2.1 Exploring Parallel Lines

Parallel Lines and Transversals

A transversal is a line that intersects two or more other lines at distinct points.

Parallel lines are lines with the same slope but different y-intercepts. Parallel lines will never intersect each other.

If two parallel lines are cut by a transversal, eight angles are created.

Corresponding angles are on the same side of the transversal, and on the same side of the parallel lines. (They are in the same position)

Corresponding Angles are equal.

\[ a = e \quad b = f \quad c = g \quad d = h \]
**Interior angles** lie inside the parallel lines.

**Co-Interior Angles:** Interior angles on the same side of the transversal.

Co-interior angles are supplementary:
\[ c + e = 180^\circ \quad d + f = 180^\circ \]

**Alternate Interior Angles:** Interior angles on opposite sides of the transversal.

Alternate interior angles are equal.
\[ c = f \quad d = e \]

**Exterior angles** lie outside the parallel lines.

**Co-Exterior Angles:** Exterior angles on the same side of the transversal.

Co-exterior angles are supplementary:
\[ a + g = 180^\circ \quad b + h = 180^\circ \]

**Alternate Exterior Angles:** Exterior angles on opposite sides of the transversal.

Alternate exterior angles are equal
\[ a = h \quad b = g \]

***If two parallel lines are cut by a transversal then Corresponding Angles, Alternate Interior Angles, & Alternate Exterior Angles are equal.***

**Use these to prove/find angle measures.**

***Likewise, if two lines are cut by a transversal and the Corresponding Angles, or Alternate Interior Angles, or the Alternate Exterior Angles are equal then the lines are parallel.***

**Use these to prove lines are parallel.**
$\angle = \text{angle}$

**Example 1:** Find each indicated angle:

a. \[\angle 1 = 80^\circ \text{ angles on line}\]
   \[\angle 2 = 80^\circ \text{ vertically opposite}\]

b. \[\angle 1 = 60^\circ \text{ angles at a point}\]

c. \[\angle 1 = 100^\circ \text{ supplementary angles}\]
   \[\angle 2 = 100^\circ \text{ corresponding angles}\]

d. \[\angle 1 = 65^\circ \text{ half of co-interior angle}\]
   \[\angle = \frac{180^\circ - 50^\circ}{2} = 65^\circ\]
   \[\angle 2 = 115^\circ \text{ co-interior angles}\]

e. \[\angle 1 = 55^\circ \text{ corresponding angles on a line}\]
   \[180 - 75 - 50 = 55^\circ\]
   \[\angle 2 = 50^\circ \text{ sum of } \angle \text{ (triangle)}\]

**Assignment:** Pg. 72 #2-6 [HW]