

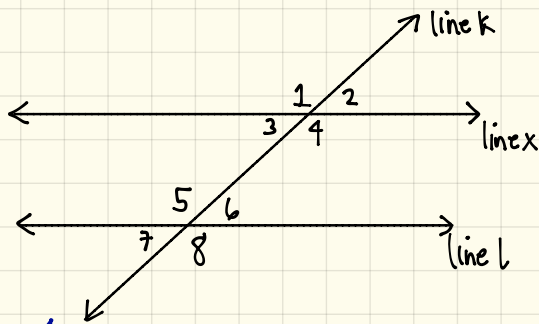
8.4 Proofs

Standard:

G.SRT.5



Old Parallel Lines & Transversals



given $\angle 4 = 70^\circ$
Find the missing angles.

with $\angle 4$:

- $\angle 1 = 70^\circ$ congruent (vertical angles)
- $\angle 2 = 110^\circ$ supplementary (linear pair)
- $\angle 3 = 110^\circ$ supplementary (linear pair)
- $\angle 4 = 70^\circ$ given

- $\angle 5 = 70^\circ$ congruent (alternate int.)
- $\angle 6 = 110^\circ$ supplementary (same side)
- $\angle 7 = 110^\circ$ supplementary
- $\angle 8 = 70^\circ$ supplementary (correspond.)

New Proofs

What is a mathematical proof?

A proof is a mathematical statement is a written account of a complete thought process that is used to reach a conclusion. Each step of the process is support by a theorem or definition or definition verifying each step.

Let's consider $6(x-2) = 30$. Prove that $x = 7$.

Mathematical Statement — Theorems

$$\begin{aligned}6(x-2) &= 30 \\6x - 12 &= 30 \\6x &= 42 \\x &= 7\end{aligned}$$

- Given
- Distributive Property
- Addition Property of Eq.
- Division Property of Eq.

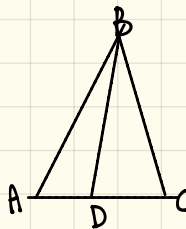
A formal 2-column proof contains the following components:

Statement	Reasons
1. Restatement of the "given" info in the proof	1. Given
2. Use givens to get to the prove statement	2. Cite appropriate theorems
3. Prove statement	3. Cite appropriate theorem.

Let's do an example in geometry.

Let's consider the figure below:

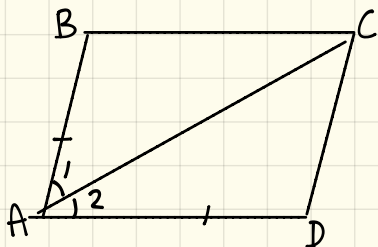
Given $\triangle ABC$ with \overline{BD} bisecting \overline{AC} .
 $AD = 6$. Prove $DC = 6$.



Statements	Reasons
1. \overline{BD} bisects \overline{AC}	1. Given
2. $\overline{AD} = 6$	2. Given
3. \overline{BD} is midpoint of \overline{AC}	3. Segment bisects intersects a segment at its midpoint
4. $\overline{AD} \cong \overline{DC}$	4. Midpoint divides segment into 2 congruent parts
5. $AD = DC$	5. Congruent segments are segments of equal measures
6. $DC = 6$	6. Substitution.

A successful strategy for completing a proof is Backwards Looking.

For most proofs problems, it's helpful to examine the problem backwards — from the prove statement back to the given information.



Given Quadrilateral ABCD.

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

$$\angle 1 \cong \angle 2$$

Prove $\overline{CD} \cong \overline{CB}$.

- Backwards look**
- \overline{CD} & \overline{CB} are corresponding parts of $\triangle ACD$ and $\triangle ACB$
 - If $\triangle ACD \cong \triangle ACB$? if so, then corresponding parts are congruent
 - $\overline{AD} \cong \overline{AB}$ and $\angle 1 \cong \angle 2$.
 - \overline{AC} is common side (Reflexive Property) — SAS

Statement	Reasons
1. $\overline{AD} \cong \overline{AB}$, $\angle 1 = \angle 2$	1. Given
2. $\overline{AC} \cong \overline{AC}$	2. Reflexive Property
3. $\triangle ACD \cong \triangle ACB$	3. SAS
4. $\overline{CD} \cong \overline{CB}$	4. Corresponding Parts of Congruent Triangles are congruent (CPCTC).