1. Using the algorithm to generate random variables from a discrete distribution, generate discrete uniform variables on $\{1, 3, 5, \ldots, 9999\}$.

2. Use the acceptance rejection method to generate samples from a distribution with,

$$f(x) = 20x(1-x)^3.$$

   (a) Take $\mathcal{U}[0,1]$ as the known density function g. You have to first determine the smallest constant c that satisfies the required inequality $(f(x) \leq cg(x))$.

   (b) Using this c, generate a random variables from $f(x)$. Check if these values convergence. Also, keep a count of number of iterations needed to generate each of the random variables.

   (c) Compute the average of all these values and compare it with the value of c that you have determined.

   (d) Now, repeat the above experiment with two values of c higher than the smallest value that you have chosen. What are your observations ?

3. Consider the problem of generating a discrete random variable X that takes one of the values $1, 2, \ldots, 10$ with corresponding probabilities of $0.11, 0.12, 0.09, 0.08, 0.12, 0.10, 0.09, 0.09, 0.10, 0.10$. Using the discrete uniform distribution on $1, 2, \ldots, 10$ as the base (*i.e.,* in place of g), generate random samples from X, with two possible values of the constant c. What is your conclusion ?

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