Ex. 1
Use Huffman's encoding for the source given in example 2.4.2 ($p_1 = 0.6, p_2 = 0.13, p_3 = 0.12, p_4 = 0.1, p_5 = 0.05$). Compare the average word length with the Shannon-Fano encoding.
Also calculate the entropy $H = -\sum p_i \log_2 p_i$ and compare.

Ex. 2
Use Shannon-Fano encoding for the source given in example 2.5.4 ($p_1 = 0.5, p_2 = 0.2, p_3 = 0.15, p_4 = 0.1, p_5 = 0.05$). Compare the average word length with the Hufmann coding. Also calculate the entropy H and compare.

Ex. 3
Find a simple necessary codition so that in Kraft's and McMillan's inequality equality $= 1$ can hold. In the noiseless coding therem, when can the lower bound be attained?

Ex. 4
Compare the noiseles coding theorem with the length of a compact encoding of $2^k - 1$ binary words with equal probability $p = \frac{1}{2^k-1}$.

Ex. 5
You are allowed six questions that will truthfully be answered by Yes or NO. Describe briefly a strategy how one can determine one square of a chessboard (64 squares). How many questions does one need to specify one square on and $n \times n$ board?

Ex. 6
Examine whether the following three codes are uniquley decipherable, prefix codes, and/or instantaneous codes.

$$C_1 = \{0, 010, 01, 10\}, C_2 = \{10, 00, 11, 110\}, C_3 = \{0, 10, 110, 111\}.$$

(Prove your statements).

Ex. 7
You are given a balance and nine apparently identical coins. One coin is different from the rest. Devise a strategy of three weigings to find the coin and whether it is heavier or lighter. Try to generalise.

To be returned in one week, before the lecture.
My web page contains a collection of related material.
http://www.ma.rhul.ac.uk/∼elsholtz/WWW/lectures/0506mt441/lecture.html