3-3 *Proving Lines Parallel*

In the preceding section you saw that when two lines are parallel, you can conclude that certain angles are congruent or supplementary. In this section the situation is reversed. From two angles being congruent or supplementary you will conclude that certain lines forming the angles are parallel. The key to doing this is Postulate 11 below. Postulate 10 is repeated so you can compare the wording of the postulates. Notice that these two postulates are converses of each other.

Postulate 10

If two parallel lines are cut by a transversal, then corresponding angles are congruent.

Postulate 11

If two lines are cut by a transversal and corresponding angles are congruent, then the lines are parallel.

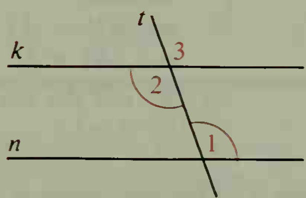
The next three theorems can be deduced from Postulate 11.

Theorem 3-5

If two lines are cut by a transversal and alternate interior angles are congruent, then the lines are parallel.

Given: Transversal t cuts lines k and n;
$\angle 1 \cong \angle 2$

Prove: $k \parallel n$



Proof:

Statements	Reasons
1. $\angle 1 \cong \angle 2$	1. Given
2. $\angle 2 \cong \angle 3$	2. Vert. ∠s are ≅.
3. $\angle 1 \cong \angle 3$	3. Transitive Property
4. $k \parallel n$	4. If two lines are cut by a transversal and corr. ∠s are ≅, then the lines are ∥.

You may have recognized that Theorem 3-5 is the converse of Theorem 3-2, "If two parallel lines are cut by a transversal, then alternate interior angles are congruent." The next theorem is the converse of Theorem 3-3, "If two parallel lines are cut by a transversal, then same-side interior angles are supplementary."