# Lesson 2.6: Special Angles on Parallel Lines

In this lesson you will:
- make 3 conjectures about the angles formed when two parallel lines are intersected by a transversal
- determine whether the converse of each conjecture is true
- prove one of the conjectures assuming one of the other conjectures is true

*Add "transversal," "corresponding angles," "alternate interior angles," and "alternate exterior angles" to your dictionary.
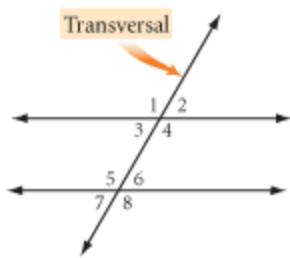
♦One pair of corresponding angles is ∠1 and ∠5. Find 3 more pairs: _____

♦One pair of alternate interior angles is ∠3 and ∠6. Find another pair: _____

♦One pair of alternate exterior angles is ∠2 and ∠7. Find another pair: _____

Investigation 2.6.1: "Which Angles Are Congruent?"

Using the lines on your paper as a guide, draw a pair of parallel lines. Or use both edges of your ruler or straightedge to create parallel lines. Label them *k* and *l*. Now draw a transversal that intersects the parallel lines. Label the transversal *m*, and label the angles with numbers as shown at right.
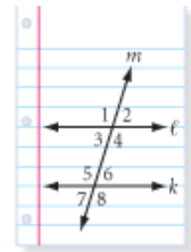
A.) Place a piece of patty paper over the set of angles 1, 2, 3, and 4. Copy the two intersecting lines *m* and *l* and the four angles onto the patty paper.

B.) Slide the patty paper down to the intersection of lines *m* and *k*, and compare angles 1 through 4 with each of the corresponding angles 5 through 8. What is the relationship between corresponding angles?
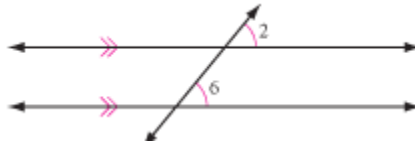
What is the relationship between alternate interior angles?

What is the relationship between alternate exterior angles?

C.) Compare your results with the results of others in your group and complete the three conjectures on the next page.
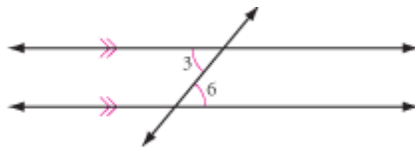
Corresponding Angles (CA) Conjecture (C-3a)

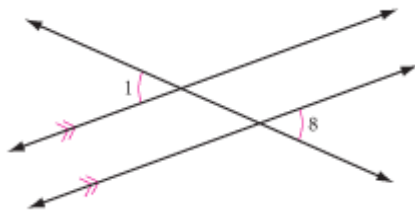If two parallel lines are cut by a transversal, then corresponding angles are _____.

Alternate Interior Angles (AIA) Conjecture (C-3b)

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

_____.

Alternate Exterior Angles (AEA) Conjecture (C-3c)

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

_____.

The three conjectures you wrote can all be combined to create a Parallel Lines Conjecture, which is really three conjectures in one.
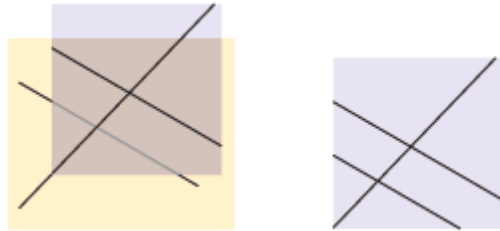
Parallel Lines Conjecture (C-3)

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

D.) What happens if the lines you start with are not parallel? Check whether your conjectures will work with nonparallel lines.
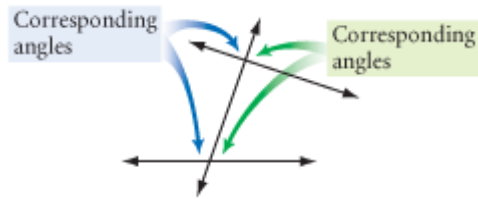
Investigation 2.6.2: "Is the Converse True?"

A.) Draw two intersecting lines on your paper. Copy these lines onto a piece of patty paper. Because you copied the angles, the two sets of angles are congruent.

Slide the top copy so that the transversal stays lined up.

Trace the lines and the angles from the bottom original onto the patty paper again. When you do this, you are constructing sets of congruent corresponding angles. Mark the congruent angles.

Are the two lines parallel? _____ You can test to see if the distance between the two lines remains the same, which guarantees that they will never meet.

B.) Repeat part A, but this time rotate your patty paper 180° so that the transversal lines up again. What kinds of congruent angles have you created?
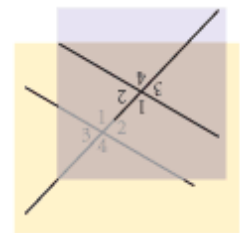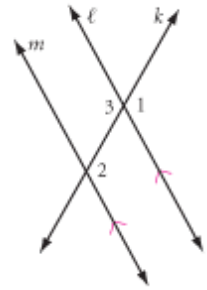

Trace the lines and angles and mark the congruent angles. Are the lines parallel? _____ Check them.

C.) Compare your results with those of your group. If your results do not agree, discuss them until you have convinced each other. Complete the conjecture below and add it to your conjecture list.

Converse of the Parallel Lines Conjecture (C-4)

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 _____.

●Example 1: Write a deductive argument explaining why the Alternate Interior Angles Conjecture is true. Assume that the Vertical Angles Conjecture and Corresponding Angles Conjecture are both true.

⇒**ASSIGNMENT**: _____