CSEP 590
Assignment 3
Due Thursday, October 25, 2007

1. Consider the probability distribution $a : 1/4, b : 1/2, c : 1/4$.

   (a) Use arithmetic coding with scaling to code the string *bbbbba*. Show the steps in the process and the value of C which keeps track of the number of complementary bits to be output after a 0 or 1 is output. I chose this example because the scaled interval are very easy to calculate.

   (b) Use arithmetic decoding with scaling to decode 00000000001 (10 zeros followed by a 1) assuming the string decoded is of length 6.

2. Let us try LZW on a special class of inputs too. Again assume the two symbol alphabet $\{a, b\}$. Consider the following strategy for encoding the dictionary symbols from LZW. Start with a dictionary of size 2 and use just one bit to transmit a symbol. When the dictionary fills up we double its size to 4 and use two bits to transmit a word in the dictionary. This doubling happens when ever the dictionary fills.

   (a) Encode a^6 and a^{28} with this version of LZW.

   (b) Compute the length, as a function of n, of the encoding of a^n with this version of LZW. (You may restrict yourself to easy n's to work with if that helps.)

   (c) Encode a^6 and a^{28} using the γ-code to represent the dictionary symbols from LZW on the strings a^6 and a^{28}.

   (d) Compute the length, as a function of n, of the encoding of a^n using the γ-code to represent the dictionary symbols of LZW. (You may restrict yourself to easy n's to work with if that helps.)