Name:_____   Date:_____

Geometry Notes Intro to Geo Proofs - 8: Simple Angle Theorems

A *theorem* is a statement that has been proven using definitions, postulates and/or previously proven theorems.
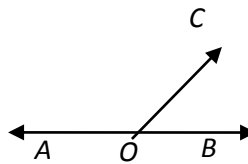
- **Theorem: All right angles are congruent.**

  Given: ∠A and ∠B are right angles

  Prove: ∠A ≅ ∠B

- **Theorem: All straight angles are congruent.**

- **Theorem: If two adjacent angles form a straight line, they are supplementary.**
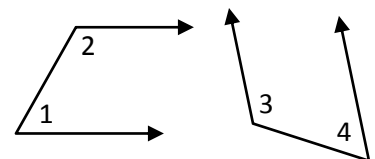
  Given: ∠AOC and ∠BOC, $\overleftrightarrow{AOB}$

  Prove: ∠AOC and ∠BOC are supplementary

- **Theorem: If two adjacent angles form a right angle, then they are complementary.**

- **Theorem: If two angles are congruent, then their supplements are also congruent.**

  Given: ∠1 ≅ ∠4, ∠2 supp. to ∠1, ∠3 supp. to ∠4
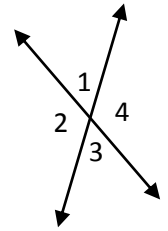
  Prove: ∠2 ≅ ∠3

- **Theorem: If two angles are supplementary to the same angle, then they are congruent.**

Note: The previous two theorems are still true if the words "supplements" and "supplementary" are replaced by "complements" and "complementary".
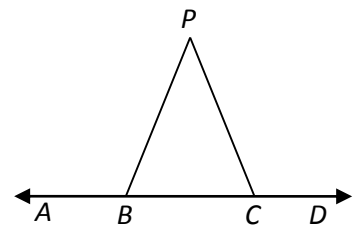
Definition: *Vertical angles* are non-adjacent angles
            formed by two intersecting lines.

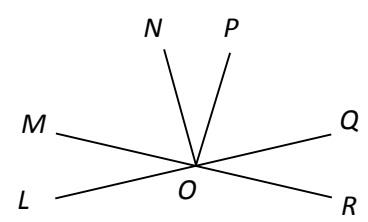- **Theorem: Vertical angles are congruent. (Prove for HW.)**

Ex: **Given:** $\overrightarrow{ABCD}$, $\angle ABP \cong \angle DCP$

Prove: $\angle CBP \cong \angle BCP$

Statement	Reason

Ex: **Given:** $\overline{MOR}$, $\overline{LOQ}$, $\overline{NO} \perp \overline{LO}$, $\overline{PO} \perp \overline{OR}$

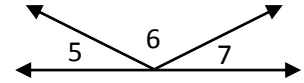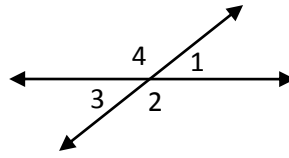**Prove:** ∠*MON* ≅ ∠*QOP*

Statement	Reason

Name:_____   **Date:**_____

1. Based on the diagrams, tell whether the given
    angles are vertical angles.

    a. $\angle 1$ and $\angle 3$ b. $\angle 1$ and $\angle 4$

    c. $\angle 2$ and $\angle 4$ d. $\angle 5$ and $\angle 7$

2. We wish to prove the following theorem: Vertical angles are congruent.

    Given: $\overleftrightarrow{AEB}$ **and** $\overleftrightarrow{CED}$

    Prove: $\angle AEC \cong \angle BED$
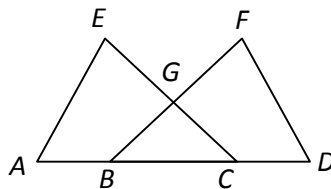
    a. Draw a diagram.

    b. Outline a proof of the theorem. (There is more than one way to do this. The easiest way is to consider   how $\angle AEC$ and $\angle BED$ are related to $\angle CEB$ and then use theorems covered in today's notes.)
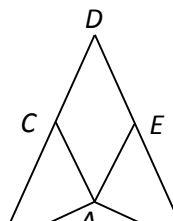
Write a complete statement-reason geometry proof for each of #1 – 4.

3. **Given:** $\overline{ABCD}$, $\angle ABG \cong \angle DCG$
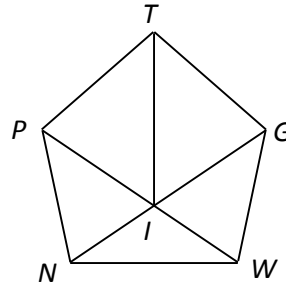
    Prove: $\angle BAE \cong \angle FAC$

4. Given: $\overline{AB} \perp \overline{AC}$, $\overline{AE} \perp \overline{AF}$

Prove: $\angle CBG \cong \angle BCG$

5. **Given:** $\overline{PIW}$, $\overline{GIN}$, $\overline{IT}$ bisects $\angle PIG$

   Prove: $\angle NIT \cong \angle WIT$

The following are algebraic exercises; *not proofs.*

6. If $\overline{AEB}$ intersects $\overline{CED}$ at E, $m\angle BEC = 5x - 25$, and $m\angle DEA = 7x - 65$, find the numerical values of the measures of all four angles.

7. If $\overline{AEB}$ intersects $\overline{CED}$ at E, $m\angle AEC = 5(x + 15)$, and $m\angle AED = 7x - 75$, find the numerical values of the measures of all four angles.