Second Bulgarian National Olympiad in Informatics

May 31 and June 1, 1986

First day

Let us consider a function $P_n(x,y)$ of two integer variables x and y, defined by the following expression:

$$\begin{aligned} P_n(x,y) = {} & a_0 + a_1 x + a_2 y + a_3 y^2 + a_4 xy + a_5 y^2 \\ & + a_6 x^3 + a_7 x^2 y + a_8 x y^2 + a_9 y^3 + \dots \\ & + a_m x^n + a_{(m+1)} x^{(n+1)} y + a_{(m+2)} x^{(n-2)} y^2 + \dots \\ & + a_{(k-1)} x y^{(n-1)} + a_k y^n, \end{aligned}$$

where $a_0, a_1, a_2, \dots, a_k$ are integers, $n >= 1$.

Problem 1

Write a program, that

a) inputs a value of n and coefficients $a_0, a_1, a_2, \dots, a_k,$ which are necessary to define the function $P_n(x,y)$;

b) inputs values of X and Y; calls the subroutine described in problem 2 in order to compute the value of $P_n(x,y)$ at $x=X$ and $y=Y$, and outputs the obtained result;

c) calls the subroutines described in problems 3 and 4, and outputs the results found there.

Problem 2.

Write a program, that computes the value of $P_n(x,y)$using the minimal number of additions and multiplications.

Problem 3.

Write a program, that computes the elements b_i of an array B, $i=0,1,2,\dots,I$, where b_i is the smallest number from among the numbers $P_n(i,0), P_n(i,1), \dots, P_n(i,Y)$. The numbers I and Y should be entered into your program before calling the subroutine.

Problem 4.

Write a program, that finds out all the samples $\{b_{(i_1)}, b_{(i_2)}, \dots, b_{(i_p)}: i_1 < i_2 < \dots < i_p, 1 <= p <= I\}$ from among the elements of B (defined in problem 3), so that the relation $b_{(i_1)} + b_{(i_2)} + \dots + b_{(i_p)} = M$ holds. The number M should be entered into your program before calling the subroutine.

Source: Obuchenieto po matematika, journal published by Bulgarian Ministry of Education, n. 3, 1986, pp. 55-56.

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