

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## **FLATLAND the Movie**

### **A Visit to Gridland**

#### **Goal**

To explore the polygons created on a square grid of points and learn to recognize and formulate patterns.

#### **Pick's Formula**

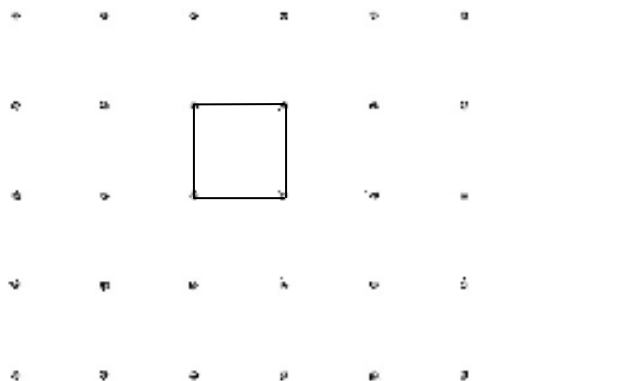
Flatland is a world where people can travel in any continuous path in two dimensions. Suppose we lay down a square grid of points and only allow motion along straight paths connecting two grid points. We could call such a world Gridland. In Gridland, we can find the area of polygons whose corners all lie on grid points using a mathematical formula called Pick's Formula.

Pick's Formula allows us to find the area of a simple (no edges overlapping) polygon by drawing it on a square grid and counting the number of grid points,  $I$ , in its interior and the number of grid points,  $B$ , on its boundary. With the following exercise, you will discover Pick's Formula for the area,  $A$ , of a polygon by tabulating and analyzing the pattern for the interior and boundary points of a few simple examples.

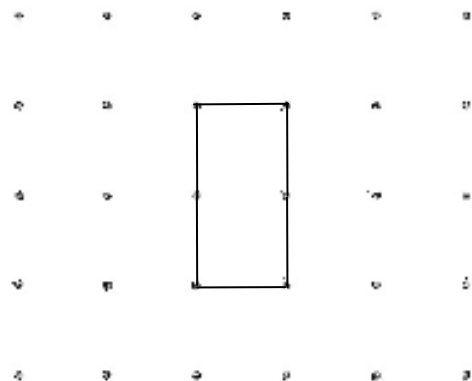
1. Complete the table below by referring to the following figures.

<b>Figure</b>	<b>Interior Points (I)</b>	<b>Boundary Points (B)</b>	<b>Area (A)</b>
1			
2			
3			
4			
5			
6			

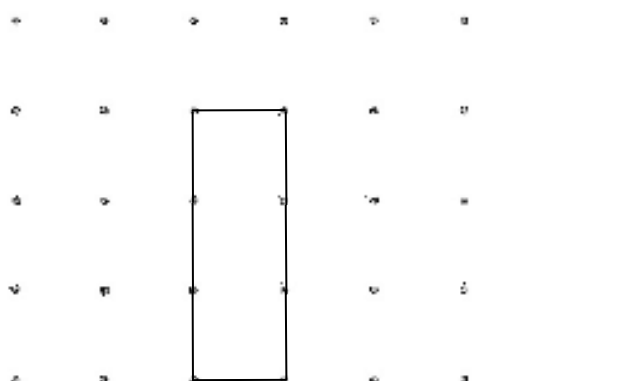




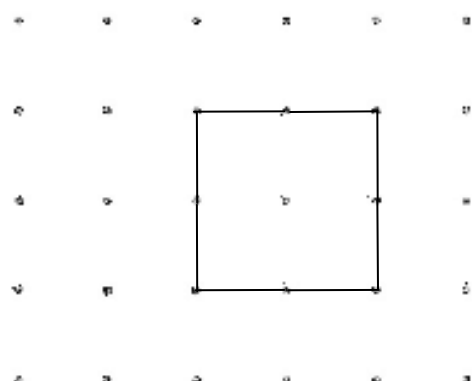
**Figure 1**



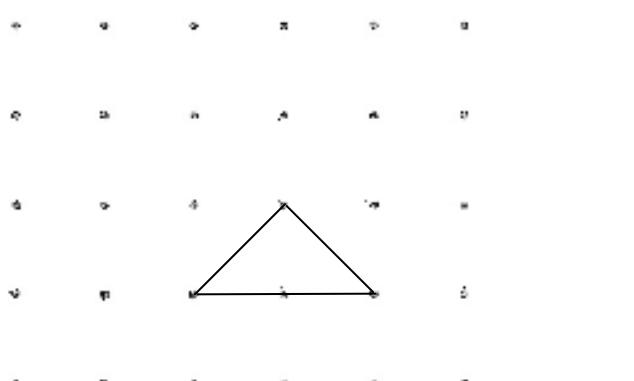
**Figure 2**



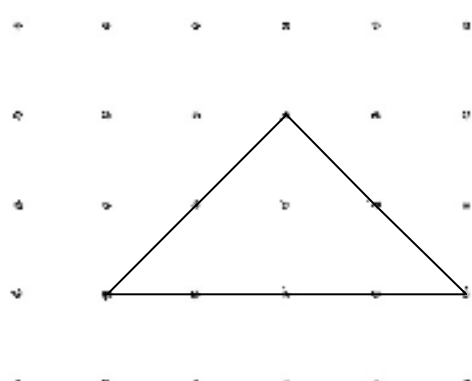
**Figure 3**



**Figure 4**



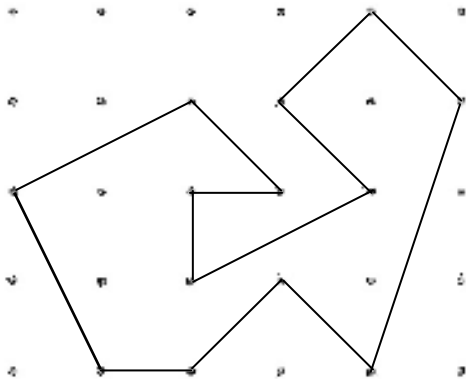
**Figure 5**



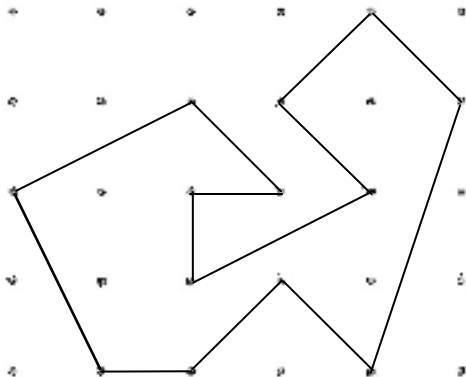
**Figure 6**

2. Using the values you entered into the table, see if you can determine the formula for the area,  $A$ , of a polygon with respect to the number of interior points,  $I$ , and boundary points,  $B$ .

3. In the movie, Arthur and Abbott worked at the Ministry measuring the angles of baby shapes. A baby whose angles were not all equal was called irregular. The shape below is a simple, irregular polygon. Using the formula you derived in the previous problem, find its area.



4. Divide up the interior of the polygon into triangles and calculate the areas of the triangles. Add up all the triangle areas to get the total area of the polygon.



5. Draw your own *simple, irregular* polygon by connecting points in the grid below and then find the area using Pick's Formula.

