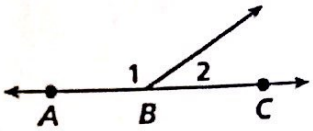
Day 6 – Geometric Proofs Notes

When writing a geometric proof, you use deductive reasoning to create a chain of logical steps that move from the hypothesis to the conclusion of the conjecture you are proving. By proving the conclusion is true, you have proven the original conjecture is true.

When writing a proof, it is important to justify each logical step with a reason. You can use symbols and abbreviations, but they must be clear enough so that anyone who reads your proof will understand them.

Practice:
Fill in the blanks to complete a two column proof of the **Linear Pair Theorem.**

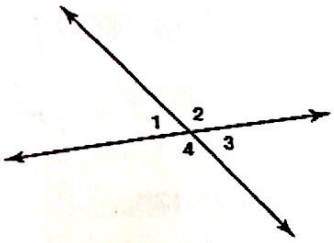
Given: Angle 1 and 2 form a linear pair.
Prove: Angle 1 and 2 are supplementary.



Statements	Reasons
1. ∠1 and ∠2 form a linear pair.	1. Given
2. $\overrightarrow{BA}$ and $\overrightarrow{BC}$ form a line. or ∠ABC is a straight angle	2. Definition of linear pair
3. m∠ABC = 180°	3. Definition of straight angle
4. m<1 + m<2 = m<ABC	4. Angle Addition Postulate
5. m<1 + m<2 = 180	5. Substitution
6. ∠1 and ∠2 are supplementary	6. Definition of Supp ∠'s

Prove the Vertical Angles Theorem using a two column proof.

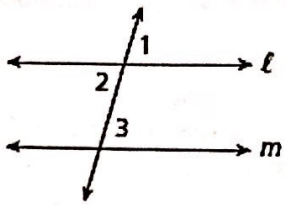
Given: Angle 4 and 1 are a linear pair.
Angle 1 and 2 are a linear pair.
Prove: ∠2 ≅ ∠4



Statements	Reasons
1. <4 and <1 are a linear pair	1. Given
2. <1 and <2 are a linear pair	2. Given
3. <4 and <1 are supp	3. Linear Pair Theorem
4. <1 and <2 are supp	4. Linear Pair Theorem
5. m<1 + m<4 = 180	5. Definition of Supplementary Angles
6. m<1 + m<2 = 180	6. Definition of Supplementary Angles
7. m<1 + m<4 = m<1 + m<2	7. Substitution
8. m<4 = m<2	8. Subtraction Property
9. <4 ≅ <2	9. Definition of Congruent Angles

Prove the Alternate Interior Angles are Congruent Theorem using a two column proof:

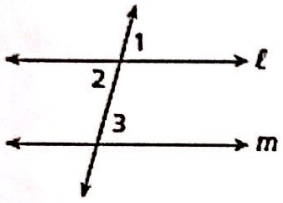
Given: l // m
Prove: ∠ 2 ≅ ∠ 3



Statements	Reasons
1. ℓ ∥ m	1. Given
2. ∠1 ≅ ∠2	2. Vertical Angles are Congruent
3. ∠1 ≅ ∠3	3. Corresponding Angles Postulate
4. ∠2 ≅ ∠3	4. Transitive Property

Prove that Corresponding Angles are congruent using a two column proof:

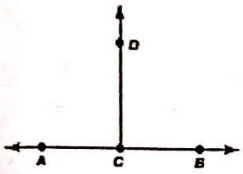
Given: l // m
Prove: ∠ 1 ≅ ∠ 3



Statements	Reasons
1. l ∥ m	1. given
2. ∠ 1 ≅ ∠ 2	2. vertical ∠'s are ≅
3. ∠ 3 ≅ ∠ 2	3. alt int ∠'s are ≅
4. ∠ 1 ≅ ∠ 3	4. transitive prop

Prove the <u>Right Angle Congruence Theorem</u> using a two column proof.

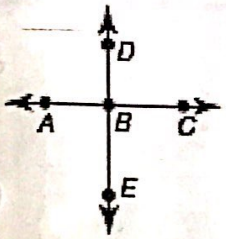
Given: ∠ACD and ∠BCD are right angles
Prove: ∠ACD ≅ ∠BCD



Statements	Reasons
1. ∠ACD is a right ∠	1. Given
2. ∠BCD is a right ∠	2. Given
3. m∠ACD = 90°	3. Def of right ∠
4. m∠BCD = 90°	4. Def of right ∠
5. m∠ACD = m∠BCD	5. Transitive Property
6. ∠ACD ≅ ∠BCD	6. = measures → ≅ ∠'s

Prove the following using a two column proof:

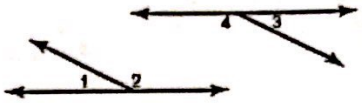
Given: $\overleftrightarrow{AC} \perp \overleftrightarrow{DE}$
Prove: ∠ABD ≅ ∠CBD



Statements	Reasons
1. $\overleftrightarrow{AC} \perp \overleftrightarrow{DE}$	1. Given
2. ∠ABD = 90°	2. Definition of Perpendicular Lines
3. ∠CBD = 90°	3. Definition of Perpendicular Lines
4. m∠ABD = m∠CBD	4. Right ∠s are ≅ OR Transitive Prop.
5. ∠ABD ≅ ∠CBD	5. Definition of Congruent Angles

Prove the Congruent Supplement Theorem using a two column proof:

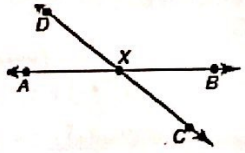
Given: $\angle 2 \cong \angle 4$
Angle 1 is supplementary to angle 2
Angle 3 is supplementary to angle 4
Prove: $\angle 1 \cong \angle 3$



Statements	Reasons
1. $\angle 2 \cong \angle 4$	1. Given
2. $m\angle 2 = m\angle 4$	2. Definition of congruent angles
3. $\angle 1$ is Supp to $\angle 2$	3. Given
4. $\angle 3$ is Supp to $\angle 4$	4. Given
5. $m\angle 1 + m\angle 2 = 180°$	5. Defintion of supplementary angles
6. $m\angle 3 + m\angle 4 = 180°$	6. Definition of Supp $\angle$'s
7. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$	7. Substitution Property or Transitive Prop
8. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$	8. Substitution Prop
9. $m\angle 1 = m\angle 3$	9. Subtraction Property of Equality
10. $\angle 1 \cong \angle 3$	10. $\cong$ $\angle$'s $\rightarrow$ = measures

Prove the following using a two column proof:

Given: $AX = CX, BX = DX$
Prove: $AB = CD$



Statements	Reasons
1. $BX = DX$	1. Given
2. $AX = CX$	2. Given
3. $AX + BX = CX + BX$	3. Addition Prop of =
4. $AX + BX = CX + DX$	4. Substitution Prop
5. $AX + BX = AB$	5. Segment Addition
6. $CX + DX = CD$	6. Segment Addition
7. $AB = CD$	7. Substitution Prop