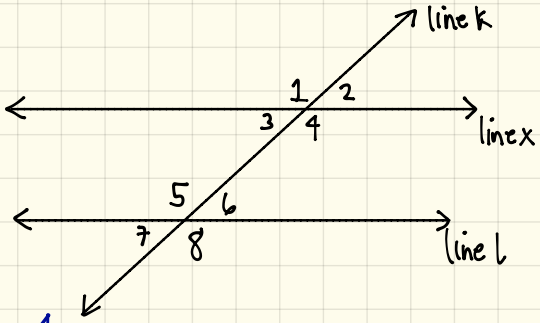
2.4 Proofs

Old Parallel Lines & Transversals



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

with $\angle 4$:

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

$\angle 5 = 70°$ congruent (alternate int.)
$\angle 6 = 110°$ supplementary (same side)
$\angle 7 = 110°$ supplementary
$\angle 8 = 70°$ 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 $x=7$.

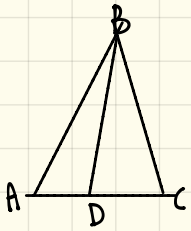
Mathematical Statement	— Theorems
$6(x-2)-30$	— Given
$6x-12=30$	— Distributive Property
$6x=42$	— Addition Property of Eq
$x=7$	— Division Property of Eq.

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:

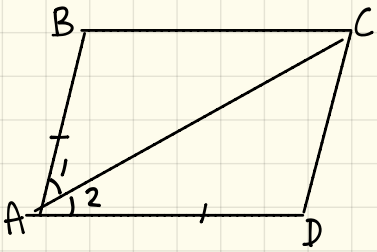


Given ΔABC with $\overline{BD}$ bisecting $\overline{AC}$.
$AD = 6$. Prove $DC = 6$.

Statements	Reasons
1. $\overline{BD}$ bisects $\overline{AC}$	1. Given
2. $AD = 6$	2. Given
3. $\overline{BD}$ is midpoint of $\overline{AC}$	3. Segment bisects interseds 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 $\overline{CD} \cong CB$.

Backwards look
- $\overline{CD}$ & $\overline{CD}$ are corresponding parts of $\triangle ACD$ and $\triangle ACB$
- If $\triangle ACD \cong \triangle ACD$? if so, then corresponding parts are congruent
- $\overline{AB} \cong \overline{AD}$ 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. Reflective Property
3. $\triangle ACD \cong \triangle ACB$	3. SAS
4. $\overline{CD} \cong \overline{CB}$	4. Corresponding Parts of Congruent Triangles are congruent (CPCTC).