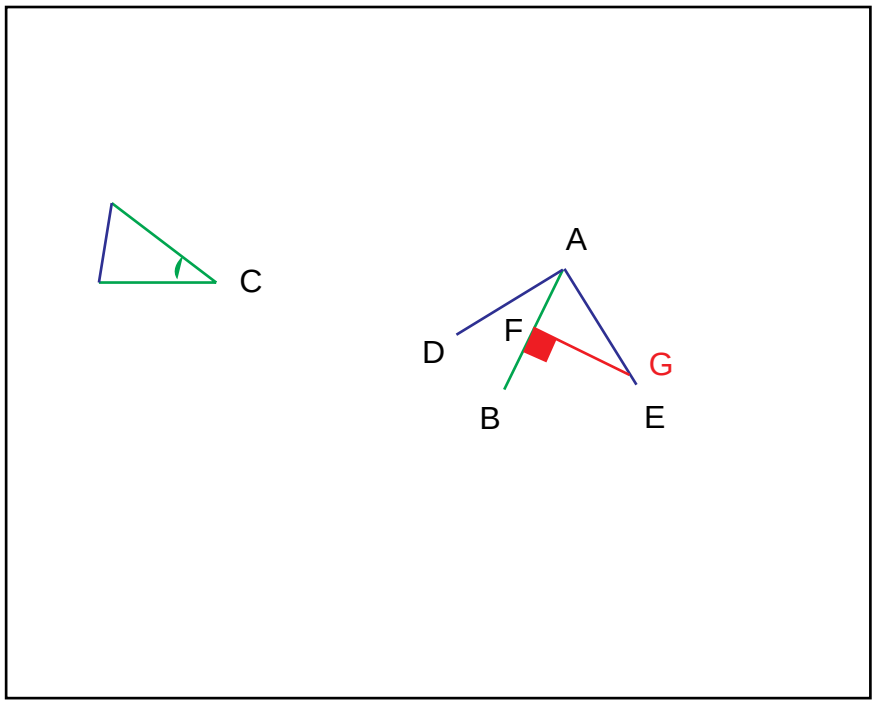
Mark the point F.

RETURN to III.33 at line 17.

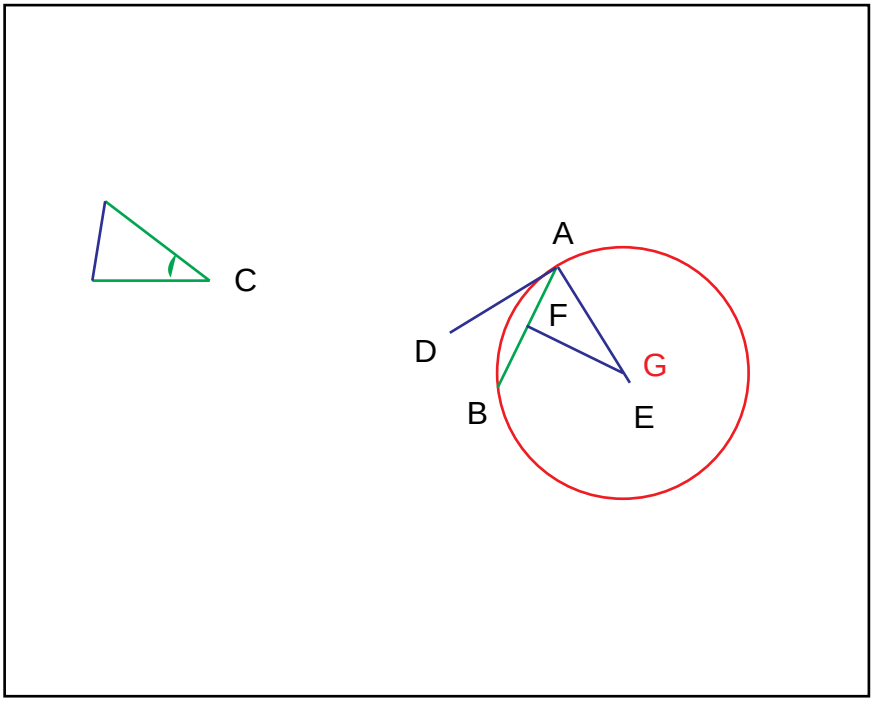
Cleanup.



III.33:18. let FG be drawn from the point F at right angles to AB, ([I.11])
But we have this line in the previous step.Mark the point G.

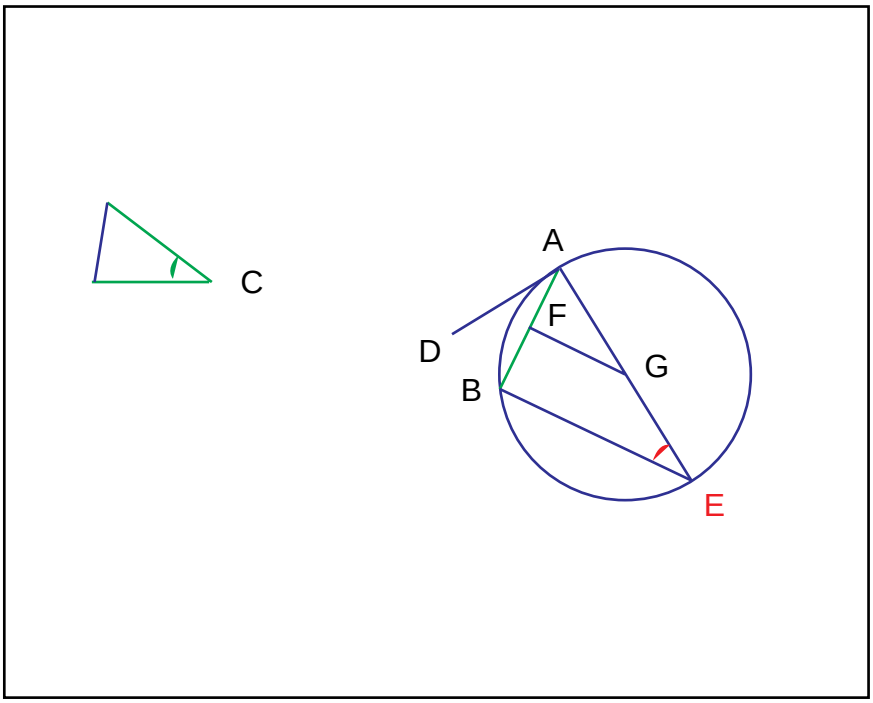


III.33:25. Therefore the circle described with centre G and distance GA will pass through B also. Let it be drawn,



Extend AE to touch this circle, locating (finally) the point E.

III.33:28. let EB be joined.



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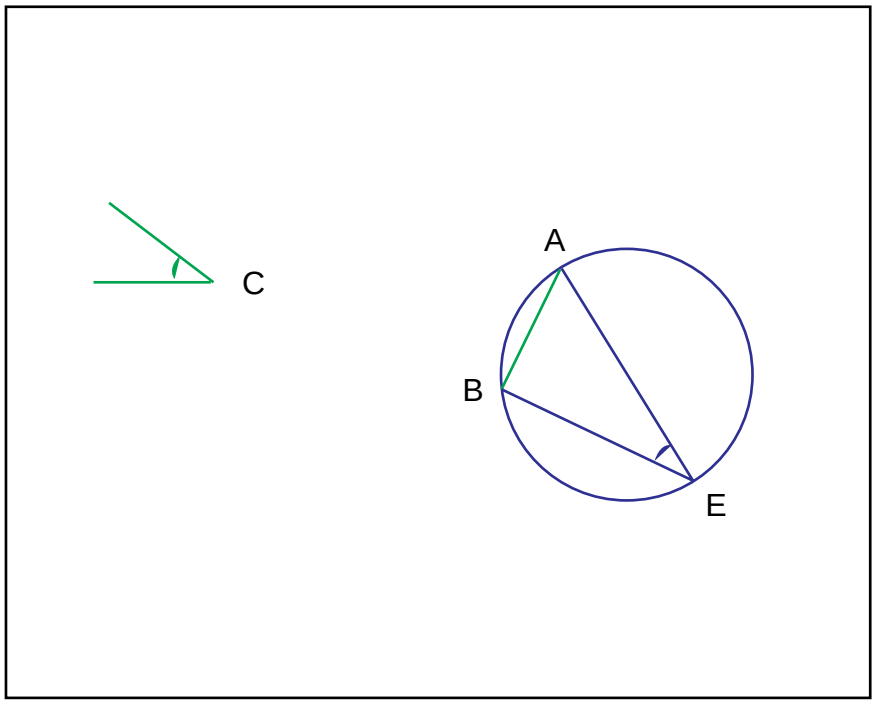
Q.E.F.