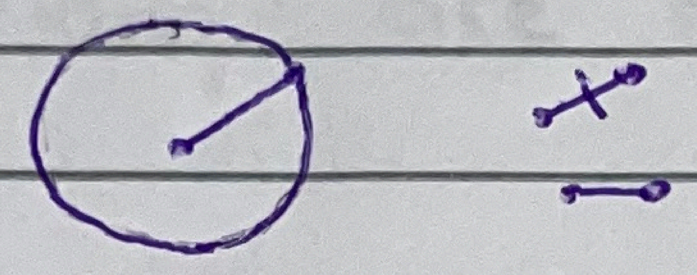
After Proposition I-1 Comes...

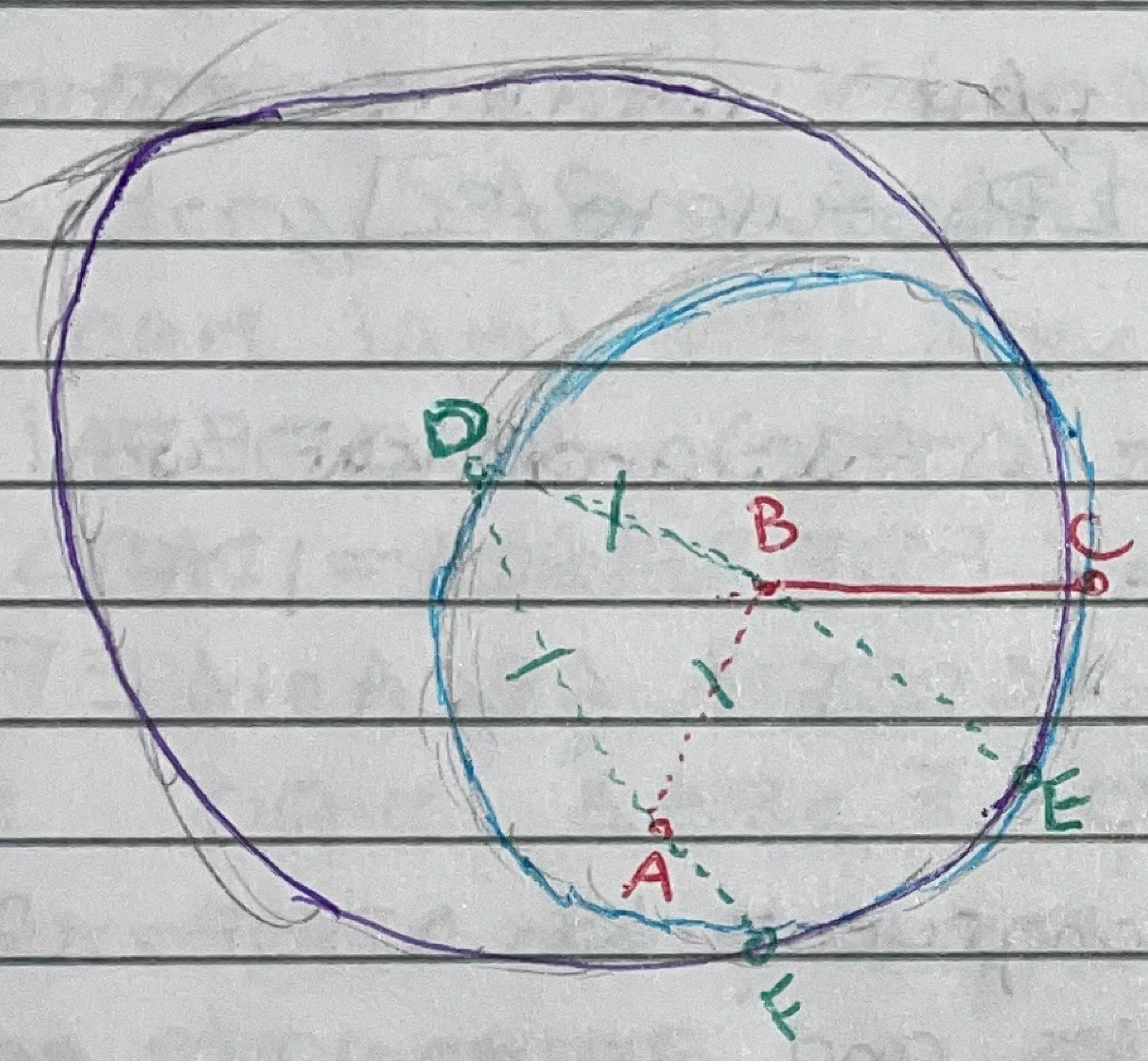
Proposition I-2: To place a given straight line equal to a given straight line at a given point as an endpoint

Postulate III



Proof

Suppose we are given a point A and a line BC



1. Connect A to B [Postulate I]
2. Build an equilatoral triangle $\triangle ABD$ [Prop. I-1]
3. Draw a circle with centre B & radius BC [Postulate III]
4. Extend DB to E on the circle [Post. II & Post. 5]
5. Draw a circle with centre D and radius DE [Postulate III]
6. Extend DA until it meets new circle at F [Postulate II & 5]

Claim: AF is equal in length to BC $|AF| = |BC|$

↳ $|BC| = |BE|$ since both are radii of the circle with centre B and radius BC

↳ $|DE| = |DF|$ since both are radii of the circle with centre D and radius DE

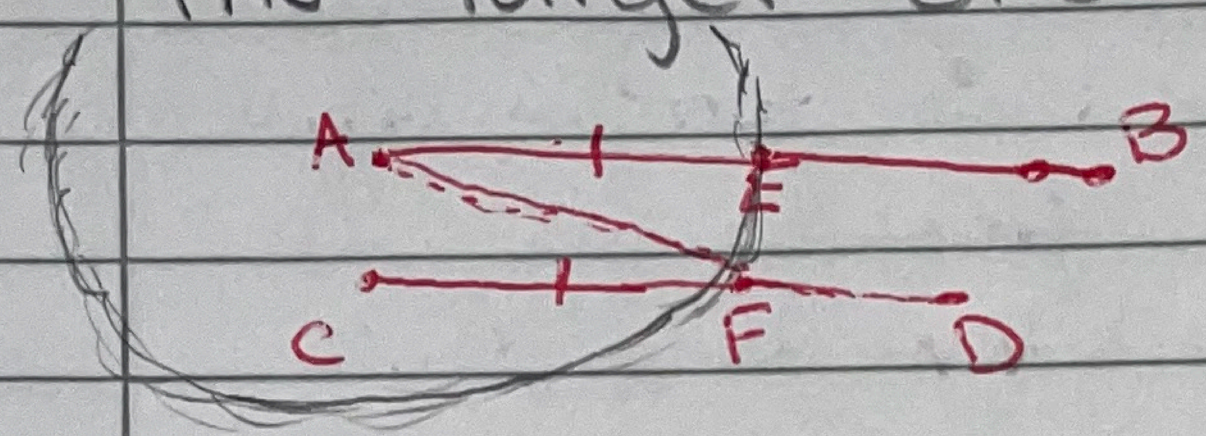
↳ $|DA| = |DB|$ since $\triangle ABD$ is an equilatoral

↳ $|BC| = |BE| = |DE| - |DB|$

↳ $= |DF| - |DA|$

$= |AF|$

Proposition I-3: Given two unequal line segments, cut off a line segment equal to the smaller one from one end of the larger one.



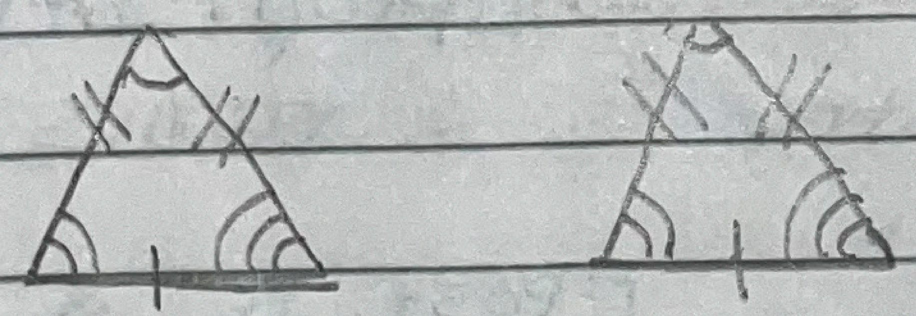
Given $|AB| > |CD|$ find a point E between A and B such that $|AE| = |CD|$

Proof: use I-2 to draw a circle at A of radius CD & E is the point of intersection of AB & the circle [Postulate 5]//

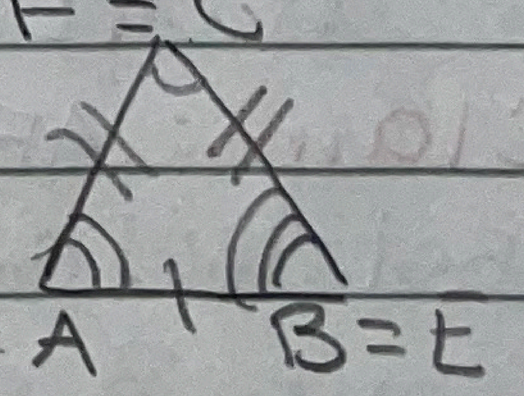
Proposition I-4: Suppose $\triangle ABC$ and $\triangle DEF$ with $|AB| = |DE|$, $\angle BAC = \angle EDF$ & $|AC| = |DF|$ then $|BC| = |EF|$, $\angle ABC = \angle DEF$ & $\angle BCA = \angle EFD$

Side-Angle-side convergence criterion

Definition: $\triangle ABC$ is congruent to $\triangle DEF$ if all the corresponding sides and angles are equal ie The triangles are identical copies...



Proof: place (or apply) $\triangle ABC$ on (to) $\triangle DEF$ so that A is placed on D and AB lies on DF and C is on the same side of DE as F



Since AB lies along DE & A is on D and $|AB| = |DE|$ we must have B on E.

Since AB lies along DE and A is on D and $\angle BAC = \angle CDF$ we must have AC on top of DF since AC along DF and A on D and $|AD| \cdot |DF|$ C is on F