TEACHING WITH PRIMARY SOURCES—MTSU
Lesson Plan: Calculating Perimeter and Area using Architectural Drawings

Grade: 5th and 6th
Subject: Math
Time required: 1-2 class periods
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OVERVIEW
Students will use real world examples of mathematics to determine the measurements of historic Tennessee buildings.

UNDERSTANDING GOAL
Using images of architectural drawings from the Historic American Buildings Survey collection at the Library of Congress, students will be given measurements to determine the area and perimeter of buildings.

OBJECTIVES
- Students will calculate the perimeter of a building using appropriate units of measurement.
- Students will calculate the area of a building using appropriate units of measurement.

INVESTIGATIVE QUESTIONS
Who would need to know the perimeter of a building? Why do you think realtors would need to know the area (square feet) of a house that they’re trying to sell?

LIBRARY OF CONGRESS RESOURCES
- Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey
- 1. MAIN (EAST) ELEVATION - Netherland Inn, 2144 Knoxville Highway, Kingsport, Sullivan County, TN [1962]
- 3. MAIN (EAST) ELEVATION, VIEW FROM THE NORTHWEST - Netherland Inn, 2144 Knoxville Highway, Kingsport, Sullivan County, TN [1962]
- 4. REAR ELEVATION - Netherland Inn, 2144 Knoxville Highway, Kingsport, Sullivan County, TN [1962]
- 6. STAIRHALL - Netherland Inn, 2144 Knoxville Highway, Kingsport, Sullivan County, TN [1962]
- HABS TENN,82-KINPO,1- (sheet 2 of 10) - Netherland Inn, 2144 Knoxville Highway, Kingsport, Sullivan County, TN [1962]
- HABS TENN,82-KINPO,1- (sheet 3 of 10) - Netherland Inn, 2144 Knoxville Highway, Kingsport, Sullivan County, TN [1962]

TENNESSEE CURRICULUM STANDARDS

5th Grade Mathematics
5.MD.C.3: Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
5.MD.C.3a: Understand that a cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume and can be used to measure volume.
5.MD.C.3b: Understand that a solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

6th Grade Mathematics
6.G.A.1: Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; know and apply these techniques in the context of solving real-world and mathematical problems.
**Step 1**
From the link to the bibliographic page for each primary source, click on the icon for “drawings” on the left. You will see a series of thumbnail images of the architectural drawings for each building. Click on a thumbnail for a closer look at a drawing, and then select an option to view as a larger, higher resolution picture. (Note: The letters and numbers are all legible from the TIFF file.) Download and print out the six larger images. To see photographs of the buildings, click on “photos” from the bibliographic pages.

**Step 2**
Review perimeter and area with your students. What is the difference between the two? Reveal to your students that the term “square footage” is another way to say “area” in units of feet, particularly with buildings. It is a term that architects often use.

**Step 3**
Distribute copies of the four photographs of Netherland Inn or project them on a screen. Ask students to make observations about the building. What use do you think this building has? What materials do you recognize? Using information from *The Tennessee Encyclopedia of History and Culture*, provide your students with an overview of the history of the building.

**Step 4**
Explain to your students that the class will be finding the perimeter and area of different parts of Netherland Inn. Introduce your students to the two architectural drawings from the *Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey*. What are these drawings showing? How are we able to identify which level or story of the building we’re looking at? Can you identify the measurements the architect made?

**Step 5**
Distribute the “Calculating Area and Perimeter using Architectural Drawings: Perimeter” worksheet and the *architectural drawing* that accompanies it. Explain what a floor plan is and that it is a representation of the “footprint” of the building, drawn to scale. Distribute the class highlighters and calculators and review the directions to the worksheet. Students may work in pairs or individually to complete this worksheet.

**Step 6**
Once the worksheets have been completed, review the answers and address any questions from the students. Distribute the “Calculating Area and Perimeter using Architectural Drawings: Area” worksheet and the *architectural drawing* that accompanies it. Students may work in pairs or individually to complete this worksheet.
Step 7 Once the worksheets have been completed, review the answers and address any questions from the students. Explain to students that they have completed work that many architects do every day: find the area and perimeter of a building. What was difficult about these worksheets? What have you learned about architectural drawings and what they can tell us? How do architects use building measurements? How are measurements and ratios used outside of the classroom? Why do you think realtors would need to know the area (square feet) of a house that they’re trying to sell? Who would need to know the perimeter of a building?

**EVALUATION**

Student grades should be based on

1) the accuracy of their perimeter calculations (40%),
2) the accuracy of their area calculations (40%), and
3) the thoughtfulness of their class participation (20%).

**EXTENSION**

Find out more about the history and visitor information for this building by visiting the following Web sites:

- Visit Kingsport: [Netherland Inn](#)
- The Tennessee Encyclopedia of History and Culture: [Netherland Inn](#)

Students can examine photographs of the inside and outside of [Netherland Inn](#) from the Web sites listed above can compare them to the historic photographs listed on the surveys for each building. Have the buildings changed at all? You could even take a field trip to one of these locations, so that students can compare the drawings to the pictures and the actual site!

The Netherland Inn currently operates as a historic inn. If your students owned this building, what would they use it for? What other businesses could operate in a building like the Netherland Inn?
Using the “First Floor Plan” on the other side of this paper, find the measurements that make up the perimeter of the outside of the building. Use your highlighter to identify each measurement needed to calculate the perimeter of the building. Don’t forget to include the measurements for the outside of the chimney! Remember that feet are shown as ′ and inches are shown as “. For example, 5′7” means 5 feet, 7 inches. Don’t forget to use your calculator for accuracy and to include the proper units of measurement.

Using the “First Floor Plan” on the other side of this paper, find the measurements that make up the perimeter of the outside of the building. Use your highlighter to identify each measurement needed to calculate the perimeter of the building. Don’t forget to include the measurements for the outside of the chimney! Remember that feet are shown as ′ and inches are shown as “. For example, 5′7” means 5 feet, 7 inches. Don’t forget to use your calculator for accuracy and to include the proper units of measurement.

According to the measurements you highlighted, what is the perimeter of the north (top) side of the building?

North Perimeter: ____________________

According to the measurements you highlighted, what is the perimeter of the south (bottom) side of the building?

South Perimeter: ____________________

According to the measurements you highlighted, what is the perimeter of the west (left) side of the building? Remember to include the outside of the chimney in your measurements.

West Perimeter: ____________________

According to the measurements you highlighted, what is the perimeter of the east (right) side of the building? Remember to include the outside of the chimney in your measurements.

East Perimeter: ____________________

To find the perimeter for the entire building, add each of the four measurements you found above. Use the template below to determine the total perimeter. Remember to show the final answer in feet and inches.

Perimeter of the Netherland Inn: ____________________
FIRST FLOOR PLAN

NAME OF STRUCTURE: NETHERLAND INN

ED R. CALLOWAY, DEL.
SCHOOL OF DESIGN
NORTH CAROLINA STATE COLLEGE

2144 KNOXVILLE HIGHWAY - KINGSPORT - SULLIVAN CO. - TENNESSEE

HISTORIC AMERICAN BUILDINGS SURVEY
SHEET 2 OF 10 SHEETS

SCHOOL OF DESIGN, UNIVERSITY OF SOUTHERN CALIFORNIA

Netherland Inn, 2144 Knoxville Highway, Kingsport, Sullivan County, TN (1962)
Using the “Second Floor Plan” on the other side of this paper, find the measurements that make up the area of the two bed rooms in the building. Use your highlighter to identify each measurement needed to calculate the area of each room. Remember that feet are shown as ‘ and inches are shown as “. For example, 5’7” means 5 feet, 7 inches. Don’t forget to use your calculator for accuracy and to include the proper units of measurement. (Hint: Area will be shown in square feet)

**CALCULATING PERIMETER AND AREA USING ARCHITECTURAL DRAWINGS:**

**Area**

Use the architectural drawing on the other side of this worksheet to answer the questions below. Don’t forget to show your work and to use the correct units of measurement for each question.

Using the “Second Floor Plan” on the other side of this paper, find the measurements that make up the area of the two bed rooms in the building. Use your highlighter to identify each measurement needed to calculate the area of each room. Remember that feet are shown as ‘ and inches are shown as “. For example, 5’7” means 5 feet, 7 inches. Don’t forget to use your calculator for accuracy and to include the proper units of measurement. (Hint: Area will be shown in square feet)

**West Bed Room**

Identify the west (left) bed room on the floor plan. In order to find the area or “square footage” of this room, we will need to locate two measurements: the length and width of the room. Highlight these measurements.

**Length of West Bed Room:** __________________

**Width of West Bed Room:** __________________

Calculate these measurements together to find the area or square footage of the room. Don’t forget to use the appropriate units of measurement.

**Area or “Square Footage” of West Bed Room:**

**East Bed Room**

Identify the west (left) bed room on the floor plan. In order to find the area or “square footage” of this room, we will need to locate two measurements: the length and width of the room. Highlight these measurements.

**Length of East Bed Room:** __________________

**Width of East Bed Room:** __________________

Calculate these measurements together to find the area or square footage of the room. HINT: You may find the width of this room in another location.

**Area or “Square Footage” of East Bed Room:**