

3-7

Angle Relationships

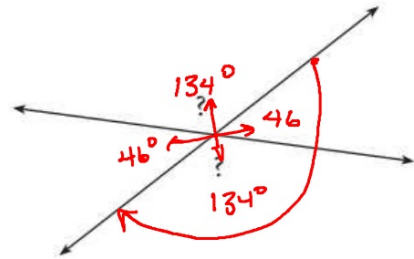
GEO

OBJECTIVE: I can classify angles and find their measures



Warm-Up

Two students are determining if the angles facing each other are the same or different. Use the diagram on the right to determine what information can be gathered from each angle. Hint, use a protractor to assist in your investigation



Essential Understanding

Essential Understanding An angle (\angle) is formed when two rays, or sides with a common endpoint called the vertex.



Key Concept: Angle Relationships

Vertical angles are the opposite angles formed by two intersecting lines. Vertical angles are congruent because the angles have the same measure.

Adjacent angles are pairs of angles that share a vertex and one side but do not overlap.

Complementary angles are two angles whose measures have a sum of 90° .

Supplementary angles are two angles whose measures have a sum of 180° . You discovered in the Explore Activity that adjacent angles formed by two intersecting lines are supplementary.

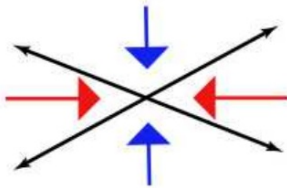


Concept Understanding



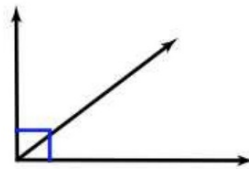
Pair angle relations

Vertical Angles



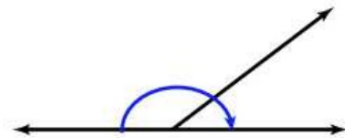
Facing angles are vertical

Complementary Angles



Angles that total 90°

Supplementary Angles



Angles that total 180°

Example

#1 Angle Pairs and One-Step Equations



Use the diagram at the right to answer the following questions.

- A** Name a pair of vertical angles.

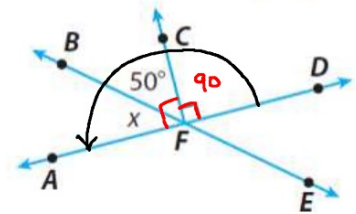
$$\angle AFB \text{ and } \angle DFE$$

- B** Name a pair of adjacent angles. → next to

$$\angle AFB \text{ and } \angle AFE$$

- C** Name two pairs of supplementary angles that include $\angle DFE$. ~ 180°

$$\angle DFE \text{ and } \angle AFE$$



- D** Find the measure of $\angle x$.

$$\begin{array}{r} 180^\circ \\ 90^\circ + 50 + x = 180^\circ \\ \underline{-140} \quad \underline{-140} \\ x = 40^\circ \end{array}$$

$$\begin{array}{r} 90^\circ \\ 50 + x = 90 \\ \underline{-50} \quad \underline{-50} \\ x = 40^\circ \end{array}$$

Your Turn to Work it Out



Use the diagram.

- A** Name a pair of supplementary angles.

$\angle EGD$ and $\angle AGE$

- B** Name a pair of vertical angles.

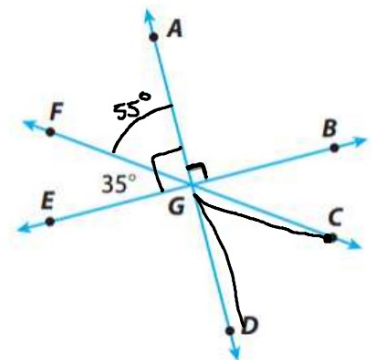
$\angle EGF$ and $\angle BGC$

- C** Name a pair of adjacent angles.

$\angle BGC$ and $\angle AGB$

- D** Name a pair of complementary angles.

$\angle AGF$ and $\angle FGE$



- E** Find the measure of $\angle CGD$.

$$90 - 35 = 55^\circ$$

$\angle AGF = 55^\circ$ and it is vertical to $\angle CGD$, so $\angle CGD$ is 55°

Example

#2 Angle Pairs and Two-Step Equations



Solve angle pairs

A Find the measure of $\angle EHF$.

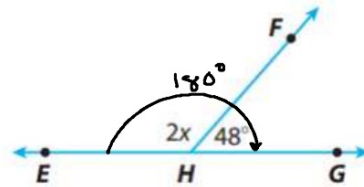
$$\begin{array}{r} 2x + 48^\circ = 180^\circ \\ -48 \quad -48 \\ \hline \end{array}$$

$$\frac{2x}{2} = \frac{132}{2}$$

$$x = 66$$

$$\begin{array}{r} 2x \\ 2(66) = 132^\circ \end{array}$$

$$\angle EHF = 132^\circ$$

**B** Find the measure of $\angle ZXY$.

$$4x + 7 + 35 = 90^\circ$$

$$\begin{array}{r} 4x + 42 = 90 \\ -42 \quad -42 \\ \hline \end{array}$$

$$\frac{4x}{4} = \frac{48}{4}$$

$$x = 12$$

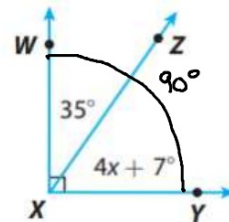
$$4x + 7$$

$$4(12) + 7$$

$$48 + 7$$

$$55^\circ$$

$$\angle ZXY = 55^\circ$$



Your Turn to Work it Out



Write and solve an equation to find the measure of $\angle JML$.

$$\begin{array}{r} 3x + 54^\circ = 180^\circ \\ \underline{-54 \quad -54} \\ 3x = 126 \\ \underline{\quad 3 \quad 3} \\ x = 42 \end{array}$$

$$\begin{array}{l} 3x \\ 3(42) = 126 \\ \angle JML = 126^\circ \end{array}$$

