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<b><u>STUDENT ID:</u></b>				
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Question 1	Answers
<p>Consider the following pair of values of 5bits in two's complement (2C) and Sign and Magnitude (SM). For each pair and in both representations, determine which number has higher value:</p> <p>a) 11001 &lt;?&gt; 10001 b) 10111 &lt;?&gt; 11010</p>	<p>a: 2C: a: SM:  b: 2C: b: SM:</p>
<p><i>Report the most relevant steps</i></p>	

Question 2
<p>Describe the existing buses in a computer and their functionalities. Then, describe the relationship between the address bus, data bus and the maximum size of the addressable memory.</p>

Question 3
<p>Check whether the following piece of code is valid for verifying that the integer data contained within the variable <math>x</math> is <u>not</u> present in the array <math>v</math> (the variables <math>x</math> and <math>v</math> <u>are initialized</u>). In case of error, write the correct version of the code.</p>
<pre>for ( i = 0 ; i &lt; N ; i++ ){     if ( v[i] != x ) {         printf("Data %d not found\n", x);     } }</pre>

#### Question 4 (PROGRAMMING)

Write a C program able to handle a list of products of a company producing electronics devices. The list of devices is stored in a text file. Each device is represented by three rows:

```
<hwcode>
<keyword1> <keyword2> <keyword3>
<swcode>
```

- the first row contains the **code of the device (<hwcode>)**, an alphanumeric sequence of 8 characters. The first two characters are **HW** (for example, HW123456); the more recent devices have higher numbers. These codes are unique;
- the second row contains a **sequence of three keywords**, separated by a single space, each composed by maximum 20 characters without spaces;
- the third row contains the **code of the software (<swcode>)** associated to the device. It is represented as an alphanumeric sequence of 10 characters. The first two characters are **SW** (for example, SW12345678), these codes can appear in more than one electronic device.
- The number of devices stored in the file **is not known**.

A second file contains a list of software. Each software is represented by two rows:

```
<swcode>
<software description>
```

where **<swcode>** has the same format as in the first file, **<software description>** is a string of maximum 100 alphanumeric characters that may include spaces. The maximum number of software codes in this file is 50, in this file the software codes are unique, and they can appear only once in the file.

Example file catalog.txt:	Example file versions_sw.txt
HW111333 door_opener remote_controller remote_control SW22222222 HW111444 door_opener local_control no_remote_controller SW22222222 HW222444 thermostat remote_controller remote_control SW12112121 HW222555 door_opener control_unit yes_remote_controller SW33335555	SW22222222 base software operating system eCos SW12112121 software version1 operating system VxWorks SW33334444 software version2 operating system VxWorks SW44445555 software version3 operating system eCos

Write a program that receives as arguments from the command line: the name of the first file containing the list of devices, a keyword, and the name of the file containing the list of software.

The program must print **for each device that contains the keyword specified as second parameter from the command line**: the hardware code, the software code available in the first file and the description of the software **if present in the list of software in the second file**. If the software is not present, the program must print the message “software description not available”.

Additionally, the program must print **for each software code contained in the second file**, the number of devices (in the first file) that use it and the hardware code of **the first version** of the device (**<hwcode> with the lowest number**) using that software. In case the software is not used by any device, the program must print “not used by any device”.

Example of execution with example files above:

```
C:\> analysis_catalog.exe catalog.txt door_opener versions_sw.txt
HW111333 SW22222222 base software operating system eCos
HW111444 SW22222222 base software operating system eCos
HW222555 SW33335555 software description not available
Statistics SW usage:
SW22222222 used by 2 devices, first device: HW111333
SW12112121 used by 1 device, first device: HW222444
SW33335555 used by 1 device, first device: HW222555
SW44445555 not used by any device
```

<b><u>SURNAME:</u></b>		<b><u>NAME:</u></b>		<b><u>C2</u></b>
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Question 1	Answers
<p>Given the following numbers represented in hexadecimal encoding:</p> <ul style="list-style-type: none"> <li>- N1: A3</li> <li>- N2: 3F</li> </ul> <p>Sum them assuming they are in two's complement (2C) of 8 bits. Report any overflow during the addition.</p>	<p>Result of the addition:</p> <p>Overflow (yes/no):</p>
<p><i>Report the most relevant steps</i></p>	

Question 2
<p>List the different types of existing memories and their characteristics. Provide also the order of magnitude (Byte, KiB, MiB, GiB) of their typical size.</p>

Question 3
<p>Check whether the following piece of code is valid for verifying that the integer data contained within the variable <math>x</math> is <u>not</u> present in the array <math>v</math> (the variables <math>x</math> and <math>v</math> are <u>initialized</u>). In case of error, write the correct version of the code.</p>
<pre>flag = 0; for ( i = 0; i &lt; N &amp;&amp; flag == 0 ; i++){     if ( v[i] == x ) {         flag = 1;     } else {         printf("Data %d not found\n", x);     } }</pre>

#### Question 4 (PROGRAMMING)

Write a C program able to handle a list of products of a company producing electronics devices. The list of devices is stored in a text file. Each device is represented by three rows:

```
<hwcode>
<keyword1> <keyword2> <keyword3>
<swcode>
```

- the first row contains the **code of the device** (<hwcode>), an alphanumeric sequence of 8 characters. The first two characters are **HW** (for example, HW123456); the more recent devices have higher numbers. These codes are unique;
- the second row contains a **sequence of three keywords**, separated by a single space, each composed by maximum 20 characters without spaces;
- the third row contains the **code of the software** (<swcode>) associated to the device. It is represented as an alphanumeric sequence of 10 characters. The first two characters are **SW** (for example, SW12345678), these codes can appear in more than one electronic device.
- The number of devices stored in the file **is not known**.

A second file contains a list of software. Each software is represented by two rows:

```
<swcode>
<software description>
```

where <swcode> has the same format as in the first file, <software description> is a string of maximum 100 alphanumeric characters that may include spaces. The maximum number of software codes in this file is 50, in this file software codes are unique, and they can appear only once in the file.

##### Example file catalog.txt:

```
HW111333
door_opener remote_controller remote_control
SW22222222
HW111444
door_opener local_control no_remote_controller
SW22222222
HW222444
thermostat remote_controller remote_control
SW12112121
HW222555
door_opener control_unit yes_remote_controller
SW33334444
```

##### Example file versions\_sw.txt

```
SW22222222
Base software operating system eCos
SW12112121
software version1 operating system VxWorks
SW33334444
software version2 operating system VxWorks
SW44445555
software version3 operating system eCos
```

Write a program that receives as arguments from the command line: the name of the file containing the list of devices, a keyword, and the name of the file containing the list of software.

The program must print, **for each device that contains the keyword specified as second parameter from the command line**: the hardware code, the software code and the description of the software with that code. **Each software code present in the first file is also present in the second file.**

Additionally, the program must print, **for each software code present in the first file**, the number of devices using it and the hardware code of the most recent version of the device using that software (**the <hwcode> with highest number**).

Example execution:

```
C:\>analysis_catalog.exe catalog.txt door_opener versions_sw.txt
```

```
HW111333 SW22222222 base software operating system eCos
HW111444 SW22222222 base software operating system eCos
HW222555 SW33334444 software version2 operating system VxWorks
Statistics SW usage:
SW22222222 used by 2 devices, the most recent version: HW111444
SW12112121 used by 1 device, the most recent version: HW222444
SW33334444 used by 1 device, the most recent version: HW222555
```