

1. Consider multiplicative group mod 2562890625. How many of its elements are of order 1350? What conditions do they have to meet (to be exactly of that order)? Find one such element and verify, computationally, that it has the desired order.
2. Design a uniform (between 0 and 1) random-number generator based on

$$x_{n+1} = a \cdot x_n + c \quad \text{mod } 4713258845712384$$

How many possible choices of a (and of c , and of x_0) are there to get the longest possible sequence, and how long is such a sequence? Find one such a (make it 8 digits long), c (not more than 2 digits) and x_0 (16 digits) and verify, computationally, that these do yield the longest cycle.

3. (Continuation of the previous question). Generate 10,000 such numbers and test (using Kolmogorov-Smirnov) whether they are uniformly distributed. Similarly test whether the corresponding first-order serial correlation coefficient is equal to zero.