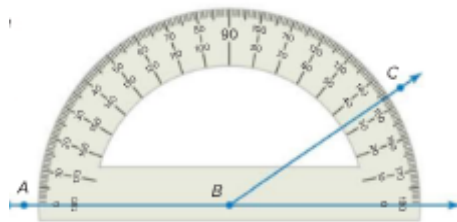


Section 2.6: Proving Angle Relationships.

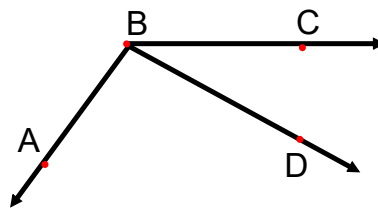
Supplementary and Complementary Angles. The Protractor Postulate illustrates the relationship between angle measures and real numbers.

Postulate 2.10 Protractor Postulate: Given any angle, the measure can be put into one to one correspondence with real numbers between 0 and 180.

If ray BA is placed along the protractor at 0 degrees, then the measure of $\angle ABC$ corresponds to a positive real number.

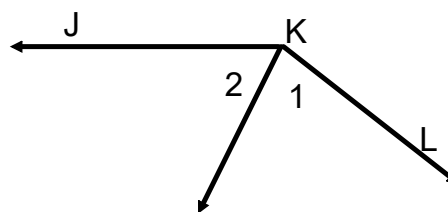


Postulate 2.11 Angle Addition Postulate: D is in the interior of $\angle ABC$ if and only if $m\angle ABD + m\angle DBC = m\angle ABC$



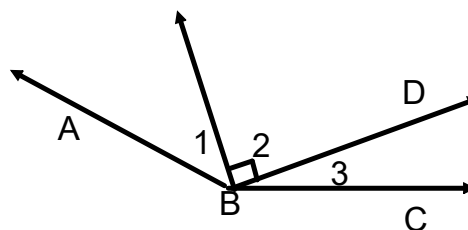
Example:

Find $m\angle 1$ if $m\angle 2 = 56$ and $m\angle JKL = 145$. Justify your steps.



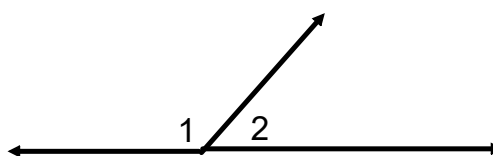
Example:

Find $m\angle 3$ if $m\angle 1 = 23$ and $m\angle ABC = 131$. Justify each step.



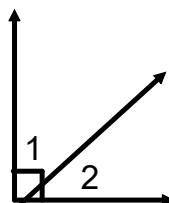
Theorem 2.3 Supplement Theorem. If two angles form a linear pair, then they are supplementary angles.

$$m\angle 1 + m\angle 2 = 180$$

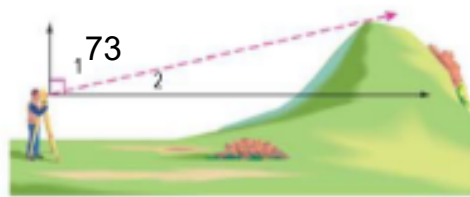


Theorem 2.4 Complement Theorem. If the non-common sides of two adjacent angles form a right angle, then the angles are complementary angles.

$$m\angle 1 + m\angle 2 = 90$$

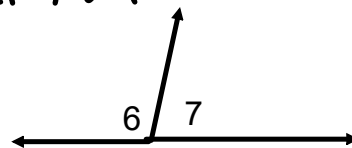


Example: Surveying. Using a transit, a surveyor sights the top of a hill and records an angle measure of about 73 degrees. What is the measure of the angle from the top of the hill makes with the horizon? Justify



Example: $\angle 6$ and $\angle 7$ form a linear pair. If $m\angle 6 = 3x + 32$ and $m\angle 7 = 5x + 12$, find x and the measure of both angles. Justify

↳ Supplement Thm



$$3x + 32 + 5x + 12 = 180$$

$$8x + 44 = 180$$

$$\frac{8x}{8} = \frac{136}{8} = 17$$

Theorem 2.5 Properties of Angle Congruence

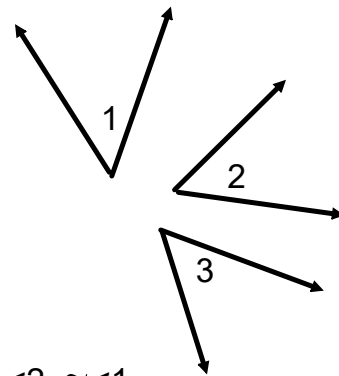
Reflexive Property of Congruence $\angle 1 \cong \angle 1$

Symmetric Property of Congruence If $\angle 1 \cong \angle 2$, then $\angle 2 \cong \angle 1$

$$\angle 1 \cong \angle 2$$

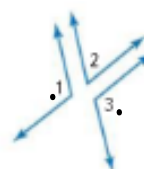
$$\begin{array}{l} \angle 2 \cong \angle 1 \\ \angle 1 \cong \angle 2 \end{array}$$

Transitive Property of Congruence If $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$, then $\angle 1 \cong \angle 3$



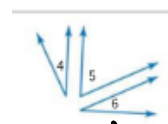
Theorem 2.6 Congruent Supplements Theorem: Angles supplementary to the same angle or to congruent angles are congruent.

If $m\angle 1 + m\angle 2 = 180$ and $m\angle 2 + m\angle 3 = 180$, then
 $\angle 1 \cong \angle 3$



Theorem 2.7 Congruent Complements Theorem: Angles complementary to the same angle or to congruent angles are congruent.

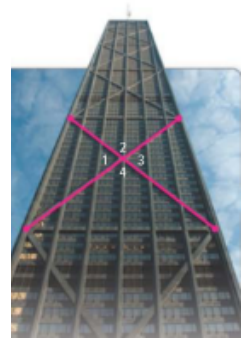
If $m\angle 4 + m\angle 5 = 90$ and $m\angle 5 + m\angle 6 = 90$, then
 $\angle 4 \cong \angle 6$



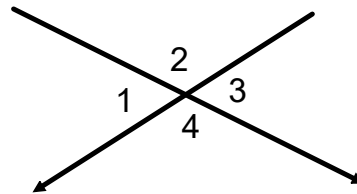
Prove that vertical angles 2 and 4 in the photo are congruent.

1. $\angle 2$ and $\angle 4$ are vertical angles
2. $\angle 2$ and $\angle 3$ form a linear pair
3. $\angle 3$ and $\angle 4$ form a linear pair
4. $\angle 2$ and $\angle 3$ are supplementary
 $\angle 3$ and $\angle 4$ are supplementary
5. $\angle 2 \cong \angle 4$

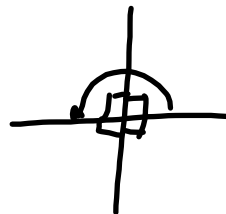
Reason.
 Def of vert \angle 's
 Def of Linear Pair
 " " "
 Supplement Thm
 \cong Supplement Thm.



Theorem 2.8 Vertical Angle Theorem: If two angles are vertical angles, then they are congruent.

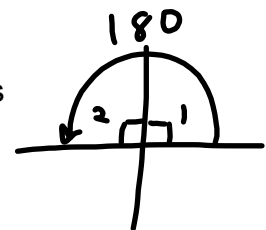


Theorem 2.9 Perpendicular lines intersect to form four right angles.



Theorem 2.10 All right angles are congruent.

Theorem 2.11 Perpendicular lines form congruent adjacent angles



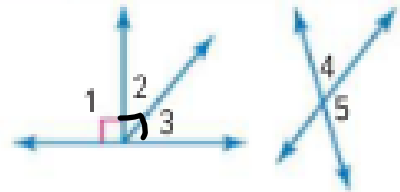
Theorem 2.12 If two angles are congruent and supplementary, then each angle is a right angle.

Theorem 2.13 If two congruent angles form a linear pair, then they are right angles.

Example

Find the measure of each numbered angle and name the theorems that justify your work.

1. $m\angle 2 = 26$
 Complement thm
 $90 - 26 = m\angle 3 = 64^\circ$



2. $m\angle 2 = x$, $m\angle 3 = x - 16$
 Complement thm

$$x + x - 16 = 90$$

$$2x - 16 = 90$$

$$2x = 106$$

$$x = 53$$

$$m\angle 2 = 53$$

$$m\angle 3 = 37$$

3. $m\angle 4 = 2x$, $m\angle 5 = x + 9$

Supplement Thm

$$2x + x + 9 = 180$$

$$3x = 171$$

$$x = 57$$

$$m\angle 4 = 134 \quad m\angle 5 = 66$$

4. $m\angle 4 = 3(x - 1)$, $m\angle 5 = x + 7$

supplement Thm

$$3x - 3 + x + 7 = 180$$

$$x = 44$$

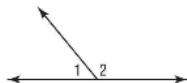
NAME _____ DATE _____ PERIOD _____

2-6 Practice

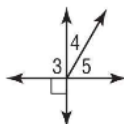
Proving Angle Relationships

Find the measure of each numbered angle and name the theorems that justify your work.

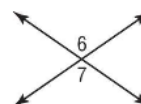
1. $m\angle 1 = x + 10$
 $m\angle 2 = 3x + 18$



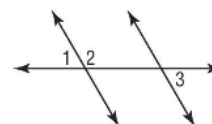
2. $m\angle 4 = 2x - 5$
 $m\angle 5 = 4x - 13$



3. $m\angle 6 = 7x - 24$
 $m\angle 7 = 5x + 14$



4. Write a two-column proof.
Given: $\angle 1$ and $\angle 2$ form a linear pair.
 $\angle 2$ and $\angle 3$ are supplementary.
Prove: $\angle 1 \cong \angle 3$



5. **STREETS** Refer to the figure. Barton Road and Olive Tree Lane form a right angle at their intersection. Tryon Street forms a 57° angle with Olive Tree Lane. What is the measure of the acute angle Tryon Street forms with Barton Road?

