# HW2

**W3101: Programming Languages, C++: Homework 3**

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- **Due Sep 30.**
- Please submit your solutions in Courseworks, do not mail them to me.
- Please submit ONLY your source (.cpp) files, not the entire project.
- Please call your files < YourName >_HW_2 to help TAs identify your file quickly.

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1. Implement a class called Game. It should have the following:
   I. A private variable called "numberOfPlayers" of type integer.
   II. A public constructor without any arguments that sets "numberOfPlayers" to 1.
   III. A second public constructor with an integer argument "n", which sets "numberOfPlayers" to "n".
   IV. A public virtual function called "bool isValid( )" that returns "true";
   V. A public virtual function called "bool isOver( )" that returns "false";
   VI. A public virtual function called "void PrintGamePosition( )" that does nothing.

2. Implement a Sudoku puzzle in a C++ class called "Sudoku" as a child class of Game class. It should have the following:
   I. A private array of integers of dimension 9 x 9 called "values", which represents the numbers of the Sudoku puzzle.
   II. A public constructor that sets all the elements of "values" to 0. You can assume 0 means it is an unfilled square. Set "numberOfPlayers" of the parent class to 1.
   III. Another public constructor that takes a array of 9 x 9 square of integers as input and sets "values" to that. Set "numberOfPlayers" of the parent class to 1.
   IV. A public function called "readDataFromFile (char *fileName)". I will post the code to read data for this function in Courseworks. You can use it as is.
   V. A boolean function called "bool isValid( )" that returns "true" if the array is valid so far. Note the array may not have all elements of the array filled. That is, some of them may be empty (represented by 0). It should return "true" if it is valid so far, "false", otherwise.
   VI. A boolean function called "bool isCorrect( )" that returns "true" if all the elements of the array are present and is a genuine Sudoku solution. It should return false if the array (values) is incomplete or incorrect.
   VII. Implement the function "bool isOver( )" that prints "true" if all the [9 x 9] = 81 integers are filled without any blanks. Return "true" even if the array of values are incorrect (e.g., the array has the same number repeating twice or more in a row or column, etc.). Return "false" otherwise, if it is correct so far but incomplete. That is, it still has at least one blank (with a value of 0).
   VIII. Implement the function "void PrintGamePosition( )" that simply prints the [9 x 9] array of integers, with a new line after each row.

3. Do the following in the main function:
   I. Create an object of Sudoku.
   II. Ask the user to enter the name of a file. Read the input from that file.
   III. Call the "PrintGamePosition( )" function.
   IV. Find out if the is over by calling "isOver( )" function.

V. Check if it is a valid Sudoku solution by calling "isValid( )" function.
VI. Check if it is a correct Sudoku solution by calling "isCorrect( )" function.

4. **Optional:** Given an array of numbers filled so far, can you fill any empty square with a valid square? If so, can you fill it recursively, until you solve the puzzle?

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