1. Estimate the value of $\pi$ by repeating Example 4 of Chapter 2.

2. Let $U_i, i \geq 1$, be uniform on (0,1). Define $N$ by

$$N = \text{Max}\{n : \prod_{i=1}^{n} U_i \geq e^{-3}\}.$$ 

   a. Find $E[N]$ by simulation.
   b. Find $\text{Prob}\{N = k\}$, for $k = 0, 1, 2, 3, 4, 5, 6$, by simulation.

3. Give an efficient algorithm to simulate the value of a random variable $X$ such that

$P(X = 1) = 0.3$, $P(X = 2) = 0.2$, $P(X = 3) = 0.35$, $P(X = 4) = 0.15$.

4. Give an algorithm to simulate the answers for a question “Are you ready for this challenge?” There are about 45% of the answers being “Yes”, and the others “No”.