

TA DA! A FORMU-LA!: A 4th Grade Unit

TEACHER'S GUIDE

Correlation to NCTM Curriculum Focal Points and Connections to the Focal Points for Grade 4

(CFP) Measurement: Developing an understanding of area and determining the areas of two-dimensional shapes.

Students recognize area as an attribute of two-dimensional regions. They learn that they can quantify area by finding the total number of same-sized units of area that cover the shape without gaps or overlaps. They understand that a square that is 1 unit on a side is the standard unit for measuring area. They select appropriate units, strategies (e.g., decomposing shapes), and tools for solving problems that involve estimating or measuring area. **Students connect area measure to the area model that they have used to represent multiplication, and they use this connection to justify the formula for the area of a rectangle.**



It is essential that these focal points be addressed in contexts that promote problem solving, reasoning, communication, making connections, and designing and analyzing representations.

Bold print in the description of the focal point identifies the topics addressed in the unit.

In this unit, students will be finding area using multiple approaches.

Prerequisite Knowledge or Skills

To be successful in this unit, students will need to have had experiences with dimensions of shapes (length, width, height) as well as experiences with generalizing situations.

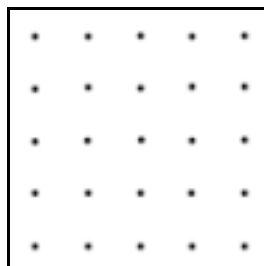
Suggested Materials

- Geoboards
- Rubber bands
- Geoboard paper
- Graph paper

WARM UP 1

Make a model for 2 x 4 with tiles. Record your model here:

Make a model for 2 x 4 on the geoboard. Record your model here:



Teacher's Guide: Grade 4

Each unit is correlated to the NCTM Curriculum Focal Points and/or the Connections to the Focal Points.

Each unit includes one or more Warm Up Problems, a Problem Solving Task and one or more Extension Problems.

This TTT program encourages visual solutions.

Possible solutions are included when one answer is appropriate.

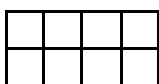
Warm Up 1 Suggestions

- Make additional rectangular area models on the geoboards using other dimensions, such as: 3×2 , 2×1 and 4×3 .
- Remind students to place rubber bands horizontally and vertically. If rectangles are created with diagonal lines on a geoboard, there is no easy way to measure the sides or area in units. (Suggestions continue...)

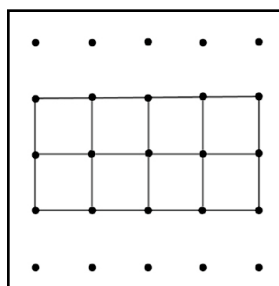
A Solution

Many solutions are possible. One variation for each task is shown below.

Tile model for 2×4 :



Geoboard model for 2×4 :

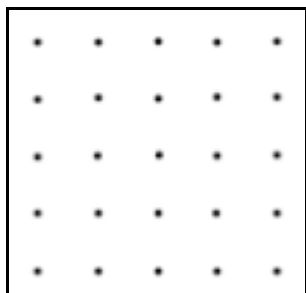


WARM UP 2

Create a 3×4 rectangle on your geoboard. Place the rubber bands horizontally and vertically.

Add rubber bands to show the interior area units of a 3×4 rectangle.

Draw this model below. Label the length and width of the rectangle.



What is the area of your 3×4 rectangle? _____ square units

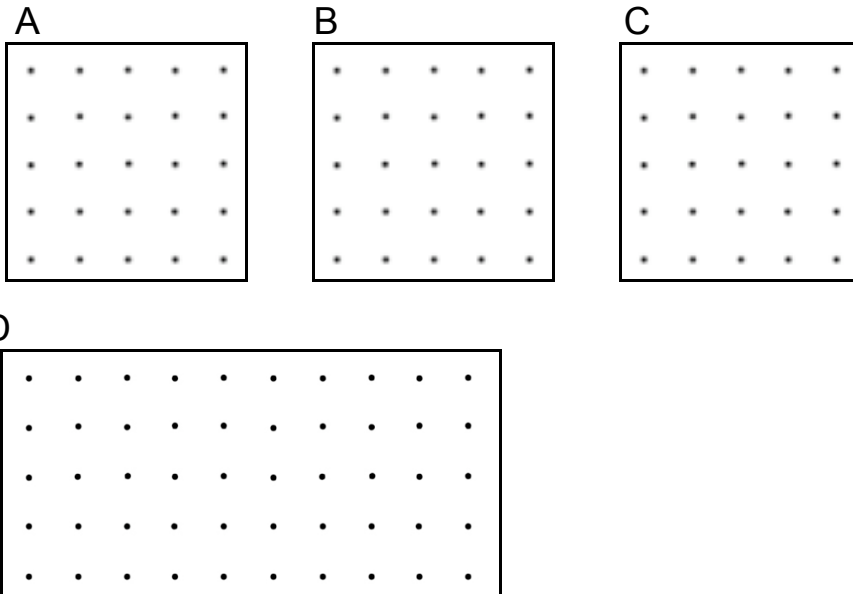
Teacher's Guide: Grade 4 (continued)

Pages have been reduced in size and combined for this sample folder.

Each unit includes black line masters of all problems with permission for one classroom teacher to make copies for his/her students.

PROBLEM SOLVING TASK

Valley Elementary School wants to build a rectangular sandbox for the kindergarten playground. The principal is asking for ideas. Create and draw four different sizes of rectangles on your geoboards. Place the rubber bands horizontally and vertically.



Label the length and width of each rectangle.

PROBLEM SOLVING TASK – page 2 of 2

Record the length, width and area of each rectangle in the chart below.

	LENGTH (units)	WIDTH (units)	AREA (square units)
A			
B			
C			
D			

Explain the relationship of the length and width to the area of each rectangle.

Note

Wooden geoboards can be placed together so that larger rectangles can be made (as in Geoboard D).

Problem Solving Task Suggestions

Teachers may want to provide geo-paper for students to record their diagrams and patterns. This could then be cut and pasted into the student's math journal. (Suggestions continue...)

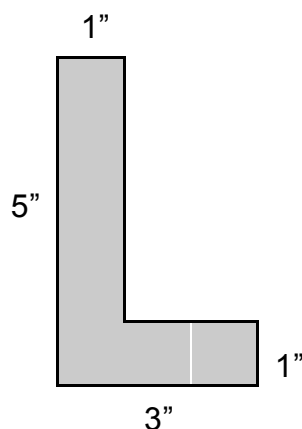
Teacher's Guide: Grade 4 (continued)

This program encourages multiple ways to find solutions. We encourage sharing the most concrete solutions first, so that all students can understand. We ask that the most abstract or the most sophisticated solutions be shared last. With that kind of scaffolding, all students can be successful.

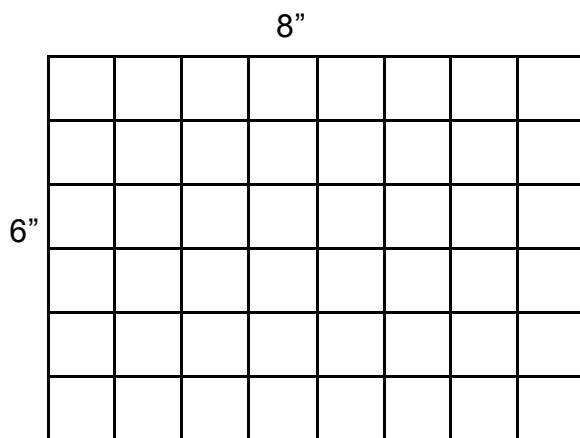
EXTENSION

The students in Jackie's class are making a quilt to auction for charity. The pattern for the border is made of "L" shaped pieces.

The students are given 6-inch x 8-inch pieces of fabric for the border pieces.



What is the greatest number of L-shaped border pieces they can cut from one 6-inch x 8-inch piece of fabric? Show and explain why you think your answer is correct.



Materials: Graph paper, computer draw program (optional), tiles

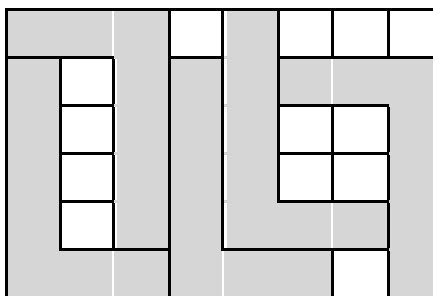
Extension Suggestions

Encourage students to make many arrangements on graph paper before they determine their answer.

A Solution

The greatest number of L's (found so far) that can be cut from one 6-inch x 8-inch piece of fabric is five. Other solutions are possible.

(Solution continues...)



Teacher's Guide: Grade 4 (continued)

The range of difficulty, from the first Warm Up to the hardest Extension, provides appropriate challenge for students of diverse skill levels.

Extension problems are included in each unit for students who need additional challenge.

E.8 TA DA! A FORMU-LA!
Student Sample and Scored Commentary

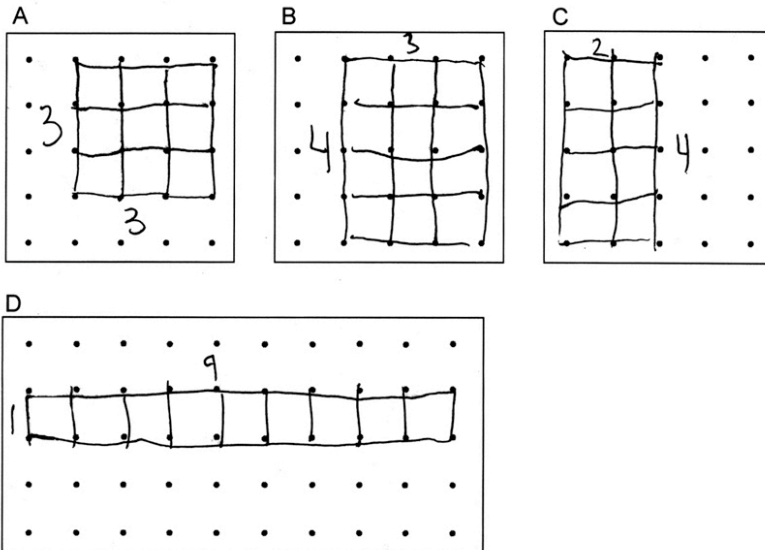
Sample (S) 1: Score 3

The response shows a clear understanding of the requirement to create four different sizes of rectangles. There is a clear connection between the drawings with the inner squares and the table. The diagrams are clearly labeled, and the explanation of the relationship between length and width is mathematically justifiable.

Sample (S) # 1—page 1 of 2

PKDW

Valley Elementary School wants to build a rectangular sandbox for the kindergarten playground. The principal is asking for ideas. Create and draw four different sizes of rectangles on your geoboards. Place the rubber bands horizontally and vertically.



Label the length and width of each rectangle.

Sample (S) # 1—page 2 of 2

PKDW

Record the length, width and area of each rectangle in the chart below.

	LENGTH (units)	WIDTH (units)	AREA (square units)
A	3	3	9
B	4	3	12
C	4	2	8
D	1	9	9

Explain the relationship of the length and width to the area of each rectangle.

You multiply the length by the width to get the area.

**Teacher's Guide:
Grade 4
(continued)**

Each Problem Solving Task has several samples with scored commentaries based on an individual rubric.

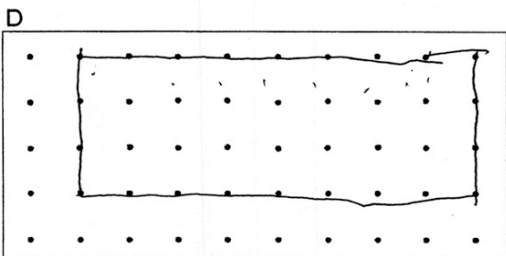
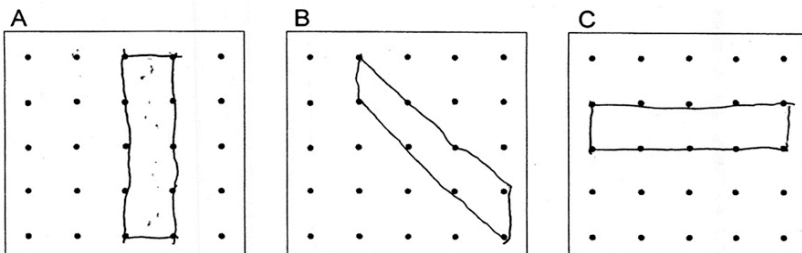
The samples, commentaries and individual rubrics assist teachers in evaluating the work of their students.

The scored samples and commentaries also help students learn how to evaluate their own work on Problem Solving Tasks.

“FIX IT!”
E.8 TA DA! A FORMU-LA!

DIRECTIONS: CHANGE OR ADD TO THE WORK BELOW TO IMPROVE THE FINAL SCORE. T/PLK

Valley Elementary School wants to build a rectangular sandbox for the kindergarten playground. The principal is asking for ideas. Create and draw four different sizes of rectangles on your geoboards. Place the rubber bands horizontally and vertically.



Label the length and width of each rectangle.

Record the length, width and area of each rectangle in the chart below.

	LENGTH	WIDTH	AREA
A	4	1	4
B	4	1	4
C	4	1	4
D	8	3	24

Explain the relationship of the length and width to the area of each rectangle.

the length and width go up every five

**Teacher’s Guide:
Grade 4
(continued)**

After a class has completed a unit, the “FIX-IT” activity can give students practice in revising and improving a work sample.

The job of the student in these exercises is to analyze what makes sense in the sample and what needs changing, and then to fix and complete the solution.

The Teacher Self-Evaluation Form is included at the end of each unit. It can assist teachers as they learn to incorporate these instructional strategies into their daily problem-solving lessons.

TEACHER SELF-EVALUATION FORM

Check the strategies you used in this unit and note what you said or did.

WAYS TO HELP STUDENTS MAKE SENSE OF PROBLEM SOLVING		WHAT I SAID OR DID
<ul style="list-style-type: none"> Be aware of the mathematics embedded in each unit—Warm Up(s), Task and Extension(s)—so you can engage students in discussions that will deepen mathematical understanding. 	✓	
<ul style="list-style-type: none"> Encourage visualization of solutions, especially with the use of manipulatives. 		

(Form continues...)