

This homework is due by 5pm on Thursday Feb 1st. Please hand it to the CS174 homework box on the second floor of Soda Hall.

1. Suppose you need a biased coin which has probability k/n of heads, for various integer values of k and n . How could you generate biased coin tosses from a fair coin ($\Pr[\text{Heads}] = 1/2$)? You should allow any value of k or n (not just powers of 2). Try to be efficient, i.e. use the minimum number of coin tosses.
2. What is the probability that 2 and 3 are adjacent in a random permutation of $1, \dots, n$? HINT: Glue 2 and 3 together and permute them along with the other numbers.
3. Suppose you are planning an all-day conference, with attendees staying for lunch and dinner. Meals are served at a large, circular table with n places. You want to try seating people so that they have different neighbors. Is random seating a good idea?
 - (a) Compute the Probability that no-one is *to the right of* someone they were to the right of at lunch. They can have the same neighbor, but on the other side.
 - (b) Compute the probability that no-one at dinner has a neighbor on the same or other side, that they had at lunch.

Simplify your answer using the approximations we have used in class. HINT: Use inclusion-exclusion on permutations, and some glue.

4. Suppose you have a Poisson random variable X with parameter λ . The expected value $E[X] = \lambda$. What is the probability $\Pr[X > \lambda]$? Simplify as much as you can, using approximations as needed.