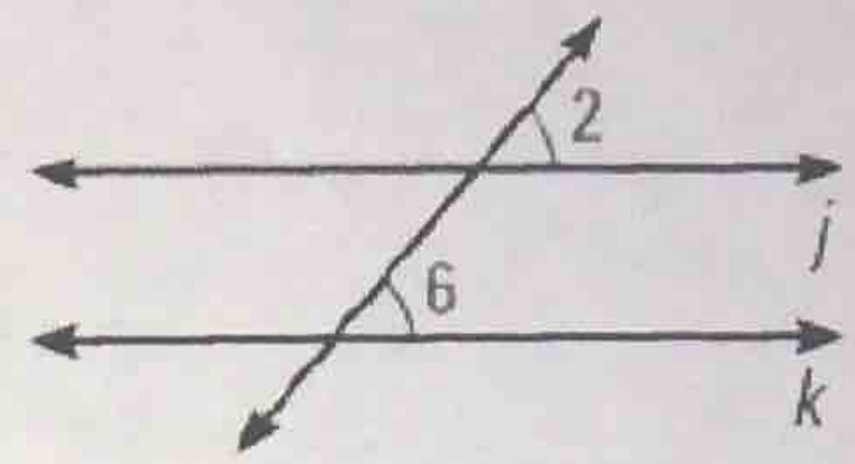
3.3 Prove Parallel Lines are Parallel

POSTULATE *For Your Notebook*

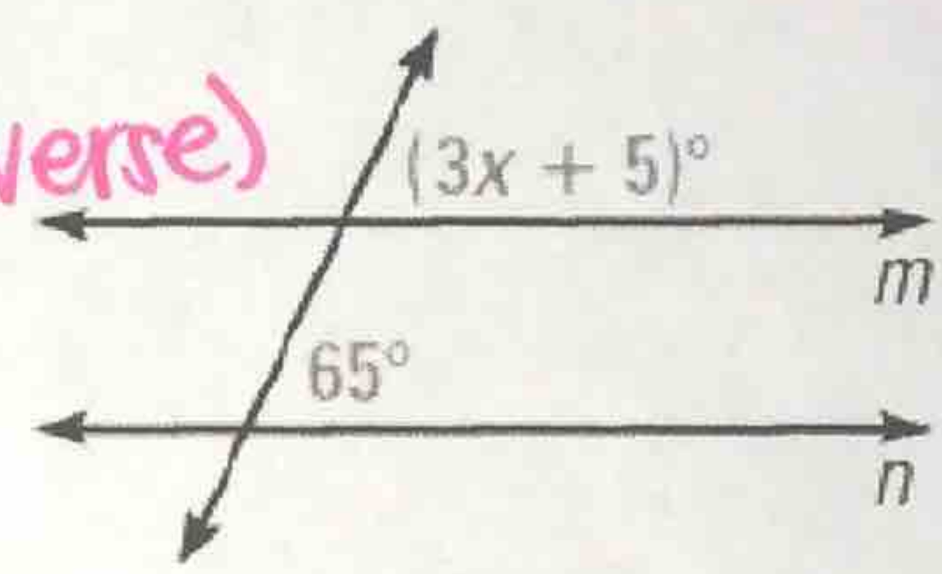
POSTULATE 16 Corresponding Angles Converse

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



$j \parallel k$

Ex 1: Find the value of x that makes m // n.



$3x+5=65$ (Corr. $\angle$s Converse)

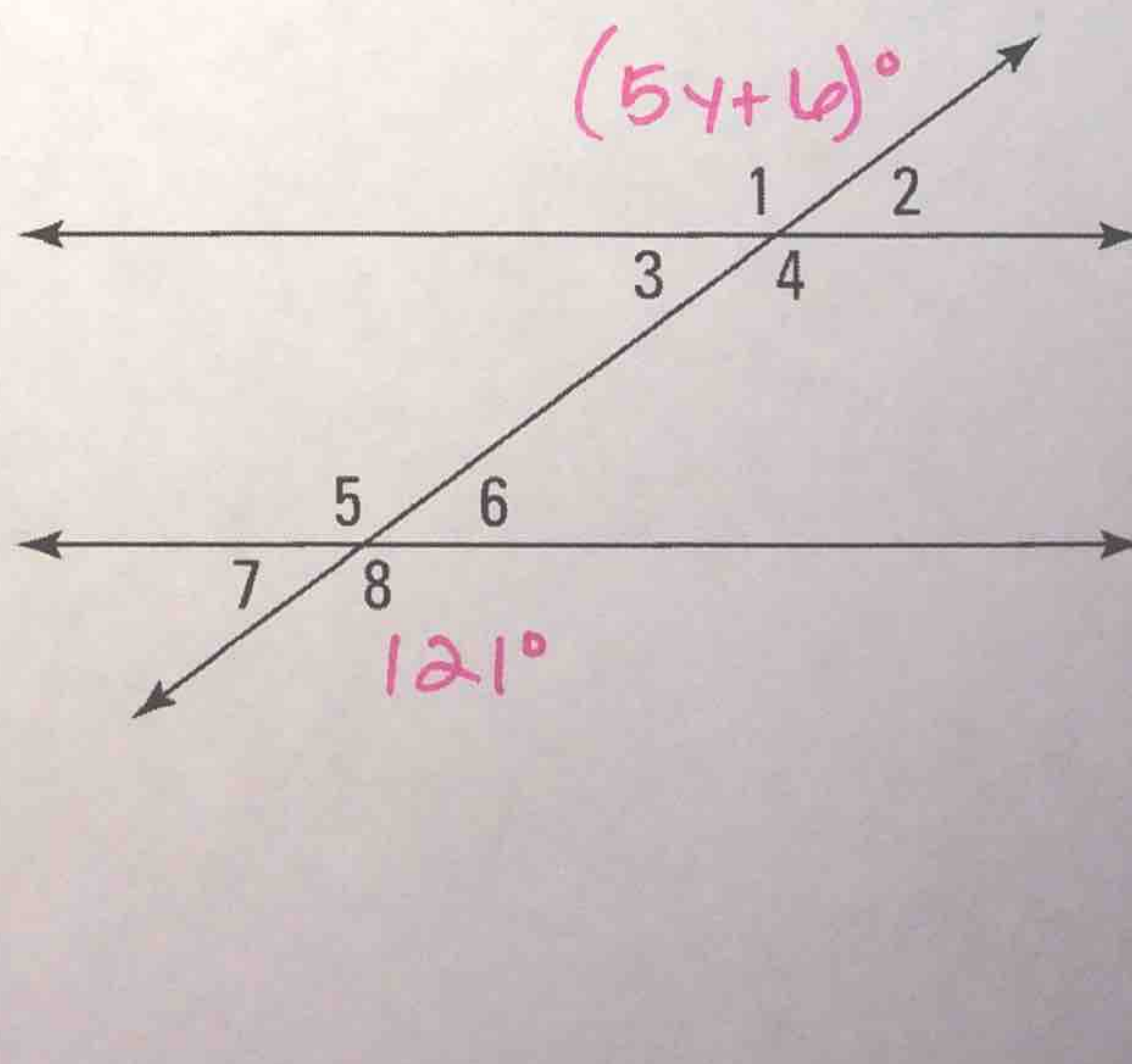
$-5 \quad -5$

$3x=60$

$\frac{3x}{3} = \frac{60}{3}$

$\boxed{x=20}$

Ex 2: If $m\angle 1 = (5y + 6)°$ and $m\angle 8 = 121°$, find the value of y that makes the lines parallel.



$5y+6=121$

$-6 \quad -6$

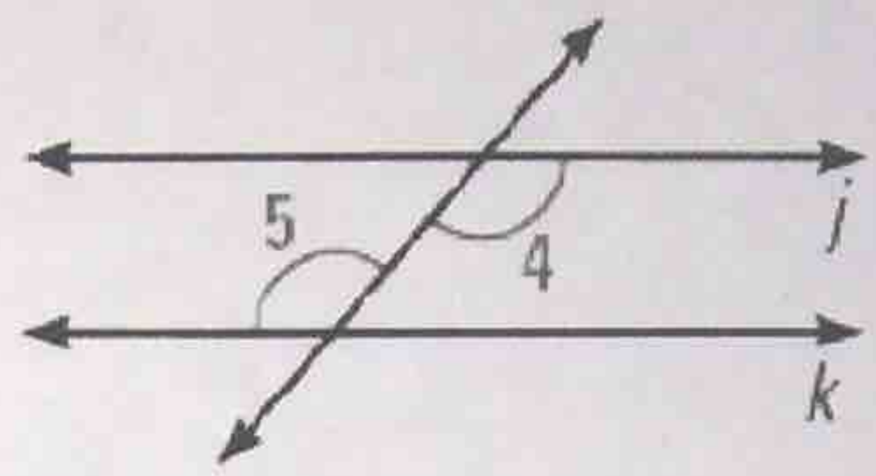
$5y=115$

$\boxed{y=23}$

THEOREMS — *For Your Notebook*

THEOREM 3.4 Alternate Interior Angles Converse

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

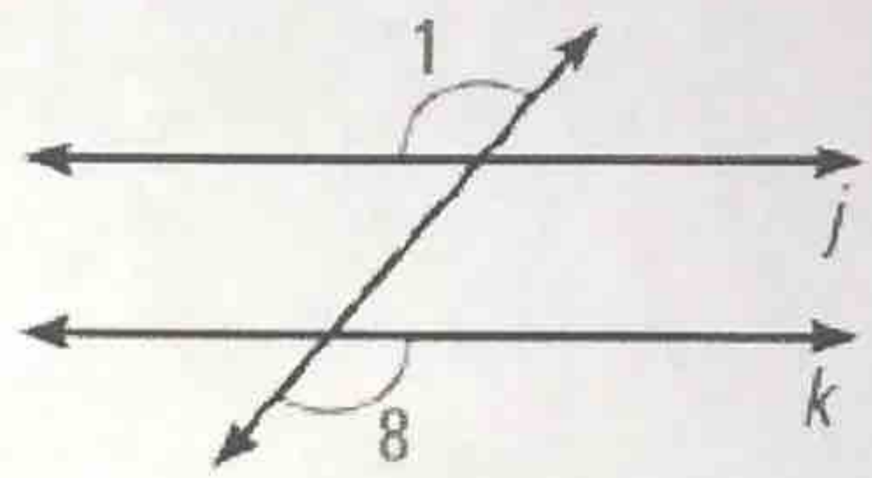


$j \parallel k$

Proof: Example 3, p. 163

THEOREM 3.5 Alternate Exterior Angles Converse

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

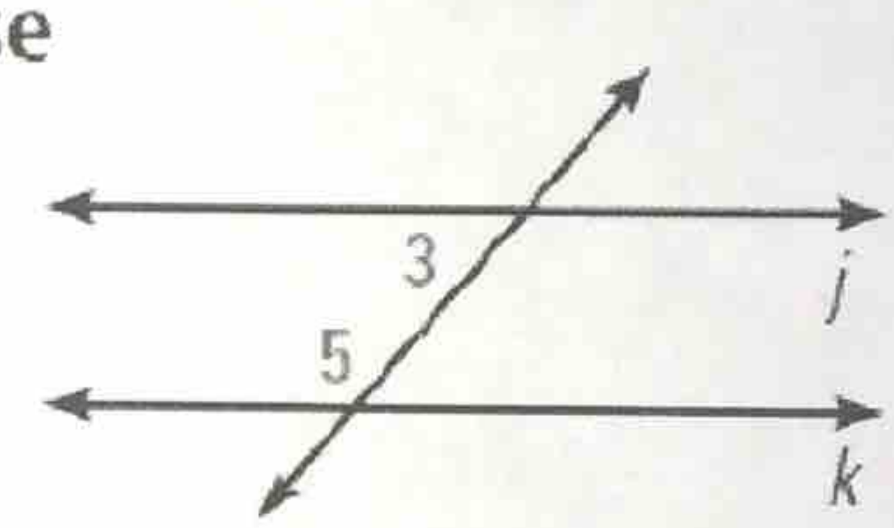


$j \parallel k$

Proof: Ex. 36, p. 168

THEOREM 3.6 Consecutive Interior Angles Converse

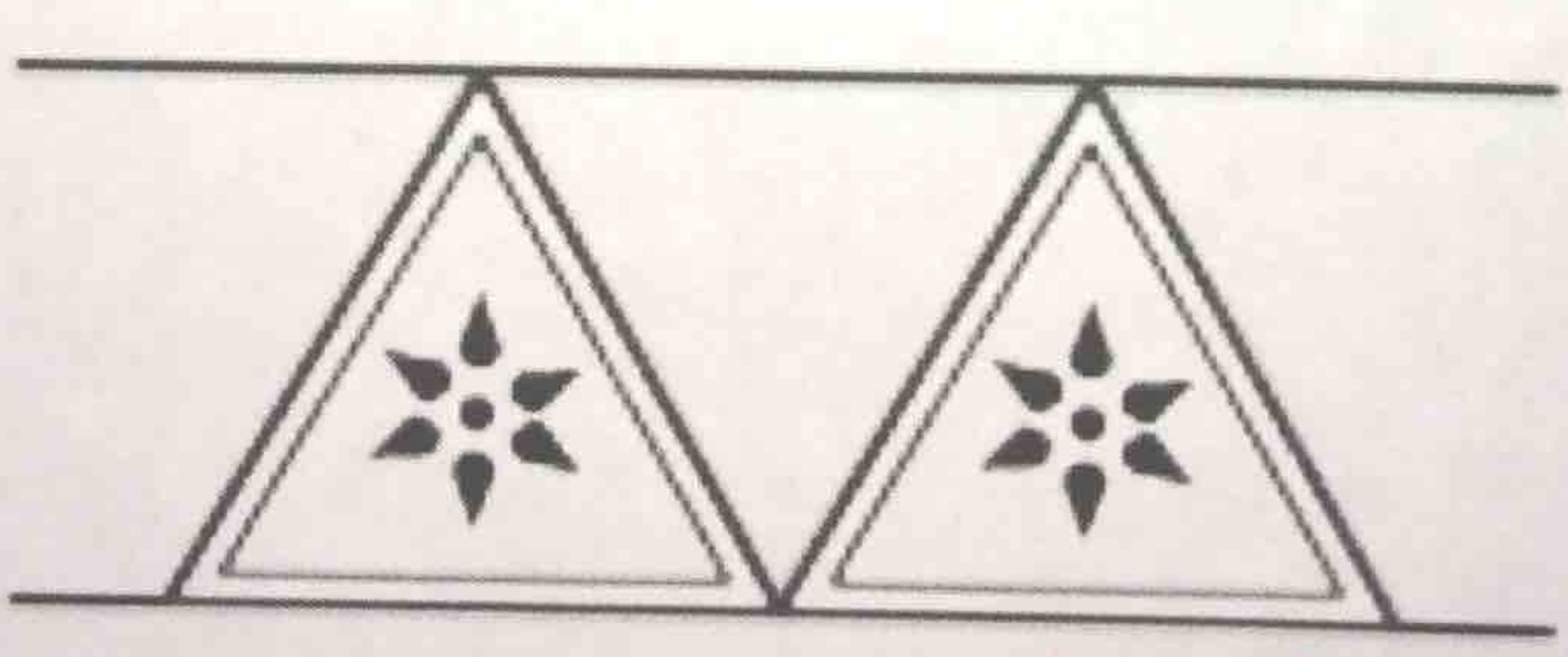
If two lines are cut by a transversal so the consecutive interior angles are supplementary, then the lines are parallel.



If $\angle 3$ and $\angle 5$ are supplementary, then $j \parallel k$.

Proof: Ex. 37, p. 168

Ex 3: Marie was stenciling this design to her kitchen walls. How can you tell if the top and bottom lines of the design are parallel?

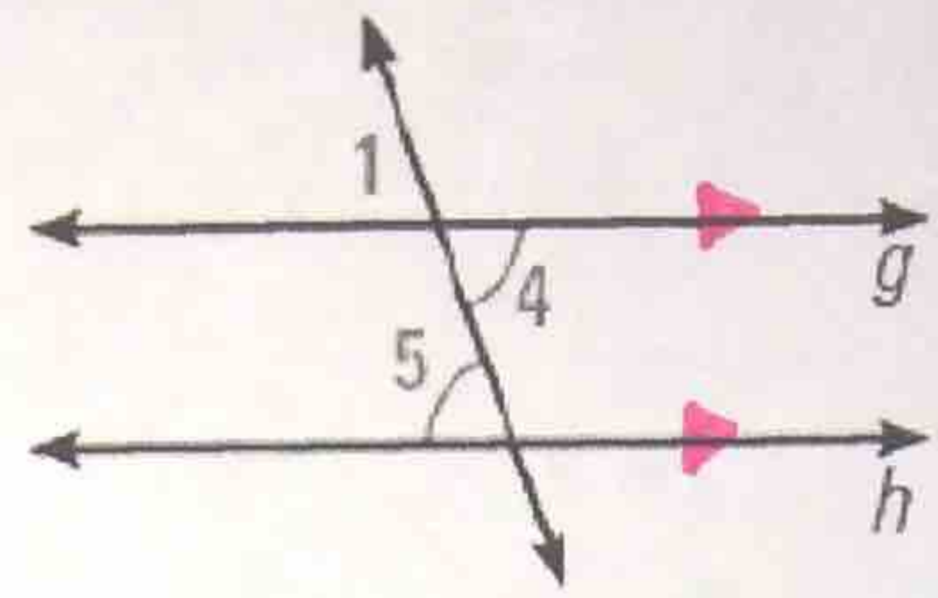


She can measure alternate interior angles and see if they are congruent.

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

GIVEN ▶ $\angle 4 \cong \angle 5$

PROVE ▶ $g \parallel h$

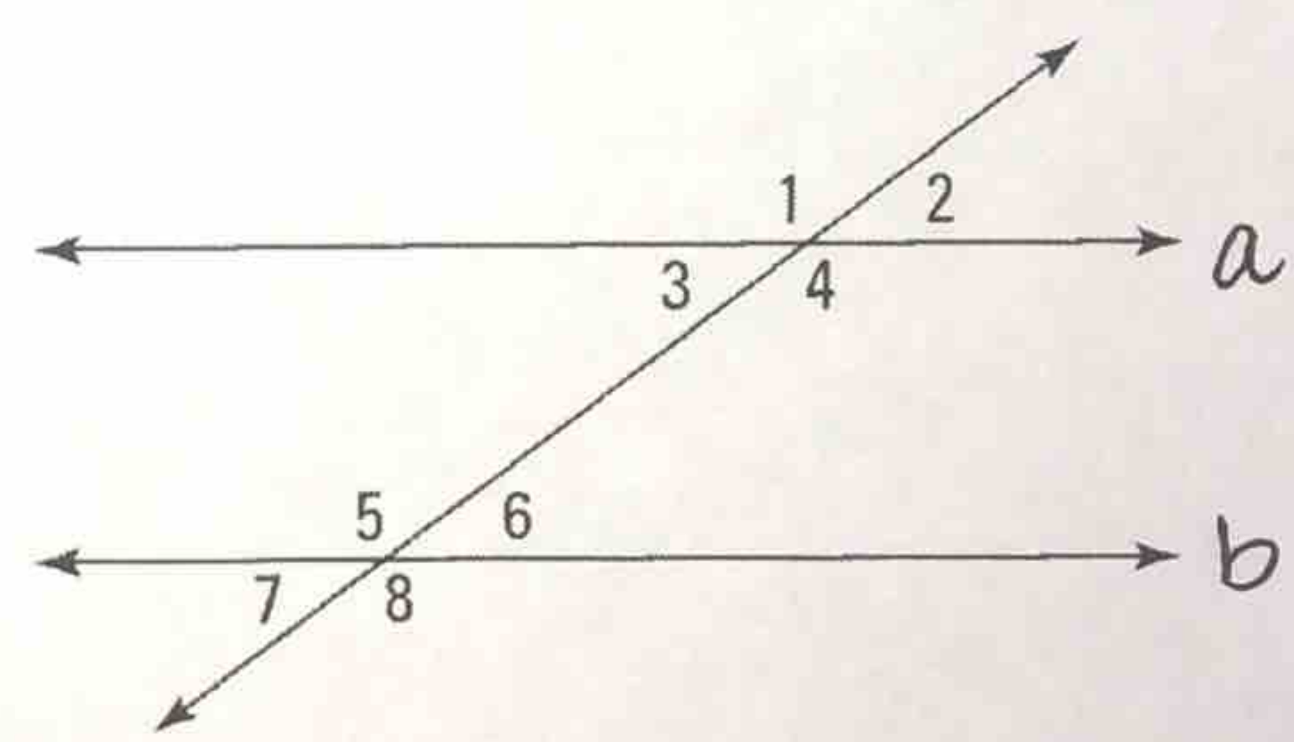


STATEMENTS	REASONS
1. $\angle 4 \cong \angle 5$	1. Given
2. $\angle 1 \cong \angle 4$	2. Vertical Angles Congruence Theorem
3. $\angle 1 \cong \angle 5$	3. Transitive Property of Congruence
4. $g \parallel h$	4. Corresponding Angles Converse

Ex 5: Prove that if angle 1 and angle 7 are supplementary, then a// b.

GIVEN: Angle 1 and angle 7 are supplementary

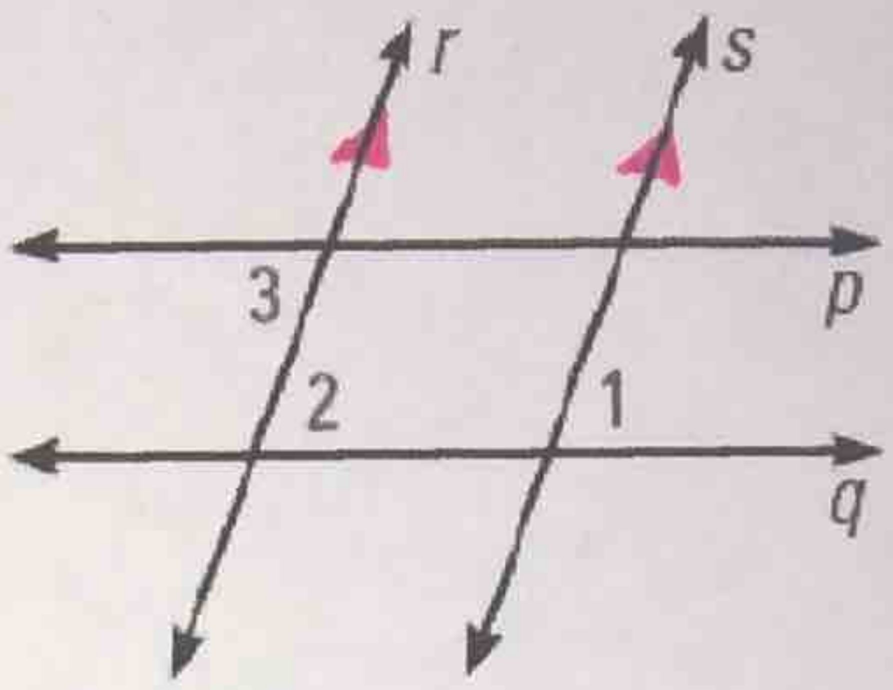
PROVE: a// b



STATEMENTS	REASONS
1. $\angle 1$ and $\angle 7$ are supplementary	1. Given
2. $m\angle 1 + m\angle 7 = 180°$	2. Definition of Supplementary Angles
3. $m\angle 1 + m\angle 3 = 180°$ $m\angle 5 + m\angle 7 = 180°$	3. Linear Pair Postulate
4. $m\angle 1 + m\angle 3 + m\angle 5 + m\angle 7 = 360°$	4. Addition
5. $m\angle 1 + m\angle 7 + m\angle 3 + m\angle 5 = 360°$	5. Commutative Property
6. $180° + m\angle 3 + m\angle 5 = 360°$	6. Substitution
7. $m\angle 3 + m\angle 5 = 180°$	7. Subtraction Property of Equality
8. $a \parallel b$	8. Consecutive Interior Angles Converse

Ex 6: In the figure r// s and angle 1 is congruent to angle 3. Prove p// q.

GIVEN: r// s and angle 1 is congruent to angle 3
PROVE: p// q

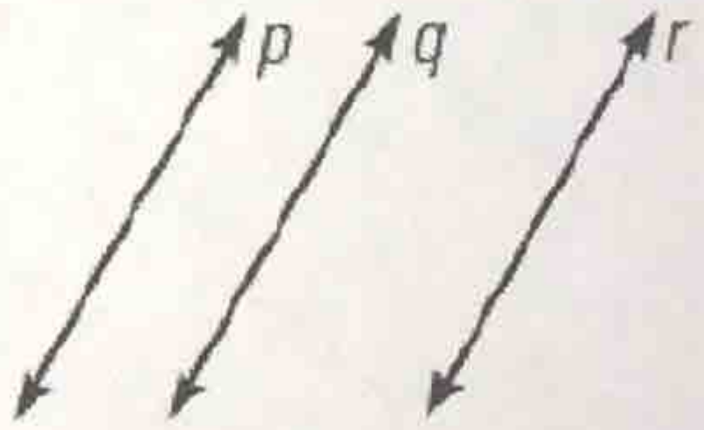


STATEMENTS	REASONS
1. $r \parallel s$, $\angle 1 \cong \angle 3$	1. Given
2. $\angle 1 \cong \angle 2$	2. Corresponding Angles Postulate
3. $\angle 2 \cong \angle 3$	3. Transitive Property of Congruence for Angles
4. $p \parallel q$	4. Alternate Interior Angles Converse

THEOREM *For Your Notebook*

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 $p \parallel q$ and $q \parallel r$, then $p \parallel r$.

Proofs: Ex. 38, p. 168; Ex. 38, p. 177