

**Pennsylvania Governor's Institute
for Mathematics Educators
2004**

Names of Group Members: Cathy Rush
Christine Preston
Marylou Montuoro

Topic/Theme: Perimeter and Area of Square and Rectangle

Level: Grade 5

Time Element: Three 45 minute class periods

NCTM Standards Addressed:

Geometry:

- Use visualization, spatial reasoning, and geometric modeling to solve problems
 - Recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life.
 - Build and draw geometric objects

Measurement:

- Understand measurable attributes of objects and the units, systems, and processes of measurement
 - Understand such attributes as length, area, weight, volume, and size of angles and select the appropriate type of unit for measuring each attribute.
- Apply appropriate techniques, tools and formulas to determine measurements
 - Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.
 - Develop, understand, and use formulas to find the area of rectangles and related triangles and parallelograms.

PA Math Standards Addressed:

2.3 Measurement and Estimation

- **2.3.5.A.** Select and use appropriate instruments and units for measuring quantities (e.g., perimeter, volume, area, weight, time, temperature).

- **2.3.5.B.** Select and use standard tools to measure the size of figures with specified accuracy, including length, width, perimeter and area.
- **2.3.5.C.** Estimate, refine and verify specified measurements of objects.
- **2.3.5.E.** Add and subtract measurements.

2.5 Mathematical Problem Solving and Communication

- **2.5.5.A.** Develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense, and explain how the problem was solved.
- **2.5.5.F.** Use appropriate problem-solving strategies (e.g.- solving a simpler problem, drawing a picture or diagram).

2.8 Algebra and Functions

- **2.8.5.B.** Connect patterns to geometric relations and basic number skills.

2.9 Geometry

- **2.9.5.E.** Construct two- and three-dimensional shapes and figures using manipulatives, geoboards and computer software.
- **2.9.5.H.** Describe the relationship between the perimeter and area of triangles, quadrilaterals and circles.

Math Assessment Anchors Addressed:

M5.B Measurement

- **M5.B.1** Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems, and processes of measurement.
 - **M5.B.1.1** Select appropriate units (customary or metric) to measure specific attributes of objects.
 - **M5.B.1.1.1** Select the appropriate unit for measuring weight (mass), capacity, length, perimeter, and area.

- **M5.B.1.2** Solve problems using simple conversions and/or add and subtract measurements.
 - **M5.B.1.2.2** Add or subtract linear measurements, (inches or feet) or units of time (hours and minutes), without having to regroup with subtraction (answer should be in simplest form).
- **M5.B.2** Apply appropriate techniques, tools and formulas to determine measurements.
 - **M5.B.2.1** Use appropriate tools to determine measurements.
 - **M5.B.2.2** Solve problems involving length, time, weight, mass, capacity, temperature, perimeter, area, and / or money.
 - **M5.B.2.2.1** Find the perimeter or area of a square or a rectangle (same system of measurement- whole numbers only).

Reading Assessment Anchors Addressed:

R5.A Comprehension and Reading Skills

- **R5.A.2** Demonstrate the ability to understand and interpret nonfiction texts including informational, e.g., textbooks and print media (magazines, brochures, etc.); autobiography; biography appropriate to grade level.
 - **R5.A.2.1** Identify the meaning of vocabulary from various subject areas.
 - **R5.A.2.3** Make inferences and draw conclusions based on text.
 - **R5.A.2.7** Analyze text organization including sequence, comparison/contrast, cause & effect, problem/solution, the headings, graphics and charts to derive meaning.

Objectives: The student will be able to:

- Define the term area.
- Discover the formula for the area of squares and rectangles
- Calculate perimeters and areas of squares and rectangles using customary measure.

Instructional Strategies and Plan (include strategies used to help different types of learners, i.e. auditory, visual, etc.):

Day 1

The students will be working in pairs. Pass out bags of squares. Using all four squares, ask the students to construct as many different figures as they can. Emphasize that at least 1 side of a square touches another. Have students record each shape on their graph paper. Circulate about room to check that students have created all possible shapes.

When students have completed the task, refer to the word *perimeter* (for review), which is listed on the word wall. Discuss the definition.

Using the square on the overhead, ask the students how to find the perimeter. Model finding the perimeter of the square to enhance student understanding. Then have the students find the perimeter of the remaining figures and record each next to the respective figure.

Using the sheet with the figures on it from the intro, ask students to color in the square and rectangle. (Tell them they must color lightly so they can see the grid.) Ask them how many squares it takes to cover the square. Ask how many to cover the rectangle. Refer students to the word *area*, which has been posted on the board. Ask students what they think the word “area” means. Formalize definition, emphasizing the use of square units and relating it to cover. Write this definition on the board. Have students include it in their math notebook. ***(Be sure to discuss the difference between perimeter and area as students tend to confuse these concepts.)***

Pass out additional graph paper. Have them make any size square or rectangle. Instruct them to lightly shade the area. Have them exchange with a partner. The partner will then find the area of the figure. Have partners discuss the appropriateness of their answers. As a closure, have the group share their ideas.

Day 2

(Lesson to be done in computer lab)

Instruct students to go to <http://matti.usu.edu/nlvm/nav/index.html>

Have them find the selection table.

- In the first column, have them find “Geometry”.

- In the Geometry row, have them click on the button for 3-5.
- Have them select “Tessellation”.

Allow students approximately 5 minutes to create various rectangle and square shapes to become familiarized with the program. Ask students to construct a 3x4 rectangle, then determine its area. Discuss student answers.

Have students refer to overhead chart. Ask them to construct each of the listed figures, one at a time. After they have constructed each figure, have them find the area of the figure. Record the answer on the chart. Emphasize the need to record the area with square units.

When the chart is completed, ask students to look at the relationship between the length and width, and area. Ask students to share the relationships that they observe.

From this discussion, develop the formula for area. Have students make a visual representation and written formula for area to be included in their notebook. If desired, teacher can use an overhead which the students may copy. (See Lesson 2- Overhead #2)

Discuss the practical applications of knowing how to compute area. Using examples of objects in the classroom, have the students record the length, width and area of teacher selected objects. Collect student work.

Day 3

Review terms- area, perimeter, using visual emphasizing the “rim” in **perimeter** if needed. Reinforce the practical applications of these concepts by having students compute a word problem similar to that below:

You are putting up an outdoor pen for your pet. The pen is 12 feet wide and 14 feet long. How much fencing do you need? How much space does your pet have to roam? Use a drawing to help you, if needed.

Discuss how the correct answer was obtained.

Ask students what their dream houses would look like. Discuss. Pass out grid paper, tracing paper, and paper clips. Have students clip tracing paper on top of grid paper. Ask students to draw a picture of the front of their dream house, using a straightedge. (*Remind students not to add decoration yet, they will be given an opportunity to do so later.*) Tell them

that they may not use circles or curves, and that all squares and rectangles must use whole grid squares.

After the houses are drawn, collect grid paper from students. Instruct students to find the perimeter of each rectangle and square in their drawing and record on a separate sheet of notebook paper. Using teacher dream house, model chart appearance. Have students find the area of each figure in their drawing and record. Students may use calculators. Tiles should also be available for use by those students who are having difficulty applying the formula, at teacher discretion. (*Special needs student: give student modified ruler and pre-made chart (Figure C).*)

When they have completed their chart, have students pass their drawing **only** to their partner. Their partner must then find the area and perimeter of the squares and rectangles, and record their answers. Once they have completed computational work, ask students to explain, in paragraph form, how they calculated the perimeter and area of the squares and rectangles.

Upon completion of their written explanation, have students share their answers with their partner. Have them discuss any discrepancies in their answers. After discussion, allow students to decorate their homes. Collect houses and chart sheets.

Materials/Resources:

Day 1

- 4- 1” squares made of sandpaper, stored in zip-loc bag- *one set / student*
- 1” graph paper- *2-3 sheets for each student*
- Ruler (customary measure)- *one /student*
- Crayons or colored pencils
- Overhead prepared with shapes

Day 2

- Computer with internet access available for each student
- Overhead #1- prepared with chart

- Overhead #2- prepared with “Area” formula and information on how to find the area of squares & rectangles.

Day 3

- Tracing paper- *2-3 sheets for each student*
- 1” graph paper- *2-3 sheets enough for each student*
- Ruler (customary measure)- *one /student*
- Colored pencils or crayons
- Paper clips
- Rulers
- Bag of 1” tiles- *optional*
- Pre-made chart for special needs students (*# as appropriate*)
- Ruler modified so it shows only 1” increments.
- Calculators for those who need them

Interdisciplinary Connections:

- **Reading**
 - Use of personal word bank for new vocabulary words
 - Construct visual of the vocabulary with the formula
 - Written explanation of how they obtained their answers in “dream house” activity.
- **Technology**

See website in *Procedures- Day 2*
- **Other**

N/A

Assessment Strategies:

- **Formative Evaluation (checking student understanding during the lesson):**

Day 1:

- Discussion of previously introduced vocabulary
- Observation of students finding area of figures

Day 2:

- Observation of student work at computer
- Contributions to overhead chart
- Completion of practical application problems

Day 3:

- Observation of student work in drawing portion of dream house activity
- Observation of partner discussions
- **Summative Evaluation (how will it be determined that the objectives were achieved?):**

Dream house activity computations

Correctives/Remediation:

- Provide additional practice using visuals found at <http://matti.usu.edu/nlvm/nav/index.html>
 - In the first column, find “Geometry”.
 - In the Geometry row, click on the button for 3-5.
 - Select “Geoboard”
- Provide opportunities to use manipulative tiles
- Provide additional computation practice using worksheets available from www.edHelper.com (Membership required - \$19.95 / yr)

Extensions/Enrichment:

- Using grid paper, calculate area of irregular shapes.
- Calculate the surface area of 3-D objects whose faces are rectangular or square.
- Use geoboards found at <http://matti.usu.edu/nlym/nav/index.html> to draw and calculate area and perimeter of various shapes.
- Give students an area and perimeter and have students construct a shape.

Special Accommodations (special needs students)

- **Description of the Special Needs Student Selected:**
 - Functioning 3 years below grade level
 - Receives learning support services for language arts and math
 - Has difficulty following directions in all instructional areas
 - General academic difficulties include:
 - Language comprehension
 - Vocabulary
 - Event-sequencing
 - Working memory
 - Reading issues:
 - Has difficulty answering inferential questions (20% accuracy)
 - Does not preview material
 - *Successful* when instructions are broken down and accompanied by modeling.
 - Math issues include:
 - Has difficulty with basic math facts for multiplication and division.
 - Has difficulty with multi-step problems.
- **Accommodations to Use with this Student:**

See noted accommodations in lessons.