Properties of Parallel and Perpendicular Lines

For more information on Parallel and Perpendicular Lines see the handout on “Coordinate Geometry”

**Parallel Lines**
If two parallel lines are cut by a third line then…

1) …alternate interior angles are congruent
\[ \angle 3 \equiv \angle 6; \quad \angle 4 \equiv \angle 5 \]

2) …corresponding angles are congruent
\[ \angle 1 \equiv \angle 5; \quad \angle 2 \equiv \angle 6; \quad \angle 3 \equiv \angle 7; \quad \angle 4 \equiv \angle 8 \]

3) …same side interior(also called consecutive interior) angles are congruent
\[ m\angle 3 + m\angle 5 = 180^\circ; \quad m\angle 4 + m\angle 6 = 180^\circ \]

In other words, 1) the small angles are equal, 2) the large angles are equal and 3) every small and large angle adds up to 180°

**Example:** In the figure, line \( l \) and \( m \) are parallel. What is the value of \( x \)?

There are many ways to approach this problem. Here’s one way.

**Solution:**
\[ x + 50 + 60 = 180 \] (x and the angle made by 50° and 60° are same side interior angles)
\[ x + 110 = 180 \]
\[ x = 70 \]

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**Perpendicular**

Definition: Two lines are perpendicular if they intersect to form a right angle.

Example: If line \( p \) and line \( q \) are perpendicular, find the value of \( x \)

\[ x + 32 = 90 \] (Defintion of Perpendicular)
\[ x = 58^\circ \]