
All the following problems are for the following general linear congruence generator:

$$\begin{aligned} x_{i+1} &= (ax_i + b) \bmod m \\ u_{i+1} &= x_{i+1}/m. \end{aligned}$$

1. Generate the sequence of numbers x_i for $a = 6,\ b = 0,\ m = 11$, and x_0 ranging from 0 to 10. Also, generate the sequence of numbers x_i for $a = 3,\ b = 0,\ m = 11$, and x_0 ranging from 0 to 10. Observe the sequence of numbers generated and observe the repetition of values. Tabulate these for each group of values. How many distinct values appear before repetitions? Which, in your opinion, are the best choices and why?

2. Generate a sequence u_i, $i = 1, 2, \ldots, 10000$ with $m = 244944,\ a = 1597,\ 51749$ (choosing x_0 as per your choice). Then group the values in the ranges

   $$[0,\ 0.05),\ [0.05, 0.10),\ [0.10,\ 0.15),\ \ldots,\ [0.95,\ 1)$$

   and observe their frequencies (*i.e.,* the number of values falling in each group). For 5 different x_0 values, tabulate the frequencies in each case, draw the bar diagrams for these data and put in your observations.

3. Generate a sequence u_i, $i = 1, 2, \ldots, 10000$ with $a = 1229,\ b = 1,\ m = 2048$. Plot in a two-dimensional graph the points (u_{i-1}, u_i), *i.e.,* the points (u_1, u_2), (u_2, u_3), (u_3, u_4), $\ldots$.

Submission Deadline: August 09, 2022, 11:50 AM