Geometry – Mr. Bo
Unit 5 – Day 5

Name ________________
Date _______

Indirect Reasoning
(Proof by Contradiction)

All possibilities are considered
All but one are eliminated (**proven false**)
The remaining one is the answer (**proven true**)

Example: The classic board game Clue is played using **Inductive Reasoning**.
In the game there are Suspects, Weapons, & Rooms.
To win the game you need to determine who the murder was, what the murder weapon was and in which room the murder took place.

Using the clue sheet, you eliminate **possibilities**.

Here, all **suspects** have been ruled out.
Thus you conclude that the murderer must be Professor Plum.

Indirect Reasoning Steps

Generally, we try to apply indirect reasoning to problems that have **2 possibilities**:

"it is" or "it isn't"

Steps:

1. Assume the opposite what you are proving.
2. Show that the assumption leads to logical contradiction. (eliminate ~~the~~ one of the possibilities)
3. Conclude what we are proving is true.

Example:

Given: You have been dealt the Colonel Mustard card.
Prove: Colonel Mustard is not the murder.

Proof:
1. Assume C.M. is the murder.

2. then his card in Secret Envelope. But, his card is in my hand. this a contradiction because his card can't be both places at once.
3. Thus C.M. is not the murder.

Let's Try a Geometry Example:

Given: ΔABC
Prove: ΔABC can't have more than 1 obtuse angle.

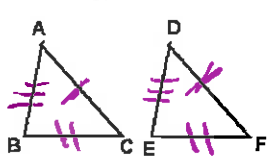
Proof:
1. Assume ΔABC has 2 obtuse $\angle$'s

2. Then each of the two obtuse angles is greater than 90°. So, their sum is more than 180°.
 This is a contradiction because a Δ has 180°.

3. thus ΔABC can't have more than 1 obtuse $\angle$.

One more Example:

Given: $\overline{AC} \cong \overline{DF}$
$\overline{BC} \cong \overline{EF}$
$m\angle C \neq m\angle F$
Prove: $AB \neq DE$



Proof:
1. Assume $AB = DE$
2. this makes $\Delta ABC \cong \Delta DEF$ by SSS. Then $\angle C \cong \angle F$ by corr. parts $\cong$ Δ's. But this is a contradiction because we are given $m\angle C \neq m\angle F$.
3. Thus $AB \neq DE$