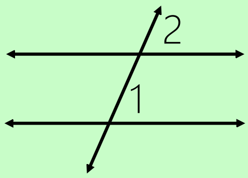
# 3.3 PROVE LINES ARE PARALLEL

## Postulate 16: Corresponding Angles Converse

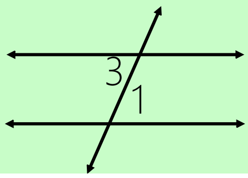
If two lines in a plane are cut by a transversal so that corresponding angles are congruent, then the lines are parallel.




If $\angle 1 \cong \angle 2$, then lines //.

## Theorem 3.4: Alternate Interior Angles Converse

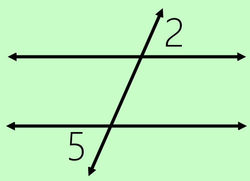
If two lines in a plane are cut by a transversal so that a pair of alternate interior angles is congruent, then the lines are parallel.




If $\angle 3 \cong \angle 1$, then lines //.

## Theorem 3.5: Alternate Exterior Angles Converse

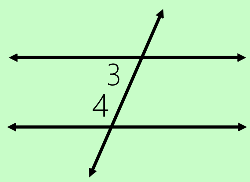
If two lines in a plane are cut by a transversal so that a pair of alternate exterior angles are congruent, then the two lines are parallel.




If $\angle 2 \cong \angle 5$, then lines //.

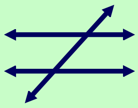
## Theorem 3.6: Consecutive Interior Angles Converse

If two lines in a plane are cut by a transversal so that consecutive interior angles are supplementary, then the lines are parallel.




If $m\angle 3 + m\angle 4 = 180$, then lines //.

# PROVING LINES PARALLEL

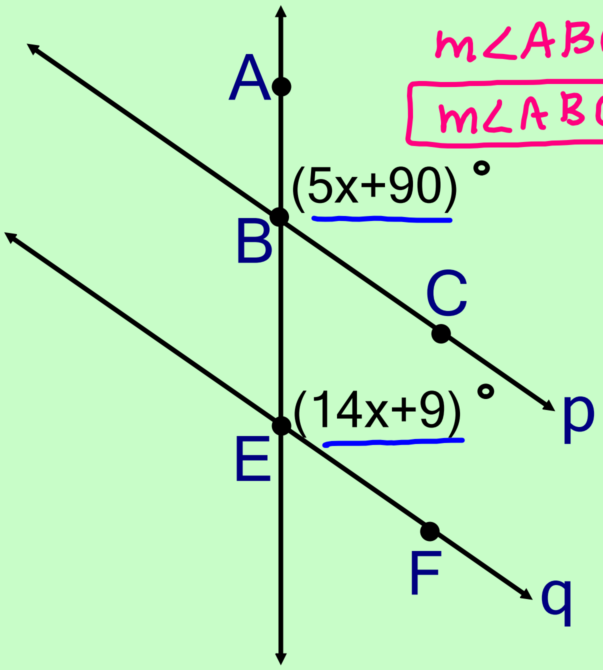
If  and...

- corresponding ∠s are ≅
- alternate interior ∠s are ≅
- alternate exterior ∠s are ≅
- consecutive interior ∠s are supplementary

...then the lines are parallel.

## Example 1

Find the value of x and m∠ABC so that *p* ∥ *q*, If ... then corr ∠ ≅.



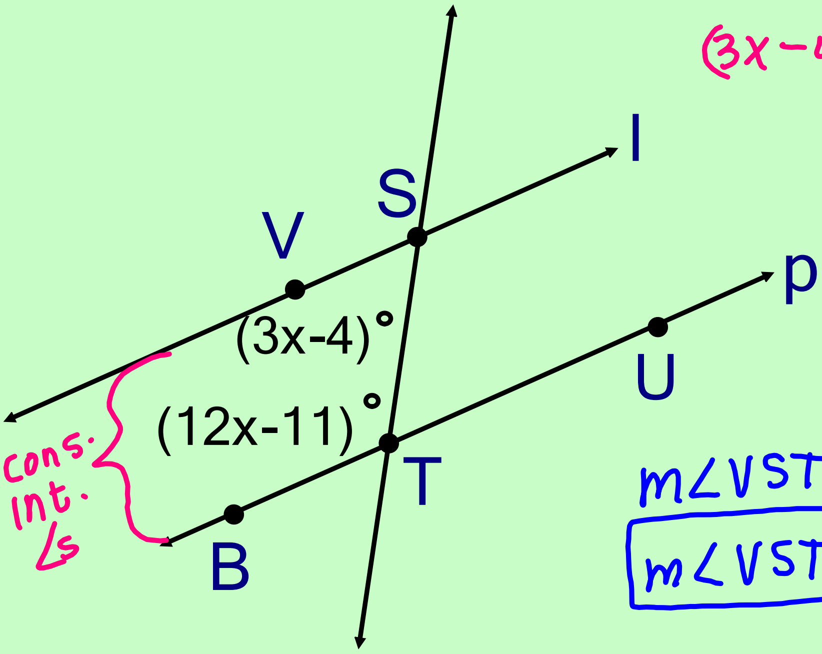

$m\angle ABC = 5(9)+90$

$\boxed{m\angle ABC = 135^\circ}$

$$14x + 9 = 5\cancel{x} + 90$$
$$-5x \qquad -\cancel{5}x$$
$$9x + \cancel{9} = 90$$
$$-\cancel{9} \qquad -9$$
$$\frac{9x}{9} = \frac{81}{9}$$
$$\boxed{x = 9}$$

## Example 2

Find the value of x and m∠VST so that $l \parallel p$.




$(3x-4)+(12x-11)=180$

$15x-\cancel{15}=180$

$\quad\ \ +\cancel{15} \quad +15$

$\frac{15x}{15}=\frac{195}{15}$

$\boxed{x=13}$

$m\angle VST=3(13)-4$

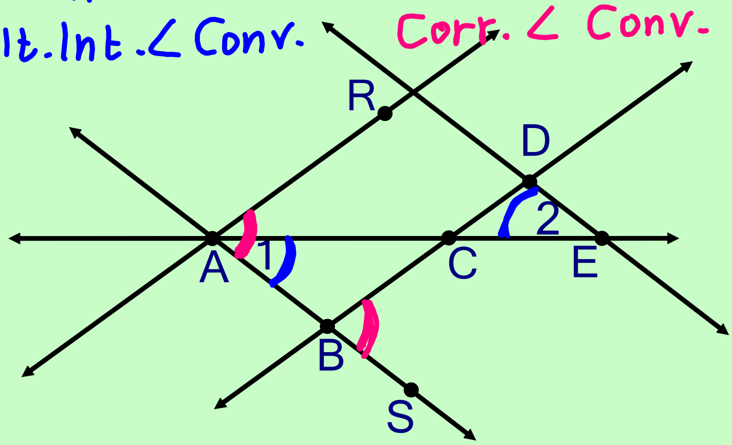
$\boxed{m\angle VST=35^\circ}$

## Example 3

If ∠1 ≅ ∠2 and ∠RAB ≅ ∠CBS,
which lines must be parallel? Explain.

$\overleftrightarrow{AB} \parallel \overleftrightarrow{DE}$ Alt. Int. ∠ Conv.

$\overleftrightarrow{RA} \parallel \overleftrightarrow{BC}$ Corr. ∠ Conv.

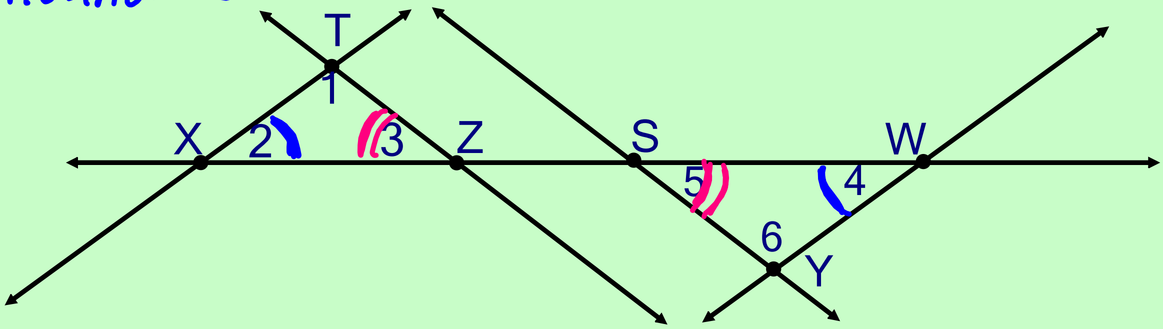


## Example 4

If $\angle 2 \cong \angle 4$ and $\angle 3 \cong \angle 5$,
which lines must be parallel? Explain.

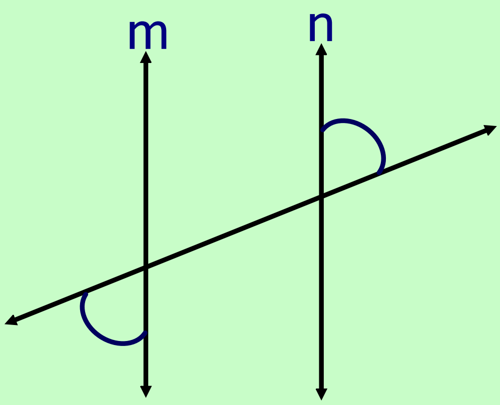
$\overleftrightarrow{XT} \parallel \overleftrightarrow{YW}$ $\overleftrightarrow{TZ} \parallel \overleftrightarrow{SY}$

Alt. Int. ∠ Conv. Alt. Ext. ∠ Conv.




## Example 5

Is there enough information to prove m || n?
If so, state the postulate or theorem you would use.

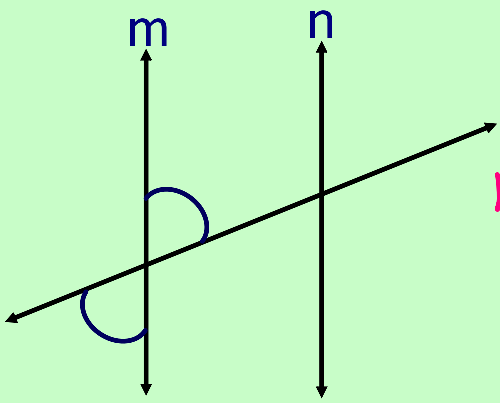



Alt. Ext. ∠ Conv.

Example 6

Is there enough information to prove m ∥ n?

If so, state the postulate or theorem you would use.

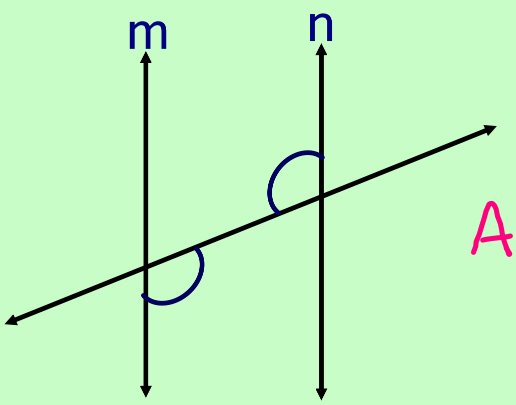



not enough info

Example 7

Is there enough information to prove m ∥ n?

If so, state the postulate or theorem you would use.

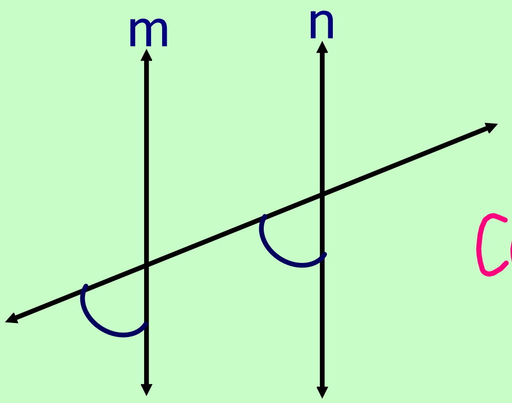



Alt. Int. ∠ Conv.

Example 8

Is there enough information to prove m || n?

If so, state the postulate or theorem you would use.




Corr. ∠ Conv.

Theorem 3.7: Transitive Property of Parallel Lines

If two lines are parallel to the same line,
then they are parallel to each other.

If p || q and q || r,
then p || r.