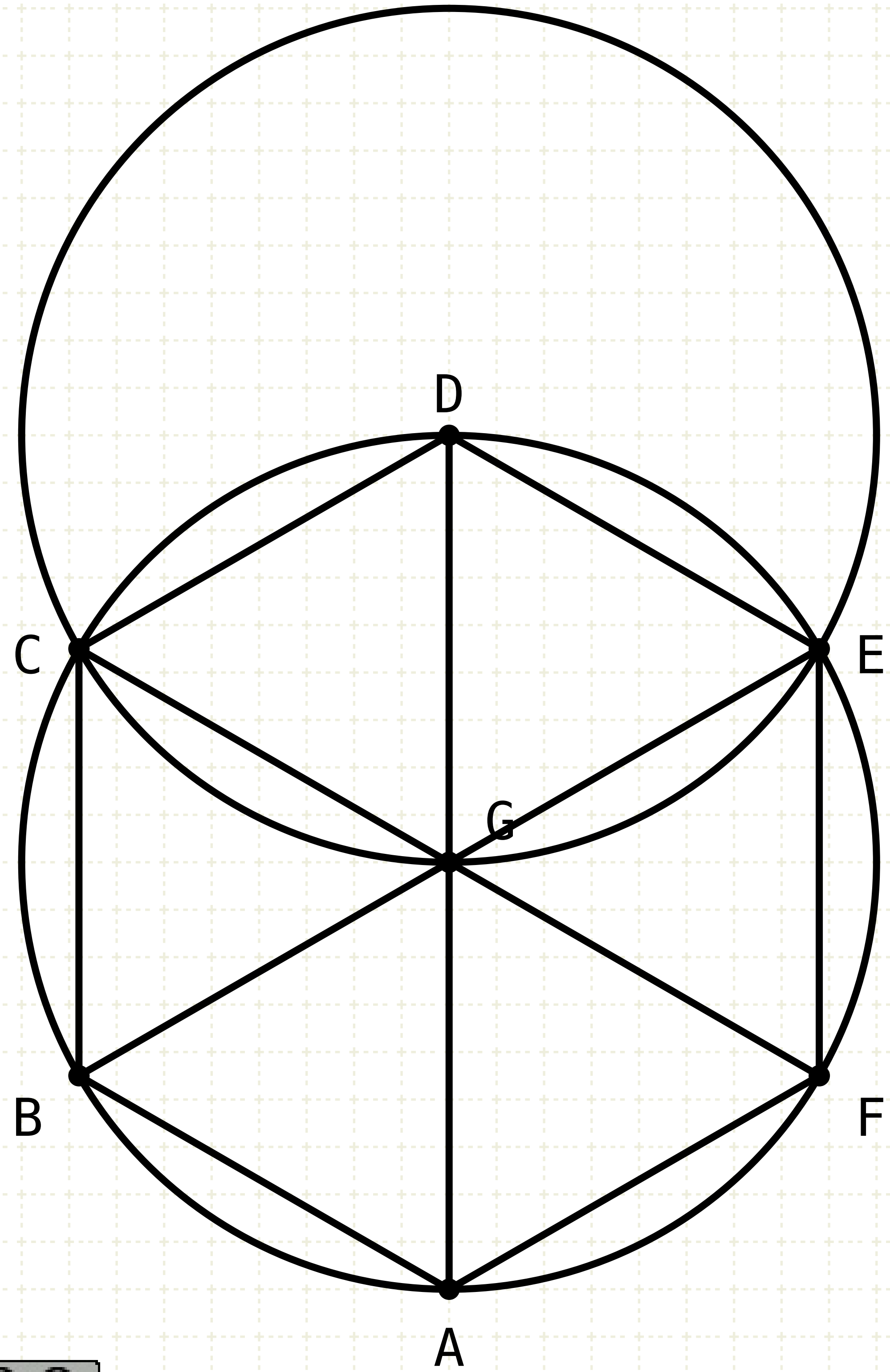
Euclid's Elements

Book IV



Philosophy (nature) is written in that great book which ever is before our eyes -- I mean the universe -- but we cannot understand it if we do not first learn the language and grasp the symbols in which it is written. The book is written in mathematical language, and the symbols are triangles, circles and other geometrical figures, without whose help it is impossible to comprehend a single word of it - without which one wanders in vain through a dark labyrinth.

Galileo Galilei

Proposition 2 of Book IV

In a given circle to inscribe a triangle equiangular with a given triangle.

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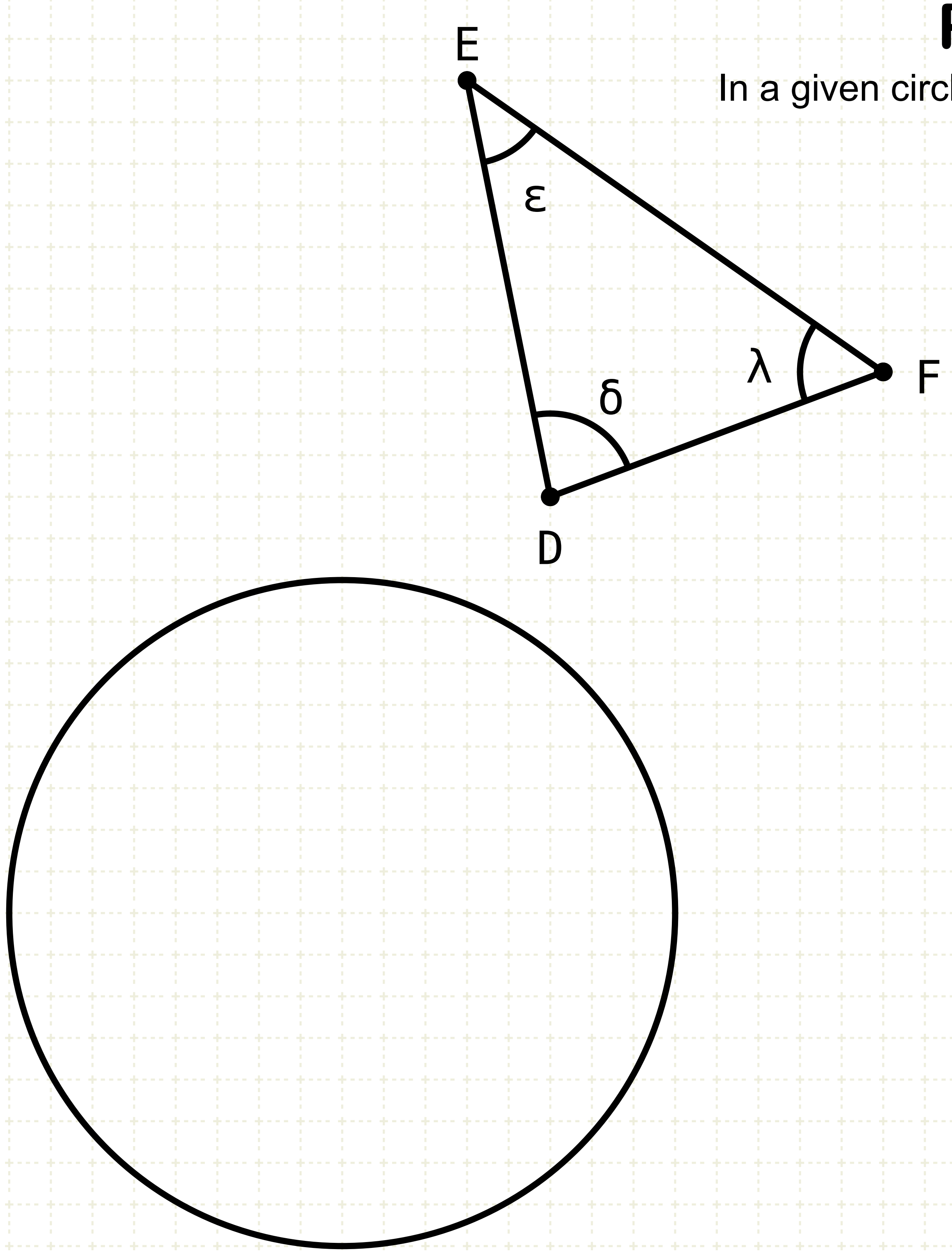

In other words

Given a circle and a triangle DEF:

Draw a triangle within the circle, where the angles in the new triangle equal the angles in triangle DEF

Proposition 2 of Book IV

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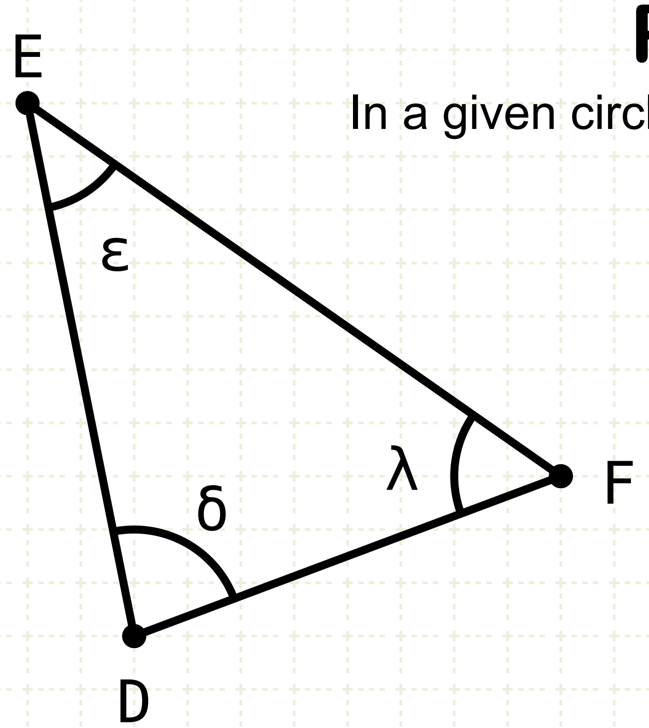

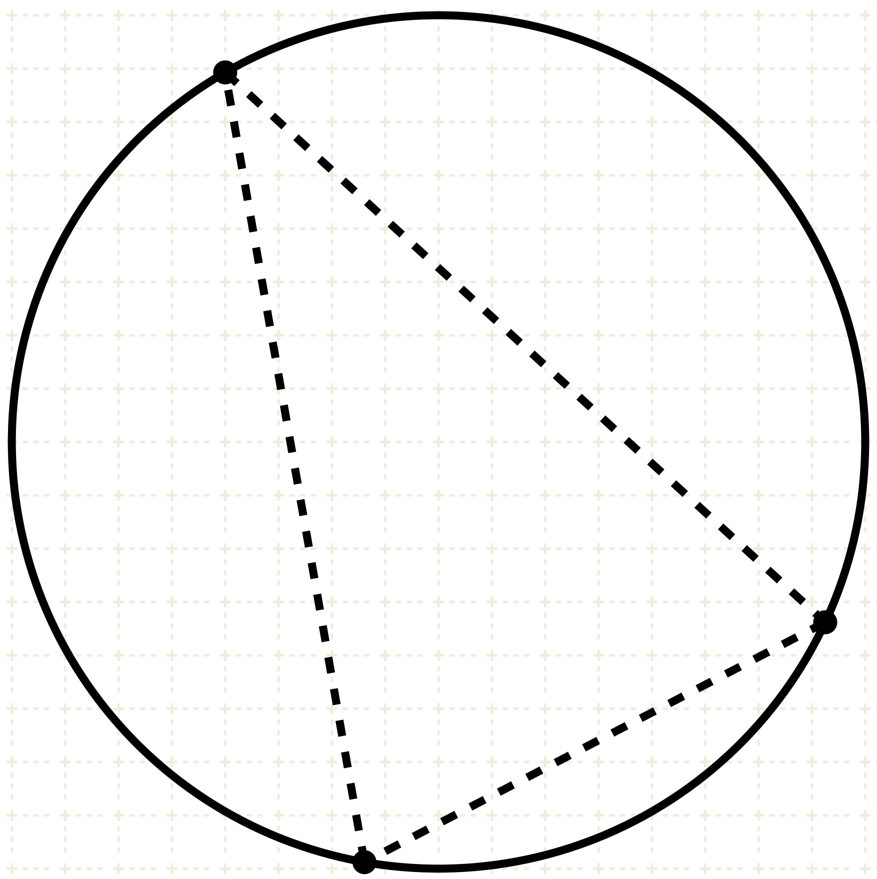

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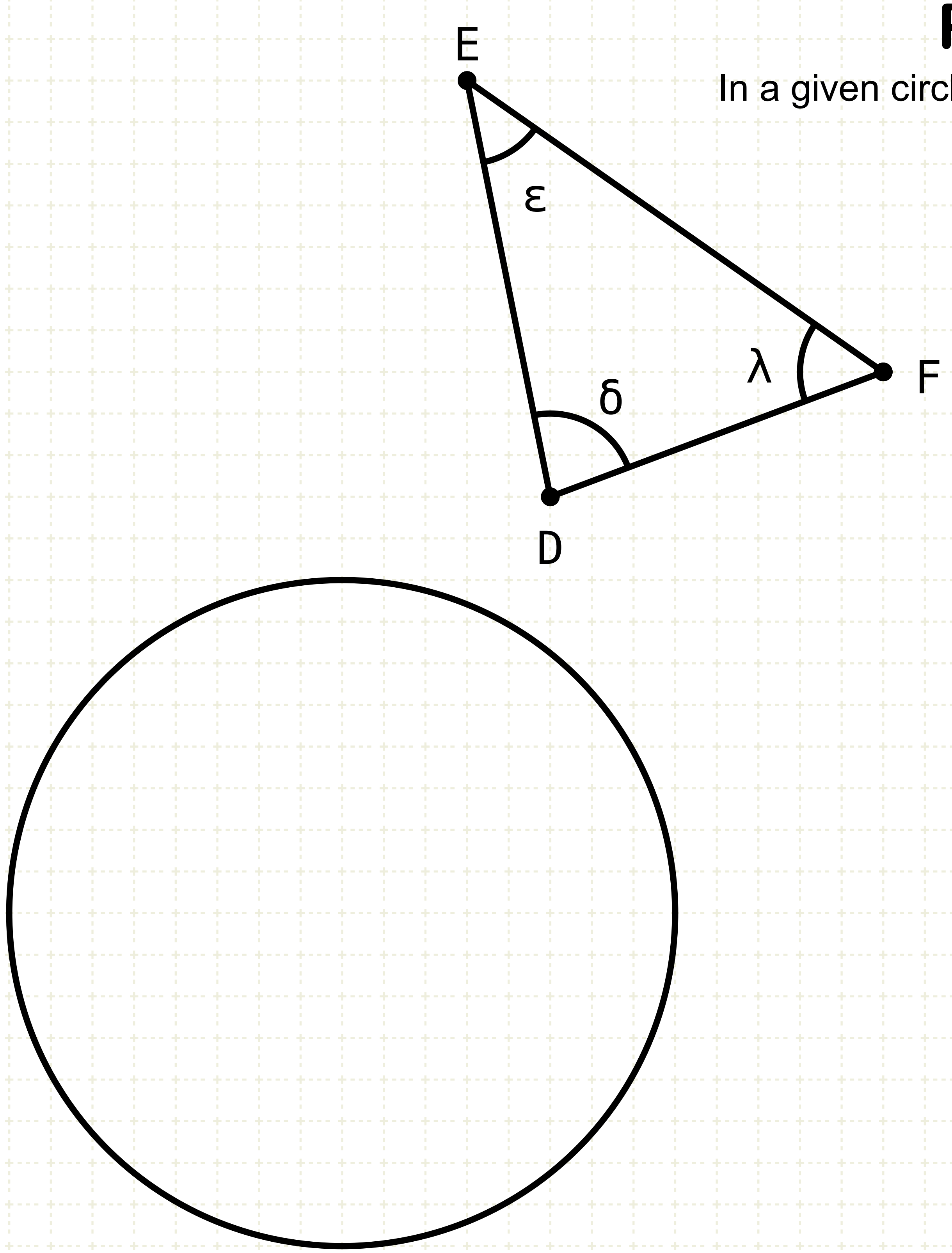

Construction

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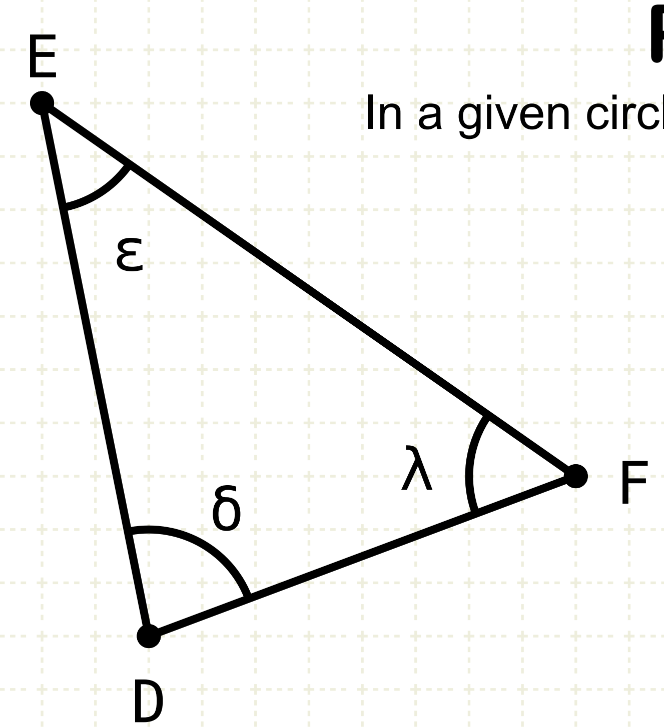
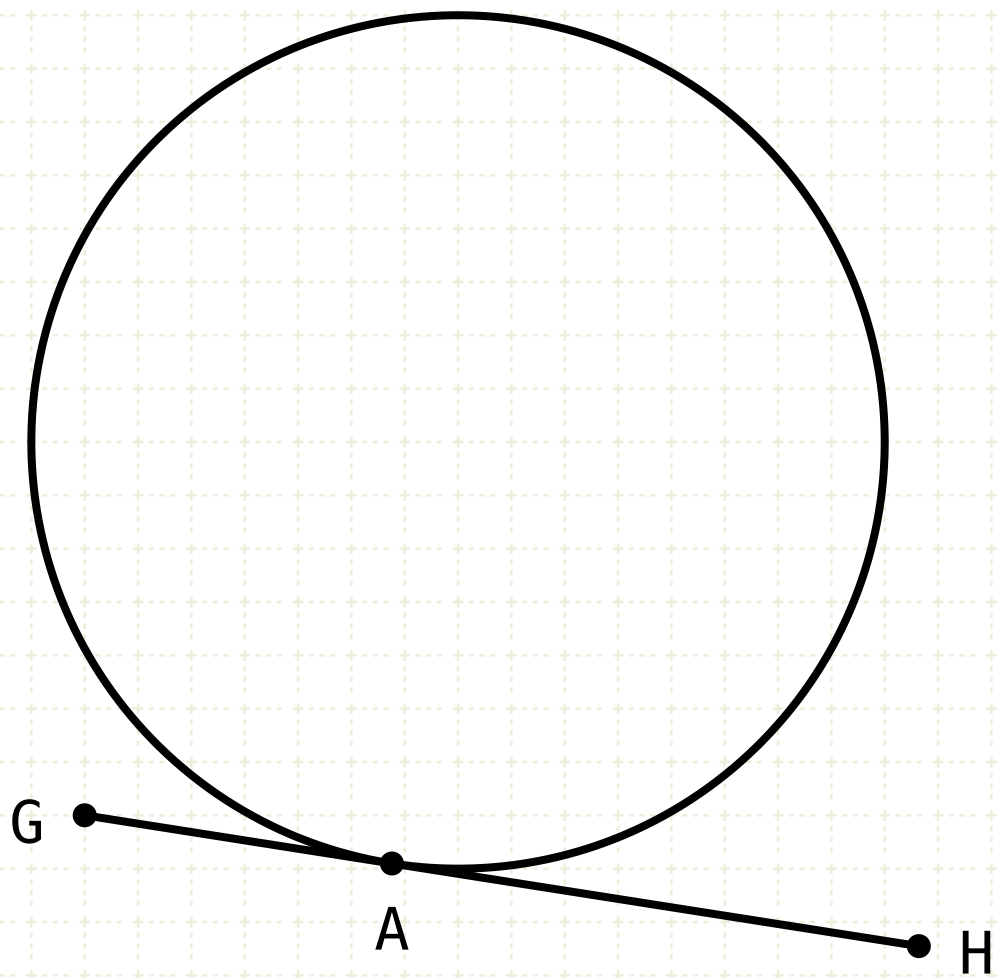


Construction

Draw a line GH touching the circle at point A (III·16)



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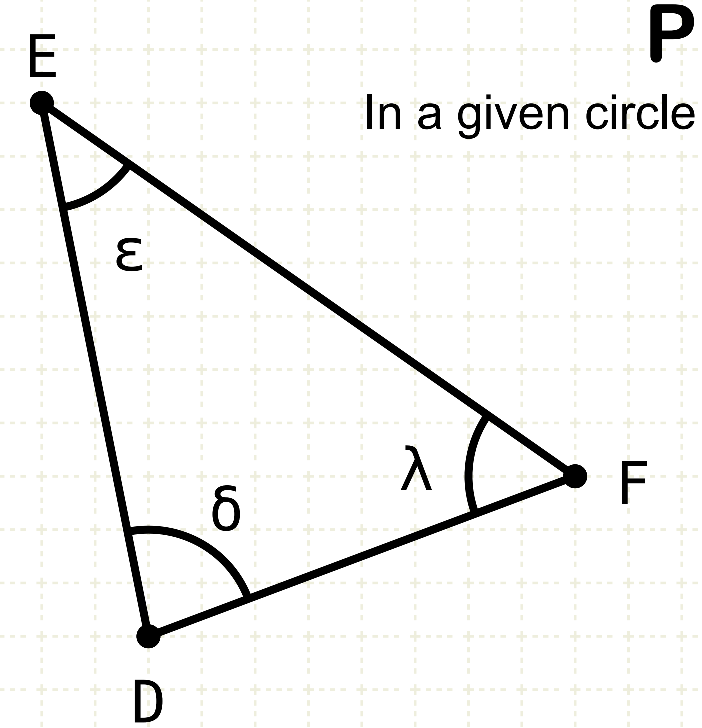

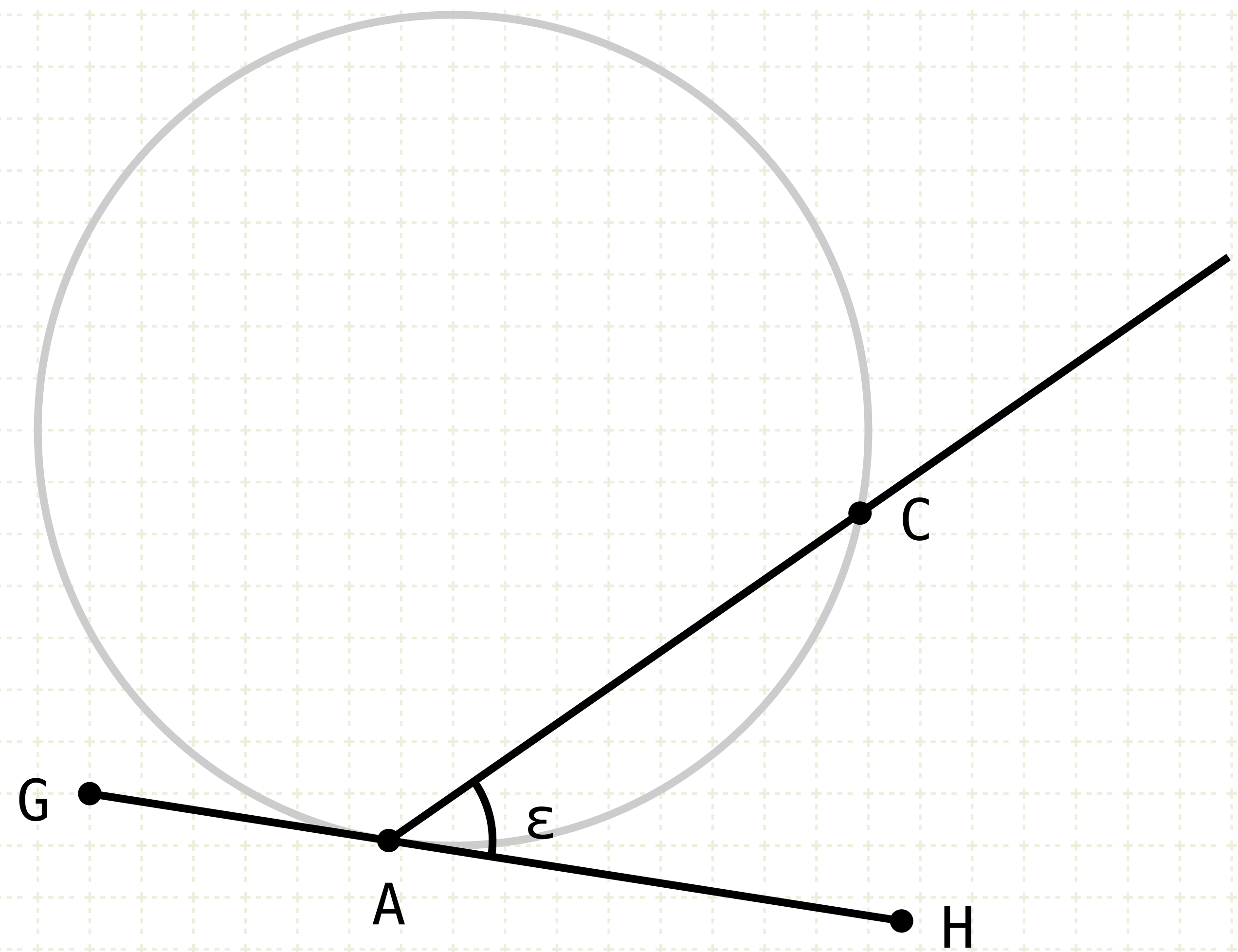

Construction

Draw a line GH touching the circle at point A (III·16)

Copy the angle ε to line GH, at point A (I·23)

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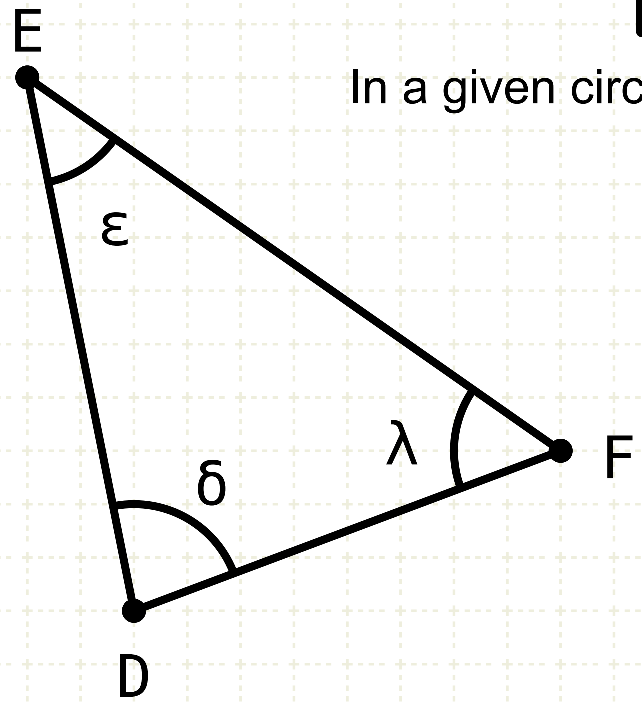

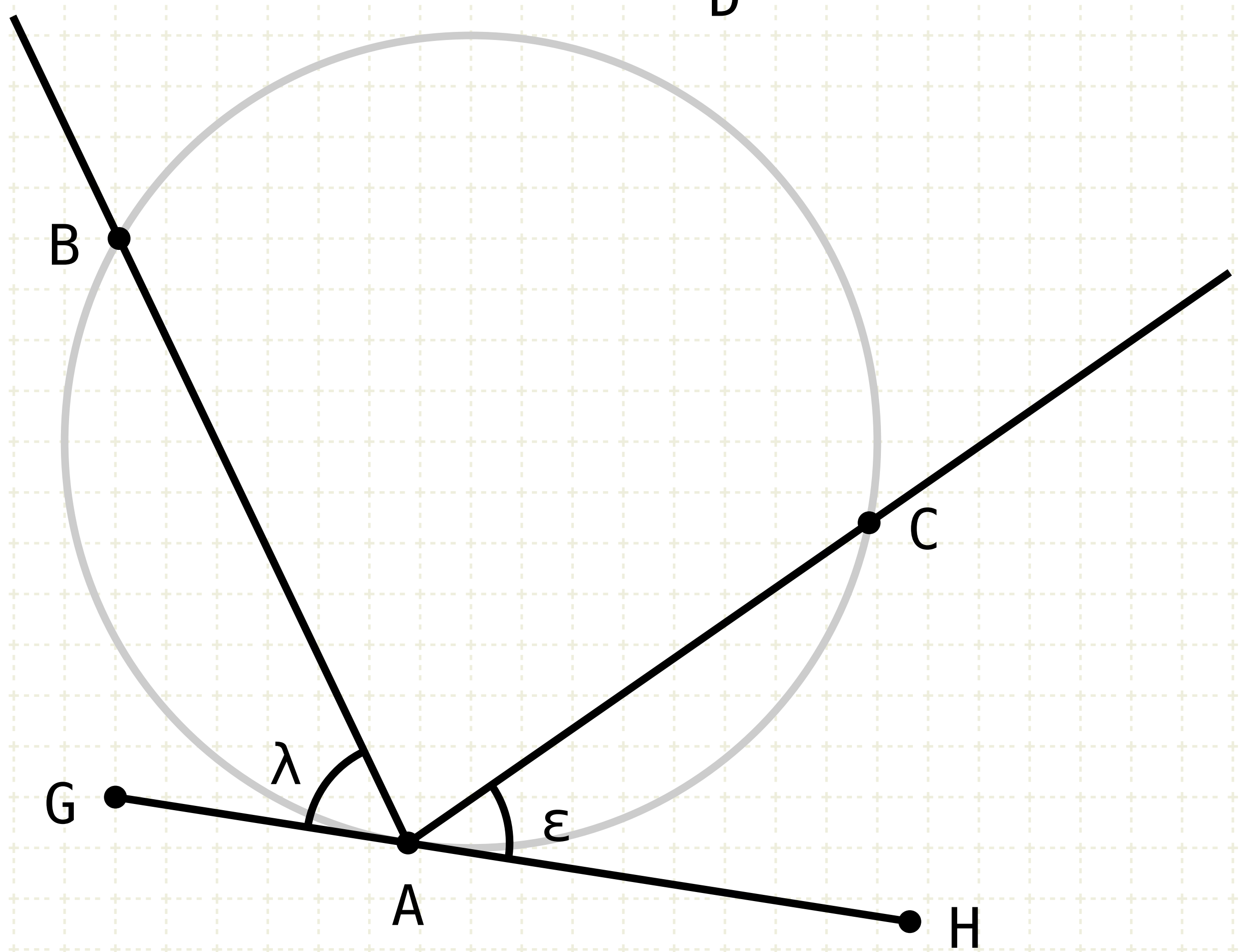

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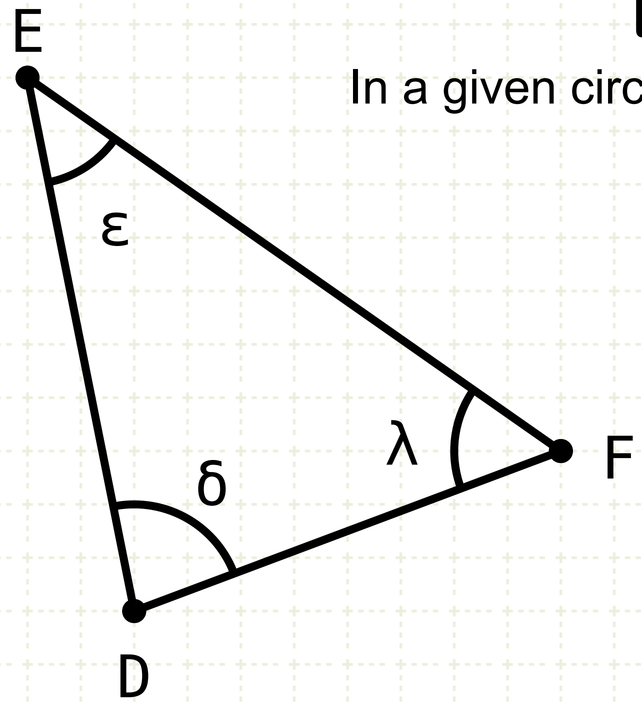

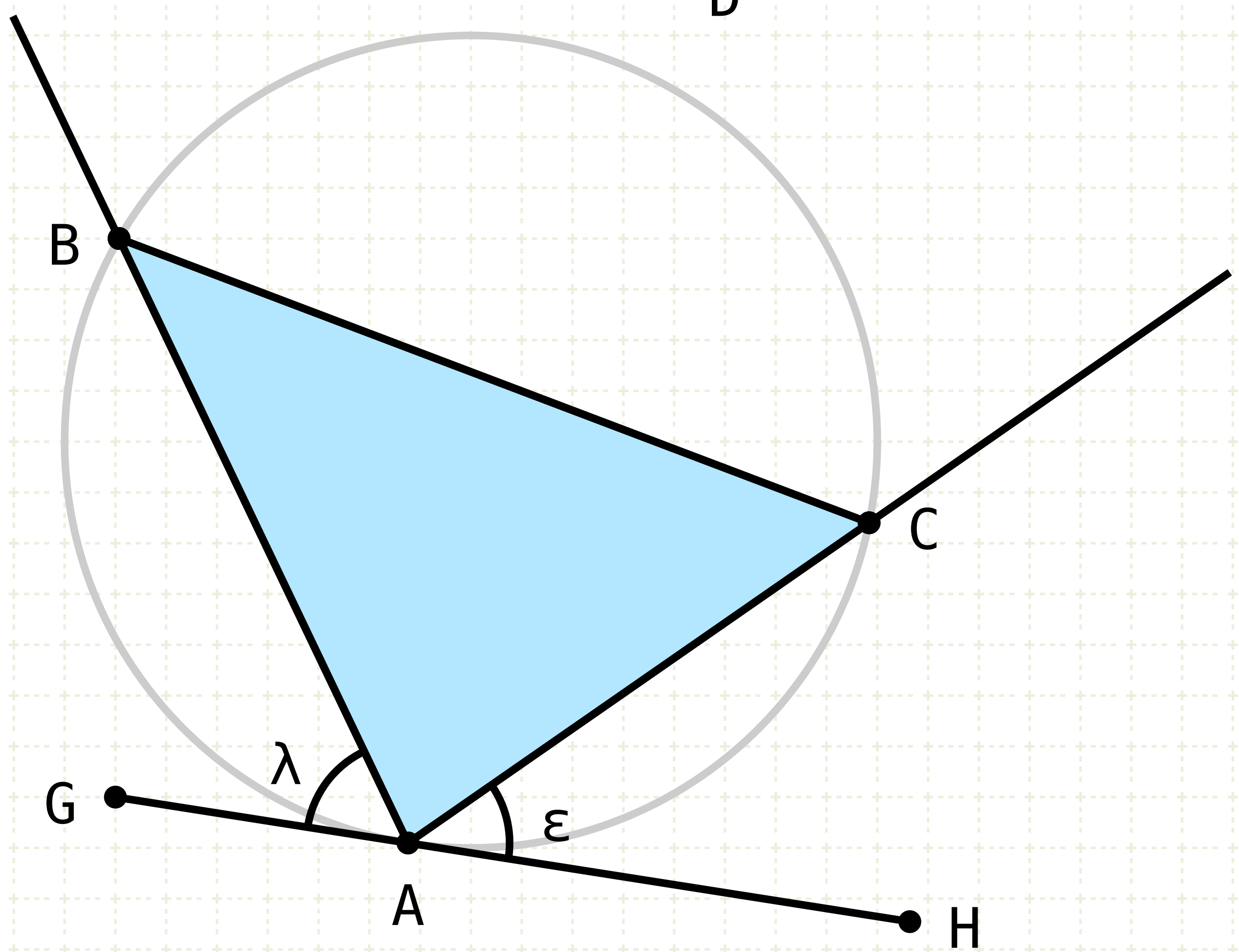

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Draw a line GH touching the circle at point A (III·16)

Copy the angle ε to line GH, at point A (I·23)

Copy the angle λ to line GH, at point A (I·23)

Connect B and C with a straight line

The resulting triangle (circumscribed by the circle) is equiangular to the original triangle DEF

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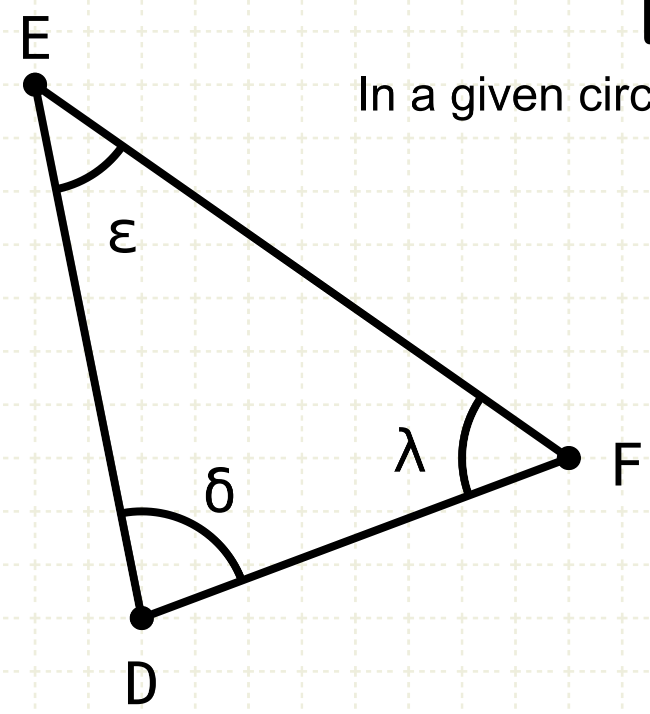
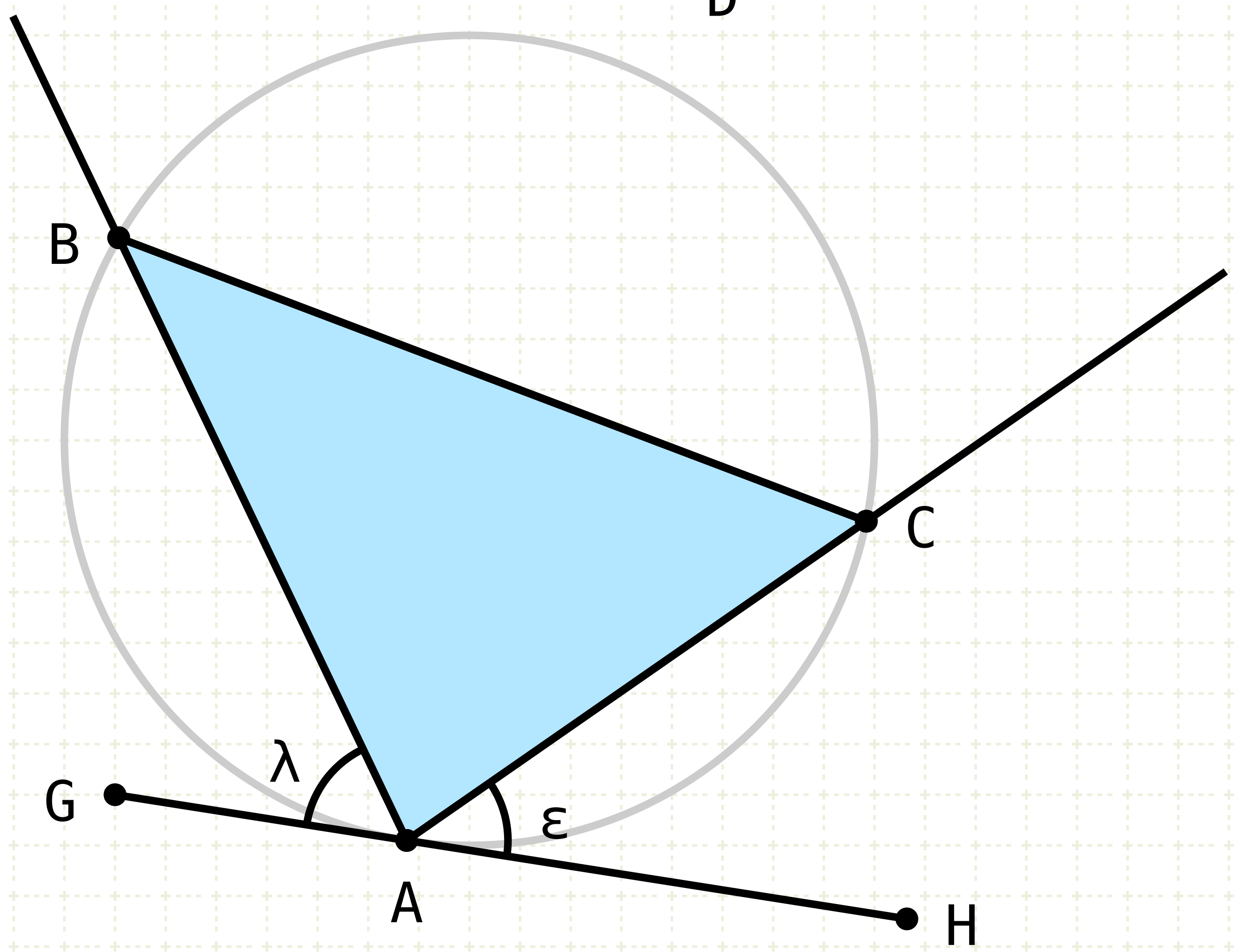
In a given circle to inscribe a triangle equiangular with a given triangle.





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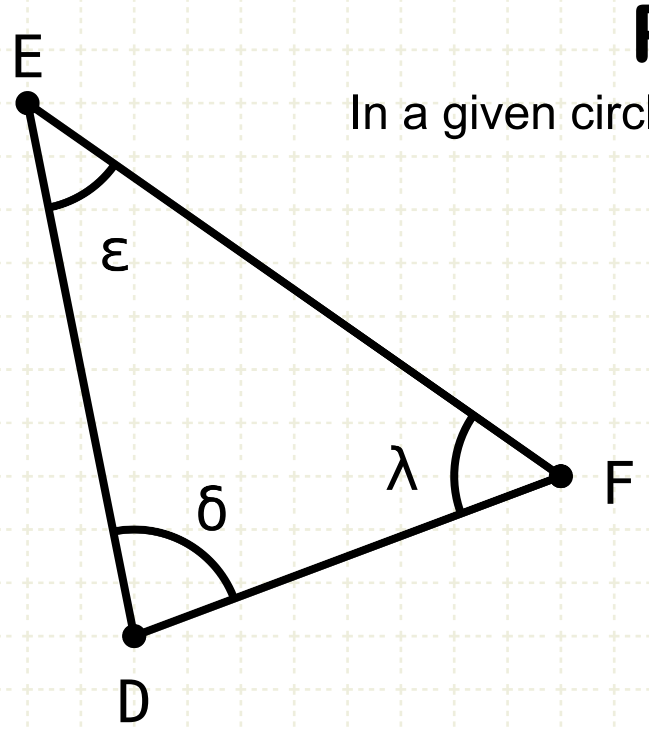
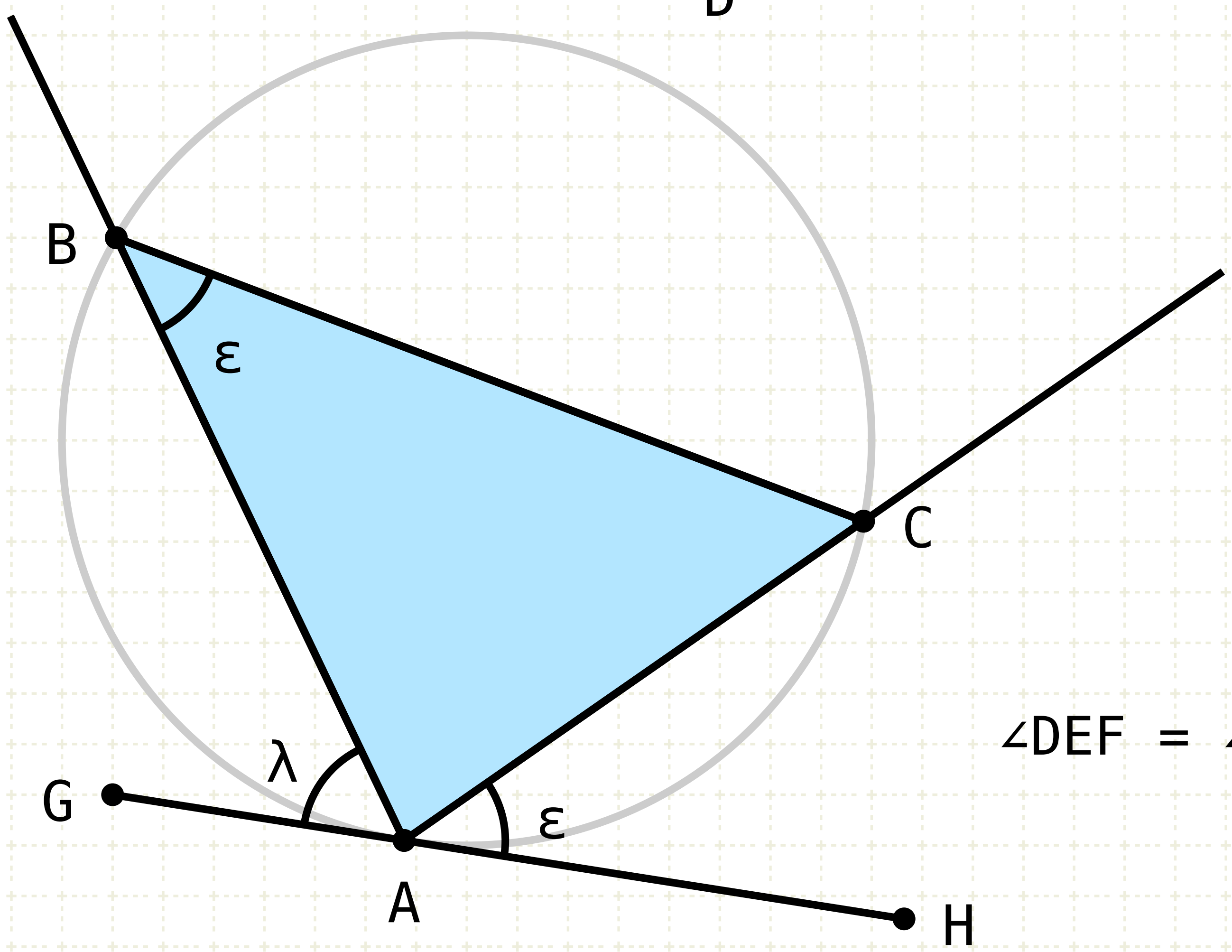
Proof

Proposition 2 of Book IV

In a given circle to inscribe a triangle equiangular with a given triangle.





$\angle DEF = \angle CAH = \angle ABC = \varepsilon$

Construction

Draw a line GH touching the circle at point A (III·16)

Copy the angle ε to line GH, at point A (I·23)

Copy the angle λ to line GH, at point A (I·23)

Connect B and C with a straight line

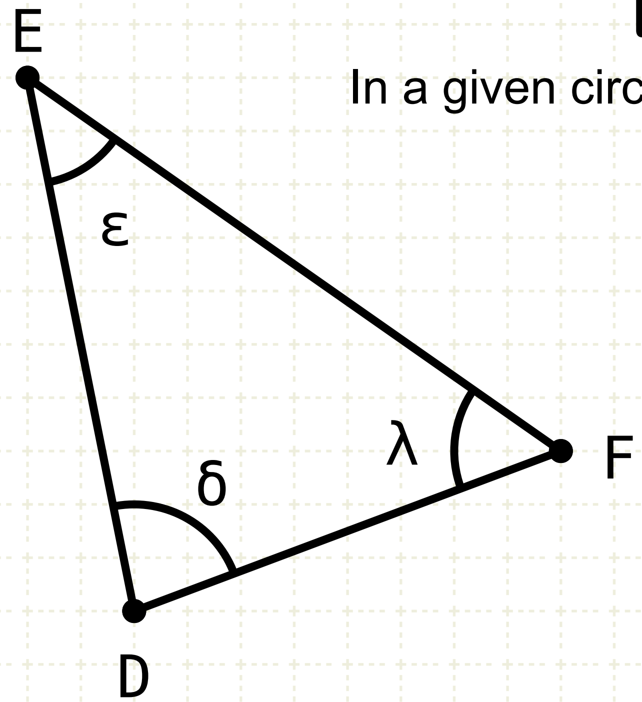
The resulting triangle (circumscribed by the circle) is equiangular to the original triangle DEF

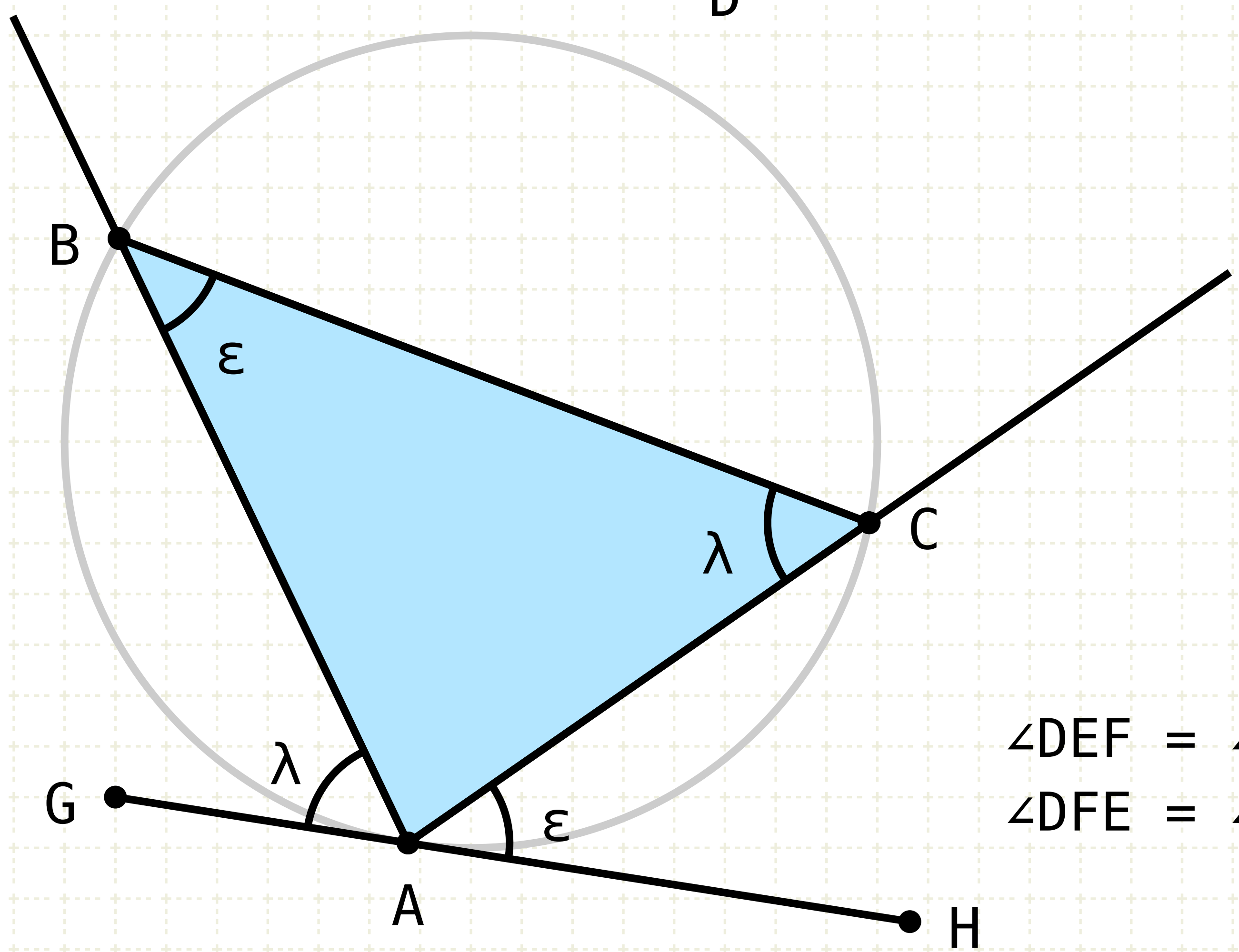
Proof

Since GH touches the circle at A, and AC cuts the circle, the angle in the alternate segment of the circle (HAC) equals the angle between GH and AC (III·32)

Proposition 2 of Book IV

In a given circle to inscribe a triangle equiangular with a given triangle.





$\angle DEF = \angle CAH = \angle ABC = \varepsilon$

$\angle DFE = \angle GAB = \angle BCA = \lambda$

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Similarly for angles GAB and BCA

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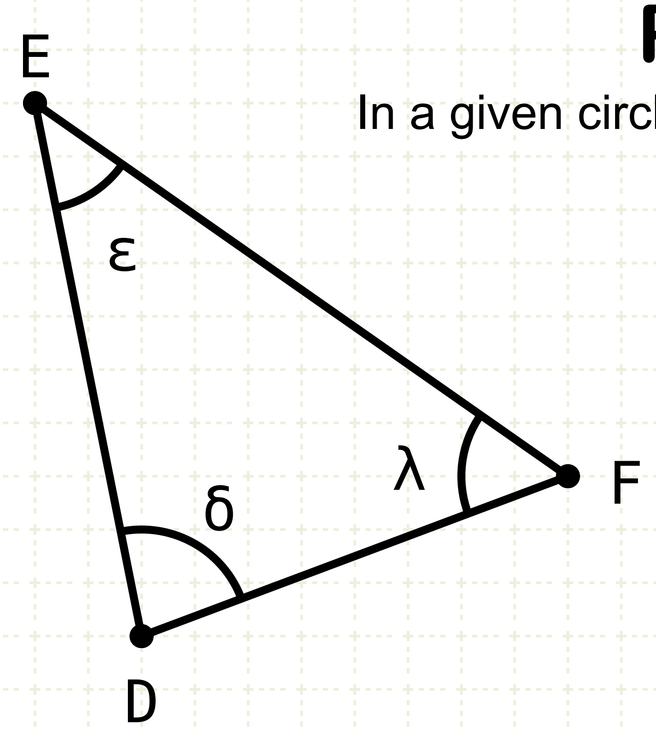

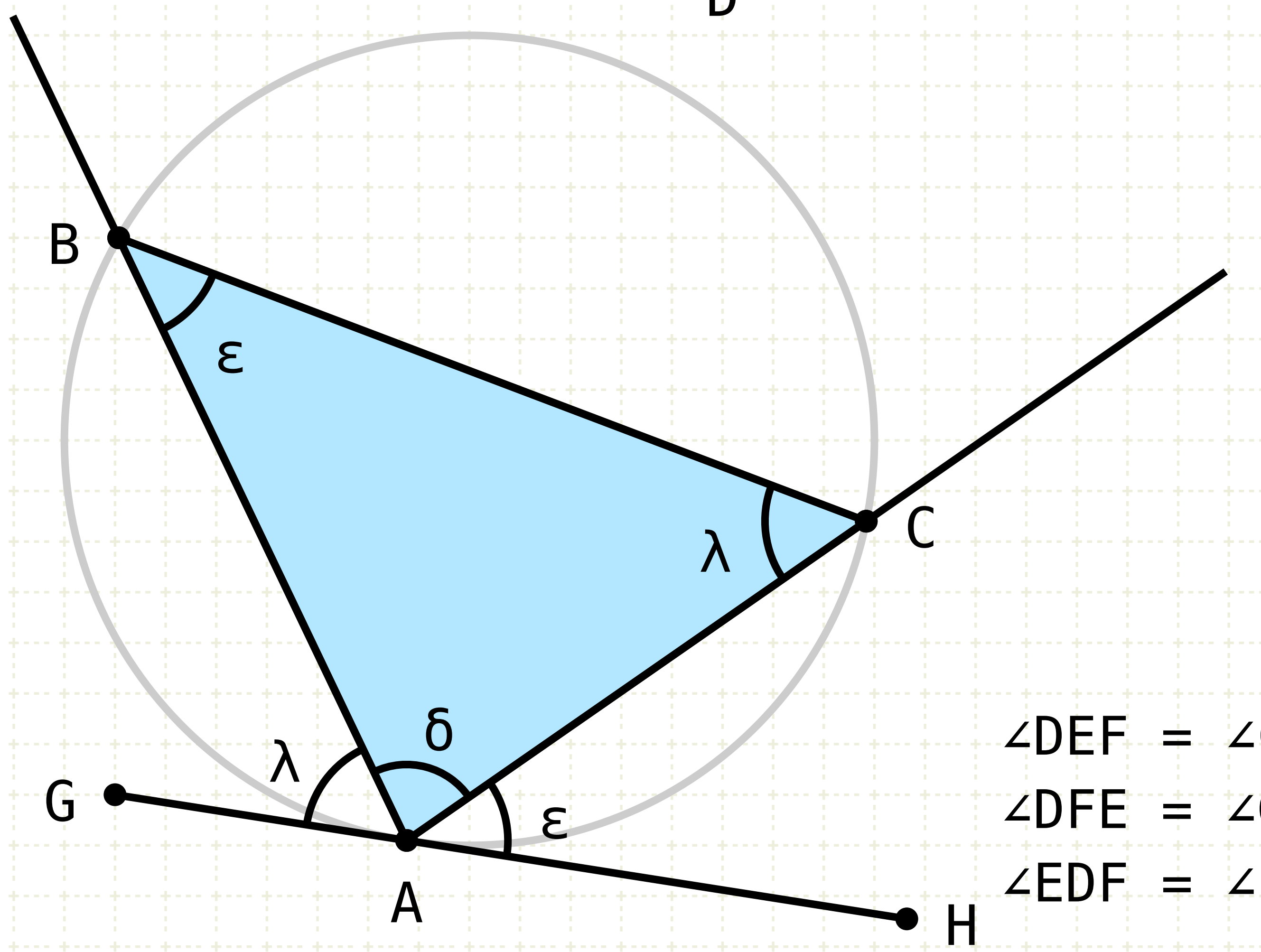

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$\angle EDF = \angle BAC = \delta$

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Proof

Since GH touches the circle at A, and AC cuts the circle, the angle in the alternate segment of the circle (HAC) equals the angle between GH and AC (III·32)

Similarly for angles GAB and BCA

And finally, the sum of all angles in both triangles equals two right angles, it follows that the remaining angle is equal to EDF

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