

Math 36 — Weekly Homework

Assigned: 9/24

Due: 10/1

1. Suppose you have a four-sided die whose balance can be adjusted so that you can precisely determine the probability of each number being rolled. Let X be the random variable that is the sum of two rolls of the die. Show that it is impossible to weight the die so that X is uniformly distributed.

2. Suppose Y is a random variable uniformly distributed on the interval $[0, 1]$. Describe how to use Y to simulate drawing a card from a full deck of 52 cards. You need to know the value (A,2,3,4,5,6,7,8,9,10,J,Q,K) and the suit (spades, clubs, hearts, diamonds).

3. Suppose there is a population of 100 individuals, that have fitness 1, 2, 3, ... 100.

Because all our other models had a single parent giving birth, and that is clearly an oversimplification of reality, we'll change our Birth-death process to account for the fact that two parents are needed to make a child.

We introduce a model of reproduction where **two** parents are chosen proportional to fitness, the average fitness of the parents becomes the fitness of the child, and an individual is chosen uniformly at random to die.

Use simulations to determine the expected fitness of the population as time goes to infinity. In addition, turn in your pseudocode for the program you used to simulate this system.