3-2 Properties of Parallel Lines

Content Standard
G.CO.9 Prove theorems about lines and angles. Theorems include: . . . when a transversal crosses parallel lines, alternate interior angles are congruent . . .

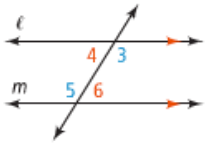
Objectives To prove theorems about parallel lines
To use properties of parallel lines to find angle measures

take note

Postulate 3-1 Same-Side Interior Angles Postulate

Postulate
If a transversal intersects two parallel lines, then same-side interior angles are supplementary.

If . . .
$\ell \parallel m$



Then . . .
$m\angle 4 + m\angle 5 = 180$
$m\angle 3 + m\angle 6 = 180$

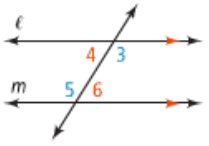
SSS

take note

Theorem 3-1 Alternate Interior Angles Theorem

Theorem
If a transversal intersects two parallel lines, then alternate interior angles are congruent.

If . . .
$\ell \parallel m$

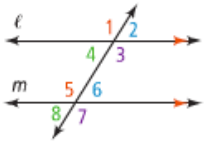


Then . . .
$\angle 4 \cong \angle 6$
$\angle 3 \cong \angle 5$

Theorem 3-2 Corresponding Angles Theorem

Theorem
If a transversal intersects two parallel lines, then corresponding angles are congruent.

If . . .
$\ell \parallel m$



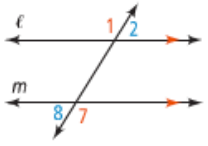
Then . . .
$\angle 1 \cong \angle 5$
$\angle 2 \cong \angle 6$
$\angle 3 \cong \angle 7$
$\angle 4 \cong \angle 8$

take note

Theorem 3-3 Alternate Exterior Angles Theorem

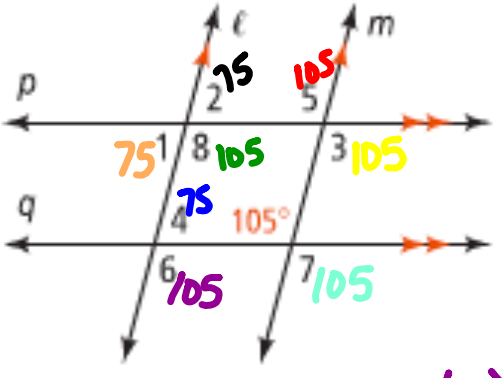
Theorem
If a transversal intersects two parallel lines, then alternate exterior angles are congruent.

If . . .
$\ell \parallel m$



Then . . .
$\angle 1 \cong \angle 7$
$\angle 2 \cong \angle 8$

Example 1: Find all the missing angle measures. Which theorem or postulate justifies each?



$\angle 4 = 180 - 105 = 75°$
Same Side Int. $\angle$s Post (Given)

$\angle 8 = 180 - 75 = 105°$
Same Side Int. $\angle$s Post ($\angle 4$)

$\angle 5 = 105°$
Corresponding $\angle$s Thm (Given)

$\angle 2 = 75°$
Corresponding $\angle$s Thm ($\angle 4$)

$\angle 1 = 75$
Vertical $\angle$s Thm ($\angle 2$)

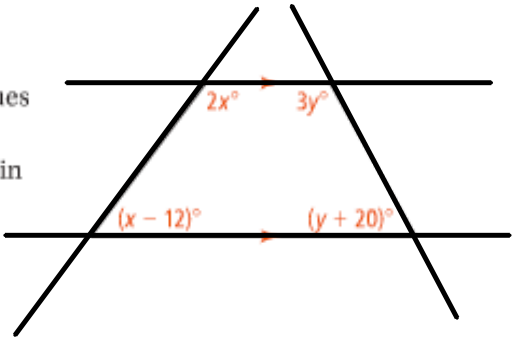
$\angle 6 = 105°$ ($\angle 8$)
Corresponding $\angle$s Thm

$\angle 3 = 105°$ ($\angle 8$)
Corresponding $\angle$s Thm

$\angle 7 = 105°$ ($\angle 3$)
Corresponding $\angle$s Thm

Got It? 4. **a.** In the figure at the right, what are the values of x and y?

b. What are the measures of the four angles in the figure?



$2x + x - 12 = 180$

$3x - 12 = 180$

$3x = 192$

$x = 64$

$2(64) = 128°$

$64 - 12 = 52°$

$3y + y + 20 = 180$

$4y + 20 = 180$

$4y = 160$

$y = 40$

$3(40) = 120°$

$40 + 20 = 60°$

Name

3.2

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Notes 3.3