

## Vertical Angles Theorem

Vertical angles are congruent.

If...



Then...  $\angle 1 \cong \angle 2$  and  $\angle 3 \cong \angle 4$ .

Non-Adjacent  
Angles formed by  
intersecting Lines  
 $\angle 1, \angle 2$        $\angle 3, \angle 4$

## Write a Two-Column Proof

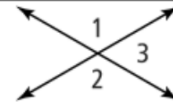


COMMON ERROR

- ▶ A theorem is a conjecture that is proven.  
Prove the Vertical Angles Theorem.

Given:  $\angle 1$  and  $\angle 2$  are vertical angles.

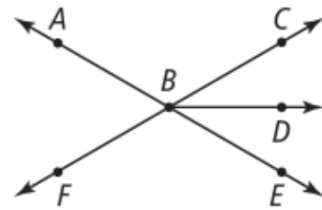
Prove:  $\angle 1 \cong \angle 2$



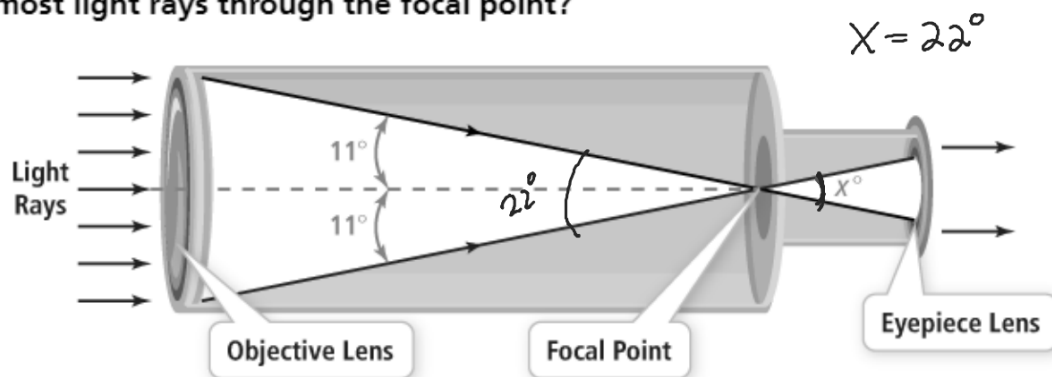
1. Write a two-column proof.

Given:  $\overrightarrow{BD}$  bisects  $\angle CBE$ .

Prove:  $\angle ABD \cong \angle FBD$



The diagram shows how glass lenses change the direction of light rays passing through a telescope. What is the value of  $x$ , the angle formed by the crossed outermost light rays through the focal point?

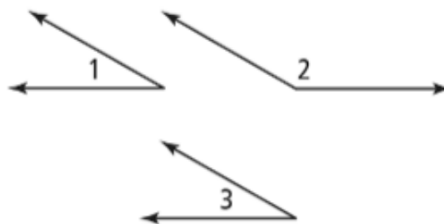


## Congruent Supplements Theorem

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

PROOF: SEE EXAMPLE 3.

If...  $m\angle 1 + m\angle 2 = 180^\circ$  and  
 $m\angle 3 + m\angle 2 = 180^\circ$



Then...  $\angle 1 \cong \angle 3$

$$m\angle 1 = 100$$

$$m\angle 2 = 80$$

$$100 + 80 = 180$$

$\updownarrow$

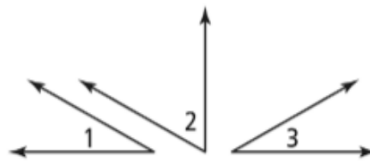
$$100 + 80 = 180$$

## Congruent Complements Theorem

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

PROOF: SEE EXAMPLE 3 TRY IT.

If...  $m\angle 1 + m\angle 2 = 90^\circ$  and  
 $m\angle 3 + m\angle 2 = 90^\circ$



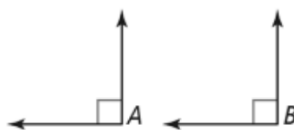
Then...  $\angle 1 \cong \angle 3$

## THEOREM 1-4

All right angles are congruent.

PROOF: SEE EXERCISE 9.

If...



Then...  $\angle A \cong \angle B$

## THEOREM 1-5

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

PROOF: SEE EXERCISE 11.

If...  $\angle 1 \cong \angle 2$  and  $m\angle 1 + m\angle 2 = 180^\circ$

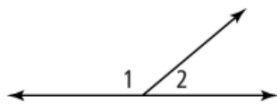


Then...  $\angle 1$  and  $\angle 2$  are right angles

## Linear Pair Postulate

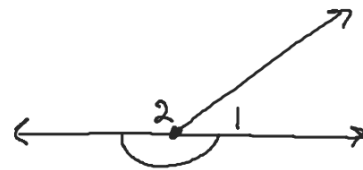
The sum of the measures of a linear pair is 180.

If...  $\angle 1$  and  $\angle 2$  form a linear pair.



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

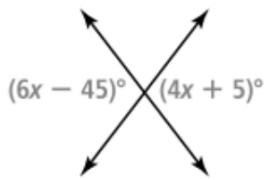
Linear Pair



- Adjacent  $\angle$ 's that are supplementary
- Adjacent  $\angle$ 's whose uncommon sides form a straight  $\angle$ .



2. a. Find the value of  $x$  and the measure of each labeled angle.



Vertical  $\angle$ 's

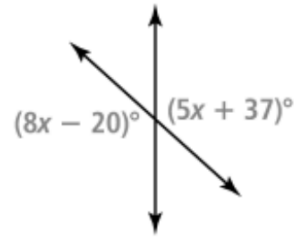
Vertical  $\angle$ 's are  $\cong$ .

$$\begin{array}{r} 6x - 45 = 4x + 5 \\ -4x \quad -4x \end{array}$$

$$2x - 45 = 5$$

$$2x = 50$$

$$x = 25$$



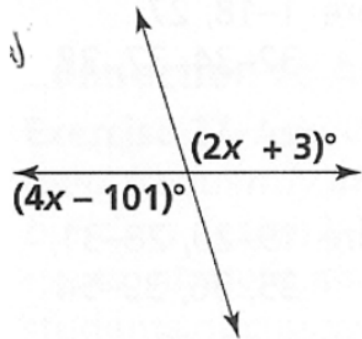
$$8x - 20 = 5x + 37$$

$$3x - 20 = 37$$

$$3x = 57$$

$$x = 19$$

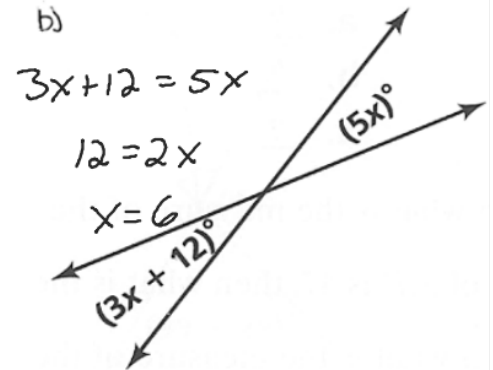
**Find the value of the varibale.**



$$4x - 101 = 2x + 3$$

$$2x = 104$$

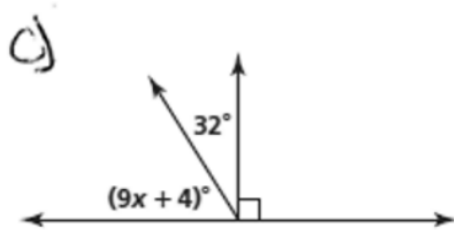
$$x = 52$$



$$3x + 12 = 5x$$

$$12 = 2x$$

$$x = 6$$



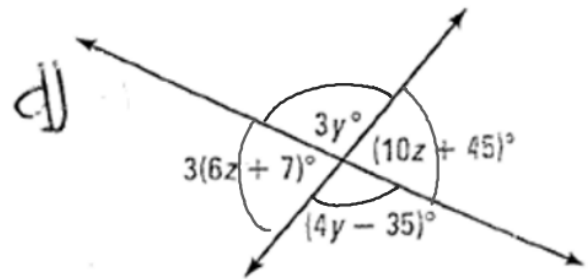
$$9x + 4 + 32 = 90$$

$$9x + 36 = 90$$

$$-36 \quad -36$$

$$9x = 54$$

$$x = 6$$



$$3(6z + 7) = 10z + 45 \quad \left| \quad 3y = 4y - 35 \right.$$

$$18z + 21 = 10z + 45 \quad \left| \quad -4y \quad -4y \right.$$

$$8z + 21 = 45$$

$$8z = 24$$

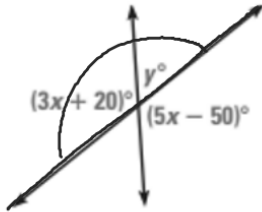
$$z = 3$$

$$-y = -35$$

$$y = 35$$

3. Solve for the variable using what you know about angle relationships. Show Work.

a.



$$3x + 20 = 5x - 50$$

$$20 = 2x - 50$$

$$70 = 2x$$

$$x = 35 \leftarrow$$

$$3x + 20 + y = 180$$

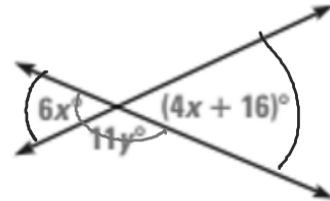
$$3(35) + 20 + y = 180$$

$$105 + 20 + y = 180$$

$$125 + y = 180$$

$$y = 55 \leftarrow$$

b.



$$6x = 4x + 16$$

$$2x = 16$$

$$x = 8$$

$$6x + 11y = 180$$

$$6(8) + 11y = 180$$

$$48 + 11y = 180$$

$$11y = 132$$

$$y = 12$$