



Princess Sumaya جامعة  
University الأميرة سميرة  
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The King Hussein School for Computing Sciences  
Department of Computer Science  
11103 - **Structured Programming** - Fall 2022

## Second Exam

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**Full Name:**

**Student ID:**

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Question	Points	Score
1	12	
2	6	
3	7	
<b>Total</b>	25	

**Circle your section:**

- Dr. Rawan Ghnemat (section 1)
- Dr. Rawan Ghnemat (section 2)
- Dr. Mohammad Abu Snober (section 3)
- Ms. Rahmah Ibrahim (section 4)
- Mr. Alaa Altarazi (section 5)

## Question 1 (12 points)

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**A.** [5 points] Implement a function named **compare** that receives a 2D array named **a** along with two integers **r1** and **r2** representing two row numbers. The function must compare the corresponding elements in the two given rows and return:

- -1 if row r1 is smaller
- 1 if row r1 is larger
- 0 if the two rows are equal.

Assume that:

- The size of the array is `ROWS x COLS`, where `ROWS` and `COLS` are global variables.
- `r1` and `r2` are guaranteed to be valid.

**Examples.** If `a[][]` is the array shown on the right:

- If `r1 = 0` and `r2 = 1`: return 1 because 9100 > 5364
- If `r1 = 3` and `r2 = 0`: return 1 because 9178 > 9100
- If `r1 = 1` and `r2 = 3`: return -1 because 5364 < 9178
- If `r1 = 2` and `r2 = 3`: return 0 because 9178 = 9178

	0	1	2	3
0	9	1	0	0
1	5	3	6	4
2	9	1	7	8
3	9	1	7	8

**B.** [7 points] Write a program that performs the following:

- Defines a 2D array of size `ROWS x COLS` and fills it with random numbers in the range 20-30 inclusive.
- Uses function **compare** to find the *minimum* row in the array.
- Swaps the contents of the minimum row with the contents of the first row in the array.

	0	1	2	3
0	29	21	20	20
1	25	23	26	24
2	24	24	24	24
3	29	21	27	28

The array on the right shows an example for which rows must be swapped.

Provide your answer on the following page and follow the steps given as comments.

```
#include <stdio.h>
#define ROWS 20
#define COLS 30

// assume that compare(...) was defined here and is ready to use

int main() {
    // 1. Define a 2D array of size ROWS x COLS

    // 2. Fill the array with random numbers in the range 20-30 inclusive.

    // 3. Using function compare(...), find the minimum row in the 2D array and
    //     store its index in the variable "Min"

    // 4. Swap the contents of row 0 with the contents of row Min.
    //     Implement this part even if you did not implement part 3.

    return 0;
}
```

## Question 2 (6 points)

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A. What is the output of the function `f1(int N)` in each of the following cases?

```
void f1(int N) {
    for (int i = 0; i < N; i++) { printf("*"); }
    printf("\n");

    for (int i = 0; i < N-2; i++) {
        printf("*");
        for (int j = 0; j < N-2; j++)
            printf(" ");
        printf("*\n");
    }

    for (int i = 0; i < N; i++) { printf("*"); }
}
```

A. If  $N = 1$

B. If  $N = 3$

C. If  $N = 10000$

B. What is the content of array `a[]` after executing the code below?

```
for (int i = 0; i < N/2; i++) {
    for (int j = N/2; j > i; j--) {
        int temp = a[j];
        a[j] = a[j-1];
        a[j-1] = temp;
    }
}
```

Answer the question for each of the following cases.

A. If  $N = 2$  and  
`a[] = {2, 1}`

B. If  $N = 3$  and  
`a[] = {3, 2, 1}`

C. If  $N = 1000$  and  
`a[] = {1, 2, 3, 4, 5, ..., 999, 1000}`

Question 3 (7 points)

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Implement a function named **snake\_mouth** that prints an open snake mouth (with scary teeth) of a random size between 3 and 9 like the ones shown below.

**Examples.**



size = 3

```
  / / \
 / / \
 / \
 ~~~~~<
 \ \
 \ \
 \ \ \
```

size = 5

```
  / / / / \
 / / / / \
 / / / \
 / / \
 / \
 ~~~~~<
 \ \
 \ \ \
 \ \ \ \
 \ \ \ \ \
```

size = 7

```
  / / / / / / \
 / / / / / / \
 / / / / / \
 / / / / \
 / / / \
 / / \
 / \
 ~~~~~<
 \ \
 \ \ \
 \ \ \ \
 \ \ \ \ \
 \ \ \ \ \ \
 \ \ \ \ \ \ \
 \ \ \ \ \ \ \ \
```

**Hint:** The snake mouth is made of three separate shapes. Try to draw each shape separately.

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