Mathematics 1550H – Introduction to probability

Trent University, Summer 2014

Assignment #3
Simulations

Due on Wednesday, 16 July, 2014.

A common problem in probability courses is to figure out how to use a possibly biased coin to simulate a fair coin. (See, for example, Assignment #3 from the Summer 2013 edition of MATH 1550H ... :-) The basic idea behind the usual solution to this problem can be used to do a little more.

1. Suppose you are stuck on a desert island with npthing but a fair coin, but you feel the urge to play a game that requires you to roll a fair (standard six-sided) die. How can you simulate rolling a die using the coin you do have? *[3]*

2. Suppose you are (still!) stuck on the desert island, but you get the urge to play a game that requires tossing a biased coin, with $P(H) = \frac{13}{20} = 0.65$ and $P(T) = \frac{7}{20} = 0.35$. How can you simulate tossing such an unfair coin using the fair coin you do have? *[3]*

3. In general, suppose (a complete description of) a random process with a finite sample space S and probabilities, not necessarily equal, for all the outcomes in S are given. Can one simulate this process by tossing a fair coin? Just when and why is it possible to do so, and, when one can, how? *[4]*