2.6 - Geometric Proof

Determine whether each statement is true or false. If false, give a counterexample.

1. It two angles are complementary, then they are not congruent.

2. If two angles are congruent to the same angle, then they are congruent to each other.

3. Supplementary angles are congruent.

Sep 20-6:06 PM

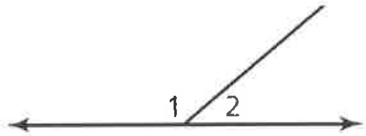
A theorem is any statement that you can prove.

Once you have proven a theorem, you can use it as a reason in later proofs.

A **postulate** is a statement we accept as true without proof.

Theorem

Linear Pair Postulate: If two angles form a linear pair, then they are supplementary



Postulate & Theorem

Given: ∠A and ∠B form a linear pair.

Prove: m∠A + m∠B = 180°

Statement	Reason
∠A + ∠B form a linear pair	Given
∠A and ∠B are supplementary	Linear Pair Postulate
m∠A + m∠B = 180°	Def. of supplementary

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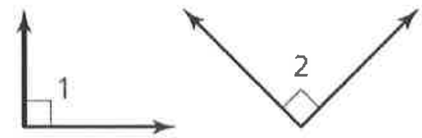
Write a two-column proof to prove the Right Angles Congruence Theorem.

Given $\angle 1$ and $\angle 2$ are right angles.

Prove $\angle 1 \cong \angle 2$



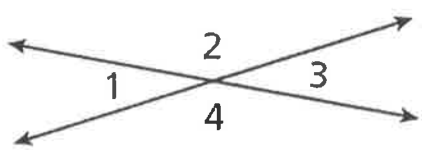
Right angle congruence Theorem: All right angles are congruent

Statement	Reason
$\angle 1$ and $\angle 2$ are right $\angle$'s	Given
$m\angle 1 = 90^\circ$, $m\angle 2 = 90^\circ$	Def. of right $\angle$
$m\angle 1 = m\angle 2$	Transitive POE
$\angle 1 \cong \angle 2$	Def. of $\cong$

Theorem

Given: $\angle 1$ and $\angle 3$ are Vertical Angles

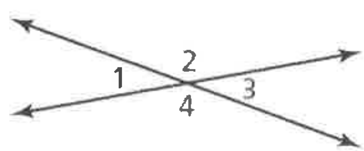
* See Next Page



Prove: $\angle 1 \cong \angle 3$

Theorem 2.6 Vertical Angles Congruence Theorem

Vertical angles are congruent.

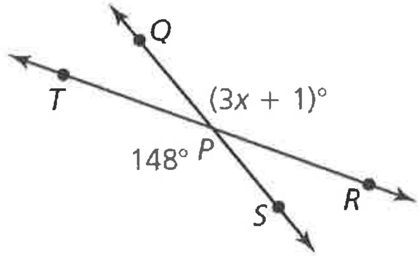


$\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$

Proof Example 3, p. 108

Statement	Reason
$\angle 1$ and $\angle 3$ are vertical $\angle$'s	Given
$\angle 1$ and $\angle 2$ form linear pair $\angle 2$ and $\angle 3$ form linear pair	> Def. of Linear Pair
$\angle 1$ and $\angle 2$ are supplementary $\angle 2$ and $\angle 3$ are supplementary	> Linear Pair Postulate
$m\angle 1 + m\angle 2 = 180$ $m\angle 2 + m\angle 3 = 180$	> Def. of Supplementary
$m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	Transitive POE
$-m\angle 2 \quad -m\angle 2$	Subtraction POE
$m\angle 1 = m\angle 3$	Simplify
$\angle 1 \cong \angle 3$	Def. of $\cong$

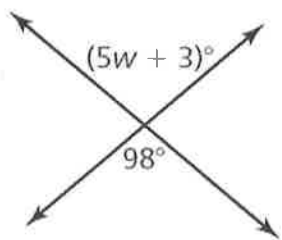
Find the value of x.



$3x+1=148$
$-1 \quad -1$
$\frac{3x}{3}=\frac{147}{3}$
$\boxed{x=49}$

Example 4

Find the value of w.



$5w+3=98$
$-3 \quad -3$
$\frac{5w}{5}=\frac{95}{5}$
$\boxed{w=19}$

Monitoring Progress 7

Homework:

~~WS 2.6A - Geometric Proof~~

WS Justifications and WS making Conclusions

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2.6B - More Geometric Proof

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Bellwork

1. " If it is July, then it is summer in the U.S. "
   a. Write the Converse, Inverse, and Contrapositive.
   b. Which one is true?

Contrapositive

2.

n	1	2	3	4
a_n	5	7	9	11

Which equation models the pattern in the table above?

A. $a_n = 5n + 2$

C. $a_n = n + 5$

B. $a_n = \frac{1}{3}n + 2$

D. $a_n = 2n + 3$

① Converse: If summer in US, then July.
$q \to p$

Inverse : If not July, then not summer in US.
$\sim p \to \sim q$

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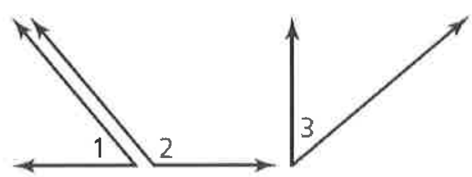
Contrapositive: If not summer in US, then not July.
$\sim q \to \sim p$

Use the given two-column proof to write a flowchart proof that proves that two angles supplementary to the same angle are congruent.

Given ∠1 and ∠2 are supplementary.

∠3 and ∠2 are supplementary.

Prove ∠1 ≅ ∠3



Two-Column Proof

STATEMENTS	REASONS
1. ∠1 and ∠2 are supplementary. ∠3 and ∠2 are supplementary.	1. Given
2. $m\angle 1 + m\angle 2 = 180°$, $m\angle 3 + m\angle 2 = 180°$	2. Definition of supplementary angles
3. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$	3. Transitive Property of Equality
4. $m\angle 1 = m\angle 3$	4. Subtraction Property of Equality
5. $\angle 1 \cong \angle 3$	5. Definition of congruent angles

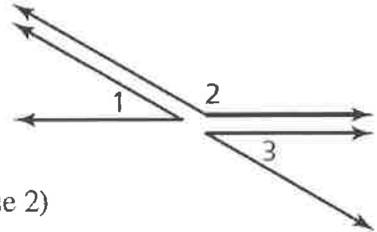
Example 2

Theorems

Theorem 2.4 Congruent Supplements Theorem

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

If $\angle 1$ and $\angle 2$ are supplementary and $\angle 3$ and $\angle 2$ are supplementary, then $\angle 1 \cong \angle 3$.

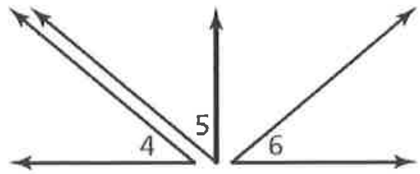


Proof Example 2, p. 107 (case 1); Ex. 20, p. 113 (case 2)

Theorem 2.5 Congruent Complements Theorem

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

If $\angle 4$ and $\angle 5$ are complementary and $\angle 6$ and $\angle 5$ are complementary, then $\angle 4 \cong \angle 6$.

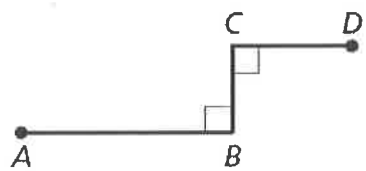


Proof Ex. 19, p. 112 (case 1); Ex. 22, p. 113 (case 2)

Theorem

Given $\overline{AB} \perp \overline{BC}$, $\overline{DC} \perp \overline{BC}$

Prove $\angle B \cong \angle C$

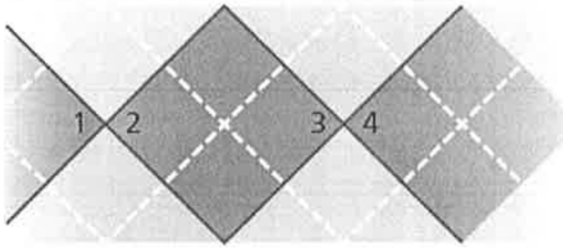


Statement	Reason
$\overline{AB} \perp \overline{BC}$, $\overline{DC} \perp \overline{BC}$	Given
$\angle B$ is a right $\angle$	Def. of perpendicular
$\angle C$ is a right $\angle$	
$\angle B \cong \angle C$	Right $\angle \cong$ Thm

Monitoring Progress 1

Given ∠1 ≅ ∠4

Prove ∠2 ≅ ∠3



Statement	Reason
∠1 ≅ ∠4	Given
∠4 ≅ ∠3	Vert. ∠'s Thm
∠1 ≅ ∠3	Transitive POC
∠1 ≅ ∠2	Vert. ∠'s Thm
∠2 ≅ ∠3	Transitive POC

Example 5

Given $AB = DE$, $BC = CD$

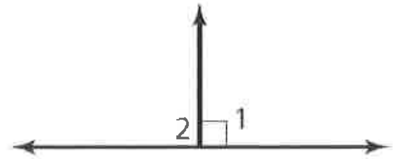
Prove $\overline{AC} \cong \overline{CE}$

STATEMENTS	REASONS
1. $AB = DE, BC = CD$	1. Given
2. $AB + BC = BC + DE$	2. Addition Property of Equality
3. $AB + BC = CD + DE$	3. Substitution Property of Equality
4. $AB + BC = AC, CD + DE = CE$	4. Segment Addition Postulate
5. $AC = CE$	5. Substitution Property of Equality
6. $\overline{AC} \cong \overline{CE}$	6. Def. of ≅

Monitoring Progress 2

Given $\angle 1$ is a right angle.

Prove $\angle 2$ is a right angle.



Statement	Reason
$\angle 1$ is a right $\angle$	Given
$\angle 1$ and $\angle 2$ form Linear Pair	Def. of Linear Pair
$\angle 1$ and $\angle 2$ are Supp.	Linear Pair Postulate
$m\angle 1 + m\angle 2 = 180°$	Def. of Supp.
$m\angle 1 = 90°$	Def. of right $\angle$
$90 + m\angle 2 = 180$	Substitution
$-90 \quad -90$	Subtraction POE
$m\angle 2 = 90$	Simplify
$\angle 2$ is a right $\angle$	Def. of Right $\angle$

~~Monitoring Progress 8~~

Homework:

~~pg. 111 # 3-5, 8, 12~~

~~(17-24 look like good proofs)~~