8.G Cutting a rectangle into two congruent triangles

Task

Below is a picture of rectangle $ABCD$ with diagonal $AC$.

a. Draw the image of triangle $ACD$ when it is rotated $180^\circ$ about vertex $D$. Call $A'$ the image of point $A$ under the rotation and $C'$ the image of point $C$.

b. Explain why $\overrightarrow{DA'} \cong \overrightarrow{DA}$ and why $\overrightarrow{DC'}$ is parallel to $\overrightarrow{AB}$.

c. Show that $\triangle A'C'D$ can be translated to $\triangle CAB$. Conclude that $\triangle ACD$ is
congruent to $\triangle CAB$.

d. Show that $\triangle ACD$ is congruent to $\triangle CAB$ with a sequence of translations, rotations, and/or reflections different from those chosen in parts (a) and (c).