Computer Science and Mathematics
Summer term 2015

Exercises 9

1. How much digital storage capacity would be necessary for the content of a library with 100,000 books, if we assume that each book has 200 pages, each page has 50 lines and each line has 80 characters, and if a 1-byte ASCII code is used for the characters?

2. Find the 8-bit two's complement representation of the negative integer –84 .

3. For a binary representation of genetic information, the four bases from DNA, adenine (A), thymine (T), guanine (G) and cytosine (C), are simply encoded by the 8-bit ASCII codes of their first letters (A = 01000001, etc.).

(a) What is the redundancy of this code, if we assume that the four bases occur with equal frequencies? (In the calculation of H_0, consider all possible 8-bit blocks as symbols of the alphabet.)

(b) Give a non-redundant binary code for A, T, G, C.

4. (a) Change the query from the library example in the script so that in addition to the overdue book, the result also contains the name of the person who has borrowed the book.

(b) Write a query which determines all books which have to be given back in the next two weeks. (Assume that from addition of a date and a number, a date results which lies the given number of days after the given date.)