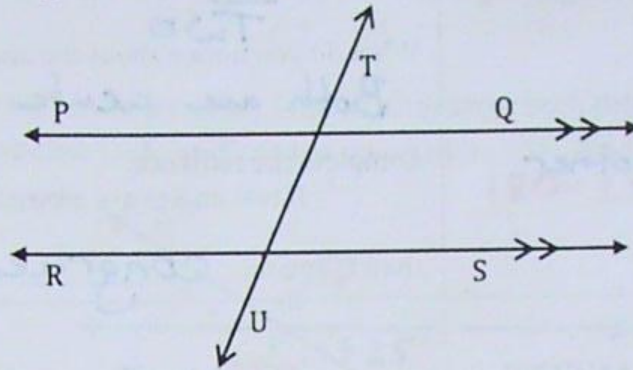


## Corresponding, Alternate Interior, and Alternate Exterior Angles

If two parallel lines are intersected by another line, how many angles are formed?

Number them on the diagram.



Parallel  
 $\overline{PQ} \parallel \overline{RS}$   
 $\overline{TU}$  is a transversal

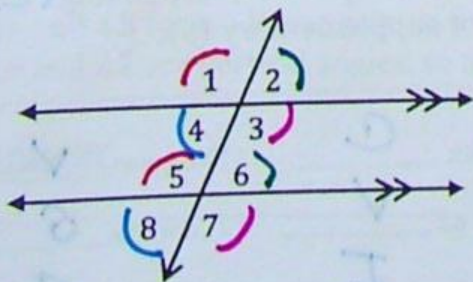
The extra arrows on two of the lines mean they are parallel.

The line that intersects the two lines is called a transversal.

The number of angles formed is 8.

The angles formed when parallel lines are cut by a transversal line have special relationships and are named according to those relationships with one another.

### CORRESPONDING ANGLES



Definition: Same side of the transversal and both are above or below the

Name the corresponding angles for the following.

- 1)  $\sphericalangle 1$  corresponds with  $\sphericalangle$  5
- 2)  $\sphericalangle 2$  corresponds with  $\sphericalangle$  6
- 3)  $\sphericalangle 3$  corresponds with  $\sphericalangle$  7
- 4)  $\sphericalangle 4$  corresponds with  $\sphericalangle$  8

What do you notice about the angle pairs above?

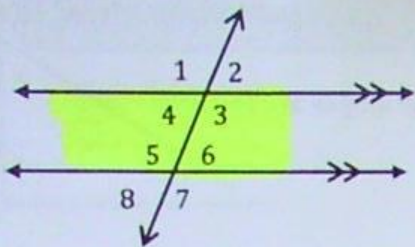
Both are acute or both are obtuse

Complete the sentence:

If two angles are *corresponding* angles,

then they are: congruent  $\cong$

ALTERNATE INTERIOR ANGLES



Word attack

To alternate means *every other*

Interior means: *inside*

Definition: *Inside the // lines and opposite sides of the transversal*  
Name the alternate interior angle for the following angles.

- 1)  $\angle 3$  is an alternate interior angle with  $\angle$  5
- 2)  $\angle 4$  is an alternate interior angle with  $\angle$  6

How many Two pairs of alternate interior angles are possible?

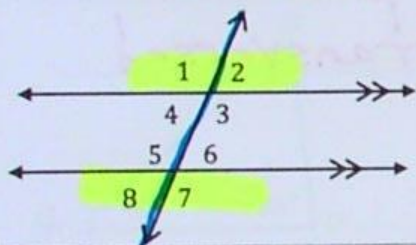
What do you notice about the angle pairs above?

*Both are acute or obtuse*

Complete the sentence:

If two angles are *alternate interior* angles, then they are: congruent

ALTERNATE EXTERIOR ANGLES



Word attack

To alternate means *every other*

Exterior means: *outside*

Definition: *Outside of the // lines and opposite sides of the transversal*  
Name the alternate exterior angle for the following angles.

- 1)  $\angle 1$  is an alternate exterior angle with  $\angle$  7
- 2)  $\angle 2$  is an alternate exterior angle with  $\angle$  8

How many Two pairs of alternate exterior angles are possible?

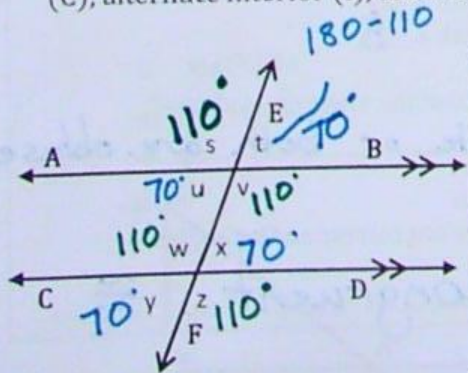
What do you notice about the angle pairs above?

*Both are acute or obtuse*

Complete the sentence:

If two angles are *alternate exterior* angles, then they are: congruent

Look at the diagram below. For each pair of angles, state whether they are corresponding (C), alternate interior (I), alternate exterior (E), vertical (V), or supplementary (S).



- |                                  |                                   |                                   |
|----------------------------------|-----------------------------------|-----------------------------------|
| 1) $\angle u, \angle x$ <u>I</u> | 6) $\angle t, \angle x$ <u>C</u>  | 11) $\angle t, \angle u$ <u>V</u> |
| 2) $\angle w, \angle s$ <u>C</u> | 7) $\angle w, \angle z$ <u>V</u>  | 12) $\angle w, \angle x$ <u>S</u> |
| 3) $\angle t, \angle y$ <u>E</u> | 8) $\angle v, \angle w$ <u>I</u>  | 13) $\angle w, \angle s$ <u>C</u> |
| 4) $\angle s, \angle t$ <u>S</u> | 9) $\angle v, \angle z$ <u>C</u>  | 14) $\angle s, \angle v$ <u>V</u> |
| 5) $\angle w, \angle y$ <u>S</u> | 10) $\angle s, \angle z$ <u>E</u> | 15) $\angle x, \angle z$ <u>S</u> |

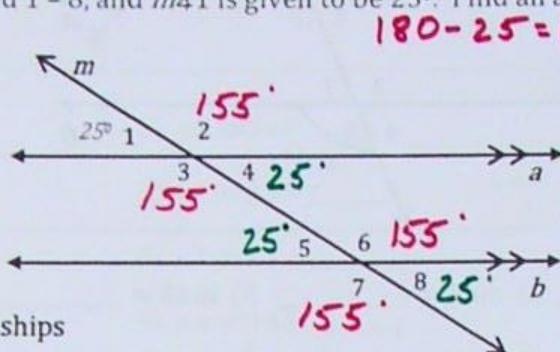
16) If  $m\angle s = 110^\circ$ , find the measure of the remaining angles.

$m\angle v = 110^\circ$   $m\angle t = 70^\circ$   $m\angle u = 70^\circ$   $m\angle w = 110^\circ$   $m\angle x = 70^\circ$   $m\angle y = 70^\circ$   $m\angle z = 110^\circ$

## Parallel Lines Cut by a Transversal

As explained in the previous section, when two parallel lines are intersected, or "cut," by a transversal, eight angles are formed. Any two angles are either congruent or supplementary! Given the measure of just one of the eight angles, the other seven can be determined.

**Example:** Lines  $a$  and  $b$  are parallel. Line  $m$  intersects both line  $a$  and  $b$ . The eight resulting angles are labeled 1 - 8, and  $m\angle 1$  is given to be  $25^\circ$ . Find all angle measures.



**Step 1:** Notice the relationships

$\angle 1$  and  $\angle 4$  are vertical angles and therefore  $\cong$ , so  $m\angle 4 = 25^\circ$ .

Other pairs of vertical angles are  $\angle 2$  and  $\angle 3$ ,  $\angle 5$  and  $\angle 8$ ,  $\angle 6$  and  $\angle 7$ .

$\angle 1$  is supplementary to  $\angle 2$ ; so the  $m\angle 2 = 180^\circ - \angle 1 = 180^\circ - 25^\circ = 155^\circ$ .

$\angle 1$  is also supplementary to  $\angle 3$ ; so the  $m\angle 3$  is also  $155^\circ$ .

Notice that  $\angle 2$  and  $\angle 3$  are vertical angles, and would have to be  $\cong$  to each other.

**Step 2:** Corresponding angles have the same relative position, like  $\angle 1$  and  $\angle 5$  are both in the upper left section of the intersecting lines. Corresponding angles are always congruent, so  $m\angle 1$  and  $m\angle 5$  are both  $25^\circ$ .  $\angle 5$  and  $\angle 8$  are vertical angles, so  $m\angle 8 = 25^\circ$ .

$\angle 6$  and  $\angle 8$  form a linear pair, so  $m\angle 6 = 180^\circ - 25^\circ = 155^\circ$ .

$\angle 6$  and  $\angle 7$  are vertical angles, so  $m\angle 7$  is also  $155^\circ$ .

**Answer:**

$m\angle 1$ ,  $m\angle 4$ ,  $m\angle 5$  and  $m\angle 8$  (all) =  $25^\circ$  and are acute angles

$m\angle 2$ ,  $m\angle 3$ ,  $m\angle 6$  and  $m\angle 7$  (all) =  $155^\circ$  and are obtuse angles