

# 2.5 Angle Relationships

## Objectives:

- I CAN apply the Linear Pair Conjecture and Vertical Angle Conjecture to solve geometric problems.
- I CAN write logical explanations in the form of paragraph proofs.

# Conjecture 1

1. On your paper, draw  $\overleftrightarrow{AB}$ .
2. Draw point  $X$  between  $A$  and  $B$  and point  $Y$  not on the line.
3. Draw  $\overrightarrow{XY}$ .
4. What kind of angles did you create?
5. Measure the two angles with your protractor. What do you notice?

## Conjecture 2

1. Draw two intersecting lines on the patty paper.
2. Label the angles 1, 2, 3, and 4.
3. What kinds of angles are 1 & 3 and 2 & 4?
4. Fold the paper so the vertical angles lie over each other.
5. What do you notice about their measures?

## C-1: Linear Pair Conjecture

Linear pairs are supplementary.

If two angles form a linear pair,  
then they are supplementary.

If



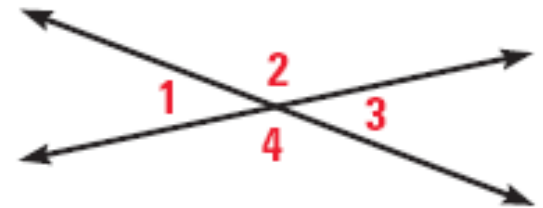
Then  $m\angle 1 + m\angle 2 = 180^\circ$

## C-2: Vertical Angles Conjecture

Vertical angles are congruent.

If two angles are vertical angles,  
then they are congruent.

**If**



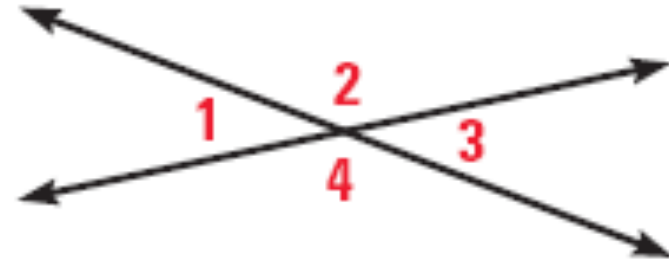
**Then**

$$\angle 1 \cong \angle 3, \angle 2 \cong \angle 4$$

## Proof of Conjecture 2: Vertical Angles Conjecture

Given : See diagram.

Prove:  $\angle 1 \cong \angle 3$

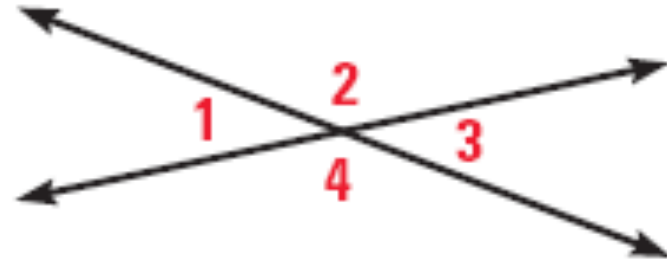


Statements	Reasons
1. $\angle 1$ & $\angle 2$ are a linear pair. $\angle 2$ & $\angle 3$ are a linear pair.	1. Given
2. $m\angle 1 + m\angle 2 = 180^\circ$ $m\angle 2 + m\angle 3 = 180^\circ$	2. Linear Pair Conjecture (C-1)
3. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	3. Substitution
4. $m\angle 1 = m\angle 3$ or $\angle 1 \cong \angle 3$	4. Subtraction

## Proof of Conjecture 2: Vertical Angles Conjecture

Given : See diagram.

Prove:  $\angle 1 \cong \angle 3$



Angles 1 and 2 and angles 2 and 3 form linear pairs.

According to the Linear Pair Conjecture,  $m\angle 1 + m\angle 2 = 180^\circ$  and  $m\angle 2 + m\angle 3 = 180^\circ$ .

By substituting, we get  $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$ .

According to the subtraction property of equality, you can subtract angle 2 from both sides, so  $m\angle 1 = m\angle 3$ .

Thus the vertical angles are congruent.