

### "Picking" Your Way Through Area Problems

ID: 8270

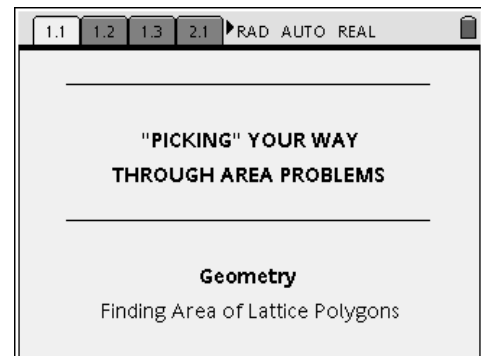
Name \_\_\_\_\_

Class \_\_\_\_\_

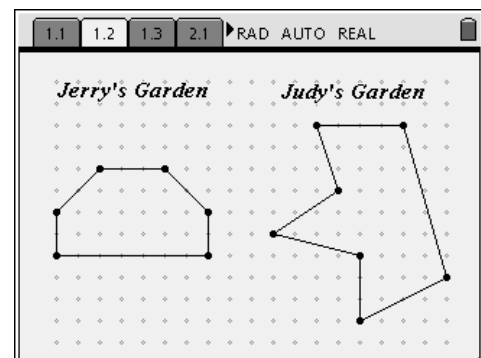
*In this activity, you will explore:*

- *The relationship between boundary and interior points of a lattice polygon and its area*

Open the file *GeoAct03\_PicksTheorem\_EN.tns* on your handheld and follow along with this document and your teacher. Use this document as a reference and to record your answers.



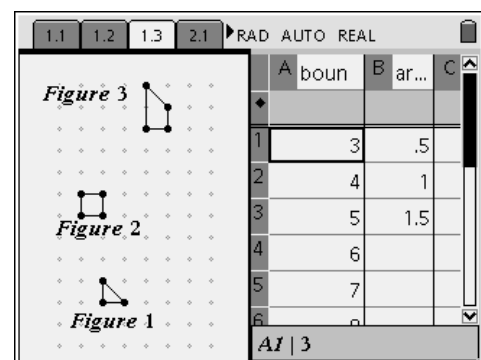
Page 1.2 shows Jerry's garden and Judy's garden. Using a distance of 1 unit between grid points, Jerry says that the area of his garden is 24 square units. The following investigation will help determine if Jerry is correct by using boundary points and interior points of a polygon to determine area.



How might you find the area of Judy's garden?

#### Problem 1 – Investigating polygons with zero interior points

On page 1.3, examine the polygons on the screen. In the spreadsheet, Column A contains the number of boundary points for each figure and Column B contains the area of those figures. Using the **Polygon** tool, draw a figure that contains 6 boundary points that does not contain any interior points. Calculate the area using the **Area** tool and record it in the spreadsheet. Do the same for 7 and 8 boundary points.

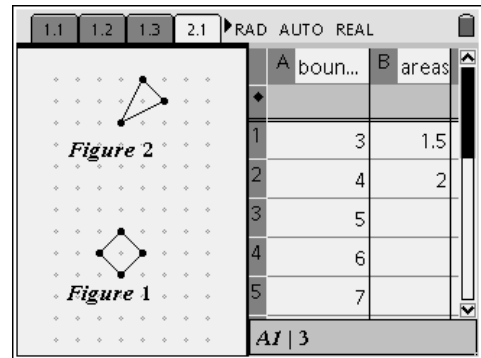


1. What happens to the area when a boundary point is added?
2. Describe the relationship between the area and the number of boundary points.
3. Write a formula showing this relationship.

A = \_\_\_\_\_

**Problem 2 – Polygons with one interior point**

The polygons on page 2.1 contain 1 interior point. Draw a polygon containing 1 interior point and 6 boundary points. Calculate the area of this figure and record it on the spreadsheet. Do the same for 7 and 8 boundary points. Try to discover all the relationships between area and boundary points as well as interior points. Think about what needs to be added or subtracted from the formula you discovered in Problem 1.

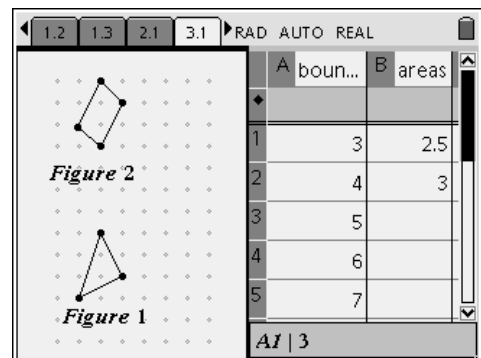


1. What happens to the area when a boundary point is added?
2. Describe the relationship between the area and the number of boundary points.
3. Write a formula showing this relationship.  

$$A = \underline{\hspace{2cm}}$$
4. How did the area formula change when increasing the interior points to 1?

**Problem 3 – Polygons with two interior points**

The polygons on page 3.1 contain 2 interior points. Draw polygons with 6, 7, and 8 boundary points where each polygon contains 2 interior points. Calculate the areas record them on the spreadsheet. Think about how adding another interior point changes the formula you found in Problem 2.

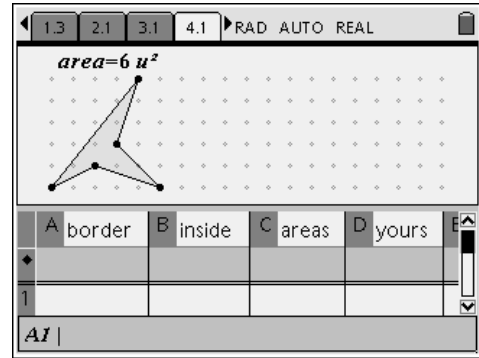


1. What happens to the area when a boundary point is added?
2. Describe the relationship between the area and the number of boundary points.
3. Write a formula showing this relationship.  

$$A = \underline{\hspace{2cm}}$$
4. How did the area formula change when increasing the interior points to two?

**Problem 4 – A polygon constructed to manipulate**

On Page 4.1, you will create a formula for area. Use the grab button to move the vertices of the polygon to create a new polygon. As you drag the vertices, the area will change. Count the number of boundary points and fill this in to Row 1 in the border column. Then count the number of interior points and fill this in to the inside column. Copy the area into the area column. In the formula row (the grey row) in Column D, write an equation that you think will result in the area. To input the equation, you must start with = and use the variable menu to use the border and inside columns in your formula. Modify your formula until the entry in Column D matches the entry in Column C. To check your formula, create a new polygon and enter the number of boundary and interior points and area in Row 1 of the spreadsheet like before. The entry in Column C and Column D should match.



1. What is the formula for area using boundary points and interior points?

$A =$  \_\_\_\_\_

On Page 4.2, you see Jerry and Judy's gardens. Jerry says that his garden is 24 square units.

2. Was Jerry correct?
3. What is the area of Judy's garden?

