

# Perusing Perimeter

**Intended for Grade:** Fifth

**Subject:** Math

**Description:** This project includes an activity in which students calculate the area and perimeter of various structures in Oxford, Mississippi.

**Objective:** The student will be able to calculate the perimeter and area of objects when provided with either images or written descriptions.

## **Mississippi Frameworks addressed:**

- Math Framework 1b: Identify, classify, and find the perimeter of polygons.
- Math Framework 1c: Find the area of squares and rectangles.
- Math Framework 2f: Solve multi-step word problems using suitable measurements.
- Math Framework 5i: Solve multi-step word problems using the four basic operations with computation and estimation.

## **National Standards addressed:**

- Math Standard: Geometry
- Math Standard: Measurement
- Math Standard: Number and Operations
- Math Standard: Problem Solving

## **Materials:**

- [Google Earth](#), freeware version
- Calculators, one per student
- Practicing Area and Perimeter worksheet
- How Does Oxford Measure Up? worksheet (for those using the Oxford, Mississippi images)

## **Background:**

Google Earth, a freeware version of which is available at <http://earth.google.com>, is a computer program that contains high-resolution aerial or satellite photographs of most cities and towns around

the world. The resolution of Google Earth images is so great you can even see the color of the cars parked in driveways! This program also contains a measuring tool that can be used to measure approximate lengths in three metric units and five standard units.

The length of the boundary of a two-dimensional object is called the **perimeter**. Since the perimeter of an object is a length measurement, students must ensure they include the length unit they use when they measure this boundary. For instance, the perimeter of an object can be 48 inches, 2 feet, or 0.25 meters, but not just 36; the unit of measurement must be included!

The **area** of a two-dimensional object is the number of 1 x 1 unit squares and fractions thereof contained within a given surface. To find the area of a square, the length (units included) is multiplied by the width (units included). This is why area is given in terms of square units; for example, 1 inch x 1 inch = 1 inch<sup>2</sup>, where the exponent on the length unit represents the number of times that unit was multiplied by itself to end up with this product. For this reason, students must understand that when they are calculating area they must measure the length and width of the object using the *same* length unit. The area of a rectangle or a square can be found by multiplying its length (units included) by its width (units included). The area of a triangle can be determined by multiplying one-half its height (units included) by its base (units included).

Many students find visualizing any sort of “square unit” challenging. If your room is tiled with square tiles, you may try tape off a rectangular section of tiles. Then, students can calculate the area by counting the number of 1 x 1 squares that will fit inside the rectangle’s perimeter. You may also want to cut out several different unit squares (1 in x 1 in, 1 ft x 1 ft, 1 cm x 1 cm, etc.) to help students visualize square units. Another suggestion would be to sketch a rectangle on an overhead transparency. After that, cut out opaque centimeter or inch unit squares, and show students how the unit squares can be placed inside the rectangle to determine its area.

Students may also have difficulty in calculating the area of a non-right triangle, since in this case the height of the triangle is not the length of one of its sides. Students may better understand triangle area problems if they begin by identifying the base of the triangle. Next, have students locate the vertex opposite this side (the only vertex of the triangle to which the base the triangle is not adjacent). The height of the triangle is the distance from the base to this vertex. Note that this technique works for ALL triangles- for a right triangle, though, the length of the side adjacent to the base and to the above mentioned vertex is also the triangle’s height.

## Procedure:

1. Download the freeware version of Google Earth at <http://earth.google.com> by clicking on the “Get Google Earth (Free Version)” link in the upper right-hand corner. After clicking on the link, make sure your computer meets or exceeds the minimum requirements listed. If Google Earth is compatible with your machine, click on the “Download Google Earth.exe” button.
2. After downloading Google Earth.exe, double click on the “GoogleEarth” icon (this icon looks like a globe in a cardboard box). Follow the installation instructions and then launch Google Earth.
3. Enter the name of your town or city in the “Search” field in the upper left hand corner and then press “Enter” on your keyboard.
4. By clicking and holding the mouse button you can “grab” and then move the Google Earth image. In this manner, move around your town or city and identify a square, triangular, or rectangular structure for which students will calculate the perimeter and area. To zoom in further, click on the “+” icon below the image. Center the structure in the image.
5. Now, click on the “Tools” dropdown menu. Select the “Measure” function. Click on the “Line” folder tab and select the units you would like to use from the dropdown menu (this menu says “miles” but by clicking the down arrow the rest of the units appear). Note that the image cannot be moved when the “Measure” window is open. If you need to zoom in or out, or move the image, you must first close the “Measure” window.
6. Measure the length of the structure you selected by clicking on one corner of the structure, releasing the mouse button, and then clicking on an adjacent corner of the structure. Write down this measured length and then repeat this procedure to measure the width (or height) of the structure.
7. Close the “Measure” tool. Click on the “File” dropdown menu and select “Save Image.” Name this image and then save it to your desktop.
8. Open this image by double clicking the corresponding icon on your desktop.
  - a. If your machine used Microsoft Office Picture Manager to open this image, click on the “File” dropdown menu and select “Send to.” Select “Microsoft Office...” from the new dropdown menu. Click the “Insert into a new Microsoft Word document” circle.
  - b. If your machine used another program to open the image, copy and paste the image into a Word document.

- 9.** Open the Word document containing the Google Earth image. Open the header and label the image.
- 10.** Use the Microsoft Word line drawing tool to draw red lines along adjacent sides of the structure. For triangular structures, draw the red lines along the base and height. The lines you draw should be in the same place as the lines the “Measure” tool created. Note: If you cannot locate the line drawing tool, click the “Tools” dropdown menu and select “Customize...” Click the box next to “Drawing” under the “Toolbars” tab and then press the “Close” button.
- 11.** Use a text box (the button that looks like an index card on the “Drawing” toolbar) to label the length of the structure. Open another text box and label the width (or height) of the structure.
- 12.** Save and print the labeled image.
- 13.** Repeat steps **3.** through **12.** three more times. However, use a different unit to measure each of the structures.
- 14.** Develop area and perimeter questions about each of the structures for students to answer.
- 15.** Introduce perimeter and area topics including formulae for squares, rectangles, and triangles.
- 16.** Have students complete the Practicing Perimeter and Area worksheet. Make sure students are including the appropriate units when they answer the questions on the worksheet!
- 17.** Divide the class into four groups. Give each group one of the images printed in **12.**
- 18.** If you are using the images of Oxford, Mississippi, have students complete the How Does Oxford Measure Up? worksheet by answering the question or questions corresponding to their assigned image. If you are not using the images of Oxford, Mississippi, have students answer the questions you created in **14.**
- 19.** When all of the groups have completed this task, have groups trade images.
- 20.** Repeat steps **18.** and **19.** until each group has calculated the perimeter and area for all of the structures.

### **Evaluation:**

Students successfully complete the Area and Perimeter worksheet and correctly determine the perimeter for and calculate the area of the structures in the printed images.

### **Extended Activities:**

Determine the height of various rectangular buildings in the images of your town. Have students then calculate the volume of these buildings.

Using tape measures, have students measure rooms and other spaces in their school and calculate perimeters and areas.

### **Sources:**

“Area.” Merriam-Webster Online Dictionary. Accessed 2 December 2005.  
<<http://www.m-w.com/cgi-bin/dictionary>>

Google Earth. Accessed 1 November 2005. <<http://earth.google.com>>

Weisstein, E. W. 1999. “Perimeter.” MathWorld. Accessed 2 December 2005. <<http://mathworld.wolfram.com/Perimeter.html>>

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December 2005

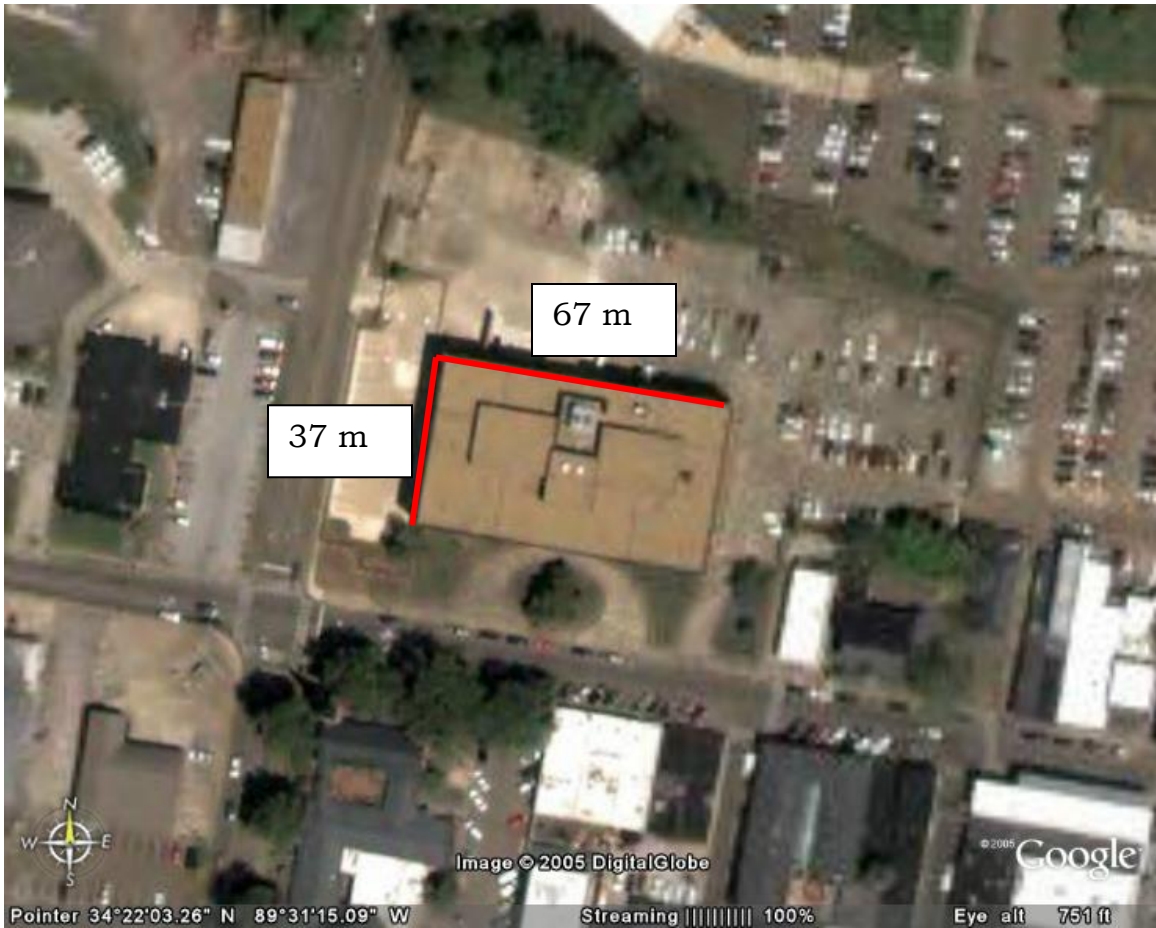
**Image #1**  
**The intersection of University Avenue and Highway 7**  
**Oxford, MS**



**Image #2**  
**Central Elementary School and Oxford Middle School**  
**Oxford, MS**



**Image #3**  
**The Federal Courthouse**  
**Oxford, MS**



**Image #4**  
**The Oxford Square**  
**Oxford, MS**

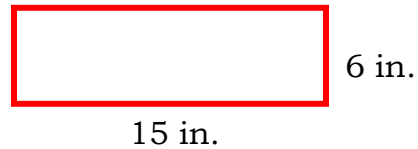


**Name:**  
**Date:**

### Practicing Area and Perimeter

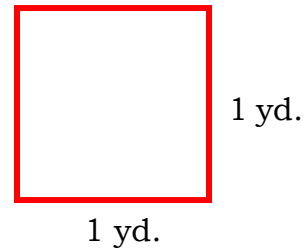
**1.** Find the perimeter and area for each of the red figures below. For **1. e.**, use the line next to the answer box to include appropriate units.

**a.** Perimeter =  in.



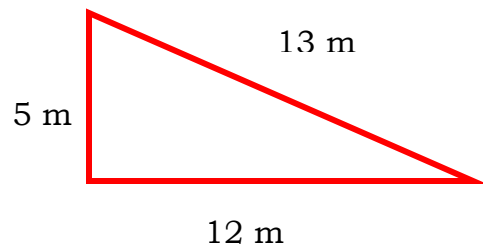
Area =  square in.

**b.** Perimeter =  yd.



Area =  square yd.

**c.** Perimeter =  m



Area =  square m

d. Perimeter =  cm

Area =  square cm

e. Perimeter =  —

Area =  \_\_\_\_\_

**2.** A rectangle is five feet long and two feet wide. Answer the following questions about this rectangle. You may draw a picture of this rectangle in the space below. **Be sure to include the proper units.**

a. What is the perimeter of this rectangle? \_\_\_\_\_

b. What is the area of this rectangle? \_\_\_\_\_

**Name:**

**Date:**

## **How Does Oxford Measure Up?**

- 1.** Use the GoogleEarth images to answer the questions below.
  - a.** Using Image #1, what is the area of the grassy triangle by University Avenue and Highway 7, in feet? \_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
  - b.** Central Elementary School is the white-roofed building in Image #2. What is the perimeter of Central Elementary School, in yards? \_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
  - c.** Using Image #2, what is the area of the first floor of Central Elementary School, in square yards? \_\_\_\_\_

- d.** The federal courthouse is the building in the center of image #3. What is the area of the second floor of the federal courthouse, in square meters? Hint: Assume that the second floor and the first floor have the same dimensions.

\_\_\_\_\_

- e.** Suppose Mayor Howorth wants to bulldoze the Oxford courthouse and then re-pave the entire square, which you will see in image #4. How many square miles will contractors repave?

\_\_\_\_\_

- f.** Mayor Howorth decides to keep the courthouse but to repave the rest of the square. If the footprint of the courthouse is 0.0009 square miles, how many square miles will the contractors repave?

\_\_\_\_\_