

2.6 Special Angles on Parallel Lines

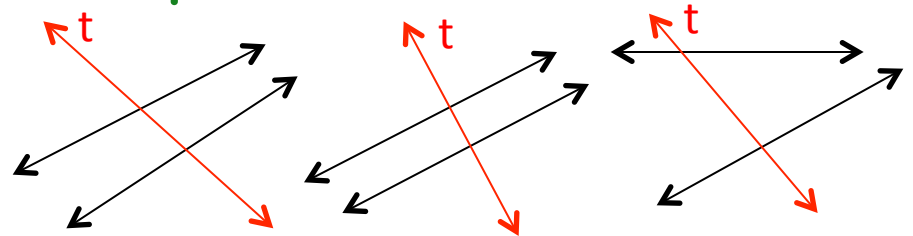
Objectives:

- I CAN define angle pairs made by parallel lines.
- I CAN solve problems involving parallel lines.

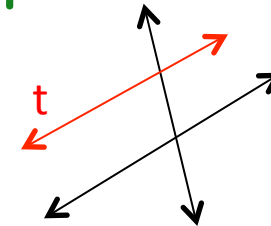
coplanar: points on the same plane

transversal: a line that crosses other coplanar lines

Examples:



Counterexample:



Angle Relationships

How many angles are there?

8

Corresponding angles.

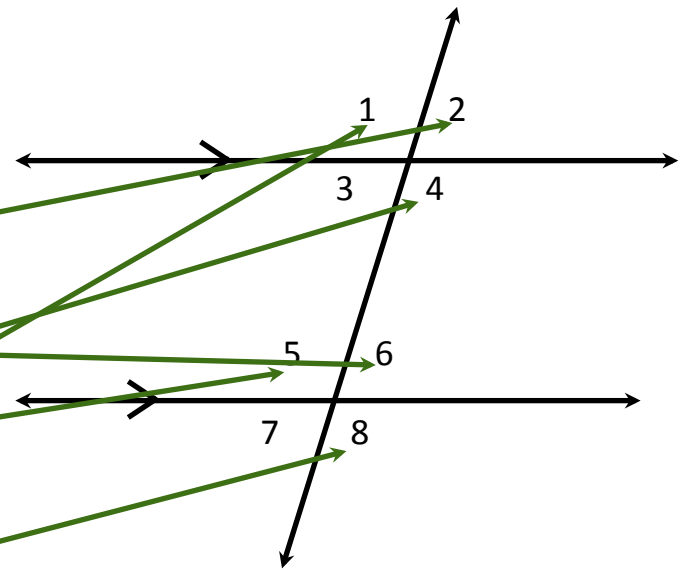
2 & 6 4 & 8 3 & 7 1 & 5

Alternate interior angles

4 & 5 3 & 6

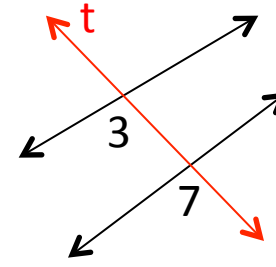
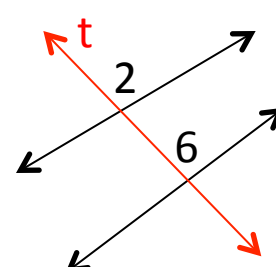
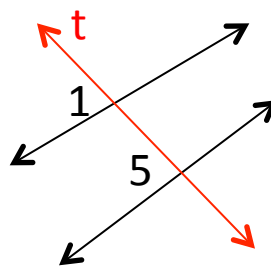
Alternate exterior angles

1 & 8 2 & 7

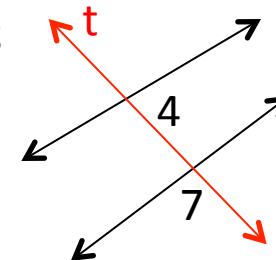


corresponding angles:
angles on same side of lines

Examples:



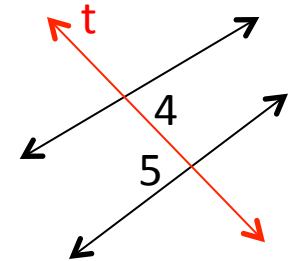
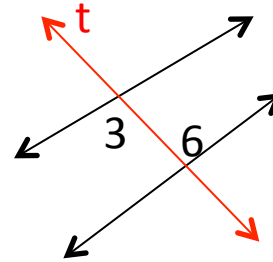
Counterexample:



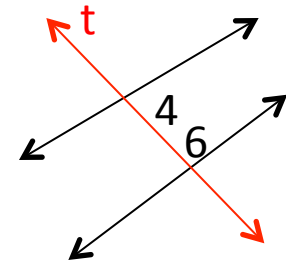
alternate-interior angles:

angles inside lines on opposite sides of transversal

Examples:



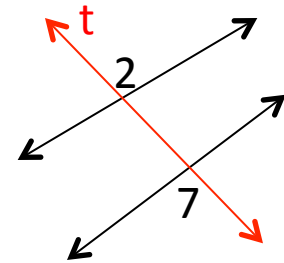
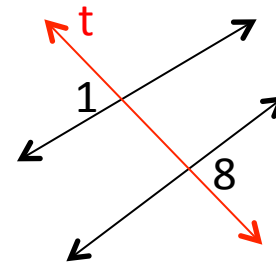
Counterexample:



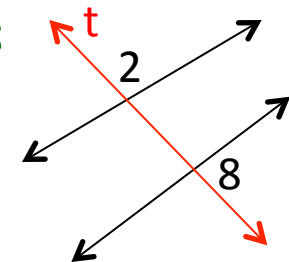
alternate-exterior angles:

angles outside lines on opposite sides of transversal

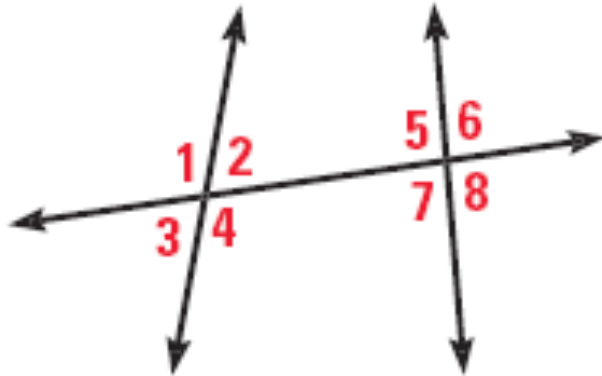
Examples:



Counterexample:



Example #1



Identify angle relationships.

- a) Corresponding
- b) Alternate Interior
- c) Alternate Exterior

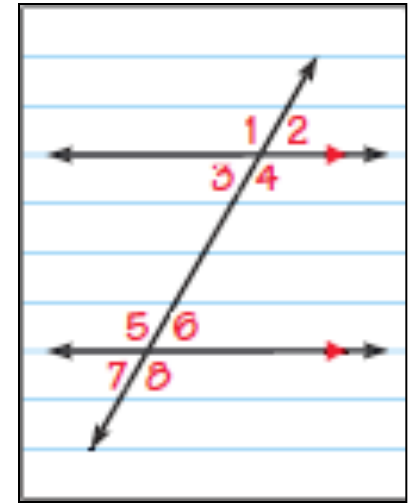
- a. $\angle 1$ and $\angle 5$
 $\angle 2$ and $\angle 6$
 $\angle 3$ and $\angle 7$
 $\angle 4$ and $\angle 8$

- b. $\angle 2$ and $\angle 7$
 $\angle 4$ and $\angle 5$

- c. $\angle 1$ and $\angle 8$
 $\angle 3$ and $\angle 6$

Investigation

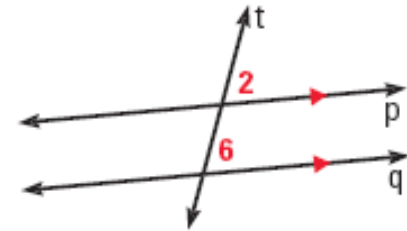
1. Draw two parallel lines.
(Use the lines on your paper or both sides of your ruler.)
2. Label the lines a and b .
3. Draw a transversal t that intersects the parallel lines.
4. Label the angles with numbers, like the diagram to the right.
5. Place a sheet of patty paper over angles 1, 2, 3, and 4 and trace them on the paper.
6. Slide the patty paper down to the other four angles.
7. What do you notice about corresponding angles, alternate interior angles, and alternate exterior angles?



C-3a: CA Conjecture
Corresponding Angles Conjecture

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

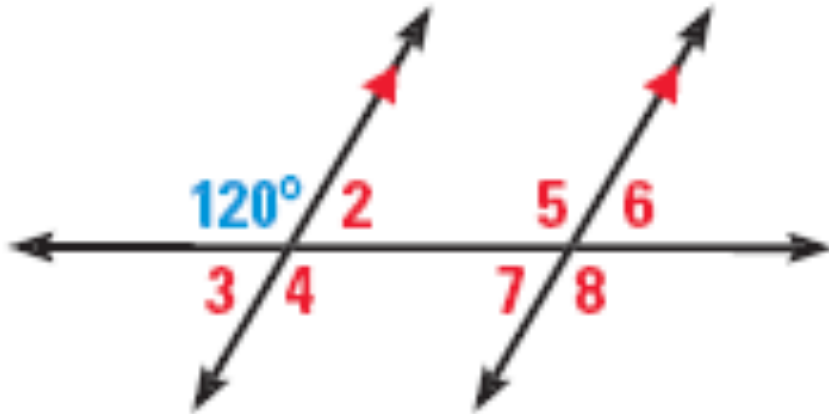
IF



THEN

$$\angle 2 \cong \angle 6$$

Example #2



The measure of three of the numbered angles is 120° . Identify the angles. Explain your reasoning.

$m\angle 5 = 120^\circ$
(Corresponding Angles Conjecture)

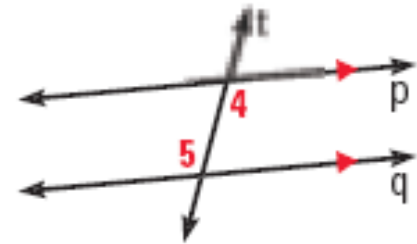
$m\angle 8 = 120^\circ$
(Vertical Angles Conjecture)

$m\angle 4 = 120^\circ$
(Corresponding Angles Conjecture)

C-3b: AIA Conjecture
Alternate Interior Angles Conjecture

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

IF



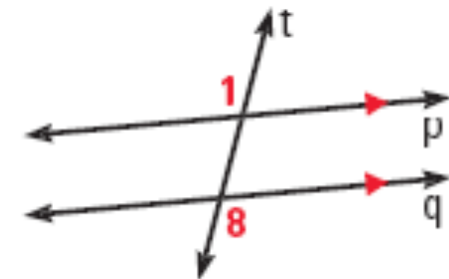
THEN

$$\angle 4 \cong \angle 5$$

C-3c: AEA Conjecture
Alternate Exterior Angles Conjecture

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

IF



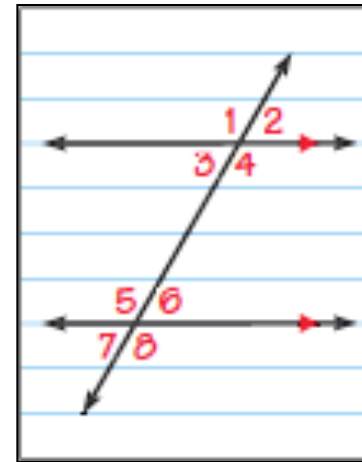
THEN

$$\angle 1 \cong \angle 8$$

C-3: Parallel Lines Conjecture

If two parallel lines are cut by a transversal, then corresponding angles are congruent, alternate interior angles are congruent, and alternate exterior angles are congruent.

IF



THEN

$$\angle 1 \cong \angle 4 \cong \angle 5 \cong \angle 8$$

$$\angle 2 \cong \angle 3 \cong \angle 6 \cong \angle 7$$

Investigation

1. Draw two intersecting lines on your paper.
2. Copy these lines onto a piece of patty paper.
3. Are the two sets of angles congruent?
4. Slide the top copy so that the transversal stays lined up.
5. Trace the lines and the angles from your paper onto the patty paper.
6. What kinds of angles were formed?
7. Use your ruler to measure the distance between the two lines in three different places. Are the two lines parallel?
8. Repeat Steps 1-7 again using another piece of patty paper, but this time rotate your patty paper around 180 degrees so that the transversal lines up again. Trace the lines and angles and mark congruent angles. Are the lines parallel?

C-4: Converse of the Parallel Lines Conjecture

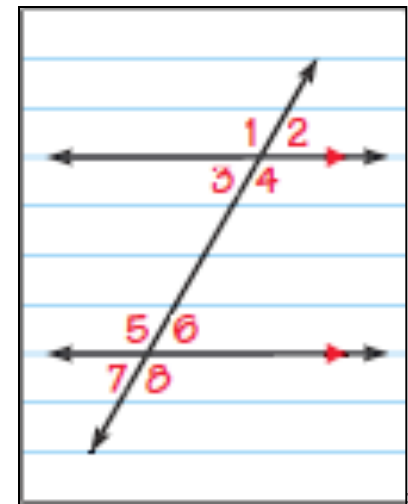
If two lines are cut by a transversal to form pairs of congruent corresponding angles, congruent alternate interior angles, or congruent alternate exterior angles, then the lines are parallel.

IF

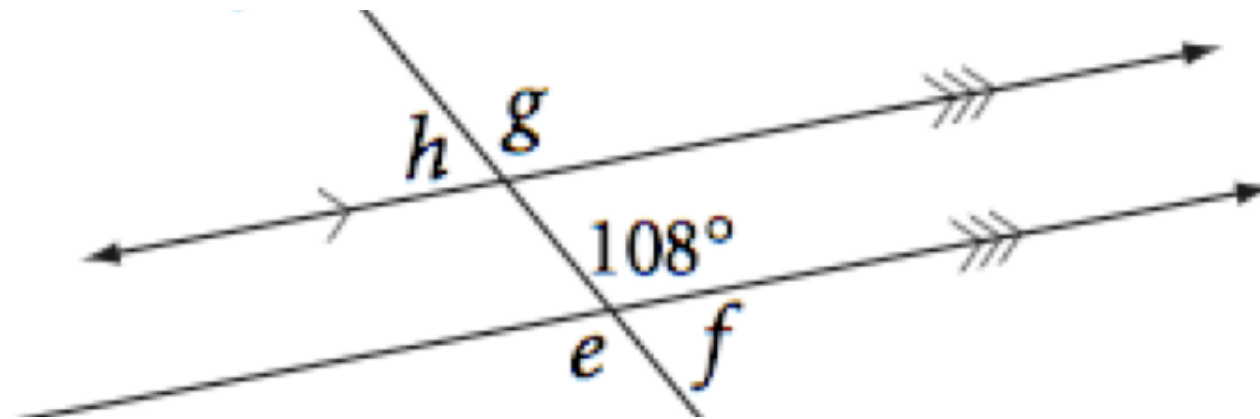
$$\angle 1 \cong \angle 4 \cong \angle 5 \cong \angle 8$$

$$\angle 2 \cong \angle 3 \cong \angle 6 \cong \angle 7$$

THEN



Angle Relationships

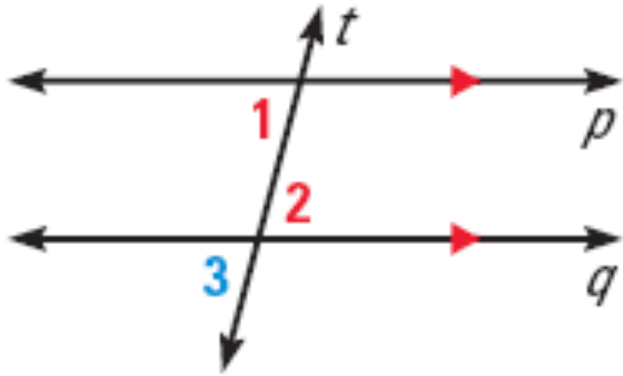


$$m\angle = 1^\circ$$

$$m\angle = \quad^\circ$$

$$m\angle = 1^\circ$$

C-3b: AIA Conjecture
Alternate Interior Angles Conjecture

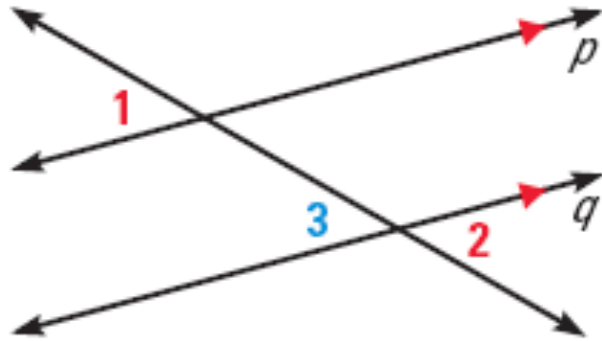


Given: $p \parallel q$

Prove: $\angle 1 \cong \angle 2$

Statements	Reasons
1. $p \parallel q$	1. Given
2. $\angle 1 \cong \angle 3$	2. Corresponding Angles Conjecture
3. $\angle 3 \cong \angle 2$	3. Vertical Angles Conjecture
4. $\angle 1 \cong \angle 2$	4. Transitive Prop

Proof of C-3c: AEA Conjecture Alternate Exterior Angles Conjecture



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 Conjecture
3. $\angle 3 \cong \angle 2$	3. Vertical Angles Conjecture
4. $\angle 1 \cong \angle 2$	4. Transitive Prop