Theorem 29 (SAS): If a triangle has two sides and the included angle congruent to two sides and the included angle of another triangle, then the triangles are congruent

Given triangles ΔABC and ΔDEF such that

- $\overline{AB} \cong \overline{DE}$, (1)
- $\overline{BC} \cong \overline{EF}$ and (2)
- $\angle ABC \cong \angle DEF$ (3)

Then

- $\underline{AB} = \underline{DE}$ because (1) (4)
- $\underline{BC} = \underline{EF}$ because (2) (5)
- $m(\angle ABC) = m(\angle DEF)$ because (3) (6)

By Axiom 3, there is an isometry f (7)

such that

- $f(B) = E$ (8)
- $f(A) \in \overrightarrow{ED}$ (9)
- $f(C)$ is on the same side of $\overleftrightarrow{ED}$ as point F (10)

By Theorem 26 and lines (7, 4, 8, 9), $f(A) = D$ (11)

By Theorem 27 and lines (7, 6, 8, 9, 10), $f(C) \in \overrightarrow{EF}$ (12)

By Theorem 26 and lines (7, 2, 8, 12), $f(C) = F$ (13)

So $f(A) = D$, $f(B) = E$, $f(C) = F$ (by lines 11, 8, 13), and by theorem 18, $f(\Delta ABC) = \Delta DEF$

Therefore $\Delta ABC \cong \Delta DEF$