QUESTION 1	*Results*

Given the following 8-bit number:
 1001 1011
Determine its decimal value when the number is expresed as:
  - Pure binary (BIN)
  - Sign and magnitude (SM)
  - Two's Complement (2C)
	BIN:
	
	SM:
	
	2C:

Steps:	

QUESTION 2	
Calculate the truth table of the following function: $f(x,y,z) = z \cdot \overline{(x \cdot y)} + \overline{z} \cdot y$	
Answers:	

QUESTION 3	
Briefly describe the role, main functionalities, and internal blocks of the Control Unit in a computer system.	
Answers:	

The file **numbers.dat** contains a list of different positive integer numbers, only one for every row. The list contains a maximum *MAX_LEN* of numbers. It is asked to write a C program that will remove every couple of rows that contains two numbers which sum equals to a given value *NUM*. The value *NUM* is specified through the command line, as the first parameter.
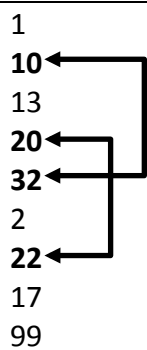
In detail, running the program as follows:

C:\> **EXAM** *NUM*

The program must read the **numbers.dat** file; then, it removes all the couple of rows containing numbers that sum *NUM*, while maintaining all the other rows in the same order. Lastly, the program must save the new list of numbers in the file **numbers.dat**.

Example:

File **numbers.dat**
1
10
13
20
32
2
22
17
99

C:\> **EXAM 42**

Considering the initial file, there are 2 couples of rows that must be removed as **highlighted** in the previous example: 10, 32 (10+32=42); and 20, 22 (20+22=42). As a result, the final file is:

File **numbers.dat**
1
13
2
17
99

NAME				LASTNAME						
Student-ID	**S**									**C/2**

AAA-LIB/English   LIC-ZZZ/English   Others:...................

QUESTION 1	Result

Given the following 8-bit number:
 1001 1101
Determine its decimal value when the number is interpreted as:
   - Pure binary (BIN)
   - Sign and magnitude (SM)
   - Two's Complement (2C)
	BIN:
	
	SM:
	
	2C:

Steps:

QUESTION 2	

Calculate the truth table of the following function:

$$f(x, y, z) = x \cdot \overline{(z \cdot y)} + \overline{z} \cdot y$$

Answer:

QUESTION 3	

Briefly describe the role, main functionalities, and internal blocks of the ALU in a computer system.

Answer:

QUESTION 4 (PROGRAMMING)

The file **numbers.dat** contains a list of different positive integer numbers, only one for every row. The list contains a maximum **MAX_LEN** of numbers. It is asked to write a C program that will remove the sequences of repeated numbers of at least **NUM** elements. The value **NUM** is specified through the command line, as the first parameter.

In detail, running the program as follows:

C:\> **EXAM NUM**

The program must read the **numbers.dat** file; then, it removes all the sequences of repeated numbers containing at least **NUM** elements, while maintaining all the other rows. Lastly, the program must save the new list of numbers in the file **numbers.dat**.

Example:

File **numbers.dat**
1
10
10
10
32
32
10
3
3
3
3
3
5

C:\> **EXAM 3**

Considering the initial file, and **NUM** = 3, the sequences to be deleted are: the sequence of "10" (3 elements), and the sequence of "3" (5 elements). As a result, the final file contains:

File **numbers.dat**
1
32
32
10
5

QUESTION 1	*Result*
Given the following 8-bit number: 1011 0110 Determine its decimal value when the number is interpreted as: - Pure binary (BIN) - Sign and magnitude (SM) - Two's complement (2C)	BIN: SM: 2C:

Steps:

QUESTION 2	

Calculate the truth table of the following function:

$$f(x, y, z) = z \cdot \overline{(x \cdot y)} + \overline{x} \cdot z$$

Answer:

QUESTION 3	

Describe the main differences between *internal memory* and *external memory?*

Answer:

Considering a file that contains the grades of a group of students from different universities. Every line in the file contains information about only one student; the first part of the line is the student ID (one string of at most 15 characters). The rest of the line contains the list of grades of the student (integer numbers from 0 to 30). The line ends with -1.

Write a C program that receives as the first parameter on the command line the name of the file containing the group of students. The program must find the ID of the student who has the highest average grade.

Additional assumptions:

- No student has exactly the same average grade with another student
- The number of students in the file is not known and may be very large
- The number of exams taken by every student is not fixed and not known
- The file format is always correct.

An example of the file:

File **grade42.dat**
s11111 30 28 18 -1
sa44er44 23 18 30 18 29 18 29 -1
s33333 30 30 -1
22222idx 18 -1

C:\> **EXAM grade42.dat**

The ID of the student with highest average grade is s33333.

NAME				SURNAME				
Student ID	**S**							**B/2**

AAA-LIB/English   LIC-ZZZ/English   Others:...................

QUESTION 1	Result:

Given the following 8-bit number:
 1011 0101
Determine its decimal value when the number is interpreted as:
  - Pure binary (BIN)
  - Sign and magnitude (SM)
  - Two's complement(2C)
	BIN:
	
	SM:
	
	2C:

Steps:	

QUESTION 2	
Calculate the truth table of the following function: $f(x, y, z) = y \cdot \overline{(x \cdot z)} + \overline{x} \cdot z$	
Answer	

QUESTION 3	
In a computer system, describe the meaning of the *frequency* of a BUS.	
Answer:	

QUESTION 4 (PROGRAMMING)	

The file **GRADES.DAT** contains the grades of a group of students from different universities. Every line in the file contains information about only one student; the first part of the line is the student ID (one string of at most 15 characters). The rest of the line contains the list of grades of the student (integer numbers from 0 to 30). The line ends with -1.

Write a C program that receives as the first parameter in the command line a grade, and produces as output the ID of the student who has that grade the greatest number of times.

Additional assumptions:

- There is only ONE student having the requested grade the greatest number of times
- The number of students in the file is not known and may be very large
- The number of exams taken by every student is not fixed and not known
- The file format is always correct.

An example of the file:

File **GRADES.DAT**
s11111 30 28 18 18 -1
sa44er44 23 18 18 29 18 29 -1
s33333 30 30 -1
22222idx 18 -1

C:\\> **EXAM 30**

The ID of the student who has the grade 30 the greatest number of times is s33333.