Lesson 4: Proposition 1.1 (continued)

Note: Proposition 1.1 means, proposition 1 from book 1 of the elements.

Labeling Practice

Lines segments - Postulate 1 & 2

Circles (center, radius, diameter) - Definition 15 & Postulate 3

Triangles (equilateral, isosceles, scalene) - Definition 20

Notations

Equal line segments - Axiom 1

Radii of circles - Definition 15

Addition/subtraction of line segments - Axioms 2-3

Practice Proof

If $\overline{AC} = \overline{DF}$ and $\overline{BC} = \overline{EF}$, then $\overline{AB} = \overline{DE}$.

Given: $\overline{AC} = \overline{DF}$, $\overline{BC} = \overline{EF}$
Show: $\overline{AB} = \overline{DE}$

Proposition 1.1 (Problem): On a given finite straight line, construct an equilateral triangle.

Given: Finite straight line.
Construct: A triangle on the given line.
Show: Sides of the triangle are equal to each other.

Let $\overline{AB}$ be the given finite straight line.
With center A and distance AB, construct the circle BCD **(P3)**.
With center B and distinct BA, construct the circle ACE **(P3)**.
At point C, where the circles cut one another (where they intersect, where they cross one another), to the points A and B, let the straight lines $\overline{CA}$, $\overline{CB}$ be joined **(P1)**.

Since point A is the center of the circle CDB, $\overline{AC} = \overline{AB}$ **(Def 15)**.
Since the point B is the center of the circle CAE, $\overline{BC} = \overline{BA}$ **(Def 15)**.
Therefore, $\overline{AC} = \overline{AB} = \overline{BC}$ **(A1)**.
In conclusion, the triangle ABC is equilateral and it has been constructed on the given finite straight line AB.

Q.E.F.