

1.5

Describe Angle Pair Relationships

- Goal** • Use special angle relationships to find angle measures.

Your Notes

VOCABULARY

Complementary angles

Supplementary angles

Adjacent angles

Linear pair

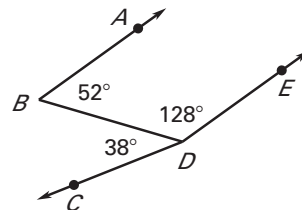
Vertical angles

In Example 1, $\angle BDE$ and $\angle CDE$ share a common vertex. But they share common

points, so they are *not* adjacent angles.

Example 1 Identify complements and supplements

In the figure, name a pair of complementary angles, a pair of supplementary angles, and a pair of adjacent angles.



Solution

Because $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = 90^\circ$, $\underline{\hspace{1cm}}$ and $\underline{\hspace{1cm}}$ are $\underline{\hspace{1cm}}$ angles.

Because $\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = 180^\circ$, $\underline{\hspace{1cm}}$ and $\underline{\hspace{1cm}}$ are $\underline{\hspace{1cm}}$ angles.

Because $\underline{\hspace{1cm}}$ and $\underline{\hspace{1cm}}$ share a common vertex and side, they are $\underline{\hspace{1cm}}$ angles.

Your Notes

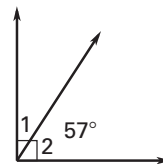
Angles are sometimes named with numbers. An angle measure in a diagram has a degree symbol. An angle name does not.

Example 2 Find measures of complements and supplements

- Given that $\angle 1$ is a complement of $\angle 2$ and $m\angle 2 = 57^\circ$, find $m\angle 1$.
- Given that $\angle 3$ is a supplement of $\angle 4$ and $m\angle 4 = 41^\circ$, find $m\angle 3$.

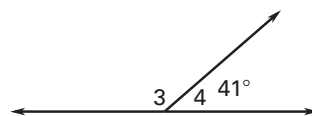
Solution

- You can draw a diagram with complementary adjacent angles to illustrate the relationship.



$$m\angle 1 = \underline{\hspace{1cm}} - \underline{\hspace{1cm}} = \underline{\hspace{1cm}} - \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

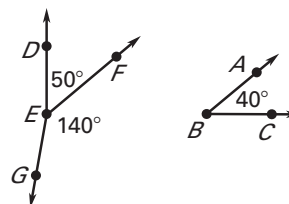
- You can draw a diagram with supplementary adjacent angles to illustrate the relationship.



$$m\angle 3 = \underline{\hspace{1cm}} - \underline{\hspace{1cm}} = \underline{\hspace{1cm}} - \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

✓ Checkpoint Complete the following exercises.

- In the figure, name a pair of complementary angles, a pair of supplementary angles, and a pair of adjacent angles.



- Given that $\angle 1$ is a complement of $\angle 2$ and $m\angle 1 = 73^\circ$, find $m\angle 2$.

- Given that $\angle 3$ is a supplement of $\angle 4$ and $m\angle 4 = 37^\circ$, find $m\angle 3$.

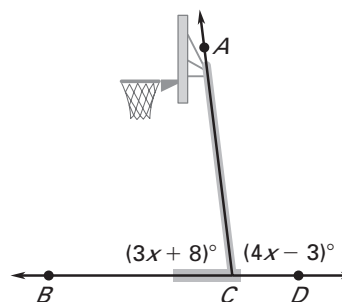
Your Notes

In a diagram, you can assume that a line that looks straight is straight. In Example 3, B , C , and D lie on \overleftrightarrow{BD} . So, $\angle BCD$ is a

_____ angle.

Example 3 Find angle measures

Basketball The basketball pole forms a pair of supplementary angles with the ground. Find $m\angle BCA$ and $m\angle DCA$.



Solution

Step 1 Use the fact that _____ is the sum of the measures of supplementary angles.

$$m\angle BCA + m\angle DCA = \underline{\hspace{2cm}}$$

Write equation.

$$(\underline{\hspace{2cm}})^\circ + (\underline{\hspace{2cm}})^\circ = \underline{\hspace{2cm}}$$

Substitute.

$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Combine like terms.

$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Subtract.

$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Divide.

Step 2 Evaluate the original expressions when $x = \underline{\hspace{2cm}}$.

$$m\angle BCA = (\underline{\hspace{2cm}})^\circ = (\underline{\hspace{2cm}})^\circ = \underline{\hspace{2cm}}$$

$$m\angle DCA = (\underline{\hspace{2cm}})^\circ = (\underline{\hspace{2cm}})^\circ = \underline{\hspace{2cm}}$$

The angle measures are _____ and _____.

✓ Checkpoint Complete the following exercise.

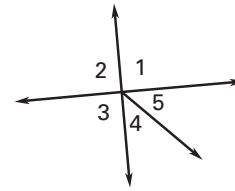
4. In Example 3, suppose the angle measures are $(5x + 1)^\circ$ and $(6x + 3)^\circ$. Find $m\angle BCA$ and $m\angle DCA$.

Your Notes

In the diagram, one side of $\angle 1$ and one side of $\angle 4$ are opposite rays. But the angles are not a linear pair because they are not _____.

Example 4 Identify angle pairs

Identify all of the linear pairs and all of the vertical angles in the figure at the right.



Solution

To find vertical angles, look for angles formed by _____.

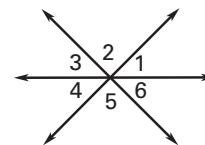
_____ and _____ are vertical angles.

To find linear pairs, look for adjacent angles whose noncommon sides are _____.

_____ and _____ are a linear pair. _____ and _____ are a linear pair.

✓ **Checkpoint** Complete the following exercise.

5. Identify all of the linear pairs and all of the vertical angles in the figure.



You may find it useful to draw a diagram to represent a word problem like the one in Example 5.

Example 5 Find angle measures in a linear pair

Two angles form a linear pair. The measure of one angle is 4 times the measure of the other. Find the measure of each angle.



Solution

Let x° be the measure of one angle. The measure of the other angle is _____. Then use the fact that the angles of a linear pair are _____ to write an equation.

_____ + _____ = _____ Write an equation.

_____ = _____ Combine like terms.

_____ = _____ Divide each side by ____.

The measures of the angles are _____ and _____

_____ = _____.

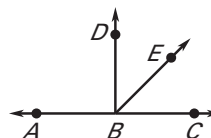
Your Notes

✓ **Checkpoint** Complete the following exercise.

6. Two angles form a linear pair. The measure of one angle is 3 times the measure of the other. Find the measure of each angle.

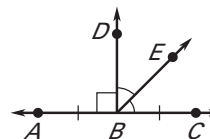
CONCEPT SUMMARY: INTERPRETING A DIAGRAM

There are some things you can conclude from a diagram, and some you cannot. For example, here are some things that you can conclude from the diagram at the right.



- All points shown are _____.
- Points A, B, and C are _____, and B is between A and C.
- \overleftrightarrow{AC} , \overleftrightarrow{BD} , and \overleftrightarrow{BE} _____ at point B.
- $\angle DBE$ and $\angle EBC$ are _____ angles, and $\angle ABC$ is a _____.
- Point E lies in the _____ of $\angle DBC$.

In the diagram above, you cannot conclude that $\overline{AB} \cong \overline{BC}$, that $\angle DBE \cong \angle EBC$, or that $\angle ABD$ is a right angle. This information must be indicated, as shown at the right.



Homework