The Pasture and the Fence

Summary

Students will use tiles and grid paper to draw rectangles and then record the perimeter and area of each.

Main Core Tie

Mathematics Grade 3

Strand: MEASUREMENT AND DATA (3.MD) Standard 3.MD.6

Additional Core Ties

Mathematics Grade 3

Strand: MEASUREMENT AND DATA (3.MD) Standard 3.MD.5

Mathematics Grade 3

Strand: MEASUREMENT AND DATA (3.MD) Standard 3.MD.7

Mathematics Grade 3

Strand: MEASUREMENT AND DATA (3.MD) Standard 3.MD.8

Materials

For each pair:

- 3- *1" Grids*
- 3- *Centimeter Grids*
- 1" colored tiles

For each student:

- Journal
- Crayons
- 3" x 5" card
- Layered journal

Additional Resources

Books

- *Racing Around*
  , by S. Murphy; ISBN 0064462447
- *Millions to Measure*
  , by D. M. Schwartz; ISBN 0688129161
- *Let's Measure It*
  , by L. Connelly; ISBN 1574710060

Background for Teachers

Students learn best when mental models are incorporated into instruction. These mental models are how the mind holds abstract information (information that has no sensory representation). Mental models are held in the memory as stories, two dimensional drawings, or analogies. Mental models help us teach something in a shorter amount of time, and the memory retains it better. For example, teach a spelling lesson on homophones using pictures to represent the words. The word "hear" with "ear" underlined would be next to a picture of an ear. The word "here" does not have "ear" in it.
Prior knowledge: Students need to know perimeter and area before doing this activity.
What: This activity helps students learn to measure area and perimeter using square inches instead of a ruler. This knowledge is then transferred to square centimeters.

Why: Math is a way of ordering and putting value on our universe. This is done either by numbers, space, or time. Learning how to measure perimeter and area gives order to space. This is a life skill that all students need to have as adults.
How: Through the use of a 1" grid and 1" square tiles, students work with partners in creating rectangles of different sizes, then measuring them by counting the tiles for both area and perimeter. A discussion follows to explore what the students learned, and journal entries are logged.

Intended Learning Outcomes

1. Demonstrate a positive learning attitude toward mathematics.
2. Become mathematical problem solvers.

Instructional Procedures

Invitation to Learn
Give each student a 3” x 5” card to record answers. Have several charts on the wall so the students can go around the room for a few minutes figuring out mental models of words found on the charts. Record these on a mental model sheet. Have students start on different sides of the room and do this for a few minutes. Some mental models for the words perimeter and area might be:
Discuss with the class other ideas for making mental models of these two words.
Instructional Procedures
Before beginning this activity, introduce “layered journals” to your students. Use the journal to explore what they learned from the Invitation to Learn.

- Explore ways of measuring lengths by using something other than a ruler or a yardstick.
- Measure with 1” colored tiles for an exact measure of rectangles for both area and perimeter.
- Explain that squares are rectangles that have four equal sides. Other rectangles have two parallel sides of one length and two parallel sides of another length. Rectangles contain four right angles. Discuss the similarity of an angle, vertex, and corner. All three terms are used in the core curriculum.
- Draw an illustration of a square that has four equal sides and rectangles with unequal sides. Show what a vertex is and what a right angle looks like. Label these for the students.
- Give each pair of students a bag of 1” colored tiles, three *1” Grids* , and a record sheet for each student.
- Have the students take out their sliding rulers and measure the tiles.
- Write on the board how a measurement using 1” tiles would be recorded (e.g., 5 square inches). Also, show the abbreviation for this (5 sq. ins. or 1 sq. in.).
- Use one of the three *1” Grids* for each student to draw on and one to make the tile representations.
- The record sheet will be used to log the measurements of each of the rectangles that will be made by each pair.
- Have each student put his/her name on his/her own grid and record sheet.
  - Put the other grid on the table between them.
  - One partner lays 1” tiles on the middle grid to form a rectangle.
  - The other partner must draw the rectangle on his/her grid using a crayon. It must be in the exact location of the tile grid and the same size.
  - Have this same partner record the perimeter and area of the rectangle that s/he drew. This is done by counting the squares on the outside (perimeter) and all the squares on the inside of the drawing (area). The other partner must also count the tiles to see if this is the correct answer. If it is, the partner who drew the rectangle marks the square on his/her sheet labeled correct with a check.
  - Partners switch and the second partner makes the tile grid. The first partner then copies that

grid on his/her own grid with a crayon and takes his/her measurements. The new tile rectangle must be a different size and in a different location from any other that has been drawn. Making a tile representation and then transferring it to another grid by drawing the exact figure helps students go from concrete to abstract in forming the idea in their minds.
Discuss what the students discovered and then have them record what they have learned in their journals.

Extensions

Give the students a measurement orally. Have them place the tiles on the middle grid the size specified.
This same activity may be done using only crayons with a centimeter grid. Instead of one partner using tiles, s/he would outline the figure on the middle grid with a crayon. The other partner would use that same color to transfer it to his/her own grid. The next figure drawn on the middle grid would be done in a different color. Use the centimeter record sheet for this activity.
Cut and laminate larger squares measuring 10" x 10". Use different colors and have the students do this activity on the floor. They could either use each square as a 1" square representation or as a 10" square to get an exact measurement. Each square could also represent 1 square centimeter. One partner would lay down
the rectangle and the other would do the measuring and recording. Then they would switch.
Base a writing assignment on the book *Racing Around*. Have students write about a time when they were too young to do something. How did they feel?

Family Connections

Send home a grid, measurement record sheet, and paper tiles for students to do this activity with family members.
Have students discuss the different kinds of perimeters and areas found at home (e.g., the backyard fence or the carpet in the living room). Students then record on another sheet of paper a list of things that could also be measured as perimeter or area.

Assessment Plan

Record sheets
Journal entries
A sheet containing rectangles divided into squares could be used to aid students in responding to a question format that is similar to the state assessments.

Bibliography

Research Basis

Payne, R. K. (2002) *Understanding Learning the How, the Why, the What*. Aha Process, Inc., Highland, TX.
Mental models are how the mind holds abstract information that has no sensory representation. In math specifically we know that it is about assigning value and order to the universe. Mental models help us to do this. By using mental models we "collapse" the time it takes to learn and retain something.
Kagan, S., *Cooperative Learning*. (1992). Spencer Kagan's Cooperative Learning Structures: a comprehensive article written by Jane Joritz-Nakagawa (Aichi University of Education)
More than 122 studies have been done on the effectiveness of cooperative learning. All have come to the same conclusion: students learn and retain knowledge better through working with partners and groups. Recent research links regular cooperative experience in the classroom with gains in a

number of areas.

Authors

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