

What's Inside?

Summary

Students will begin to understand the concept of an area using hands on activities.

Materials

Invitation to Learn

Tangram sets

Tangram shape laminated cards

Instructional Procedures

Math journal

Pencil

- *Pezzettino*

Various 1 cm paper tiles

- [One-on-the-Mountain](#) (pdf)

Glue sticks

Tangram sets

Overhead tangram set

Additional Resources

Books

- *Pezzettino*

, by Leo Lionni; ISBN 039483156

- *Tangram Puzzles*

, by Chris Crawford; ISBN 080697589

Background for Teachers

This lesson is an opportunity for students to explore area without the requirement of a formula to determine the area of a polygon. These hands-on activities will help students understand the concept of area. Students need to understand that area is the number of square units inside a flat, two-dimensional figure. Math concepts such as area can be abstract and hard to understand. Teaching area from a non-formula basis helps the understanding of the concept become more concrete, making the transition to using a formula easier. Finding the area of an irregular figure requires students to decompose the figure into smaller rectangles or triangles, finding the area of the smaller figures and then adding.

Before beginning this lesson, students should be able to easily identify and name different polygons. It will help if students have worked with polygons in composing other shapes. This lesson serves as a good introduction into area and the determination of such based on a predetermined square unit. By using paper tiles to represent one square unit, students are constructing their own mathematical understanding of area. Practicing with the area of polygons, sets up students for success in developing an understanding of the surface area of a three dimensional solid.

Instructional Procedures

Invitation to Learn

Provide small groups or pairs of students with a set of tangrams and a laminated card with a shape on it. Pairs will try to reproduce the shape with no overlapping pieces from the tangram set. This activity leads right into a discussion of what area is and how is it determined.

Instructional Procedures

Read *Pezzettino* to students, emphasizing the illustrations.

Discuss and define area with students as the number of square units inside a figure. Share with students that we are finding area without the use of a formula. Also revisit polygons to clarify student understanding.

Hand out *One-on-the-mountain* from the story and colored paper tiles. Using the tiles, have students fill in the area of the animal and determine the number of square units used, or area. Students will record area on bottom of sheet and attach to journal.

Handout sets of tangrams to individual students.

Starting with the small square, trace around shape in journal. Assign the square the area of one square unit. Write one square unit next to the square.

Using overhead tangrams, make a square with the two small congruent triangles. Ask students what the area of the square is? What would the area of one triangle be? Trace around one of the congruent triangles and label the area next to it.

Continue on for each different piece within the tangram set. Remind students to label the area for each shape. Allow students time to discover the make-up of each shape.

Discuss how area of different shapes can be determined with tangrams. Help students having trouble with the building or visualization of filling the area with other shapes.

Students will now be able to make any polygon with the tangrams and determine the area. Each person will design a polygon for a partner to determine the area. Students will trade polygons and determine the area.

Allow several pairs to share a polygon, using the overhead tangrams, with the class.

Using an overhead tangram set, display a trapezoid. As a class have students determine the area of a trapezoid using the overhead tangram pieces.

In Math Journal have students construct and trace their trapezoid. Have students trade journals and determine the area.

Strategies for Diverse Learners

Special needs students may glue down tangram paper tiles to determine area.

Extensions

Using black line tangram animal figures from the Invitation to Learn, determine the area.

Use this lesson as a first step in helping students discover their own formula for area.

Measure the actual area of each tangram piece and chart results of measurements.

Have students build their own tangram shape, specify a square unit and have a partner determine the area.

Apply to real life situations by determining the amount of floor covering needed for a room or tile patterns for a floor.

Language Arts--integrate curriculum by having students write a story, design and illustrate with tile animals, determine and label area of each animal. Write a class story and each student illustrate a portion of the story. Share story with a younger grade level.

Students can determine area of regular/irregular polygons using coordinate graphing of the polygon vertices and diagonal multiplication.

Place a polygon on coordinate graph and determine ordered pairs of vertices.

List vertex pairs going around the polygon and include starting point at end. Diagonally multiply both sides and total.

Find the difference between the 2 sums and divide by 2.

Family Connections

Students will find a polygon shape in the home, trace or plot onto graph paper and determine the area using predetermined square unit or diagonal multiplication.

Compile a list of uses of area within the home. Share list with the class.
Send home a set of tangrams for students to share with family.

Assessment Plan

Assess ability to determine area by supplying tangram silhouette and assigning a random unit for the square.

Math journal--examples of polygons with area determined.

Repeat the same steps with the tangram, changing the square unit to another number such as 3.

Observation and discussion of the activity.

Journaling--Ask students to define area and explain one way to determine area.

Bibliography

Moyer, P. (2004). Controlling choice: teachers, students and manipulatives in mathematics classrooms. *School Science and Mathematics*. 104(1). 16-32.

This research study of instructional practices of teachers shows those who demonstrate the use of manipulatives as a tool for better understanding of concepts and allow access to manipulatives often are opening doors for students struggling with abstract concepts. Allowing the use of manipulatives encourages student ownership of strategies, ideas, and processes and gives students a strong conceptual base on which they can begin to construct higher mathematical thinking.

Furner, J., Yahya, N., Duffy M.L. (2005). 20 Ways to teach mathematics: strategies to reach all students. *Intervention in School and Clinic*. 41(1). 16-23.

Educators must make every effort to ensure all students have equal access to learning mathematics. Incorporating multiple intelligences enables all learners the opportunities to develop mathematically. Applying skills to a problem-solving task benefits learners in later applying information to real life situations.

Authors

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