Number Drafting, Part 2: Foraging for (Modestly) Large Numbers

Numbers like 3^{77}, used as an example in the first article of this series [1], may seem very large. Written out with commas for readability, 3^{77} is

5,474,401,089,420,219,382,077,155,933,569,751,763

Such numbers are very large compared to numbers we commonly encounter. For example, at the moment of this writing, the United States national debt, which most folks think is a bit large, is

$7,120,642,280,428

3^{77} is 7,120,642,280,438 times this number. But the national debt is not a physical thing.

Think of something physically big, like the universe. The radius of the universe is thought to be about 10 billion light years. A light year is about 9,500,000,000,000 kilometers. Multiplying out, the radius of the universe is on the order of 95,000,000,000,000,000,000,000 kilometers, or 95,000,000,000,000,000,000,000,000 meters, or 9,500,000,000,000,000,000,000,000,000 centimeters. These numbers, while immense in physical terms, are much smaller than 3^{77}. 3^{77} is 576,252,746 times the radius of the universe in centimeters.

But in the mathematical domain, numbers like 3^{77} are puny. At the time of this writing, the largest known prime number is $2^{20,996,011} - 1$. It has 6,320,430 decimal digits. This is 170,822 times the number of digits in 3^{77}. If written out at 100 digits per line and 60 lines per page, this prime would take 1,053 pages — almost as big as some computer books.

It is time for a reality check. For the purposes of weaving, a few hundred digits is more than enough and in most cases fewer are desirable. Numbers of this size are "modestly" large.

The supposed purpose of number drafting is to produce attractive weaves from modestly large interesting numbers. The choice of numbers comes first. So what are interesting numbers?

Some kinds of numbers are inherently uninteresting for the purposes of number drafting. Approximations, like the estimated population of China, which as of the last census was 1,260,000,000, lack sufficient detail. A good estimate, on the other hand, can be interesting. For China's population, it presently is 1,261,832,482.

Some candidates for interesting numbers are (small) prime numbers, numbers in interesting sequences like the Fibonacci sequence, whose 100th term is 354,224,848,179,261,915,075, Gödel numbers for interesting mathematical expressions [2], and so on.

Other candidates are the initial parts of the decimal expansions of important constants, like π, e (the base of the natural logarithms), and ϕ (the golden mean).

Given an interesting number, the next step is to derive an attractive weave. Number drafting, described in the first article in this series [1], provides a mechanism for producing threading and treadling sequences from a number. Weaves then can be produced by modifications of the sequences, such as reflection to obtain symmetry, and by the choice of a tie-up. The following pages show some examples.

References

1. *Number Drafting,Part 1: Introduction*, Ralph E. Griswold, 2004: http://www.cs.arizona.edu/patterns/weaving/webdocs/gre_num1.pdf.

2. *Silliness: Gödel-Numbering Drawdowns*, Ralph E. Griswold, 2004: http://www.cs.arizona.edu/patterns/weaving/webdocs/gre_godl.pdf.

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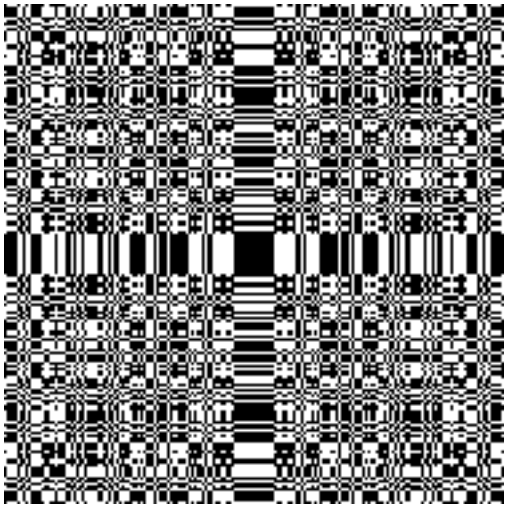
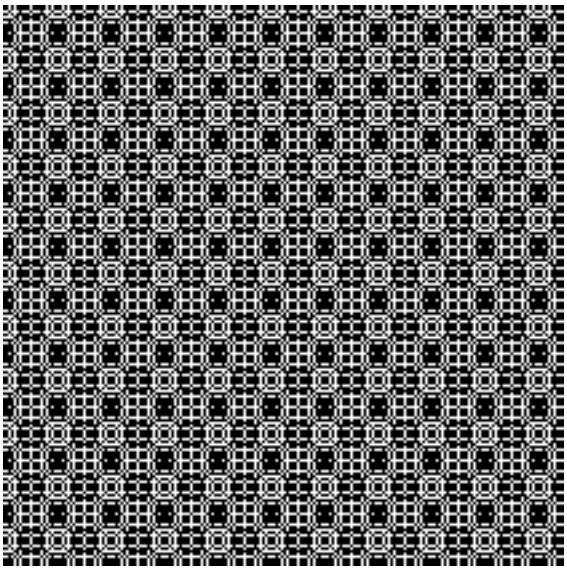
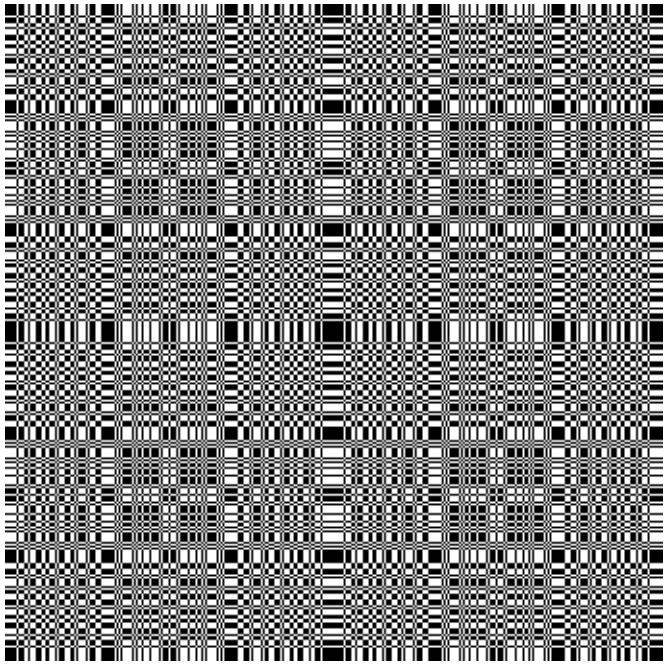


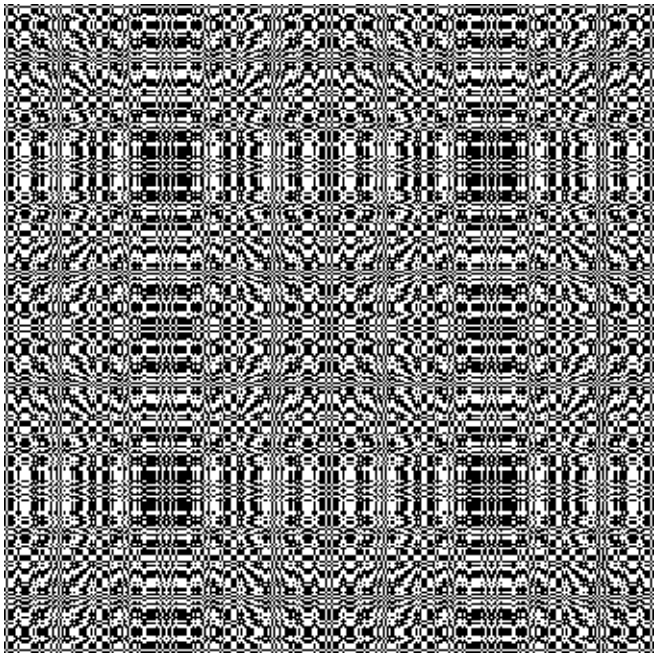
(∃x)(x = sy) ala Gödel



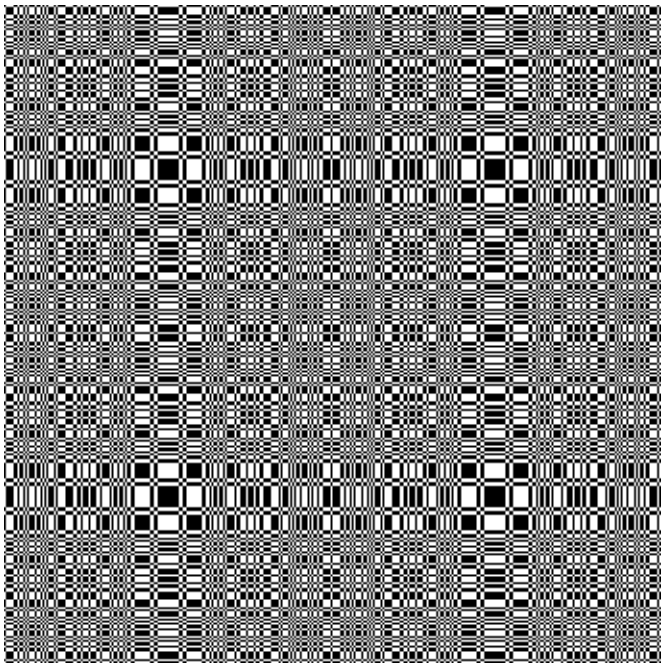
China's Population



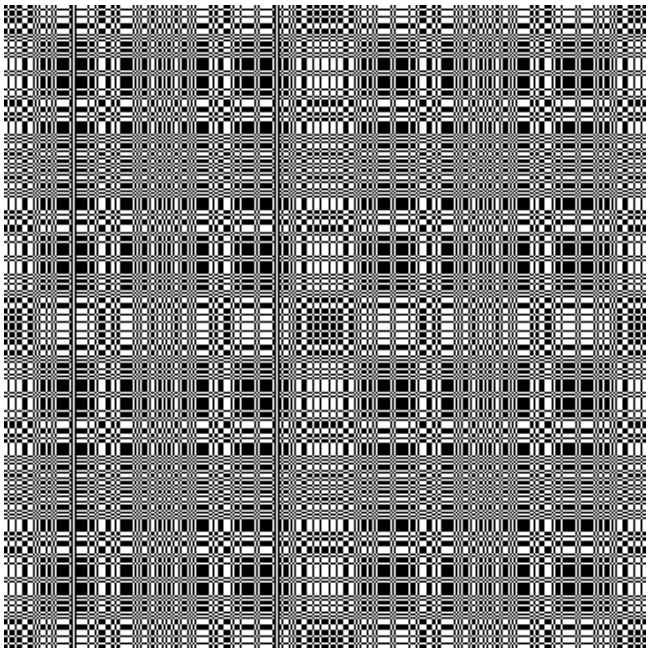
e



π



ϕ



The Beginning of a Large Prime