**Homework 5:** (Chapter 3 Entropy)

**Chapter 3 Exercises: 3.4, 3.6, 3.8 (20%)**

**Exercise 3.4 (6%)**
Find the word-lengths, average word-length, and efficiency of a binary Shannon-Fano code for a source $S$ with probabilities $p_i = 0.4, 0.3, 0.1, 0.1, 0.06, 0.04$. Compare this with Exercise 3.3, which concerns an optimal code for $S$.

**Exercise 3.6 (6%)**
Let $S$ have q equiprobable symbols. Find the average word-length $L_n$ of an $r$-ary Shannon-Fano code for $S^n$, and verify that $\frac{1}{n}L_n \to H_r(S)$ as $n \to \infty$.

**Exercise 3.8 (8%)**
A source $S$ consists of the sum of the scores of two independent unbiased dice. Find the probability distribution and the binary entropy of $S$, together with the average word-lengths of binary Huffman and Shannon-Fano codes for S.