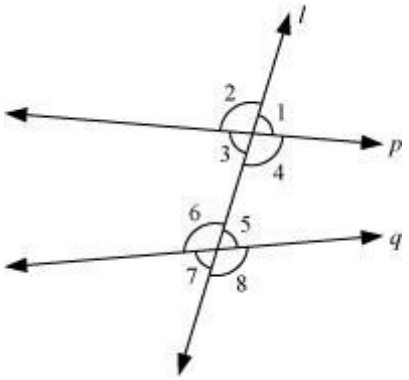
2. Parallel lines and Transversal

- A line which intersects two or more lines at distinct points is called **transversal** to the lines.



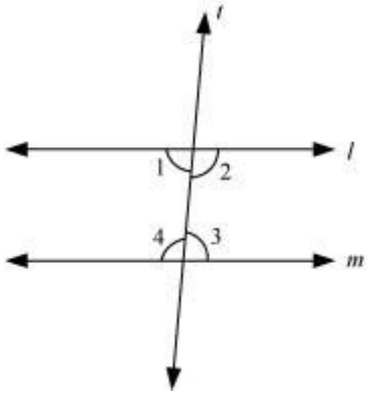
Here, line l is a transversal with respect to lines p and q.

1. $\angle 1$ and $\angle 5$, $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$, $\angle 4$ and $\angle 8$ are pairs of corresponding angles.
2. $\angle 3$ and $\angle 5$, $\angle 4$ and $\angle 6$ are pairs of alternate interior angles.
3. $\angle 1$ and $\angle 7$, $\angle 2$ and $\angle 8$ are pairs of alternate exterior angles.
4. $\angle 3$ and $\angle 6$, $\angle 4$ and $\angle 5$ are pairs of interior angles on the same side of the transversal.
5. $\angle 1$ and $\angle 8$, $\angle 2$ and $\angle 7$ are pairs of exterior angles on the same side of the transversal.

- **Property of interior angles on the same side of a transversal:**

  If a transversal intersects two parallel lines, then the angles in a pair of interior angles on the same side of the transversal are supplementary.

  For example,



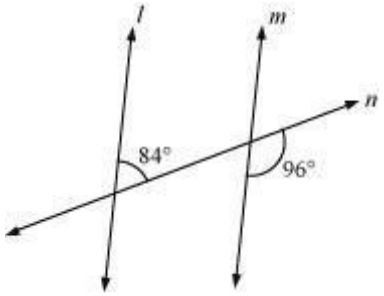
In the given figure, if lines l and m are parallel to each other then $\angle 1 + \angle 4 = 180°$ and $\angle 2 + \angle 3 = 180°$.

- **Converse of the property of interior angles on the same side of a transversal:**

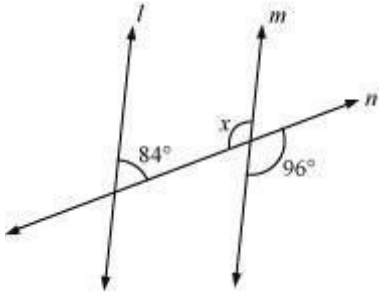
  If a transversal intersects two lines such that the interior angles on the same side of the transversal are supplementary, then the lines intersected by the transversal are parallel.

Example:

In the given figure, decide whether l is parallel to m or not.



Solution:



$\angle x = 96°$ (Vertically opposite angles)

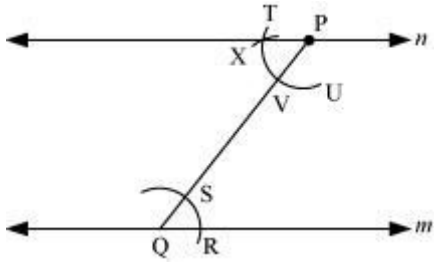
$\angle x + 84 = 96° + 84° = 180°$

i.e., Sum of the interior angles on the same side of the transversal is supplementary. Therefore, $l \| m$.

- **Construction of line parallel to given line:**
  - **Using ruler and compass:**

Steps of construction to draw a line parallel to a given line m, through a point P, outside the line m:

1. Take any point Q on m and join PQ.
2. With Q as centre and convenient radius, draw an arc cutting m at R and PQ at S.
3. With P as centre and the same radius, draw an arc TU cutting PQ at V; then with V as centre and radius equal to RS, draw an arc cutting TU at X.
4. Join PX to draw a line n.



Now, the line *n* is parallel to *m*. [Corresponding pairs of angles are equal]

- **Using ruler and set square:**

Steps of construction of a line parallel to $\overleftrightarrow{AB}$ through point P:

1. Place your set square such that one of its shorter edges i.e., XY lies just along line AB.
2. Place your ruler such that one of its edges lies just along the shorter edge i.e., XZ of the set square. Hold the ruler firmly and slide the set square along the ruler until the edge XY of the set square passes through P.
3. Draw a line along the edge XY of the set square. This is the required line through point P. Note that it is parallel to line AB.