Mastermind.

Project2

CSC- 5 – 46091 Intro 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 have some sort of log of players' best scores. The log 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 game would start by asking who the player was and if no profile exist the program would ask the player to create one. 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

My main purpose was to create a Mastermind game more like the original. So I started with mastermind Jr. which is a simpler version of mastermind I came up with. Mastermind Jr. only had 3 digit pins so in the second version I decided to keep the 3 digit pin as an option for easy and added a 4 digit option for a normal mode.

Because most of the logic was already there from the Mastermind Jr. game I only had to add a few items to make it work. These items included more variables, a two dimensional dynamic array, a static array, a method for filling those arrays, pointers for the dynamic and a sorting method to sort the answers the that user gave. I also added a swapping method to sort the answers that that user gave. In addition the program now outputs the current answer to a file. This allows the user to check to see what the answer was if they do not get it right. Lastly I solved a bug in which the program gave the wrong amount of os when the answer had doubles.

3. Research

I. Double Pointer
The only way I know how to create a dynamic parallel array is to use a double pointer. Because of my need to use a dynamic array I implemented this code

II. Parallel arrays
In this project because I used arrays I then could use parallel arrays. I needed parallel arrays to check in a particular location (answer[0] compare to usrG[0]), was the same or not. Then after comparing on location I could then loop the next (answer[0] compare to usrG[1]).

III. Bubble sort
I thought it would be need to show the player's answers then sort them numerically. Though it is not the most efficient sort I decided to implement the bubble sort due to the fact there would only be nine columns to sort max. The bubble sort check each digit of each row to the row after it. If the second row is smaller it is swapped with the first one. I used a Mark in place swap.

IV. Dynamic Arrays
This program is designed to log all of the players' answers for one round. Because the program allows the player can choose a 3 digit or a 4 digit pin, I wanted to implement a logging system that changes in size. So using a dynamic array, if the player chooses a four digit pin the array would have four columns, if three the array would have three columns.

4. Variables list

Type	**Variable Name**	**Description**	**Line**
int	Level	How many digits the pin is	33
	xs	right place counter	40
	counter	How many times the player guessed	44
	answer[SIZE]	Array for the answer	35
	Indx	Location for the table	265
short	os	right number counter	35
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)

Group	type	code	line
Variables	int	int xs	37
	Bool	bool swap = false;	264
	Short	Short ox	38
	string	string usrG;	39
Input Output	Getline	getline(cin, temp);	69
	cout	cout<<"Input your guess: "<<endl;	74
	endl	cout<<endl;	55
Math statements		table[i+1]	294
Type conversion			
Constants	Global	const int SIZE = 4;	27
	local		
condition	=	int level = 3;	33
	==	while(isvalid(usrG) == false);	97
style	comment	//variables	31
Decisions	!=	if(usrG.length() != level){	189
	<, >, ||	if (usrG[i] <48 || usrG[i] > 57){	195
Validating user input		while	
multiway branches	if	if(usrG.length() != level){	189
	else	else{	193
Loops	nested	do{	65
Conditional		if(input.is_open()){	45
		for(int j = 0; j<level;j++){	173
	for	for(int i = 0; i<9; i++){	172
	do-while	while(temp[0]!=49 && temp[0]!=50);	70,71
Increment	++	i++;	124
Decrement	--	guess--	109
Sentinel		}while(swap == true);	309
Counter		xs++	188
predefined function	srand, time	srand(time(0));	41
	rand	answer[i] = rand()%10;	159
Function prototypes	Prototyping	int compare(int [], short&, string, …	21
	Bool	bool isvalid(string, int);	20
	void	void gssHst(string, int, char **, int);	22
	Pass by value	bool isvalid(string usrG, int level)	195
	Pass by reference	int compare(int [], short&, string, bool …	21
	Defaulted Arguments	int level = 3	151
	Static Variables	guess = 9	156
	Stubs	//cout<<"answer = "<<answer[i]; //For diagonostics	162

	Drivers	Version 3	
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
	Gobal	const int SIZE = 4;	27
array	1-Dim	int answer[SIZE];	34
	2-Dim	cout<<table[i][j]	284
	Paralled	table[counter][i]	258

	Searching	for(int i = 0; i<level; i++){ //i is position of answer
		for(int j = 0; j<level; j++){
		if(j !=i && match[j] == false && answer[i] == usrG[j]-48){
		os++;
		match[i] = true;
		}
		}
		}
			238-247

	Sorting	do{
		swap = false;
		
		for(int i = 0; i<counter-1; i++){ indx = 0;
		
		while(table[i][indx]==table[i+1][indx] && indx<level)indx
		(table[i][indx]>table[i+1][indx]){
		for(int j = 0; j <level; j++){
		table [i][j] = table [i][j]^table[i+1][j];
		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);
			289-309

	int array	Int answer[SIZE]	34
	bool aray	Bool mathc[SIZE]	35
Pointers	Dynamic arrrays	char **table;	153
Files	Ascii	input.open("instructions.txt");	52
	Binary	output.open("Answer.dat");	83

6. Libraries included

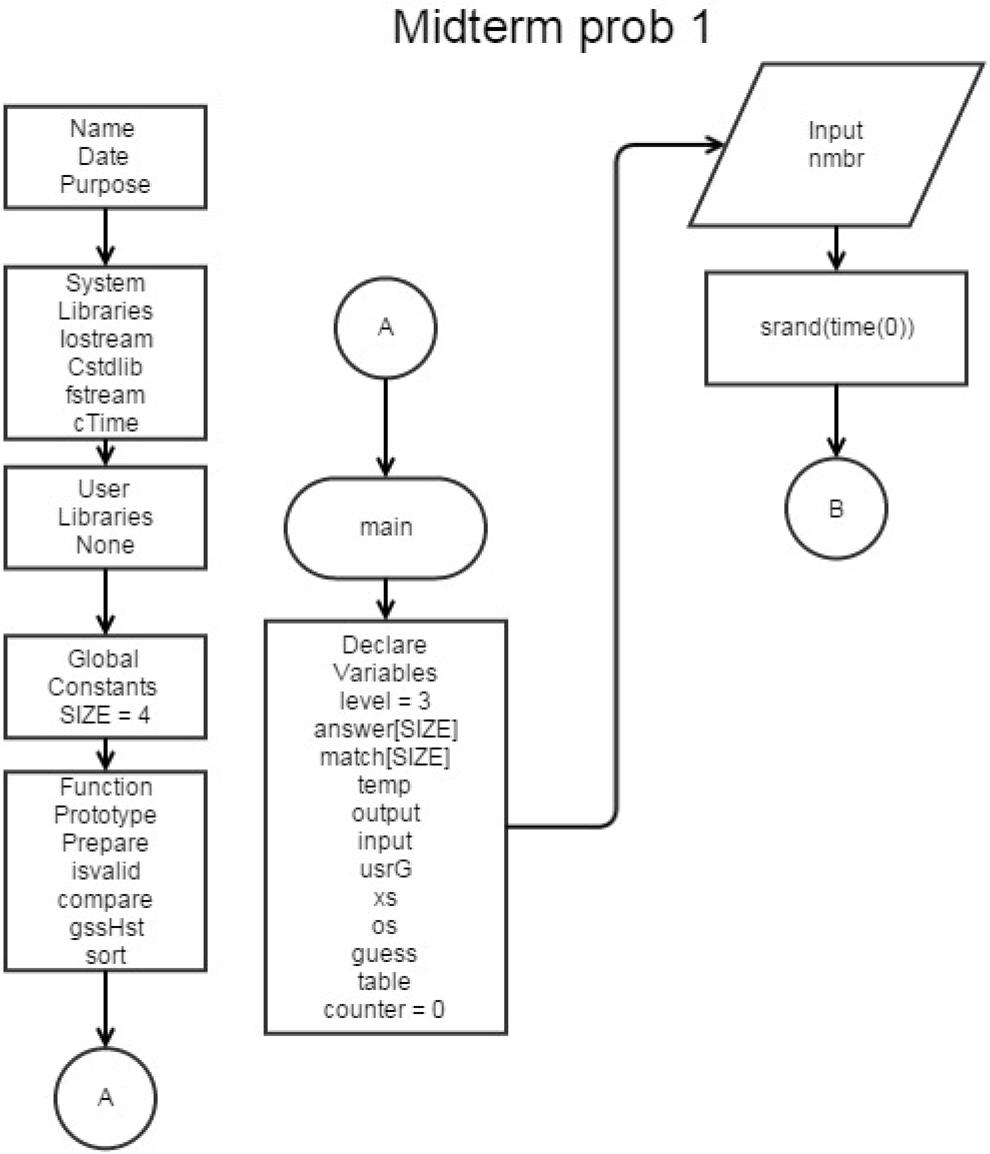
- <cstdlib>
- <iostream>
- <ctime>
- <fstream>
- <string>

7. Pseudo code

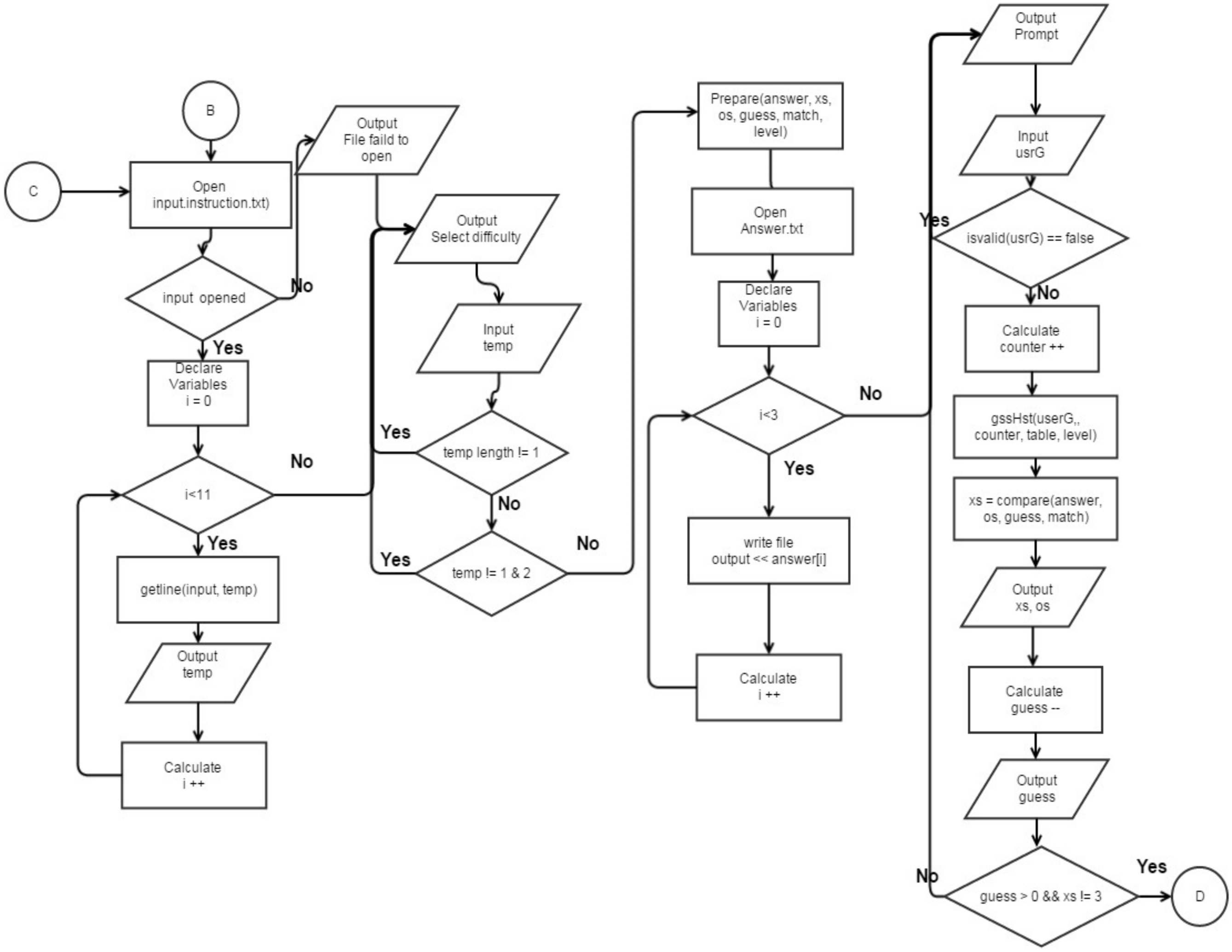
```
Set time seed
Output instruction from file
Do
    Ask user for easy or normal
Do
    Call prepare function
        Random answer and initialize other variables
        Create table
    Output the answer to file
    Game start
    do
        Input guess number
        Call isvalid to check validation
        Call gssHst
        Call compare function
        Display Xs and Ox (result)
        Guess -1
    While guess>0 and guess answer is not correct
    Call sort answers
    Delete table
    If x==level output win
    Else output lose
    Ask for another new game
While(Yes)
```

7. Flowchart

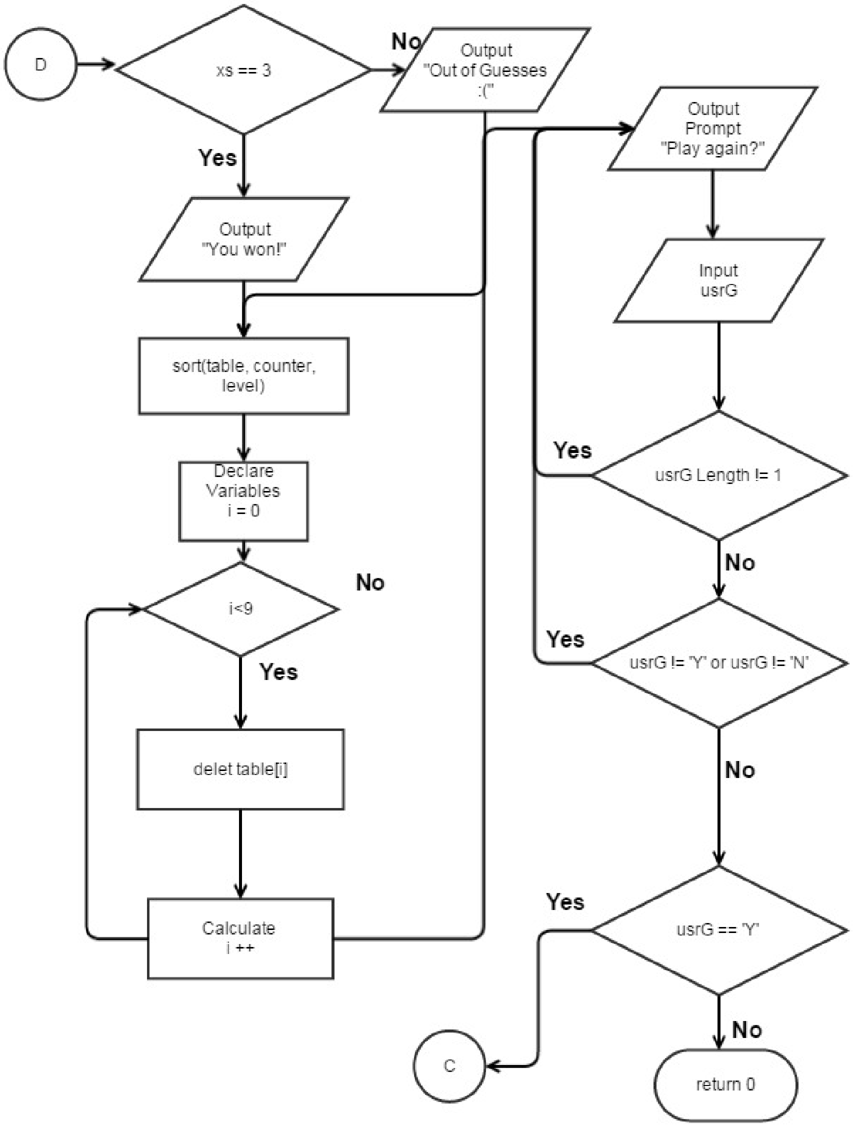
Main



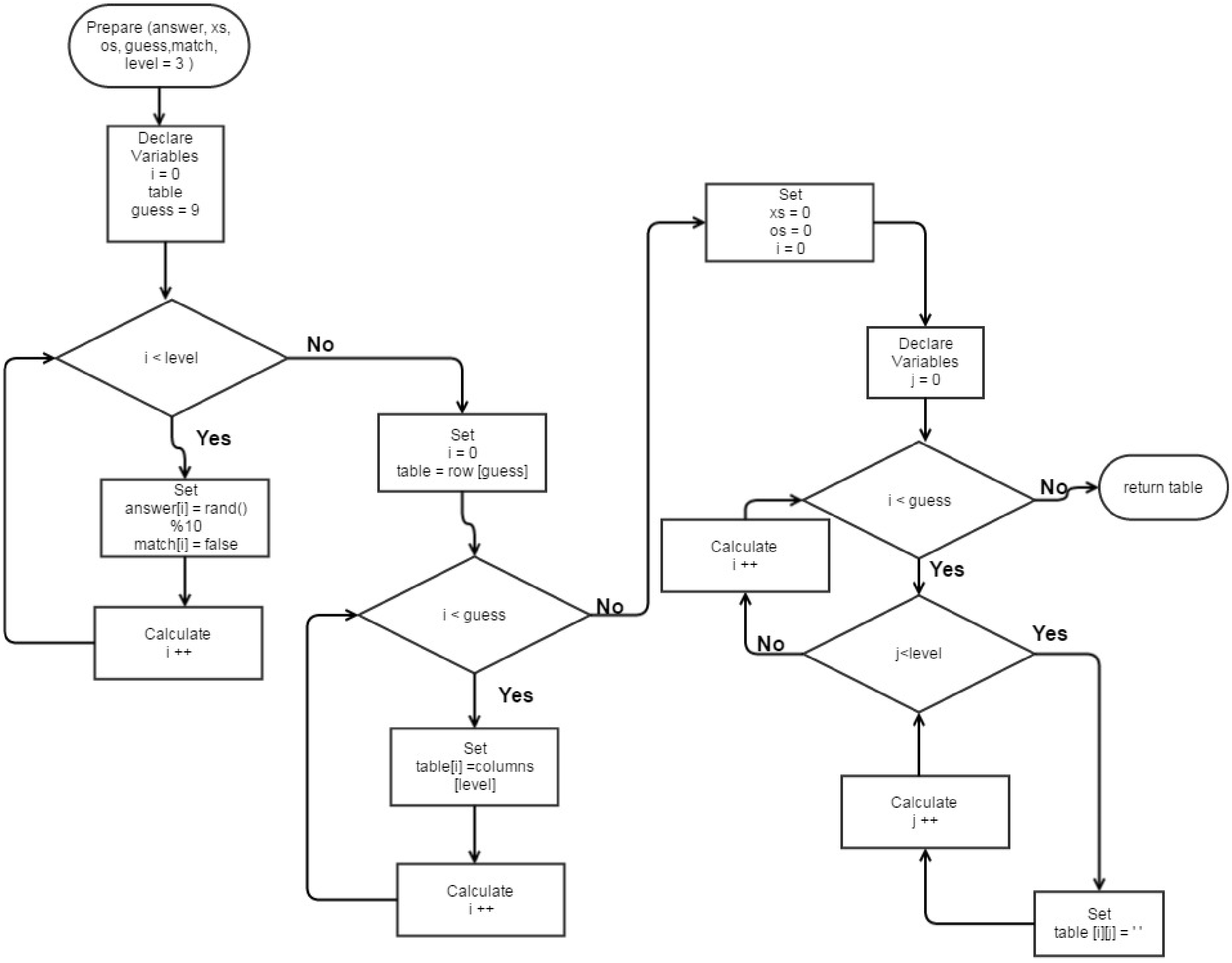
Main


B
C
Open
input.instruction.txt)
input opened
No
Output
File faild to
open
Yes
Declare
Variables
i = 0
i<11
No
Yes
getline(input, temp)
Output
temp
Calculate
i ++
Output
Select difficulty
Input
temp
Yes
temp length != 1
No
Yes
temp != 1 & 2
No
Prepare(answer, xs,
os, guess, match,
level)
Open
Answer.txt
Declare
Variables
i = 0
i<3
No
Yes
write file
output << answer[i]
Calculate
i ++
Output
Prompt
Input
usrG
Yes
isvalid(usrG) == false
No
Calculate
counter ++
gssHst(userG,,
counter, table, level)
xs = compare(answer,
os, guess, match)
Output
xs, os
Calculate
guess --
Output
guess
No
guess > 0 && xs != 3
Yes
D

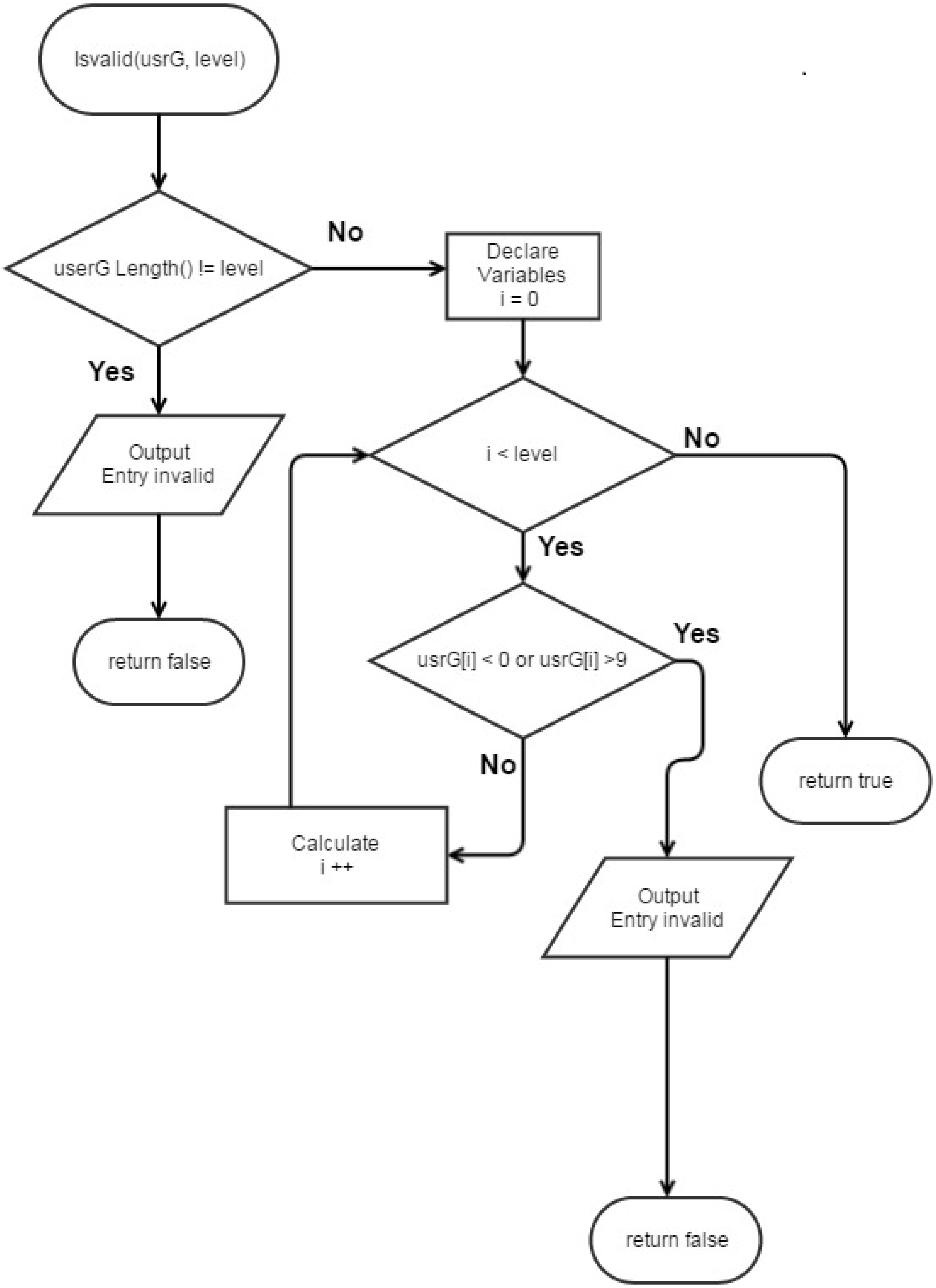
Main


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

Prepare

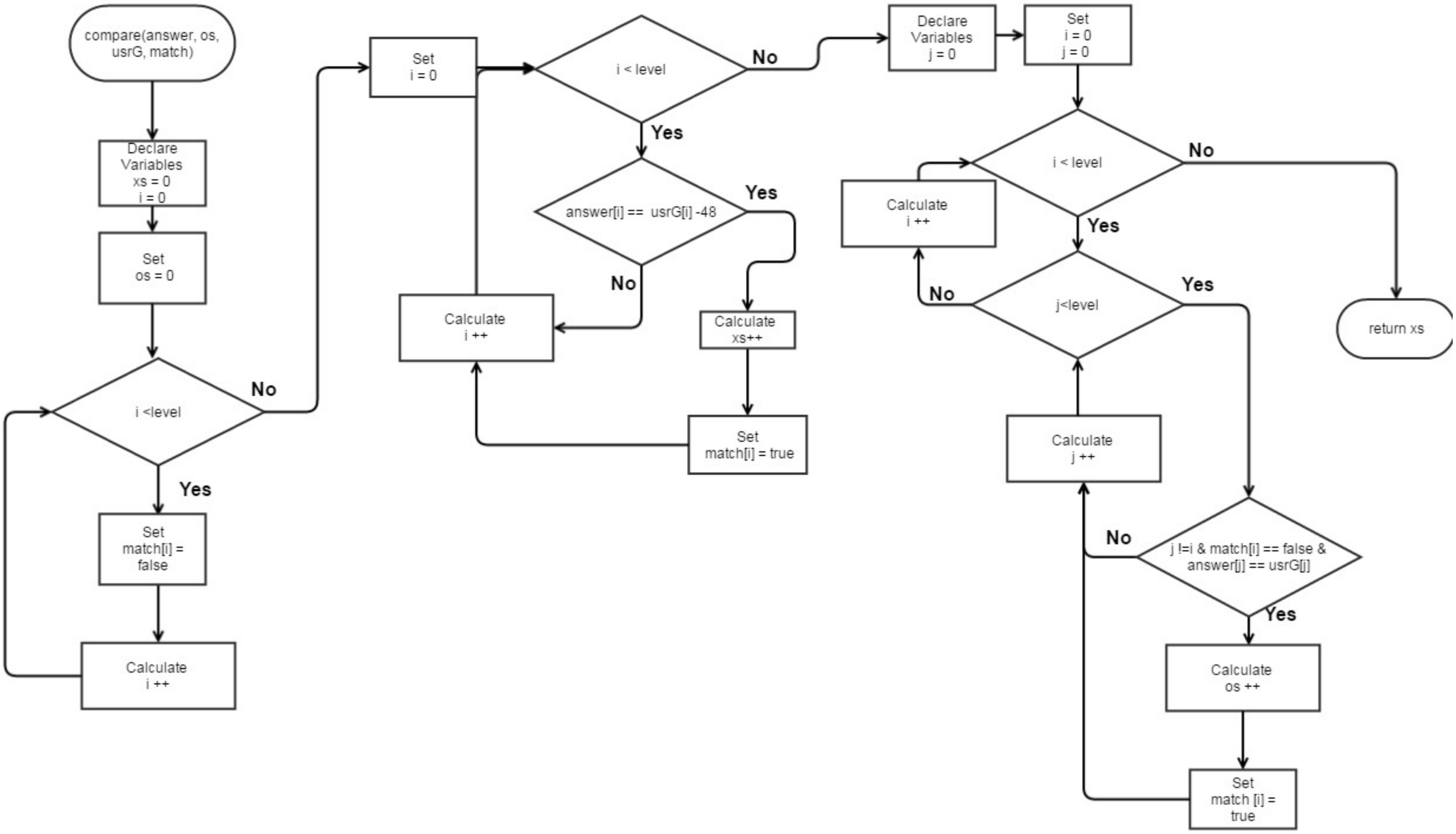

Prepare (answer, xs, os, guess,match, level = 3)
Declare Variables i = 0 table guess = 9
i < level
No
Yes
Set answer[i] = rand() %10 match[i] = false
Calculate i ++
Set i = 0 table = row [guess]
i < guess
No
Yes
Set table[i] =columns [level]
Calculate i ++
Set xs = 0 os = 0 i = 0
Declare Variables j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

isValid

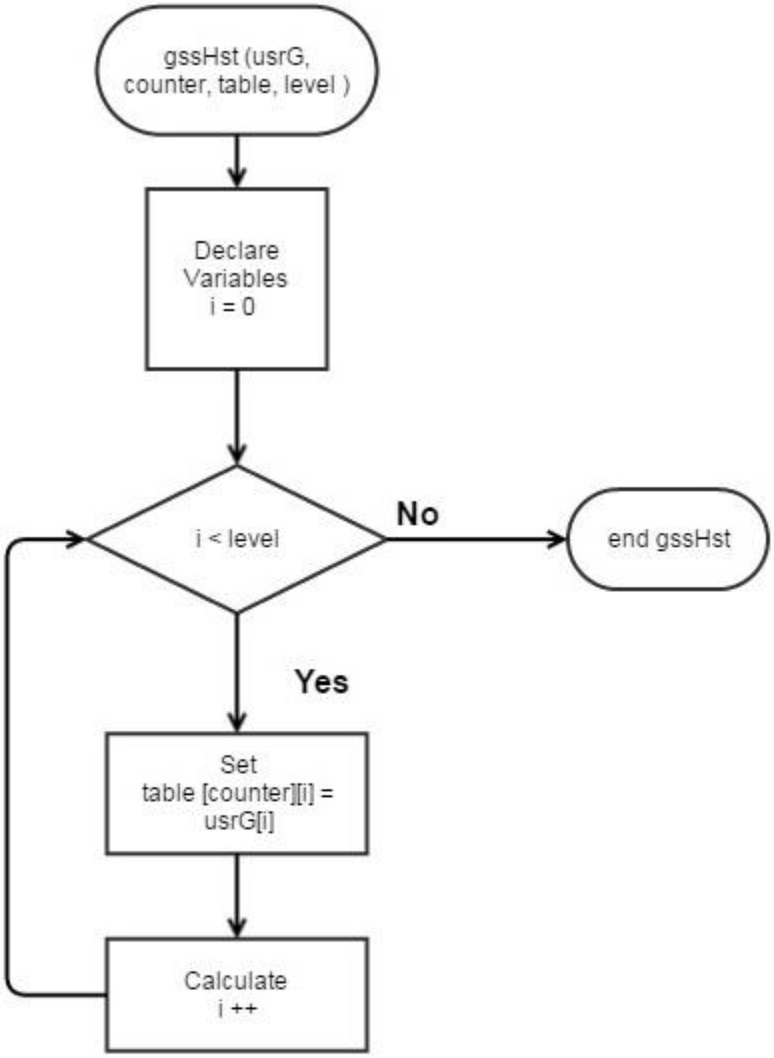


Isvalid(usrG, level)
userG Length() != level
No
Declare
Variables
i = 0
Yes
Output
Entry invalid
i < level
No
return false
Yes
usrG[i] < 0 or usrG[i] >9
Yes
No
return true
Calculate
i ++
Output
Entry invalid
return false

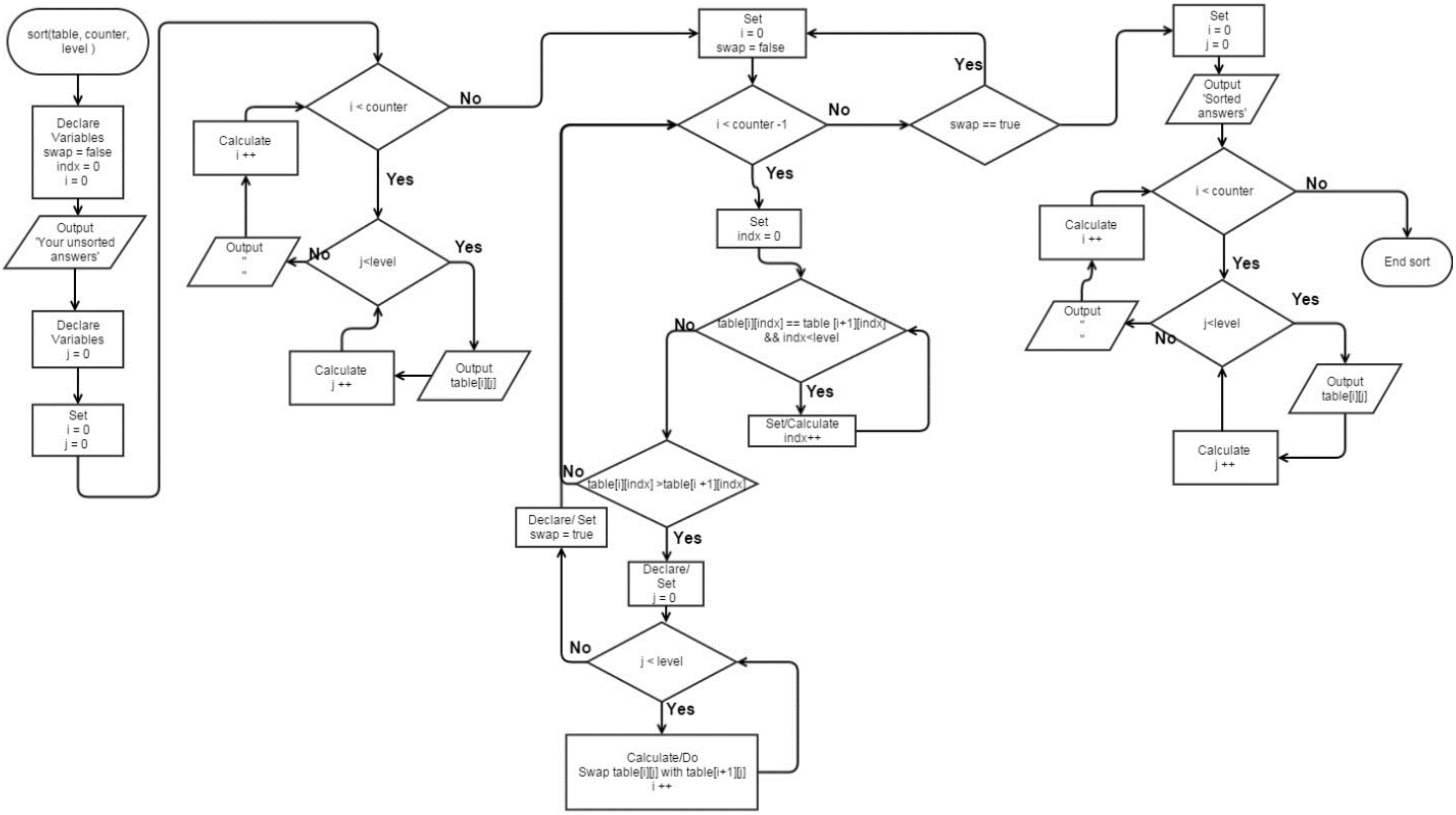
Compare


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

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

8. Input, output (raw)

```
****************************************************************************************
**                                   **Mastermind **
**          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 **
**          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)
```

9. Code

```
/*
 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>

using namespace std;

char ** prepare(int [], int&, short&, int&, bool[], int);
bool isvalid(string, int);
int compare(int [], short&, string, bool[], int);
void gssHst(string, int, char **, int);
void sort(char **, int, int);

//Global

const int SIZE = 4;

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

    //Variables

   int level = 3; //Difficulty  of game
   int answer[SIZE];    //number of pin
   bool match[SIZE]; //Which numbers are matched
   string temp; //For the file output
   ofstream output;     //
   ifstream input; //inputting to the file
   string usrG; //The users guess or input
   int xs; //How many x's
   short os; //How many o'x
   int guess; //How many guess the user had guessed
   char **table;  //Table of the user guesses
   int counter = 0; //Row counter for table

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

       counter = 0;

      // cout<<"Call prepare."<<endl;//For diagonostics
       input.open("instructions.txt");
       if(input.is_open()){
           for (int i = 0; i<12; i++){
           getline(input,temp); //Change instructions
           cout<<temp;
           }
           input.close();
        }
       else{
           cout<<"Instructions failed to open"<<endl;
       }
       cout<<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, xs, os, guess, match, level); //Initialize

       // cout<<"Call prepare."<<endl;//For diagonostics
       output.open("Answer.dat");

       for (int i = 0; i<level; i++){
        output<<answer[i];
        }
       output.close();


//      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
           xs=compare(answer, os, usrG, match, level);

           cout<<"X(s)="<<xs<<endl; //Right numbers in right space
           cout<<"O(s)="<<os<<endl; //How many Correct number but in the incorrect space
           guess--;
           cout<<"Guesses left: "<<guess<<endl;
       }while(guess > 0 && xs != level);// User out of guess or has guess correctly

       if ( 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(usrG[0]!=89 && usrG[0]!=78);
           //}while(usrG[0] > 'Y' || usrG < 'N' || (usrG[0]>'N' && usrG[0]<'Y'));
   }while(usrG[0]=='Y' );

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



    return 0;
}

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


*****************************************************************************************
******/
char ** prepare (int answer[], int &xs, short &os, int &guess, bool match[], int level =
3){

    char **table;


   guess = 9;

    for (int i = 0; i<level; i++){
        answer[i] = rand()%10; //creating answer from 0-9
        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;
    xs = 0;
    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, os, usrG, match, level
 * Output:xs
```

```
*****************************************************************************************
******/

int compare(int answer[], short &os, string usrG, bool match[], int level){
    int xs = 0;
    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
           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[j] == false && answer[i] == usrG[j]-48){
//     //           cout<<"Match["<<i<<"] = "<<match[i]<<" usrG["<<j<<"] =
"<<usrG[j]<<endl
//      //                  <<"Answer["<<i<<"] = "<<answer[i]<<endl;
                os++;
                match[i] = true;
            }
        }
    }
    return xs;
}
/***************************************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<<"i>i+1"<<endl;//For diagnostics
                for(int j = 0; j <level; j++){ //Swapping each 2 rows and their
respective columns until all the rows are swapped
                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;
    }
}
```