

# Pairs of Angles

## Purpose

Students will become familiar with vertical, adjacent, complementary, and supplementary angles by describing their relationships and solving problems involving an unknown angle.

## Materials

*For the teacher:* 3 large circles, protractor, black marker, 4 colored markers, chalk, chalkboard

*For each student:* copy of Black Line Master (BLM) *Pairs of Angles*, 3 pieces of colored paper, compass, scissors, protractor, pencil

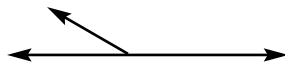
## Activity

### A. Introduction

1. Have students draw and cut out three large circles from their three pieces of paper. Ask them to mark the center of the circles.
2. Tell students that angle measures are based on the idea that all the way around a circle measures  $360^\circ$ .

### B. Class Activity

1. Have each student take one of the circles, fold it in half, and cut along the fold. Tell students that the diameter may be thought of as a straight angle by using the center of the circle as the angle's vertex and the two radii that make up the diameter as the sides of the angle. Tell students the measure of a straight angle is  $180^\circ$ .
2. Show the students how to put another radius in this half circle so that there are two angles. Explain that these two measures total  $180^\circ$ . Ask students to use their pencil as a radius and form two angles in the half circle.



3. Have the students compare their half circle to a protractor. Have the students measure each angle and add the two measures. Tell the students that when the measure of two angles totals  $180^\circ$ , they are called *supplementary angles*.
4. Ask students to find the supplement of  $45^\circ$  [ $135^\circ$ ]. Ask them to find two numbers that add to be  $180^\circ$  and write:  $\angle 1 + \angle 2 = 180^\circ$ . Replace " $\angle 1$ " and " $\angle 2$ " with the numbers given and explain that since the sum equals  $180^\circ$ ,  $\angle 1$  and  $\angle 2$  are supplementary angles.
5. Have the students take the second large circle from their original three large circles, fold it into fourths and cut it along the folds.

(continued)

connecting  
across the  
curriculum



### Visual Arts

Give students a magazine containing architectural photos. Have students create a collage of angles from buildings and bridges on a poster board. Create a classroom display showcasing the students' projects.


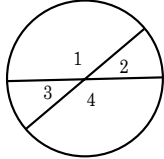
MEETING  
INDIVIDUAL  
NEEDS



For students who need additional help, try one or more of these ideas. Create a bulletin board with examples of special angles. Have students visit [www.mathleague.com/help/geometry/angles.htm](http://www.mathleague.com/help/geometry/angles.htm), Math League's Web site containing examples of special angles. Refer students to their textbook to find examples of these special angle pairs.

Standards Link  
6.5.1

**Activity (continued)**


- Ask them to find the angle formed at the center of the circle. Show them the angle by tracing it with your hand.
- Ask students how big this angle is. [ $90^\circ$  because it is one-fourth of  $360^\circ$ ]
  - Show students how to use the pencil as a radius to show how two angles would look in this fourth.
  - Tell the students that when the measures of two angles add to  $90^\circ$  they are called *complementary angles*. Write  $\angle 1 + \angle 2 = 90^\circ$ . Explain to the students that  $\angle$ one and  $\angle$ two are complementary. 
  - Ask students to find the complement of an angle that measures  $35^\circ$ . [ $55^\circ$ ]
  - Ask students to draw two diameters across the third circle and label the angles as done here: 
  - Explain to the students that there are two other special pairs of angles that exist.
  - Mark  $\angle 2$  and  $\angle 3$  with the same color marker. Mark  $\angle 1$  and  $\angle 4$  with another color. Tell students these two pair of angles have the same measure.
  - Draw two intersecting lines on the chalkboard. Tell the students that vertical angles exist whenever there are two intersecting lines, not only with diameters of a circle. Identify the resulting vertical angles in your drawing.
  - Draw two angles that share a common side on the board. Draw them so that they are not complementary or supplementary. Use colored chalk to highlight the shared side.
  - Tell students that angles that share a common side are called *adjacent angles*.


**C. Practice**


- Distribute a copy of the BLM *Pairs of Angles* to each student.
- Allow ample time for the students to complete the BLM. Discuss results with the entire class.


**Classroom Assessment****Basic Concepts and Processes**

During the activity and when reviewing the BLM, discuss the following questions with your students to gauge their understanding of the Standard Indicators:

 What are adjacent angles?

 How are adjacent angles and supplementary angles different?

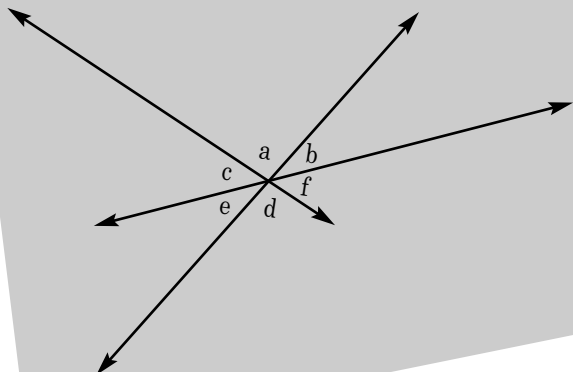
 What are vertical angles?

 How are complementary and supplementary angles different?

Name: \_\_\_\_\_

# PAIRS OF ANGLES

1. Look for pairs of vertical angles in the drawing.



$\angle a = \angle$  \_\_\_\_\_  
 $\angle c = \angle$  \_\_\_\_\_  
 $\angle e = \angle$  \_\_\_\_\_

2. On the back of this paper, sketch each of the following angles. Sketch the supplement of each angle. Compute the measure of each supplement.

- a.  $\angle 1 = 87^\circ$
- b.  $\angle 2 = 60^\circ$
- c.  $\angle 3 = 100^\circ$

3. On the back of this paper, sketch each of the following angles. Sketch the complement of each angle. Compute the measure of each complement.

- a.  $\angle a = 10^\circ$
- b.  $\angle b = 60^\circ$
- c.  $\angle c = 45^\circ$

4. Finish the chart.

Measure of $\angle x$	Measure of the supplement of $\angle x$	Measure of the complement of $\angle x$	Measure of the angle vertical to $\angle x$
$22^\circ$			
$63^\circ$			

# PAIRS OF ANGLES

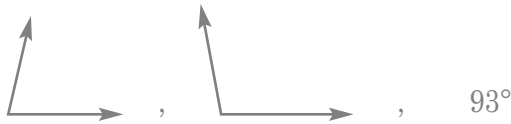
## Teacher Directions

Distribute a copy of the BLM *Pairs of Angles* to each student. Review the properties of complementary, supplementary, vertical, and adjacent angles with the class. Discuss BLM instructions with the class. Walk about the room and offer individual help as needed.

## Answer Key

1.  $\angle d$ ,  $\angle f$ ,  $\angle b$

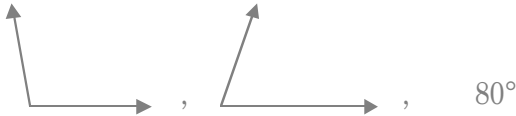
2. a.



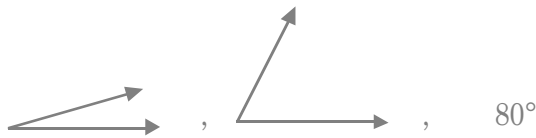
b.



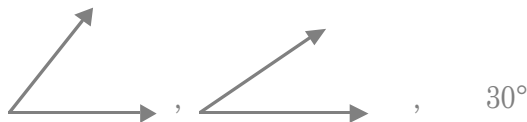
c.



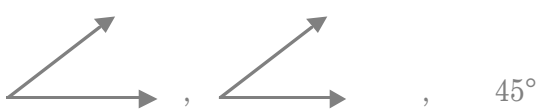
3. a.



b.



c.



Measure of $\angle x$	Measure of the supplement of $\angle x$	Measure of the complement of $\angle x$	Measure of the angle vertical of $\angle x$
$22^\circ$	$158^\circ$	$68^\circ$	$22^\circ$
$63^\circ$	$117^\circ$	$27^\circ$	$63^\circ$