

## Lesson 2-5L : Geometric Proofs

### Agenda

- Check and Review Homework 2-4L Proofs
- Mini Quiz #2
- Guided Notes - need pouches, notes, and your unit outline/lesson summaries/axioms pages

### HW

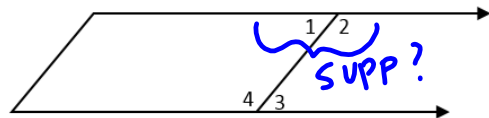
- 2-5 LAB problems in your packet
- Cumulative Review due tomorrow!

### 2-5 Note Sheet: Geometric Proofs

#### LINEAR PAIR THEOREM (review)

Anytime you have a LINEAR PAIR, you can *deduce* that the angles are SUPPLEMENTARY.  
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) $\angle 1$ & $\angle 2$ ARE A LINEAR PAIR | 1) DEFN OF LINEAR PAIR                        |
| 2) $\angle 1$ SUPP $\angle 2$                | 2) LINEAR PAIR $\rightarrow$ SUPP $\angle$ 'S |

How do we know if two angles are supplementary?

- 1) SUM MEASURES =  $180^\circ \rightarrow$  SUPP (DEFN OF SUPP  $\angle$ 'S)
- 2) IT IS STATED (GIVEN)
- 3) LINEAR PAIR  $\rightarrow$  SUPP (LINEAR PAIR  $\rightarrow$ )  
(DEFN) SUPP  $\angle$ 'S

#### CONGRUENT SUPPLEMENTS THEOREM (new)

##### Theorem

##### THEOREM

##### 2-6-2 Congruent Supplements Theorem

If two angles are supplementary to the same angle (or to two congruent angles), then the two angles are congruent.

Identify the hypothesis: 2  $\angle$ 'S

- SUPP TO SAME  $\angle$
- SUPP TO  $\cong \angle$ 'S

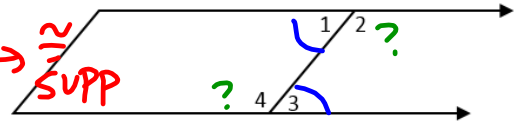
Identify the conclusion:  
THE  $\angle$ 'S ARE  $\cong$

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

LINEAR PAIR  $\rightarrow$  SUPP  $\rightarrow$   $\cong$  SUPP



| Statements  | Reasons  |
|---|--|
| 1. $\angle 1 \cong \angle 3$  | 1. GIVEN   |
| 2. $\angle 1$ and $\angle 2$ form a linear pair<br>$\angle 3$ and $\angle 4$ form a linear pair | 2. Defn: 2 adjacent angles whose non-common sides are opposite rays form a linear pair |
| 3. $\angle 1$ and $\angle 2$ are supplementary<br>$\angle 3$ and $\angle 4$ are supplementary   | 3. LINEAR PAIR $\rightarrow$ SUPP $\angle$ 'S  |
| 4. $\angle 2 \cong \angle 4$  | 4. CONGRUENT SUPPLEMENTS THEOREM   |

**RIGHT ANGLE CONGRUENCE THEOREM**

**Theorems**

**THEOREM**

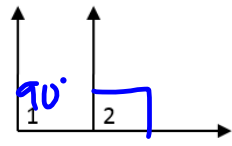
**2-6-3 Right Angle Congruence Theorem**  
 All right angles are congruent.

So, anytime you have RIGHT  $\angle$ 'S, you can deduce that they are CONGRUENT.

\*Note: you can go right from right angle to congruency without going through equal measures of  $90^\circ$ .

How Right Angle Congruence Theorem is used in a Proof:

Ex 4: 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. DEFN OF RT $\angle$             |
| 3. $\angle 2$ is a right angle | 3. GIVEN                           |
| 4. $\angle 1 \cong \angle 2$   | 4. RIGHT $\angle$ 'S ARE CONGRUENT |

How do we know if two angles are complementary?

1) SUM 2  $\angle$ 'S =  $90^\circ \rightarrow$  comp

(DEFN OF  
COMP  $\angle$ 'S)

2) IT IS STATED (GIVEN)

X RT  $\angle \rightarrow$   $\angle$  ADD POST +  
DEFN RT  $\angle \rightarrow$  COMP  
SUBST

CONGRUENT COMPLEMENTS THEOREM

**2-6-4 Congruent Complements Theorem**

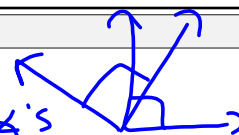
If two angles are complementary to the same angle (or to two congruent angles), then the two angles are congruent.

Identify the hypothesis:

- COMP SAME  $\angle$
- COMP  $\cong$   $\angle$ 'S

Identify the conclusion:

THE  $\angle$ 'S ARE  $\cong$



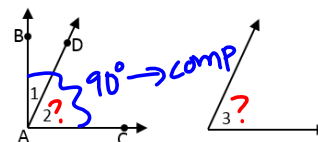
Complements to the same  $\angle$  are congruent OR Complements to  $\cong$   $\angle$ 's are congruent

How Congruent Complements Theorem is used in a Proof:

Ex 3: Given:  $m\angle 1 + m\angle 2 = 90^\circ$   
 $m\angle 1 + m\angle 3 = 90^\circ$  }  $\rightarrow$  comp

Prove:  $\angle 2 \cong \angle 3$

$\cong$  COMP THEOREM


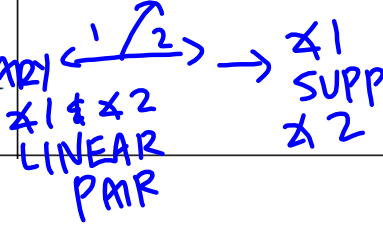


| Statements  | Reasons                                 |
|---|---|
| 1. $m\angle 1 + m\angle 2 = 90^\circ$<br>$m\angle 1 + m\angle 3 = 90^\circ$                   | 1. GIVEN                                |
| 2. $\angle 1$ and $\angle 2$ are complementary<br>$\angle 1$ and $\angle 3$ are complementary | 2. DEFN OF<br>COMPLEMENTARY $\angle$ 'S |
| 3. $\angle 2 \cong \angle 3$  | 3. CONGRUENT<br>COMPLEMENTS<br>THEOREM  |

**\*\*Fill in axioms pages:**

- **Angle Pairs:** Congruent Supplements Theorem, Congruent Complements Theorem (*Linear Pair should already be filled in*)
- **Right Angles:** Definition (add in), Right Angle Congruence

**Angle Pairs**

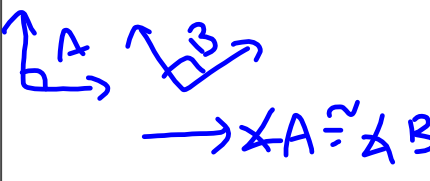
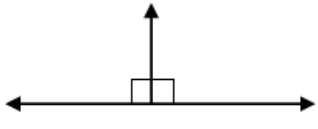
| Conditional Statement   | Diagram / Example   | Stated as a Reason in a Proof  |
|---|---|--|
| The sum of two angles = $90^\circ$ if and only if the angles are _____  |   |  |
| The sum of two angles = $180^\circ$ if and only if the angles are _____   |   |  |
| If two angles are adjacent and their noncommon sides form opposite rays, then the angles are a <b>LINEAR PAIR</b> |  | Defn. of a Linear Pair   |
| If two $\sphericalangle$ 's form a linear pair, then they are <b>SUPPLEMENTARY</b>                                |  | Linear pairs of $\sphericalangle$ 's are supplementary.<br>Linear Pair $\rightarrow$ Supp $\sphericalangle$ 's |

| Angle pairs (Con't)   |  |   |
|---|--|---|
| 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<br>Vertical $\sphericalangle$ pairs are $\cong$ |
| If 2 angles are supplementary to the same angle, then they are<br><u>CONGRUENT</u>            | <p> <math>\sphericalangle 2</math> SUPP <math>\sphericalangle 1</math><br/> <math>\sphericalangle 3</math> SUPP <math>\sphericalangle 1</math> <math>\rightarrow \sphericalangle 2 \cong \sphericalangle 3</math> </p>   | Congruent Supplements Theorem<br>Or<br>Supplements of the same angle are congruent                    |
| If 2 angles are supplementary to congruent angles, then they are<br><u>CONGRUENT</u>          | <p> <math>\sphericalangle 2</math> SUPP <math>\sphericalangle 1</math><br/> <math>\sphericalangle 3</math> SUPP <math>\sphericalangle 4</math><br/> <math>\sphericalangle 1 \cong \sphericalangle 4</math> <math>\rightarrow \sphericalangle 2 \cong \sphericalangle 3</math> </p> | Congruent Supplements Theorem<br>Or<br>Supplements of congruent angles are congruent                  |

| Angle pairs (Con't)  |  |  |
|--|--|--|
| If 2 angles are complementary to the same angle, then they are<br><u>CONGRUENT</u>   | <p> <math>\sphericalangle 1</math> COMP <math>\sphericalangle 3</math><br/> <math>\sphericalangle 1</math> COMP <math>\sphericalangle 2</math> <math>\rightarrow \sphericalangle 2 \cong \sphericalangle 3</math> </p>   | Congruent Supplements Theorem<br>Or<br>Supplements of the same angle are congruent   |
| If 2 angles are complementary to congruent angles, then they are<br><u>CONGRUENT</u> | <p> <math>\sphericalangle 1</math> COMP <math>\sphericalangle 2</math><br/> <math>\sphericalangle 4</math> COMP <math>\sphericalangle 3</math><br/> <math>\sphericalangle 1 \cong \sphericalangle 4</math> <math>\rightarrow \sphericalangle 2 \cong \sphericalangle 3</math> </p> | Congruent Supplements Theorem<br>Or<br>Supplements of congruent angles are congruent |

Add: Defintion of a right angle

**Right Angles**  $m \sphericalangle = 90^\circ \longleftrightarrow RT \sphericalangle$

|   |  |  |
|---|--|--|
| <p>If 2 <math>\sphericalangle</math>'s are right <math>\sphericalangle</math>'s, then _____<br/> <u>THEY ARE <math>\cong</math></u></p> |  <p><math>\sphericalangle A \cong \sphericalangle B</math></p> | <p>Right <math>\sphericalangle</math>'s are <math>\cong</math>.</p>                  |
| <p>If 2 <math>\cong</math> <math>\sphericalangle</math>'s are supplementary, then _____<br/> <u>Note conjunction!</u></p>               |   | <p>Congruent &amp; supplementary angles are right <math>\sphericalangle</math>'s</p> |