MT 453 Elements Day 6

Speaker: Tom Quan
Scribes: Rebecca Wentzel, Kerry Fitzmaurice

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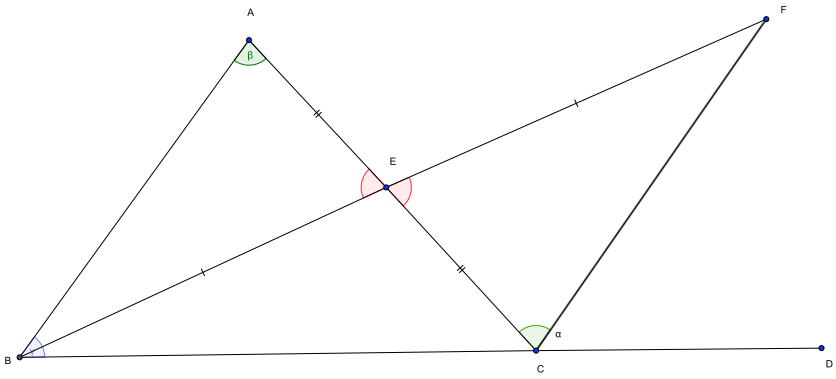
Proposition I.16

In a triangle, if one of the lines is extended, then the exterior angle is greater than either of the two interior opposite angles.

Draw triangle ABC and extend BC to D.
Claim: $\alpha > \beta$, $\alpha > \gamma$
Bisect AC at E (prop. I.10).
Draw BE (post. 1) and extend BE (post. 2) to F such that $BE = EF$ (prop. I.3).
Draw FC (post. 1)
$BE = EF$, $AE = EC$, and $\angle AEB = \angle FEC$ (prop. I.15).
Then $\triangle ABE \cong \triangle CFE$ (prop. I.4).
Therefore $\beta = \angle ECF$.
By c.n. 5, $\alpha > \angle ECF$, so $\alpha > \beta$.
Similarly we can extend AC to G and bisect BC to show that $\alpha > \gamma$. **QED**


A
F
β
E
α
B
C
D