

2.7 Prove Angle Pair Relationships

G.CO.9 Prove theorems about lines and angles.

Before You identified relationships between pairs of angles.

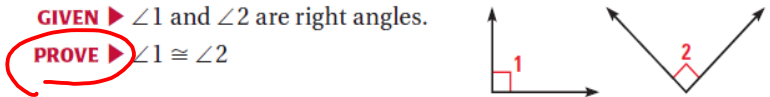
Now You will use properties of special pairs of angles.

Why? So you can describe angles found in applications.

THEOREM 2.3

RIGHT ANGLES CONGRUENCE THEOREM - All RIGHT angles are \cong .

PROOF: RIGHT ANGLES CONGRUENCE THEOREM



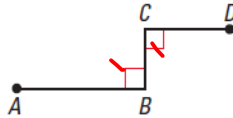
STATEMENTS	REASONS
1. $\angle 1$ and $\angle 2$ are right angles.	Given
2. $m\angle 1 = 90^\circ, m\angle 2 = 90^\circ$	Def'n of rt \angle
★ 3. $m\angle 1 = m\angle 2$	Transitive / Subst. Prop =
★ 4. $\angle 1 \cong \angle 2$	Def'n \cong or \cong Post

EXAMPLE 1: USE RIGHT ANGLE CONGRUENCE

Write a proof.

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

PROVE $\angle B \cong \angle C$



STATEMENTS	REASONS
1. $\overline{AB} \perp \overline{BC}, \overline{DC} \perp \overline{BC}$	Given
2. $\angle B$ and $\angle C$ are right angles.	Def'n \perp
3. $\angle B \cong \angle C$	\forall rt $\angle \cong$

THEOREM 2.4
CONGRUENT SUPPLEMENTS THEOREM - If two angles are SUPPLEMENTARY to the same angle (or to congruent angles), then they are CONGRUENT.

Conclusion: $m\angle 1 + m\angle 2 = 180^\circ$, $m\angle 3 + m\angle 2 = 180^\circ \Rightarrow m\angle 1 = m\angle 3$
 $\angle 1 \cong \angle 3$

THEOREM 2.5
CONGRUENT COMPLEMENTS THEOREM - If two angles are COMPLEMENTARY to the same angle (or to congruent angles), then they are CONGRUENT.

Conclusion: $m\angle 4 + m\angle 5 = 90^\circ$, $m\angle 6 + m\angle 5 = 90^\circ \Rightarrow m\angle 4 = m\angle 6$
 $\angle 4 \cong \angle 6$

EXAMPLE 2: Prove a case of Congruent Supplements Theorem
 Prove that two angles supplementary to the same angle are congruent.

GIVEN ▶ $\angle 1$ and $\angle 2$ are supplements.
 $\angle 3$ and $\angle 2$ are supplements.
PROVE ▶ $\angle 1 \cong \angle 3$



STATEMENTS	REASONS
1. $\angle 1$ and $\angle 2$ are supplements. $\angle 3$ and $\angle 2$ are supplements.	Def'n of Supp. \hookrightarrow
2. $m\angle 1 + m\angle 2 = 180^\circ$ $m\angle 3 + m\angle 2 = 180^\circ$	
3. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$	Trans.
4. $m\angle 1 = m\angle 3$	Prop.
5. $\angle 1 \cong \angle 3$	Def'n \cong , \cong Post.

INTERSECTING LINES: When two lines INTERSECT, pairs of Vertical \angle s and Linear Pair \angle s are formed.

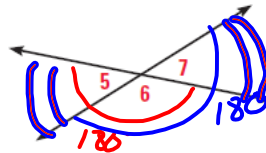
POSTULATE 12
LINEAR PAIR
POSTULATE: If two angles form a LINEAR PAIR, then they are SUPPLEMENTARY.
 Conclusion: $m\angle 1 + m\angle 2 = 180^\circ$

THEOREM 2.6
VERTICAL ANGLES CONGRUENCE
THEOREM: Vertical angles are congruent.
 Conclusion: $m\angle 1 = m\angle 3$ $m\angle 2 = m\angle 4$
 $\angle 1 \cong \angle 3$ $\angle 2 \cong \angle 4$

EXAMPLE 3: Prove the Vertical Angles Congruence Theorem

Prove vertical angles are congruent.

GIVEN ▶ $\angle 5$ and $\angle 7$ are vertical angles.
PROVE ▶ $\angle 5 \cong \angle 7$



STATEMENTS	REASONS
1. $\angle 5$ and $\angle 7$ are vertical angles.	GIVEN
2. $\angle 5$ and $\angle 6$ are a linear pair. $\angle 6$ and $\angle 7$ are a linear pair.	Def'n of a L.P. (as shown in the Diagram)
3. $\angle 5$ and $\angle 6$ are supplementary. $\angle 6$ and $\angle 7$ are supplementary.	Linear Pair Postulate
4. $\angle 5 \cong \angle 7$	\cong Supp. Thm

★ EXAMPLE 4 Standardized Test Practice

Which equation can be used to find x ?

- (A) $32 + (3x + 1) = 90$
- (B) $32 + (3x + 1) = 180$
- (C) $32 = 3x + 1$
- (D) $3x + 1 = 212$

