

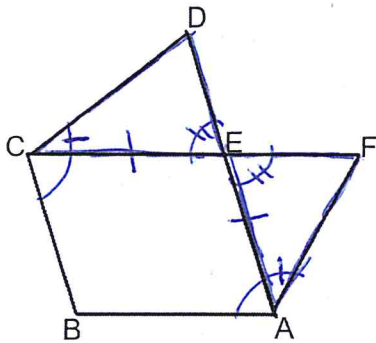
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Date _____
Geometry

Parallelogram Proofs with Additional Tools

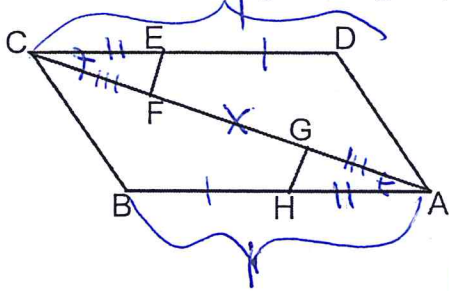
1. Given: Rhombus AECB, $\angle FAB \cong \angle DCB$

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



- | Statements | Reasons |
|---------------------------------------|---|
| ① Rhombus AECB | ① given |
| ② $\overline{CE} \cong \overline{EA}$ | ② A rhombus has consecutive sides congruent |
| ③ $\angle FAB \cong \angle DCB$ | ③ given |
| ④ $\angle EAB \cong \angle ECB$ | ④ A rhombus has opposite angles congruent |
| ⑤ $\angle DCE \cong \angle FAE$ | ⑤ Subtraction Property |
| ⑥ $\angle DEC \cong \angle AEF$ | ⑥ Vertical angles are congruent |
| ⑦ $\triangle CED \cong \triangle AEF$ | ⑦ ASA \cong ASA |
| ⑧ $\overline{DE} \cong \overline{EF}$ | ⑧ CPCTC |

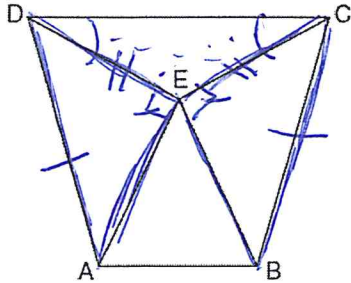
2. Given: ABCD is a parallelogram, $\overline{AF} \cong \overline{GC}$, $\overline{BH} \cong \overline{DE}$ Proves $\overline{EF} \cong \overline{GH}$



- | Statements | Reasons |
|---------------------------------------|---|
| ① ABCD is a parallelogram | ① given |
| ② $\overline{CD} \cong \overline{BA}$ | ② A parallelogram has opposite sides congruent |
| ③ $\overline{BH} \cong \overline{DE}$ | ③ given |
| ④ $\overline{CE} \cong \overline{HA}$ | ④ Subtraction Property |
| ⑤ $\overline{AF} \cong \overline{GC}$ | ⑤ given |
| ⑥ $\overline{CF} \cong \overline{AG}$ | ⑥ Reflexive Property |
| ⑦ $\overline{CF} \cong \overline{AG}$ | ⑦ Addition Property |
| ⑧ $\angle DCA \cong \angle BAC$ | ⑧ A parallelogram has parallel lines cut by a transversal forming congruent alternate interior angles |
| ⑨ $\triangle FCE \cong \triangle GAH$ | ⑨ SAS \cong SAS |
| ⑩ $\overline{EF} \cong \overline{GH}$ | ⑩ CPCTC |

3. Isosceles trapezoid $ABCD$ has bases \overline{DC} and \overline{AB} with nonparallel legs \overline{AD} and \overline{BC} . Segments \overline{AE} , \overline{BE} , \overline{CE} , and \overline{DE} are drawn in trapezoid $ABCD$ such that $\angle CDE \cong \angle DCE$, $\overline{AE} \perp \overline{DE}$, and $\overline{BE} \perp \overline{CE}$.

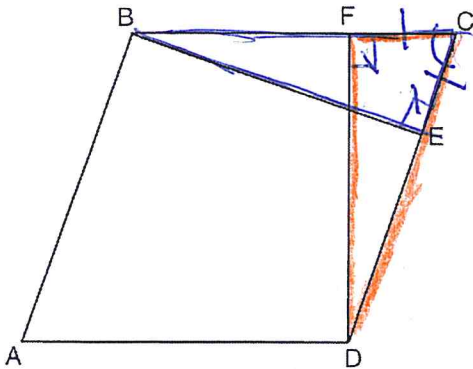
Prove $\triangle ADE \cong \triangle BCE$ and prove $\triangle AEB$ is an isosceles triangle.



Statements	Reasons
① Isosceles trapezoid $ABCD$	① given
② $\overline{DA} \cong \overline{CB}$	② An isosceles trapezoid has congruent legs
③ $\angle CDE \cong \angle DCE$	③ given
④ $\overline{DE} \cong \overline{EC}$	④ Isosceles Triangle Theorem
⑤ $\overline{AE} \perp \overline{DE}$, $\overline{BE} \perp \overline{CE}$	⑤ given
⑥ $\angle CEB \cong \angle DEA$	⑥ Perpendicular lines create congruent right angles
⑦ $\triangle ADE \cong \triangle BCE$	⑦ HL \cong HL
⑧ $\overline{AE} \cong \overline{EB}$	⑧ CPCTC
⑨ $\triangle AEB$ is isosceles	⑨ Isosceles Triangle Theorem

4. In the diagram of parallelogram $ABCD$ below, $\overline{BE} \perp \overline{CE}$, $\overline{DF} \perp \overline{BF}$, $\overline{CE} \cong \overline{CF}$.

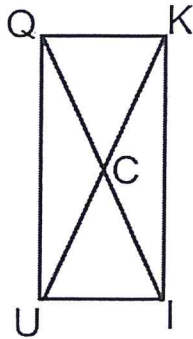
Prove $ABCD$ is a rhombus.



Statements	Reasons
① Parallelogram $ABCD$	① given
② $\overline{BE} \perp \overline{CE}$ $\overline{DF} \perp \overline{BF}$	② given
③ $\angle BEC \cong \angle CFB$	③ Perpendicular lines create \cong right angles
④ $\overline{CE} \cong \overline{CF}$	④ given
⑤ $\angle C \cong \angle C$	⑤ Reflexive Property
⑥ $\triangle CEB \cong \triangle CFB$	⑥ ASA \cong ASA
⑦ $\overline{BC} \cong \overline{CD}$	⑦ CPCTC
⑧ $ABCD$ is a rhombus	⑧ A rhombus is a parallelogram with consecutive sides \cong

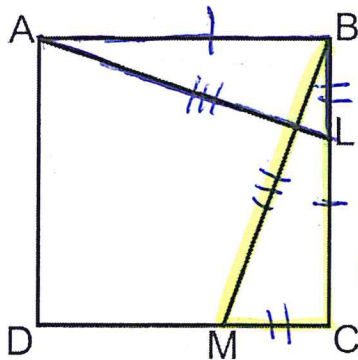
5. Given: QUIK is a parallelogram, $\angle QUI \cong \angle KIU$

Prove: QUIK is a rectangle



Statements	Reasons
① QUIK is a parallelogram	① given
② $\angle QUI \cong \angle KIU$	② given
③ QUIK is a rectangle	③ A rectangle is a parallelogram with consecutive angles \cong

6. Given: Rhombus ABCD, $\overline{BL} \cong \overline{CM}$, $\overline{AL} \cong \overline{BM}$ → Need to prove rectangle property
 Prove: ABCD is a square

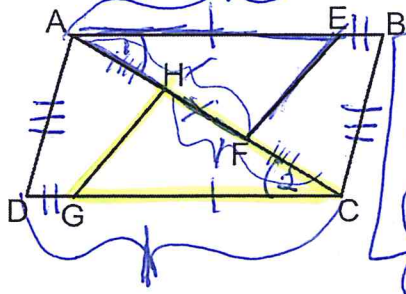


Statements	Reasons
① Rhombus ABCD	① given
② $\overline{AB} \cong \overline{BC}$	② A rhombus has consecutive sides congruent
③ $\overline{BL} \cong \overline{CM}$	③ given
④ $\overline{AL} \cong \overline{BM}$	④ given
⑤ $\triangle ABL \cong \triangle BCM$	⑤ SSS \cong SSS
⑥ $\angle ABL \cong \angle BCM$	⑥ CPCTC
⑦ ABCD is a square	⑦ A square is a rhombus with consecutive angles ^{congruent} congruent

*Prove it is a P-gram to use those properties!

7. Given: $\overline{AE} \cong \overline{CG}$, $\overline{BE} \cong \overline{DG}$, $\overline{AH} \cong \overline{CF}$, $\overline{AD} \cong \overline{CB}$

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



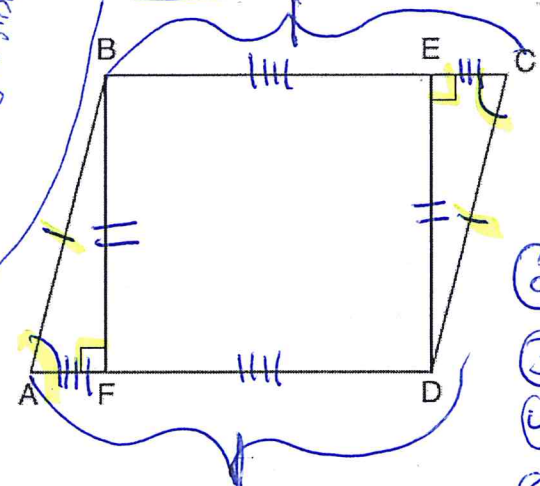
- Statements
- ① $\overline{AE} \cong \overline{CG}$
 - ② $\overline{BE} \cong \overline{DG}$
 - ③ $\overline{AB} \cong \overline{DC}$
 - ④ $\overline{AD} \cong \overline{CB}$
 - ⑤ ABCD is a P-gram
 - ⑥ $\angle 1 \cong \angle 2$
 - ⑦ $\overline{AH} \cong \overline{CF}$
 - ⑧ $\overline{HF} \cong \overline{HE}$
 - ⑨ $\overline{AF} \cong \overline{HC}$

- Reasons
- ① given
 - ② given
 - ③ Addition Property
 - ④ given
 - ⑤ A P-gram has 2 pairs of opp sides \cong
 - ⑥ A P-gram has 11 lines cut by a transversal creating \cong alternate interior angles
 - ⑦ given
 - ⑧ Reflexive Property
 - ⑨ Addition Property

8. Given: Parallelogram ABCD, $\overline{BF} \perp \overline{AFD}$, and $\overline{DE} \perp \overline{BEC}$

Prove: BEDF is a rectangle

always Prove triangles first
 Most Prove P-gram first



- ⑩ $\triangle AEF \cong \triangle CGH$
- ⑪ $\overline{EF} \cong \overline{GH}$

- ⑩ SAS \cong SAS
- ⑪ CPCTC

Statements

- ① Parallelogram ABCD
- ② $\angle BAF \cong \angle DCE$
- ③ $\overline{BA} \cong \overline{CD}$
- ④ $\overline{BF} \perp \overline{AFD}$, $\overline{DE} \perp \overline{BEC}$
- ⑤ $\angle BFA \cong \angle DEC$
- ⑥ $\triangle BFA \cong \triangle DEC$
- ⑦ $\overline{BF} \cong \overline{ED}$
- ⑧ $\overline{AF} \cong \overline{EC}$
- ⑧ $\overline{BC} \cong \overline{AD}$
- ⑨ $\overline{BE} \cong \overline{FD}$
- ⑩ BEDF is a Parallelogram
- ⑪ $\angle BFD$ is a right angle
- ⑫ BEDF is a rectangle

- Reasons
- ① given
 - ② opposite angles of a P-gram are congruent
 - ③ opposite sides of a P-gram are congruent
 - ④ given
 - ⑤ perpendicular lines create \cong right angles
 - ⑥ AAS \cong AAS
 - ⑦ CPCTC
 - ⑧ A P-gram has opposite sides congruent
 - ⑨ Subtraction Property
 - ⑩ A parallelogram has 2 pairs of opposite sides \cong
 - ⑪ perpendicular lines form \cong right angles
 - ⑫ A rectangle is a P-gram with a right angle.