ACEI Standard 4 . Assessment for instruction-

This is an area and perimeter lesson plan based on the book *Spaghetti and Meatballs for All!* The assessments used in this assignment are informal assessments. The students will follow along with the story and demonstrate using manipulatives the area and perimeter of each table and the story continues. By carefully observing each student during this lesson, I can accurately assess how well the students understand area and perimeter, how successfully I have instructed the class on area and perimeter, which students need more instruction on the topic, and what lessons to plan for the future.

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Title of Lesson: Spaghetti and Meatballs for All!

Length of lesson: 2 45 minute class periods.

Grade Level: 4th-5th grade

**1. Learning Objectives**

* The students will be able to formulate the problem from listening to the story.
* The students will be able to identify that perimeter is the distance around a shape.
* The students will be able to recognize that shapes with different perimeters may have the same area.
* The students will be able to relate the concept of perimeter to their everyday lives.
* The students will be able to use manipulatives, diagrams, or illustrations to represent the problem as the story is being read.
* The students will be able to explain the problem and their solutions in a group setting.

**2. Assessment**

**a. What should the students know before the lesson?**

* Students should have math literacy/reading skills on par with their grade level.
* Addition
* Subtraction
* Multiplication
* Some division
* How to identify and solve word problems
* Definition and formula to find perimeter of simple polygons
* Definition and formula to find area of simple polygons

**b. Focus of this lesson in relation to objectives:**

* Formulating problems from a story
* Identify that the perimeter is the distance around the tables
* Identify that the area is the amount of space that the tables cover
* Recognizing that polygons with different perimeters may have the same areas and being able to explain or illustrate why

**c. Method of assessment used in this lesson:**

**Informal assessment** tools will include the teacher watching and observing each child to check for understanding of each concept. The teacher should watch for: signs that the students can interpret the problem, illustrate the problem using cut out tiles or diagrams, discuss and explain the problem to each other, the ability to make connections between area and perimeter, the ability to show perimeter, ability to show area.

**In-class group activity:** See attached

**Homework #1:** See attached

**3. Target Vocabulary- everyday and mathematical:**

* + Area
  + Perimeter
  + Spaghetti, meatballs, garlic bread
  + Family reunion

**4. Materials:**

* + Book *Spaghetti and Meatballs for All!* By Marilyn Burns
  + Square tiles (at least eight for each student)
  + In-class small group worksheet
  + Homework #1 sheet
  + Calculators
  + Scissors for students that would like to cut their own manipulatives
  + Rulers for students that would like to measure their own perimeters
  + Paper and colored pencils for students that would like to draw diagrams

**5. Lesson Process**

**a. Introduction** (approximately 15 minutes)

The teacher will engage the students in a conversation that introduces the book and the story line of the book. The teacher should ask the students such as: “Who knows what a family reunion is?”, “Has anyone here been to a family reunion?”,”Who usually attends family reunions or parties?”, “What kinds of food do you usually eat at a big get-together?”, and “Who knows how to make spaghetti and meatballs? How?”.

The teacher will then pass out at least eight tiles to each student and explain to them that each tile represents one of Mrs. Comfort’s tables, and side of the table can seat one guest. Ask the students if they can try and rearrange the tiles on their desk each time the tables in the story get rearranged.

The teacher will then read the story out loud to the class, pausing to check that each student

is following along with the story and representing the tables on their desks by manipulating the tiles. The teacher should ask questions as the story is being read such as “What do you think will happen if they move this table?”, or “Do you see any patterns developing?”.

**b. Learning Procedures relating to objectives/Core** (Explore) (approximately 30 minutes).

**- How will the students be grouped**?

The students will be grouped heterogeneously in groups of three or four.

**- Description of the task**

Each group of students will be given an in-class activity sheet that will give the students an opportunity to do sample perimeter and area word problems. The students will work together as a group to brainstorm and come up with the best possible solution for each problem. Each student in the group should be able to illustrate and explain the answers that their group came up with. At the end of the activity, each group will participate in a full class discussion explaining and discussing each possible answer. The students will be provided with tiles, colored pencils, paper, scissors and calculators to help them explore and explain their answers. While the students are participating in the activity, the teacher should be circulating from group to group observing asking questions and observing each group’s strategy for completing the worksheet.

**- Product/Outcome:** See attached group activity and homework assignment.

**- Questions that support student thinking.**

If the students get stuck or are unsure how to proceed with the problem, the teacher should pose the following questions to the inspire each student to think *before* giving them the answer:

* What do you know so far?
* How did you figure that out?
* Can you show me trace for me on this tile the perimeter?
* Can you show me on this tile what the area is?
* What do you think the next step might be?

**- Questions that promote student communication.**

If there is any group that finishes the task before the other groups, the teacher should pose additional question to that group to keep the engaged in the activity . Some of these questions may be:

* Can you find any other way to arrange the tiles so that the area is the same, but the perimeter is different?
* If Mrs. Comfort invited 7 more people to dinner, what is the fewest number of tables that she would need to seat everybody? (Use the tiles to figure this out and show it. Remember that each side of the tile is equal to one seat or unit).
* Can you make another polygon with the same perimeter, but a different shape.
* Can you make another polygon with the same area but different perimeter?

**- Differentiation of task and/or product.**

**For students with physical disabilities:**

The students can be provided with supplemental manipulatives to aid in their understanding of the text. The book can be displayed on the document viewer to aid students with visual or hearing impairments.

**For Students with learning disabilities:**

One possible way to differentiate the lesson for students with learning disabilities is to read the book through one time first so that the students are familiar with the story line before introducing the manipulatives. Another way to accommodate students with learning disabilities is to provide them with a pre-designed story map that already has the table configurations printed on it (made by the teacher) so that as the story is being read, the student just has to match the tiles to the pre-made story map. This will prevent confusion and help the student to keep up with the rest of the class.

**For students that are English Language Learners (ELL):**

ELL students may be paired with an English speaking student so that they can see what the students are doing. The teacher can look for a translation of the book in the student’s first language to aid in the interpretation process. The teacher can model the expected actions on the board or on the document viewer to that the ELL students can copy the teacher’s actions.

**For students that are gifted or advanced:**

Gifted or talented students may be expected to expand on the problems that are given. For example, they may be asked to show multiple solutions or representations of each problem. There is also a passage in the book (page 5), in which Mr. Comfort describes how much food he will be making (16 loaves of garlic bread, 8 pounds of pasta, 8 quarts or sauce, and 96 meatballs). Advanced students may be asked if they can come up with a model to show how this food should be distributed amongst the 32 guests.

**- Learning Standards:**

**Problem Solving Strand**

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| 4.PS.1 | Explore, examine, and make observations about a social problem or mathematical situation |
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| 4.PS.3 | Interpret information correctly, identify the problem, and generate possible solutions |
| 4.PS.4 | Act out or model with manipulatives activities involving mathematical content from literature |
| 4.PS.5 | Formulate problems and solutions from everyday situations |
| 4.PS.6 | Translate from a picture/diagram to a numeric expression |
| 4.PS.11 | Make pictures/diagrams of problems |
| 4.PS.12 | Use physical objects to model problems |
| 4.PS.13 | Work in collaboration with others to solve problems |
| 4.PS.21 | Discuss with peers to understand a problem situation |
| 4.RP.1 | **Reasoning and Proof Strand**  Use representations to support mathematical ideas |
| 4.RP.7 | Discuss, listen, and make comments that support or reject claims made by other students |
| 4.CM.1 | **Communication Strand**  Understand and explain how to organize their thought process |
| 4.CM.2 | Verbally explain their rationale for strategy selection |
| 4.CM.3 | Provide reasoning both in written and verbal form |
| 4.CM.4 | Organize and accurately label work |
| 4.CM.5 | Share organized mathematical ideas through the manipulation of  objects, drawings, pictures, charts, graphs, tables, diagrams, models, symbols, and expressions in written and verbal form |
| 4.CM.6 | Answer clarifying questions from others |
| 4.CM.8 | Consider strategies used and solutions found in relation to their own work |
| 4.CN.1 | **Connection Strand**  Recognize, understand, and make connections in their everyday experiences to mathematical ideas |
| 4.CN.2 | Compare and contrast mathematical ideas |
| 4.CN.5 | Model situations with objects and representations and be able to make observations |
| 4.CN.6 | Recognize the presence of mathematics in their daily lives |
| 4.CN.7 | Apply mathematics to solve problems that develop outside of  mathematics |
| 4.CN.8 | Recognize and apply mathematics to other disciplines |
| 4.R.1 | **Representation Strand**  Use verbal and written language, physical models, drawing charts, graphs, tables, symbols, and equations as representations |
| 4.R.2 | Share mental images of mathematical ideas and understandings |
| 4.R.3 | Recognize and use external mathematical representations |
| 4.R.4 | Use standard and nonstandard representations with accuracy and detail |
| 4.R.6 | Connect mathematical representations with problem solving |
| 4.R.7 | Construct effective representations to solve problems |
| 4.R.9 | Use mathematics to show and understand social phenomena (e.g., determine the number of buses required for a field trip) |
| 4.N.15 | **Number Sense and Operations Strand**  Select appropriate computational and operational methods to solve problems |
| 4.G.3 | **Geometry Strand**  Find perimeter of polygons by adding sides |
| 4.G.4 | Find the area of a rectangle by counting the number of squares needed to cover the rectangle |

**c. Conclusion/Closing** (explain/elaborate) (approximately 30 minutes)

**- Questions that promote students’ reflection on the activity.**

These are questions that the teacher poses to the students to encourage them to explain their strategies, decisions, and processes for completing the activities. This is when the students can explain their solutions to the teacher and the rest of the class. These questions can be presented to the entire class, small groups or individual students.

* What is your solution?
* How did you reach that solution?
* Did anyone get the same answer, but in a different way?
* Did anyone get a different answer?
* Can anyone explain why their answer works?

**- Student connection of ideas.**

This is the point when the teacher will explain the different possible solutions to the students. The teacher should explain that there are many possible correct solutions, and why these solutions are all plausible. The teacher will review the concepts of perimeter (distance around the polygon) and area (distance that a polygon covers) at this time. At this time the teacher should ask is anyone has any additional comments or unanswered questions.

**6. Extension** (approximately 15 minutes)

If there is time at the end of the lesson, the teacher should ask students questions such as:

* How many ways can you arrange all 8 tables so that there is a total perimeter of 14?
* What would you have to do to change the total area of the tables?
* How do you think you find the perimeter of a triangle?
* Can you try to find a way to calculate the area of a triangle?

These extension questions will help the students to begin thinking about how to find the area and perimeter of other polygons, which will be addressed in the next lesson.

Another extension activity for this lesson will be a homework assignment in which the students have to find the area and perimeter of different rectangular arrays.

**References:**

Burns, M. (1997), *Spaghetti and Meatballs for All! A Mathematical Story.* New York, NY: Scholastic Inc.

Super Teacher Worksheets retrieved on April 21, 2009 from: [www.superteacherworksheets.com](http://www.superteacherworksheets.com)

The University of the State of New York, The State Education Department, (2005), Mathematics Core Curriculum. Albany, NY

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

**Directions**: Read and answer each problem as a group. Please write every answer that your group comes up with and be prepared to explain each answer. Please show all of your work, you can use the back of this paper if you need to.

Don’t forget that **PERIMETER** is the distance **AROUND** a polygon and **AREA** is the amount of space **COVERED** by a polygon.

**P= sum of all sides** **A= length x width**

1) At first Mrs. Comfort arranged each table individually. Draw and label each table with each side labeled with the correct units. Remember that 1 person can sit at each side of an individual table, making each side equal to 1 unit.

What is the perimeter of each individual table? What is the area of each individual table?

What is the total perimeter of all of the tables? What is the total area of all of the tables?

2) Mrs. Comfort’s daughter pushes two tables together. What could the new arrangement of the tables look like?

What is the perimeter of each new polygon? What is the area of each new polygon?

What is the total Perimeter of the polygons? What is the total area of the polygons?

3) Mrs. Comfort’s son pushed another table into the two that are squished together. Now there are 3 tables pushed together and 5 tables by themselves. Can you draw a picture of how the tables might be arranged?

Can you think of another way to arrange the tables, leaving the 5 individual tables alone?

Can you seat more people at the first arrangement or the second arrangement? How do you know?

4) Can you show two arrangements of the tables in which the total perimeter for all of the tables equals 22?

Can you show two arrangements of the tables in which the total perimeter for all of the tables equals 18?

Can you show two arrangements of the tables in which the total perimeter for all of the tables equals 16?

5) What do you notice about the total area of all of these problems? Explain why you think this is the case?