

Homework 10 Part 2: Prove diagonals of a parallelogram bisect each other

Given: $ABDC$ is a parallelogram Prove: The diagonals bisect each other ($\overline{EA} \cong \overline{ED}$ and $\overline{EB} \cong \overline{EC}$)

Paragraph Proof

We know that $ABDC$ is a parallelogram because it is given. If the shape is a parallelogram, then we know \overline{AB} is parallel to \overline{CD} by the
definition of a parallelogram. This lets us use special angles. Looking at \overline{CB} as a transversal of \overline{AB} and \overline{CD} , we can see that $\angle ABC$ is
congruent to $\angle BCD$ because they are alternate interior angles. Similarly, looking at \overline{AD} as a transversal of \overline{AB} and \overline{CD} , we can see that
$\angle BAD$ is congruent to $\angle CDA$ because they are alternate interior angles. So far we have two pairs of congruent angles, so I need a pair
of congruent sides. I know that \overline{AB} and \overline{CD} are congruent because that is a property of parallelograms. Now I can use ASA congruence
criteria to state that $\triangle EAB$ is congruent to $\triangle EDC$. Finally, since \overline{EA} in $\triangle EAB$ corresponds to \overline{ED} in $\triangle EDC$, and \overline{EB} in $\triangle EAB$ corresponds
to \overline{EC} in $\triangle EDC$, then \overline{EA} must be congruent to \overline{ED} and \overline{EB} must be congruent to \overline{EC} , because corresponding parts of congruent
triangles are congruent. Q.E.D.

Statement	Reason
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Given: ABDC is a parallelogram

Prove: The diagonals bisect each other ($\overline{EA} \cong \overline{ED}$ and $\overline{EB} \cong \overline{EC}$)

