Continuously Assessed Questions (06-11582)

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4 August 2011

Each question is worth 10%. Marks will be awarded for correctness, elegance and efficiency. You have to submit your answers by noon on Tuesday, the 15th of November 2011. You have to submit both (a) a hardcopy of your answers to the receptionist with an appropriate covering sheet and also (b) an electronic version of your answers to me at either `ard` or `A.R.Diller@cs.bham.ac.uk` as a text file.

(1) A *segment* of a list `xs` is a non-empty list of adjacent elements of `xs`. For example, *all* the segments of the list `[1, 2, 3]` are the following: `[1]`, `[1, 2]`, `[1, 2, 3]`, `[2]`, `[2, 3]` and `[3]`. Thus, `[2, 3]` is a segment of `[1, 2, 3]`, but `[1, 3]` is not. *All* the segments of the list `[7, 7, 3]` are: `[7]`, `[7, 7]`, `[7, 7, 3]`, `[7, 3]` and `[3]`. A list is said to be *flat* if all its elements are the same. Define a function `llfs` such that `llfs xs` returns the length of the longest flat segment of `xs`. Thus, `llfs [1, 2, 3] = 1` and `llfs [7, 7, 3] = 2`.

(2) A *partition* of a positive integer n is a representation of n as the sum of any number of positive integers. For example, there are seven partitions of 5, namely $1+1+1+1+1$, $1+1+1+2$, $1+1+3$, $1+2+2$, $1+4$, $2+3$ and 5. There are five partitions of 4, namely $1+1+1+1$, $1+1+2$, $1+3$, $2+2$ and 4. Define a function `parts` which returns the list of distinct partitions of n as lists. Thus, for example:

$$\texttt{parts}\ 5 = [[1,1,1,1,1],[1,1,1,2],[1,1,3],[1,2,2],[1,4],[2,3],[5]],$$
$$\texttt{parts}\ 4 = [[1,1,1,1],[1,1,2],[1,3],[2,2],[4]].$$