UNIVERSITY OF PARMA

Department of Engineering and Architecture
Degree course in Computer, Electronic and Communications Engineering
PRACTICAL TEST IN COMPUTER SCIENCE & PROGRAMMING LABORATORY
July 31st , 2024

Name: _____ Surname:_____ Matr:_____ Workstation: _____

Write a program using the C language (name the project with your student **<ID>**) that behaves as described below. The available time is 120 minutes. At the end of the time, the saved files on **U:** are going to be automatically collected. Additional documents, files… are available in **T:\Bertozzi**, it is recommended to use WordPad to read text files.

A mechanical processing company uses a machine capable of laser cutting circles or rectangles from rectangular metal sheets. For purely technological reasons, this machine can only handle integer numbers expressed in mm. This applies both to the dimensions of the rectangular sheets to be cut and to the dimensions of the shapes to be obtained (sides of the rectangles or radius of the circle). Additionally, during the cutting phase, it must necessarily stay at least 1 mm away from the edges of the sheet being processed.

We want to develop a program that can calculate the data for the operation of this machine based on information from an ASCII file. Each line contains the necessary information for processing, separated by one or more spaces. Each line therefore contains: the dimensions of the sheet to be processed in mm (two integers), a letter indicating the shape to be cut ('C' → circle, 'R' → rectangle) and, in the case of a rectangle only, an additional letter ('P' or 'A') indicating the type of processing and a third integer K.

The program:

1. Reads the file line by line.
2. For each line read, invokes a specific function depending on the desired geometric shape. It passes the read data to the function.
3. Contains specific functions related to the two geometric shapes that return:
    1. In the case of the circle, the measure of the radius that allows obtaining the circle with the maximum possible area.
    2. In the case of the rectangle, the dimensions of the sides that allow obtaining a rectangle satisfying the following conditions:
    - The sum of the area and the two sides must be equal to K.
    - Depending on whether the requested type of processing is 'A' or 'P', it has the maximum possible perimeter or the maximum possible area.

    If the input data, for the rectangle, do not lead to a valid solution, this function must return -1 as the value of the sides.
4. Prints, in an intelligible manner, the dimensions of the sheet read from the file and the values returned by the functions, or an error if it is not possible to determine the requested values.

Execution example

```
Sheet dimensions: 209 x 317, maximum circle radius: 103
Sheet dimensions: 210 x 297, rectangle dimensions with maximum perimeter: 8 x 224
Sheet dimensions: 210 x 297, rectangle dimensions with maximum area: 44 x 44
Sheet dimensions: 345 x 800, rectangle dimensions not determinable with the given data
```

The code should be developed following the proposed order. The correction stops at the first incorrectly implemented step.