

The King Hussein School for Computing Sciences Department of Computer Science Structured Programming - Spring 2022

Second Exam

Full Name: Student ID:

Question	Points	Score
1	4	
2	3	
3	4+1	
4	7	
5	7	
Total	25+1	

Circle your section:

o Dr. Mu'awya Al-Dala'ien	(section 1)
o Dr. Rawan Ghnemat	(section 2)
o Dr. Abdullah Aref	(section 3)
o Dr. Mu'awya Al-Dala'ien	(section 4)
o Dr. Rawan Ghnemat	(section 5)
o Dr. Sawsan Alshatnawi	(section 6)
o Dr. Mohammad Al Nabhan	(section 7)
o Dr. Sawsan Alshatnawi	(section 8)
o Dr. Mohammad Abu Snober	(section 9)
o Dr. Mohammad Abu Snober	(section 10)
o Dr. Khaled Mansour	(section 11)
o Dr. Abedalrhman Alkhateeb	(section 13)
o Dr. Khaled Mansour (section	
○ Dr. Rafat Hammad	(section 15)

Fill the **Output** column in the table below with the output of the code provided in the **Code** column. If the code does not compile, write "**compilation error**" instead of the output.

	Code	Output
1.	<pre>int a[2][2] = {{1, 2}, {3, 4}}; printf("%d", a[0][1]);</pre>	
2.	<pre>int a[3][3] = {{1, 2}, {3, 4}}; printf("%d", a[2][2]);</pre>	
3.	<pre>int a[][] = {{1, 2}, {3, 4}}; printf("%d", a[1][1]);</pre>	
4.	<pre>int x = 2; do printf("%d ", x); while (x >= 2);</pre>	
5.	<pre>for (int i = 0; i < 3; i++) if (i == 1) continue; else</pre>	
6.	<pre>for (int i = 0; i < 3; i++) if (i == 1) break; else</pre>	
7.	<pre>for (int i = 0; i < 2; i++) printf("%d ", i); for (int j = 0; j < 2; j++) printf("%d ", j);</pre>	
8.	<pre>void f(int x) { if (x == 3) break; else</pre>	

Convert the following function to a recursive function:

```
void boom(int n) {
    while (n > 0)
        printf("%d ", n--);
    printf("Boooom!");
}
```

Question 3 (4+1 points)

```
PART 1.

for (int i = 0; i < n; i++) {
    for (int j = 0; j < n - 1; j++) {
        if (a[i][j] == a[i][j+1]) printf("1 ");
        else if (a[i][j] == a[i][j-1]) printf("0 ");
    }
}</pre>
```

- A. Provide an example of an array a[][] of size [n=3]x[n=3] that will cause the above code to print 1 1 1 1 1.
- **B.** Provide an example of an array a[][] of size [n=3]x[n=3] that will cause the above code to print 1 1 1 1 0.
- c. [+1 point] Provide an example of an array a[][] of size[n=3]x[n=3] that might cause the above code to crash.

Note. This part is a **bonus** question. Do **not** spend time on it until you are done with the other required questions.

```
PART 2.
```

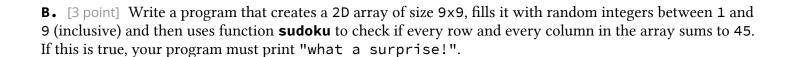
```
void f1(int a[], int n) {
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n - 1; j++) {
            int hold = a[j];
            a[j] = a[j+1];
            a[j+1] = hold;
        }
}</pre>
```

D. What are the contents of array a[] after calling function f1
 if n = 2 and a[] = {2, 1}?

E. What are the contents of array a[] after calling function f1 if n = 100 and $a[] = \{100, 99, 98, 97, ..., 3, 2, 1\}$?

Question 4 (7 points)

A. [4 points] Implement a function named **sudoku**, which receives as an argument a 2D array of integers of size 9x9. The function returns **1** if every column sums to **45** and every row sums to **45**. The function returns **0** otherwise.



Question 5 (7 points)

In Number Theory, a Taxicab Number is a number that can be expressed as a sum of cubes in *more than one* way. For example, 1729, 4104 and 13832 are taxicab numbers, because:

$$1729 = 1^3 + 12^3$$
 and also $1729 = 10^3 + 9^3$
 $4104 = 2^3 + 16^3$ and also $4104 = 9^3 + 15^3$
 $13832 = 20^3 + 18^3$ and also $13832 = 24^3 + 2^3$

A. [5 points] Implement a function named **taxicab** that receives an integer and prints "taxicab" if the integer is a taxicab number and "not taxicab" otherwise.

B. [2 points] Reimplement function taxicab such that it prints all the taxicab numbers that are less than the received integer.