

## Unit 1 - Day 16L - Geometric Proofs

### Agenda

- Go over HW 1.15
- Notes - Need Pouch

### HW

Problem Set Proof Packet- 1.16

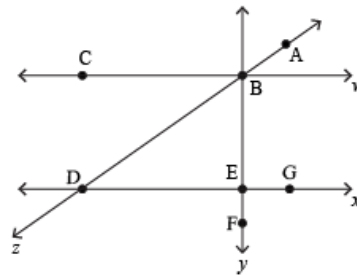
Continue to Fill out Lesson Summaries and Axioms

## Warm UP - Quiz I

1. Given:  $\angle J$  and  $\angle K$  are right angles  
 Conclusion: \_\_\_\_\_  
 Reason: \_\_\_\_\_  
 \_\_\_\_\_

2. Given:  $\angle 1$  supplementary  $\angle 2$   
 $\angle 1$  supplementary  $\angle 3$   
 Conclusion:  $\angle 2 \cong \angle 3$   
 Reason: \_\_\_\_\_  
 \_\_\_\_\_

For 3 & 4, use the drawing as the given



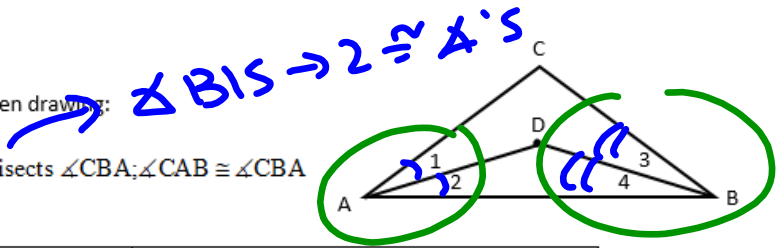
3. Conclusion: \_\_\_\_\_  
 Reason: Vertical Angle Pairs are Congruent
4. Conclusion:  $\angle BED$  &  $\angle BEG$   
 form a linear pair  
 Reason: \_\_\_\_\_  
 \_\_\_\_\_

Warm Up - Quiz H

1. Draw or describe a counterexample to the conditional statement, "If  $\overline{TR} \cong \overline{RY}$ , then R is the midpoint of  $\overline{TY}$ ."

2. Fill in the following proof using the given drawing:

Given:  $\overline{AD}$  bisects  $\angle CAB$ ;  $\overline{BD}$  bisects  $\angle CBA$ ;  $\angle CAB \cong \angle CBA$   
 Prove:  $\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle 4$



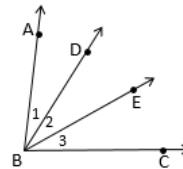
Statements	Reasons
1. $\overline{AD}$ bisects $\angle CAB$ ; $\overline{BD}$ bisects $\angle CBA$	1. Given
2. $\angle 1 \cong \angle 2$ and $\angle 3 \cong \angle 4$	2. BIS $\rightarrow$ 2 $\cong$ HALVES
3. $\angle CAB \cong \angle CBA$	3. GIVEN
4. $\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle 4$	4. HALVES OF $\cong$ $\angle$ 'S ARE $\cong$

Unit 1B Geometry Proofs Packet for Homework Days 15, 16, 17

Day 1-15 LAB

Complete the following 2-column proofs.

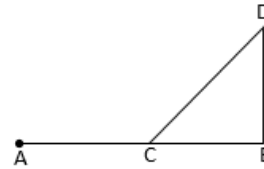
1. **Given:**  $\angle 1 \cong \angle 2$ ,  $\overline{BE}$  bisects  $\angle DBC$   
**Prove:**  $m\angle 1 = m\angle 3$



Statements	Reasons
1. $\angle 1 \cong \angle 2$	1.
2. $\overline{BE}$ bisects $\angle DBC$	2.
3. $\angle 2 \cong \angle 3$	3.
4. $\angle 1 \cong \angle 3$	4.
5. $m\angle 1 = m\angle 3$	5.

2. Given:  $C$  is the midpoint of  $\overline{AB}$ ,  $\overline{CB} \cong \overline{DB}$

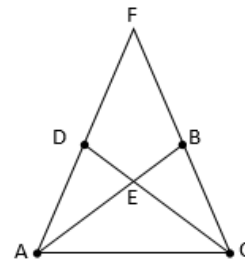
Prove:  $\overline{AC} \cong \overline{DB}$



Statements	Reasons
1. $C$ is the midpoint of $\overline{AB}$	1. Given
2.	2.
3. $\overline{CB} \cong \overline{DB}$	3. Given
4. $\overline{AC} \cong \overline{DB}$	4.

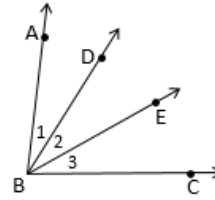
3. Given:  $D$  bisects  $\overline{AF}$ ;  $B$  is the midpoint of  $\overline{CF}$ ;  $\overline{ADF}$ ;  $\overline{CBF}$ ;  
 $\overline{AF} \cong \overline{CF}$

Prove:  $\overline{AD} \cong \overline{CB}$



Statements	Reasons
1. $D$ bisects $\overline{AF}$ ; $\overline{ADF}$	1. Given
2.	2.
3. $B$ is the midpoint of $\overline{CF}$ ; $\overline{CBF}$	3. Given
4.	4. Midpoint $\rightarrow$ 2 congruent collinear segments
5.	5. Given
6. $\overline{AD} \cong \overline{CB}$	6.

4. Given:  $\angle 2 \cong \angle 1, \angle 1 \cong \angle 3$   
Prove:  $\overline{BE}$  bisects  $\angle DBC$



Statements	Reasons
1. $\angle 2 \cong \angle 1, \angle 1 \cong \angle 3$	1. Given
2.	2. Transitive Property of Congruence (Step 1 $\rightarrow$ 1)
3. $\overline{BE}$ bisects $\angle DBC$	3.

Geometry LAB Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_  
 1-16L Note Sheet: Geometric Proofs

- Fill in/review the Axioms Pages for Angle Pairs and Right Angles **Axioms**
- How do we know if two angles are supplementary?
  - 1) SUM TO 180°  $\rightarrow$  SUPP 3) GIVEN
  - 2) LINEAR PAIR  $\rightarrow$  SUPP  
DIAGRAM
- How do we know if two angles are complementary?
  - 1) SUM TO 90°  $\rightarrow$  COMP 2) GIVEN

### From Axiom Sheet Page 1 - Sum of Parts

<p>If points C and D are in the interior of <math>\angle AOB</math> AND <math>\angle AOD \cong \angle BOC</math>, then  <math>\angle AOC \cong \angle DOB</math></p> <p>See lesson summaries for 3 step process                  (can also go <math>\cong</math> bigs <math>\rightarrow</math> <math>\cong</math> littles)</p>		<p>Common Angle Theorem                  Or                  Overlapping Angles Theorem</p>
<p>If A, B, and C are collinear, then  <math>AB + BC = AC</math></p>		<p>Segment Addition Postulate</p>
<p>If points A, B, C, AND D are collinear and <math>AB \cong CD</math>, then  <math>AC \cong BD</math></p> <p>See lesson summaries for 3 step process                  (can also go <math>\cong</math> bigs <math>\rightarrow</math> <math>\cong</math> littles)</p>		<p>Common Segment Thm                  Or                  Overlapping Segments Thm</p>

From Outline

<p>1-17                  + See Axioms Pages</p>	<p>• Common/Overlapping Segment Theorem (Similar for Common Angle Theorem)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Given Littles <math>\cong</math></p> </div> <div style="text-align: center;"> <p>Given Overlapping Pieces <math>\cong</math></p> </div> </div> <ol style="list-style-type: none"> <li>1) <math>EF \cong GH</math> GIVEN</li> <li>2) <math>FG \cong FG</math> REFLEXIVE</li> <li>3) <math>EG \cong FH</math> OVERLAPPING SEGMENT THM</li> </ol> <ol style="list-style-type: none"> <li>1) <math>EG \cong FH</math> GIVEN</li> <li>2) <math>FG \cong FG</math> REFLEXIVE</li> <li>3) <math>EF \cong GH</math> OVERLAPPING SEGMENT THM</li> </ol> <ul style="list-style-type: none"> <li>• Paragraph proofs consist of matches statements and their reasons in _____ often using "since _____, then _____".</li> <li>• Flowchart proofs place statements in _____ with reasons underneath. Boxes are connected by _____ going left to right or top to bottom.</li> </ul>
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## Bisectors, page 2

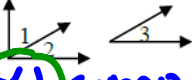

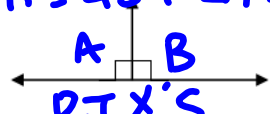
<p>If 2 <math>\cong</math> angles are bisected, then their  <u>HALVES ARE <math>\cong</math></u></p>	<p><math>\angle A \cong \angle B</math></p> <p><math>\angle A</math> &amp; <math>\angle B</math> BISECTED <math>\rightarrow</math> <math>\angle 1 \cong \angle 2 \cong \angle 3 \cong \angle 4</math></p>	<p>Halves of Congruent Angles are Congruent.</p>
<p>If 2 <math>\cong</math> segments are bisected, then their  <u>HALVES ARE <math>\cong</math></u></p>	<p><math>AB \cong CD</math></p> <p><math>AB</math> &amp; <math>CD</math> BISECTED <math>\rightarrow</math> <math>AE \cong EB \cong CF \cong FD</math></p>	<p>HALVES OF CONGRUENT SEGMENTS ARE <math>\cong</math></p>

**Angle Pairs**

Conditional Statement	Diagram / Example	Stated as a Reason
The sum of two angles = $90^\circ$ if and only if the angles are _____		
The sum of two angles = $180^\circ$ if and only if the angles are _____		
If two angles are adjacent and their noncommon sides form opposite rays, then the angles are a _____		Defn. of a Linear Pair

**Angle Pairs (Cont)**

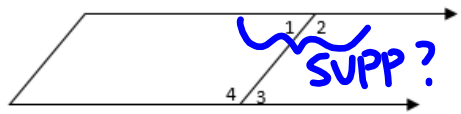
If two $\sphericalangle$ 's form a linear pair, then they are _____		Linear pairs of $\sphericalangle$ 's are supplementary. Linear Pair $\rightarrow$ Supp $\sphericalangle$ 's
If 2 non-adjacent $\sphericalangle$ 's are formed by intersecting lines then they are _____.		Defn of Vertical Angles
If angles are vertical $\sphericalangle$ 's , then the angles are _____		Vertical $\sphericalangle$ pairs are equal in measure Vertical $\sphericalangle$ pairs are $\cong$
If 2 angles are supplementary to the same angle, then they are <b>CONGRUENT</b>	<p> <math>\sphericalangle 1</math> SUPP <math>\sphericalangle 2</math>  <math>\sphericalangle 1</math> SUPP <math>\sphericalangle 3</math> </p> <p><math>\rightarrow \sphericalangle 2 \cong \sphericalangle 3</math></p>	Congruent Supplements Theorem Or Supplements of the same angle are congruent
If 2 angles are supplementary to congruent angles, then they are <b>CONGRUENT</b>	<p> <math>\sphericalangle 1</math> SUPP <math>\sphericalangle 2</math>  <math>\sphericalangle 4</math> SUPP <math>\sphericalangle 3</math> </p> <p><math>\sphericalangle 1 \cong \sphericalangle 4</math></p> <p><math>\rightarrow \sphericalangle 2 \cong \sphericalangle 3</math></p>	Congruent Supplements Theorem Or Supplements of congruent angles are congruent

<p>If 2 angles are complementary to the same angle, then they are</p> <p><b>CONGRUENT</b></p>	 <p><math>\angle 1</math> COMP <math>\angle 2</math>  <math>\angle 1</math> COMP <math>\angle 3</math>  <math>\rightarrow \angle 2 \cong \angle 3</math></p>	<p><b>Comp</b>          Congruent Supplements Theorem  <del>Comp</del> Or          Supplements of the same angle are congruent</p>
<p>If 2 angles are complementary to congruent angles, then they are</p> <p><b>CONGRUENT</b></p>	 <p><math>\angle 1</math> COMP <math>\angle 2</math>  <math>\angle 3</math> COMP <math>\angle 4</math>  <math>\angle 2 \cong \angle 3</math>  <math>\rightarrow \angle 1 \cong \angle 4</math></p>	<p><b>Comp</b>          Congruent Supplements Theorem  <del>Comp</del> Or          Supplements of congruent angles are congruent</p>
<p><b>Right Angles</b></p>		
<p>The measure of an angle is <math>90^\circ</math> if and only if the angle is a <b>RIGHT</b> angle</p>	<p><b>A RT <math>\angle</math> MEASURES <math>90^\circ</math></b></p>	
<p>If 2 <math>\angle</math>'s are right <math>\angle</math>'s, then</p> <p><b>THEY ARE <math>\cong</math></b></p>	<p><math>\angle C</math> IS A RT <math>\angle</math>  <math>\angle S</math> IS A RT <math>\angle</math>  <math>\rightarrow \angle C \cong \angle S</math></p>	<p>Right <math>\angle</math>'s are <math>\cong</math>.</p>
<p>If 2 <math>\cong</math> <math>\angle</math>'s are supplementary, then</p> <p><b>THEY ARE RT <math>\angle</math>'S</b></p> <p>Note conjunction!</p>	<p><math>\angle A \cong \angle B + \angle A</math> SUPP <math>\angle B</math></p>  <p><b>RT <math>\angle</math>'S</b></p>	<p>Congruent &amp; supplementary angles are right <math>\angle</math>'s</p>

**LINEAR PAIR THEOREM**

Anytime you have a **LINEAR PAIR** by looking at the diagram, you can *deduce* that the angles are **SUPP  $\angle$ 'S**. Here is an example of how you would use the Linear Pair Theorem in a future proof:

**Ex 1:** Given: the diagram at the right  
 Prove:  $\angle 1$  and  $\angle 2$  are supplementary  $\angle$ 's



Statements	Reasons
1. $\angle 1$ & $\angle 2$ LINEAR PAIR	1. <b>DIAGRAM</b>
2. $\angle 1$ SUPP $\angle 2$	2. <b>LINEAR PAIR</b>

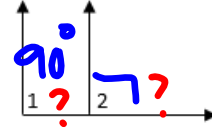
**$\rightarrow$  SUPP  $\angle$ 'S**

**Right Angle Congruency**

Right angles are congruent. How Right Angle Congruence Theorem is used in a Proof:

Ex 2: Given:  $m\angle 1 = 90^\circ$ ;  $\angle 2$  is a right angle

Prove:  $\angle 1 \cong \angle 2$



Statements	Reasons
1. $m\angle 1 = 90^\circ$	1. GIVEN
2. $\angle 1$ is a right angle	2. A RT $\angle$ MEASURES $90^\circ$
3. $\angle 2$ is a right angle	3. GIVEN
4. $\angle 1 \cong \angle 2$	4. RIGHT $\angle$ 'S ARE CONGRUENT

GIVEN  
A RT  $\angle$  MEASURES  $90^\circ$   
GIVEN  
RIGHT  $\angle$ 'S ARE CONGRUENT

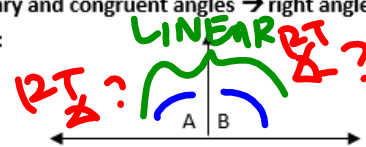
**Supplementary + Congruent Angles**

Must be two supplementary and congruent angles  $\rightarrow$  right angles!

How Supplementary & Congruent Angles Theorem is used in a Proof:

Ex 3: Given:  $\angle A \cong \angle B$

Prove:  $\angle A$  &  $\angle B$  are right angles



Statements	Reasons
1. $\angle A$ & $\angle B$ form a linear pair	1. DIAGRAM
2. $\angle A$ & $\angle B$ are supplementary	2. LINEAR PAIR $\rightarrow$ SUPP $\angle$ 'S
3. $\angle A \cong \angle B$	3. GIVEN
4. $\angle A$ & $\angle B$ are right angles	4. 2 SUPP & CONGRUENT $\angle$ 'S ARE RIGHT ANGLES

DIAGRAM  
LINEAR PAIR  $\rightarrow$  SUPP  $\angle$ 'S  
GIVEN  
2 SUPP & CONGRUENT  $\angle$ 'S ARE RIGHT ANGLES

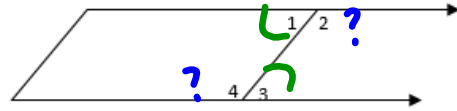


**CONGRUENT SUPPLEMENTS THEOREM**

Supplements to the same  $\angle$  are congruent OR Supplements to  $\cong \angle$ s are congruent

Here is an example of how you would use the Congruent Supplements Theorem in a future proof:

**Ex 4:** Given:  $\angle 1 \cong \angle 3$   
 Prove:  $\angle 2 \cong \angle 4$



Statements	Reasons
1. $\angle 1$ and $\angle 2$ form a linear pair $\angle 3$ and $\angle 4$ form a linear pair	1. <b>DIAGRAM</b>
2. $\angle 1$ and $\angle 2$ are supplementary $\angle 3$ and $\angle 4$ are supplementary	2. <b>LINEAR PAIR <math>\rightarrow</math> SUPP. <math>\angle</math>'S</b>
3. $\angle 1 \cong \angle 3$	3. <b>GIVEN</b>
4. $\angle 2 \cong \angle 4$	4. <b>SUPPLEMENTS OF <math>\cong \angle</math>'S ARE CONGRUENT</b>

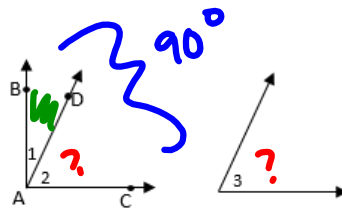
**CONGRUENT SUPPLEMENTS THEOREM**

**CONGRUENT COMPLEMENTS THEOREM**

Complements to the same  $\angle$  are congruent OR Complements to  $\cong \angle$ s are congruent

How Congruent Complements Theorem is used in a Proof:

**Ex 5:** Given:  $m\angle 1 + m\angle 2 = 90^\circ$   
 $m\angle 1 + m\angle 3 = 90^\circ$   
 Prove:  $\angle 2 \cong \angle 3$



Statements	Reasons
1. $m\angle 1 + m\angle 2 = 90^\circ$ $m\angle 1 + m\angle 3 = 90^\circ$	1. <b>GIVEN</b>
2. $\angle 1$ and $\angle 2$ are complementary $\angle 1$ and $\angle 3$ are complementary	2. <b>2 <math>\angle</math>'S WITH SUM = <math>90^\circ \rightarrow</math> COMPLEMENTARY <math>\angle</math>'S</b>
3. $\angle 2 \cong \angle 3$	3. <b>COMPLEMENTS OF THE SAME ANGLE ARE <math>\cong</math></b>

**CONGRUENT COMPLEMENTS THM.**