

Indirect Proof

(either recall these rules or find in 2.2 to fill in the table below)

Conditional	$P \rightarrow Q$	If P, then Q
Negation	$\sim P$	
Converse	$Q \rightarrow P$	
Inverse	$\sim P \rightarrow \sim Q$	
Contrapositive	$\sim Q \rightarrow \sim P$	

Here is a conditional statement:

If two sides of a triangle are equal, then the triangle is isosceles.

Converse: $Q \rightarrow P$

If the triangle is isosceles, then the triangle has two equal sides.

Inverse: $\sim P \rightarrow \sim Q$

If the triangle does not have two equal sides, then the triangle is not isosceles.

Contra-positive: $\sim Q \rightarrow \sim P$

If a triangle is not isosceles, then the triangle does not have two equal sides.

Example 1:

Write the inverse, converse, and contra-positive of the following statement.

If a number is positive, then the number is greater than zero.

Be sure to look over example 1 in 2.2 page 77. Copy and place in your notes ☺

Law of Negative Inference (Contra-positive)

This will help so you will understand why contra-positive works.

$$\begin{array}{r} P \rightarrow Q \\ \sim Q \\ \hline \sim P \end{array}$$

If Pablo lives in Guadalajara, then he lives in Mexico.
Pablo does not live in Mexico.

Conclusion is that: Pablo does not live in Guadalajara.

The Law of Negative Inference is referred to as Indirect Proof.

Example 2:

Assuming that statements 1 and 2 are true, draw a valid conclusion.

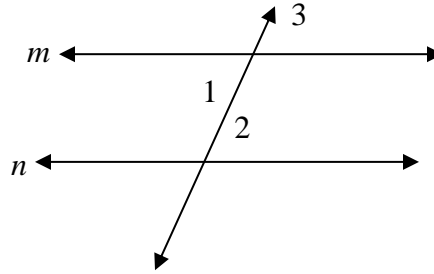
1. If two angles are both right angles, then the angles are congruent.
2. $\angle R$ and $\angle S$ are not congruent.

\therefore

Example 3: We are now going to look at a proof done first indirect and then indirect.

Given : $\angle 1 \cong \angle 2$

Prove: $m \parallel n$



Direct Proof:

Statements	Reasons
1. $\angle 1 \cong \angle 2$	1.
2. $\angle 1 \cong \angle 3$	2.
3. $\angle 3 \cong \angle 2$	3.
4. $m \parallel n$	4.

Indirect proof:

Statements	Reasons
1. $\angle 1 \cong \angle 2$	1.
2. m is not parallel to n	2.
3. $\angle 1 \neq \angle 2$	3.

Example 5: If $\angle 1 \neq \angle 2$, then $\angle 1$ and $\angle 2$ are not vertical angles.

Given: $\angle 1 \neq \angle 2$

Prove: $\angle 1$ and $\angle 2$ are not vertical angles.

Statements	Reasons
1. Suppose $\angle 1$ and $\angle 2$ are vertical angles.	1.
2. $\angle 1 \cong \angle 2$	2.
3. $\angle 1$ and $\angle 2$ are not vertical angles.	3.

OK, TRY THESE: p. 81 #'s 19, 24