



Area is Always Flat, But It's Not Always Regular

National Teacher Training Institute
Media-Rich Lesson Plan
by Sheryl Kohl
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Grade Levels: grades 3 - 4 regular education
grades 5 - 6 students with special needs

Time Allotment: Three 45 minute class periods

Overview: Students will learn that area is the number of square units needed to cover a figure. The units used to measure area are based on units of length.

Subject Matter: Area of a polygon

Learning Objectives:

Students will be able to:

- find the area of regular and irregular polygons by counting squares
- find the area of regular and irregular polygons by finding the number of whole squares and half-squares within the polygon
- find the area of regular polygons by multiplying the number of squares in a row by the number of rows
- find the area of a rectangle by using the formula, $l \times w$
- label the area of a polygon with square units

Standards:

**From the National Council of Teachers of Mathematics Standards
for grades 3-5, available online at**

<http://standards.nctm.org/document/chapter5/numb.htm>

Measurement Standard for Grades 3-5:

In grades 3 - 5 all students should -

- understand such attributes as length, area, weight volume, and size of angle and select the appropriate type of unit for measuring each attribute;
- explore what happens to measurements of a two-dimensional shape such as its perimeter and area when the shape is changed in some way;
- 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.

From the Montana Standards for Mathematics, available online at

<http://www.opi.state.mt.us/index.html>

Content Standard 5:

All students should know, understand, and be able to demonstrate understanding of measurable attributes and an ability to use measurement processes.

- By the end of grade 4, all student will estimate, measure, and investigate length, capacity, weight, mass, **area**, volume, time, and temperature.
- By the end of grade 8, all students will apply the concepts of perimeter, **area**, volume and capacity, weight and mass, angle measure, time, and temperature.

Media Components:**Video**

PBS video series: *Cyberchase, episode 105, Sensible Flats*

Web Sites**Funbrain: *Shape Surveyor Geometry Game***

<http://www6.funbrain.com/poly/index.html>

This web site is an interactive game in which the students find the area of a rectangle when given the length and width. Students know they have “won” when the archeological puzzle is complete.

Materials:**For the class:**

- display mats 1, 2, 3, 4, 5
- at least 28 construction paper squares 6” x 6”
- at least 6 construction paper triangles (1/2 the size of the squares)
- copies of *Squares and Rectangles*

Prep for Teachers:

- Prior to teaching this lesson, bookmark the web site used in the lesson on each computer to be used by the students.
- Make the display mats (see direction under “Student Materials”)
- Draw and cut out the 28 construction paper squares (may wish to laminate) at least 5 of color #1, at least 5 of color #2, remaining of color #3
- Draw and cut out the construction paper triangles (may wish to laminate)
- Print out and copy *Squares and Rectangles* available from <http://mason.gmu.edu/~mmankus/AreaLab/1Sqrect.htm>

When using media, provide students with a FOCUS FOR MEDIA INTERACTION, a specific task to complete and/or information to identify during or after viewing of video segments, Web sites, or other multimedia elements.

Introductory Activity:

Step 1: Place display mat #1 on the floor for all students to see. Explain to the students that they will find the area of the rectangle, marked on the mat, by counting the number of squares. They should be told that the area will be labeled square units. Ask the students, “What is the area of the rectangle?”

(12 square units)

Step 2: Place display mat #2 on the floor for all students to see. Have the students find the area individually or in small groups. As a class, find the area. Make sure all students have arrived at the same answer.

(18 square units)

Learning Activity:

Step 1: Insert *PBS Cyberchase, episode 105, Sensible Flats* into your VCR. Provide the students with a FOCUS FOR MEDIA INTERACTION: The Cyberchase team uses their bandannas to measure the area of something. What is it?

(The team measures the area of the bed frame to make sure they have enough bandannas to cover it and make a sail.)

START the tape as Matt points to the wagon and says, “Hang on. I think our bus is here.”

PAUSE the tape when the team yells, “Ya-hoo!” as they fly to town on their prairie schooner.

Step 2: Place display mat #3 on the floor for all students to see. Explain to the students that this time they will find the area of the rectangle in a different way. Have one student place construction paper squares, of one color, inside the top row of the rectangle. Ask the students, “How many squares does it take to fill up the top row of the rectangle?”

(5 squares)

Have another student place squares, of another color, inside the second row. Have a third student place squares, of a third color, inside the bottom row of the rectangle. Ask the students, “How many squares were needed to fill up the second and third rows?”

(5 squares each)

Ask the students, “How many rows were used to cover the rectangle?”

(3 rows)

Ask the students, “How many squares were used to cover the entire rectangle?”

(15 squares)

Ask the students how they arrived at their answer. Explain to the students that there are three ways to find the area of the rectangle:

- counting the number of squares used to cover the rectangle,
- adding the number of squares in each row, $5 + 5 + 5$, or
- multiplying the number of squares in the row, 5, by the number of rows, 3, that is, 5×3 .

Step 4: Insert *PBS Cyberchase, episode 105, Sensible Flats* into your VCR. FOCUS FOR MEDIA INTERACTION: The Cyberchase team discovered a quicker way to find the area of a rectangle than by counting the squares. What did they discover?

(The team discovered that to find the area of a rectangle, they could multiply the length of the rectangle by the width of the rectangle.)

START the tape when Digit exclaims, “Have no fear, the Dig is here!”, as the team is placing red tarps in the area of a land claim.

PAUSE the tape when Matt is explaining how to find area by multiplying length times width and concludes, “only faster!”

Step 5: Inform the students that the most common way to the area of a rectangle is to multiply the number of squares needed to fill up the top row by the number of rows. This is referred to as length times width. Explain to the students that they will practice the skill of finding the area of a rectangle by using an activity found on the Funbrain website. Explain to the students that they will be shown a rectangle with the dimensions labeled. They are to find the area by multiplying length times width. The game is over when they get all of the pieces for the archeological puzzle. Have the students log on to the *Shape Surveyor Geometry Game* at <http://www6.funbrain.com/poly/index.html>. FOCUS FOR MEDIA INTERACTION; ask the students how they find the area of a rectangle when given the length and width.

(multiply the length times the width)

Step 6: Hand out to each student the *Squares and Rectangles* sheet available online at <http://mason.gmu.edu/~mmankus/AreaLab/1Sqrect.htm>. This may be completed individually or in small groups.

Step 7: Explain to the students that so far they have only found the area of rectangles. Now they will discover what happens when a shape is irregular. Insert *PBS Cyberchase, episode 105, Sensible Flats* into your VCR. Provide the students with a FOCUS FOR MEDIA INTERACTION: How did the Cyber-Team prove that Hacker’s piece of land is not larger than Judge Trudy’s piece of land?

(They found the area of the irregular shaped piece of land and the area of the rectangular shape piece of land that belonged to Judge Trudy. The two pieces of land had the same area.)

START the tape when Inez is holding two grids and states, “The evidence please!”

PAUSE the tape after Judge Trudy has seen the evidence and exclaims, “The same area exactly!”

Step 8: Place display mat #4 on the floor for all students to see. Have the students find the area of the rectangle. Provide the colored construction paper squares if needed. Ask the students, “What is the area of the rectangle.”

(28 square units)

Leave display mat #4 on the floor for Step 9.

Step 9: Place display mat #5 on the floor for all students to see. Provide the colored construction paper squares and half-squares (triangles) if needed. Ask the students, “What is the area of the rectangle.”

(28 square units)

The teacher may need to lead the students to the understanding that two triangles, $\frac{1}{2}$ of a square plus $\frac{1}{2}$ of a square, equals one square. This may be demonstrated using display mat #5 and the half-square (triangle) pieces of construction paper.

Step 10: Have the students compare their results from display mat #4 and display mat #5. Ask the students, “What was the area of each polygon?”

(28 square units)

Explain to the students that polygons of different lengths, widths, and shapes may have the same area.

Culminating Activity:

Step 1: Insert PBS *Cyberchase*, episode 105, *Sensible Flats*, into your VCR. Provide the students with a FOCUS FOR MEDIA INTERACTION: Have the students find two examples of using area in a real life situation.

(The team is trying to find out how much paint is needed to cover a table; in For Real, the girl is trying to find out how many sleeping bags will fit in the living room.)

START the video at the beginning and play the entire episode.

Real-life Applications:

- Have students determine the area of a room floor. Then have them determine the yardage needed to carpet or the number of tiles needed to cover the floor.
- Have students determine if a gallon, quart, or pint of paint is enough to cover a surface of a table, etc.
- Have students choose from several seed packets which ones they will “plant”. Then have the students determine the area of garden needed to accommodate the plants.
- Have students determine the area of a playground and how much concrete is needed to cover the surface.
- Have students determine the area of a grassed section of the school. Have them determine the number of rolls of sod needed to cover the surface.

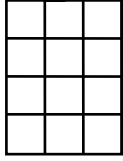
Student Materials:

Squares and Rectangles

<http://mason.gmu.edu/~mmankus/AreaLab/1Sqrect.htm>

Display Mat Outlines

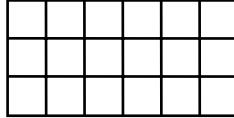
Display Mat #1



$$3u \times 4u = 12 u^2$$

actual size: 18" x 24"

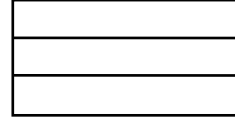
Display Mat #2



$$6u \times 3u = 18 u^2$$

actual size: 48" x 18"

Display Mat #3



$$5u \times 3u = 15 u^2$$

actual size: 30" x 18"

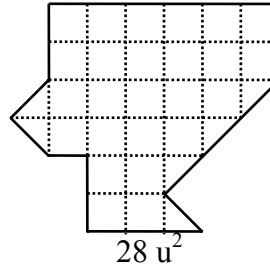
Display Mat #4



$$7u \times 4u = 28 u^2$$

actual size: 42" x 24"

Display Mat #5



$$28 u^2$$

To make the mats reusable - use vinyl tablecloths:

- Lay the tablecloth on a flat surface.
- Using colored tape outline the shape given for the mat.
- The actual measurement for each square unit is 6 inches squared.
- For mats 1 and 2 outline all square units.
- For mat 3 outline the perimeter and the horizontal rows
- For mat 4 outline only the perimeter.
- For mat 5 outline only the perimeter. The dashed lines are only for reference.