Mastermind.

Project1

CSC- 17a – 48983 C++

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Content

1. Introduction

Rules and Gameplay

This version of mastermind allows for two modes of gameplay easy or normal. In the easy mode the player has to guess a 3 digit pin, in normal a 4 digit pin. Regardless of which mode is selected the program will make each digit, of the pin, some number between 0-9. Each time after the player guesses, the program will tell the player how many digits are correct and are in the right place, and how many digits are the right digits, but not in the right place. The program will then display how many guess the player has left. If the player fails to guess the right pin in 9 tries, the program will display all the guesses that the player submitted, then sort and display them with and numerical sort and ask the player if they would like to try again.

Thoughts after Program

Next version of this game should start to rewrite the program in a modular fashion. Roping in related variables into constructs with constructors and de-structers . Then tying into that functions rather then in the program itself. I believe this will greatly “clean” up the code and make it easier for future editors to understand. Finally I could place a log in a construct which would contain the players name, age, amount of games played, and the average of how many number of guesses it took to guess the answer. The log would then be updated each and every time the player plays and the user can then check his ranking against other players before or after he/she plays.

2. Development

Approach Strategy

In updating Mastermind my main purpose was to implement concepts I had recently learned in class. The goal was to take a already working piece of code and implement more advance functions and tools to remove clutter and reduce the lines of code

Because most of the logic was already there from the previous version game I went through the code again looking for places to implement several changes. These items included more the use of dat files, advance read write functions, character array, structures, and pointers to structures.

3. Research

I. Structures

Using structures in this program as a more simplified way to multiple variable in a single variable. Also allowed the use of pointers to structurs

II. Structure pointers

By applying the use of pointers passing multiple variables or referencing multiple variables in a function became much easier. Instead of having to pass in both xs and oxs I could simply pass in the pointer to the structure.

III. Batch writing to Binary files

Wanted a way to shorten up the lines of code needed for writing data to a file. By changing the format of my files from .txt to .dat and writing in binary format I was able to write a whole array of answers from the user in one line. No for loop needed Nice!

4. Variables list

Type	Variable Name	Description	Line
int	Level	How many digits the pin is	33
	counter	How many times the player guessed	44
	answer[SIZE]	Array for the answer	35
	Indx	Location for the table	265
char	** table	Dynamic array for the players guesses	43
string	temp	Temporary place holder for the file	36
	usrG	For the player to input guess	39
bool	match[SIZE]	check whether user digits matches answer	34
	Swap	Check to see if swap was made	264
const int	SIZE	Size of arrays	27
ofstream	output		37

5. Topic Covered (Checklist)

Chapter	type	code	line
2 Variables	int	int xs	37
2 Input Output	Getline	getline(cin, temp);	69
	cout	cout<<"Input your guess: "<<endl;	74
	endl	cout<<endl;	55
2.3 data types	Short	Short ox	38
	bool	bool swap = false;	264
	string	string usrG;	39
2 condition	=	int level = 3;	33
	==	while(isvalid(usrG) == false);	97
	++	i++;	124
2 style	comment	//variables	31
3 boolean expression	!=	if(usrG.length() != level){	189
	<, >, ||	if (usrG[i] <48 || usrG[i] > 57){	195
3 multiway branches	if	if(usrG.length() != level){	189
	else	else{	193
	nested	do{	65
		if(input.is_open()){	45
		for(int j = 0; j<level;j++){	173
3.3 type of loop	for	for(int i = 0; i<9; i++){	172
	do-while	while(temp[0]!=49 && temp[0]!=50);	70,71
4 predefined function	srand, time	srand(time(0));	41
	rand	answer[i] = rand()%10;	159
4function prototypes	Int	int compare(int [], short&, string, …	21
	Bool	bool isvalid(string, int);	20
5 void function	void	void gssHst(string, int, char **, int);	22
5 call-by-reference	&	int compare(int [], short&, string, bool …	21
6 streams and basic	ofsream declare	ofstream output;	37
	Ifstream declare	Ifstream input	38
	Input	input.open("instructions.txt");	52
	Input.close	input.close();	58
	output	output.open("Answer.txt");	83
	close	output.close();	86
7 array	int array	Int answer[SIZE]	34
	bool aray	Bool mathc[SIZE]	35
9 Memory Allocation	char**	table = new char *[guess]; ...	195
10 String Objects	string	string temp;	44
10 Conversion	toupper	toupper(usrG[0]) == 'Y')	157
10 Char array	Char array[]	char sAnswer[SIZE];	42

11 Structured data	struct Numbers	struct Numbers{	21

11 Combing data types	Numbers	struct Numbers{
		int xs; //How many x's
		short os; //How many o'x
		};
			21-24

11 Dot operator	nmbr.xs	cout << "X(s)=" << nmbr.xs << endl;	130

11 Structure initialization	Struct Numbers	struct Numbers{
		int xs; //How many x's
		short os; //How many o'x
		};
			21-24

11 Structures in Arguments	nPtr->xs == level	if (nPtr->xs == level) {	137
12 Binary files	"Answer.dat"	inOut.open("Answer.dat", ios::out | ios::binary | ios::app);	103
12 Writing to binary	inOut.write	inOut.write(sAnswer, sizeof (sAnswer));	107
12 Batch Writing to binary with array	inOut.write	inOut.write(sAnswer, sizeof (sAnswer));	107
12 Reading binary files	"instructions.dat", ios::in	inOut.open("instructions.dat", ios::in);	61

6. Libraries included

- <cstdlib>
- <iostream>
- <ctime>
- <fstream>

7. Pseudo code

Set time seed

Output instruction from file

Do

    Ask user for easy or normal

Do

    Call prepare function

        Random answer and initialize other variables

        Create table

    Output the answer to file

    Game start

    do

        Input guess number

        Call isvalid to check validation

        Call gssHst

        Call compare function

        Display Xs and Ox (result)

        Guess -1

    While guess>0 and guess answer is not correct

    Sort answers

    Delete table

    If x==level output win

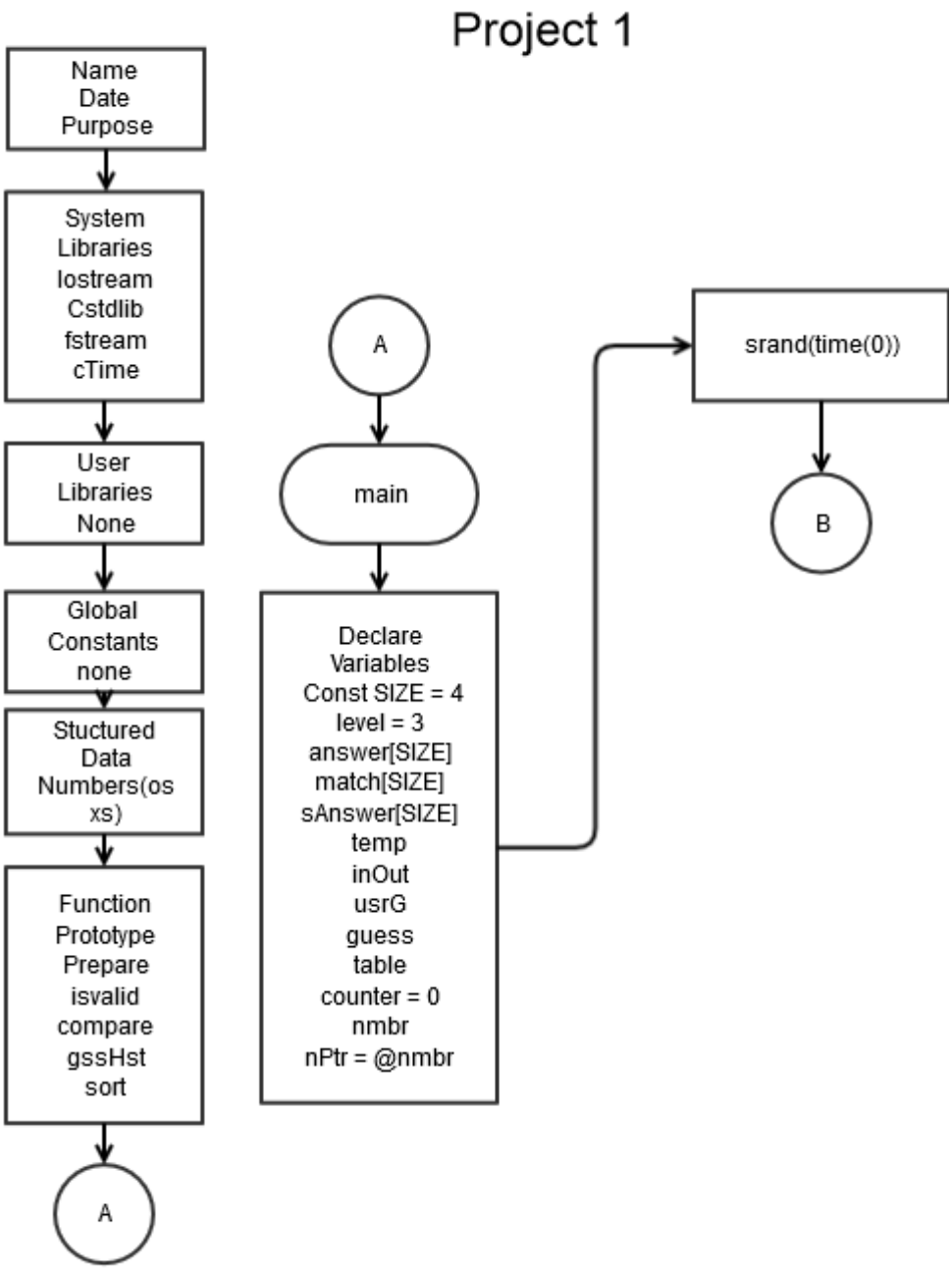
    Else output lose

    Ask for another new game

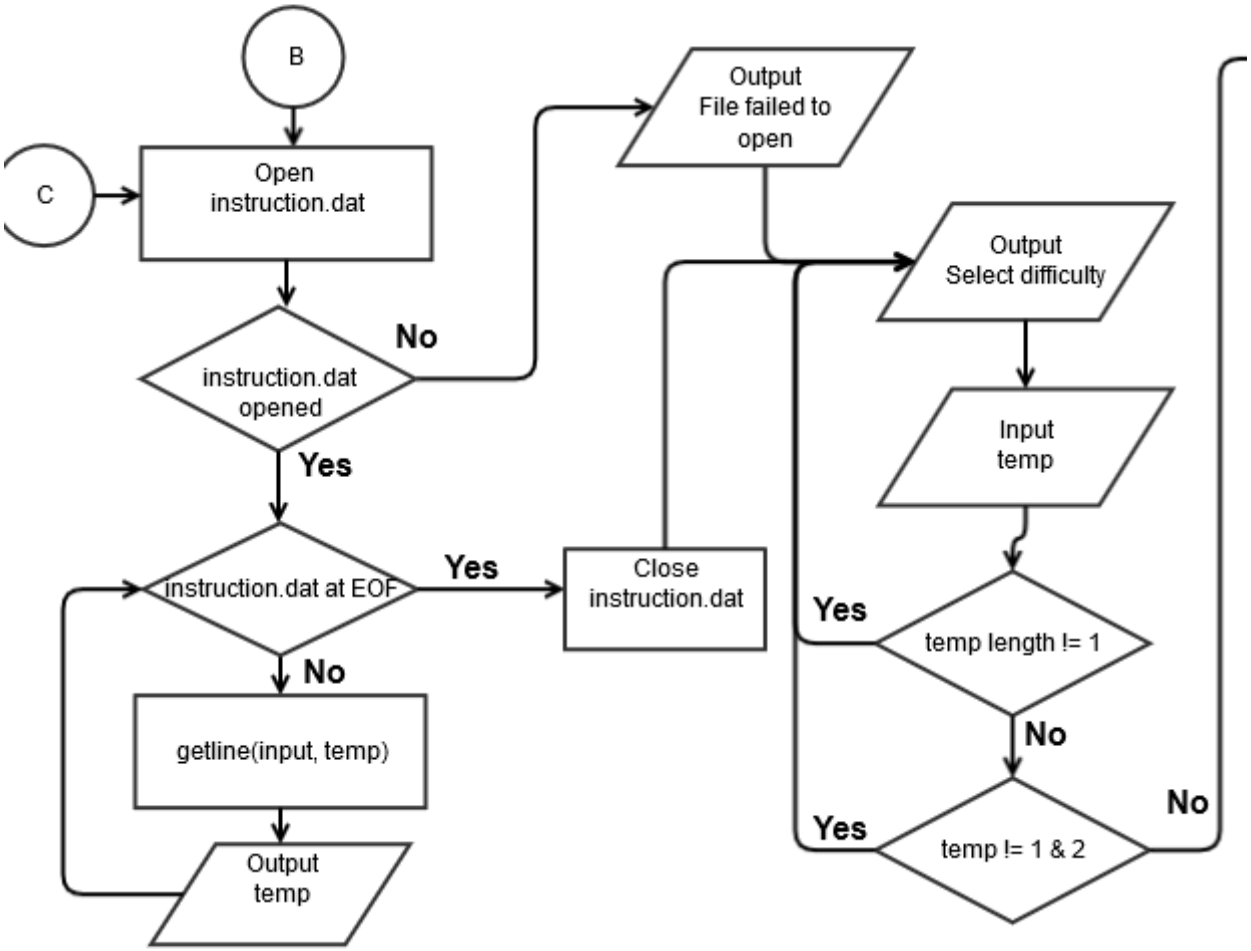
While(Yes)

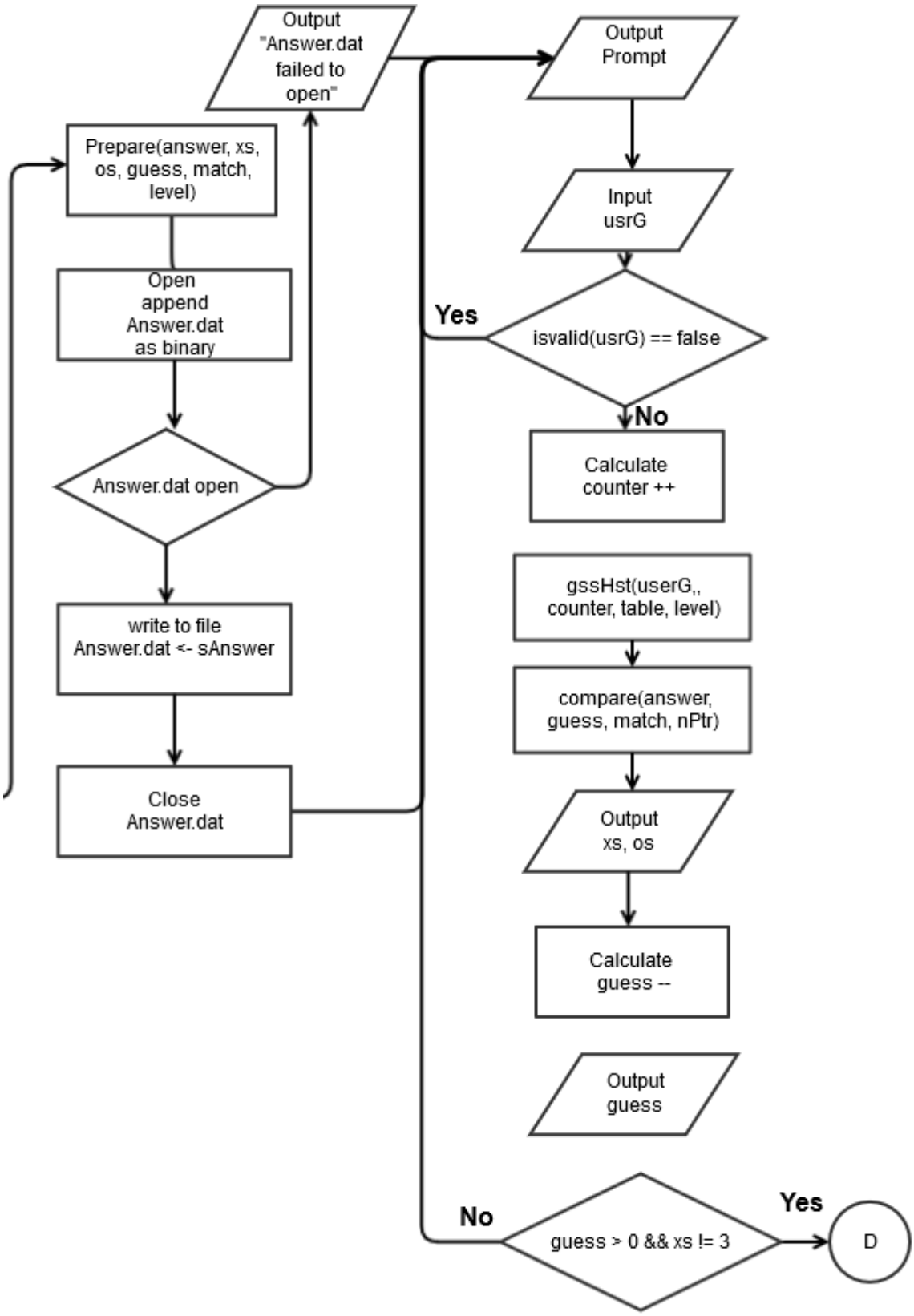
7. Flowchart

Main

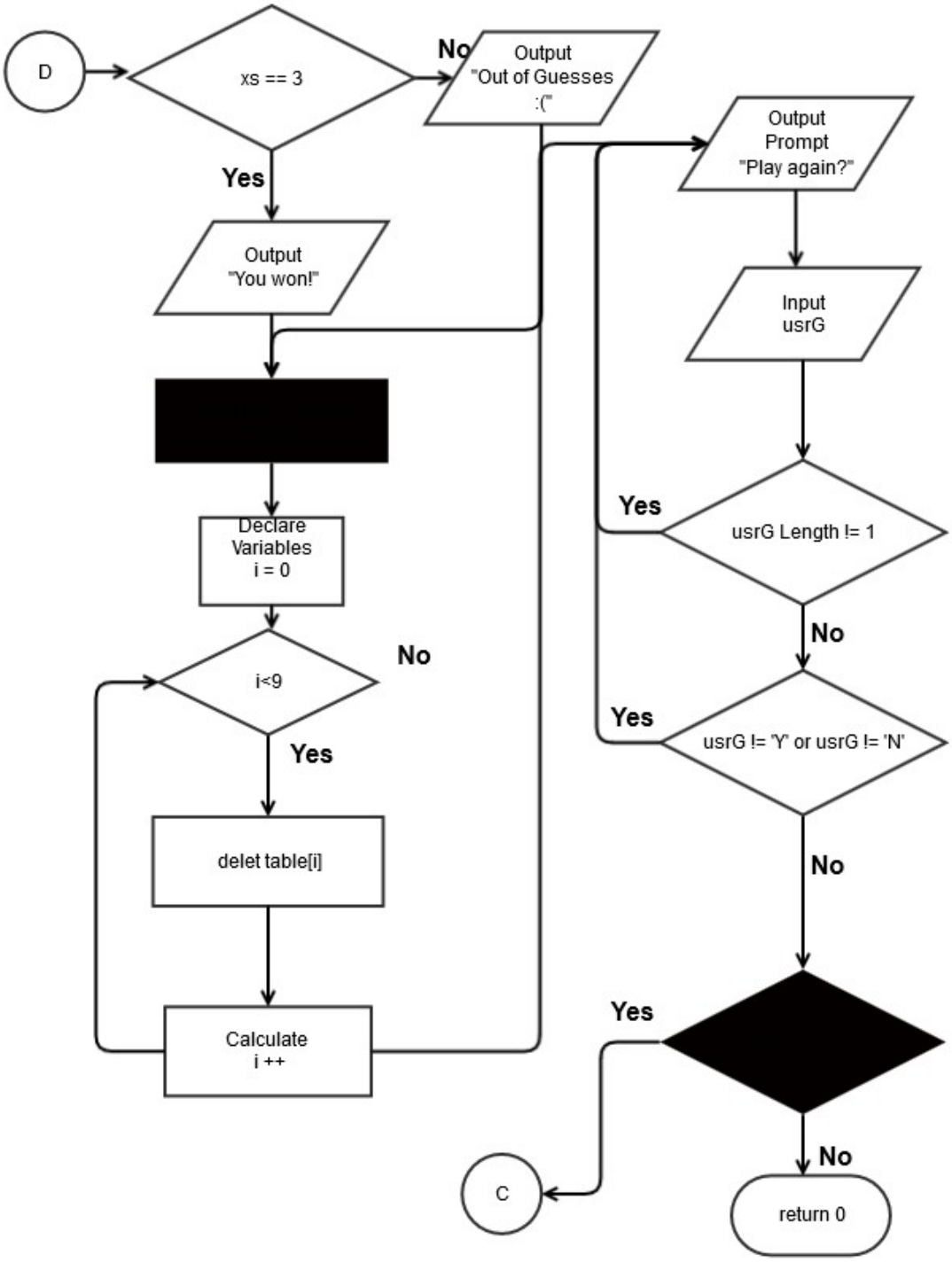


Main

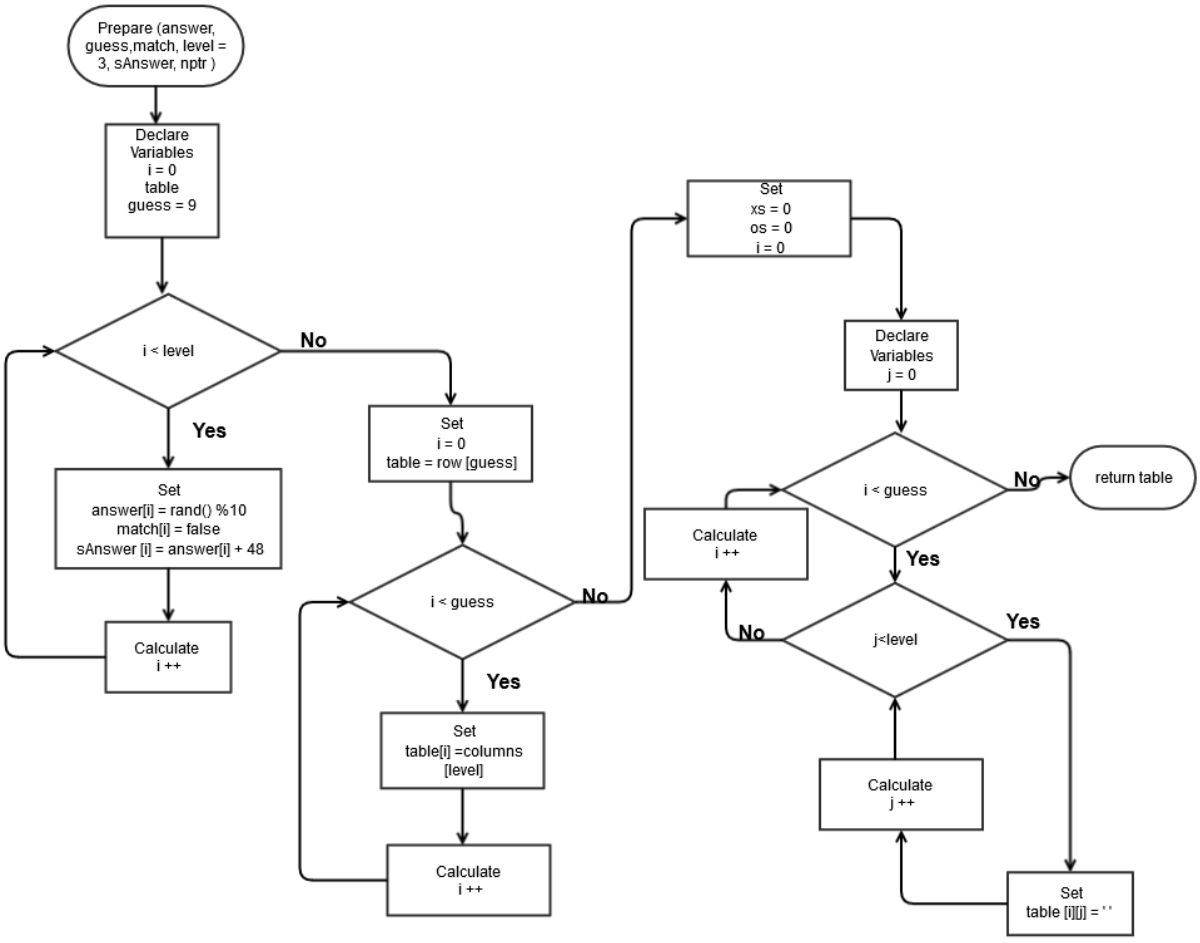

B
C
Open
instruction.dat
instruction.dat
opened
No
Yes
Output
File failed to
open
instruction.dat at EOF
Yes
Close
instruction.dat
No
getline(input, temp)
Output
temp
Output
Select difficulty
Input
temp
Yes
temp length != 1
No
Yes
temp != 1 & 2
No


Output "Answer.dat failed to open"
Output Prompt
Prepare(answer, xs, os, guess, match, level)
Input usrG
Open append Answer.dat as binary
Yes
isvalid(usrG) == false
No
Answer.dat open
Calculate counter ++
gssHst(userG,, counter, table, level)
write to file Answer.dat <- sAnswer
compare(answer, guess, match, nPtr)
Close Answer.dat
Output xs, os
Calculate guess --
Output guess
No
guess > 0 && xs != 3
Yes
D

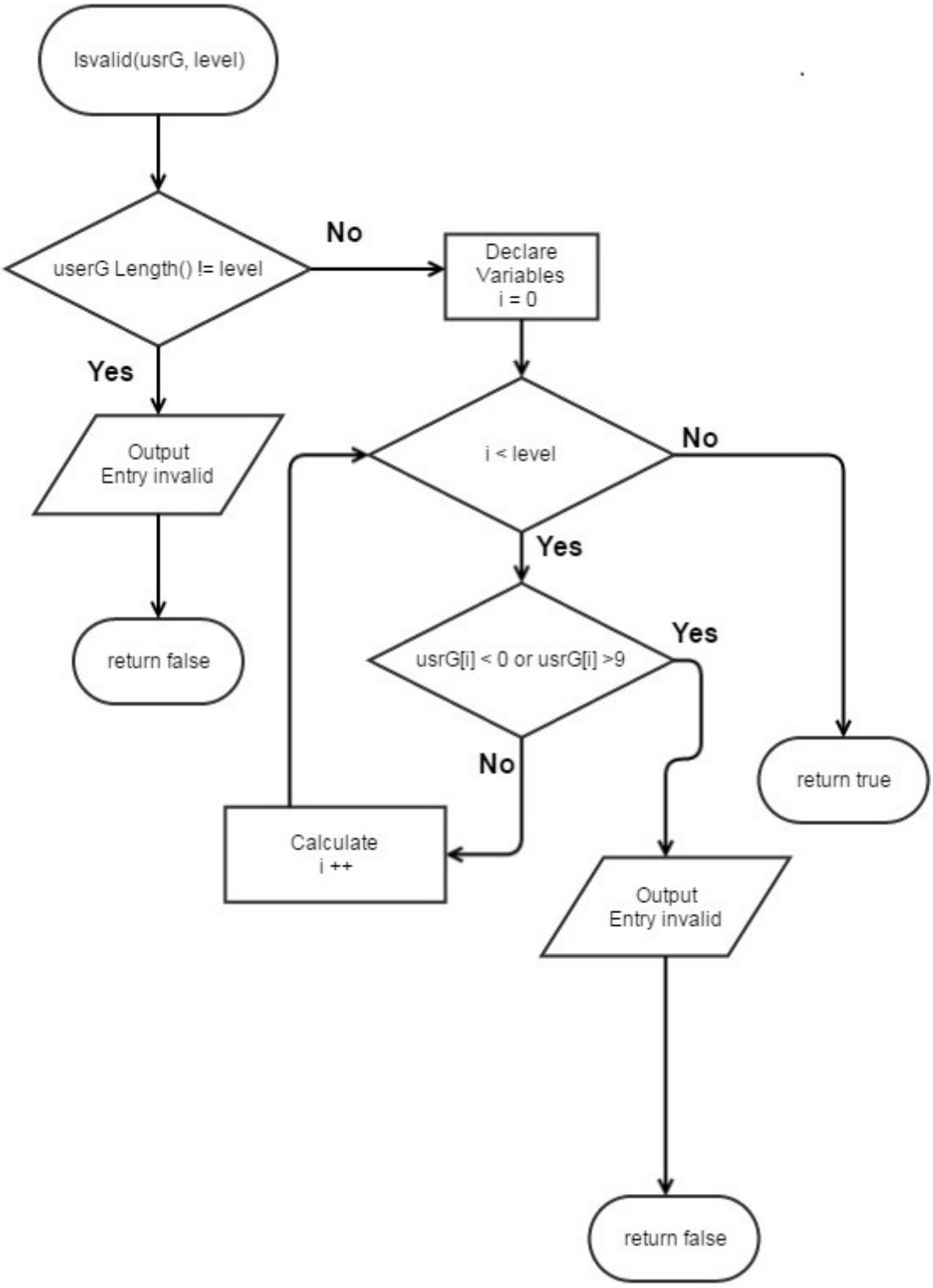
Main


D
xs == 3
No
Output
"Out of Guesses
:("
Yes
Output
"You won!"
Output
Prompt
"Play again?"
Input
usrG
Yes
usrG Length != 1
No
Yes
usrG != 'Y' or usrG != 'N'
No
Declare
Variables
i = 0
i<9
No
Yes
delet table[i]
Calculate
i ++
Yes
No
C
return 0

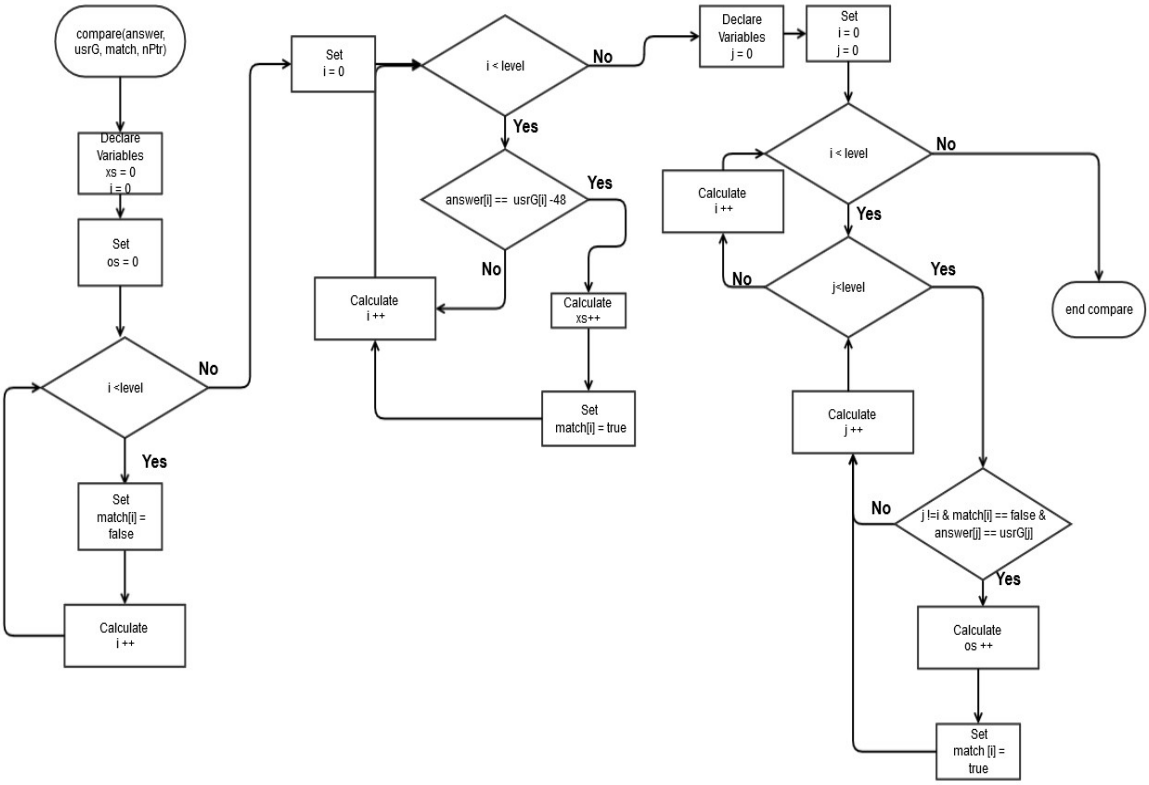
Prepare


Prepare (answer, guess,match, level = 3, sAnswer, nptr)
Declare Variables i = 0 table guess = 9
i < level
No
Yes
Set answer[i] = rand() %10 match[i] = false sAnswer [i] = answer[i] + 48
Calculate i ++
Set i = 0 table = row [guess]
i < guess
No
Yes
Set table[i] =columns [level]
Calculate i ++
Set xs = 0 os = 0 i = 0
Declare Variables j = 0
i < guess
No
return table
Yes
Calculate i ++
j<level
No
Yes
Calculate j ++
Set table [i][j] = ' '

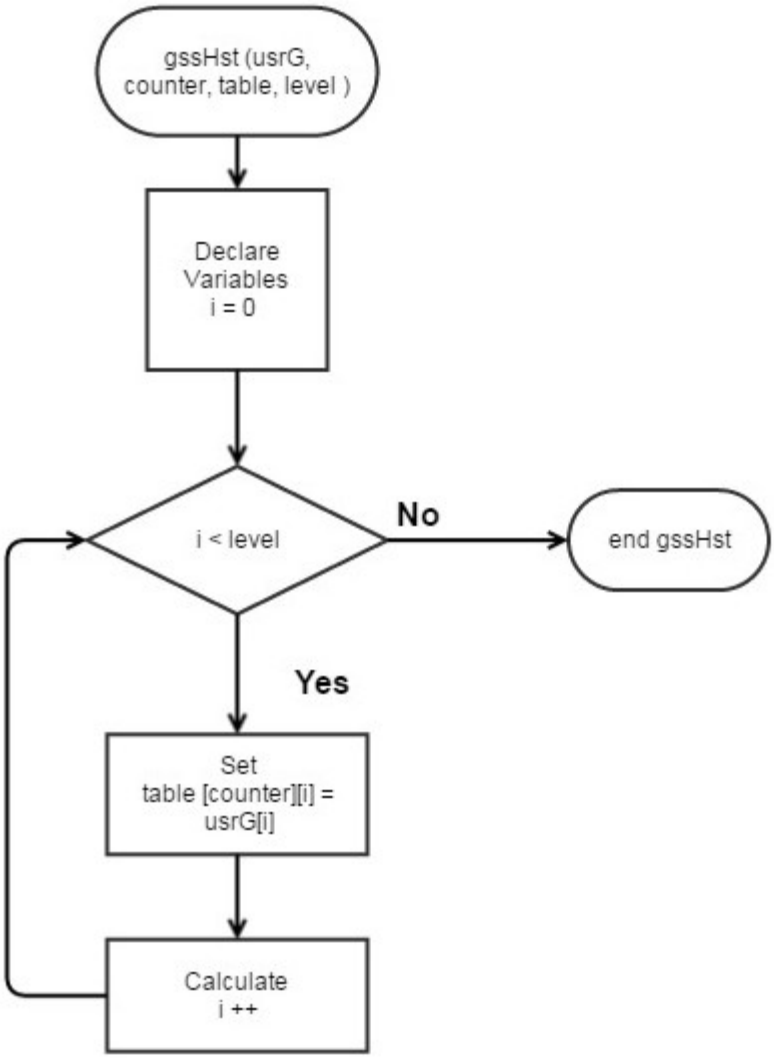
isValid


Isvalid(usrG, level)
userG Length() != level
No
Declare
Variables
i = 0
Yes
Output
Entry invalid
return false
i < level
No
Yes
usrG[i] < 0 or usrG[i] >9
Yes
No
return true
Calculate
i ++
Output
Entry invalid
return false

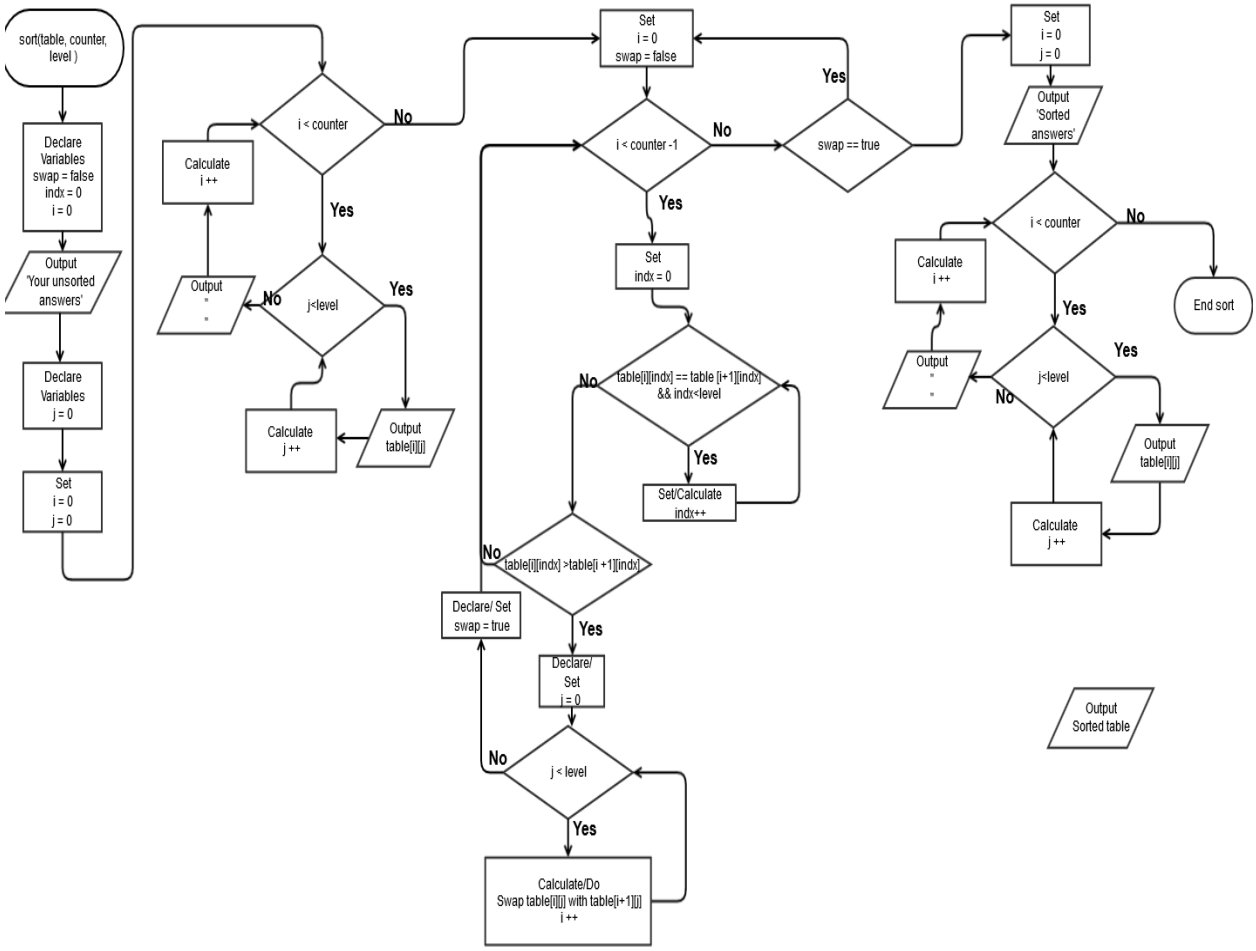
Compare


compare(answer, usrG, match, nPtr)
Declare Variables xs = 0 i = 0
Set os = 0
i <level
No
Yes
Set match[i] = false
Calculate i ++
Set i = 0
i < level
No
Yes
answer[i] == usrG[i] -48
Yes
No
Calculate xs++
Calculate i ++
Set match[i] = true
Declare Variables j = 0
Set i = 0 j = 0
i < level
No
Yes
Calculate i ++
j<level
No
Yes
Calculate j ++
j !=i & match[i] == false & answer[j] == usrG[j]
No
Yes
Calculate os ++
Set match [i] = true
end compare

gssHst


gssHst (usrG,
counter, table, level)
Declare
Variables
i = 0
i < level
No
end gssHst
Yes
Set
table [counter][i] =
usrG[i]
Calculate
i ++

Sort


sort(table, counter, level)
Declare Variables swap = false indx = 0 i = 0
Output 'Your unsorted answers'
Declare Variables j = 0
Set i = 0 j = 0
i < counter
No
Yes
Calculate i ++
Output " "
j<level
No
Yes
Calculate j ++
Output table[i][j]
Set i = 0 swap = false
i < counter -1
No
Yes
Set indx = 0
table[i][indx] == table [i+1][indx] && indx<level
No
Yes
Set/Calculate indx++
table[i][indx] >table[i +1][indx]
No
Yes
Declare/ Set swap = true
Declare/ Set j = 0
j < level
No
Yes
Calculate/Do Swap table[i][j] with table[i+1][j] i ++
swap == true
Yes
Set i = 0 j = 0
Output 'Sorted answers'
i < counter
No
Yes
Calculate i ++
Output " "
j<level
No
Yes
Output table[i][j]
Calculate j ++
End sort
Output Sorted table

8. Input output (raw)

```
**********************************************************************
***************
**                          **Mastermind jr.**                       **
**        You have to guess numbers that are between 0-9 within 9 guesses!          **
**          First select either easy or normal. easy = 3 numbers normal = 4        **
**                        First type in three or four numbers as your guess         **
**      Then the game will show you the amount of Os and Xs you have for that guess.    **
**  An O means that one of your numbers is correct but it is in the wrong position      **
**     An X means that you have a number correct and in the right possition!         **
**  So guess away! But remember you only have 9 guess. Run out of guesses and you lose.  **
**              Do you have what it takes? Can you decode the sequence?           **
**                          We will soon find out...;)                            **
**********************************************************************
***************What difficulty would you like to play? 1 for Easy or 2 for Hard: 2
Input your guess:
12314
Please enter 4 numbers.
Input your guess:
1231215
Please enter 4 numbers.
Input your guess:
dfe
Please enter 4 numbers.
Input your guess:
1234
x=0
o=3
Guesses left: 8
Input your guess:
9999
x=1
o=0
Guesses left: 7
Input your guess:
5689
x=0
o=1
Guesses left: 6
Input your guess:
342
Please enter 4 numbers.
Input your guess:
2315
x=2
```

o=1
Guesses left: 5
Input your guess:
2912
x=4
o=0
Guesses left: 4
Congrats you won!
Unsorted answers from you!!
1234
9999
5689
2315
2912
Sorted answers via bubble sorts !!
1234
2315
2912
5689
9999
Play again Y/N?
1
Play again Y/N?
4
Play again Y/N?
s
Play again Y/N?
Y
****
****
**   **Mastermind jr.**   **
**   You have to guess numbers that are between 0-9 within 9 guesses!   **
**   First select either easy or normal. easy = 3 numbers normal = 4   **
**   First type in three or four numbers as your guess   **
**   Then the game will show you the amount of Os and Xs you have for that guess.   **
** An O means that one of your numbers is correct but it is in the wrong position   **
**   An X means that you have a number correct and in the right possition!   **
** So guess away! But remember you only have 9 guess. Run out of guesses and you lose. **
**   Do you have what it takes? Can you decode the sequence?   **
**   We will soon find out...;)   **
****
**********What difficulty would you like to play? 1 for Easy or 2 for Hard: 1
Input your guess:
123
x=0
o=0

Guesses left: 8
Input your guess:
123
x=0
o=0
Guesses left: 7
Input your guess:
123
x=0
o=0
Guesses left: 6
Input your guess:
1234
Please enter 3 numbers.
Input your guess:
543
x=0
o=0
Guesses left: 5
Input your guess:
674
x=1
o=1
Guesses left: 4
Input your guess:
865
x=1
o=0
Guesses left: 3
Input your guess:
456
x=0
o=0
Guesses left: 2
Input your guess:
345
x=0
o=0
Guesses left: 1
Input your guess:
86
Please enter 3 numbers.
Input your guess:
567
x=1
o=1

Guesses left: 0
Sorry but you ran out of guesses. :(
Unsorted answers from you!!
123
123
123
543
674
865
456
345
567
Sorted answers via bubble sorts !!
123
123
123
345
456
543
567
674
865
Play again Y/N?
N
See you again next time!

RUN SUCCESSFUL (total time: 1m 21s)

```
/*
 File:   Game.cpp
 Author: Jonathan Balisky
 Created on July 25, 2015, 9:18 pM
 Purpose:  Mastermind jr.
 */

//Libraries



#include <iostream>
#include <string>
#include <cstdlib>
#include <fstream>
#include <ctime>

//User libraries

using namespace std;
//structured data
struct Numbers{
    short xs; //How many x's
    short os; //How many o'x
};

//Functions Prototypes
char ** prepare(int [], int&, bool[], int, char[], Numbers *);
bool isvalid(string, int );
void compare(int [], string, bool[], int, Numbers *) ;
void gssHst(string, int, char **, int);
```

```
void sort(char **, int, int );

//Global

int main(int argc, char** argv) {

    const int SIZE = 4;
    //Variables

    int level = 3; //Difficulty  of game
    int answer[SIZE]; //number of pin
    char sAnswer[SIZE]; //Answer
    bool match[SIZE]; //Which numbers are matched
    string temp; //For the file output
    fstream inOut; // for file stream
    string usrG; //The users guess or input
    int guess; //How many guess the user had guessed
    char **table; //Table of the user guesses
    int counter = 0; //Row counter for table
    Numbers nmbr; //Variable for structure
    Numbers *nPtr = &nmbr;//Pointer to numbers

    srand(time(0)); //setting time seed
    do {

        counter = 0;



        // cout<<"Call prepare."<<endl;//For diagonostics
```

```
inOut.open("instructions.dat", ios::in);
if (inOut.is_open()) {
   while (getline(inOut, temp)) {
      cout << temp;
   }
   inOut.close();
} else {
   cout << "Instructions failed to open" << endl;

}
do {
   do {
      cout << "What difficulty would you like to play? 1 for Easy or 2 for normal: ";

      getline(cin, temp);
   } while (temp.length() != 1); // User did not enter 1 digit
} while (temp[0] != 49 && temp[0] != 50); // User did not enter 1 or 2

if (temp[0] == 49) { //Level is easy
   level = 3;
} else { //User selected hard level
   level = 4;
}

table = prepare(answer, guess, match, level, sAnswer, nPtr); //Initialize

// cout<<"Call prepare."<<endl;//For diagonostics
//   //Out Put answer to a file
//      inOut.open("Answer.dat", ios::out);
//
```

```
//      if(inOut.is_open()){
//
//          for (int i = 0; i<level; i++){
//           inOut<<answer[i];
//           }
//          inOut.close();
//      }
//      else{
//          cout<<"Failed to write answer to file";
//      }
//
//Output answer as Binary
inOut.open("Answer.dat", ios::out | ios::binary | ios::app);

if (inOut.is_open()) {
   inOut<<endl;
   inOut.write(sAnswer, sizeof (sAnswer));
   inOut.close();
}
else {
   cout << "Failed to write answer to file" << endl;
}

//      for(int i=0;i<3;i++){
//cout<<answer[i]; //For diagonostics
//      }

do {
   do {
       cout << "Input your guess: " << endl; //User enter guess
```

```
        getline(cin, usrG);
        //cin.ignore();

    } while (isvalid(usrG, level) == false); //Loop until user enters valid answer

    gssHst(usrG, counter, table, level);
    counter++; //gssHst Ran
  compare(answer, usrG, match, level, nPtr);

    cout << "X(s)=" << nPtr->xs << endl; //Right numbers in right space
    cout << "O(s)=" << nPtr->os << endl; //How many Correct number but in the incorrect space
    guess--;
    cout << "Guesses left: " << guess << endl;

} while (guess > 0 && nPtr->xs != level); // User out of guess or has guess correctly

if (nPtr->xs == level) { //user won
    cout << "Congrats you won!" << endl;
} else { //user lost
    cout << "Sorry but you ran out of guesses. :( " << endl;

}

sort(table, counter, level);

for (int i = 0; i < 9; i++) {
    delete table[i];
}
delete[] table;
do { //Checking for an input of Y or N
```

```
        do { //Checking for input over 1 char
            cout << "Play again Y/N?" << endl;
            getline(cin, usrG);
        } while (usrG.length() != 1);
    } while (toupper(usrG[0]) != 89 && toupper(usrG[0]) != 78);
    //}while(usrG[0] > 'Y' || usrG < 'N' || (usrG[0]>'N' && usrG[0]<'Y'));
} while (toupper(usrG[0]) == 'Y');

cout << "See you again next time!" << endl;



return 0;
}

/
**************************************Prepare*********************************************
**
 * Purpose: Initializing values for the game.
 * Input: answer, guess, match, level, nPtr
 * Output:
 * table

*****************************************************************************************
**/
char ** prepare(int answer[], int &guess, bool match[], int level, char sAnswer [],Numbers *nPtr) {

    char **table;



    guess = 9;
```

```
for (int i = 0; i < level; i++) {
    answer[i] = rand() % 10; //creating answer from 0-9
    sAnswer [i] = answer[i] + 48; //ascii equivalent to numbers
    match[i] = false; //Set all to false

    //cout<<"answer = "<<answer[i]; //For diagonostics
}




//    answer[0]=3;
//    answer[1]=3;
//    answer[2]=4;
//

table = new char *[guess]; //Creating 2 d dynamic array
for (int i = 0; i < guess; i++) { //
    table[i] = new char[level];
}
// cout<<endl;
nPtr->xs = 0;
nPtr->os = 0;

for (int i = 0; i < guess; i++) {//Filling the array with empty spaces
    for (int j = 0; j < level; j++) {
        table[i][j] = ' ';
    }
}
```

```
    return table;
}


/
**************************************isvalid*********************************************
*
 * Purpose: To check whether or not the user entered 3 numbers
 * Input: usrG, level
 * Output: True or false


*****************************************************************************************
**/
bool isvalid(string usrG, int level) {
    // cout<<"Call isvalid."<<endl; //For diagonostics
    if (usrG.length() != level) {
        cout << "Please enter " << level << " numbers." << endl;
        return false;
    } else {
        for (int i = 0; i < level; i++) {
            if (usrG[i] < 48 || usrG[i] > 57) {
                cout << "Number not entered" << endl;
                return false;
            }
        }
        // cout<<"number valid"<<endl;//For diagonostics
        return true;
    }

}
```

```
/
*************************************Compare*****************************************
***
 * Purpose: To compare the user's guess with the answer and return how many
 * were correct or incorrect.
 * Input: answer,  usrG, match, level, nPtr
 * Output:none

*****************************************************************************************
**/

void compare(int answer[], string usrG, bool match[], int level, Numbers *nPtr) {
   nPtr->xs = 0;
   nPtr->os = 0;

   for (int i = 0; i < level; i++) {
      match[i] = false; //int all values to zero again
   }

   //Checking for correct numbers in the right position
   for (int i = 0; i < level; i++) {
      if (answer[i] == (usrG[i] - 48)) { //subtracting 48 makes it an integer
         nPtr->xs++;
         //cout<<"match["<<i<<"] = true"<<endl;
         match[i] = true;
      }
   }
   //Checking for os
   for (int i = 0; i < level; i++) { //i is position of answer
      for (int j = 0; j < level; j++) { //j is position of usrG(user guess)
         if (j != i && match[i] == false && answer[i] == usrG[j] - 48) {
```

```
            //   //           cout<<"Match["<<i<<"] = "<<match[i]<<" usrG["<<j<<"] = "<<usrG[j]<<endl
            //     //                 <<"Answer["<<i<<"] = "<<answer[i]<<endl;
            nPtr->os++;
            match[i] = true;
          }
       }
   }

}

/
**************************************gssHst*************************************************
*
 * Purpose: To keep a record of the the user's guesses
 * Input: usrG, counter, table
 * Output:none

*****************************************************************************************
**/
void gssHst(string usrG, int counter, char **table, int level) {
   for (int i = 0; i < level; i++) {
      table[counter][i] = usrG[i];
   }
   //   cout<<"\n"; //For Diagnositics
   //   for(int i=0;i<9;i++){
   //       for(int j=0;j<level;j++){
   //           cout<<table[i][j];
   //       }
   //       cout<<"\n";
   //   }
   //   cout<<"\n\n\n\n";
```

```
}

/
**********************************Sort**************************************************
 * Purpose: To Sort all the user guesses to show I can do it...so HA! Using a bubble sort
 * Input: table, counter, level
 * Output:none

*****************************************************************************************
**/
void sort(char **table, int counter, int level) {

   bool swap = false; //For the bubble swap function
   int indx = 0; //Second index location for table

   cout << "Unsorted answers from you!!" << endl;
   for (int i = 0; i < counter; i++) {
      for (int j = 0; j < level; j++) {
         cout << table[i][j];
      }
      cout << endl;
   }

   do {
      swap = false;

      for (int i = 0; i < counter - 1; i++) { //counter -1 because bubble swap is always columns - 1
         indx = 0;
         while (table[i][indx] == table[i + 1][indx] && indx < level)indx++; //Checking to see if current
         //index is equal then going to next location if they
```

```
            //are equal.
            if (table[i][indx] > table[i + 1][indx]) { //If that row and col. not equal
                //then check if first is larger if it is then swap all numbers
                //cout << endl << "i = " << i << endl;
                for (int j = 0; j < level; j++) { //Swapping each 2 rows and their respective columns until all the rows are swapped
                  // cout << "Table[i] = " << table[i][j] << "table[i+1] = " << table[i + 1][j] << endl; //For diagnostics
                   table [i][j] = table [i][j]^table[i + 1][j]; //in place swap. to hopefully make Dr lehr happy so he give me extra credit
                   table [i + 1][j] = table [i][j]^table[i + 1][j];
                   table [i][j] = table [i][j]^table[i + 1][j];
                }
                swap = true;
            }

        }
    } while (swap == true);

    cout << "Sorted answers via bubble sorts !!" << endl;
    for (int i = 0; i < counter; i++) {
        for (int j = 0; j < level; j++) {
            cout << table[i][j];
        }
        cout << endl;
    }

}
```