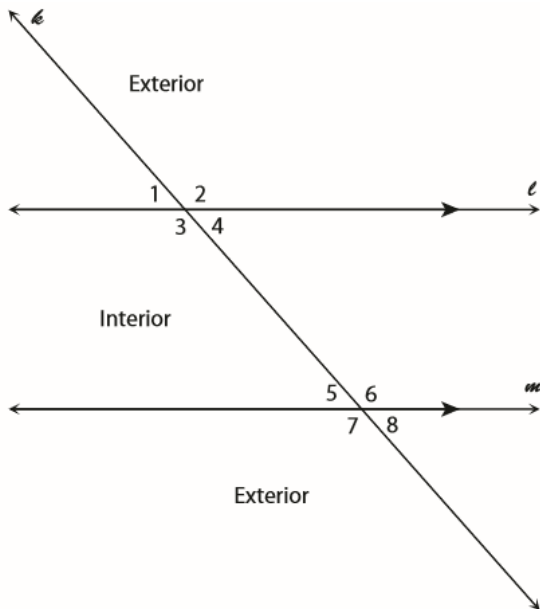


## UNIT 4 – LESSON 5 ANGLES IN PARALLEL LINES CUT BY A TRANSVERSAL

In the lesson you will determine angle relationships when parallel lines are cut by a transversal.

A **transversal** is a line that intersects a system of two or more lines.

Look at the diagram...notice the interior angles versus the exterior angles. The interior angles lie between the parallel lines and the exterior angles lie outside the parallel lines.



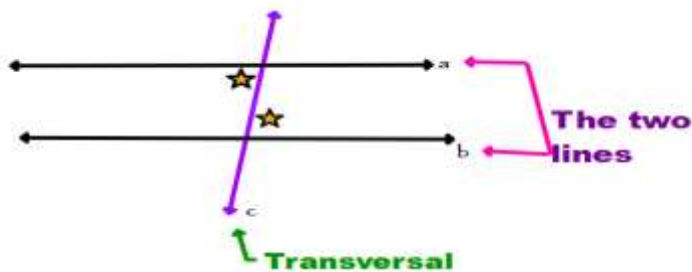
Lines  $l$  and  $m$  are parallel lines.

Line  $k$  is the transversal.

The exterior angles are  $\angle 1, \angle 2, \angle 7, \angle 8$

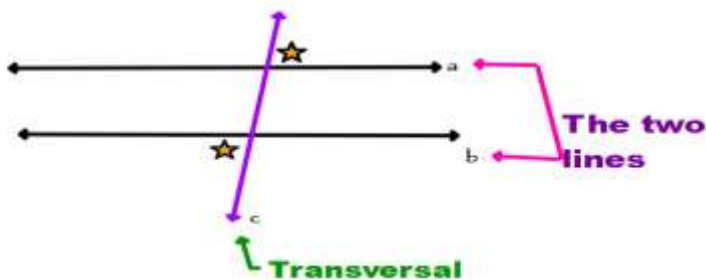
The interior angles are  $\angle 3, \angle 4, \angle 5, \angle 6$

**1. Alternate Interior Angles - Two angles that are on opposite sides of the transversal and inside of the two lines.**



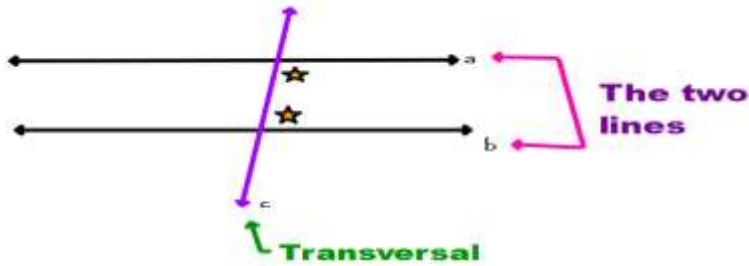
WHEN THE TWO LINES ARE PARALLEL, THESE ANGLES ARE CONGRUENT!!!

**2. Alternate Exterior Angles - Two angles on opposite sides of the transversal and outside of the two lines.**



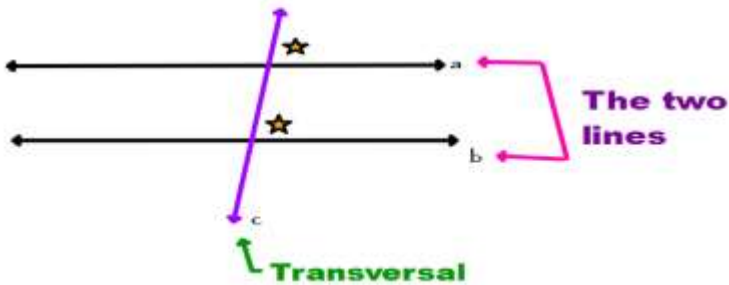
WHEN THE TWO LINES ARE PARALLEL, THESE ANGLES ARE CONGRUENT!!!

**3. Consecutive Interior Angles** -- Angles that are on the **same side** of the transversal and **inside** of the two lines.



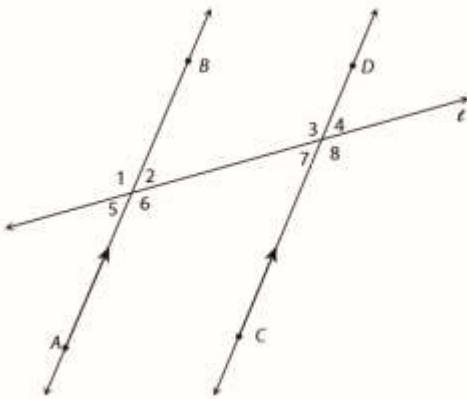
WHEN THE TWO LINES ARE PARALLEL, THESE ANGLES ARE SUPPLEMENTARY!!!

**4. Corresponding Angles** -- Angles that are on the **same side** of the transversal and one **inside** of the two lines and one **outside**.



WHEN THE TWO LINES ARE PARALLEL, THESE ANGLES ARE CONGRUENT!!!

Use the following diagram to solve problems 1 – 3, given that  $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$  and line  $l$  is the transversal. Justify your answers using angle relationships in parallel lines intersected by a transversal.



1. Find  $m\angle 5$  if  $m\angle 5 = 2(3x + 13)$  and  $m\angle 7 = 3x + 50$ .

$m\angle 5$  and  $m\angle 7$  are Corresponding angles which makes them congruent.

$$2(3x + 13) = 3x + 50$$

$$6x + 26 = 3x + 50$$

$$3x = 24$$

$$x = 8$$

Now plug  $x = 8$  into the equation for  $m\angle 5$

$$m\angle 5 = 2(3x + 13)$$

$$= 6x + 26$$

$$= 6(8) + 26$$

$$m\angle 5 = 74^\circ$$

2. Find  $m\angle 2$  if  $m\angle 2 = 4x + 39$  and  $m\angle 7 = 12x - 17$ .

$m\angle 2$  and  $m\angle 7$  are Alternate interior angles which makes them congruent.

$$12x - 17 = 4x + 39$$

$$8x - 17 = 39$$

$$8x = 56$$

$$x = 7$$

Now plug  $x = 7$  into the equation for  $m\angle 2$

$$m\angle 2 = 4x + 39$$

$$= 4(7) + 39$$

$$\mathbf{m\angle 2 = 67^\circ}$$

3. Find  $m\angle 6$  if  $m\angle 6 = 7x + 41$  and  $m\angle 7 = 3x - 1$ .

$m\angle 6$  and  $m\angle 7$  are Consecutive interior angles which makes them supplementary (equal to  $180^\circ$ ).

$$7x + 41 + 3x - 1 = 180$$

$$10x + 40 = 180$$

$$10x = 140$$

$$x = 14$$

Now plug  $x = 14$  into the equation for  $m\angle 6$

$$m\angle 6 = 7x + 41$$

$$= 7(14) + 41$$

$$\mathbf{m\angle 6 = 139^\circ}$$