

Activity 1

Count Them Up

Objective

- ◆ To use Geoboard to determine areas of rectangles and squares

Materials

- ◆ TI-73
- ◆ Student Activity pages (pp. 4 – 6)

In this activity you will

- ◆ Count individual unit squares to find area.
- ◆ Combine equal rows of unit squares to find area.
- ◆ Combine equal columns of unit squares to find area.
- ◆ Combine squares and parts of squares to find area.

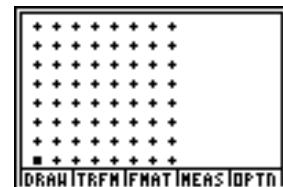
Introduction

Area may be defined as the amount needed to cover a surface. To find the area of a region, you need to know how many units it will take to cover it. (Squares are most often chosen as the basic unit.) The area of a shape is the number of square units it takes to cover the shape.

Investigation

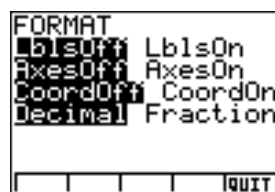
In this activity, you will investigate the areas of rectangles and squares by splitting them up into unit squares and/or half-unit squares and combining them.

1. To start the Geoboard application, press **[APPS]**. Select **Geoboard** from the list. (It will appear in different positions in the list on different calculators depending on when it was installed.) The Geoboard startup screen appears. Press any key to continue.
2. To use an 8×8 board, select **3:8x8**.



3. To format the geoboard, select **FMAT** and make sure that the following settings are selected:

LblsOff (Labels are off)
AxesOff (Axes are off)
CoordOff (Coordinates are off)
Decimal (Measurement is in decimal form)



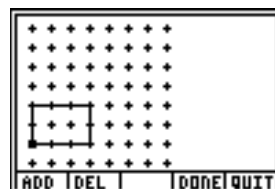
To change a setting, press \leftarrow or \rightarrow to select, and then press **ENTER** to change the setting.

Select **QUIT** to exit the **FORMAT** menu.

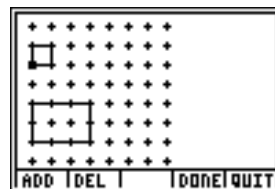
4. On this geoboard, construct a 2-unit by 3-unit rectangle.
- Starting at the lower left peg, move the cursor up one unit by pressing \uparrow .
 - To start the rectangle, select **DRAW, ADD**.
 - To complete the side, move the cursor three units to the right by pressing \rightarrow \rightarrow \rightarrow and selecting **ADD**.
 - To complete the next side, move the cursor up two units by pressing \uparrow \uparrow and selecting **ADD**.
 - To complete the third side, press \leftarrow \leftarrow \leftarrow and select **ADD**.
 - Press \downarrow \downarrow and select **ADD, DONE** to complete the rectangle.






*Note: When completing an object, set the last point by selecting **DONE**. You may also use **ADD, DONE**, but **ADD** is not necessary.*

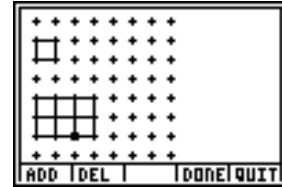
Your geoboard should look like the screen at the right.



5. Construct a basic square unit that has one square unit of area. This square unit is also called a 1x1 (1-by-1) square. This square unit will be the basic covering unit for all shapes.
- The cursor should be at the bottom left corner of the 2x3 (2-by-3) rectangle. To make the unit square, move the cursor up four units by pressing \uparrow \uparrow \uparrow \uparrow and then selecting **ADD** to start the square.
 - To complete the square, press \rightarrow **ADD** \uparrow **ADD** \leftarrow **ADD** \downarrow **DONE**. Your geoboard should now show the 2x3 rectangle with the 1-square unit above it.



6. Now split the 2x3 rectangle into unit squares by drawing horizontal and vertical line segments in the rectangle.
 - a. Move your cursor to the middle point on the left side of the 2x3 rectangle. Draw a horizontal line segment across the rectangle by selecting **ADD**    **DONE**.
 - b. Draw the two vertical line segments from top to bottom that will complete the splitting up of the 2-by-3 rectangle. Create each segment by selecting **ADD**   **DONE**.



7. To exit the drawing board, select **QUIT**.
8. To clear the board, select **OPTN, 4:Erase Board**. The confirmation message **Erase Board?** appears.
9. Select **2:YES**. The board reappears with all objects erased.

Measuring an object's area

In this activity, you will determine the area of rectangles by counting the number of square units. You can also measure the area of rectangles using the Geoboard application. For instructions, see Appendix, page 152.

Student Activity

Name _____

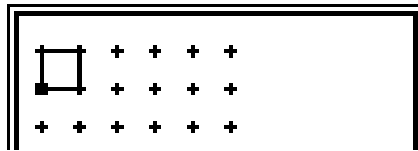
Date _____

Activity 1: Count Them Up

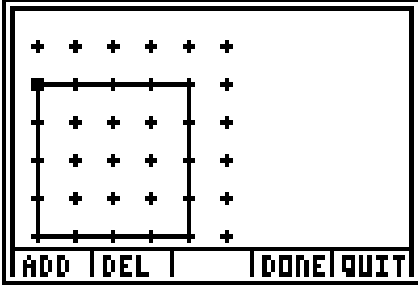
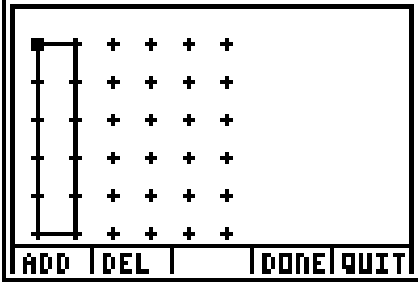
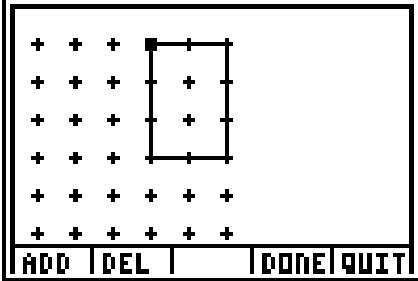
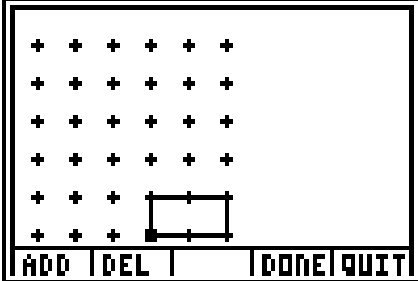
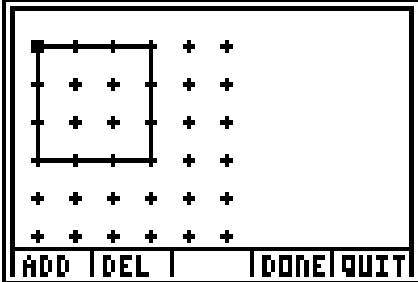
The shape in the first screen has an area of one square unit. Make each rectangle on your geoboard. Find its area by splitting it up into unit squares or half-unit squares and counting. Record the number of square units each rectangle contains.

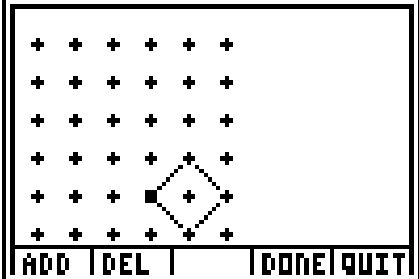
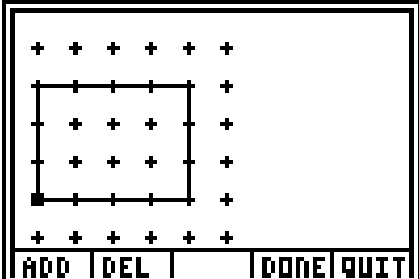
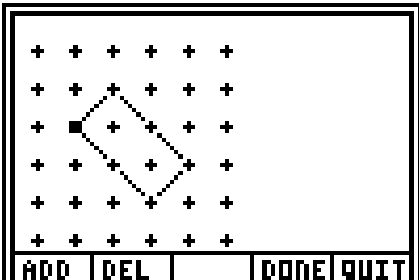
To change to a 6x6 board, select **OPTN, 1:Main Menu**. The confirmation message **Exit this board?** appears. Select **2:YES**. The main Geoboard menu appears. Select **2:6x6**.

Note: This is 1 square unit.



<p>1. Area: _____ square units</p>	
<p>2. Area: _____ square units</p>	
<p>3. Area: _____ square units</p>	

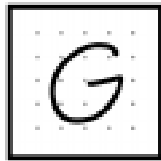
<p>4. Area: _____ square units</p>	
<p>5. Area: _____ square units</p>	
<p>6. Area: _____ square units</p>	
<p>7. Area: _____ square units</p>	
<p>8. Area: _____ square units</p>	

9. Area: _____ square units	
10. Area: _____ square units	
11. Area: _____ square units	

12. Use your geoboard to determine the number of square feet a rectangular pasture would have if the distance between each fence pole on the boundary is 10 feet. There are five fence poles going horizontally and six fence poles vertically.

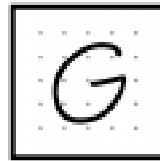
①

Opposite sides
are parallel



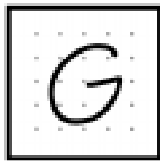
①

The area is
6 square units



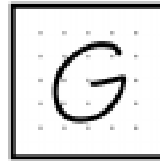
①

The length is
three times the
width



①

None of the four
sides are
horizontal or
vertical



①

Opposite sides are
congruent



①

Each angle is
a right angle



Teacher Notes



Activity 1

Count Them Up

Objective

- ◆ To use the geoboard to determine areas of rectangles and squares

NCTM Standards

- ◆ Select and apply techniques and tools to accurately find area...to appropriate levels of precision

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Investigation

When discussing area problems, emphasize that areas are given in *square units* because this tells us how many *unit squares* would be needed to cover the shape.

On the Geoboard application, the smallest square on each geoboard is one square unit of area. This square unit always has horizontal and vertical sides with no points inside.

Comments for Step 5:

- ◆ Students can find the area of a 2×3 rectangle by counting squares or by thinking about two rows of 3-unit squares or by thinking about three columns of 2-unit squares. If students suggest multiplying length by width as a quick way of finding area, that is fine, but do not emphasize a formula at this time.
- ◆ Students can check their answers using the measure menu (**MEAS**) on the TI-73. To find the area of any rectangle, move the cursor to a corner point and select **MEAS, 2:Area** and press **ENTER**. The area will appear in the upper right corner of the screen. To clear the area, select **QUIT**.
- ◆ Students have an option to have the area measured in fraction or decimal form. Select **FMAT** and then select **Fractions** or **Decimals**. After making a selection, press **ENTER**. Select **QUIT** to return to the 8×8 board.

Answers to Student Activity pages

- | | | |
|-------|------|----------------------|
| 1. 8 | 5. 5 | 9. 2 |
| 2. 3 | 6. 6 | 10. 12 |
| 3. 4 | 7. 2 | 11. 4 |
| 4. 16 | 8. 9 | 12. 2000 square feet |

Group Problem Solving: The area of rectangles

The Group Problem Solving cards are challenge problems that can be used alone or with the individual sections of this book. The problems are designed to be used in groups of four (five or six in a group are possibilities using the additional cards) with each person having one of the first four clues. Students can read the information on their cards to others in the group but all should keep their own cards and not let one person take all the cards and do the work.

The numbers at the top of the cards indicate the lesson with which the card set is associated. The fifth and sixth clues (the optional clues) have the lesson number shown in a black circle.

The group problems can be solved using the first four clues. The fifth and sixth clues can be used as checks for the group's solution or they can be used as additional clues if a group gets stuck. Some problems have more than one solution. Any shape that fits all the clues should be accepted as correct.

With a little experience, students should be able to design their own group problems. They could then switch problems with other groups for additional problem solving practice.

One solution for this problem solving exercise:

