

4.2.8 A.1 Understand and apply concepts involving lines and angles.

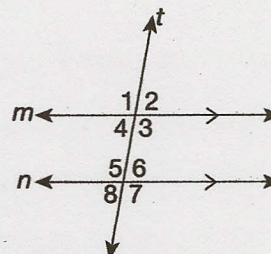
**Perpendicular lines** are lines that intersect to form  $90^\circ$  angles. The symbol  $\perp$  means *is perpendicular to*.

**Parallel lines** are lines in a plane that do not intersect.

The symbol  $\parallel$  means *is parallel to*. In a diagram, arrowheads can be used to indicate parallel lines.

A **transversal** is a line that intersects two other lines. You can use the relationships among special angle pairs formed by parallel lines and a transversal to find angle measures.

Transversal  $t$  intersects parallel lines  $m$  and  $n$ , forming eight angles.



#### NJ ASK Tip

**Geometry** When parallel lines are cut by a transversal, angle 1 and angle 2 are two different angle measures. The rest of the angles are congruent to these two.

- Four of the angles are **interior** (between  $m$  and  $n$ ):  $\angle 3$ ,  $\angle 4$ ,  $\angle 5$ ,  $\angle 6$ .

Two pairs of **alternate interior angles** are formed. Alternate interior angles are equal in measure. Since  $\angle 3$  and  $\angle 5$  are alternate interior angles,  $m\angle 3 = m\angle 5$ . Since  $\angle 4$  and  $\angle 6$  are alternate interior angles,  $m\angle 4 = m\angle 6$ .

- Four of the angles are **exterior** (outside of  $m$  and  $n$ ):  $\angle 1$ ,  $\angle 2$ ,  $\angle 7$ ,  $\angle 8$ . Two pairs of **alternate exterior angles** are formed. Alternate exterior angles are equal in measure. Since  $\angle 1$  and  $\angle 7$  are alternate exterior angles,  $m\angle 1 = m\angle 7$ . Since  $\angle 2$  and  $\angle 8$  are alternate exterior angles,  $m\angle 2 = m\angle 8$ .

These eight angles also form four pairs of **corresponding angles**:  $\angle 1$  corresponds to  $\angle 5$ ;  $\angle 2$  corresponds to  $\angle 6$ ;  $\angle 3$  corresponds to  $\angle 7$ ; and  $\angle 4$  corresponds to  $\angle 8$ . Corresponding angles are equal in measure. They are in similar positions on the same side of the transversal.

In the diagram below, transversal  $t$  intersects parallel lines  $a$  and  $b$ . If  $m\angle w = 130^\circ$ , what are the measures of  $\angle x$ ,  $\angle y$ , and  $\angle z$ ?

**Use the relationships of special angle pairs.**

**Step 1 Relate  $\angle w$  and  $\angle x$ .**

Since  $\angle w$  and  $\angle x$  are alternate interior angles,  $m\angle w = m\angle x$ .

Since  $m\angle w = 130^\circ$ ,  $m\angle x = 130^\circ$ .

**Step 2 Relate  $\angle x$  and  $\angle y$ .**

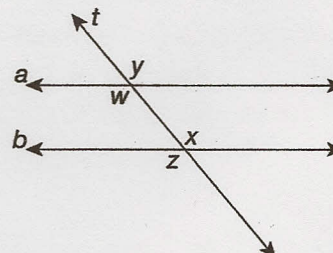
Since  $\angle x$  and  $\angle y$  are corresponding angles,  $m\angle x$  equals  $m\angle y$ .

Since  $m\angle x = 130^\circ$ ,  $m\angle y = 130^\circ$ .

**Step 3 Relate  $\angle y$  and  $\angle z$ .**

Since  $\angle y$  and  $\angle z$  are alternate exterior angles,  $m\angle y$  equals  $m\angle z$ .

Since  $m\angle y = 130^\circ$ ,  $m\angle z = 130^\circ$ .



If  $m\angle w = 130^\circ$ , the measure of  $\angle x$ ,  $\angle y$ , and  $\angle z$  is also  $130^\circ$ .