EXAMINATION INSTRUCTIONS

* Do not turn this page until asked to do so.
* Exam time is 50 minutes.
* Put the answers on the same question sheet, do not use any additional papers, even for scratch.
* Write your name, ID, section no. in the indicated places.
* Read the exam instructions.
* Read the honesty policy.
* Sign the following statement.

**Academic Integrity Policy**

Cheating in Exams is a violation of the Academic Integrity policy of AUC. Whispering, talking, looking at someone else’s paper, or copying from any source is considered cheating. Any one who does any of these actions or her/his answers indicates that she/he did any of them, will receive a punishment ranging from zero in this exam to failing the course. If repeated, it may lead to dismissal from AUC.

I have read the honesty policy and exam instructions and I am presenting this exam as entirely my effort.

Signature: ______________

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DO NOT USE THIS SECTION

<table>
<thead>
<tr>
<th>Question</th>
<th>Points</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td></td>
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<td>3</td>
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<td>4</td>
<td>10</td>
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<tr>
<td>5</td>
<td>15</td>
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<tr>
<td>Total</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>
**Question 1 (15 points)**

The academic standing of a Computer Science student is determined based on the number of the credit hours that the student has achieved. The rules are as follows:

<table>
<thead>
<tr>
<th>Number of Credit Hours (CrH)</th>
<th>Academic Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CrH &lt;= 30</td>
<td>Freshman</td>
</tr>
<tr>
<td>30 &lt; CrH &lt;= 60</td>
<td>Sophomore</td>
</tr>
<tr>
<td>60 &lt; CrH &lt;= 90</td>
<td>Junior</td>
</tr>
<tr>
<td>90 &lt; CrH</td>
<td>Senior</td>
</tr>
</tbody>
</table>

Draw a flow chart and write a program in C++ to input the name of the student and the number of credit hours achieved by the student and print out the name, the achieved credit hours, and the academic standing in appropriate format (use setw()). **Show the three phases of software development: the analysis, design, and implementation. The program should validate the user input number of credit hours to be only between 0 and 120.**
The Program
## Question 2 (10 points)

Write a program that uses *nested loops* to produce the following output:

<table>
<thead>
<tr>
<th>1</th>
<th>##</th>
</tr>
</thead>
<tbody>
<tr>
<td>123</td>
<td>####</td>
</tr>
<tr>
<td>12345</td>
<td>######</td>
</tr>
<tr>
<td>1234567</td>
<td>#######</td>
</tr>
<tr>
<td>123456789</td>
<td></td>
</tr>
</tbody>
</table>

## Question 3 (10 points)

1. Rewrite the Boolean expression eliminating the not (!) operator.

   ![Image](image1.png)

2. What is the value of the following expressions:

   ![Image](image2.png)
### Question 4 (10 points)

Show the output of each of the following program segments:

```c
int k;
for (k=1; k <= 20; k++)
    if ((k % 5 == 0) && (k % 3 == 0))
        cout << k << "n;";
    cout << "Required number:" << setw(4) << k - 1 << endl;
```

```c
int x, y = 13;
for (x = 5; x > y; x *= 2)
    cout << setw(3) << x << setw(3) << y << endl;
cout << "The Final Value Is: << setw(5) << y / 2 % x;
```

```c
int x = 1, y = 1;
while ( y < 3 )
    { y = y + y / ++x;
    cout << setw(3) << x << setw(3) << y << endl;
    }
```

...
Question 5 (15 points)

A large commercial company has 20 branches each of which is assigned a number from 1 to 20. There are branch number 1, branch number 2, branch number 3, ..., and branch number 20. Write a C++ program to perform the following:

1- Input the amount of sales of each branch. The amount of sales of each branch should be restricted between 0 and 10000.

2- Compute and print out the average amount of sales for the 20 branches.

3- Determine and print out the branch number (1, 2, ..., or 20) which had achieved the highest sales and the amount of this highest sales.

The Program

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