## Assignment #8

Due: never. However, please keep in mind that similar questions may be included in the final exam. Lec. 13 will help you to do this assignment.

1. How many bits are needed to represent a 500-page of book written in English? Assume that (i) there are 30 lines of text per page, (ii) 15 words per line, (iii) each word has on average 5 letters. Assume that all letters are equiprobable.

2. How the answer to Q1 would change if we take into account the actual probabilities (frequencies) of the English letters, as shown in the figure below ? A more detailed (accurate) information can be found at https://en.wikipedia.org/wiki/Letter_frequency Comment/explain on the difference, if any, to Q1. How can you exploit it in practice?

3. Repeat Q2 for French (use the reference above to find the letter frequencies) and compare your answer to Q2. Which language is more efficient?

4. Consider Q1 and assume that each letter is encoded into bits individually (rather than as a long sequence) so that only integer number of bits per letter is allowed. Compare the answer here to that in Q1 and explain the difference, if any.

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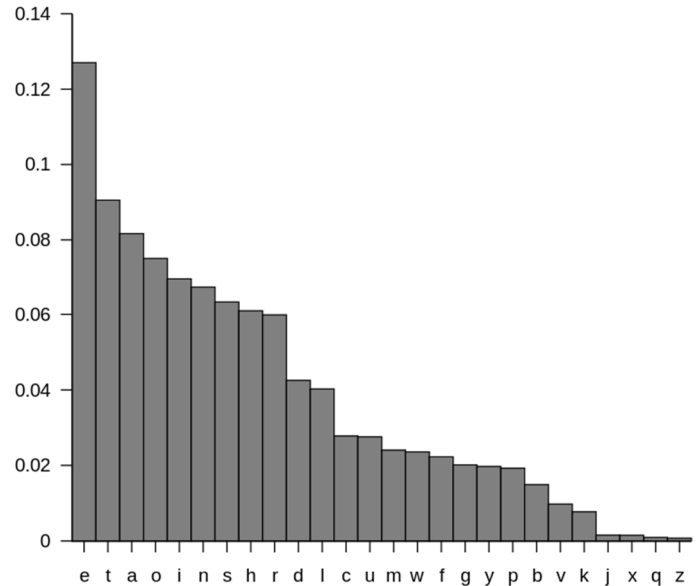
Please include in your solutions all the intermediate results and their numerical values (if applicable). **Detailed solutions with explanations are required**, not just the final answers/equations; **all symbols used must be defined**, including units used, if applicable (e.g. f = frequency [Hz]). Missing explanations, symbol definitions/units will be penalized. Your answers should demonstrate the full extent of your knowledge and the latter will determine your marks.

Plagiarism (i.e. "cut-and-paste" from a student to a student, other forms of "borrowing" the material for the assignment) is absolutely unacceptable and will be penalized. Each student is expected to submit his own solutions. If two (or more) identical or almost identical sets of solutions are found, each student involved receives 0 (zero) for that particular assignment. If this happens twice, the students involved receive 0 (zero) for the entire assignment component of the course in the marking scheme and the case will be send to the Dean's office for further investigation.

Please read appropriate chapters of the textbook first, study all the examples, attempt to do them with the closed book. Remember the learning efficiency pyramid!