NOTES 2.2: Biconditionals & Reasoning

Objective:_____

_____

Biconditional Statement:

Write the conditional statement and converse within the biconditional.

Example 1: An angle is obtuse if and only if its measure is greater than $90°$ and less than $180°$.

Conditional	
Converse	

Example 2: A solution is neutral iff its pH is 7.

Conditional	
Converse	

For each conditional, write the converse and a biconditional statement.

Example 3: If $5x - 8 = 37$, then $x = 9$.

Converse	
Biconditional	

Example 4: If two angles have the same measure, then they are congruent.

Converse	
Biconditional	

For a biconditional statement to be true, both the conditional statement and its converse must be true. If either the conditional or the converse is false, then the biconditional statement is false.

Determine if the biconditional is true. If false, give a counterexample.

Example 5: A rectangle has side lengths of $12\ cm$ and $25\ cm$ if and only if its area is $300\ cm^2$.	True / False
Counterexample:	
Example 6: An angle is a right angle iff its measure is $90°$.	True / False
Counterexample:	

Write each definition as a biconditional.

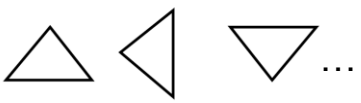
Example 7: A pentagon is a five-sided polygon.

Example 8: A right angle measures $90°$.

Inductive Reasoning:

Conjecture:

Find the next item in each pattern.

Example 9: January, March, May, ...
Example 10: $7, 14, 21, 28, \ldots$
Example 11:  …

Notes 2.2 (Continued)
Complete each conjecture.

Example 12: The sum of two positive numbers is _____.
Example 13: The number of lines formed by 4 points, no three of which are collinear, is _____.

*To show that a conjecture is always true, you must prove it.
*To show that a conjecture is false, you have to find only one example in which the conjecture is not true.

Counterexample:

A counterexample can be a drawing, a statement, or a number.

Inductive Reasoning
1. Look for a pattern.
2. Make a conjecture.
3. Prove the conjecture or find a counterexample.

Show that each conjecture is false by finding a counterexample.

Example 14: For every integer n, n^3 is positive.

Counterexample:

Example 15: Two complementary angles are not congruent.

Counterexample:

Example 16: The monthly high temperature in Abilene is never below $90°F$ for two months in a row.

Monthly High Temperatures ($°F$) in Abilene, Texas											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
88	89	97	99	107	109	110	107	106	103	92	89

Counterexample:

Determine if each conjecture is true. If false, give a counterexample.

Example 17: The quotient of two negative numbers is a positive number.	True / False
Counterexample:	
Example 18: Two supplementary angles are not congruent.	True / False
Counterexample:	

Deductive Reasoning:

State whether each conclusion uses inductive or deductive reasoning.

Example 19: There is a myth that you can balance an egg on its end only on the spring equinox. A person was able to balance an egg on July 8, September 21, and December 19. Therefore, this myth is false.	
Example 20: There is a myth that the Great Wall of China is the only man-made object visible from the Moon. The Great Wall is barely visible in photographs taken from 180 miles above Earth. The Moon is about 237,000 miles from Earth. Therefore, the myth cannot be true.	
Example 21: Opposite rays are two rays that have a common endpoint and form a line. $\overrightarrow{YX}$ and $\overrightarrow{YZ}$ are opposite rays.