UNIFORM RNG, SIMPLE APPLICATION

CONSIDER MODELS GOVERNED BY DIFFERENTIAL EQNS. GIVEN INITIAL + BOUNDARY CONDITIONS, THE SOLUTION IS MATHEMATICALLY CERTAIN & CAN BE DETERMINED W/ APPROPRIATE NUMERICAL METHODS TO A PRESCRIBED ACCURACY. THOSE ARE DETERMINISTIC MODELS; A STOCHASTIC MODEL INCLUDES UNCERTAINTY FROM NOISE.

COMPUTATIONAL SIMULATION OF A STOCHASTIC SYSTEM MIMICS NOISE W/ RANDOM NUMBER GENERATION.

MORE HONESTLY, COMPUTATIONAL RANDOM NUMBERS ARE PSEUDO-RANDOM BC THEY ARE GENERATED W/ AN ALGORITHM.

THE GOAL OF RANDOM NUMBER GENERATION IS TO OUTPUT NUMBERS THAT ARE INDEPENDENT + IDENTICALLY DISTRIBUTED (IID). "INDEPENDENT" IN THAT X_n DOES NOT DEPEND ON ANY PRECEDING X_{n-i} AND "IDENTICALLY DISTRIBUTED" SUCH THAT THE DISTRIBUTION X_n IS INDEPENDENT OF n.

RANDOM NUMBERS ARE CHOSEN FROM FIXED PROBABILITY DISTRIBS.
→ UNIFORM, EXPONENTIAL, NORMAL

(eg) NONZERO INTEGER X_0 AS SEED, THEN

$$\left.\begin{aligned} X_i &= 13 X_{i-1} \\ y_i &= \underbrace{X_i \bmod 31}_{31} \end{aligned}\right\} \rightarrow \begin{aligned} X_i &= a X_{i-1} + b \\ y_i &= \underbrace{X_i \bmod m}_{m} \end{aligned}$$