HELSINKI UNIVERSITY OF TECHNOLOGY
Networking Laboratory
S-38.3148 Simulation of data networks, fall 07

Exercise 1
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1. Generate, by using the linear congruential method (LCG), a sequence of four pseudo random numbers. Use initial values $X_0 = 10,\ a = 23,\ c = 1$, and $m = 64$.

2. What is the length of the random number sequence generated by the LCG algorithm with the above parameters? How would you change the value of a to obtain a full length (i.e., 64 different numbers)?

3. A random number generator of a computer draws samples from a $\mathrm{U}(0,1)$ distribution. Assume that the generator has generated a sample $u = 0.57306$. What is the corresponding value of a random variable X, when X is the number of trials before the first six appears when rolling a dice?

4. Apply the inverse transformation method to generate rv:s from the Weibull distribution with the cumulative distribution function

$$F(x) = 1 - e^{-(\lambda x)^{\beta}}.$$

   Also, give the algorithm to generate the samples.

5. Given a uniformly distributed sample U, i.e., $U \sim U(0,1)$, samples of X are generated with the following inverse transformation method:

$$X = \begin{cases} \sqrt{2U}, & 0 \le U \le 1/2, \\ 2 - \sqrt{2 - 2U}, & 1/2 < U \le 1. \end{cases}$$

   What is the probability density function of X? Draw a picture.