

2nd Mid-term Exam

C COMPUTER PROGRAMMING (I)

November 24, 2022

Exam rules

- Only Dev-C++ can be used for the exam.
 - If your codes cannot be compiled by Dev-C++, it is considered as syntax error.
 - Please write all your codes as a c source file named after your student ID.
 - If your codes cannot output the desired result, your points will be deducted.
 - Please check whether your codes can be compiled and output the desired result before submitting to National Sun Yat-sen Cyber University.
 - No reason for late submission.
 - It is forbidden to search for information during the exam.
 - The cheaters will get zero point.
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Please design a program to complete the following problems step by step, and output two XY planes to the console.

a. (20 points)

Please implement a stack with a linked list, design a function containing rand() to generate 100 sets of (X,Y) coordinates, and then push these coordinates into your stack group by group.

Note:

- (1) Please set the seed of rand() using srand(1).
- (2) Random number range for the X and Y values: from -50 to 50.
- (3) Please design a function to implement the push operation.
- (4) The push operation can only add new nodes using **malloc()**.

b. (30 points)

Please pop all the coordinates from your stack and store them into an array, and then sort the array by the Y value in descending order each inserting, or by the X value in ascending order if the Y values are equal. Finally, push all elements of the array into your stack.

Note:

- (1) Please design a function to implement the pop operation.
- (2) Each element in your array will be a set of (X,Y) coordinates.
- (3) Please design a recursive function to implement the sorting operation.

c. (10 points)

Please design a function to find the minimum and maximum values of X and Y stored in your stack (Xmin, Ymin, Xmax, Ymax), and then calculate and output the area of a rectangle composed of four points: (Xmin, Ymax), (Xmax, Ymax), (Xmin, Ymin), (Xmax, Ymin).

d. (20 points)

Please draw the X and Y axes, mark the values on the axes, depict the rectangle of problem c on an XY plane, and then output it to the console.

Note:

- (1) Range of the X and Y axes: from -55 to 55.
- (2) Please use "-" to draw the X-axis, use "|" to mark the scale every 10 points, and replace "-" with ">" when the X value is 55.
- (3) You have to mark the values on each scale of the X-axis, and print the word "X-axis" under the X-axis.
- (4) Please use "|" to draw the Y-axis, mark the value every 10 points, and replace "|" with "^" when the Y value is 55.
- (5) You have to print the word "Y-axis" on right side of the Y-axis.
- (6) Please use "-" to print the horizontal side of the rectangle, use "|" to print the vertical side of the rectangle.

e. (20 points)

Please draw the X and Y axes, mark the values on the axes, print all the points in your stack, and then output it to the console. Note:

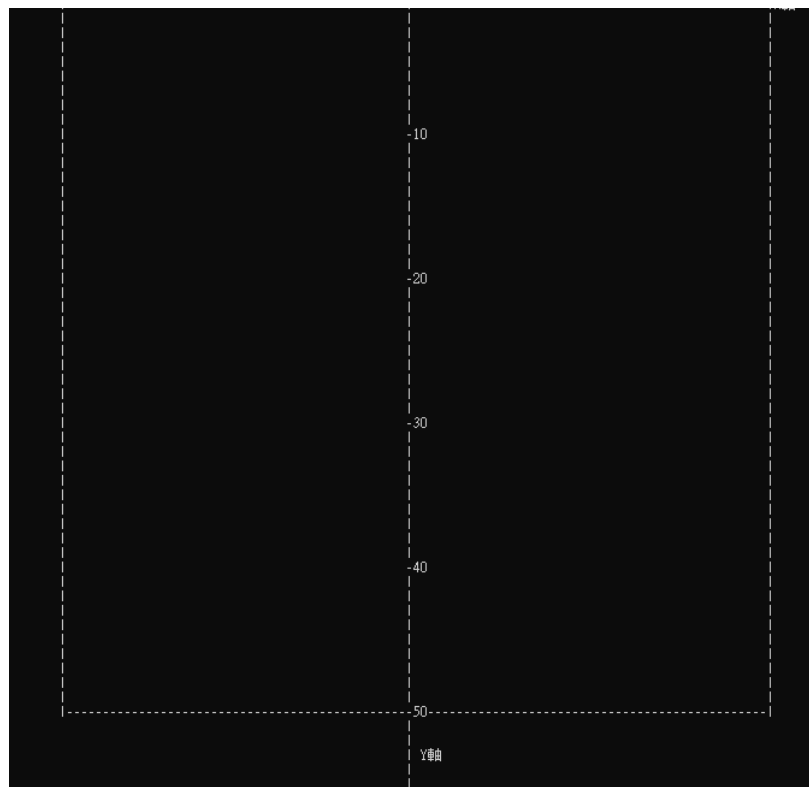
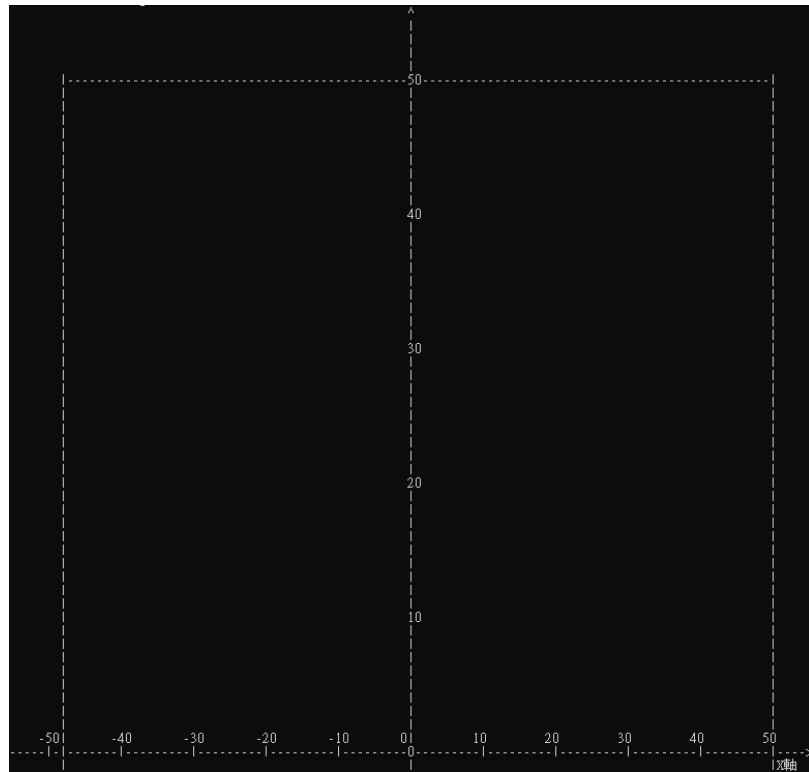
- (1) Range of the X and Y axes: from -55 to 55.
- (2) Please use "-" to draw the X-axis, use "|" to mark the scale every 10 points, and replace "-" with ">" when the X value is 55.
- (3) You have to mark the values on each scale of the X-axis, and print the word "X-axis" under the X-axis.
- (4) Please use "|" to draw the Y-axis, mark the value every 10 points, and replace "|" with "^" when the Y value is 55.
- (5) You have to print the word "Y-axis" on right side of the Y-axis.
- (6) Please use "*" to print the points in your stack.

Sample output:

c.

```
Xmin = -48, Xmax = 50, Ymin = -50, Ymax = 50  
The area of rectangle = 9800
```

d.



e.

