

Reasoning and Proof Unit

2-2 Conditional Statements

Conditional Statement

- if, then statement
- the **if** part is **hypothesis**
- the **then** part is **conclusion**

	How?	Example
Conditional Statement	if, then	If an angle measures 15 degrees, then it is acute.
Converse	switch if and then	If an angle is acute, then it measures 15 degrees.
Inverse	negate original conditional	If an angle does not measure 15 degrees, then it is not acute.
Contrapositive	negate converse	If an angle is not acute, then it does not measure 15 degrees

Counterexample

- something that proves a statement false
- counterexample for the converse above? 20 degrees

Another Example

Original Statement: When I study, I pass my Geometry test.

Conditional:
 Hypothesis:
 Conclusion:
 Converse:
 Inverse:
 Contrapositive:



Can you think of any counter examples for the statements above?

2-3 Biconditionals and Definitions

Biconditional

- a true statement that has a true conditional and true converse
- connects the hypothesis and conclusion with "if and only if"

Conditional: If a triangle has three congruent sides, then the triangle is equilateral.

Converse: If a triangle is equilateral, then the triangle has three congruent sides.

Can it be a biconditional? YES

Biconditional: A triangle is equilateral IF AND ONLY IF the triangle has three congruent sides.

OR

A triangle has three congruent sides IF AND ONLY IF the triangle is equilateral.

Got It? What is the converse of the following true conditional? If the converse is also true, rewrite the statements as a biconditional.

If two angles have equal measure, then the angles are congruent.

Converse:

Can it be a biconditional?

Biconditional:

Definition

- a statement that is clear, precise and reversible
- *note: reversible means that the conditional and converse are both true

Could this statement be used as a definition?

An obtuse angle measures 100 degrees.

Conditional: If an angle is obtuse, then it measures 100 degrees.

Converse: If an angle measures 100 degrees, then it is obtuse.

Got It? Is this definition of *straight angle* reversible? If yes, write it as a true biconditional.

A straight angle is an angle that measures 180.

Conditional:

Converse:

Is this a Good Definition?

Biconditional:

Separate the definition into the conditional and the converse.

Definition: A quadrilateral is a polygon with 4 sides.

Conditional:

Converse:

2-4 Deductive Reasoning

Deductive Reasoning

-Arriving at a conclusion using facts, definitions, rule, or properties

Law of Detachment

-If the hypothesis of a true conditional is true, then the conclusion is true.

Conditional: If 2 segments are congruent, they have the same measure.

Specific Example Concerning Hypothesis: \overline{AD} and \overline{BC} are congruent.

Conclusion? \overline{AD} and \overline{BC} have the same measure.

Got It? What can you conclude from the given information?

If there is lightning, then it is not safe to be out in the open.

Marla sees lightning from the soccer field.

Conclusion:

Law of Syllogism

-If $A=B$ and $B=C$, then $A=C$.

-Only works if the conclusion of one statement is the hypothesis of another.

If a figure is a square, then it is a rectangle.

If a figure is a rectangle, then it is a quadrilateral.

Conclusion? If a figure is a square, then it is a quadrilateral.

Complete each conclusion.

9. If it is July, then you are on summer vacation.

If you are on summer vacation, then you work in a smoothie shop.

Conclusion:

10. If a figure is a rhombus, then it has four sides.

If a figure has four sides, then it is a quadrilateral.

Conclusion:

Using Law of Detachment and Law of Syllogism Together

Got It? What can you conclude from the given information? What is your reasoning?

If a river is more than 4000 mi long, then it is longer than the Amazon.

If a river is longer than the Amazon, then it is the longest river in the world.

The Nile is 4132 mi long.

Conclusion:

2-5 Reasoning in Algebra and Geometry

Vocabulary

Postulate - an accepted statement of fact

Conjecture - an educated guess resulting from observation

Theorem - a conjecture that is proven

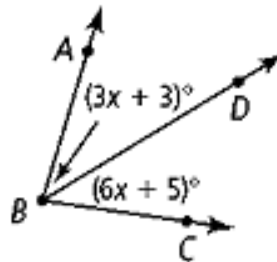
Deductive Reasoning - reasoning logically from given facts to a conclusion

Proof - a convincing argument that uses deductive reasoning

Let's Go Over the Reasons on the Wall!!!!

Proof:

Given: $m\angle ABC = 80$



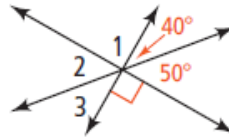
Statements	Reasons
1. $m\angle ABD + m\angle DBC = m\angle ABC$	1.
2. $(3x + 3) + (6x + 5) = 80$	2.
3. $9x + 8 = 80$	3.
4. $9x = 72$	4.
5. $x = 8$	5.

2-6 Proving Angles Congruent

Vertical Angles Theorem

-If angles are vertical, then they are congruent.

What are the measures of $\angle 1$, $\angle 2$, and $\angle 3$?



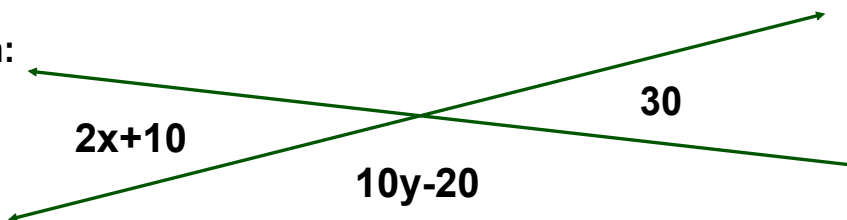
Can you PROVE the value of x is 10 in the problem below?

Statements	Reasons
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Linear Pair Postulate

-If angles are a linear pair, then they add up to 180.

Given:



Prove: $y = 17$

Statements	Reasons
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.