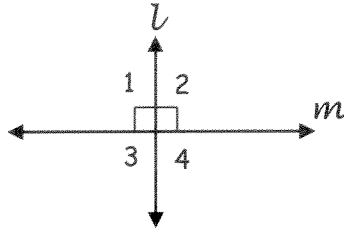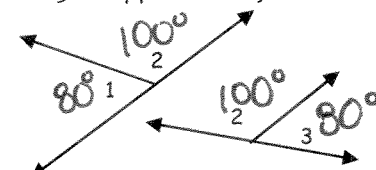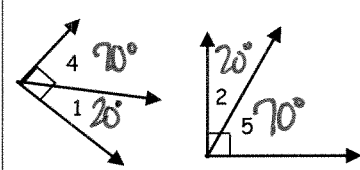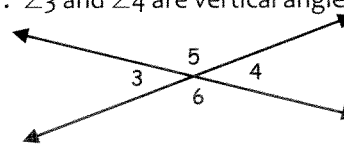# Day 08: 2-8 Proving Angle Relationships

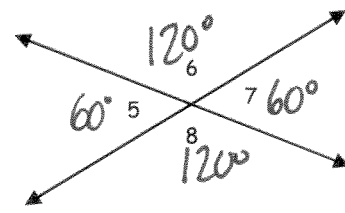| Properties of Equality (POE)	Properties of Angle Congruence (POC) – Theorems
Reflexive Property of Equality: m∠A = m∠A	**Congruent Angles are Reflexive:** ∠A ≅ ∠A
Symmetric Property of Equality: If m∠A = m∠B, then m∠B = m∠A	**Congruent Angles are Symmetric:** If ∠A ≅ ∠B, then ∠B ≅ ∠A
Transitive Property of Equality: If m∠A = m∠B, and m∠B = m∠C, then m∠A = m∠C	**Congruent Angles are Transitive:** If ∠A ≅ ∠B, and ∠B ≅ ∠C, then ∠A ≅ ∠C
Angle Addition Postulate	**Example:**
If R is in the interior of ∠PQS, then m∠PQR + m∠RQS = m∠PQS.	

Definition of perpendicular lines: If two lines are perpendicular, then they intersect to form a _____ angle.

Theorems: Memorize Them!	Given Information and Diagram	Conclusion
1. Perpendicular lines form **4 right angles**. 2. All right angles are **congruent**. 3. If 2 ∠s are ≅ & supplementary, then each ∠ is a **right angle**. 4. If 2 ≅ ∠s form a linear pair, then they are both **right angles**.	If: lines l & m are perpendicular ∠1 ≅ ∠2 ≅ ∠3 ≅ ∠4	Then: ∠1, ∠2, ∠3 & ∠4 are right ∠s
5. Angles supplementary to the same angle or congruent angles are **congruent**. 6. If 2 ∠s form a linear pair, then they are **supplementary** angles.	If: ∠1 is supplementary to ∠2 ∠3 is supplementary to ∠2	Then: ∠1 ≅ ∠3
7. Angles complementary to the same angle or congruent angles are **congruent**. 8. If the non-common sides of two adjacent angles form a right angle, then the angles are **Complementary**.	If: ∠4 is complementary to ∠1 ∠5 is complementary to ∠2 ∠1 ≅ ∠2	Then: ∠4 ≅ ∠5
9. If 2 angles are vertical angles, then they are always **Congruent**.	If: ∠3 and ∠4 are vertical angles If: ∠5 and ∠6 are vertical angles	Then: ∠3 ≅ ∠4 ∠5 ≅ ∠6

1-4: Use the diagram to decide whether the statement is true or false.

1. If $m\angle 5 = 42$, then $m\angle 6 = 48$ $42 + 48 \neq 180$ <u>False</u>

2. If $m\angle 5 = 42$, then $m\angle 7 = 42$ Vert. $\angle$s R $\cong$ <u>True</u>

3. $m\angle 5 + m\angle 7 = m\angle 6 + m\angle 8$ $120° \neq 240°$ <u>False</u>

4. $m\angle 5 + m\angle 8 = m\angle 6 + m\angle 7$ $180° = 180°$ <u>True</u>

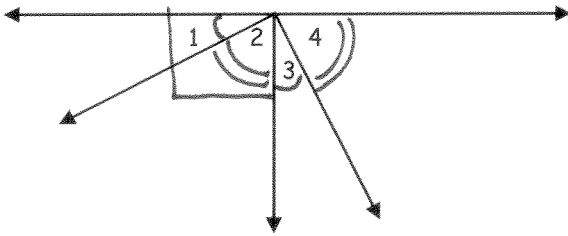Put in #5 to verify your answers!

(diagram: $120°$ at 6, $60°$ at 5, $60°$ at 7, $120°$ at 8)

5: Give a Reason for each step of the proof.

5. Given: $\angle 1$ and $\angle 2$ are complementary.

  $\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$

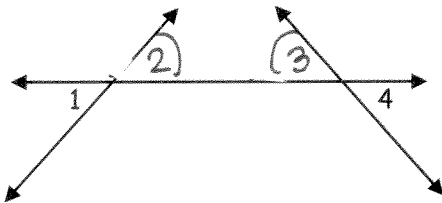 Prove: $\angle 3$ and $\angle 4$ are complementary.

Statements	Reasons
1. $\angle 1$ and $\angle 2$ are complementary	1. Given
2. $m\angle 1 + m\angle 2 = 90°$	2. <u>Def. comp. $\angle$s</u>
3. $\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$	3. Given
4. $m\angle 1 = m\angle 3$, $m\angle 2 = m\angle 4$	4. <u>Def. $\cong \angle$s</u>
5. $m\angle 3 + m\angle 2 = 90°$	5. <u>Substitution (4 into 2)</u>
6. $m\angle 3 + m\angle 4 = 90°$	6. <u>Substitution (4 into 5)</u>
7. $\angle 3$ and $\angle 4$ are complementary	7. <u>Def. comp. $\angle$s</u>

6: Write a two-column proof.

6. Given: $\angle 2 \cong \angle 3$

  Prove: $\angle 1 \cong \angle 4$
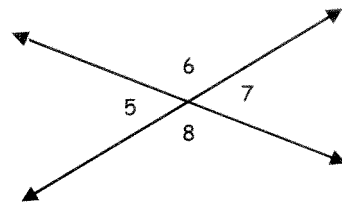
Statements	Reasons
1. $\angle 2 \cong \angle 3$	1. Given
2. $\angle 3 \cong \angle 4$	2. Vert. $\angle$s are $\cong$
3. $\angle 2 \cong \angle 4$	3. Transitive POC
4. $\angle 1 \cong \angle 2$	4. Vert. $\angle$s are $\cong$
5. $\angle 4 \cong \angle 1$	5. Transitive POC
6. $\angle 1 \cong \angle 4$	6. Symmetric POC

7-9: Use the diagram to write an equation and solve for x.

7. Given: $m\angle 5 = 4x - 17$ and $m\angle 7 = 2x + 9$ Vert. $\angle$s are $\cong$!

$$4x - 17 = 2x + 9$$
$$2x - 17 = 9$$
$$2x = 26$$
$$\boxed{x = 13}$$

(diagram with angles 5, 6, 7, 8)

8. Given: $m\angle 8 = 7x + 2$ and $m\angle 7 = 3x + 8$ Linear pair

$$7x + 2 + 3x + 8 = 180$$
$$10x + 10 = 180$$
$$10x = 170$$
$$\boxed{x = 17}$$

9. Given: $\angle 5$ is a right angle and $m\angle 6 = 5x - 10$

5 & 6 are a linear pair, so $\angle 6$ is also $90°$!

$$5x - 10 = 90$$
$$5x = 100$$
$$\boxed{x = 20}$$