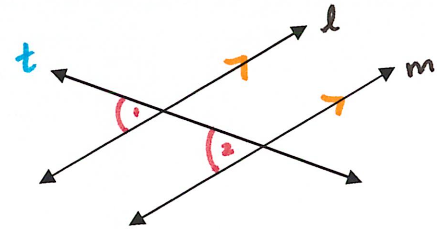
Chapter 3.3: Prove Lines are Parallel

Objective: I can use angle relationships to prove that lines are parallel

Corresponding Angles Converse (Postulate 16):

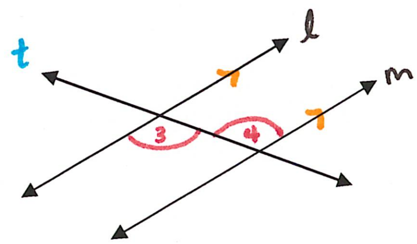
If two lines are cut by a transversal so the **Corresponding Angles** are Congruent, then the lines are parallel.



If $m\angle 1 \cong m\angle 2$, then $\ell \parallel m$

Alternate Interior Angles Converse (Theorem 3.4):

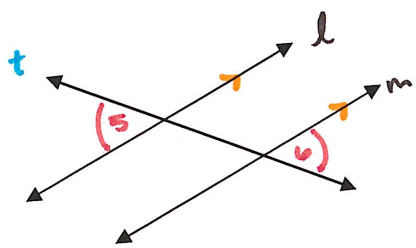
If two lines are cut by a transversal so the **Alternate Interior Angles** are Congruent, then the lines are parallel.



If $m\angle 3 \cong m\angle 4$, then $\ell \parallel m$

Alternate Exterior Angles Converse (Theorem 3.5):

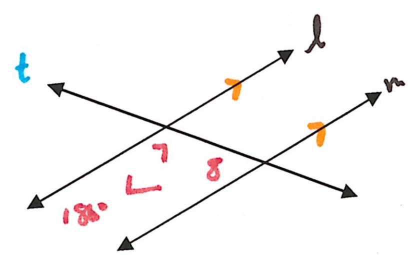
If two lines are cut by a transversal so the **Alternate Exterior Angles** are Congruent, then the lines are parallel.



If $m\angle 5 \cong m\angle 6$, then $\ell \parallel m$

Consecutive Interior Angles Converse (Theorem 3.6):

If two lines are cut by a transversal so the **Consecutive Interior Angles** are Supplementary, then the lines are parallel.

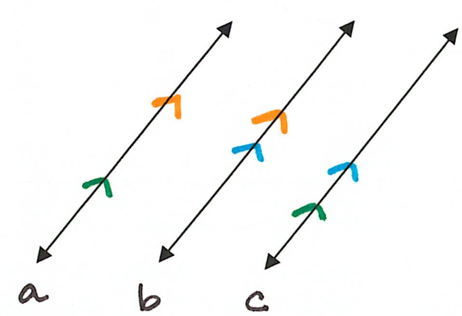


If $m\angle 7 + m\angle 8 = 180°$, then $\ell \parallel m$

Transitive Property of Parallel Lines (Theorem 3.7):

If two lines are parallel to the same line, the they are also.

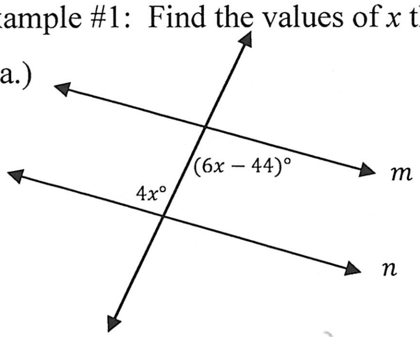
Parallel to each other.



If $a \parallel b$ and $b \parallel c$, then $a \parallel c$

Example #1: Find the values of x that makes $m \parallel n$.

a.)



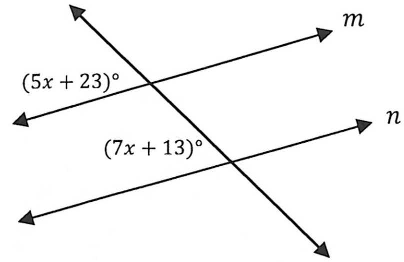
(Alt. Interior Angles)

$4x = 6x - 44$
$-6x \quad -6x$

$-2x = -44$
$\overline{-2} \quad \overline{-2}$

$x = 22$

b.)



(Corresponding Angles)

$5x + 23 = 7x + 13$
$-5x \quad -5x$

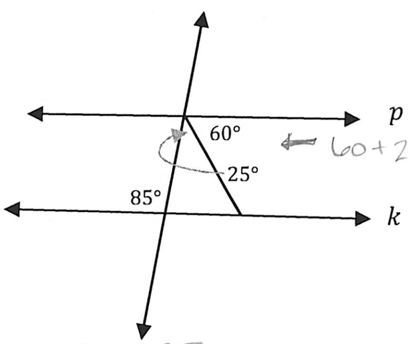
$23 = 2x + 13$
$-13 \quad -13$

$10 = 2x$
$\overline{2} \quad \overline{2}$

$5 = x$

Example #2: Is it possible to prove that line p and k are parallel? If so, state the postulate or theorem you would use.

a.)

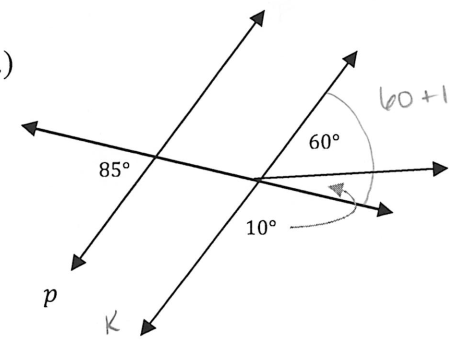


$\leftarrow 60 + 25 = 85°$

$85 = 85$

a. Yes; Alternate Interior Angle Converse

b.)

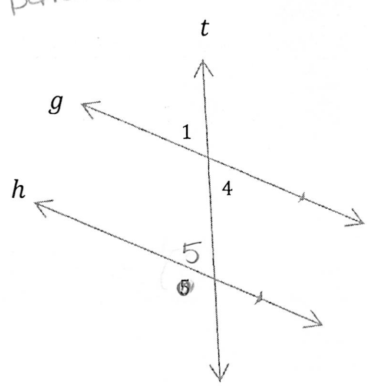


$60 + 10 = 70°$

$85° \neq 70°$

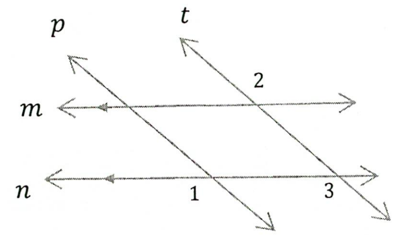
Alt. Exterior Angles need to be $\cong$ for p to be parallel to K.

Example #3: **Given:** $\angle 4 \cong \angle 5$
Prove: The Alternate Interior Angles Converse: $g \parallel h$



Statement	Reason
1. $\angle 4 \cong \angle 5$	1. Given
2. $\angle 1 \cong \angle 4$	2. Vertical Angles
3. $\angle 1 \cong \angle 5$	3. Transitive Prop.
4. $g \parallel h$	4. Corresponding Angles Converse

Example #4: **Given:** $\angle 1 \cong \angle 2, n \parallel m$
Prove: $p \parallel t$



Statement	Reason
1. $\angle 1 \cong \angle 2$	1. Given
1. $n \parallel m$	
2. $\angle 2 \cong \angle 3$	2. Alternating Exterior Angles
3. $\angle 1 \cong \angle 3$	3. Transitive Property
4. $p \parallel t$	4. Corresponding Angles Converse

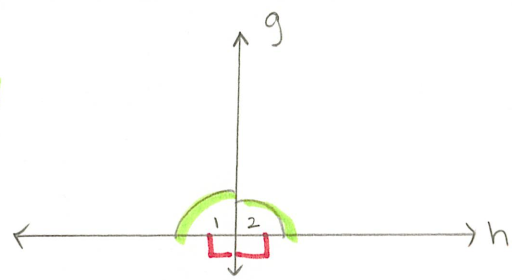
Chapter 3.6: Prove Theorems about Perpendicular Lines

Objective: I can prove lines perpendicular and parallel.

Congruent Linear Pair Theorem (Theorem 3.8):

If two lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.

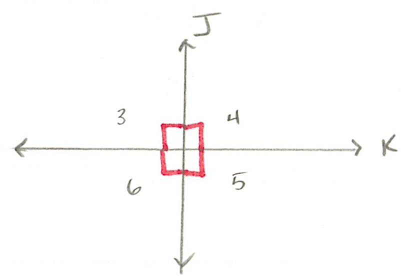
If $m\angle 1 \cong m\angle 2$, then $h \perp g$



Perpendicular Lines-Right Angles Theorem (Theorem 3.9):

If two lines are perpendicular, then they intersect to form four right angles.

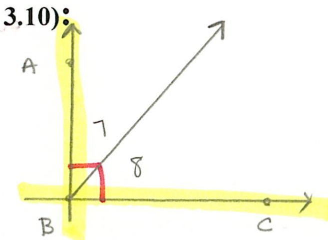
If $J \perp K$, then $\angle 3, \angle 4, \angle 5, \angle 6$ are right angles



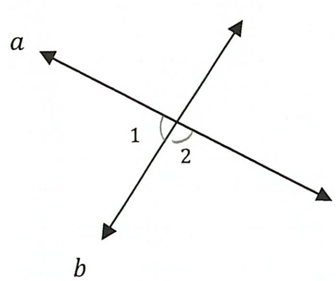
Complementary Adjacent Acute Angles Theorem (Theorem 3.10):

If two sides of two adjacent acute angles are perpendicular, then the angles are Complementary.

If $\overrightarrow{BA} \perp \overrightarrow{BC}$, then $\angle 7$ and $\angle 8$ are complementary angles



Example #1: In the diagram, $\angle 1 \cong \angle 2$. What can you say about a and b?



$a \perp b$; Congruent linear pair thrm (3.8)