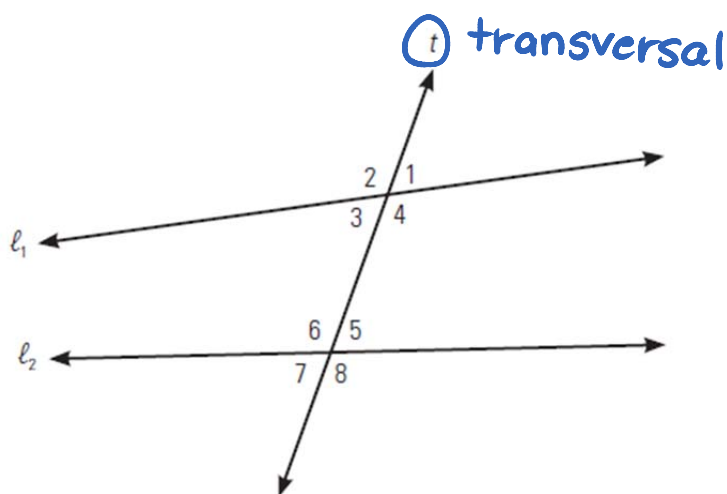


### 5.3 – Non-Parallel Lines and Transversals

Many angles can be formed by two lines and a **transversal**. By definition, a transversal is just a line that intersects (or crosses) two or more other lines. Whether or not the two lines the transversal crosses are parallel, there are specific relationships formed when lines intersect. The illustration below shows these relationships.

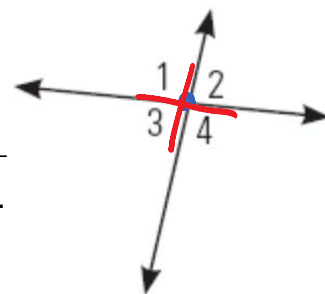


In this diagram, the two lines,  $l_1$  and  $l_2$  are clearly not parallel. The relationships described below holds true for parallel lines too.

There are eight angles, of varying sizes and relationships formed.

**Vertically opposite angles:** angles created by intersecting lines, share vertex. Look for an “X”.

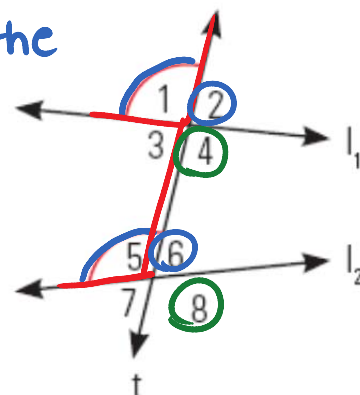
$$\angle \underline{1} \text{ and } \angle \underline{4}, \angle \underline{2} \text{ and } \angle \underline{3}$$



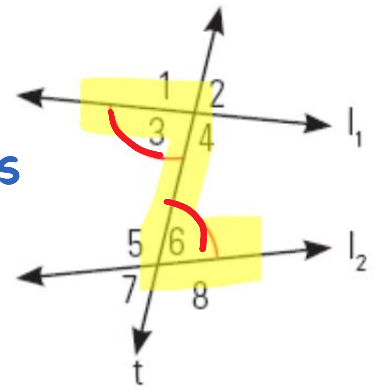
F 7 E D T

**Corresponding angles:** two angles that have the same location at diff. intersections. Look for an “F”.

$$\begin{array}{l} \angle \underline{5} \text{ and } \angle \underline{1}, \angle \underline{6} \text{ and } \angle \underline{2}, \angle \underline{8} \text{ and } \angle \underline{4}, \\ \angle \underline{7} \text{ and } \angle \underline{3} \end{array}$$

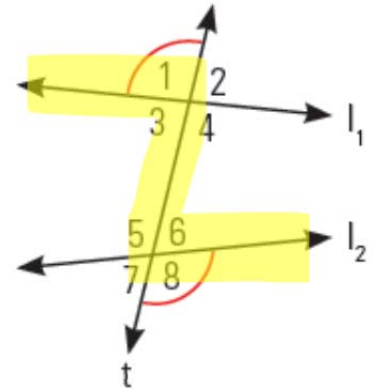


Alternate interior angles: angles in opposite positions on different lines that is intersected by a transversal. Look for a "Z". The angles are inside the "Z".



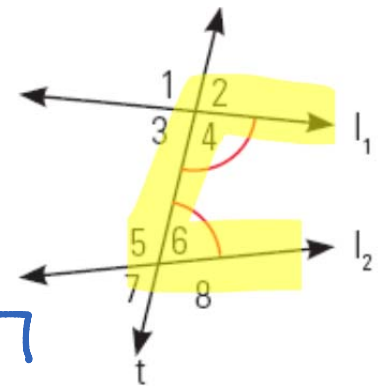
$$\angle \underline{3} \text{ and } \angle \underline{6}, \angle \underline{5} \text{ and } \angle \underline{4}$$

Alternate exterior angles: Look for a "Z". The angles are outside "Z".



$$\angle \underline{1} \text{ and } \angle \underline{8}, \angle \underline{2} \text{ and } \angle \underline{7}$$

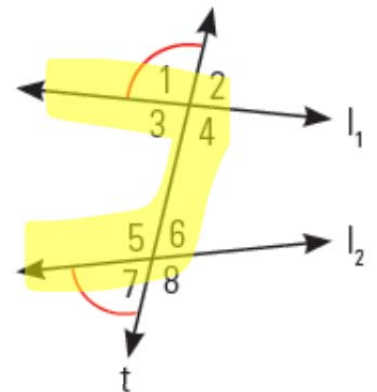
Interior angles on the same side of the transversal: Look for a "C". The angles are on the inside.



$$\angle \underline{4} \text{ and } \angle \underline{6}, \angle \underline{3} \text{ and } \angle \underline{5}$$

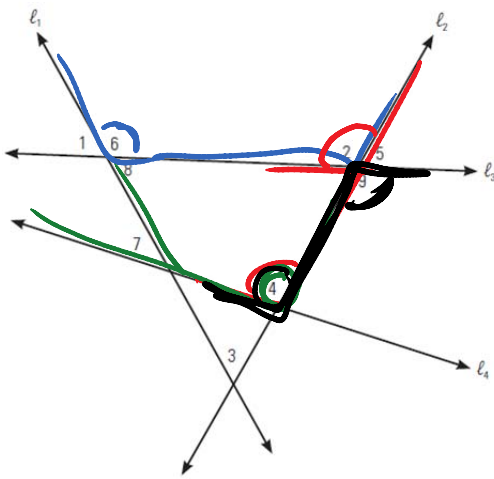
]] [[, U, n

Exterior angle on the same side of the transversal: Look for a "C". The angles are on the outside of the "C".



$$\angle \underline{1} \text{ and } \angle \underline{7}, \angle \underline{2} \text{ and } \angle \underline{8}$$

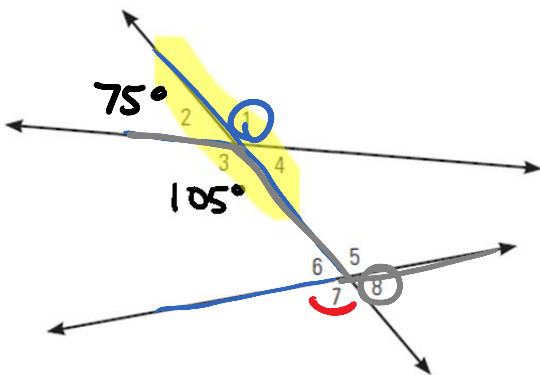
**Example 1:** In the following diagram, identify each of the following, and specify which lines and transversals you are using.



- a) an interior angle on the same side of the transversal as  $\angle 6$  [  $\angle 2$   
 $l_1$  and  $l_2$   
 $l_3$  transversal
- b) an angle corresponding to  $\angle 2$   
 $l_2$  trans.  $\angle 4$   
 $l_3$  and  $l_4$
- c) an angle corresponding to  $\angle 4$   
 $l_4$  trans.  $\angle 7$   
 $l_1$  and  $l_2$
- d) an alternate interior angle to  $\angle 4$   
 $l_2$  trans  $\angle 9$   
 $l_3$  and  $l_4$

**Example 2:** In the following diagram identify the value of each angle if  $\angle 3$  is  $105^\circ$ .

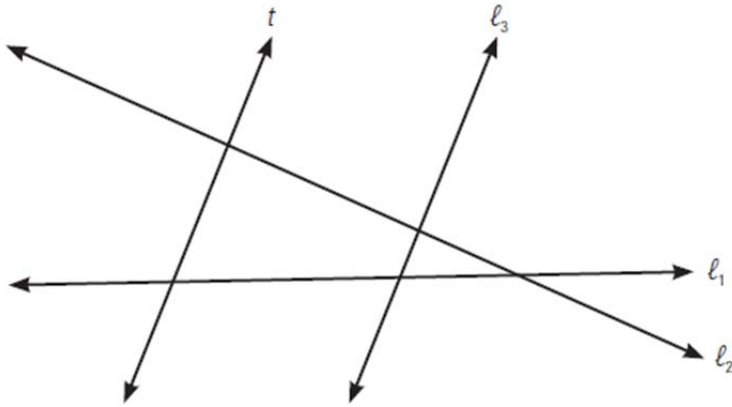
$180 - 105 = 75^\circ$



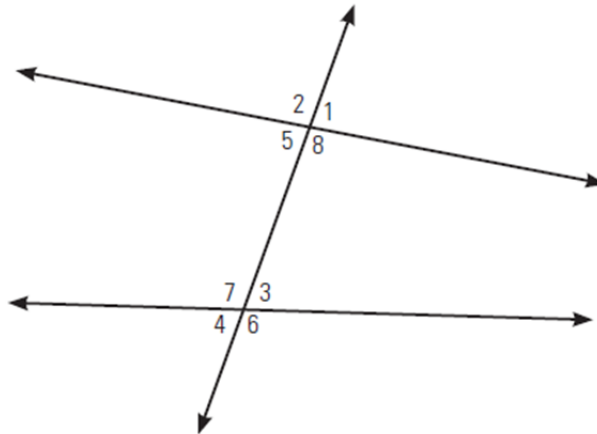
- a) the exterior angle on the same side of the transversal as  $\angle 7$   $1 + 2 = 180$   
 $\angle 7 = \angle 2 = 75^\circ$   $1/2$
- b) the angle corresponding to  $\angle 6$  (F)  
 $\angle 6 = \angle 2 = 75^\circ$
- c) the angle vertically opposite to  $\angle 1$   
 $\angle 1 = \angle 3 = 105^\circ$
- d) the alternate exterior angle to  $\angle 8$   
 $\angle 8 = \angle 2 = 75^\circ$

## Non-Parallel Lines and Transversals Worksheet

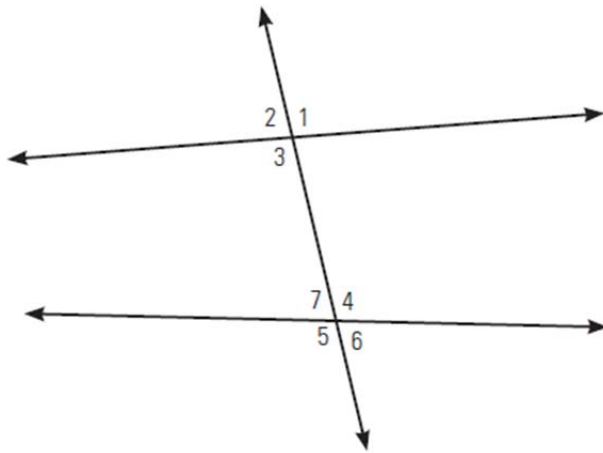
- 1) In the diagram below,  $t$  is a transversal that intersects  $l_1$  and  $l_2$ . Name another pair of lines and their transversal.



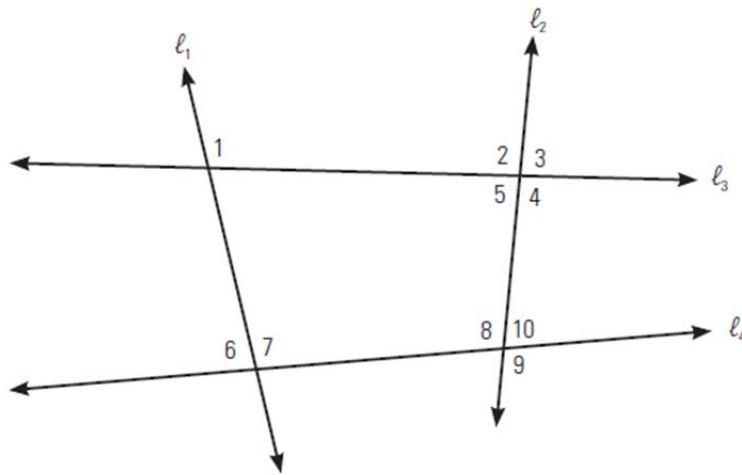
- 2) In the diagram below, identify the relationship between each pair of angles.



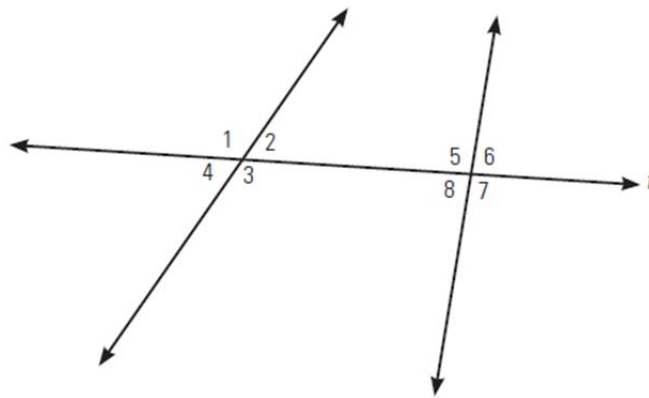
- a)  $\angle 7$  and  $\angle 8$
  - b)  $\angle 2$  and  $\angle 7$
  - c)  $\angle 1$  and  $\angle 6$
  - d)  $\angle 5$  and  $\angle 7$
- 3) Given the diagram below, identify the following angles.



- a) An alternate exterior angle to  $\angle 2$
  - b) An interior angle on the same side of the transversal as  $\angle 7$
  - c) An alternate interior angle to  $\angle 4$
  - d) An angle corresponding to  $\angle 5$
- 4) Identify each of the following angles. Name the two lines and the transversal you are using.

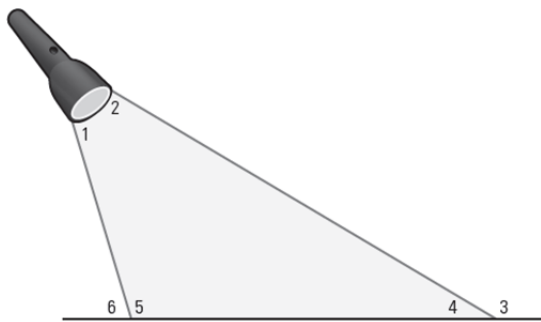


- a) two angles corresponding to  $\angle 1$
  - b) an interior angle on the same side of the transversal as  $\angle 10$
  - c) an alternate interior angle to  $\angle 5$
  - d) two interior angles on the same side of the transversal as  $\angle 8$
- 5) In the diagram below, where  $t$  is the transversal, identify two pairs of each of the following angles.

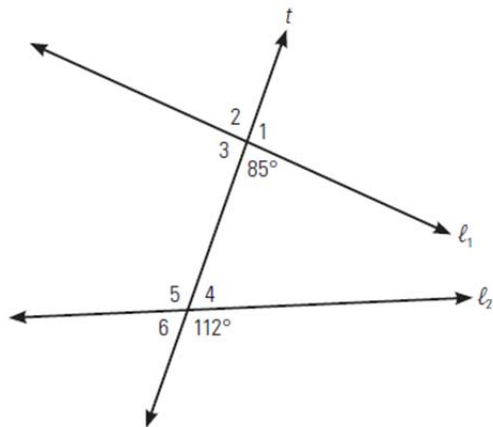


- a) alternate interior angles
- b) corresponding angles
- c) interior angles on the same side of the transversal

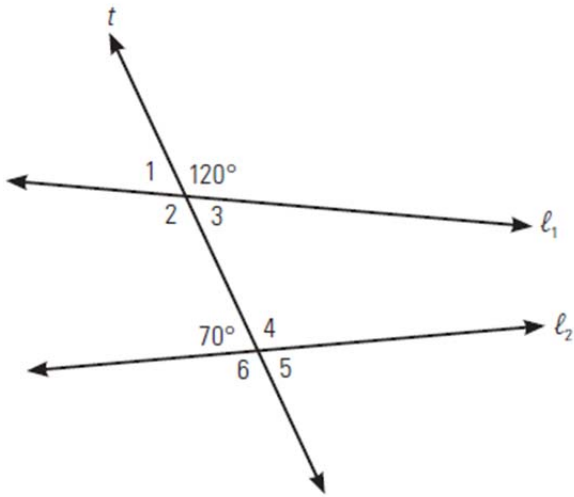
6) A flashlight shines down onto a floor as shown in the diagram below. If the outer rays are considered to be two lines and the floor is a transversal, name a pair of corresponding angles.



7) In the diagram below, calculate the sizes of each of the interior angles. What is their sum?



8) Calculate the sizes of the six angles indicated in the figure.



Answers:

1)  $t$  and  $l_3$  intersected by  $l_1$  and  $l_2$ .

2) a) alternate interior angles b) corresponding angles c) exterior angles on the same side of the transversal d) interior angles on the same side of the transversal

3) a)  $\angle 6$  b)  $\angle 3$  c)  $\angle 3$  d)  $\angle 3$

4) a)  $\angle 7$ , using lines  $l_3$  and  $l_4$  with transversal  $l_1$ .  $\angle 3$ , using lines  $l_1$  and  $l_2$  with transversal  $l_3$ . b)  $\angle 4$ , using lines  $l_3$  and  $l_4$  with transversal  $l_2$ . c)  $\angle 10$ , using lines  $l_3$  and  $l_4$  with transversal  $l_2$ . d)  $\angle 5$ , using lines  $l_3$  and  $l_4$  with transversal  $l_2$ .  $\angle 7$ , using lines  $l_1$  and  $l_2$  with transversal  $l_4$ .

5) a)  $\angle 3$  and  $\angle 5$ ;  $\angle 2$  and  $\angle 8$  b)  $\angle 1$  and  $\angle 5$ ;  $\angle 2$  and  $\angle 6$ ;  $\angle 3$  and  $\angle 7$ ;  $\angle 4$  and  $\angle 8$

c)  $\angle 2$  and  $\angle 5$ ;  $\angle 3$  and  $\angle 8$

6)  $\angle 3$  and  $\angle 5$ ;  $\angle 4$  and  $\angle 6$

7)  $\angle 1 = 95^\circ$   $\angle 2 = 85^\circ$   $\angle 3 = 95^\circ$   $\angle 4 = 68^\circ$   $\angle 5 = 112^\circ$   $\angle 6 = 68^\circ$ ;  $85^\circ + \angle 3 + \angle 4 + \angle 5 = 360^\circ$

8)  $\angle 1 = 60^\circ$   $\angle 2 = 120^\circ$   $\angle 3 = 60^\circ$   $\angle 4 = 110^\circ$   $\angle 5 = 70^\circ$   $\angle 6 = 110^\circ$