

Lab 1

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1 Random Numbers

We may all have an intuitive sense of what a random number is. We may think of choosing lottery numbers and the respective draws that occur. This is a repeated process without any deterministic pattern. Mathematically this can be a bit tricky to understand. See the code example.

Randomness: a lack of predictability

Random Number Generator: generation of a number sequence without any pattern.

Pseudorandom Number Generator: algorithm that describes properties of randomness. We begin with a state, using a seed producing the same sequence.

Example:

1/ Try random number generation using the GSL GNU scientific library:

<https://www.gnu.org/software/gsl/> see rng.cpp

2/ See the RANDU problem

2 Properties

Probability Density Function: a function whose definite integral over a given range gives the probability of occurrence within that range.

Cumulative Distribution Function: gives the probability that a random variable is less than or equal to the independent variable of the function.

3 QUESTIONS

1/ What base 10 number is defined by (sign, fraction, base, exponent) = (1,your-name,13,1)

2/ On paper, calculate the following as a base ten integer:

sign = 1

exponent = 10110101

fraction = 000000000000001000001011

3/ Determine the first 20 values of the Fibonacci sequence

4/ Write a function that generates the pseudorandom number generator known as RANDU. The range is $[0,1]$, begin with a seed of 12345, with $10E+05$ instances.