# Line and Angle Relationships Summary

## KEY TERMS

- Triangle Sum Theorem
- exterior angle of a polygon
- remote interior angles of a triangle
- Exterior Angle Theorem
- transversal
- alternate interior angles
- alternate exterior angles
- same-side interior angles
- same-side exterior angles
- Angle-Angle (AA) Similarity Theorem

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**LESSON 1**

## Pulling a One-Eighty!

The **Triangle Sum Theorem** states that the sum of the measures of the interior angles of a triangle is 180°. The longest side of a triangle is opposite the interior angle with the greatest measure and the shortest side is opposite the interior angle with the least measure.

An **exterior angle of a polygon** is an angle between a side of a polygon and the extension of its adjacent side. It is formed by extending a ray from one side of the polygon. For example, in the diagram, $\angle 1$, $\angle 2$, and $\angle 3$ are the interior angles of the triangle, and $\angle 4$ is an exterior angle of the triangle. $\angle 1$ and $\angle 2$ are remote interior angles. The **remote interior angles of a triangle** are the two angles that are non-adjacent to the specified exterior angle.
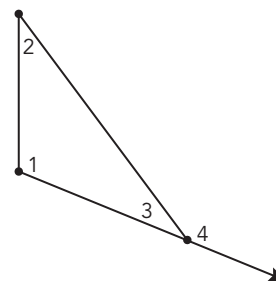
The **Exterior Angle Theorem** states that the measure of the exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles of the triangle. In the diagram shown, $m\angle 1 + m\angle 2 = m\angle 4$.

# LESSON 2

## Crisscross Applesauce

A **transversal** is a line that intersects two or more lines. In this diagram, two parallel lines, *m* and *l*, are intersected by a transversal, *t*.
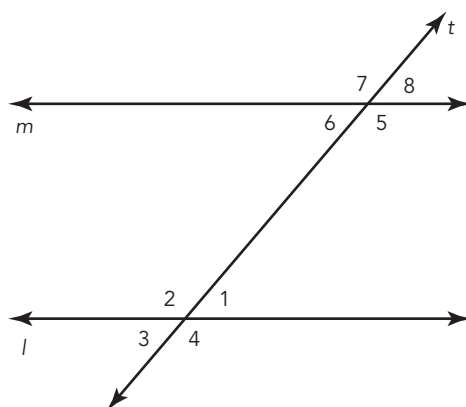


Corresponding angles have the same relative positions in geometric figures. An example of corresponding angles are ∠2 and ∠7.

**Alternate interior angles** are on opposite sides of the transversal and are between the two other lines. An example of alternate interior angles are ∠1 and ∠6.

**Alternate exterior angles** are on opposite sides of the transversal and are outside the other two lines. An example of alternate exterior angles are ∠4 and ∠7.

**Same-side interior angles** are on the same side of the transversal and are between the other two lines. An example of same-side interior angles are ∠2 and ∠6.

**Same-side exterior angles** are on the same side of the transversal and are outside the other two lines. An example of same-side exterior angles are ∠4 and ∠8.

When two parallel lines are intersected by a transversal,
  • Corresponding angles are congruent;
  • Alternate interior angles are congruent;
  • Alternate exterior angles are congruent;
  • Same-side interior angles are supplementary;
  • Same-side exterior angles are supplementary.

# The Vanishing Point

The **Angle-Angle (AA) Similarity Theorem** states that if two angles of one triangle are congruent to the corresponding angles of another triangle, then the triangles are similar.

For example, in the figure shown, $\triangle XWV$ is similar to $\triangle ZYV$ by the AA Similarity Theorem. Because $\angle XWV$ and $\angle ZYV$ are right angles, they are congruent to each other. Because $\angle WVX$ and $\angle YVZ$ are vertical angles, they are congruent to each other. Thus, $\triangle XWV$ is similar to $\triangle ZYV$.

You can use dilations and other transformations, line and angle relationships, measurements, and/or the Angle-Angle Similarity Theorem to demonstrate that two triangles are similar.