1. Construct the $1$ bisector of \( \overline{AB} \)

Steps:

a) Draw $2$ semi circles of radius $\overline{AB}$ at centers $A$ and $B$.

b) Label the intersections of the semi circles $D$, $E$ and connect the two points.

c) Label the intersection of $DE$ and $AB$, $C$.

Claim \( \overline{DE} \) is the $1$ bisector of $\overline{AB}$.

\[ \text{Pf:} \]

Consider $\triangle DAB \sim \triangle EAD$.

\[ \overline{AD} = \overline{DE} = \overline{AE} \quad \text{(radii)} \]

\[ \triangle DAB \cong \triangle EAD \quad \text{(SSS)} \]

\[ \angle ADB = \angle AEB \quad \text{(corresponding)} \]

\[ \angle DAB = \angle EBA \quad \text{(CE-S)} \]

\[ \angle DCA = \angle ECA \quad \text{(CPCTC)} \]

\[ \angle DCE = \angle EDE \quad \text{(CPCTC)} \]

$\overline{DE}$ is the $1$ bisector of $\overline{AB}$.

2. Given points $A$, $B$ prove the locus of points equidistant from $A$, $B$ is equal to $1$ bisector of line segment $\overline{AB}$.

From problem 1, $\overline{DE}$ is the $1$ bisector of $\overline{AB}$, thus $\overline{AC} = \overline{CB}$ and $\angle PCB = \angle PCA = 90^\circ$.

Pick any point, $P$ on $\overline{DE}$ and draw lines from $P$ to $A$ and $B$.

Consider $\triangle APC \sim \triangle BPC$.

by $\text{SAS, } \angle APC = \angle BPC$ and $\overline{PA} = \overline{PB}$ (CPCTC).

If $\overline{PA} = \overline{PB}$, then $\angle PAC = \angle PBC$ and $\overline{AC} = \overline{BC}$ (congruent).

\[ \angle APC = \angle BPC, \text{ which implies that} \]

$\overline{PC}$ is in $\overline{DE}$.\]