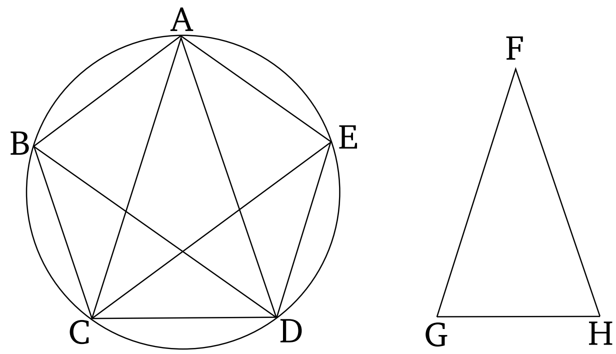
# Book 4
# Proposition 11

To inscribe an equilateral and equiangular pentagon in a given circle.




Let $ABCDE$ be the given circle. So it is required to inscribed an equilateral and equiangular pentagon in circle $ABCDE$.

Let the the isosceles triangle $FGH$ be set up having each of the angles at $G$ and $H$ double the (angle) at $F$ [Prop. 4.10]. And let triangle $ACD$, equiangular to $FGH$, have been inscribed in circle $ABCDE$, such that $CAD$ is equal to the angle at $F$, and the (angles) at $G$ and $H$ (are) equal to $ACD$ and $CDA$, respectively [Prop. 4.2]. Thus, $ACD$ and $CDA$ are each double $CAD$. So let $ACD$ and $CDA$ have been cut in half by the straight-lines $CE$ and $DB$, respectively [Prop. 1.9]. And let $AB$, $BC$, $DE$ and $EA$ have been joined.

Therefore, since angles $ACD$ and $CDA$ are each double $CAD$, and are cut in half by the straight-lines $CE$ and $DB$, the five angles $DAC$, $ACE$, $ECD$, $CDB$, and $BDA$ are thus equal to one another. And equal angles stand upon equal circumferences [Prop. 3.26]. Thus, the five circumferences $AB$, $BC$, $CD$, $DE$, and $EA$ are equal to one another [Prop. 3.29]. Thus, the pentagon $ABCDE$ is equilateral. So I say that (it is) also equiangular. For since the circumference $AB$ is equal to the circumference $DE$, let $BCD$ have been added to both. Thus, the whole circumference $ABCD$ is equal to the whole circumference $EDCB$. And the angle $AED$ stands upon circumference $ABCD$, and angle $BAE$ upon circumference $EDCB$. Thus, angle $BAE$ is also equal to $AED$ [Prop. 3.27]. So, for the same (reasons), each of the angles $ABC$, $BCD$, and $CDE$ is also equal to each of $BAE$ and $AED$. Thus, pentagon $ABCDE$ is equiangular. And it was also shown (to be) equilateral.

Thus, an equilateral and equiangular pentagon has been inscribed in the given circle. (Which is) the very thing it was required to do.