

# Understanding Patterns from Initial Values and Rate of Change

Ask students to build the following pattern using toothpicks. The area of Figure 0 is 2.5 square units.



Figure 0

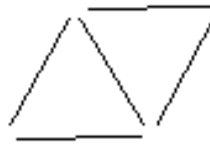


Figure 1

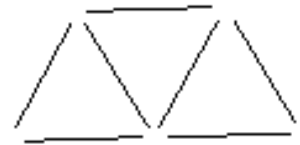


Figure 2

Let's study several patterns:

Figure Number	0	1	2			
Number of Toothpicks						
Number of Toothpicks on the Perimeter						
Number of Horizontal Toothpicks						
Number of Slanted Toothpicks						
Area of the Figure						

Build Figure 3. Complete the table for Figure 3.

Describe how the numbers in each row are changing. Describe how this number is happening in each figure.

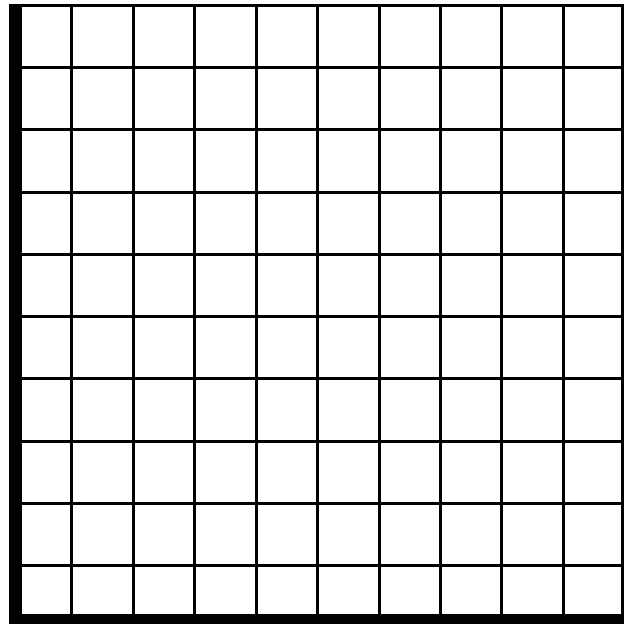
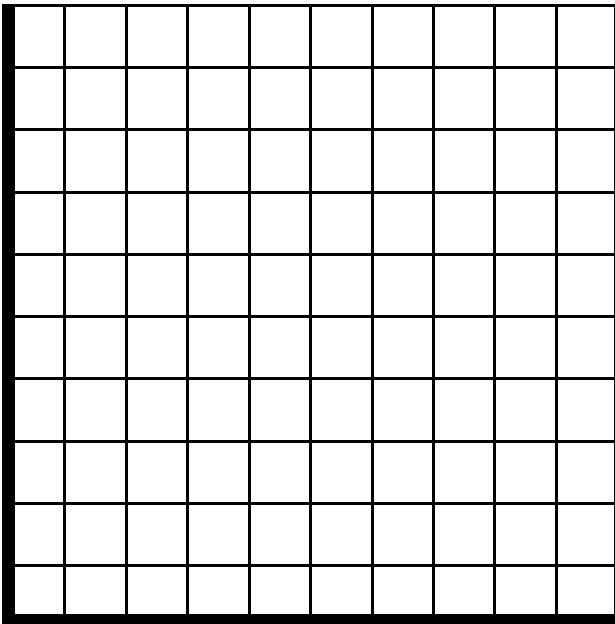
Without building Figure 4, predict the numbers that will fit in the table.

Predict the numbers that will fit Figure 10. Explain how you found this answer.

Let's graph some of the data.

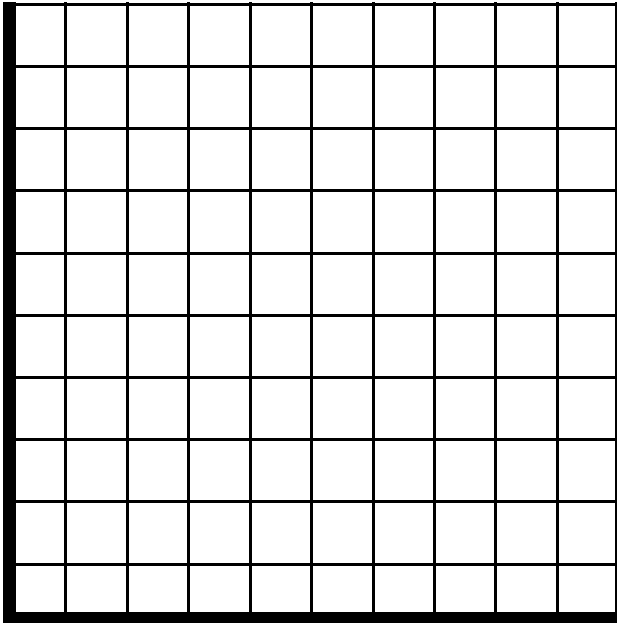
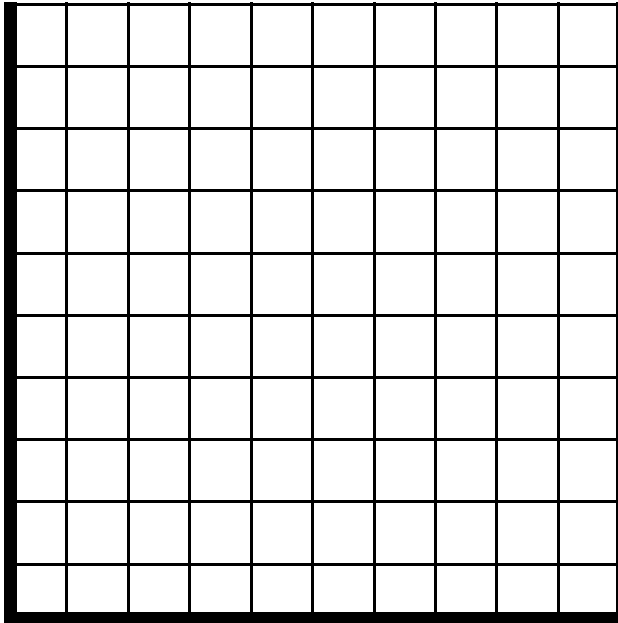
Graph the Figure Number vs. the Number of Toothpicks

Graph the Figure Number vs. the Perimeter

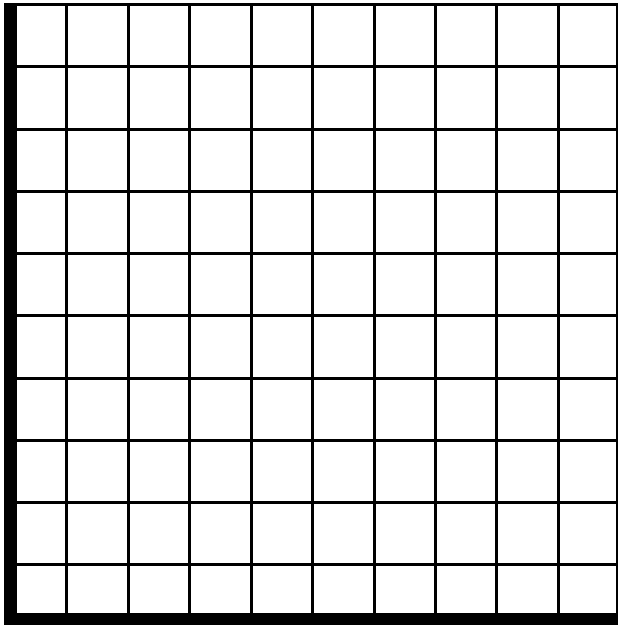


Graph the Figure Number vs. the Number of Horizontal Toothpicks

Graph the Figure Number vs. the Area



Graph the Figure Number vs. the Number of Slanted Toothpicks



Study each graph.

How do the points on the graph change? How much do the points rise every time you move over one point?

How does this number relate to the chart? Does this number determine how steep the row of points is?

Where does each graph hit the y-axis? What is special about this number.

If the Figure were numbered 25, can you predict how you will find the number to fill in each row of the chart?

If the Figure were numbered  $x$ , how can you predict how you will find the number to fill in each row of the chart?