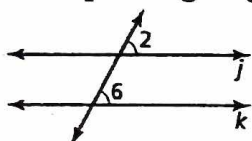


Parallel Line Theorem Converses

Lesson Objective INBAT determine ~~what~~ under what conditions are 2 lines parallel.

Corresponding Angles Postulate: If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent.

Corresponding Angles Converse:



If: If two lines are cut by a transversal so that the corresp. angles are $\cong$

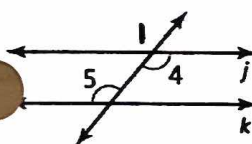
Then: the lines are $\parallel$

Corresp. $\angle s \cong \rightarrow \parallel$

Alternate Interior Angles Theorem: If two lines are cut by a transversal, then the pairs of alternate interior angles are congruent.

parallel

Alternate Interior Angles Converse:



If: If two lines are cut by a transversal so that the alt. int. angles are $\cong$

Then: the lines are $\parallel$

alt. int. $\angle s \cong \rightarrow \parallel$

PROOF:

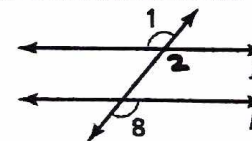
Given: $\angle 4 \cong \angle 5$
Prove: $j \parallel k$

Statements	Reasons
1. $\angle 1 \cong \angle 4$	1. vert. $\angle s \cong$
2. $\angle 4 \cong \angle 5$	2. Given
3. $\angle 1 \cong \angle 5$	3. trans. prop. $\cong$
4. $j \parallel k$	4. Corresp. $\angle s \cong \rightarrow \parallel$

Alternate Exterior Angles Theorem: If two lines are cut by a transversal, then the pairs of alternate exterior angles are congruent.

parallel

Alternate Exterior Angles Converse:



If: If two lines are cut by a transversal so that the alt. ext. angles are $\cong$

Then: the lines are $\parallel$

alt. ext. $\angle s \cong \rightarrow \parallel$

PROOF: use the one above (for alt. int. angles) to help you ☺

Given: ~~$\angle 1 \cong \angle 8$~~ $\angle 1 \cong \angle 8$
Prove: $j \parallel k$

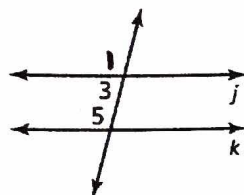
S	R
① $\angle 1 \cong \angle 2$	① vert. $\angle s \cong$
② $\angle 1 \cong \angle 8$	② given
③ $\angle 2 \cong \angle 8$	③ trans. prop. $\cong$
④ $j \parallel k$	④ Corresp. $\angle s \cong \rightarrow \parallel$

Consecutive Interior Angles Theorem: If two lines are cut by a transversal, then the pairs of consecutive interior angles are supplementary.

parallel

Consecutive Interior Angles Converse:

If: If two lines are cut by a transversal so that the consec. int. angles are Supp



Then: the lines are parallel.

consec. int. $\angle$ s supp $\rightarrow \parallel$

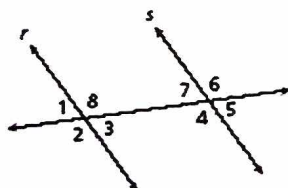
PROOF:

Given: $\angle 3$ supp $\angle 5$
Prove: $j \parallel k$

Statements	Reasons
1. $\angle 3$ supp $\angle 5$	1. Given
2. $m\angle 3 + m\angle 5 = 180$	2. $\text{supp} \leftrightarrow \text{add to } 180^\circ$
3. $m\angle 1 + m\angle 3 = 180$	3. lin. pair $\rightarrow \text{supp}$
4. $m\angle 1 + m\angle 3 = m\angle 3 + m\angle 5$	4. trans. prop =
5. $m\angle 1 = m\angle 5$	5. subtr. prop =
6. $\angle 1 \cong \angle 5$	6. $= \leftrightarrow \cong$
7. $j \parallel k$	7. corresp $\angle$ s $\cong \rightarrow \parallel$

Examples:

Use theorems and given information to show that $r \parallel s$.



1. $\angle 1 \cong \angle 5$ alt. ext. $\angle$ s $\cong \rightarrow \parallel$

2. $m\angle 3 + m\angle 4 = 180^\circ$

consec. int. $\angle$ s supp $\rightarrow \parallel$

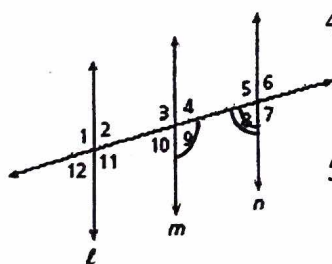
3. Given $m\angle 4 = (13x - 4)^\circ$, $m\angle 8 = (9x + 16)^\circ$, what value of x makes the lines parallel?

$$13x - 4 = 9x + 16$$

$$4x = 20$$

$$\boxed{x = 5}$$

For the given information, tell which pairs of lines must be parallel. Name the postulate or theorem that supports your answer.



4. $m\angle 2 = m\angle 10$

$l \parallel m$: alt. int. $\angle$ s $\cong \rightarrow \parallel$

5. $m\angle 8 + m\angle 9 = 180^\circ$

$m \parallel n$: consec. int. $\angle$ s supp $\rightarrow \parallel$

6. $\angle 1 \cong \angle 7$ $l \parallel n$: alt. ext. $\angle$ s $\cong \rightarrow \parallel$