



PERIMETER: GETTING AROUND AN AREA

Subject Matter: Mathematics

Grade Levels: 3-5, but may be adapted to other grade levels

Time Allotment: Two 40-minute class sessions

Master Teacher: Christine Barr

Overview

How do we determine the size of an object? Through activities presented in this lesson, students will gain an understanding of how we measure the perimeter and area of objects.

Learning Objectives

Students will be able to:

- Define the term “perimeter.”
- Define the term “area.”
- Compare the surface area of objects.
- Develop strategies to measure the perimeter and area of simple polygons and everyday objects.

Oregon Standards Available at:

<http://www.ode.state.or.us/cifs>

Mathematics - Measurement

- Select the appropriate units and tools to measure length, perimeter, weight, area, volume, time, temperature, money and angle.
- Measure length, perimeter, weight, area, volume, time, temperature and angle using standard and nonstandard units of measurement.

Mathematics - Geometry

- Use geometric representations to solve problems.

Media Components

Video

Check the link at <http://www.opb.org/edmedia/trs/> to find access to the video(s) from unitedstreaming™ referenced in this lesson plan.

- “Mathematical Eye: Area and Volume” (20:04)
 - **Clip:** “Defining Perimeter” (04:30)
 - **Clip:** “Videomath: Surfaces” (15:58)
 - **Clip:** “HT: Rearranging Shapes” (02:31)
 - **Clip:** “Comparing Surface Shape and Size” (03:59)

Web

- **Perimeter of a Rectangle**

This site offers several options. The “Learn” option gives students the formula used to calculate the perimeter of a rectangle. The “Practice” option allows students time to practice using the formula. The “Play” option has three games from which the students can choose to calculate the perimeter of a rectangle.

<http://www.aaamath.com/geo78-perimeter-rectangle.html - section2>
- **Family Education Network - Shape Surveyor**

This is an interactive site where students are shown a rectangle with its dimensions labeled. Students calculate the area or perimeter of the rectangle. Each correct answer receives a piece of an archeological puzzle. When students have earned all pieces of the puzzle, a famous archeological find is displayed.

<http://www6.funbrain.com/poly/index.html>
- **National Library of Virtual Manipulatives for Interactive Mathematics**

This is an interactive site where students have the option to use a virtual geoboard, illustrating the concept of area and perimeter. Another option is the virtual tangram puzzle where students use pieces of the tangrams to make various shapes, allowing the investigation of surface area.

http://matti.usu.edu/nlvm/nav/category_g_2_t_4.html

Materials

For Each Student:

- Scissors
- Several 4” x 5” sheets of paper
- Grid paper
- Colored pencils

Prep for Teachers

Prior to teaching this lesson, bookmark all the Web sites used in the lesson on each computer in your classroom.

Download the video clips onto the computer you will use to project the clips for the classroom presentation. Be certain each computer in the classroom has a copy of the free Windows Media Player installed (some clips aren't available for use with QuickTime Player).

When using media, provide students with a **Focus for Media Interaction**, a specific task to complete and/or information to identify during or after viewing of video segments, Web sites or other multimedia elements.

Introductory Activity

Step 1: Hold up a half sheet of 4" x 5" paper. Ask students to predict how big the paper is. Write down student predictions on the board.

Step 2: Ask students if the paper is larger or smaller than an average human is. (Students will say that the paper is smaller.) Tell students that in this lesson you will prove that an average-sized human can fit through that piece of paper.

Step 3: Ask the students if they can define what "perimeter" is. (Student answers will vary. If your students cannot define the term, explain to the students that the perimeter is what we call the distance around something.) Write the definition on the board.

Step 4: Ask the students if they can define what "area" is. (Student answers will vary. If your students cannot define the term, explain to the students that the area is the amount or size of a surface.) Write the definition on the board.

Step 5: Explain to your students that in this lesson you will be examining how to measure area and perimeter.

Learning Activities

Step 1: Explain to the students that they will be watching a video clip that defines perimeter. Provide students with a **Focus for Media Interaction**, asking them to watch for the definition of perimeter and how someone can measure perimeter. **Play** the video clip, "Defining Perimeter" (04:30), from the video, "Mathematical Eye: Area and Volume" (20:04). **Pause** the video when you hear, "... Perimeters have caused all sorts of trouble throughout history."

Ask students to recall the definition for perimeter. (Students should say perimeter is the distance around a shape or object.) Ask students, "How do you measure the perimeter?" (Students should say that you measure the sides and add these measurements together.) Write the process of measuring the perimeter on the board.

Tell students that in the next section of the video they will learn how the concept of perimeter might cause trouble. Provide students with a **Focus for Media Interaction**, asking them to watch for how Hingus the Saxon got a large perimeter for his land. **Resume** the video.

Pause the video when you hear, "... so that's how the Saxons came to stay." Discuss with the students how Hingus got a large piece of land. (He used a big piece of leather that he cut into a narrow strip to make a perimeter around a hill.) Ask students if they think the solution Hingus used would really work. (Student replies will vary.) Tell students that in the next section of the video they will see how Hingus' solution might have worked and they will see an average-sized human fit through a piece of paper. Provide students with a **Focus for Media Interaction**, asking them to watch for how the students in the video thought like Hingus to fit through a piece of paper. **Resume** the video.

Step 2: Discuss with the students how the students in the video thought like Hingus. (Answers will vary, but should include the idea that the paper was being cut in a manner to fit around a person's body.) Ask students for their ideas on how the students in the video were able to fit through the piece of paper. (Answers will vary, but should include several ideas on how to fold and cut the paper.)

Step 3: Tell students that they will try the experiment of cutting a piece of paper that will fit around a person. Pass out 4" x 5" sheets of paper and scissors for the students to try the experiment. Explain to the students that they will have 10 minutes to see if they can complete the experiment.

After 10 minutes have passed, ask the students if anyone was successful at cutting the paper so they could fit inside. Have successful students explain how they were able to complete the experiment.

Step 4: Tell the students that they will now watch a video about surface area. In the video an animated character, HT, is helping a little man solve a problem. Provide students with a **Focus for Media Interaction**, asking them to watch for the little man's problem with his dragon and how HT solved it. **Play** the video clip, "HT: Rearranging Shapes" (02:31), from the video, "Videomath: Surfaces" (15:58).

When the video clip is finished, ask students to tell what the little man's problem was with his dragon. (Students should say that the man and the dragon were arguing about who was bigger.) Ask students if HT helped to solve the problem. (Students should say that he did help by rearranging the shapes to show that they were the same size.) Tell students that HT demonstrated one way to compare surface areas.

Step 5: Tell students that they are going to watch one more video that investigates how to compare the shape and size of objects. Provide students with a **Focus for Media Interaction**, asking them to watch for some ways to compare the surfaces of objects. **Play** the video clip,

“Comparing Surface Shape and Size” (03:59), from the video, “Videomath: Surfaces” (15:58). **Pause** the video when you hear, “... 300 grams (the boy is weighing the box).”

Discuss with the students some of the ways the surfaces of objects were compared. (The orange peel was placed on top of the banana peel; the boxes were cut and placed on top of each other.)

Tell students that they will watch more of the video to see a way to get a specific measurement of area. Provide students with a **Focus for Media Interaction**, asking them to watch for how they can use string and squares to measure an area. **Resume** the video. **Pause** the video shortly after you hear, “... How big can it get?” (You will see the string making a circle on the grid.) Discuss with the students how the string and squares were used to measure area. (The discussion should lead to the concept that the string was the perimeter and the number of squares was the area inside the perimeter.)

Explain to the students that you are going to show them one more model that uses dominoes for measuring perimeter and area. Provide students with a **Focus for Media Interaction**, asking them to examine how they could use this model for measuring a rectangle. **Resume** the video.

When the video has ended, ask students how they could use the domino model to measure the area and perimeter of a rectangle. (Answers will vary, but students should come to the conclusion that the perimeter is the number of squares around the outside and the area is the number of squares that complete the shape.)

Culminating Activity

Step 1: Review with the students the definition of perimeter (measurement around an object) and area (the surface size of an object). Ask students to recall some methods for measuring area and perimeter. (Answers will vary, but should include: comparing objects by placing them on top of each other, counting the squares or units around an object, counting the squares inside a surface.)

Step 2: Have students log on to the Family Education Network Shape Surveyor Web site at <http://www6.funbrain.com/poly/index.html>. Provide a **Focus for Media Interaction** by telling students to think about the strategy needed to calculate the perimeter and area of rectangles. Instruct students that they will practice calculating perimeter and area of rectangles on this Web site. Allow students 10 minutes to practice measurements at this site.

Step 3: Tell students that they are going to use a geoboard model to measure the perimeter and area of squares and rectangles. Explain to them that they can determine the perimeter by counting the squares on the outside of the shape and they will measure area by counting the squares on the inside of the shape. They will be using a virtual geoboard on the computer, but will need to draw their models on graph paper with colored pencils. (Use student models on the graph paper as an assessment.)

Step 4: Hand out graph paper and colored pencils to each student. Have students log on to the virtual geoboard at http://matti.usu.edu/nlvm/nav/category_g_2_t_4.html. Provide a **Focus for Media Interaction** by asking students to think about how square units can be used to determine area and perimeter when using the geoboard model. Tell students they can experiment making shapes with the virtual geoboard and that they need to record at least eight different squares and/or rectangles that they made on their graph paper, and write the area and perimeter for each one.

Step 5: When students have completed their area and perimeter models on graph paper, have them log on to the virtual tangrams at http://matti.usu.edu/nlvm/nav/category_g_2_t_4.html. Provide students with a **Focus for Media Interaction** by asking them to consider strategies for comparing surface area while completing tangram puzzles. Have students compare surface areas by completing at least three of the tangram puzzles.

Cross-Curricular Extensions

Art

- Have students use construction paper pieces of the tangram puzzle to create a unique picture. Then have the students write a story about their picture.

Language Arts/Writing

- Have students write creative stories about the tangram pictures they made.

Social Studies

- Have students research the Chinese Tangram and see if they can find stories related to the tangram.

Community Connections

- Have students measure the perimeter and area of rooms in their homes.
- Invite a general contractor to speak to the class about how area and perimeter measurements are used on the job.
- Have students try to determine the amount of wallpaper needed to cover the walls of the classroom.
- Have students compare surface areas of cereal boxes or other containers brought from home.
- Ask students to estimate what it would cost to seed a barren public space with grass for a future playing field and what it would cost to fence the same field.