Given: see figure

AB is congruent to DE, so DE is the image of AB in a series of reflections.

So A′=D, B′=E. Where is C′?

Because distances are preserved we have A′C′=AC=DF, so C′ must be on the circle centered at D, with radius DF.

Because angles are preserved, C′ is either on ray DF, or on ray DF′s reflection across DE.

There are two possibilities, depending on which of the two rays C′ is on.

If C′=F, we are done: ΔA′B′C′ is ΔDEF, so we have superposed ΔABC onto ΔDEF with a series of reflections, and thus they are congruent.

If C′≠F, reflect ΔA′B′C′ in DE. A′′=A′=D, and B′′=B′=E. Because angles and distances are preserved, C′′ is at the intersection of the circle centered at D with radius DF, and the ray that makes an angle equal to angle A with side DE.

So C′′= F. Therefore ΔA′B′C′′ is ΔDEF, and we have superposed ΔABC onto ΔDEF with a series of reflections, and thus they are congruent.