



Princess Sumaya جامعة  
University الأميرة سميرة  
for Technology للتكنولوجيا

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

## First Exam

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**Full Name:**

**Student ID:**

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Question	Points	Score
1	4	
2	6	
3	5	
4	5	
5	5	
<b>Total</b>	<b>25</b>	

**Circle your section:**

- Dr. Mu'awya Al-Dala'ien (section 1)
- Dr. Rawan Ghnemat (section 2)
- Dr. Abdullah Aref (section 3)
- Dr. Mu'awya Al-Dala'ien (section 4)
- Dr. Rawan Ghnemat (section 5)
- Dr. Sawsan Alshatnawi (section 6)
- Dr. Mohammad Al Nabhan (section 7)
- Dr. Sawsan Alshatnawi (section 8)
- Dr. Mohammad Abu Snober (section 9)
- Dr. Mohammad Abu Snober (section 10)
- Dr. Mohammad Al Nabhan (section 11)
- Dr. Khaled Mansour (section 12)
- Dr. Abedalrhman Alkhateeb (section 13)
- Dr. Khaled Mansour (section 14)
- Dr. Rafat Hammad (section 15)

## Question 1 (4 points)

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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.

Assume `x` is defined as follows:

```
int x = 5;
```

<b>Code</b>	<b>Output</b>
1. <code>printf("%d", x / 2);</code>	
2. <code>printf("%d", x + rand() % 1);</code>	
3. <code>printf("%c", 'c' + x);</code>	
4. <code>printf("%d", x++);</code>	
5. <code>printf("%d", ++2);</code>	
6. <code>printf("%d", 2 + 3 - 4 / 2 * 3 + 4);</code>	
7. <pre><b>if</b> (2 = 2)     printf("equal"); <b>else</b>     printf("not equal");</pre>	
8. <pre><b>void</b> f(<b>int</b> y) {     y = 5; }  <b>int</b> main() {     <b>int</b> y = 0;     f(y);     printf("%d", y);     <b>return</b> 0; }</pre>	

## Question 2 (6 points)

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**PART 1.** What is the output of the function **f1(int n)** in each of the following cases?

```
void f1(int n) {
    int x = 0;
    int c = abs(n); // absolute value

    while (c > 0) {
        x = x + 2;
        c = c - 1;
    }

    if (n >= 0) printf("%d", x);
    else      printf("%d", -x);
}
```

**A.** If  $n = 0$

**B.** If  $n = 2$

**C.** If  $n = 111$

What is the purpose of (الهدف من) function **f1**?  
(Do not use > 10 words and write in the box).

**PART 2.** What are the contents of array **a[]** after calling the function **f2** in each of the following cases?

```
void f2(int a[], int n) {
    for (int i = 0; i < n-1; i = i + 2)
        a[i+1] = a[i];
}
```

**A.** If  $n = 2$  and  $a[] = \{1, 2\}$

**B.** If  $n = 1$  and  $a[] = \{1\}$

**C.** If  $n = 1000$  and  
 $a[] = \{1, 2, 3, 4, 5, \dots, 1000\}$

What is the purpose of (الهدف من) function **f2**?  
(Do not use > 20 words and write in the box).

**PART 3.** What is the output of calling the function **f3** in each of the following cases?

```
void f3(int a[], int n) {
    int b[3] = {0};

    for (int i = 0; i < n; i++)
        if (a[i] >= 0 && a[i] <= 2)
            b[a[i]]++;

    printf("%d %d %d",
           b[0], b[1], b[2]);
}
```

- A.** If  $n = 1$  and  $a[] = \{5\}$
- B.** If  $n = 3$  and  $a[] = \{0, 1, 2\}$
- C.** If  $n = 1000$  and  
 $a[] = \{1, 0, 1, 0, 1, 0, \dots\}$

What is the purpose of (الهدف من) function **f3**?  
(Do not use > 20 words and write in the box).

### Question 3 (5 points)

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Implement a function named **median**, which receives three integer arguments and returns the median (الوسيط), where the median is the *middle* element if the elements are sorted.

**Examples.**

- `median(3, 1, 2)` returns 2
- `median(3, 0, 5)` returns 3
- `median(4, 3, 4)` returns 4
- `median(1, 1, 1)` returns 1
- `median(1, 2, 3)` returns 2
- `median(5, 8, 6)` returns 6

#### Question 4 (5 points)

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Implement a function named **almost\_max**, which receives as arguments an array of integers and the size of this array. The function returns the number of elements in the array that are **1** below the max.

You can assume that the size is 1 or more (no need to check for this).

#### Examples.

If the array = {1, 4, 2, 3} the function returns 1, because the max is 4 and the array has only one 3.

If the array = {1, 2, 1, 1} the function returns 3, because the max is 2 and the array has three 1s.

If the array = {1, 2, 5, 3} the function returns 0, because the max is 5 and there are no 4s.

#### Question 5 (5 points)

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Implement a function named **the\_search**, which receives an array of characters and its size as arguments and returns **1** if **"the"** appears at least once in the array and **0** otherwise.

#### Examples.

- If the size is 4 and the array is "hello" the function returns 0
- If the size is 11 and the array is "hello there" the function returns 1
- If the size is 17 and the array is "the theater theme" the function returns 1
- If the size is 7 and the array is "The boy" the function returns 0  
(Look for the not The)

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