

Lesson 1-12L /1-9R Conditional Statements and Axioms

Agenda

- Go over Bridge
- Guided Notes
- Review Axioms from Bridge Assignment

Homework

- p. 77 #19,
- p. 85-86 #32, 34, 61
- p. 100-101 # 11,15, 18, 23-25, 39, 33,36, 40, 53

Bridge to Unit 2

- Since we know that the statements "segments with equal measure are congruent" AND "congruent segments have equal measure", what do you think the symbol means when used like the following: "segments with equal measure \leftrightarrow segments"? **BOTH DIRECTIONS ARE TRUE**
- Inductive reasoning** means that we look at patterns and make a conjecture based on that pattern. I listed the following: A, E, I. What do you think comes next? **O** Defend your choice: **NEXT VOWEL**
- Given the algebraic equation, match the **algebraic property** which justifies each step that generates an equivalent equation for $4(x+3) = 6$
 - $4x+12-2=6$ 1) Addition or Subtraction Property of Equality
 - $4x+10=6$ 2) Multiplication or Division Property of Equality
 - $4x=-4$ 3) Simplification
 - $x=-1$ 4) Distribution
- If $x=8$ and $8=y$, then what do you know about x & y ? **$x=y$ TRANSITIVE**
- If I said that **ALL** Ballston Spa students clean their rooms on Friday night, would you believe me? **NO** Why or why not? **JEFFREY DOESN'T**
- If I said, "Ballston Spa's mascot is the Scottie Dog, **and** our colors are red & black," was I being truthful? **NO** Why or why not? **CONJUNCTION** **1 PART FALSE**
- Look at the drawing at right.
 - What conclusion can you make about $\angle 1$ & $\angle 3$? **\cong MEASURE**
 - Here is the proof; see if you can match the reasons:
 - B** $m\angle 1 + m\angle 2 = 90^\circ$ $m\angle 3 + m\angle 2 = 90^\circ$
 - A** $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$
 - A** $m\angle 2 = m\angle 2$
 - D** $m\angle 1 = m\angle 3$
 - C** $\angle 1 \cong \angle 3$

A) Substitution

B) Definition of Complementary Angles

C) Definition of Congruency or \cong measure \leftrightarrow figures

D) Subtraction Property of Equality

E) Reflexive Property of Equality

Regents Geometry & Lab Name _____ Date _____
 Lesson 2 Day 1 Notes – Definitions and Axioms

CONDITIONAL STATEMENTS

- A conditional statement is an "if-then" (\rightarrow) statement. It has a hypothesis and a conclusion.

Ex: If two angles are a linear pair, then the angles are supplementary. Is this a true statement? **YES**

Hypothesis
Conclusion

Diagram:

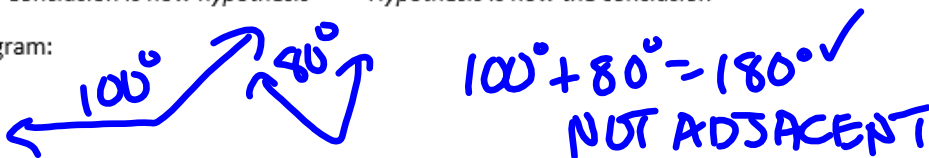


- A conditional statement will not always be true if the hypothesis & conclusion are reversed. This is also called the **CONVERSE** statement to the original conditional statement.

Ex: If two angles are supplementary, then the angles are a linear pair. Is this a true statement? **NO**

Conclusion is now hypothesis
Hypothesis is now the conclusion

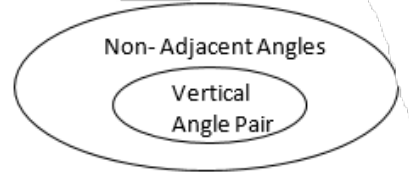
Diagram:



- This diagram/example is called a **COUNTER-EXAMPLE**, which disproves a statement (or shows the statement to be false).

- Venn Diagrams can also be used to write conditional statements.

EX:



Written as a conditional statement:

IF 2 ANGLES ARE VERTICAL ANGLES, THEN THEY ARE NON-ADJACENT ANGLES.

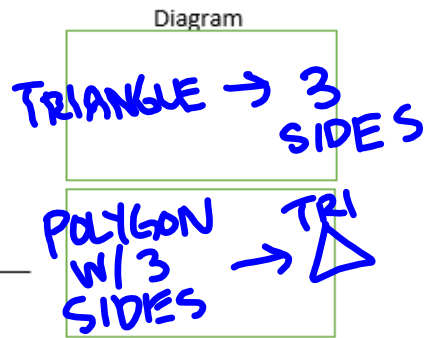
- A Biconditional Statement is an "if-and-only-if" statement. \leftrightarrow
 - o These statements include both the **ORIGINAL** statement AND the **CONVERSE** statement.
 - o A biconditional statement is true only when **BOTH** the conditional & converse statements are **TRUE**
 - o Biconditional statements are used to write definitions.

Ex: A polygon is a triangle if and only if it has three sides.

Conditional: If a polygon is a triangle, then it has three sides.

Converse: If a polygon has three sides, then it is a triangle.

Definition: **A TRIANGLE IS A 3-SIDED POLYGON.**



Practice. Write the following definition in the appropriate forms.

An angle that measure 90° is a right angle.

Conditional IF AN ANGLE MEASURES 90° , THEN IT IS A RIGHT \angle .

Converse IF AN ANGLE IS A RIGHT \angle , THEN IT MEASURES 90° .

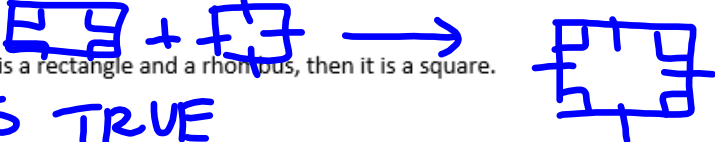
Biconditional AN ANGLE MEASURES 90° IF AND ONLY IF IT IS A RIGHT ANGLE.

CONJUNCTIONS

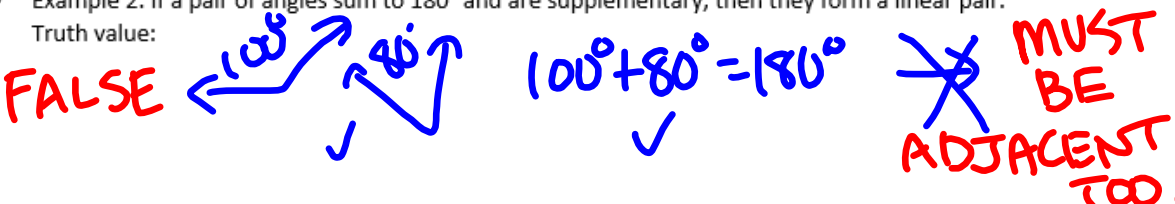
A conjunction is a compound sentence formed by combining two sentences (or facts) using the word "and." A conjunction is true only when BOTH sentences (or facts) are true.

- Example 1: If a quadrilateral is a rectangle and a rhombus, then it is a square.

Truth value: YES TRUE


- Example 2: If a pair of angles sum to 180° and are supplementary, then they form a linear pair.

Truth value: FALSE



MUST BE ADJACENT TOO.

Often, to make a valid conclusion, you will need more than one condition/property. This is immensely important in your logical geometric reasoning. Rewrite example 2 such that it is a true/valid conclusion:

IF A PAIR OF ANGLES SUM TO 180° AND ARE ADJACENT, THEN THEY FORM A LINEAR PAIR.

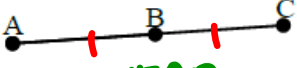
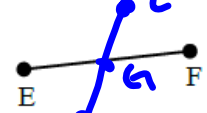

Sum of Parts		
Conditional Statement	Diagram / Example	Stated as a Reason in a Proof
If point C is in the interior of $\angle AOB$, then $m\angle AOC + m\angle BOC = m\angle AOB$		ANGLE ADDITION POSTULATE
Given a sequence of n consecutive adjacent angles whose interiors are all disjoint such that the angle formed by the first $n-1$ angles and the last angle are a linear pair, then the angle measures <u>sum to 180°</u>		Consecutive adjacent angles on a line sum to 180°
If the sum of the measures of all angles formed by three or more rays with the same vertex and whose interiors do not overlap, then the angle measures <u>sum to 360°</u>		Angles at a point sum to 360°
If points C and D are in the interior of $\angle AOB$ AND $\angle AOD \cong \angle BOC$, then See lesson summaries for 3 step process (can also go \cong bigs \rightarrow \cong littles)		Common Angle Theorem Or Overlapping Angles Theorem

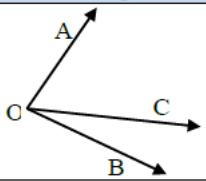
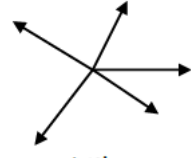
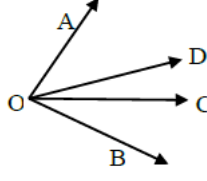
Sum of parts (con't)		
If A, B, and C are collinear, then $AB + BC = AC$		SEGMENT ADDITION POSTULATE
If points A, B, C, AND D are collinear and $\overline{AB} \cong \overline{CD}$, then See lesson summaries for 3 step process (can also go \cong bigs \rightarrow \cong littles)		Common Segment Thm Or Overlapping Segments Thm

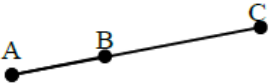
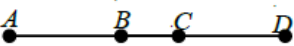
Bisectors

Conditional Statement	Diagram / Example	Stated as a Reason in a Proof
If \overline{BD} bisects $\angle ABC$, then $\angle ABD \cong \angle CBD$		Definition of Angle Bisector Or
If $\angle ABD \cong \angle CBD$ and they are adjacent, then \overline{BD} BISECTS $\angle ABC$	(Diagram shared with the previous row)	Angle Bisector \leftrightarrow two congruent adjacent angles

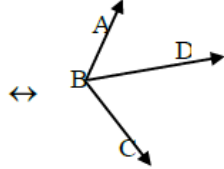
Note conjunction!

<u>Bisectors</u> (con't)		
If B is the midpoint of \overline{AC} , then $\overline{AB} \cong \overline{BC}$	B MIDPOINT OF \overline{AC} \leftrightarrow  $\overline{AB} \cong \overline{BC}$	Definition of a Midpoint or Midpoint \leftrightarrow two congruent collinear segments
If $\overline{AB} \cong \overline{BC}$ and A, B, and C are collinear, then B IS MIDPOINT OF \overline{AC} <i>Note conjunction!</i>	\overline{CD} BISECTS \overline{EF} @ G \leftrightarrow  G IS MIDPOINT OF \overline{EF}	\overline{CD} BISECTS \overline{EF} @ G \leftrightarrow G IS MIDPOINT OF \overline{EF}
\overline{CD} bisects \overline{EF} at G and $\overline{EG} \cong \overline{GF}$.	\overline{CD} BISECTS \overline{EF} @ G \leftrightarrow  G IS MIDPOINT OF \overline{EF} COLLINEAR	Segment bisector \leftrightarrow 2 \cong collinear segments. Or Definition of a Segment Bisector

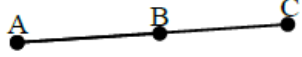
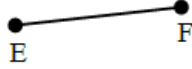
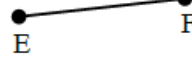
Sum of Parts		
Conditional Statement	Diagram / Example	Stated as a Reason in a Proof
If point C is in the interior of $\sphericalangle AOB$, then _____		
Given a sequence of n consecutive adjacent angles whose interiors are all disjoint such that the angle formed by the first $n-1$ angles and the last angle are a linear pair, then the angle measures _____	(\sphericalangle 's on a line)	Consecutive adjacent angles on a line sum to 180°
If the sum of the measures of all angles formed by three or more rays with the same vertex and whose interiors do not overlap, then the angle measures _____	 (\sphericalangle 's at a point)	Angles at a point sum to 360°
If points C and D are in the interior of $\sphericalangle AOB$ AND $\sphericalangle AOD \cong \sphericalangle BOC$, then _____ <i>See lesson summaries for 3 step process (can also go \cong bigs \rightarrow \cong littles)</i>		Common Angle Theorem Or Overlapping Angles Theorem

Sum of parts (con't)		
If A, B, and C are collinear, then _____		
If points A, B, C, AND D are collinear and $\overline{AB} \cong \overline{CD}$, then _____ <i>See lesson summaries for 3 step process (can also go \cong bigs \rightarrow \cong littles)</i>		Common Segment Thm Or Overlapping Segments Thm

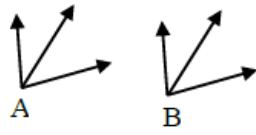
Bisectors

Conditional Statement	Diagram / Example	Stated as a Reason in a Proof
If \overline{BD} bisects $\angle ABC$, then _____		Definition of Angle Bisector Or
If $\angle ABD \cong \angle CBD$ and they are adjacent, then _____ <i>Note conjunction!</i>		Angle Bisector \leftrightarrow two congruent adjacent angles

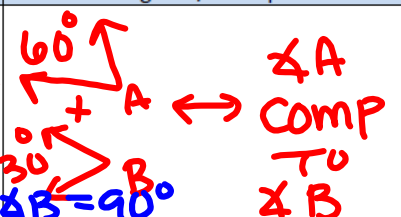
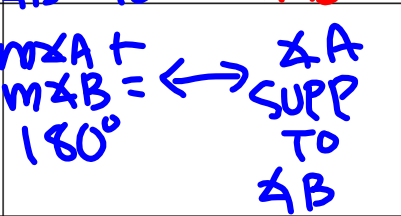
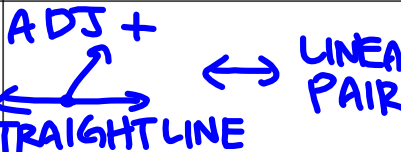
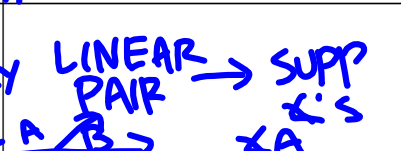
Bisectors (con't)


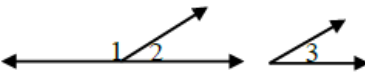
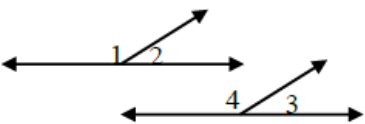
If B is the midpoint of \overline{AC} , then _____		Definition of a Midpoint or Midpoint \leftrightarrow two congruent collinear segments
If $\overline{AB} \cong \overline{BC}$ and A, B, and C are collinear, then _____ <i>Note conjunction!</i>		
\overline{CD} bisects \overline{EF} at G and $\overline{EFG} \leftrightarrow G$ is the midpoint.		
\overline{CD} bisects \overline{EF} at G and $\overline{EFG} \leftrightarrow \overline{EG} \cong \overline{GF}$.		Segment bisector \leftrightarrow 2 \cong collinear segments. Or Definition of a Segment Bisector

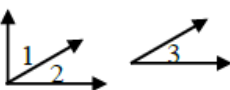

Bisectors (con't)

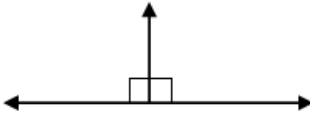
<p>If 2 \cong angles are bisected, then their</p> <hr/>		<p>Halves of Congruent Angles are Congruent.</p>
<p>If 2 \cong segments are bisected, then their</p> <hr/>		

Angle Pairs

Conditional Statement	Diagram / Example	Stated as a Reason in a Proof
<p>The sum of two angles = 90° if and only if the angles are COMPLEMENTARY</p>		<p>COMPLEMENTARY ANGLES SUM TO 90°</p>
<p>The sum of two angles = 180° if and only if the angles are SUPPLEMENTARY</p>		<p>SUPPLEMENTARY ANGLES SUM TO 180°</p>
<p>If two angles are adjacent and their noncommon sides form opposite rays, then the angles are a LINEAR PAIR</p>		<p>Defn. of a Linear Pair</p>
<p>If two \sphericalangle's form a linear pair, then they are SUPPLEMENTARY</p>		<p>Linear pairs of \sphericalangle's are supplementary. Linear Pair \rightarrow Supp \sphericalangle's</p>

Angle pairs (Con't)		
If 2 non-adjacent \sphericalangle 's are formed by intersecting lines then they are VERTICAL \sphericalangle'S		Defn of Vertical Angles
If angles are vertical \sphericalangle 's, then the angles are CONGRUENT	$\sphericalangle 1 \cong \sphericalangle 2$ VERTICAL \sphericalangle'S $\rightarrow \sphericalangle 1 \cong \sphericalangle 2$	Vertical \sphericalangle pairs are equal in measure Vertical \sphericalangle pairs are \cong
If 2 angles are supplementary to the same angle, then they are _____		Congruent Supplements Theorem Or Supplements of the same angle are congruent
If 2 angles are supplementary to congruent angles, then they are _____		Congruent Supplements Theorem Or Supplements of congruent angles are congruent

Angle pairs (Con't)		
If 2 angles are complementary to the same angle, then they are _____		Congruent Supplements Theorem Or Supplements of the same angle are congruent
If 2 angles are complementary to congruent angles, then they are _____		Congruent Supplements Theorem Or Supplements of congruent angles are congruent

<p>FIX Right Angles</p> <p>If 2 \sphericalangle's are right \sphericalangle's, then _____</p> <p>_____</p>	<p>RIGHT</p> <p>$m\angle A = 90^\circ \rightarrow$ $\angle A$ IS A RIGHT \sphericalangle</p>	<p>A RIGHT \sphericalangle MEASURES 90°</p> <p>Right \sphericalangle's are \cong.</p>
<p>If 2 \cong \sphericalangle's are supplementary, then _____</p> <p>_____</p> <p><i>Note conjunction!</i></p>		<p>Congruent & supplementary angles are right \sphericalangle's</p>

