Properties of Angle Pairs

Intersecting lines form four angles. The pairs of angles across from each other are called vertical angles. The measures of vertical angles are equal.

\[ \angle x \text{ and } \angle y \text{ are vertical angles} \]
\[ \angle w \text{ and } \angle z \text{ are vertical angles} \]

If the sum of the measures of two angles is exactly 180°, then the angles are called supplementary angles.

\[ \angle c \text{ and } \angle d \text{ are supplementary} \]
\[ c = 110^\circ \quad \text{and} \quad d = 70^\circ \]

If the sum of the measures of two angles is exactly 90°, then the angles are called complementary angles.

\[ \angle a \text{ and } \angle b \text{ are complementary} \]
\[ a = 30^\circ \quad \text{and} \quad b = 60^\circ \]

Angles that share a vertex and one side but have no common interior points (that is, do not overlap each other) are called adjacent angles.

\[ \angle m \text{ and } \angle n \text{ are adjacent angles} \]

For additional information, see the Math Notes box in Lesson 8.3.2 of the Core Connections, Course 2 text.
Example 1

Find the measure of the missing angles if $m \angle 3 = 50^\circ$.

- $m \angle 1 = m \angle 3$ (vertical angles)  
  $\Rightarrow m \angle 1 = 50^\circ$
- $\angle 2$ and $\angle 3$ (supplementary angles)  
  $\Rightarrow m \angle 2 = 180^\circ - 50^\circ = 130^\circ$
- $m \angle 2 = m \angle 4$ (vertical angles)  
  $\Rightarrow m \angle 4 = 130^\circ$

Example 2

Classify each pair of angles below as vertical, supplementary, complementary, or adjacent.

- a. $\angle 1$ and $\angle 2$ are adjacent and supplementary
- b. $\angle 2$ and $\angle 3$ are complementary
- c. $\angle 3$ and $\angle 5$ are adjacent
- d. $\angle 1$ and $\angle 4$ are adjacent and supplementary
- e. $\angle 2$ and $\angle 4$ are vertical

Problems

Find the measure of each angle labeled with a variable.

1. $a = 80^\circ$

2. $b = 35^\circ$

3. $c = 75^\circ$

4. $f = 40^\circ$

5. $g = 120^\circ$

6. $h = 110^\circ$

Answers

1. $m \angle a = 100^\circ$

2. $m \angle b = 55^\circ$

3. $m \angle c = 105^\circ$

4. $m \angle f = 50^\circ$

5. $m \angle g = 60^\circ$

6. $m \angle j = 75^\circ$

7. $m \angle k = 65^\circ$

8. $m \angle l = 40^\circ$

9. $m \angle m = 140^\circ$

10. $m \angle n = 105^\circ$

11. $m \angle p = 105^\circ$