

Name and Surname	
Student ID	
Course AAA-LIB (Squillero) <input type="checkbox"/> LIC-ZZZ (Sanchez) <input type="checkbox"/>	

Theory

Question 1

	<i>Result</i>
Given the following number represented with 6 bits 110101 determine its decimal representation interpreting it as: <ul style="list-style-type: none"> - Pure Binary (BIN) - Sign and Magnitude (SM) - 2's complement (2C) 	BIN: SM: 2C:
The most significant steps to arrive the result	

Question 2

Given the following decimal number: $X1 = +253$ $X2 = -310$ represent them in two's complement format on nine bits, and then calculate the following operation, checking if overflow occurs: $X3 = X1 + X2$	X3: overflow (yes/no):
The most significant steps to arrive the result	

Question 3

Supposing to use a computer in which the integers are represented with 32bit. Which is the minimum number of bytes occupied by the following data structure? <pre> typedef struct { char name[20]; char surname[20]; char student_ID[8]; int years; } student; student register[100]; </pre>	#Bytes:
The most significant steps to arrive the result	

Programming

Write a C program aimed at the management of the game called “Battleship”. Consider to have a text file containing the current status of the match.

The game board, or game map, has dimensions **RxC**, where **R** and **C** are constant parameters known at priori (use a `#define`). The presence of a ship in the board is indicated with the character ‘**V**’, while a portion of sea is indicated with the character ‘**o**’. In addition, when a ship has been hit, this event is marked with ‘**A**’ in the map. The number of positioned ships is not known at priori, as well as their length. The ships could be positioned horizontally or vertically (not diagonally), and they have not contact points (two ships are always separated by a portion of the sea).

The C program receives from the command line the name of the file containing the game map. Then, it reads the coordinates of the shots to be fired in the format “row column”, where row and column are two integers entered from the keyboard. The program continues to acquire coordinates and it ends when all the ships have been sunk.

If the shot hits the sea, the program must report on the screen that the shot hits in an empty place; instead, if the shot hits a ship, the program reports on the screen that a ship has been hit, and if the ship has been sunk; finally, if the shot hits a position previously hit, the program must report this on the screen.

The following example shows the content of the referred file in the case the game board is 7x10 (RxC) with 4 ships.

An example of the map: *map.txt*

```
oooVVVVo  
oooooooo  
oooooooo  
oVooVVVVV  
oVoooooooo  
ooooAAoooo
```

Program execution example

```
> prog.exe mappa.txt  
Insert the coordinates of the shot in the format R C: 1 1  
Sea  
Insert the coordinates of the shot in the format R C: 4 2  
Ship hit  
Insert the coordinates of the shot in the format R C: 1 7  
Ship hit  
Insert the coordinates of the shot in the format R C: 5 2  
Ship hit and sunk  
Insert the coordinates of the shot in the format R C: 4 2  
Position already hit
```

