

# Geometry

## Notes Section 2.7

### Prove Angles Pair Relationships

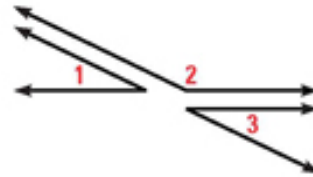
**THEOREM 2.3** Right Angles Congruence Theorem

All right angles are congruent.

**THEOREM 2.4** Congruent Supplements Theorem

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

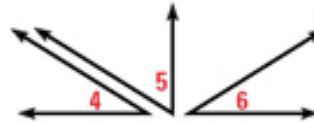
If  $\angle 1$  and  $\angle 2$  are supplementary and  $\angle 3$  and  $\angle 2$  are supplementary, then  $\angle 1 \cong \angle 3$ .



**THEOREM 2.5** Congruent Complements Theorem

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

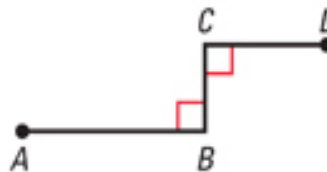
If  $\angle 4$  and  $\angle 5$  are complementary and  $\angle 6$  and  $\angle 5$  are complementary, then  $\angle 4 \cong \angle 6$ .



**EXAMPLE 1** Complete the reasons for the following proofs.

a) **GIVEN**  $\overline{AB} \perp \overline{BC}$ ,  $\overline{DC} \perp \overline{BC}$

**PROVE**  $\angle B \cong \angle C$



- |  |          |
|--|----------|
| 1. $\overline{AB} \perp \overline{BC}$ , $\overline{DC} \perp \overline{BC}$ | 1. _____ |
| 2. $\angle B$ and $\angle C$ are right angles.                               | 2. _____ |
| 3. $\angle B \cong \angle C$   | 3. _____ |

- b) GIVEN** ▶  $\angle 1$  and  $\angle 2$  are supplements.  
 $\angle 3$  and  $\angle 2$  are supplements.  
**PROVE** ▶  $\angle 1 \cong \angle 3$



1.  $\angle 1$  and  $\angle 2$  are supplements.  
 $\angle 3$  and  $\angle 2$  are supplements.
2.  $m\angle 1 + m\angle 2 = 180^\circ$   
 $m\angle 3 + m\angle 2 = 180^\circ$
3.  $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$
4.  $m\angle 1 = m\angle 3$
5.  $\angle 1 \cong \angle 3$

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**POSTULATE 12** Linear Pair Postulate

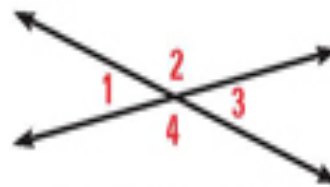
If two angles form a linear pair, then they are supplementary.

$\angle 1$  and  $\angle 2$  form a linear pair, so  $\angle 1$  and  $\angle 2$  are supplementary and  $m\angle 1 + m\angle 2 = 180^\circ$ .



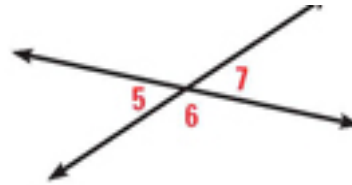
**THEOREM 2.6** Vertical Angles Congruence Theorem

Vertical angles are congruent.



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

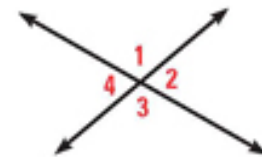
- c) **GIVEN** ▶  $\angle 5$  and  $\angle 7$  are vertical angles.  
**PROVE** ▶  $\angle 5 \cong \angle 7$



- |   |                              |
|---|------------------------------|
| 1. $\angle 5$ and $\angle 7$ are vertical angles.   | 1. <u>Given</u>              |
| 2. $\angle 5$ and $\angle 6$ are a linear pair.<br>$\angle 6$ and $\angle 7$ are a linear pair. | 2. <u>Def. of linear pr.</u> |
| 3. $\angle 5$ and $\angle 6$ are supplementary.<br>$\angle 6$ and $\angle 7$ are supplementary. | 3. <u>Postulate 12</u>       |
| 4. $\angle 5 \cong \angle 7$  | 4. <u>Theorem 2-4</u>        |

**EXAMPLE 2** Find the indicated angles from the diagram.

- a) If  $m\angle 1 = 112^\circ$ , find  $m\angle 2$ ,  $m\angle 3$ , and  $m\angle 4$ .
- b) If  $m\angle 2 = 67^\circ$ , find  $m\angle 1$ ,  $m\angle 3$ , and  $m\angle 4$ .
- c) If  $m\angle 4 = 71^\circ$ , find  $m\angle 1$ ,  $m\angle 2$ , and  $m\angle 3$ .



**EXAMPLE 3** Find  $x$  and  $m\angle TPS$ .

