

Secret Formulas:

Calculating the Perimeter and Area of Rectangles and Squares



Grades 3–5

Using AIT Products

- *Math Works*, Program 1, “Measurement: Finding Areas of Rectangles”
- *Math Works*, Program 9, “Measurement: The Difference Between Perimeter and Area”
- *Math Can Take You Places*, Episode 1, “The Long and Tall of It (Measurement)”

Overview

Imagine trying to build a fence around a yard or trying to determine how much paint you need to paint a room without having a basic knowledge of measurement and shapes. Being able to measure shapes is crucial when completing many ordinary tasks. This lesson is designed to help students develop formulas and procedures for determining the perimeter and area of rectangles and squares. Students will calculate the perimeter and area of common objects found in the classroom and at home and discover how people apply measurement skills in everyday situations.

Objectives

Students will:

- Use a formula to calculate the perimeter of rectangles and squares.

- Use appropriate units to describe the perimeter of rectangles and squares.
- Use a formula to calculate the area of rectangles and squares.
- Use appropriate units to describe the area of a rectangle and square.
- Explain the difference between perimeter and area.
- Describe instances when people need to calculate perimeter and area in everyday life.

Vocabulary

area
perimeter
quadrilateral
square centimeter

Preparation

Materials Needed

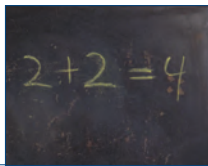
- AIT video: *Math Works*, Program 1, “Measurement: Finding Areas of Rectangles”
- AIT video: *Math Works*, Program 9, “Measurement: The Difference Between Perimeter and Area”
- AIT video: *Math Can Take You Places*, Episode 1, “The Long and Tall of It (Measurement)”
- Book: *Harry Builds a House*, by Derek Radford
- Rules and/or yardsticks
- Grid paper

Planning Notes

Arrange students in work groups to complete this lesson. Groups of three to five are best.

Time

This project will take four 45-minute class periods, in addition to homework and extension activity time.



All things which can be known have number; for it is impossible for a thing to be conceived or known without number.

—Philolaus (Pythagorean)

Procedure—Day 1

Introduce Topic

Read *Harry Builds a House*, by Derek Radford, aloud to students.

After the story, explain to students that when people build and decorate houses, they must do a lot of measuring. Have students name some things that Harry and his crew had to measure before they built the house.

Tell students that people often have to calculate the perimeter or area of shapes when building and decorating houses. Perimeter is the distance around the outside of a two-dimensional shape. Area is the number of square units it takes to cover a surface.

Group Work

Tell students that you are going to measure the perimeter of the classroom. Give each group rulers and/or yardsticks and assign each group one wall to measure. Ask groups to record their measurement on the board. Have students help you add all the measurements.

Ask students if there is an easier way to calculate the perimeter of the room. Students should know that you can also calculate the area by measuring one length of the room and one width of the room, adding these measurements together, and multiplying by two.

Have each group calculate the perimeter of two objects in the classroom, sketch the shapes of the objects, and record the perimeter of the objects without identifying the objects.

Tell groups to exchange their papers with the measurements. Have students figure out what the objects are by measuring.

Homework

Have students calculate the perimeter of three objects at home. Students should write down the measurements of the objects, as well as the perimeter.

Procedure—Day 2**Introduce New Topic**

Tell students that you would like to cover a bulletin board with colored paper. Ask them how you can figure out how much paper you need.

Explain that in order to determine how much paper you need, you have to calculate the area of the bulletin board. Remind students that area is the number of square units it takes to cover a surface.

Pre-Viewing Activity

Give each student a copy of the square-centimeter grid paper (Appendix A). Tell students that each square measures exactly one centimeter on each side and that the squares are called “square centimeters.”

Ask students to explain how they can calculate the area of the rectangle shown on the graph paper.

Tell students that there are several ways to calculate the area. They will watch a video that describes some of the ways to calculate area.

Video

Cue Program 1 from the series *Math Works* to approximate time code 09:50 (the beginning of the animation). Tell students to write down the different ways to calculate area. Play the video until the end of the animation.

After the video, use the following as prompts for discussion.

- How did Wanda figure out the area of Mother Witch’s plot of land?
- Why was Wanda able to find the answer before Grizelda did?

Have students explain how to calculate the area of the rectangle on the square-centimeter grid paper.

Group Work

Have each group calculate the area of two different objects in the classroom. Then ask each group to explain to the class how they calculated the area of the objects.

Homework

Have students calculate the area of three objects at home. Students should write down the measurements of the objects, as well as the area.

Procedure—Day 3**Introduce New Topic**

Give each student a copy of the Perimeter and Area worksheet (Appendix B). Have students calculate the perimeter of each rectangle or square. Students should notice that all the quadrilaterals on the page have the same perimeter.

Ask students if they think all of the rectangles and squares on the page have the same area.

Video

Tell students that they will now watch a video that describes the difference between perimeter and area. Cue Program 9 from the series *Math Works* to approximate time code 12:52 (the beginning of the animation). Play the video until the end of the animation.

After the video, ask the following questions.

- What was the perimeter of Ali Baba’s magic carpet?

- What was the area of Ali Baba’s magic carpet?
- Why was Ali Baba’s new carpet so much smaller than his old one, even though the perimeters were the same?

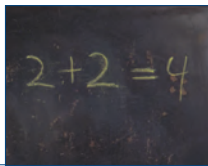
Have students calculate the area of each rectangle or square. Students should notice that the areas are all different, even though the perimeters are the same.

Group Work

Have groups of students work together to solve the following problems.

Problem One. Your class is going to plant a garden in the playground. You have been given 100 feet of fencing to place around the perimeter of your garden. You want your garden to be as large as possible. What dimensions should your garden be?

Problem Two. You have been asked to help build a sandbox for the kindergartners at your school. The perimeter of the sandbox should be 20 feet. If you want the sandbox to take up the least amount of space possible, what should the dimensions of the sandbox be?



Mathematics compares the most diverse phenomena and discovers the secret analogies that unite them.

—Joseph Fourier

Procedure—Day 4

Introduce New Topic

Explain to students that many people calculate perimeter and area when they build a fence or when they have to figure out how much wallpaper they need to buy to redecorate their bedroom. Ask students to name some other everyday examples of when people might need to calculate perimeter and area.

Video

Tell students that they will now watch a video in which an athletic trainer explains how staff members at hotels calculate perimeter and area to determine how they can accommodate seven-and-a-half foot basketball players. Cue Episode 1 from the series *Math Can Take You Places* to approximate time code 03:08 (when Roger Hinds appears on the screen). Play the video until approximate time code 08:25 (when Roger Hinds stops talking).

Use the following as prompts for discussion after the video.

- What must staff members at hotels do to provide a comfortable sleeping space for basketball players?
- Describe how staff members at hotels use perimeter and area to help them rearrange their rooms for basketball players.

Group Work

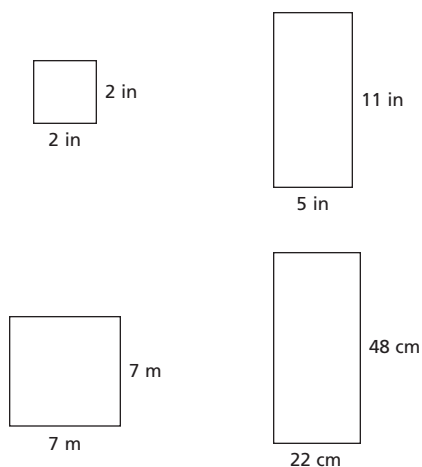
Tell students to imagine that five new students will be joining their class. They need to rearrange the room to accommodate these new students. Each student will need a desk to work at, and they want to have as much room as possible for the teacher and students to walk around the classroom. Have each group come up with a new layout for the classroom. Students should draw their designs on a piece of grid paper. Their designs should show the dimensions of the

classroom, as well as the dimensions of the furniture. Have all the groups share their designs with the class.

Assessment

Individual Assessment

Have students calculate the perimeter and area of the following quadrilaterals.



Writing Assignment

Have students write a story about building a new house. This story should include a description of when the construction crew needs to calculate the perimeter and area of shapes.

Extension Activity

Have students interview an adult, asking about instances when he or she has had to calculate the perimeter or area of a shape.

Resources

PBS Kids

Cyberchase—Totally Rad Kids

pbskids.org/cyberchase/parentsteachers/pdf/WR_totally_rad.pdf

This worksheet challenges students to examine shapes with a perimeter of 12 and determine which shape has the largest area.

Cyberchase—Airlines Builder

pbskids.org/cyberchase/games/perimeterarea/perimeterarea.html

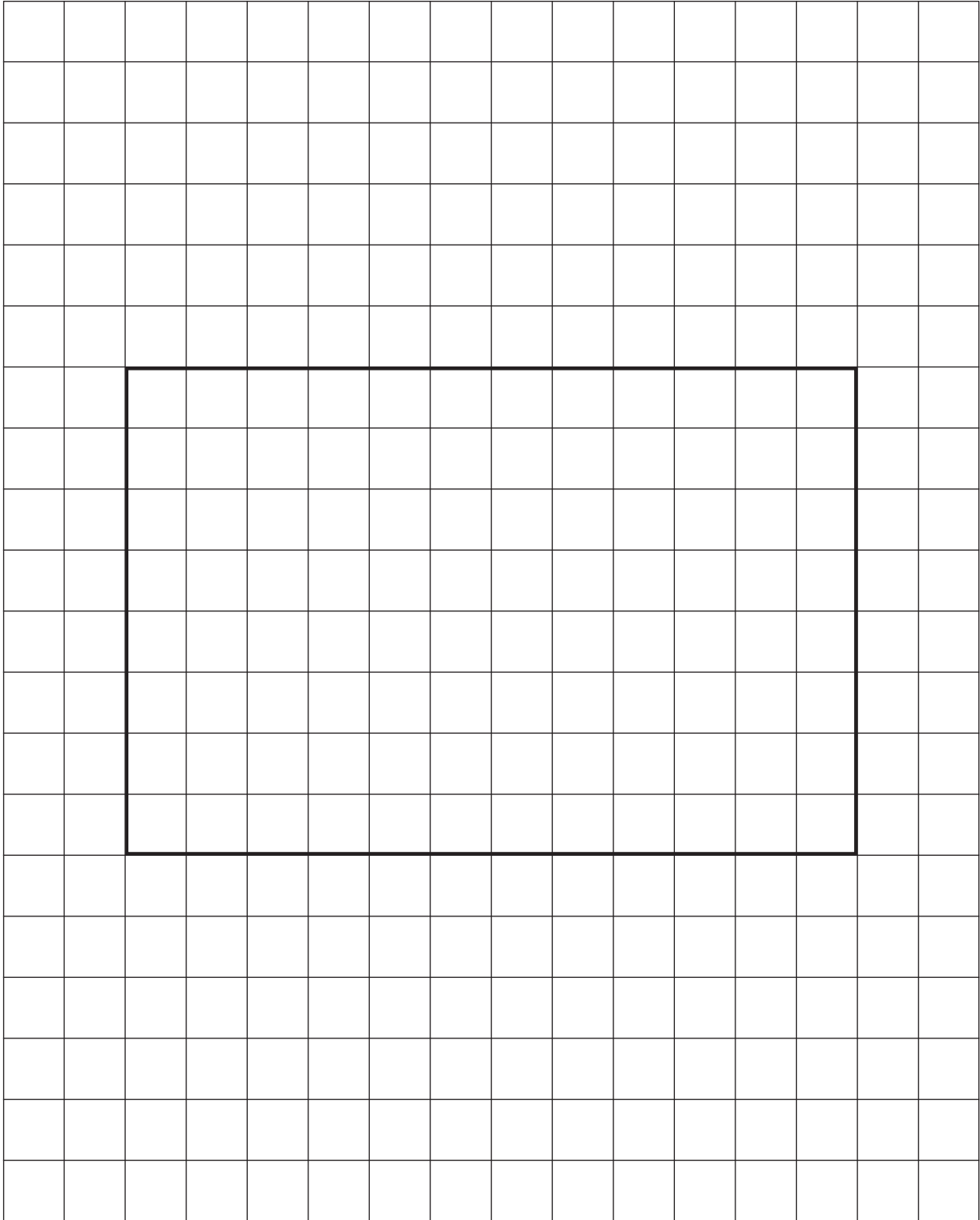
This online activity gives students the opportunity to use an interactive ruler to measure shapes on a Geoboard. Students are then prompted to find the area and perimeter of the shape.

Fun Brain.com—Shape Surveyor

www.funbrain.com/poly

This Web site includes an online, interactive game that gives students practice calculating the perimeter and area of squares and rectangles.

Appendix A: Square-Centimeter Grid Paper



Appendix B: Perimeter and Area Worksheet

