Grades 3 & 4

House Geometry

LESSON 5

Objectives

The students will:

- Practice measuring angles.
- Define and identify right, obtuse and acute angles and intersecting lines.

Materials

- Student Handout: "A House and Geometric Vocabulary" (one copy per student)
- Crayons for each student (preferably red, yellow and green)
- Student Handout: "Measuring Angles"
- Protractors or angle rulers (one for each pair of students)
- "Winter in Songming" book

Procedure

1. **Introduce angles and their significance.** In the story, "Winter in Songming," Zadou's father is in charge of setting the corners and making sure they are "square corners." This means he makes sure the corners of the walls meet at a 90 degree angle, which is necessary for square or rectangle rooms.

ACTIVITY

How do they measure "square corners" in Songming County?

People in rural parts of China usually have only basic tools to use in construction. When building walls that need to meet at right angles, they will build the foundation level of a rectangular shaped room, and then use string to make sure the diagonals between the opposite corners of the room are equal length. This ensures that the four corners are all 90 degree angles. Here's a way you can demonstrate this technique with your students.

Materials:

- Ruler, meter stick, yardstick or measuring tape
- Cardboard packing boxes (can vary in size) – one per group

Procedure:

1. Remove all top and bottom flaps from each box, leaving only the four connected sides of the box.
2. Divide your class into several groups and give each group a box.
3. Have students notice the various parallelograms that can be made by pushing in on the sides of their box.
4. Instruct students to hold their box in any parallelogram shape. Have them measure the diagonal lengths between opposite corners of the box and record measurements.
5. Tell the students to adjust the boxes until the corners appear to be right angles. Have them measure the diagonals. Notice that when right angles are achieved, the diagonals are of equal length.

National Standards Addressed

COMMON CORE MATH

Geometry

3.G.1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

4.G.1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

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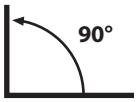
Procedure (continued)

Review what an angle is. Explain that when two straight lines cross, the intersection creates angles. Working in pairs, have students draw several examples of non-parallel lines that intersect. As one student draws a pair of intersecting lines, have another student identify and mark the angles.

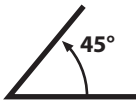
Distribute the student handout "A House and Geometric Vocabulary." Review the vocabulary examples and let students find and color other examples on the page.

2. **Explain how to measure angles and discuss acute, obtuse and right angles.** Explain that we use a measurement called degrees to describe how wide or narrow the space between lines is. Provide the definition of three types of angles:



Right Angle:
An angle that measures exactly 90 degrees.

Obtuse Angle:
An angle that measures more than 90 degrees.



Acute Angle:
An angle that measures less than 90 degrees.

Distribute protractors or angle rulers and show how to measure an angle. With their partner, have students measure the angles that they previously marked. Then distribute the student handout "Measuring Angles" and have students complete it.

3. **Discuss the importance of right angles.** Explain that you can find right angles in many places. Ask your students to look around the classroom and identify right angles they can see.

Ask students to name parts of a house that use right angles. Answers include corners where walls meet, and where the walls and floor meet. Ask students to consider what would happen if the walls met the floor at an acute angle or an obtuse angle. For both situations, the wall would be leaning either in or out and would not be stable. The wall would likely collapse.

Ask students what would happen if you were trying to build a rectangular room and one corner of the room had two walls meeting at an acute angle. What if they met at an obtuse angle? The walls would angle either too far in or too wide and would not meet the other corners at a right angle.

Extension Activity

Paper Folding

Most westerners are familiar with the paper folding craft known as origami. While often associated with Japan, paper folding is a traditional craft in many areas of East Asia, including China. Paper folding is also a fantastic tool for teaching about geometric concepts. Lead the class in making a simple box using folded paper. While making the boxes, students should identify parallel lines, intersecting lines and angles in the folds they are making in the paper. Instructions for making an origami box can be found at www.origami-instructions.com/origami-box.html.

Links To Heifer International

Building Skills

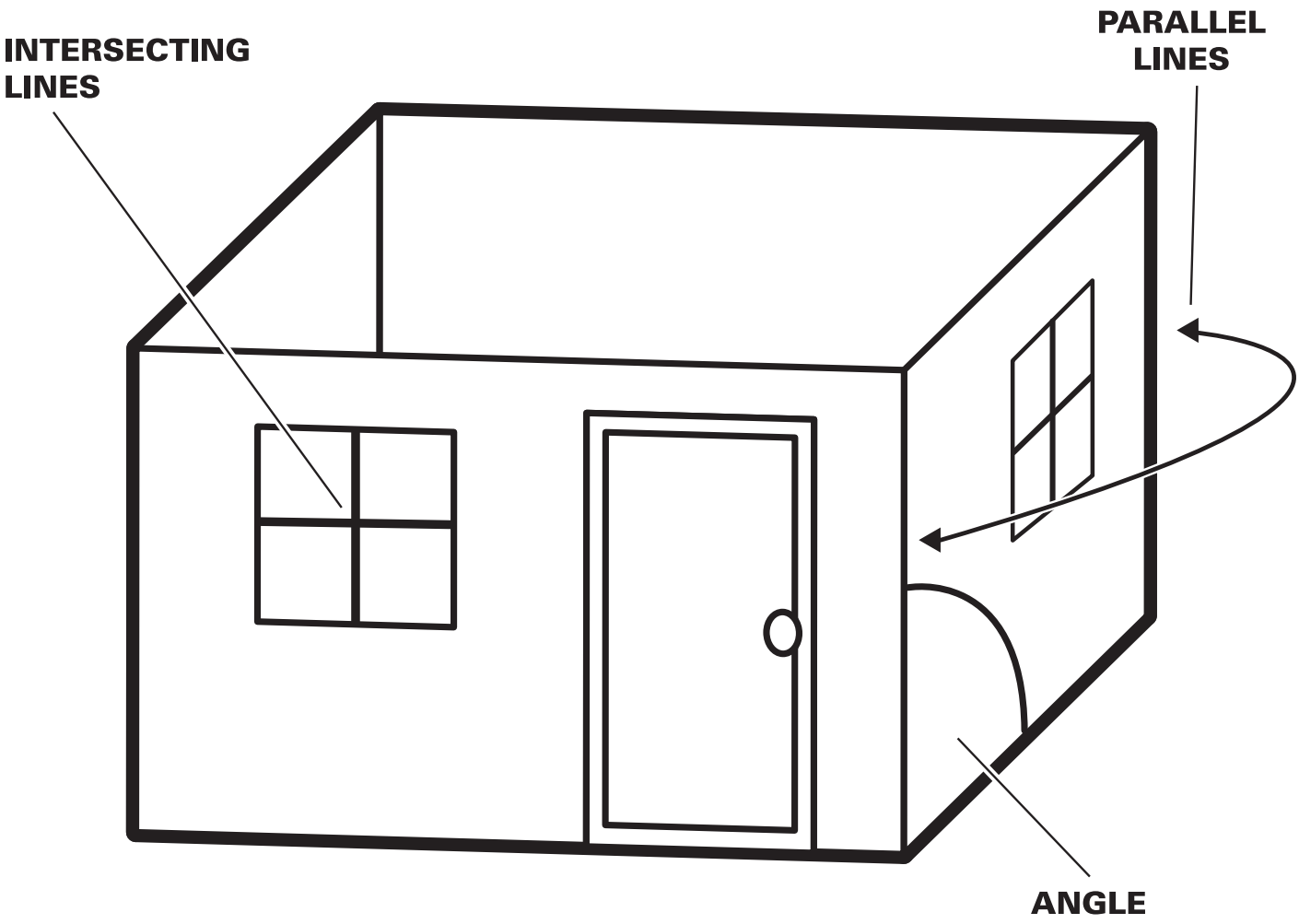
Heifer International provides many resources to community groups, including knowledge and technical training. For example, instead of providing only a livestock animal, Heifer International field workers provide training on how to care for the animal. When a Heifer International project includes other factors such as constructing a house, a stable for animals or a kitchen area, Heifer International provides technical training on how to construct the building. Someone in charge of important parts of the construction of buildings, like Zadou's father, would receive training from Heifer International field workers or local organizations that work together with Heifer International.

Student Handout:

A House and Geometric Vocabulary

_____

Name



Can you find more angles? Trace them in red.

Can you find more parallel lines? Trace a pair of parallel lines in green.

Can you find more intersecting lines? Trace one set of intersecting lines in yellow.

Student Handout:

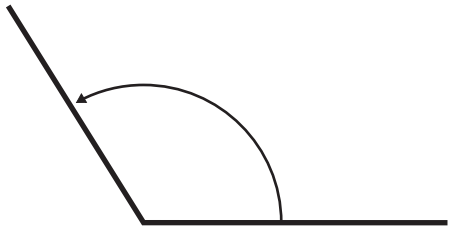
Measuring Angles

Name _____

Estimate _____

Type of angle _____

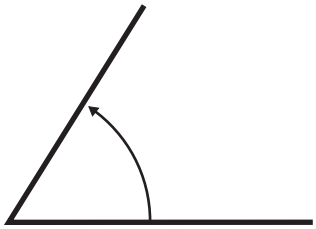
Measurement of angle _____



Estimate _____

Type of angle _____

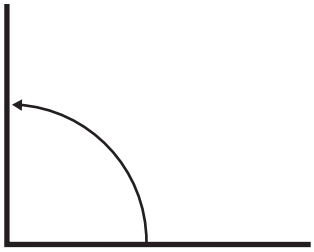
Measurement of angle _____



Estimate _____

Type of angle _____

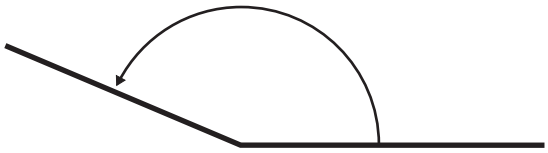
Measurement of angle _____



Estimate _____

Type of angle _____

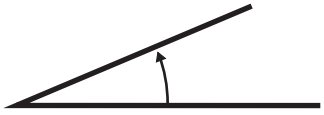
Measurement of angle _____



Estimate _____

Type of angle _____

Measurement of angle _____

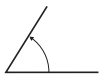


Teacher's Reference Sheet:

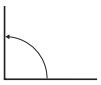
Measuring Angles Key

Type of angle: Obtuse
Measurement of angle: 122°

Type of angle: Acute
Measurement of angle: 58°



Type of angle: Right
Measurement of angle: 90°



Type of angle: Obtuse
Measurement of angle: 157°

Type of angle: Acute
Measurement of angle: 23°