

ORIENTATION OF SOLAR DEVICES

OBJECTIVES

The student will do the following:

1. Use a compass to determine the orientation of the exterior wall of the school.
2. Determine the degree of variance from true south of the southern-oriented wall.
3. Compare the orientations of the walls to observations of the amounts of sunlight hitting them.

SUBJECTS:

General Science, Physical Science, Industrial Arts, Environmental Science

TIME:

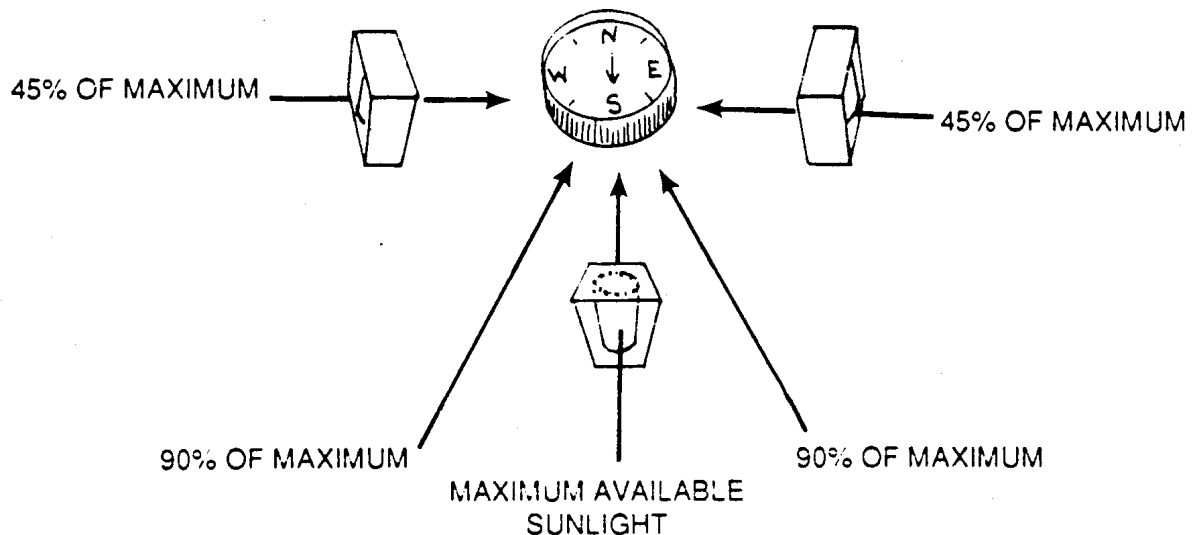
1 class period

MATERIALS:

compass, student sheets (included)

BACKGROUND INFORMATION

The effective use of energy-saving solar devices depends upon careful selection of their locations. The collectors or cells must be oriented so that they receive the greatest possible amounts of solar energy. To receive maximum amounts of sunlight throughout the year, the southern exposure of a building and/or the solar devices should be oriented as close to true south as possible. If this orientation is not feasible the direction may vary by up to 30 degrees east or west of south. This will result in only about 10 percent reduction of the amount of available sunlight. Deviations greater than 30 degrees from true south may significantly affect the energy collection of the system.



PROCEDURE

- I. Discuss with the students the importance of orienting solar devices or systems to maximize their energy collection.
- II. Demonstrate the use of the compass. Explain that the students will use compasses to determine the orientations of the walls of the school.
- III. Divide the class into small groups (or pairs). Distribute the student sheets (included). Direct the students to the major exterior school walls. Have them determine the orientation of each major wall.
- IV. When they determine which wall has the southernmost exposure, have them use the “Sun Finder” student sheet and their compasses to determine the wall’s degree of variance from true south.
- V. Continue with the follow-up below.

FOLLOW-UP

- I. Which school walls face north? east? west? south?
- II. How many degrees east west of true south is the south-facing wall?
- III. If variance from true south cannot exceed 30 degrees east or west without seriously affecting the ability of a solar device located there to collect energy, is the southern wall of the school a suitable place for a solar device?
- IV. Ask the students to compare the data collected on the orientation of the school’s walls to their observations of the amounts of sunlight hitting the respective walls.

East-facing walls are exposed to morning sunlight but shadowed in the afternoon. The opposite is true for western walls. Students may have observed that walls with a southern exposure receive sunlight for more hours of the day throughout the year.
- V. Ask the students for ideas as to how they might be able to demonstrate that the wall whose orientation is nearest to true south receives more solar energy than other walls.

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Instructions

1. Using the compass, determine the orientation of at least four walls of your school building that have different exposures. Record in the data table the directions they face.
2. Return to the wall that is the most south-facing. Use the "Sun Finder" handout to determine the number of degrees east or west of true south that the wall deviates. Record this data in the column called "Degrees of Variance." (This will be the only entry in this column.)
3. Observe the exposure of each wall to sunlight at various times of the day. (if this is not possible, try to recall each wall's exposure at other times of the day.) Describe the amounts of sunlight.

DATA TABLE

| WALL | DESCRIBE LOCATION OF WALL | ORIENTATION OF WALL | DEGREES OF VARIANCE | DESCRIBE EXPOSURE TO SUNLIGHT |
|-------|---------------------------------|------------------------|---------------------------|----------------------------------|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| OTHER | | | | |

SUN FINDER

Find the exact Direction for your Solar System

WHAT YOU NEED

1. This page
2. Compass

WHERE TO PLACE

1. Using the compass, decide which wall faces closest to south
2. Place the arrows at the bottom of this page against the face of the south wall
3. Put your compass exactly in the center of the circle marked "COMPASS GOES HERE"

HOW TO USE

1. The compass needle will point to an angle printed on this page
2. This angle will be either east or west of south
3. This will tell you how many degrees off south your wall faces

