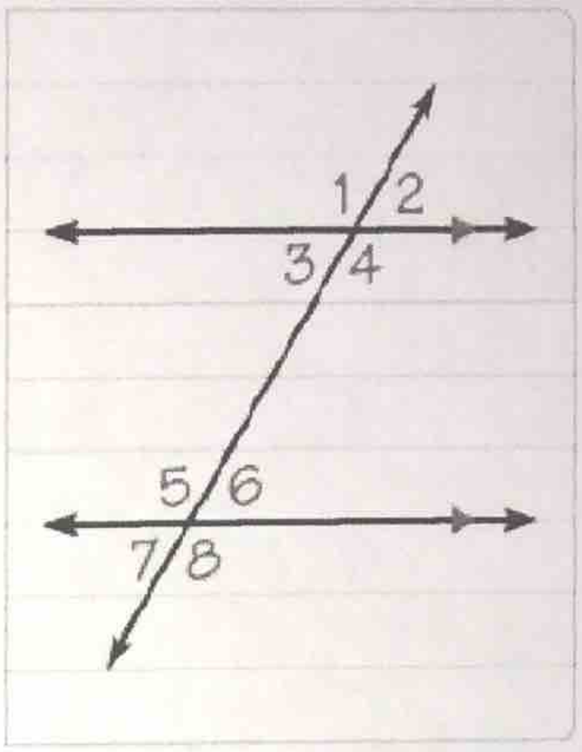
3.2 Use Parallel Lines and Transversals

ACTIVITY EXPLORE PARALLEL LINES

Materials: lined paper, tracing paper, straightedge

STEP 1 **Draw** a pair of parallel lines cut by a nonperpendicular transversal on lined paper. Label the angles as shown.



STEP 2 **Trace** your drawing onto tracing paper.

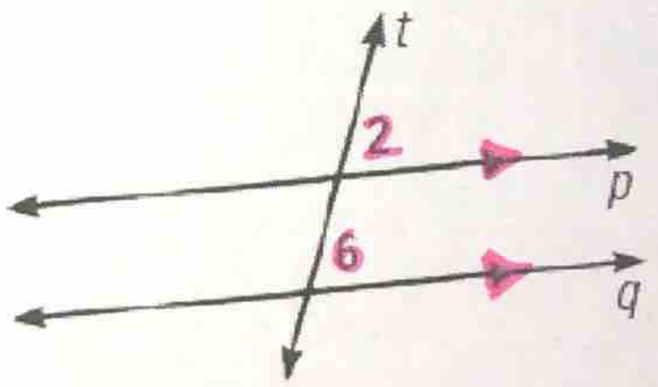
STEP 3 **Move** the tracing paper to position $\angle 1$ of the traced figure over $\angle 5$ of the original figure. Compare the angles. Are they congruent?

STEP 4 **Compare** the eight angles and list all the congruent pairs. What do you notice about the special angle pairs formed by the transversal?

POSTULATE *For Your Notebook*

POSTULATE 15 Corresponding Angles Postulate

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



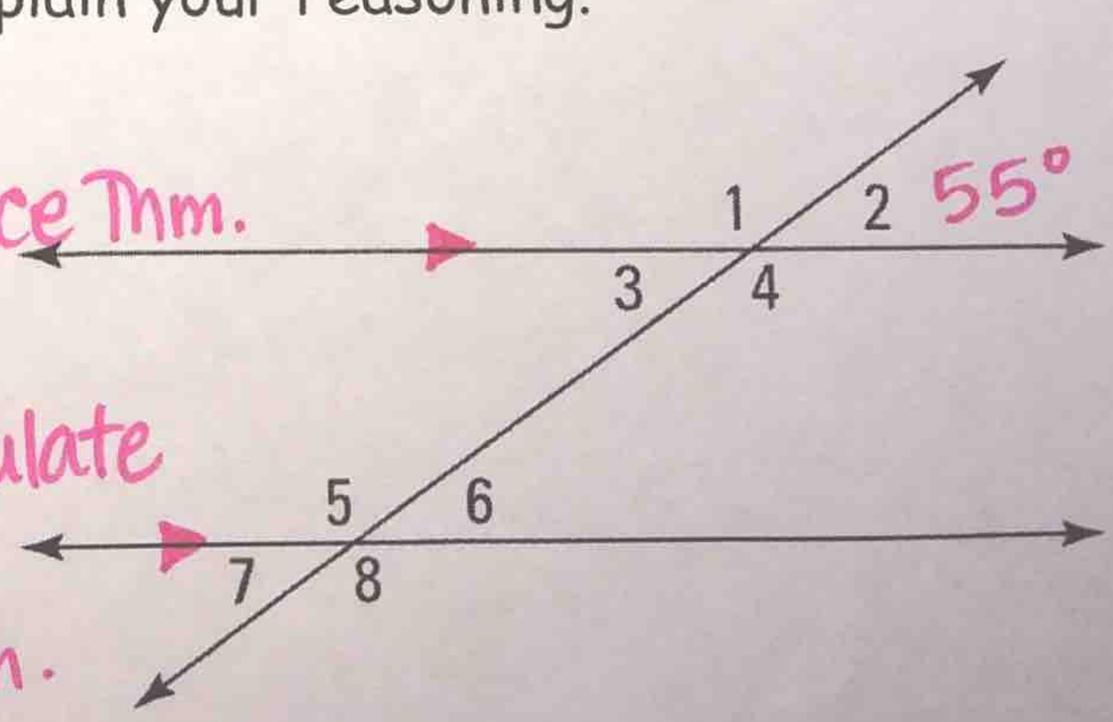
$\angle 2 \cong \angle 6$

Ex 1: If $m\angle 2 = 55°$, then the measure of three other numbered angles is 55°. Identify the angles. Explain your reasoning.

$m\angle 3 = 55°$
Vertical Angles Congruence Thm.

$m\angle 6 = 55°$
Corresponding Angles Postulate

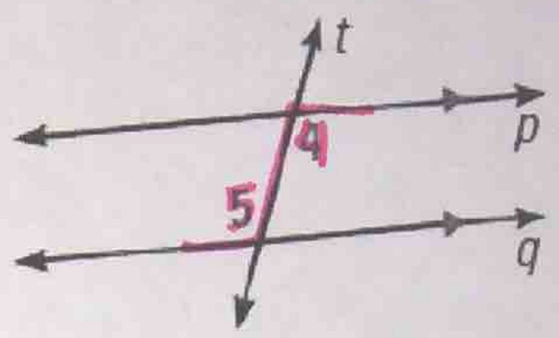
$m\angle 7 = 55°$
Vertical Angles Corng. Thm.



THEOREMS — For Your Notebook

THEOREM 3.1 Alternate Interior Angles Theorem

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

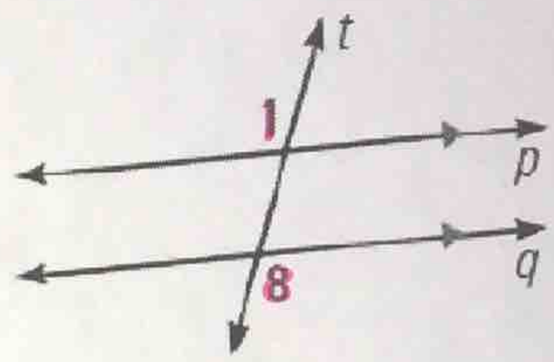


$\angle 4 \cong \angle 5$

Proof: Example 3, p. 156

THEOREM 3.2 Alternate Exterior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of alternate exterior angles are congruent.

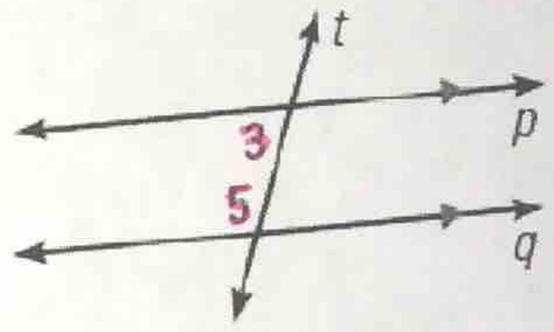


$\angle 1 \cong \angle 8$

Proof: Ex. 37, p. 159

THEOREM 3.3 Consecutive Interior Angles Theorem

If two parallel lines are cut by a transversal, then the pairs of consecutive interior angles are supplementary.

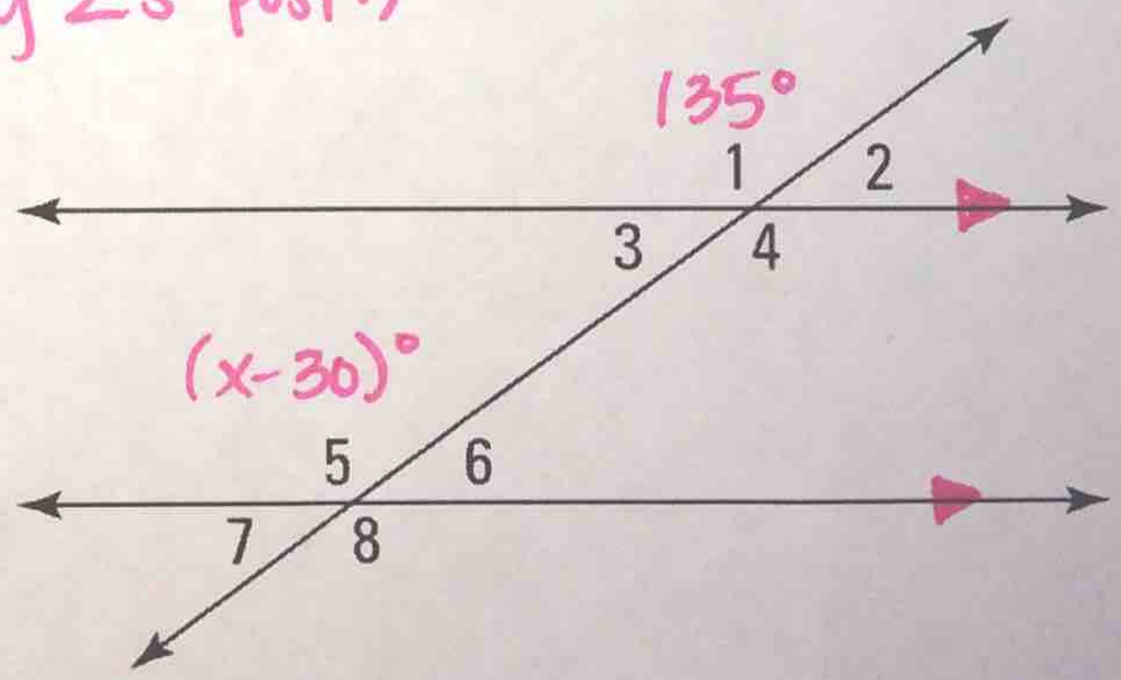


$\angle 3$ and $\angle 5$ are supplementary.

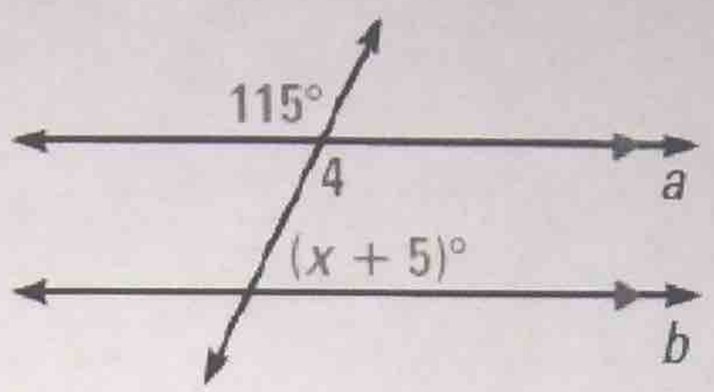
Proof: Ex. 41, p. 159

Ex 2: If $m\angle 1 = 135°$ and $m\angle 5 = (x - 30)°$, find the value of x.

$135 = x - 30$ (corresponding $\angle$s post.)
$+30 \quad +30$
$x = 165$



Ex 3: Find the value of x.



$m\angle 4 + (x+5)° = 180°$ (consecutive interior $\angle$s thm)

$115 + (x+5) = 180$ (vertical angles cong. thm)

$x + 120 = 180$

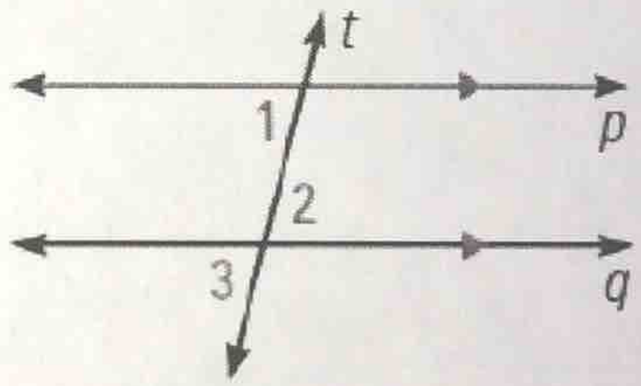
$-120 \quad -120$

$x = 60$

Ex 4: Prove that if 2 parallel lines are cut by a transversal, then the pairs of alternate interior angles are congruent.

GIVEN ▶ $p \parallel q$

PROVE ▶ $\angle 1 \cong \angle 2$



STATEMENTS	REASONS
1. $p \parallel q$	1. Given
2. $\angle 1 \cong \angle 3$	2. Corresponding Angles Postulate
3. $\angle 3 \cong \angle 2$	3. Vertical Angles Congruence Theorem
4. $\angle 1 \cong \angle 2$	4. Transitive Property of Congruence