SSS

Given: $\triangle ABC$, $\triangle DEF$ such that

$\overline{AB} \cong \overline{DE}$ (1)

$\overline{BC} \cong \overline{EF}$ (2)

$\overline{AC} \cong \overline{DF}$ (3)

by thm 13, there exists an angle $\measuredangle FEZ$
such that $\measuredangle FEZ \cong \measuredangle ABC$ (4)
and Z is on ~~same~~ opposite side of $\overleftrightarrow{EF}$ from D (5)

by thm 12, there is a point G on $\overrightarrow{EZ}$ (6)
such that $\overline{AB} \cong \overline{EG}$ (7)

Now $\overline{AB} \cong \overline{EG}$ by 7, $\angle FEG \cong \angle ABC$ by 4 and 6,
and $\overline{BC} \cong \overline{EF}$ by 2

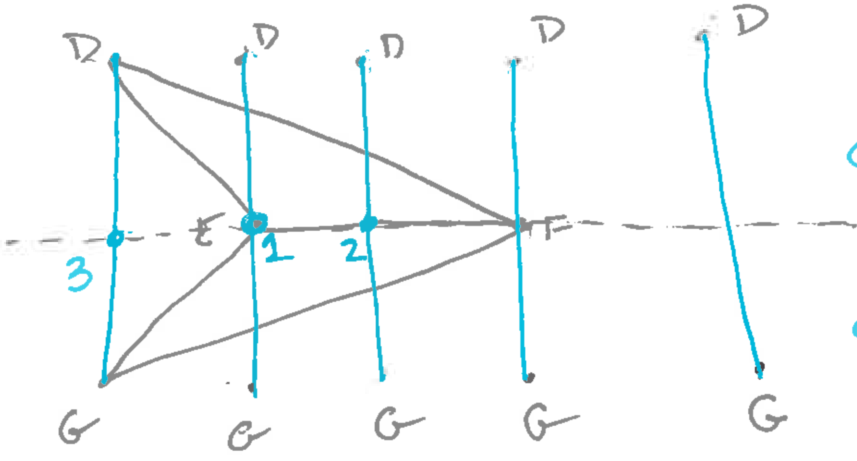
So $\triangle ABC \cong \triangle GEF$ (8)

Now, because $\overline{AB} \cong \overline{GE}$ (7) and $\overline{AB} \cong \overline{DE}$ (1)
$\overline{DE} \cong \overline{GE}$ (9)

And, because $\triangle ABC \cong \triangle GEF$, by CPCTC, $\overline{AC} \cong \overline{GF}$
and by 3 $\overline{AC} \cong \overline{DF}$

so, $\overline{DF} \cong \overline{GF}$ (10)

If I draw in segment $\overline{DG}$

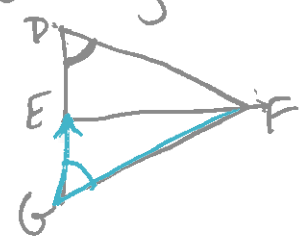


Case 1: $\overline{DG}$ includes E or F (we may assume E)

Case 2: $\overline{DG} \cap \overline{EF}$ at a point P that is not E or F.

Case 3: $\overline{DG}$ does not intersect $\overline{EF}$ (we may assume $\overline{DG} \cap \overleftrightarrow{EF}$ on ray $\overrightarrow{FE}$)

Case 1: $E \in \overline{DG}$



Now $\overline{DF} \cong \overline{GF}$ by line 10

So, because $\triangle DFG$ is isosceles, then $\angle FDG \cong \angle FGD$

$\angle FDG = \angle FDE$

and

$\angle FGD = \angle FGE$

So $\angle FDE \cong FGE$

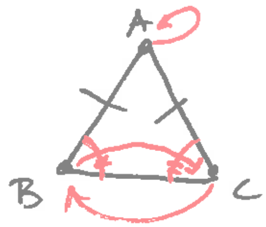
and $\overline{ED} \cong \overline{EG}$ by line

and $\overline{DF} \cong \overline{GF}$ by line

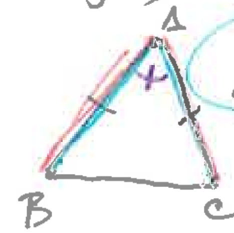
By SAS $\triangle EDF \cong \triangle EGF$

Thm 14 $\quad \cong$ Sides $\longrightarrow$ $\cong$ Angles

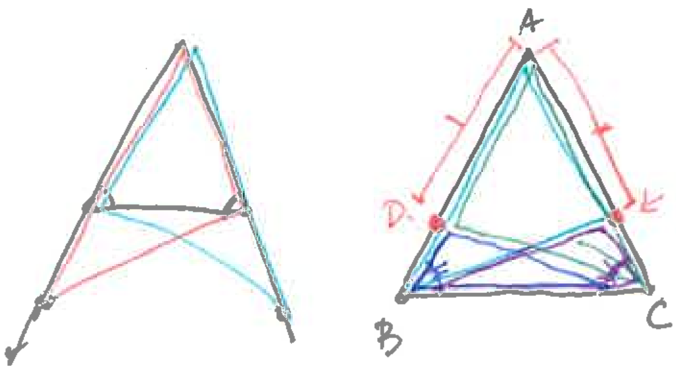
① isometry



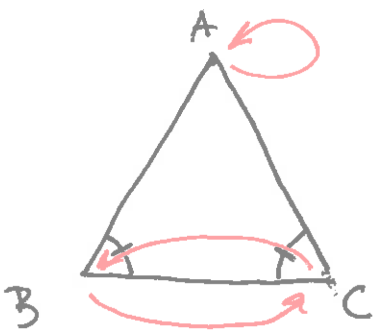
②

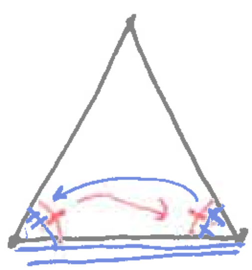


$\triangle ABC \cong \triangle ACB$
by SAS



Thm 15 $\quad \cong$ Angles $\longrightarrow$ $\cong$ Sides





ASA

congruent to itself