How Close Is Our Estimate?

Lesson Topic

Estimation and measurement

Grade

5

Lesson Length

50 minutes

NCTM Standards Addressed

- Understand measurable attributes of objects and the units, systems, and processes of measurement.
- Understand such attributes as length, area, and volume.
- Understand the need to measure with standard units.
- Develop strategies for estimating the perimeter, area, and volume.

Sample State Standards Addressed

- Select and use appropriate instruments and units for measuring quantities (e.g., perimeter, area, volume).
- Estimate, refine, and verify specified measurements of objects.
- Add and subtract measurements.

Student Objectives

Students will:

- estimate perimeter, area, and volume
- measure perimeter and area using nonstandard units of measurement
- add and subtract non-standard units of measurement.

Grouping for Instruction

- Individually
- Groups of three or four

Overview of Lesson

Students use non-standard units to explore the concepts of perimeter, area, and volume. Students estimate measures of perimeter, area, and volume of their classroom. Students add and subtract units of measurement.

Background Information

Students should be able to add mixed numbers and simplify the sum.

Materials and Equipment

- Box of tennis balls
- Pieces of rope that are the length of five tennis balls
- Grids with measurements that are five-tennis-balls by five-tennis-balls
- Estimation sheets (one for each student)
- Chalk or masking tape for marking regions on the floor

Procedure

A. Motivation and introduction

1. Say: "Today I am going to have you investigate the dimensions of our classroom. But first I'm going to let you estimate the dimensions to see how close you can come."
2. Give each student a questionnaire (Worksheet A: How Big Is Our Classroom?, page 98). Tell students they have two minutes to complete the questionnaire.
3. After two minutes, collect the questionnaires.
4. Explain that today's lesson involves an investigation of distance around (perimeter), region covered (area), and space filled (volume).

B. Development (including discussion points and feedback)

1. Divide the class into heterogeneous groups of three or four students, and number the groups one, two, three, etc.
2. Explain that each group should:
    - estimate the number of tennis balls it will take to go around the classroom, to cover the floor, and to fill the classroom
    - use the tennis balls to measure.
3. Give each group a questionnaire (Worksheet B: How Big Is Our Classroom?, page 99).
4. Tell the students they have five minutes to complete the questionnaire and that every student in each group should be involved in the process.
5. Observe the students as they work. Note students' interaction and reasoning.
6. Collect the questionnaires after five minutes.

7. Explain: “Now that we have thought about this and made an estimate, we are going to figure out a way to measure the class using tennis balls.”
8. Give a set of three tennis balls to half of the groups (the odd-numbered groups). Give ropes that are five-tennis-balls long to the other half of the groups (even-numbered groups).
9. Assign groups one and two the task of measuring the front wall, groups three and four the task of measuring the back wall, etc. Instruct the students with tennis balls to measure to the nearest half of a ball and those with ropes to measure to the nearest fifth of a rope.
10. Compile the results from the class.
11. Discuss the methods used to measure. Discover what efficient methods can be used and how accurate the measurements are.
12. Have the groups that measured with tennis balls use the ropes and the groups with the ropes use the tennis balls.
13. Having previously divided the classroom into sections, assign the groups the task of measuring the area of a section of the classroom in tennis balls or in five-by-five tennis-ball grids.
14. Once all measurements are taken, compile the results.
15. Discuss the methods of finding the area of sections. Ask: “How many tennis balls are in one of the grids? How many tennis balls would be in a 12-ball by 12-ball grid?”

C. Summary and closure

1. Say: “Today we measured the perimeter and area of the floor of our classroom with non-standard units of measurement. If you were going to buy carpet for our classroom, would you give the salesman the measurements in tennis balls?” (Responses)
2. Say: “What kinds of measurement would you give the salesman?” (Responses)
3. Say: “How exact would these measurements have to be?” (Responses)
4. Develop a discussion of non-standard and standard units of measurement and the need for exact measurement at critical times.

D. Assignment

“Describe how you would determine the number of tennis balls it would take to fill our classroom. You must write at least four sentences telling the procedures.”

Assessment

Most of the assessment for this lesson is embedded in the activities. Each student has individually filled out a questionnaire. Each group has completed a questionnaire. Each student can now be asked to answer the questions: “How would you estimate the perimeter of our classroom in feet? How would you estimate the area of our room in square yards?”

Worksheet A

Name _____

HOW BIG IS OUR CLASSROOM?

You have 2 minutes to **estimate** different measurements in our classroom. You are to work by yourself and put down your best guess.

1. How many tennis balls would it take to go around our classroom? _____
   (The balls are lined up around the edges of our classroom; each ball touches the next ball.)

2. How many tennis balls would it take to cover the floor of our classroom? _____
   (The balls touch each other.)

3. How many tennis balls would it take to fill our classroom? _____

Worksheet B

Names of Group Members:

_____
_____
_____
_____

HOW BIG IS OUR CLASSROOM?

You have 5 minutes to **estimate** different measurements in our classroom. You are to work as a group to determine the best estimate.

1. How many tennis balls would it take to go around our classroom? _____
   (The balls are lined up around the edges of our classroom; each ball touches the next ball.)

2. How many tennis balls would it take to cover the floor of our classroom? _____
   (The balls touch each other.)

3. How many tennis balls would it take to fill our classroom? _____

4. Explain how your group decided on the best estimates. Your explanation should contain at least two sentences.