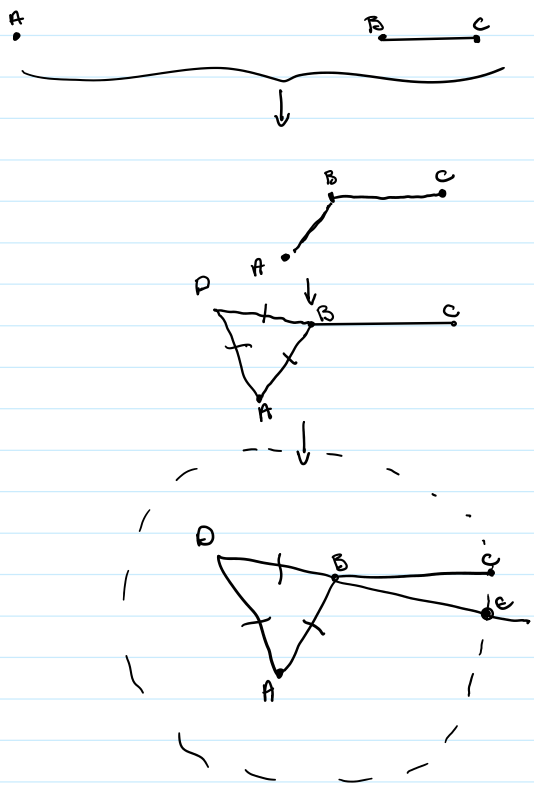
Lecture 2

Tuesday, January 9, 2024 8:45 PM

After proposition I-1 comes...

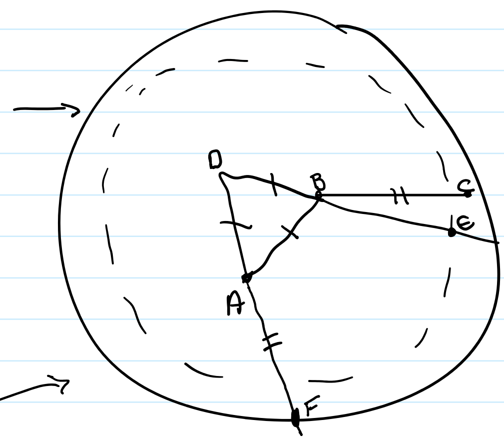
proposition I-2: To place a straight line equal to a given straight line at a given pt as an endpt.

Proof: suppose we are given a pt A and a line BC



* Steps:

1) connect A to B or C (postulate 1)
2) use proposition I-1 to build equilateral triangle on AB - triangle $\triangle ABD$ (poposition I-1)
3) Draw circle w centre B and radius BC (postulate 3)
4) Extend DB to E on the circle (postulate 2 and 5)
5) Draw a circle with centre D and radius DE (postuate 3)



* Claim $|AF| = |BC|$

6) Extend DA until it meets the new circle (bigger one) at F (postulate 2 and 5)

Proof of claim:

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

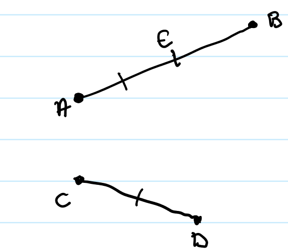
$|DE| = |DF|$ since both are radii of the circle with centre D and radius DE

$|DA| = |DB|$ since $\triangle ABD$ is an equilateral

Thus...

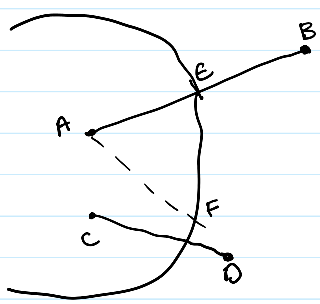
$|BC| = |BE|$
$= |DE| - |DB|$
$= |DF| - |DA|$
$= |AF|$ // $\therefore |BC| = |AF|$ ✓

Now moving on to proposition 3: Given two unequal (length) line segments, cut of a line segment equal to the smaller one from one end of the larger one



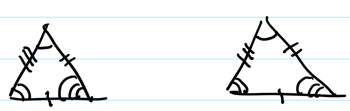
Given $|AB| > |CD|$, find a pt E between A & B such that $|AE| = |CD|$.

proof use I-2 to draw a circle at A of radius CD & E is the pt of intersection of AD and the circle (postulate 3) //



Now moving on to proposition 4: Suppose $\Delta ABC, \Delta DEF$ w $|AB| = |DE|$, $\angle BAC = \angle EDF$ and $|AC| = |DF|$. then $|BC| = |EF|$, $\angle ABC = \angle DEF$, and $\angle BCA = \angle EFD$. } side-angle-side congruence criterion

Def'n ΔABC is congruent to ΔDEF if all the corresponding sides and angles are equal.

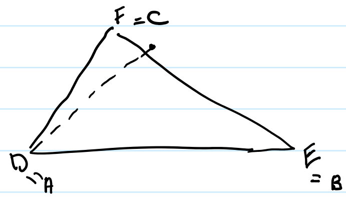


ie) the triangles are identical copies

Proof we have (suppose) ΔABC and ΔDEF
w . . . " "

place (or apply) ΔABC on (to) ΔDEF so that A is placed on D. and AB lies on DE, and C is on the same side of DE as F.

- Since AB lies along DE and A is on D, and by assumption $|AB| = |DE|$, we must have B on E.



- Since AB lies along DE and A is on D, and $\angle BAC = \angle EDF$, we must have AC on top of DF.

- Since AC lies along DF and A is on D and $|AC| = |DF|$, C is on F.

- Since the relocated $\triangle ABC$ is vertex-for-vertex $\triangle DEF$. All corresponding angles and sides are equal.

Now Proposition 5: The base angles of an isoceles (two sides equal) triangle are equal.