

1 Discrete Maths Basics

1.1 Counting

- a.) How many functions are there with domain $\{0,1\}^n$ and range $\{0,1\}^k$? Suppose $k = 2$, how many are there with codomain $\{0,1\}^2$? Can you write a formula for general k , for functions with codomain $\{0,1\}^k$?
- b.) A function $f : \{0,1\}^n \rightarrow \{0,1\}^k$ is symmetric if for any reordering σ of $\{1, \dots, n\}$ (permutation) and any $x \in \{0,1\}^n$, $f(x) = f(\sigma(x))$. How many symmetric functions are there of the form $f : \{0,1\}^n \rightarrow \{0,1\}^k$?

1.2 Probability

- a.) Suppose you toss a coin 5 times. What is the probability that you see 101 consecutively (where 1, 0 stands for heads and tails respectively)?
 - b.) Suppose there is a group of 5 people and every pair of them is equally likely to be friends or non-friends. Find the probability of the event that there are at least three people who are mutual friends.
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