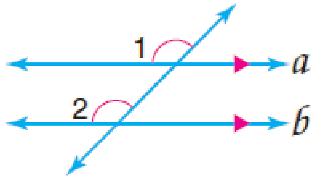
Proving Parallel Lines

Postulate 1: Converse of Corresponding Angles

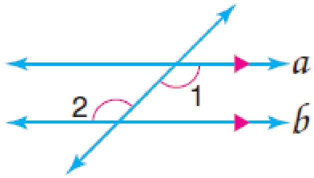
In a plane, if two lines are cut by a transversal so that a pair of corresponding angles is congruent, then the lines are parallel



If $\angle 1 \cong \angle 2$, then $a \parallel b$

Theorem 2: Converse of Alternate Interior Angles

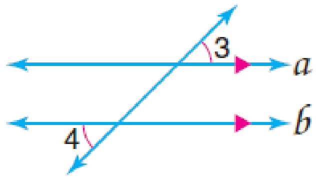
In a plane, if two lines are cut by a transversal so that a pair of alternate interior angles is congruent, then the two lines are parallel



If $\angle 1 \cong \angle 2$, then $a \parallel b$.

Theorem 2: Converse of Alternate Exterior Angles

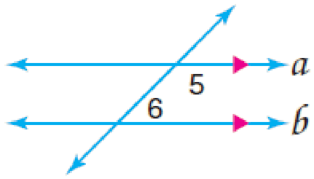
In a plane, if two lines are cut by a transversal so that a pair of alternate exterior angles is congruent, then the two lines are parallel



If $\angle 3 \cong \angle 4$, then $a \parallel b$.

Theorem 3: Converse of Consecutive Interior angles

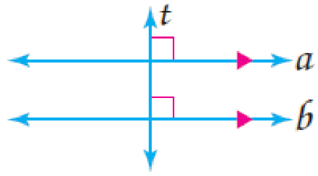
In a plane, if two lines are cut by a transversal so that a pair of consecutive interior angles are supplementary, then the two lines are parallel



If $m\angle 5 + m\angle 6 = 180$,
then $a \parallel b$.

Theorem 4

In a plane, if two lines are perpendicular to the same line, then the two lines are parallel

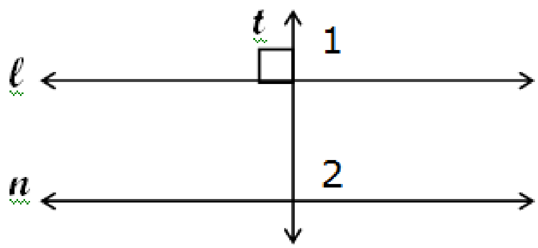


If $a \perp t$ and $b \perp t$,
then $a \parallel b$.

As a summary, to prove that two lines are perpendicular, you have to prove:

- A pair of alternate interior angles are congruent
- A pair of alternate exterior angles are congruent
- A pair of corresponding angles are congruent
- A pair of consecutive interior angles are supplementary
- Two lines are perpendicular to a third line

Example 1:
Given: transversal t cuts l and n;
t ⊥ l; l ll n

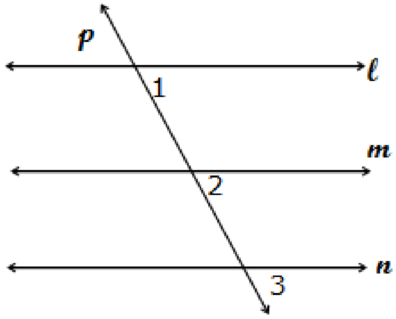


Prove: t ⊥ n

Statements	Reasons
1. t ⊥ l	1.Given
2. $m\angle 1 = 90$	2. Def of ⊥ lines
3. l ll n	3. Given
4. $\angle 1 \cong \angle 2$, ($m\angle 1 = m\angle 2$)	4. Corr.∠s Post
5. $m\angle 2 = 90$	5. Sub
6. ∴ t ⊥ n	6. Def of ⊥ lines

Example 2:

Given: l ll n, m ll n
p is a transversal of l, m and n.

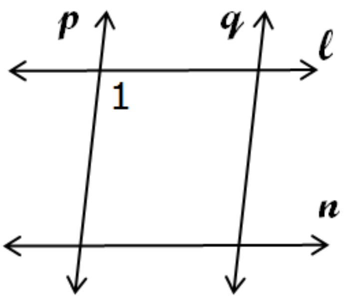


Prove: l ll m

Statements	Reasons
1. l ll n	1. Given
2. ∠1 ≅ ∠3	2. Corr ∠s Post
3. m ll n	3. Given
4. ∠3 ≅ ∠2	4. Corr ∠s Post
5. ∠1 ≅ ∠2	5. Trans prop
6. ∴ l ll m	6. Conv Corr ∠s Post

Example 3:

Given: l ll n, $m\angle 1 = m\angle 3$



Prove: p ll q

Statements	Reasons
1. l ll n	1. Given
2. $m\angle 1 = m\angle 2$	2. Corr ∠s Post
3. $m\angle 1 = m\angle 3$	3. Given
4. $m\angle 2 = m\angle 3$	4. Substitution
5. ∴ p ll q	5. Converse of Alt Int ∠s thm