

<u>SURNAME:</u>		<u>NAME:</u>		<u>B1</u>
<u>STUDENT ID:</u>				
<u>TEACHER:</u>				

Question 1	Answer
<p>Given two numbers 21_z and 13_z (in base z) whose sum is 37_{10} (base 10). Find the value of the base z. $21_z + 13_z = 37_{10}$.</p>	<p>$z =$ _____</p>
<p>Show the most relevant steps</p>	

Question 2
<p>Given the following Boolean variables A, B e C check whether the following Boolean equation is correct: $\overline{A} \cdot \overline{B} \cdot \overline{C} = AB + C$</p>
<p>Show the most relevant steps</p>

Question 3
<p>Given the following piece of code, and assuming that the variable a is allocated at the memory address 0x000300f0, what will be printed once the program is run? Motivate your answer.</p> <pre>#include <stdio.h> int main() { int a=3; printf("&a = 0x%x\n", &a); }</pre>

Question 4 (PROGRAMMING)

Implement a program able to check whether some thermostatic valves work correctly. This program is part of a larger smartphone application used for monitoring temperature variations of some thermometers distributed in the different rooms in a house. Such valves are used for regulating the temperature within houses during winter.

Data from all thermometers are gathered with a rate of one sample per minute and stored in a text file. The number of samples is not known a priori. The structure of the test file is the following:

- The very first row indicates the number of thermometers involved in the measurement;
- Then, each row contains the time stamp and the temperature samples, in the following format:
 - The time instant of the sample (format hh:mm);
 - A maximum of 20 values (and a minimum of 1 value) of temperature (real numbers with 1 decimal digit). Each of these values represents the temperature measured in Celsius degrees by a thermometer.

The samples are gathered in the same day (at least 10 samples are presents). Samples within the text file are ordered according to the time instant (the oldest are in the firsts rows). Please note that the time instants of two consecutive rows differ of 1 minute. The file does not contain any error.

The program receives from the command line the following parameters: the name of the text file containing the samples; the thermometers number id (from 1 to 20) that should be monitored.

Therefore, the number of input parameters is variables between 2 and 21 (1 for the name of the file and then from 1 up to 20 numbers for the thermometers).

In the example reported below, there are 5 thermometers. The thermometers that should be monitored are thermometer number 3, 4 and 5. Therefore, thermometers 1 and 2 must not be taken into consideration. For each of the chosen thermometers, the program must report:

1. Whether, over a period of 1 minute, there exist at least a time interval during which there is a temperature variation greater than 0.3 degree in absolute value.
2. Whether, over a period of 10 minutes, there exist time intervals during which there is a temperature variation greater than 1 degree in absolute value.

In the following example, the sequence that exceed the limits are underlined.

28december2018.txt

5

```
12:00 20.4 21.3 19.8 20.2 21.0
12:01 20.5 21.4 19.7 20.4 21.1
12:02 20.6 21.5 19.3 20.5 21.2
12:03 20.5 21.6 19.5 20.7 21.3
12:04 20.6 21.7 19.4 20.8 21.4
12:05 20.2 21.8 19.3 20.9 21.5
12:06 20.3 21.9 19.6 21.0 21.4
12:07 20.5 22.0 19.5 21.1 21.3
12:08 20.6 22.1 19.4 21.3 21.2
12:09 20.4 22.1 19.5 21.3 21.1
12:10 20.3 22.0 19.4 21.4 21.0
12:11 20.2 21.9 19.5 21.3 21.1
12:13 20.3 21.7 19.5 21.4 21.2
12:14 20.2 21.6 19.4 21.8 21.1
```

c:\> programName 28december2018.txt 3 4 5

Variations greater than 1C/10 minutes in sensor(s) 4.

Variations greater than 0.3C minute in sensor(s) 3 4.

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Question 1	Result
<p>Given two numbers 24_z and 11_z (in base z) whose sum is 32_{10} (base 10). Find the value of the base z. $24_z + 11_z = 32_{10}$.</p>	$z = \underline{\hspace{2cm}}$
<p>Show the most relevant steps</p>	

Question 2
<p>Given the following Boolean variables A, B e C check whether the following Boolean equation is correct:</p> $\overline{AB} \cdot \overline{C} = A + B + C$
<p>Show the most relevant steps</p>

Question 3
<p>Given the following piece of code, and assuming that the variable a is allocated at the memory address 0x000300f4, what will be printed once the program is run? Motivate your answer.</p> <pre>#include <stdio.h> int main() { int a=3; printf("*&a = 0x%x\n", *&a); }</pre>

Question 4 (PROGRAMMING)

Implement a program able to check whether some thermostatic valves work correctly. This program is part of a larger smartphone application used for monitoring temperature variations of some thermometers distributed in the different rooms in a house. Such valves are used for regulating the temperature within houses during winter.

Data from all thermometers are gathered with a rate of one sample per minute and stored in a text file. The number of samples is not known a priori. The structure of the test file is the following:

- The very first row indicates the number of thermometers involved in the measurement;
- Then, each row contains the time stamp and the temperature samples, in the following format:
 - The time instant of the sample (format hh:mm);
 - A maximum of 20 values (and a minimum of 1 value) of temperature (real numbers with 1 decimal digit). Each of these values represents the temperature measured in Celsius degrees by a thermometer.

The samples are gathered in the same day (at least 10 samples are presents). Samples within the text file are ordered according to the time instant (the oldest are in the firsts rows). Please note that the time instants of two consecutive rows differ of 1 minute. The file does not contain any error.

The program receives from the command line the following parameters: the name of the text file containing the samples; the thermometer number id (**a single value**, from 1 to 20) that should be monitored only. In the example reported below, the thermometer number 4 should be monitored only. Thermometers 1, 2, 3 and 5 should not be taken into consideration.

For the chosen thermometer, the program must report:

- (i) Over 1 minute, the number of times there is a variation greater than 0.3 degree (example **grayed**).
- (ii) Over 1 minute, the maximum temperature variation.
- (iii) Over 10 minutes, how many time intervals in which the absolute temperature variations are greater than 1 degree (**underlined values**);
- (iv) Over 10 minutes, the maximum temperature variation;

In the example, the sequences that exceed the limits are underlined. Please note that the sequences that exceed the limits may be overlapped. Moreover, since there are not variations greater than 1 degree over 10 minutes, it is not reported any maximum variation.

28december2018.txt

5

12:00	20.4	21.3	19.8	20.1	21.0
12:01	20.5	21.4	19.7	20.5	21.1
12:02	20.6	21.5	19.3	<u>20.6</u>	21.2
12:03	20.5	21.6	19.5	<u>20.7</u>	21.3
12:04	20.6	21.7	19.4	<u>20.8</u>	21.4
12:05	20.2	21.8	19.3	<u>20.9</u>	21.5
12:06	20.3	21.9	19.6	<u>21.0</u>	21.4
12:07	20.5	22.0	19.5	<u>21.0</u>	21.3
12:08	20.6	22.1	19.4	<u>21.1</u>	21.2
12:09	20.4	22.1	19.5	<u>21.2</u>	21.1
12:10	20.3	22.0	19.4	21.0	21.0
12:11	20.2	21.9	19.5	21.2	21.1
12:13	20.3	21.7	19.5	21.6	21.2
12:14	20.2	21.6	19.4	21.7	21.1

c:\> programName 28dicembre2018.txt 4

Variations greater than 0.3C in a minute: 2.

Maximum variation over 1 minute 0.4c.

Variations greater than 1C in 10 minutes: 1.

Maximum variation over 10 minutes 1.1c.