

M460 Information and Coding Theory

practice exam 2

not graded, no solutions!

Exercise # 1

(0 points)

There are 6 urns labeled by $u \in \{0, 1, \dots, 5\}$, each containing ten balls. Urn u contains $2u$ black balls and $10 - 2u$ white balls. Fred selects an urn u at random and draws N times with replacement from that urn, obtaining n_B blacks and $N - n_B$ whites. Fred's friend, Bill, looks on. If after $N = 10$ draws $n_B = 3$ blacks have been drawn, what is the probability that the urn Fred is using is urn u , from Bill's point of view? (Bill does not know the value of u .) Plot the probability distribution.

Exercise # 2

(0 points)

How many students must enroll in a course so that the probability that two students have the same birthday is more than 50%?

Exercise # 3

(0 points)

How many symbols are needed to make a source whose binary Huffman code has average word length 2.9?

Exercise # 4

(0 points)

Encode the following text using

- a) A binary Huffman code
- b) A Shannon-Fano code
- c) A binary Huffman code encoding pairs of source words

In each case, compute the expected word length and efficiency.

Denver NewOrleans LasVegas Denver Denver NewOrleans NewOrleans
LasVegas Denver LasVegas NewOrleans Denver Huston Denver NewOr-
leans Huston LasVegas Denver NewOrleans LasVegas Huston Denver
Huston LasVegas Denver NewOrleans LasVegas NewOrleans LasVegas
Denver NewOrleans Denver