Line and Angle Relationships Summary

KEY TERMS

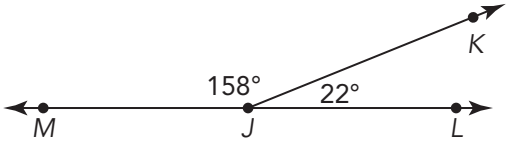
- straight angle
- supplementary angles
- complementary angles
- perpendicular
- adjacent angles
- linear pair
- vertical angles
- Triangle Sum Theorem
- exterior angle of a polygon
- remote interior angles of a triangle
- Exterior Angle Theorem
- transversal
- alternate interior angles
- alternate exterior angles
- same-side interior angles
- same-side exterior angles
- Angle-Angle Similarity Theorem

LESSON 1

Seeing It From a Different Angle

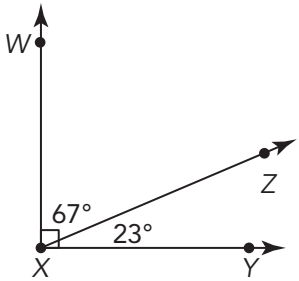
A **straight angle** is formed when the sides of the angle point in exactly opposite directions. The two legs form a straight line through the vertex.

Two angles are **supplementary angles** if the sum of their angle measures is equal to 180 degrees. For example, angles *MJK* and *KJL* are supplementary angles.



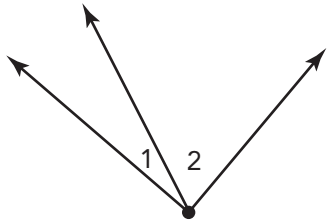
Two angles are **complementary angles** if the sum of their angle measures is equal to 90 degrees. For example, angles *WXZ* and *ZXY* are complementary angles.

Two lines, line segments, or rays are **perpendicular** if they intersect to form 90 degree angles. The symbol for perpendicular is $\perp$.

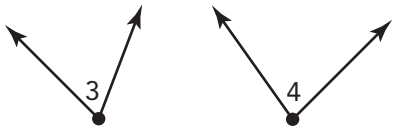


Adjacent angles are two angles that share a common vertex and share a common side.

∠1 and ∠2 are adjacent angles.

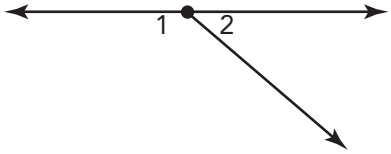


∠3 and ∠4 are *not* adjacent angles.

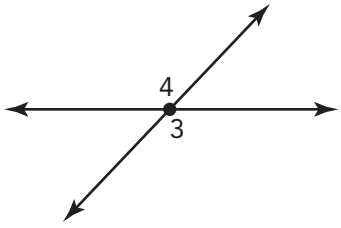


A **linear pair** of angles is formed by two adjacent angles that have noncommon sides that form a line. Linear pairs are supplementary.

∠1 and ∠2 form a linear pair.

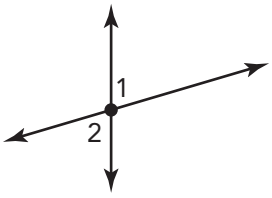


∠3 and ∠4 do *not* form a linear pair.

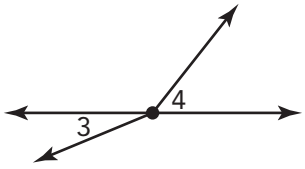


Vertical angles are two nonadjacent angles that are formed by two intersecting lines. Vertical angles are congruent.

∠1 and ∠2 are vertical angles.



∠3 and ∠4 are *not* vertical angles.

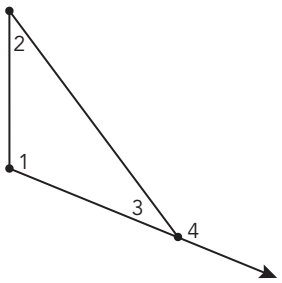


LESSON
2

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, ∠1, ∠2, and ∠3 are the interior angles of the triangle, and ∠4 is an exterior angle of the triangle. ∠1 and ∠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.

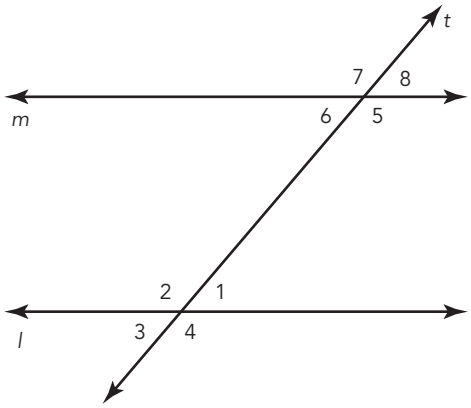


The **Exterior Angle Theorem** states that the measure of the exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles of the triangle. In the diagram shown, $m\angle 1 + m\angle 2 = m\angle 4$.

LESSON 3

Criscrossed 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,

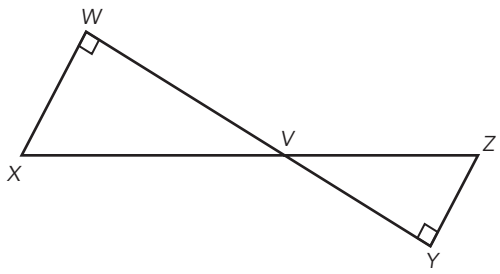
- Corresponding angles are congruent.
- Alternate interior angles are congruent.
- Alternate exterior angles are congruent.
- Same-side interior angles are supplementary.
- Same side exterior angles are supplementary.

LESSON
4

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, ΔXWV is similar to ΔZYV 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, ΔXWV is similar to ΔZYV.



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