

1. Use singly linked lists to implement *replacements* on a sequence of integer values. A sequence of integers, S , is an ordered collection of integer values, S_1, S_2, S_3, \dots , in which values can be repeated.

Represent a sequence, S , as a singly linked list of elements called *chunks* (each chunk capable of holding upto 8 integers) in which only the last chunk of S can contain less than 8 integers. A *replacement* is specified by 2 sequences of integers, *Pattern* and *Text*. In a *replacement*, all (non-overlapping) occurrences of *Pattern* in S are (i) found and (ii) replaced by *Text*. Assume that an empty *Pattern* matches (only) at the beginning of S .

- (a) Write a C function to perform a *replacement* on a sequence.
 - (b) Write a C function to input (output) a sequence from (to) stdin (stdout) as comma separated integer values terminated by a \$.
 - (c) Write a C main() which will read (from stdin) a sequence of integers, S , and then repeatedly
 - Read (from stdin) a *Pattern* sequence
 - Read (from stdin) a *Text* sequence
 - Output (to stdout) the sequence S after the *replacement* has been performed
2. Use doubly linked lists to implement the addition and multiplication operations on bivariate polynomials with real valued coefficients. A bivariate polynomial, $f(x, y)$, is a polynomial in 2 variables x and y

$$f(x, y) = \sum_{i,j \geq 0} a_{i,j} x^i y^j$$

where the $a_{i,j}$'s are the polynomial coefficients.

Represent a degree n polynomial P by a linked list of elements $(i, j, p_{i,j}), p_{i,j} \neq 0, i + j \leq n$, sorted in decreasing order of $i + j$ (and among all elements with a given value of $i + j$, sorted in decreasing order of i). In order to approximate real values, implement the polynomial coefficients using C float.

- (a) Write C functions to perform bivariate polynomial addition and multiplication.
- (b) Write C functions to input (output) a bivariate polynomial from (to) stdin (stdout) as comma separated pairs of the form $(i, j, p_{i,j})$ ordered as specified above.
- (c) Write a C main() which will repeatedly
 - Read (from stdin) from separate lines (i) an operator op (either + or *), (ii) a bivariate polynomial A and (iii) a bivariate polynomial B
 - Output (to stdout) the bivariate polynomial $C = A \text{ } op \text{ } B$

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