Introduction to Paragraph Proofs

A **paragraph proof** is another way a proof is often written. The advantage of a paragraph proof is that you have the chance to explain your reasoning in your own words. In a paragraph proof, the statements and their justifications are written together in a logical order in a paragraph form. There is always a diagram and a statement of the given and prove sections before the paragraph.

1. a. What information does the first sentence of a paragraph proof contain?

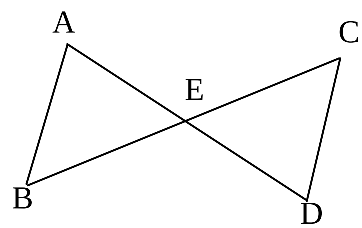
   b. What information does the last sentence of a paragraph proof contain?

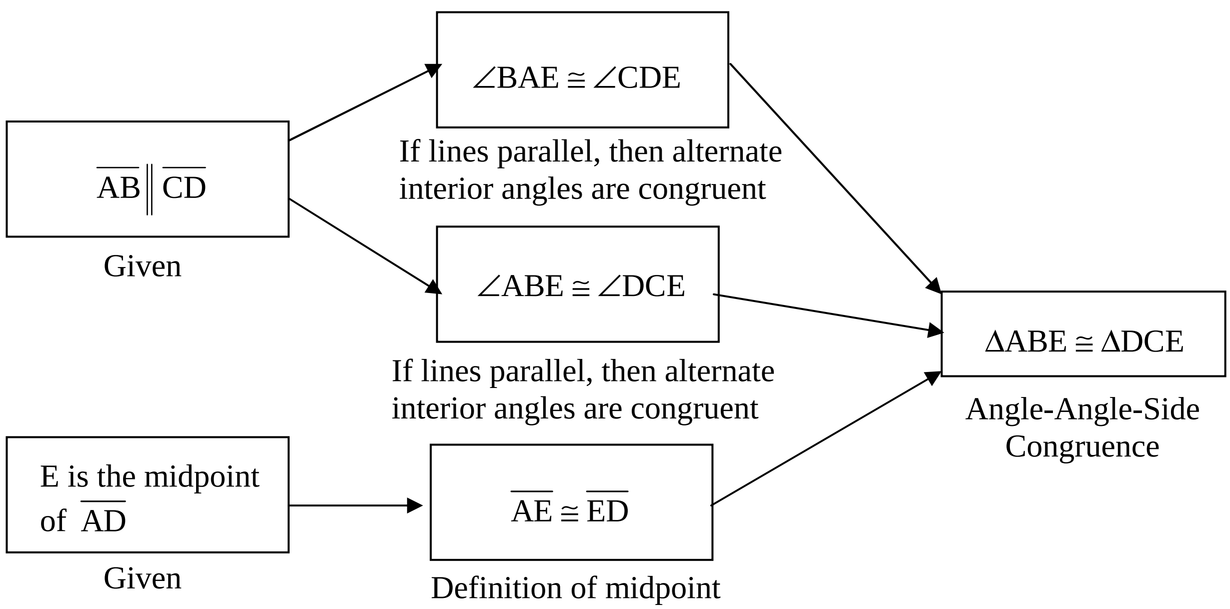
2. For the flow chart proof below, rewrite each box as a statement with the reason for the box as the justification.

Given: $\overline{AB} \parallel \overline{CD}$

E is the midpoint of $\overline{AD}$

Prove: $\Delta ABE \cong \Delta DCE$



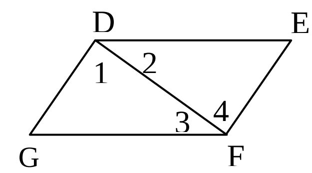


Introduction to Paragraph Proofs (Continued)

3. Fill-in the missing statements and justifications in the following paragraph proof.

Given: $\overline{DG} \parallel \overline{EF}$, $\overline{DE} \parallel \overline{GF}$

Prove: $\overline{DG} \cong \overline{EF}$



Since $\overline{DG} \parallel \overline{EF}$ and $\overline{DE} \parallel \overline{GF}$ are given, then $\angle 1 \cong \angle 4$ and $\angle 3 \cong \angle$______ because

____. $\overline{DF} \cong \overline{DF}$ because

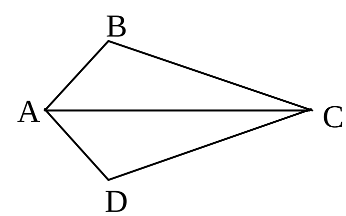
___________________. Then $\Delta DGF \cong \Delta$_____ by ________. Therefore, $\overline{DG} \cong \overline{EF}$ by

____________________________.

4. Fill-in the missing statements and justifications in the following paragraph proof.

Given: $\overline{AC}$ bisects $\angle BAD$
$\overline{AC}$ bisects $\angle BCD$

Prove: $\overline{AB} \cong \overline{AD}$



Since $\overline{AC}$ bisects $\angle BAD$ is given, then $\angle BAC \cong \angle$_________ because

________________. Since $\overline{AC}$ bisects $\angle BCD$ is given, then $\angle BCA \cong \angle$______ because

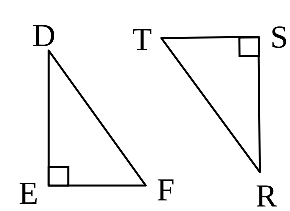
____________. $\overline{AC} \cong \overline{AC}$ because ____________. Then $\Delta BAC \cong \Delta$________ by _______.

Therefore $\overline{AB} \cong \overline{AD}$ by _________.

5. Mark the given on the figure. Write your own paragraph proof for the following information.

Given: E and S are right angles.
$\overline{EF} \cong \overline{ST}$ and $\overline{ED} \cong \overline{SR}$

Prove: $\Delta DEF \cong \Delta RST$



Answers:

1. a. The first sentence contains the given statements.
   b. The last sentence contains what is to be proved.
2. Lines $\overline{AB}$ and $\overline{CD}$ are parallel and E is the midpoint of $\overline{AD}$. Since the $\overline{AB}$ and $\overline{CD}$ are parallel, angles BAE and CDE are congruent because if two parallel lines are cut by a transversal, then alternate interior angles are congruent. For this same reason, angles ABE and DCE are congruent. Since E is the midpoint of $\overline{AD}$, $\overline{AE}$ and $\overline{ED}$ are congruent. Therefore, by angle-angle-side triangle congruence, ΔABE is congruent to ΔDCE.
3. Since $\overline{\mathrm{DG}} \parallel \overline{\mathrm{EF}}$ and $\overline{\mathrm{DE}} \parallel \overline{\mathrm{GF}}$ are given, then $\angle 1 \cong \angle 4$ and $\angle 3 \cong \angle 2$ because when two parallel lines are cut by a transversal, then alternate interior angles are congruent. $\overline{\mathrm{DF}} \cong \overline{\mathrm{DF}}$ because of the reflexive property of congruence. Then $\Delta \mathrm{DGF} \cong \Delta \mathrm{FED}$ by angle-side-angle triangle congruence. Therefore, $\overline{\mathrm{DG}} \cong \overline{\mathrm{EF}}$ by the definition of triangle congruence.
4. Since $\overline{\mathrm{AC}}$ bisects $\angle \mathrm{BAD}$ is given, then $\angle \mathrm{BAC} \cong \angle \mathrm{CAD}$ because of the definition of angle bisectors. Since $\overline{\mathrm{AC}}$ bisects $\angle \mathrm{BCD}$ is given, then $\angle \mathrm{BCA} \cong \angle \mathrm{ACD}$ because of the definition of angle bisectors. $\overline{\mathrm{AC}} \cong \overline{\mathrm{AC}}$ because of the reflexive property of congruence. Then, $\Delta \mathrm{BAC} \cong \Delta \mathrm{DAC}$ by the angle-side-angle triangle congruence theorem. Therefore $\overline{\mathrm{AB}} \cong \overline{\mathrm{AD}}$ by the definition of triangle congruence.
5. Since $\angle \mathrm{E}$ and $\angle \mathrm{S}$ are right angles, they both measure 90 degrees by the definition of right angles. Because of this, they are also congruent. We are also given that $\overline{\mathrm{EF}} \cong \overline{\mathrm{ST}}$ and $\overline{\mathrm{ED}} \cong \overline{\mathrm{SR}}$. Because of this information, $\Delta \mathrm{DEF} \cong \Delta \mathrm{RST}$ because of side-angle-side triangle congruence.