

## Pairs of Lines and Angles

### Lesson Objective

IDENTIFY PARALLEL, PERPENDICULAR, AND SKEW LINES; IDENTIFY PAIRS OF ANGLES FORMED BY TRANSVERSALS.

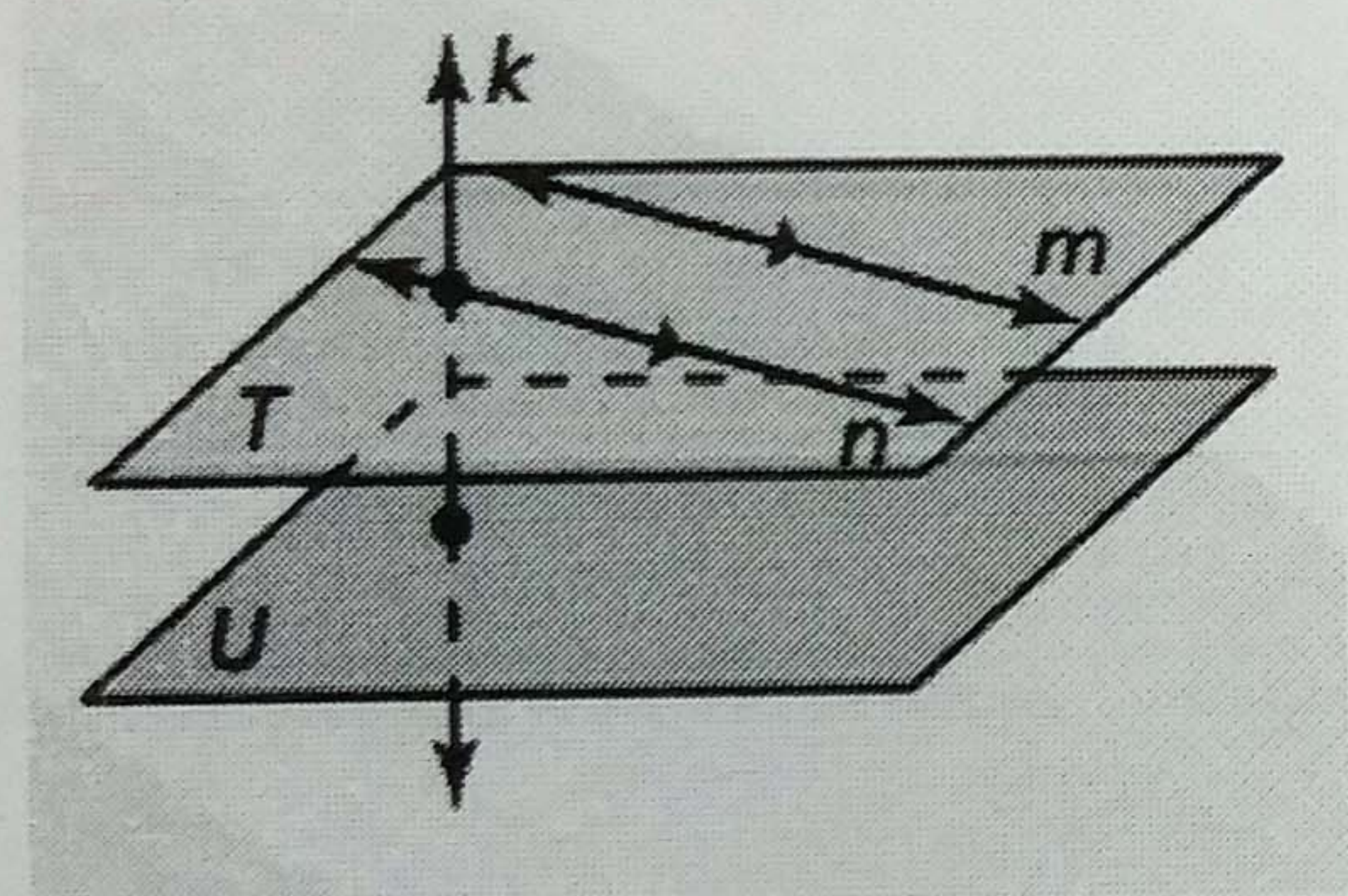
Two lines that do NOT intersect are either PARALLEL lines or SKEW lines.

Parallel Lines: two lines are parallel lines when they do NOT intersect and are COPLANAR.

Skew Lines: two lines are skew lines when they do NOT intersect and are NOT COPLANAR.

Parallel Planes: two planes are parallel planes if they do NOT intersect.

Example:

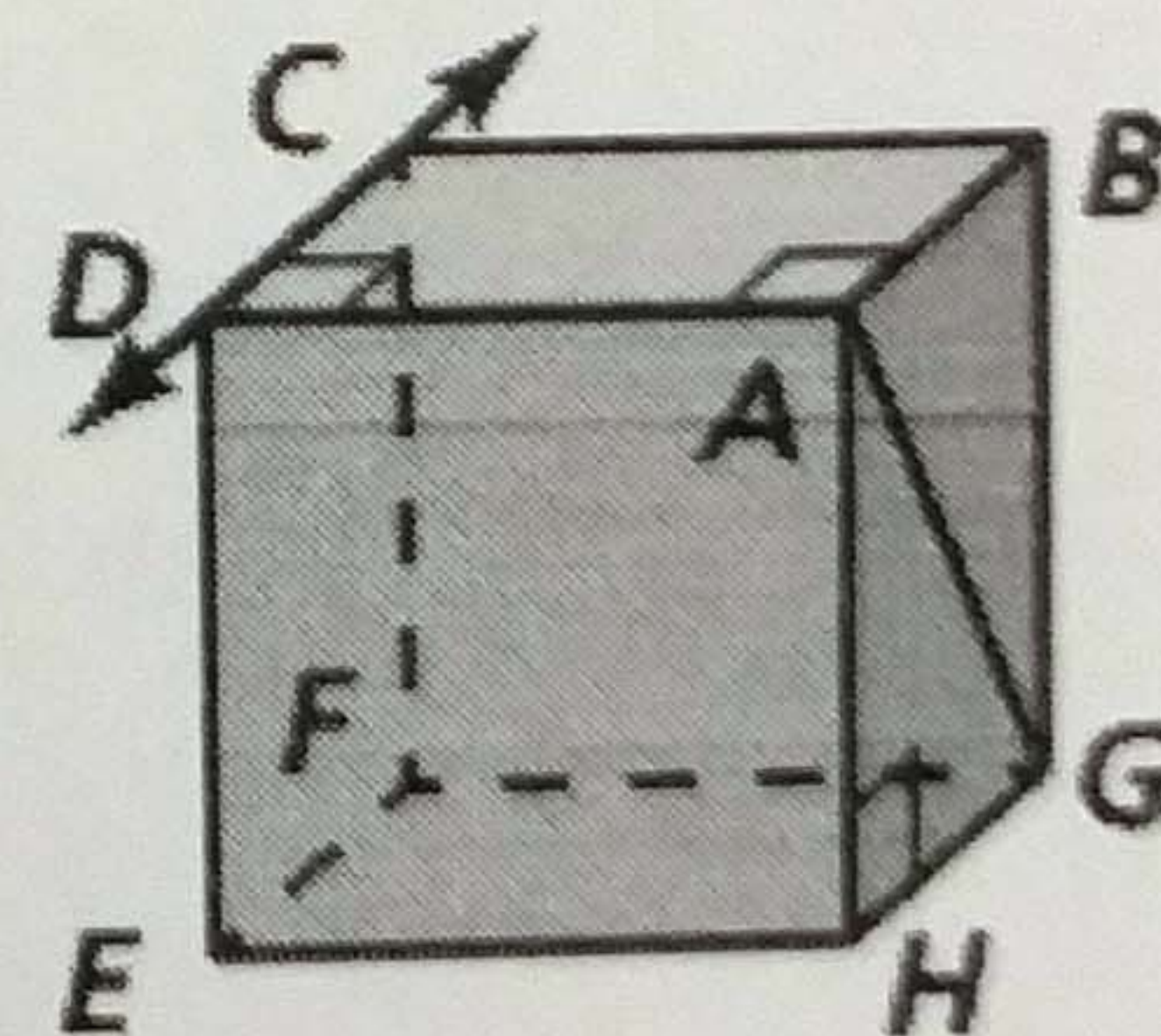


1. Which lines are parallel?  
 → Small directed arrows (usually RED in color) are used to show lines are parallel.  
 → The symbol // means "is parallel to"  $m \parallel n$
2. Which lines are skew?  $m$  and  $k$  
 $m$  is "behind"  
 $k$
3. Which planes are parallel? plane T and plane U
4. Name the line(s) parallel to plane U.  $m$  and  $n$

Think About It... Are segments and rays that are within parallel lines also parallel? Why or why not?

Example:

5. Think of each segment in the figure as part of a line. Which line(s) or plane(s) appear to fit the description?

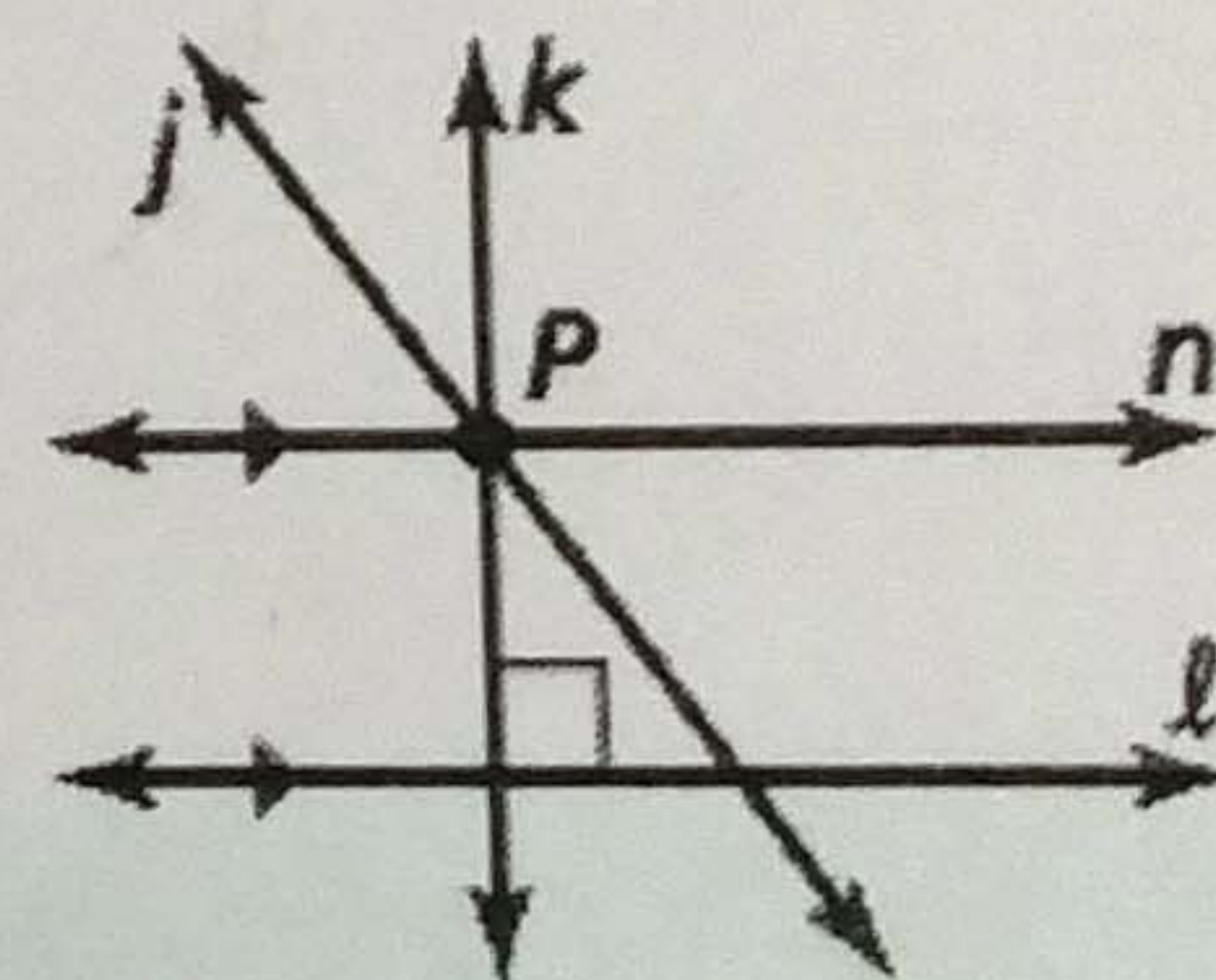


- a. Line(s) parallel to  $\overleftrightarrow{CD}$  and containing point A  $\overline{BA}$
- b. Line(s) skew to  $\overleftrightarrow{CD}$  and containing point A  $\overline{HA}$  and  $\overline{AG}$
- c. Line(s) perpendicular to  $\overleftrightarrow{CD}$  and containing point A  $\overline{AD}$
- d. Plane(s) parallel to plane EFG and containing point A plane ABC

→ Two distinct lines in the same plane are either parallel (like  $n$  and  $l$ ) or intersect in a point (like  $n$  and  $j$ ).

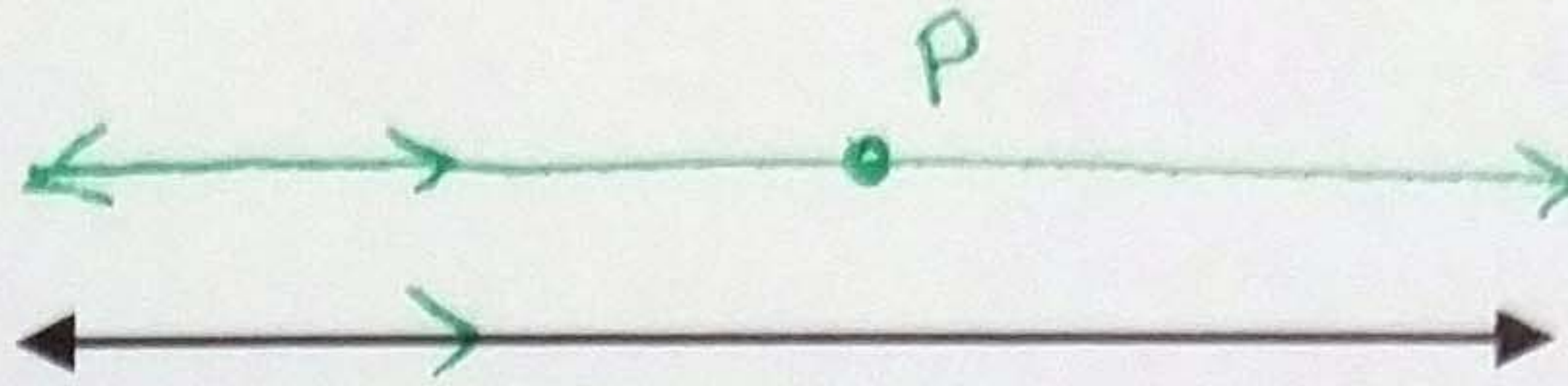
Think About It...

- How many through point P are parallel to line  $l$ ? ONE  
 → How many through point P are perpendicular to line  $l$ ? ONE

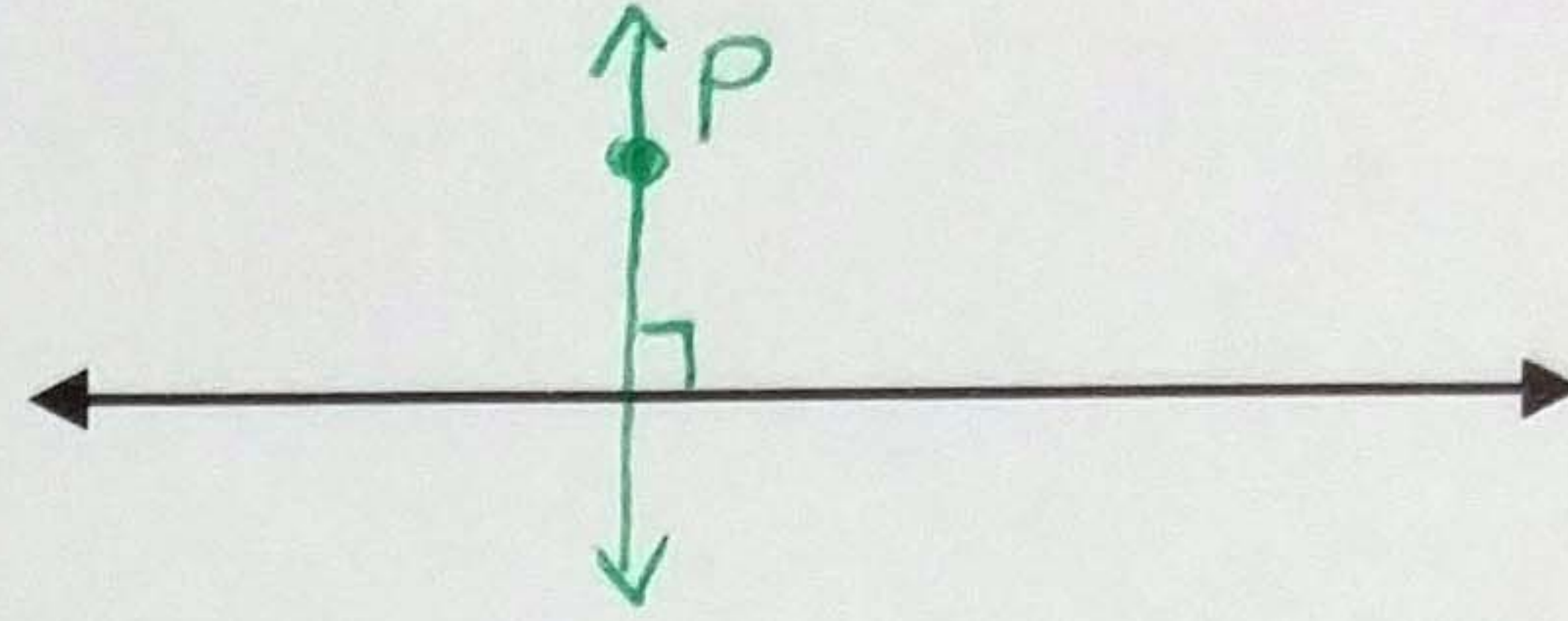




**Parallel Postulate:** If there is a line and a point not on the line, then there is exactly ONE line through the point that is PARALLEL to the given line.

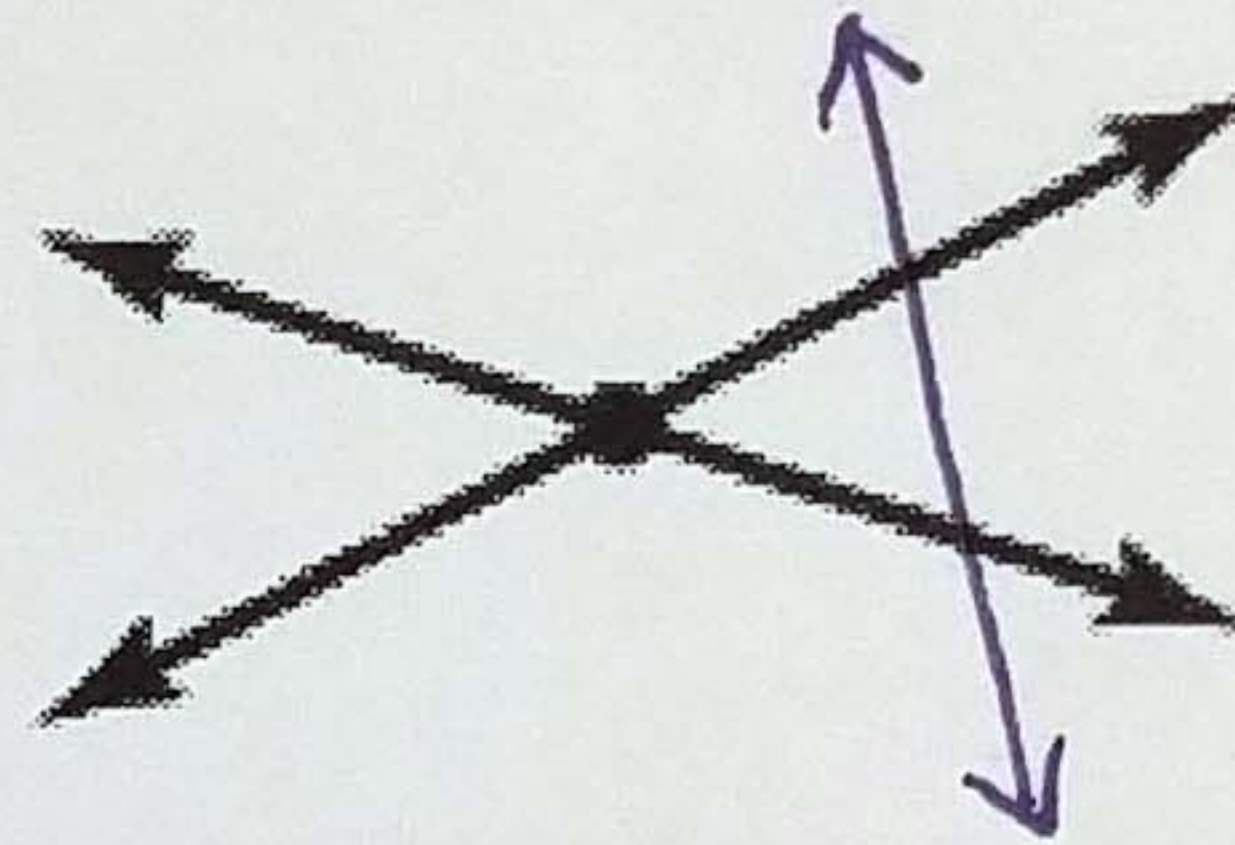
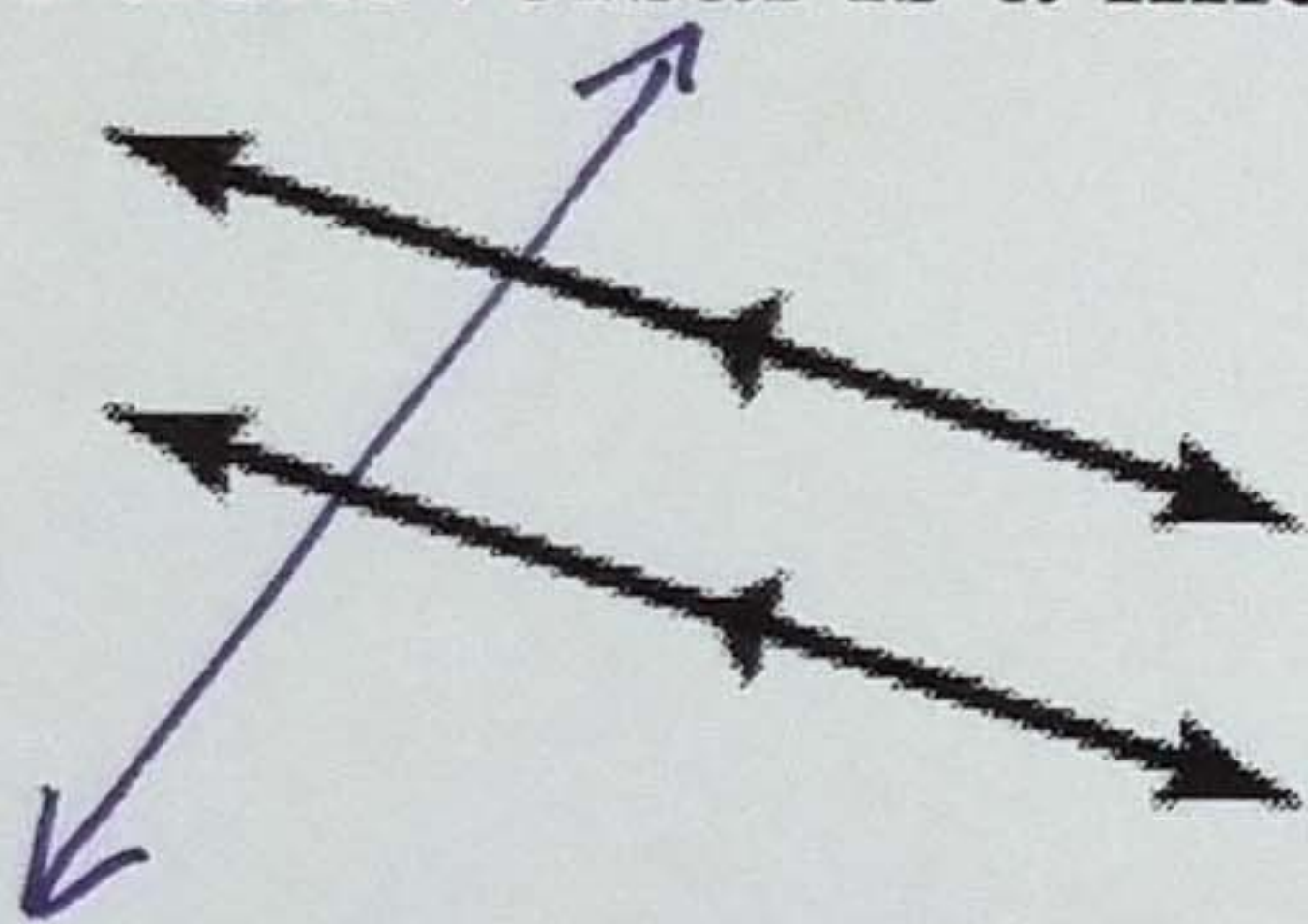


**Perpendicular Postulate:** If there is a line and a point not on the line, then there is exactly ONE line through the point that is PERPENDICULAR ( $\perp$ ) to the given line.



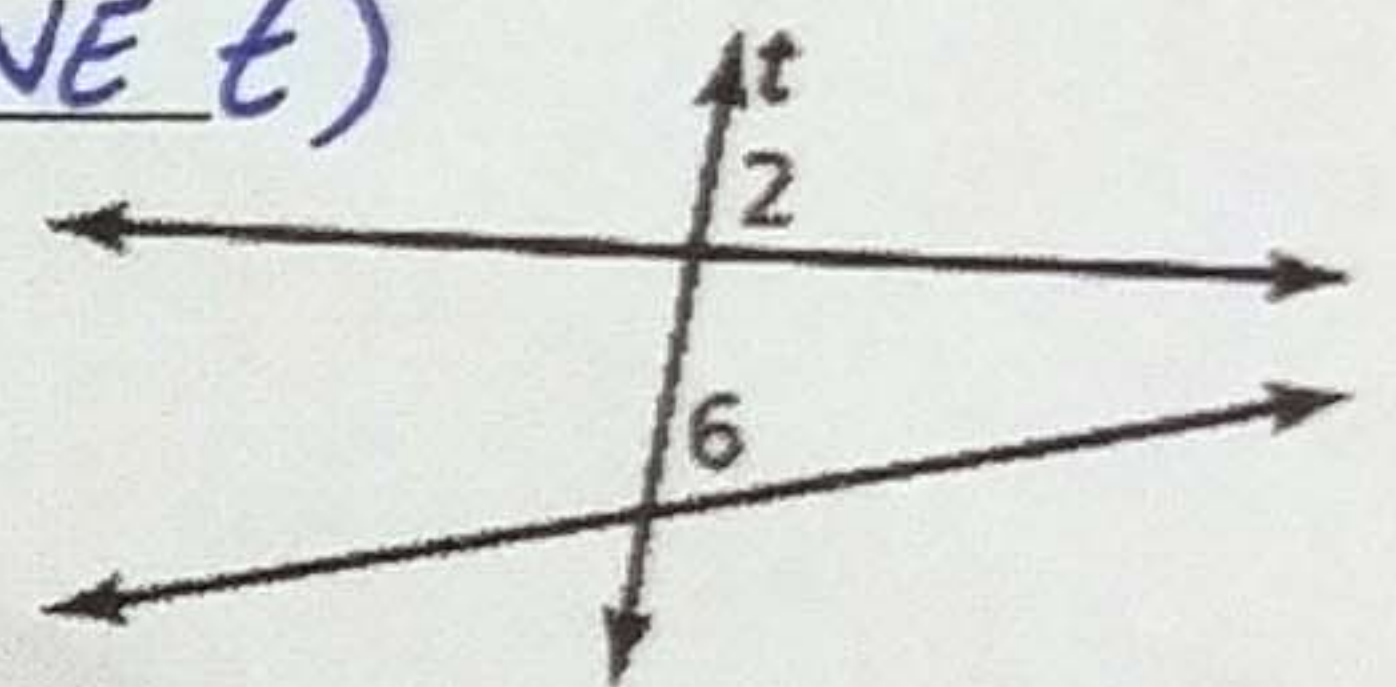
### Identifying Pairs of Angles

**Transversal:** A transversal is a line that intersects TWO OR MORE coplanar lines at DIFFERENT points.

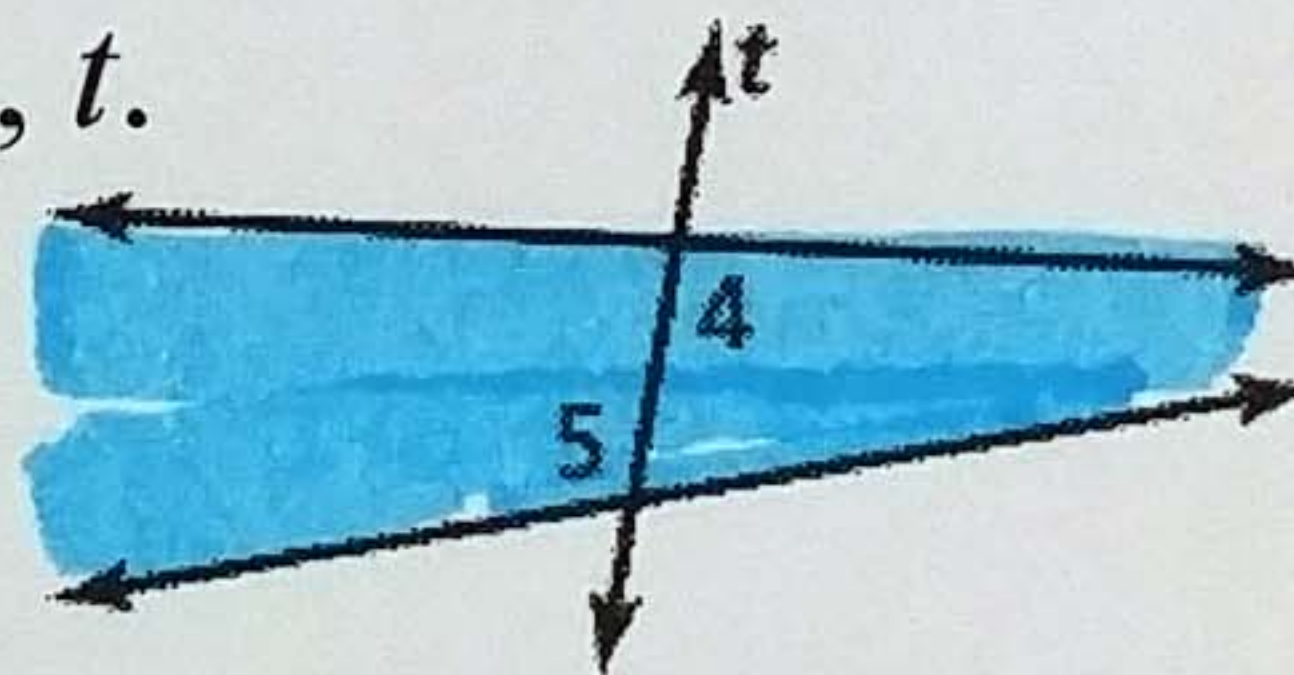


**Corresponding Angles:** two angles are corresponding when they have corresponding POSITIONS.

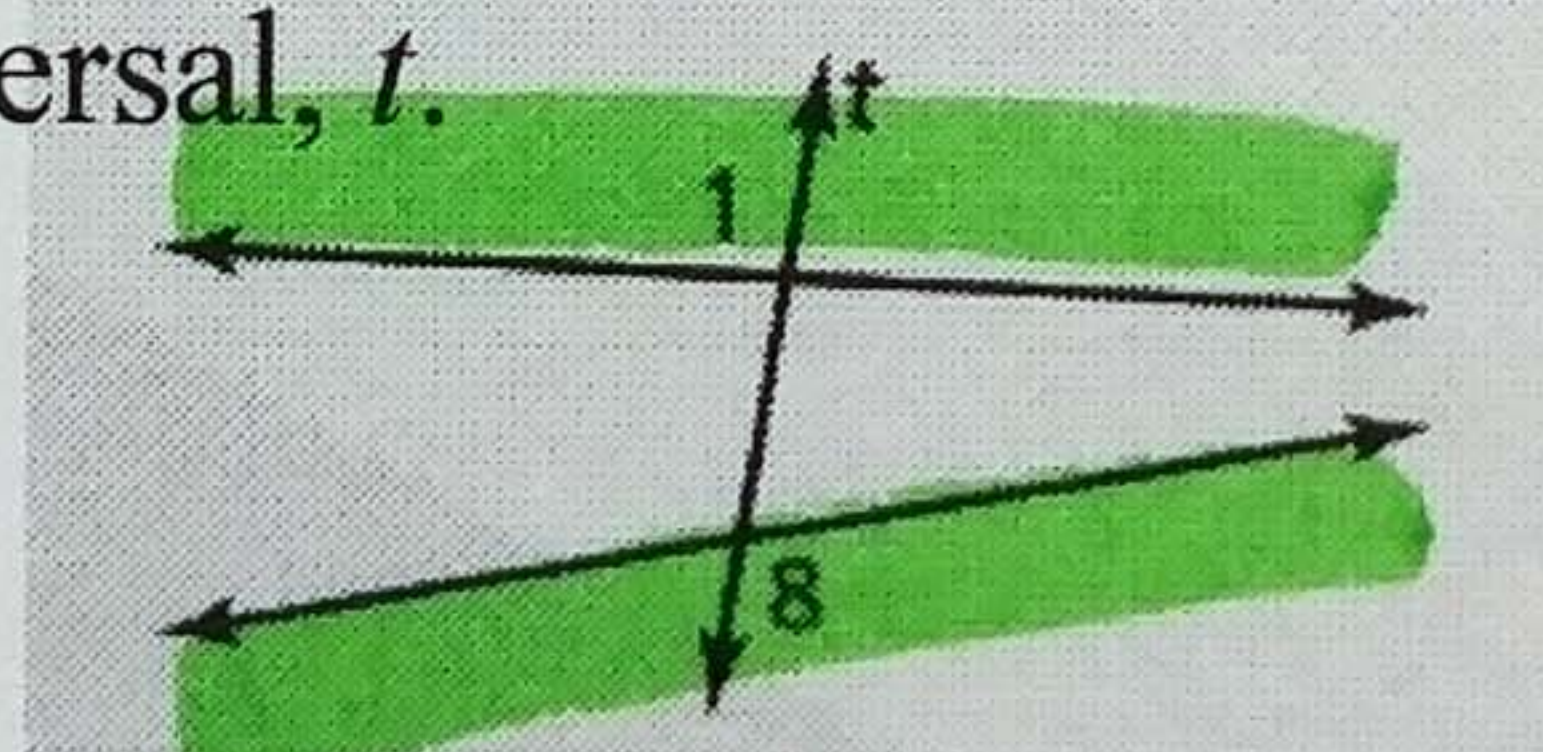
→  $\angle 2$  and  $\angle 6$  are ABOVE the lines and to the RIGHT of the TRANSVERSAL (LINE  $t$ )



**Alternate Interior Angles:** two angles are alternate interior angles when they lie BETWEEN the two lines and on OPPOSITE sides of the transversal,  $t$ .

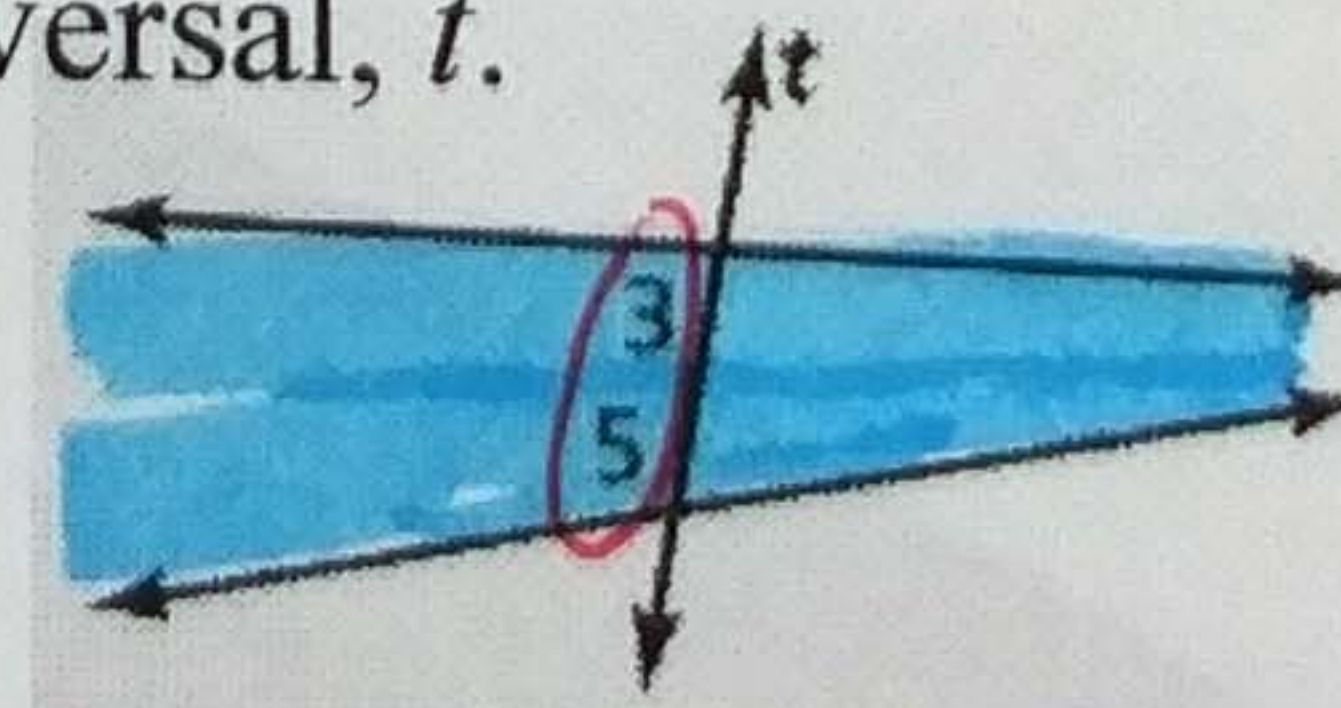


**Alternate Exterior Angles:** two angles are alternate exterior angles when they lie OUTSIDE the two lines and on OPPOSITE sides of the transversal,  $t$ .



**Consecutive Interior Angles:** two angles are consecutive interior angles when they lie BETWEEN the two lines and on the SAME side of the transversal,  $t$ .

→ Also called Same-Side Interior Angles



**Example:**

6. Identify all pairs of angles of the given type.

a. Corresponding  $\angle 1 \& \angle 5, \angle 2 \& \angle 6, \angle 3 \& \angle 7, \angle 4 \& \angle 8$

b. Alternate Interior  $\angle 2 \& \angle 7, \angle 4 \& \angle 5$

c. Alternate Exterior  $\angle 1 \& \angle 8, \angle 3 \& \angle 6$

d. Consecutive Interior SAME-SIDE  $\angle 2 \& \angle 5, \angle 4 \& \angle 7$

