Massachusetts Institute of Technology
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6.02 Fall 2011 **Solutions to Chapter 3** Written: September 8, 2011

Please send information about errors or omissions to hari; questions best asked on piazza.

1. 1 bit. 50% of the fish are bass, so the Huffman code would represent that with 1 bit (say, 0), and the other fish would all start with the bit 1.

2. (a) Yes, a valid Huffman code; it's prefix-free and corresponds, for instance, to probabilities $P(A) = 1/2, P(B) = 1/4, P(C) = 1/8, P(D) = 1/8$.

   (b) No, it isn't prefix-free. The code for B is a prefix of the code for D.

   (c) No, because a more optimal (i.e., shorter) code would have C and D encoded in 2 bits, as 10 and 11 (or vice versa), and that would be a Huffman code for the same symbol probabilities, not the one given.

3. From PSet. Solutions will be given later.

4. The string table will have "aa", "aaa", "aaaa", "aaaaa", ... in addition to the single-byte characters (all 256 of those, including "a").

   If the receiver has received E encoded symbols, then the k^{th} of these symbols must correspond to the string "aaa...a" (k a's). Hence, the number of a's that it can decode is $E(E+1)/2$.

5. table[256] = 'ab', table[257] = 'bb', table[258] = 'bba', table[259] = 'abb', cumulative output of decoder = 'abbbabbba'.

6. From PSet. Solutions will be given later.

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