

## Proving Angle Relationships Notes

### Definition of Congruent Angles:

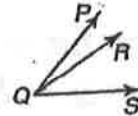
If  $m\angle 1 = m\angle 2$ , then  $\angle 1 \cong \angle 2$ .

If  $\angle 1 \cong \angle 2$ , then  $m\angle 1 = m\angle 2$ .

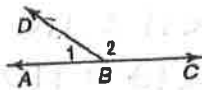
### Angle Addition Postulate:

If R is in the interior of  $\angle PQS$ , then  $m\angle PQR + m\angle RQS = m\angle PQS$ .

If  $m\angle PQR + m\angle RQS = m\angle PQS$ , then R is in the interior of  $\angle PQS$ .

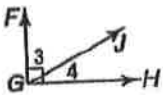


**Supplement Theorem:** If two angles form a linear pair then they are supplementary.



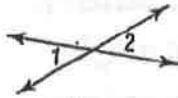
If  $\angle 1$  and  $\angle 2$  form a linear pair, then  $m\angle 1 + m\angle 2 = 180$ .

**Complement Theorem:** If the noncommon sides of two adjacent angles form a right angle, then the angles are complementary.



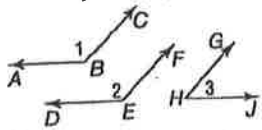
If  $\overline{GF} \perp \overline{GH}$ , then  $m\angle 3 + m\angle 4 = 90$ .

**Vertical Angles Theorem:** If two angles are vertical angles then they are congruent.



### Theorems:

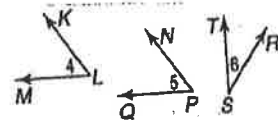
- Angles supplementary to the same angle or to congruent angles are congruent.



If  $\angle 1$  and  $\angle 2$  are supplementary to  $\angle 3$ , then  $\angle 1 \cong \angle 2$   
Abbreviation: ( $\angle$ 's suppl. to same  $\angle$  or  $\cong \angle$ 's are  $\cong$ )

- Angles complementary to the same angle or to congruent angles are congruent.

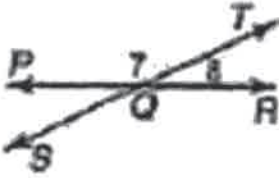
If  $\angle 4$  and  $\angle 5$  are complementary to  $\angle 6$ , then  $\angle 4 \cong \angle 5$   
Abbreviation: ( $\angle$ 's compl. to same  $\angle$  or  $\cong \angle$ 's are  $\cong$ )



**Examples:**

**Find the measure of each numbered angle.**

1.



$$m\angle 7 = 5x + 5 = 155$$

$$m\angle 8 = x - 5 = 25$$

$$5x + 5 + x - 5 = 180$$

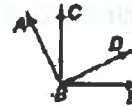
$$6x = 180$$

$$x = 30$$

**Complete each proof.**

1.

Given:  $\angle ABC$  and  $\angle CBD$  are complementary.  
 $\angle DBE$  and  $\angle CBD$  form a right angle.  
 Prove:  $\angle ABC \cong \angle DBE$



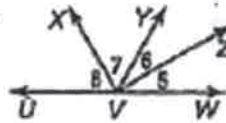
**Statements**

1.  $\angle ABC$  and  $\angle CBD$  are complementary.  
 $\angle DBE$  and  $\angle CBD$  form a right angle.
2.  $\angle DBE$  and  $\angle CBD$  are complementary.
3.  $\angle ABC \cong \angle DBE$

**Reasons**

1. Given
2. complement theorem
3.  $\angle$ 's comp to same  $\angle$  are  $\cong$ .

2.



$$m\angle 5 = 6x, m\angle 6 = 4x + 6,$$

$$m\angle 7 = 10x,$$

$$m\angle 8 = 12x - 12$$

$$x = 6$$

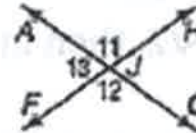
$$m\angle 5 = 30$$

$$m\angle 6 = 30$$

$$m\angle 7 = 60$$

$$m\angle 8 = 60$$

3.



$$m\angle 11 = 11x,$$

$$m\angle 12 = 10x + 10$$

$$11x = 10x + 10$$

$$x = 10$$

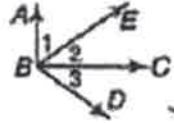
$$m\angle 11 = 110$$

$$m\angle 12 = 110$$

$$m\angle 13 = 70$$

2.

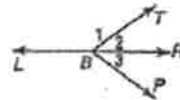
Given:  $\overline{AB} \perp \overline{BC}$ ;  
 $\angle 1$  and  $\angle 3$  are  
 complementary.  
 Prove:  $\angle 2 \cong \angle 3$



Statements	Reasons
a. $\overline{AB} \perp \overline{BC}$	a. Given
b. $\angle ABC$ is a right $\angle$	b. Definition of $\perp$
c. $m\angle 1 + m\angle 2 = m\angle ABC$	c. $\angle$ addition post.
d. $\angle 1$ and $\angle 2$ form a rt $\angle$ .	d. substitution
e. $\angle 1$ and $\angle 2$ are compl.	e. complement theorem
f. $\angle 1$ & $\angle 3$ are complementary	f. Given
g. $\angle 2 \cong \angle 3$	g. $\angle$ 's complementary to the same $\angle$ are $\cong$ .

3.

Given:  $\angle 1$  and  $\angle 2$   
 form a linear pair.  
 $m\angle 1 + m\angle 3 = 180$   
 Prove:  $\angle 2 \cong \angle 3$



Statements	Reasons
a. $\angle 1$ and $\angle 2$ form a linear pair. $m\angle 1 + m\angle 3 = 180$	a. Given
b. $\angle 1$ is suppl. to $\angle 2$	b. Suppl. Theorem
c. $\angle 1$ is suppl. to $\angle 3$ .	c. def. of suppl.
d. $\angle 2 \cong \angle 3$	d. $\angle$ 's suppl. to the same $\angle$ are $\cong$ .

