

## 9.1: Parallel Lines and Angles

When you have two parallel lines that are cut by a transversal, the angles that are created are all related to each other. Many of these angles will either be **congruent** or **supplementary**.

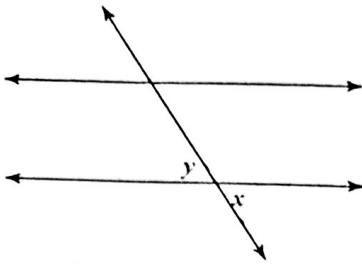
Congruent	Supplementary
$\cong$ , have the same measure	measures add to $180^\circ$

Define and label each of the following relationships. Then determine if the angles are congruent or supplementary.

<p>Corresponding Angles                      Angles in the same spot between the top &amp; bottom group are <u>congruent</u></p>	
<p>Alternate Interior Angles                      Angles on opposite sides of the line inside the parallel lines are <u>congruent</u></p>	
<p>Alternate Exterior Angles                      Angles on opposite sides of the transversal outside the parallel lines are <u>congruent</u></p>	
<p>Same Side Interior Angles                      Angles on the same side of the transversal inside the parallel lines are <u>supplementary</u></p>	
<p>Vertical Angles                      Angles across from each other are <u>congruent</u></p>	
<p>Adjacent Angles                      Angles next to each other (form a line) are <u>supplementary</u></p>	

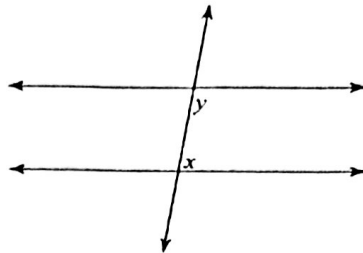
1) Identify each relationship. State whether the angles are congruent or supplementary.

a)



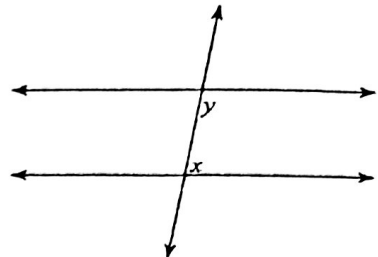
Vertical angles  
congruent

b)



Same side interior,  
supplementary

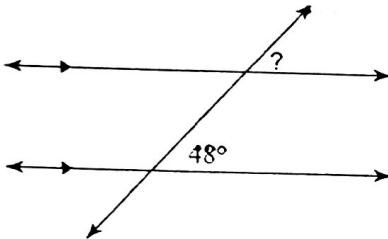
c)



Same side interior,  
supplementary

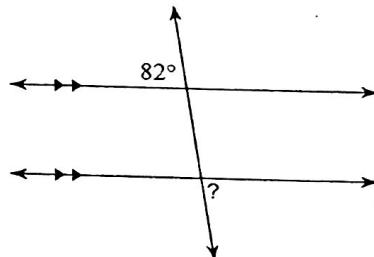
2) Find the measure of the missing angle.

a)



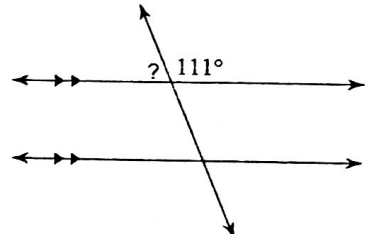
Corresponding: congruent  
 $48^\circ$

b)



Alternate exterior:  
congruent  
 $82^\circ$

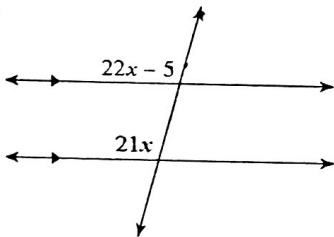
c)



Adjacent: supplementary  
 $180 - 111 = 69^\circ$

3) Find the value of  $x$ . Then solve for the measure of the angle.

a)



Corresponding, congruent

$$22x - 5 = 21x$$

$$-22x \quad -22x$$

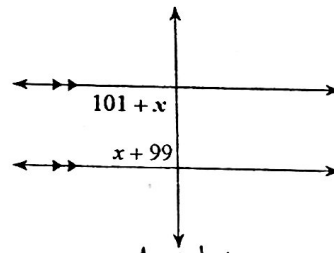
$$-5 = -x$$

$$\boxed{5 = x}$$

Plug back in to  
find angle measure

$$21(5) = \boxed{105^\circ}$$

b)



Same side interior,  
supplementary

Plug  $x$  into both since they  
have different measures

$$101 + x + x + 99 = 180$$

$$2x + 200 = 180$$

$$-200 \quad -200$$

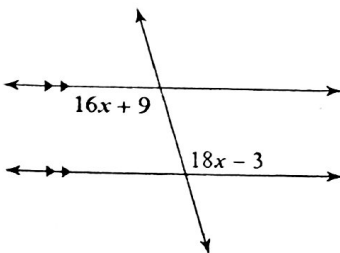
$$\frac{2x}{2} = \frac{-20}{2}$$

$$\boxed{x = -10}$$

$$101 + (-10) = \boxed{91^\circ}$$

$$(-10) + 99 = \boxed{89^\circ}$$

c)



Alternate interior, congruent  
Because the angles are congruent,  
you only have to plug  $x$  into  
one of the angles

$$16x + 9 = 18x - 3$$

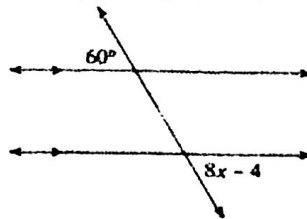
$$-16x + 3 \quad -16x + 3$$

$$\frac{12}{2} = \frac{2x}{2}$$

$$\boxed{6 = x}$$

$$16(6) + 9 = 96 + 9 = \boxed{105^\circ}$$

d)



Alternate exterior, congruent

$$8x - 4 = 60$$

$$+4 \quad +4$$

$$\frac{8x}{8} = \frac{64}{8}$$

$$\boxed{x = 8}$$

$$\boxed{60^\circ}$$