

M460 Information and Coding Theory

exercise sheet # 2

Exercise # 1 (2 points)

Is there an instantaneous code over \mathbb{Z}_3 with word length $\ell_i = 1, 2, 2, 2, 2, 2, 3, 3, 3, 3$? Construct one with $\ell_i = 1, 2, 2, 2, 2, 2, 3, 3, 3$. How many such codes are there?

Exercise # 2 (2 points)

The binary code $\mathcal{C} = \{0, 10, 11\}$ is used. How many code-sequences of length j digits can be formed from \mathcal{C} ? Hint: find and solve a recurrence relation for this number.

Exercise # 3 (2 points)

Use a binary Huffman code to encode the following text:

zebra rhino dog cat cat giraffe elephant elephant dog giraffe dog elephant dog rhino
dog lion elephant zebra dog rhino cat elephant lion giraffe zebra dog rhino zebra
rhino giraffe rhino lion rhino dog lion elephant lion rhino elephant rhino cat dog
zebra cat giraffe

Exercise # 4 (4 points)

You are given 12 balls, all equal in weight except for one that is either heavier or lighter. You are given a two-pan balance to use. In each use of the balance you may put any number of the 12 balls on the left pan, and the same number on the right pan, and push a button to initiate the weighing. There are three possible outcomes: either the weights are equal, or the balls on the left are heavier, or the balls on the left are lighter. Your task is to design a strategy to determine which is the odd ball and whether it is heavier or lighter than the others in as few uses of the balance as possible. You may draw your solution in the form of a tree.

due Friday, 2/2/06.