Number Properties

**Name(s):** _____

In this activity you will explore the whole numbers 1 to 100. You'll look at three types of whole numbers.

Square numbers are produced by multiplying a number by itself, such as $4 \times 4 = 16$. You say that 16 is a *perfect square*. You can represent a perfect square number by arranging objects in the shape of a square. At right is a square made up of 16 smaller squares, showing that 16 is a perfect square.
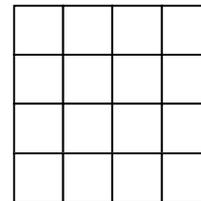
Triangular numbers can be represented by objects arranged in the shape of an equilateral triangle. Here are triangles that represent the first four triangular numbers. What are the numbers?
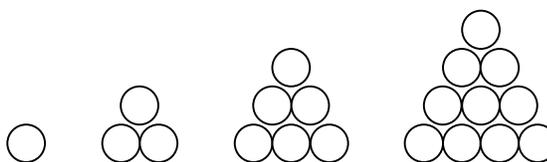
Prime numbers have only two factors—1 and the number itself. For example, 5 is a prime number because its only factors are 1 and 5.

At right are the data for the number 36. The "yes" and "no" values for the attributes show that 36 is a perfect square and a triangular number, but it is not prime.

Plot and Investigate

Now you'll look at the data to see what patterns you can find. Let's start with the perfect squares.

1. Open the document **Number Properties.tp.** You'll see a stack of data cards like the one above.

2. You'll also see a plot of square icons ordered by *number*. Drag the bottom edge, right edge, or bottom-right corner to make a stack that is 4 wide, as shown at right. You can also use the **Icon Size** slider to make the squares fit better, but don't make them too small.

3. Select the attribute *perfect_square* in the data cards. The color of the plot will change, as shown at right. Include a copy of this plot with your assignment.

4. Do you see a pattern to the square numbers in the plot? Describe the pattern as fully as you can.

5. Assume that you have data for numbers greater than 100. Based on the pattern that you see, where will the next five perfect squares appear? If you can, figure out the value of those square numbers.

6. Drag the edges or corner of the plot to change the size of the stack. Find another stack that helps you see a pattern to the square numbers. Include a copy of this plot with your assignment.

7. Fully describe the pattern that you see in this stack. Explain how this pattern compares with the pattern that you saw in Step 4.

Now you'll look at the triangular numbers.

8. Select the attribute *triangular* in the data cards. Change your plot or make a new plot that shows a pattern to the triangular numbers. Feel free to experiment with different options. For example, you don't have to use square icons. Include a copy of your plot with your assignment.

9. Describe the pattern that you see in the triangular numbers as completely as you can. Based on your pattern, what are the next five triangular numbers greater than 100?

Now you'll explore the prime numbers.

10. Select the attribute *prime* in the data cards.

11. Make at least one plot that shows possible patterns for the prime numbers. Include a copy of your plot(s) with your assignment.

12. Describe any possible patterns that you see in the prime numbers. Your answer should say how your plots help you see these patterns. Can you use the patterns to predict the next five prime numbers greater than 100?