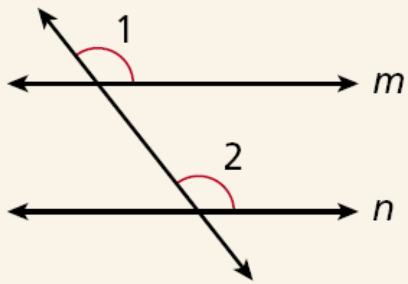
Objective

Use the angles formed by a transversal to prove two lines are parallel.

Recall that the converse of a theorem is found by exchanging the hypothesis and conclusion. The converse of a theorem is not automatically true. If it is true, it must be stated as a postulate or proved as a separate theorem.

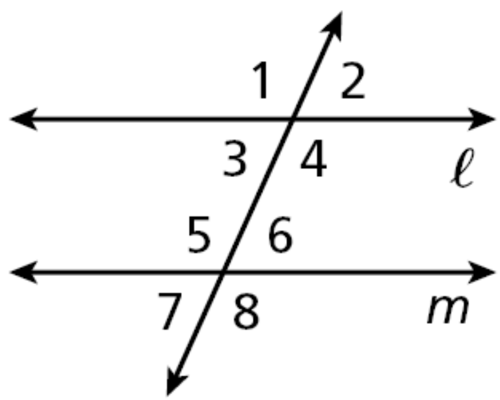
Postulate 3-3-1 Converse of the Corresponding Angles Postulate

THEOREM	HYPOTHESIS	CONCLUSION
If two coplanar lines are cut by a transversal so that a pair of corresponding angles are congruent, then the two lines are parallel.	$\angle 1 \cong \angle 2$ 	$m \parallel n$

Example 1A: Using the Converse of the Corresponding Angles Postulate

Use the Converse of the Corresponding Angles Postulate and the given information to show that ℓ || *m*.

∠4 ≅ ∠8

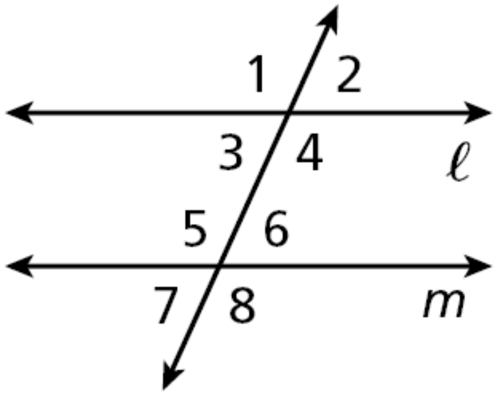


∠4 ≅ ∠8 — *∠4 and ∠8 are corresponding angles.*

ℓ || *m* — *Conv. of Corr. ∠s Post.*

Example 1B: Using the Converse of the Corresponding Angles Postulate

Use the Converse of the Corresponding Angles Postulate and the given information to show that $\ell \parallel m$.



$m\angle 3 = (4x - 80)°$,
$m\angle 7 = (3x - 50)°$, $x = 30$

$m\angle 3 = 4(30) - 80 = 40$ — *Substitute 30 for x.*

$m\angle 8 = 3(30) - 50 = 40$ — *Substitute 30 for x.*

$m\angle 3 = m\angle 8$ — *Trans. Prop. of Equality*

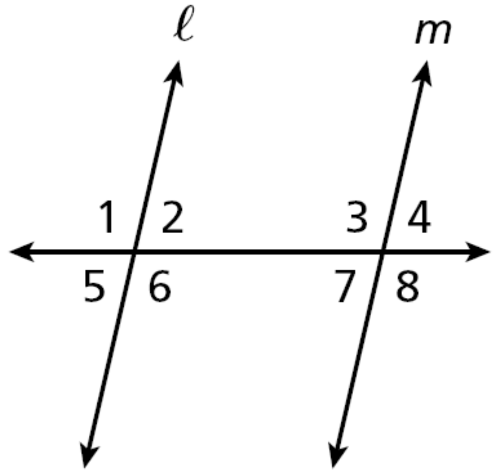
$\angle 3 \cong \angle 8$ — *Def. of ≅ ∠s.*

$\ell \parallel m$ — *Conv. of Corr. ∠s Post.*

Check It Out! Example 1a

Use the Converse of the Corresponding Angles Postulate and the given information to show that ℓ || *m*.

m∠1 = m∠3



∠1 ≅ ∠3 — *∠1 and ∠3 are corresponding angles.*

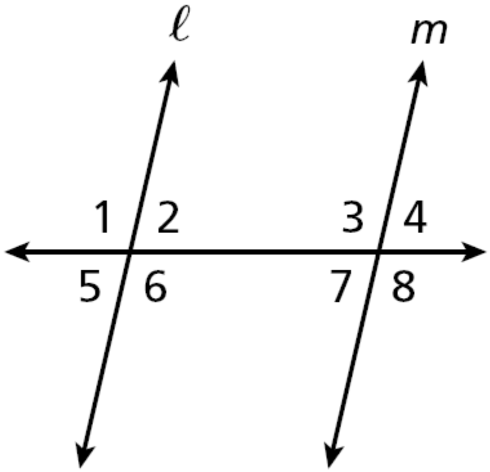
ℓ || *m* — *Conv. of Corr. ∠s Post.*

Check It Out! Example 1b

Use the Converse of the Corresponding Angles Postulate and the given information to show that $\ell \parallel m$.

$m\angle 7 = (4x + 25)°$,

$m\angle 5 = (5x + 12)°$, $x = 13$



$m\angle 7 = 4(13) + 25 = 77$ — *Substitute 13 for x.*

$m\angle 5 = 5(13) + 12 = 77$ — *Substitute 13 for x.*

$m\angle 7 = m\angle 5$ — *Trans. Prop. of Equality*

$\angle 7 \cong \angle 5$ — *Def. of ≅ ∠s.*

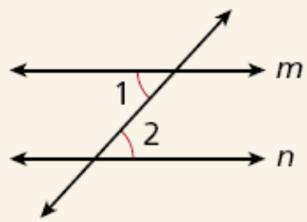
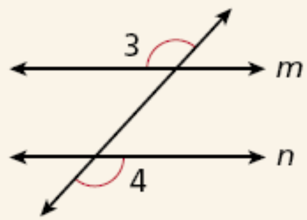
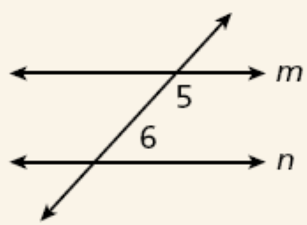
$\ell \parallel m$ — *Conv. of Corr. ∠s Post.*

Postulate 3-3-2 **Parallel Postulate**

Through a point P not on line ℓ, there is exactly one line parallel to ℓ.

The Converse of the Corresponding Angles Postulate is used to construct parallel lines. The Parallel Postulate guarantees that for any line ℓ, you can always construct a parallel line through a point that is not on ℓ.

Theorems — Proving Lines Parallel

	THEOREM	HYPOTHESIS	CONCLUSION
3-3-3	**Converse of the Alternate Interior Angles Theorem** If two coplanar lines are cut by a transversal so that a pair of alternate interior angles are congruent, then the two lines are parallel.	$\angle 1 \cong \angle 2$ 	$m \parallel n$
3-3-4	**Converse of the Alternate Exterior Angles Theorem** If two coplanar lines are cut by a transversal so that a pair of alternate exterior angles are congruent, then the two lines are parallel.	$\angle 3 \cong \angle 4$ 	$m \parallel n$
3-3-5	**Converse of the Same-Side Interior Angles Theorem** If two coplanar lines are cut by a transversal so that a pair of same-side interior angles are supplementary, then the two lines are parallel.	$m\angle 5 + m\angle 6 = 180°$ 	$m \parallel n$