3-3

Proving Lines Parallel

OBJECTIVE

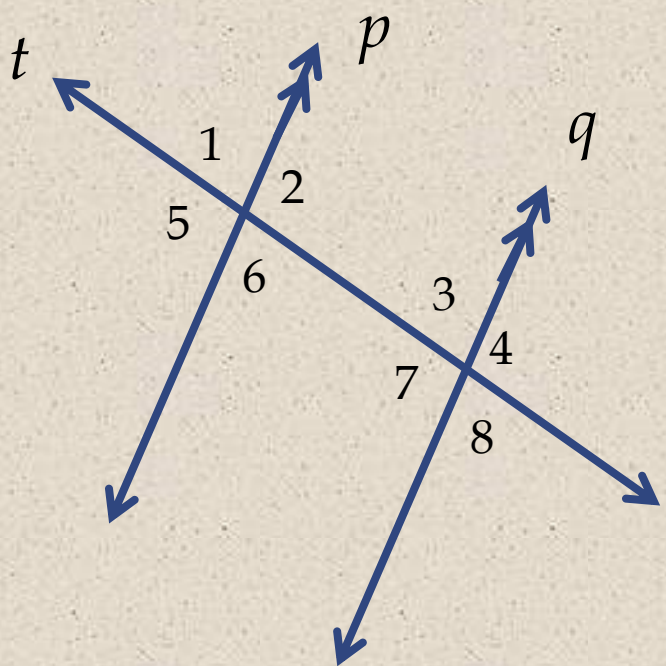
To use the angles formed by a transversal to prove two lines are parallel

KEY CONCEPTS

Converse of the Corresponding Angles Postulate:

If two lines and a transversal form corresponding angles that are congruent, then the lines are parallel.

If $\angle 1 \cong \angle 3$, then $p \| q$

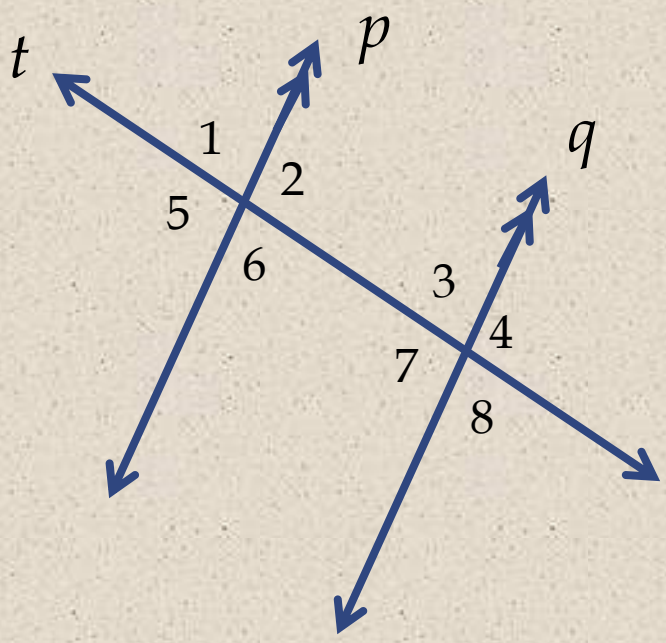


KEY CONCEPTS

Converse of the Alternate Interior Angles Theorem:

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

If $\angle 2 \cong \angle 7$, then $p \| q$

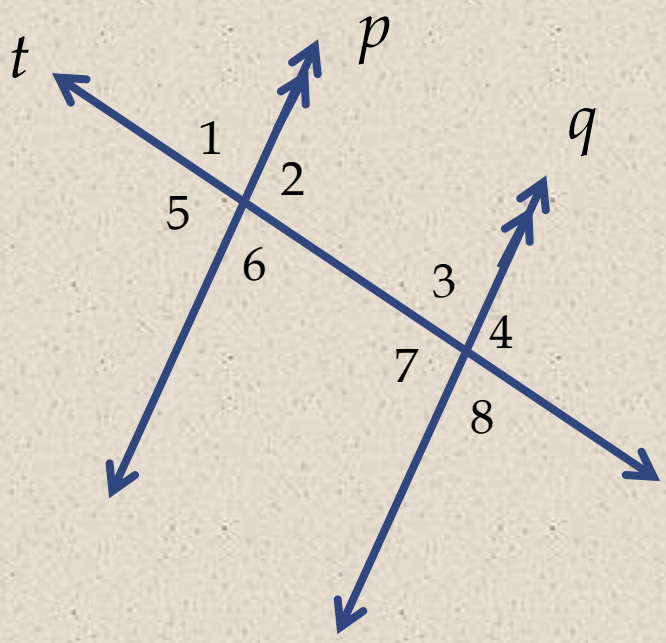


KEY CONCEPTS

Converse of the Same-Side Interior Angles Theorem:

If two lines and a transversal form same-side interior angles that are supplementary, then the lines are parallel.

If $m\angle 2 + m\angle 3 = 180$, then $p \| q$

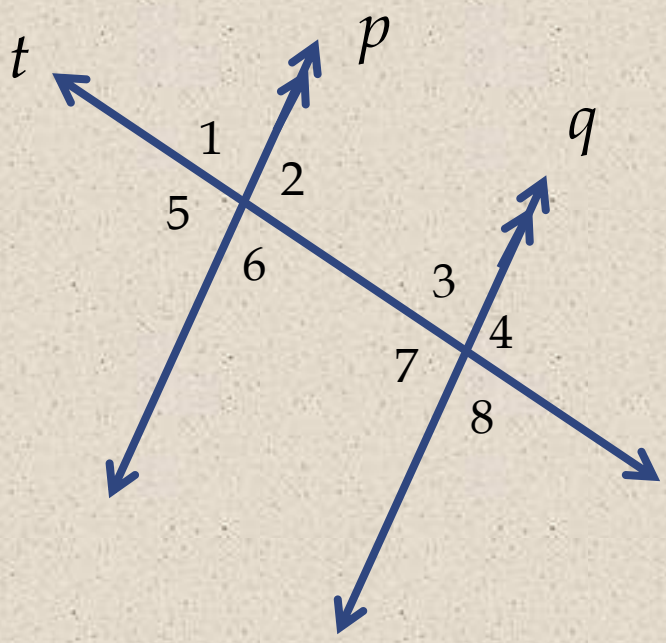


KEY CONCEPTS

Converse of the Alternate Exterior Angles Theorem:

If two lines and a transversal form alternate exterior angles that are congruent, then the lines are parallel.

If $\angle 1 \cong \angle 8$, then $p \| q$

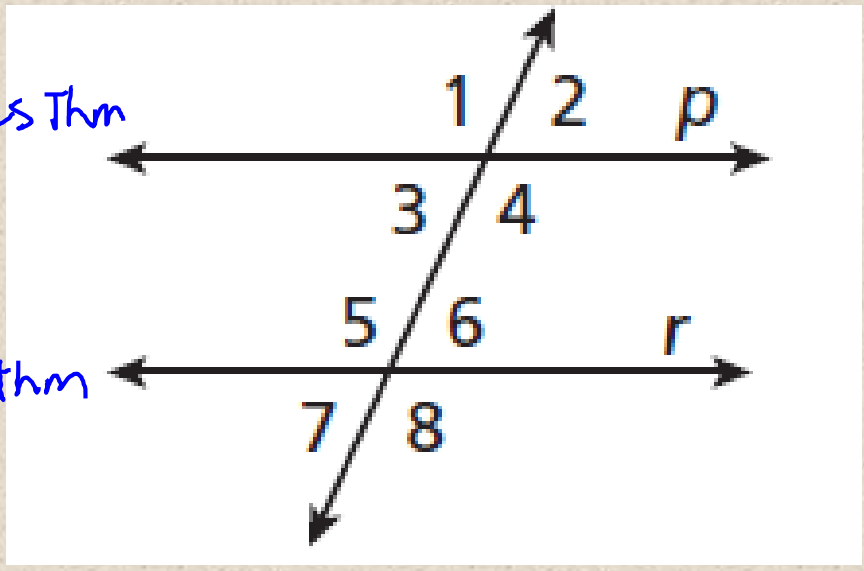


CLASS WORK

Name the Postulate or Theorem that proves $p \parallel r$

1. $\angle 4 \cong \angle 5$

Conv of Alternate Int. Ls Thm



2. $\angle 2 \cong \angle 7$

Conv. of Alt Ext Ls thm

3. $\angle 3 \cong \angle 7$

Conv. of Corr Ls Postulate

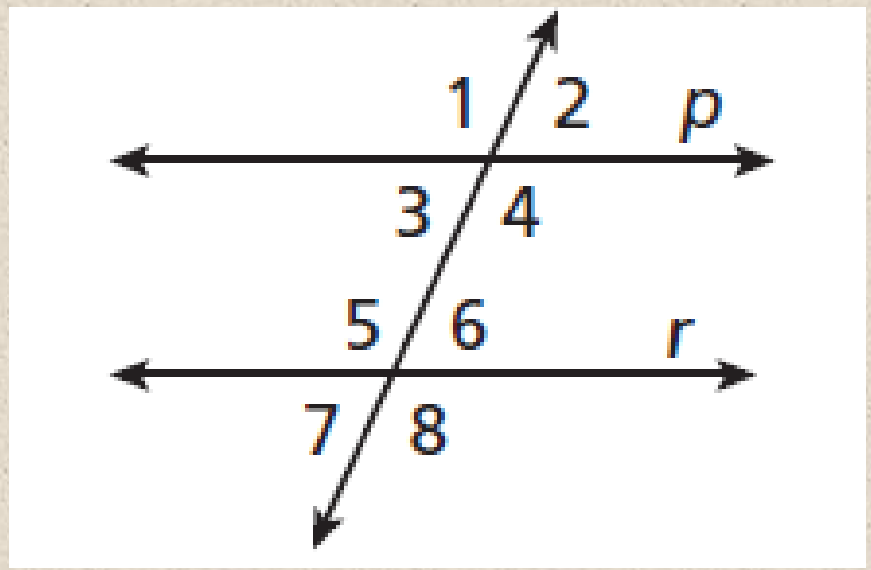
4. $\angle 3$ and $\angle 5$ are supplementary

Conv. of SS Int Ls Theorem

CLASS WORK

Use the theorems and given informatio n to prove $p \parallel r$

5. $m\angle 2 = (5x + 20)°$; $m\angle 7 = (7x + 8)°$; and $x = 6$



$m\angle 2 = m\angle 7$

$5x + 20 = 7x + 8$ → $5x + 20 = 7x + 8$

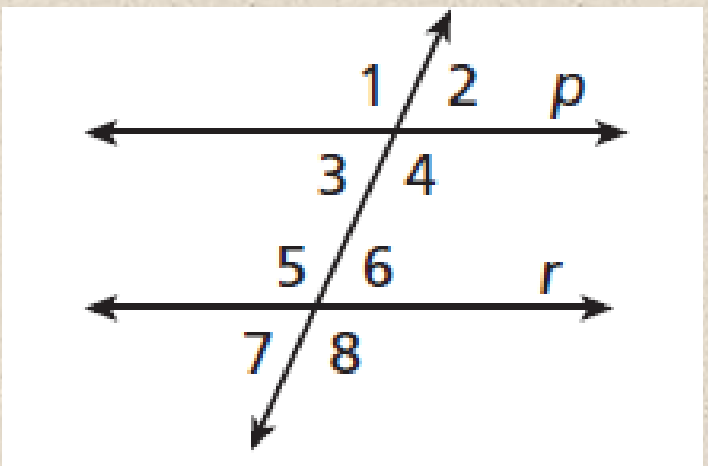
$5(6) + 20 = 7(6) + 8$ $\quad 12 = 2x$

$50 = 50$ ✓ $\quad 6 = x$ ✓

CLASS WORK

Find the value of x that shows that $p \parallel r$

6. $m\angle 4 = (5x - 10)^\circ$;
$m\angle 6 = (8x - 5)^\circ$



$m\angle 4 + m\angle 6 = 180$

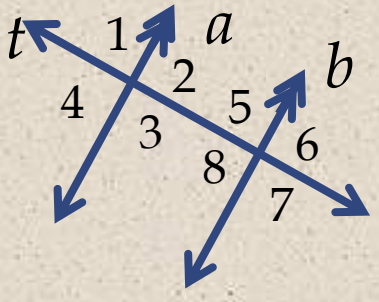
$5x - 10 + 8x - 5 = 180$

$13x - 15 = 180$

$13x = 195$

$x = 15$

Proof of Converse of Alternate Interior Angles Theorem

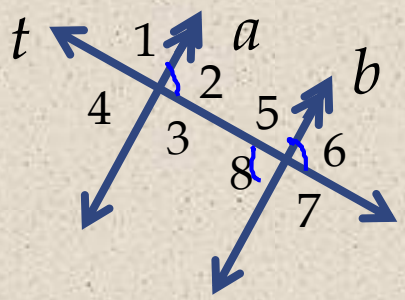


Given: $\angle 2 \cong \angle 8$

Prove: $a \parallel b$

Statements	Reasons

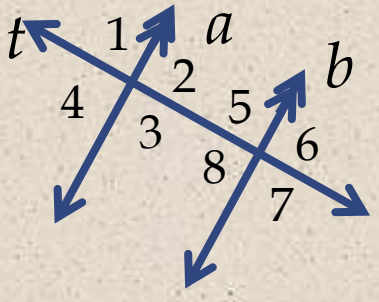
Proof of Converse of Alternate Interior Angles Theorem



Given: $\angle 2 \cong \angle 8$
Prove: $a \parallel b$

Statements	Reasons
$\angle 2 \cong \angle 8$	Given
$\angle 6 \cong \angle 8$	Vertical angles are congruent.
$\angle 2 \cong \angle 6$	Transitive Property of Congruence
$a \parallel b$	Converse of Corresponding Angles Postulate

Proof of Converse of Alternate Exterior Angles Theorem

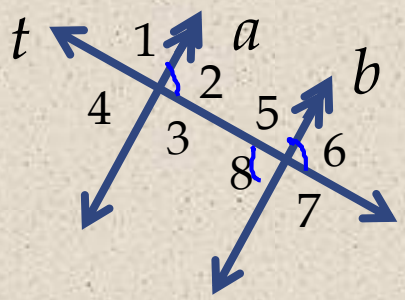


Given: $\angle 1 \cong \angle 7$

Prove: $a \parallel b$

Statements	Reasons

Proof of Converse of Alternate Exterior Angles Theorem



Given: $\angle 1 \cong \angle 7$
Prove: $a \parallel b$

Statements	Reasons
$\angle 1 \cong \angle 7$	Given
$\angle 1 \cong \angle 3$	Vertical angles are congruent.
$\angle 3 \cong \angle 7$	Transitive Property of Congruence
$a \parallel b$	Converse of Corresponding Angles Postulate

SUMMARY

If two lines and a transversal form:

- congruent corresponding angles
- congruent alternate interior angles
- congruent alternate exterior angles
- supplementary same-side interior angles

then the two lines are parallel.

LEARNING RUBRIC

- Got It: Proves Theorem converses with proofs
- Almost There: Applies postulate and theorems to build equations to prove lines parallel in complex/real-world situations
- Moving Forward: Applies postulate and theorems to build equations to prove lines parallel
- Getting Started: Uses a given variable value to prove lines parallel

HOMEWORK

Pages 167 – 169

16 – 22 even

30, 34, 36, 38, 40, 44, 48, 52