

Informatics

February, 1987

First round (for high school students, 8-11 grades)

Problem 1.

Work out a program, that performs subsequently the following tasks:

- a) Writing into the computer memory coordinates of n points, $A_1, A_2, \dots, A_n$, ($n \geq 1$) given in the plane.
- b) Rendering on the computer screen the visible part of a piecewise line F composed of straight line segments subsequently connecting $A_1, A_2, \dots, A_n$. If some point A_i is not within the domain of the computer screen, then line segments $A_{(i-1)}A_i$ and $A_iA_{(i+1)}$ should not be displayed.
- c) Execution of the subroutines described in items a) and b).

Problem 2.

Let us consider a rectangle P with sides parallel to the coordinate axes. The rectangle P is specified by coordinates of its vertices.

- a) Find out whether the figure F (from the problem 1) can be completely placed within the rectangle P after applying appropriate moves described in problem 3.
- b) Find out whether there exists at least one set of 4 subsequent points, $A_i, A_{(i+1)}, A_{(i+2)}, A_{(i+3)}$, ($i=1, 2, 3, \dots, n$) from among the above given points, which are vertices of a right trapezoid (i.e. four-sided figure having two sides parallel and a right angle).

Problem 3.

Realize by a subroutine the moves of the figure F , which transfer it toward any one of the four main directions: upwards, downwards, leftwards and rightwards. Each move must be started by pressing a designated key on the computer keyboard. Have in mind, that during the process of movement, some parts of F may become invisible, whereas some other parts may come into the field of vision.

Source: Obuchenieto po matematika, journal published by Bulgarian Ministry of Education, n. 3, 1987, p. 61.

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