

Worksheet 1.2: more challenging questions

- 1 Binary coded decimal (BCD) can be used to store currency values with each individual denary digit represented by one BCD code and an implied position for the decimal point. It is possible to carry out arithmetic using BCD but this requires a special technique as discussed in the coursebook.
- a Use the following diagram to show the BCD representations of the two numbers 9.75 and 7.68 assuming packed BCD is used.

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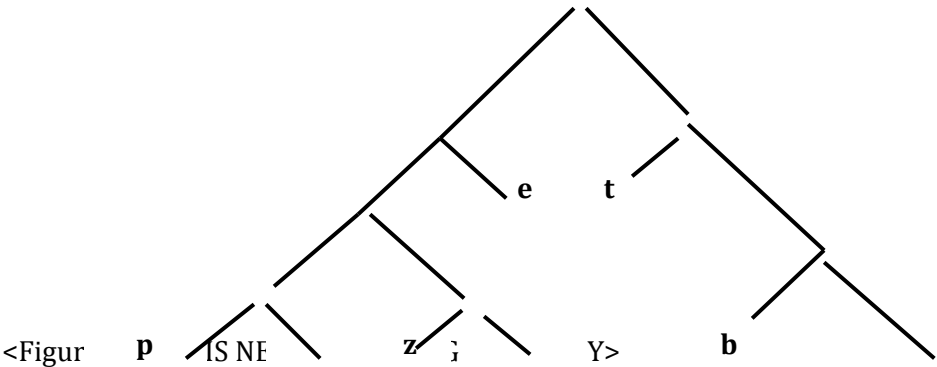
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- b If the two numbers are added what is the total expressed as a denary value?
- c If the two binary representations are added ignoring the fact that they are BCD codes what is the result obtained?
- d Show a correct calculation using the BCD values but applying the correction factor 0110.
- e Why does this correction factor work?
- f 9.75 can be represented exactly as a fixed-point binary value but 7.68 cannot. Why is this so?
- 2 The following table is a rearranged version of Table 1.04 in the coursebook. It shows a possible set of Huffman codes to be used for lossless compression of a text consisting only of the eight letters shown.

e	t	o	h	l	p	w	z
10	01	111	110	0001	0000	0011	0010

The codes will have been chosen by using an algorithm that has as input the frequencies of occurrence of each of the letters in the particular text. The choice of codes can be represented as a Huffman tree. A partially completed tree is shown below:



- a Can you work out the rules that are being used to position the letters on the tree so that they have the codes as shown in the table?
- b Can you complete the tree by placing the remaining letters?
- c Could this tree be extended to include more letters? If not why not?
- d Can you suggest a modification of the tree to include two more letters?