

Philip Pesic

Week 17

December 11 2022

Week 17 Final Project

Final Project Part 2 - Memory Matching Game Code – Text Based

Game

Requirements

Create a class ‘MemoryMatchGame’, with the various variables, arrays and functions need to play the game.

Hint: Use functions to divide the code up into specific functional areas

Have the game player select a 1 of the 3 Themes and have 50 words associated with the selected theme.

Choose game theme:

- 1) Theme name 1
- 2) Theme name 2
- 3) Theme name 3

Creating the three(3) theme files is part 1 of the final project.

- o Words must have a common theme - your choice
- o MAX individual word length is 8 characters, no spaces, 1 word per line...
- o Examples: Like Periodic Table Elements, or Sports teams, or Types of cars...
- o Hint: load, from one of the three files, into a single dim array of string in class (Menu to select)

Have one Term describing a category you picked. This is the FACE term...

Additional Menu User Interaction:

Level of Play – Use selects at start of game

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4 x 4 grid (Easy)

6 x 6 grid (Moderate)

8 X 8 grid (Difficult)

Hint: Save as a variable in the class

Speed of Play – At start of game, User selects time interval for User selected term-pair to display

2 seconds (Difficult)

4 seconds (Moderate)

6 seconds (Easy)

Hint: Save as a variable in the class, for MS Window coders – use “sleep” code for delay...

Next, Populate answer Grid with randomly selected Terms from the theme array

At start of game – program places the same face/theme term in ALL visible squares in the visible grid

Real Answers not yet visible, only theme name is displayed in all squares, at start of game.

Program select number of random terms from the 50 available for selected theme (that programmer set up)

- o If 4 x 4 grid, randomly pick 8 terms, place each image name twice in 2-Dim array.
- o If 6 x 6 grid, randomly pick 18 terms, place each image name twice in 2-Dim array.
- o If 8 x 8 grid, randomly pick 32 terms, place each image name twice in 2-Dim array.

Hint: Randomly shuffle theme array and just pick the first 8, or 18 or 32 terms per game player selection

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Next, display the current game state on screen.

Note: 'Answer' array is different from 'display' array

During the course of play, the face/theme term in the display grid is replaced by a

corresponding array terms, when user selects a grid square

Decide on how the user select/chooses a square/cell/location that is displayed... there many

different

methods.

Game Play

1) User selects a FIRST square, the theme/face term in the grid square is replace with

correspond stored term, from the 2-dim answer array

2) User selects a SECOND square, the term theme/face in the second grid square is replace with

the corresponding stored term, from the 2-dim answer array

3) The computer compares the terms for the two selected squares.

If they are the same, the terms remain on the screen and can no longer be selected.

If they are different, the term remain the screen for 2, 4 or 6 seconds, depending on user

selection at the beginning of the game. After that elapse time, those two grid terms are

replaced with the face/theme term.

=====

The class you write

A class consists of variables/arrays and functions.

All your variables/arrays and functions are to be encapsulated inside the Memory Match game

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class you write.

The class will use 1 and 2 dimensional arrays

The class will have several variables

The class will have several functions – clearly named

There will be NO GLOBAL VARIABLES/Arrays or functions declared above int main(). All variables

and arrays and functions will be ENCAPSULATED in the class.

The int main() in your code contain only two lines of code::

```
#include iostream;
```

```
using namespace std;
```

```
#include string;
```

```
#include MemoryMatchGame;
```

```
Int main() {
```

```
    MemoryMatchGame Game1; // first line - declare instance of game
```

```
    Game1.start();           // second line - start game
```

```
}
```

Timer (Extra credit) - Create/display a timer that keep track of the number of seconds it took to win a game.

To receive the most credit, this project must be functional.

Hint:

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Possible arrays needed:

string theme50Words[50] - load from file into this array

string answerArray[#][#} - load 8, 18, or 32 words twice into this array, depending on game size

selected

string gamePlayArray[#][#] – Game play and display array

//

// main.cpp

// Week 17 Final Project

//

// Created by Pippo Pesic on 11/28/22.

//

#include "MemoryMatchGame.h"

int main() {

 MemoryMatchGame game1;

 game1.start();

 return 0;

}

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```
//
```

```
// MemoryMatchGame.h
```

```
// Week 18 Final Project
```

```
//
```

```
// Created by Pippo Pesic on 11/28/22.
```

```
//
```

```
#ifndef MemoryMatchGame_h
```

```
#define MemoryMatchGame_h
```

```
#include <iostream>
```

```
#include <fstream>
```

```
#include <string>
```

```
#include <iomanip>
```

```
#include <stdlib.h>
```

```
#include <unistd.h>
```

```
#include "Board.h"
```

```
using namespace std;
```

```
class MemoryMatchGame {
```

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```
//Define Board Arrays
```

```
Board board = *new Board();
```

```
int rowGuess1 = -1;
```

```
int columnGuess1 = -1;
```

```
int rowGuess2 = -1;
```

```
int columnGuess2 = -1;
```

```
int difficultyLevel;
```

```
string theme;
```

```
int guessTime;
```

```
const int BASE_TIME = 1000000; //In Milliseconds
```

```
string guessedThemeWords[32];
```

```
public:
```

```
void setTheme() {
```

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```
bool isThemeSelected = false;

while (!isThemeSelected){

    cout << "Select theme: Cars, Elements, Fruit: [c,e,f] ";

    cin >> theme;

    cout << endl;

    if (theme == "c" or theme == "e" or theme == "f") {

        isThemeSelected = true;

    }

    else {

        cout << endl << "Invalid theme" << endl;

    }

}

}

}

void setDifficultyLevel() {

    cout << "Enter difficulty level (4, 6, 8): ";

    cin >> difficultyLevel;

    if (difficultyLevel != 4 and difficultyLevel != 6 and difficultyLevel != 8) {

        cout << endl << "Invalid difficulty level" << endl;

    }

}
```


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```
}
```

```
void setTimeDelay() {
```

```
    cout << endl << "Enter time in seconds between guesses (2, 4, 6): ";
```

```
    cin >> guessTime;
```

```
    if (guessTime == 2 or guessTime == 4 or guessTime == 6) {
```

```
        guessTime = guessTime * BASE_TIME;
```

```
    }
```

```
    else {
```

```
        cout << endl << "Invalid time" << endl;
```

```
    }
```

```
}
```

```
void gameLoop() {
```

```
    int guessedWordsCount = 0;
```

```
    int uniqueWordCount = difficultyLevel * difficultyLevel / 2;
```

```
    while (guessedWordsCount < uniqueWordCount) {
```

```
        cout << "Guess 1:" << endl;
```

```
        cout << "Enter column (0, 1, 2, 3...) ";
```

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```
        cin >> columnGuess1;

        cout << endl << "Enter row (0, 1, 2, 3...) ";

        cin >> rowGuess1;


        // re-print board

        board.printBoard(guessedThemeWords, rowGuess1, columnGuess1, -1, -1);


        cout << endl << "Guess 2:" << endl;

        cout << "Enter column (0, 1, 2, 3...) ";

        cin >> columnGuess2;

        cout << endl << "Enter row (0, 1, 2, 3...) ";

        cin >> rowGuess2;


        if (board.isMatch(rowGuess1, columnGuess1, rowGuess2, columnGuess2)){

            guessedThemeWords[guessedWordsCount] = board.getElement(rowGuess1,
columnGuess1);

            guessedWordsCount++;

        }

        else {

            board.printBoard(guessedThemeWords, rowGuess1, columnGuess1, rowGuess2,
columnGuess2); // print both guesses and delay
```

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```
        usleep(guessTime);
    }

    // re-print board
    board.printBoard(guessedThemeWords, -1, -1, -1, -1);
}
}

//Start procedure and guess loop
void start() {

    setTheme();
    setDifficultyLevel();
    setTimeDelay();

    board.boardSize = difficultyLevel;
    board.theme = theme;
    board.initializeBoard();
    board.printBoard(guessedThemeWords, -1, -1, -1, -1);

    gameLoop();
}
```

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```
        cout << "You won!" << endl;

        cout << "Philip Pesic 12/11/22" << endl;

    }

};
```

```
#endif /* MemoryMatchGame_h */
```

```
//
```

```
// Board.h
```

```
// Week 17 Final Project
```

```
//
```

```
// Created by Pippo Pesic on 11/28/22.
```

```
//
```

```
#ifndef Board_h
```

```
#define Board_h
```

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```
#include <iostream>
```

```
#include <fstream>
```

```
#include <string>
```

```
#include <iomanip>
```

```
#include <stdlib.h>
```

```
#include <unistd.h>
```

```
using namespace std;
```

```
class Board {
```

```
    string boardData[8][8];
```

```
    string allThemeWords[50];
```

```
public:
```

```
    int boardSize;
```

```
    string theme;
```

```
    // Randomizes the order of words
```

```
    void shuffleArray(string arr[], int size){
```

```
        srand(time(0));
```

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```
for(int i = 0; i < size; i++){

    int randomIndex = rand() % size;

    //swap

    string temp = arr[i];

    arr[i] = arr[randomIndex];

    arr[randomIndex] = temp;

}

}

// check if arr contains a value

bool contains(string arr[], int size, string val){

    for(int i = 0; i < size; i++){

        if(arr[i] == val){

            return true;

        }

    }

    return false;

}

bool isMatch(int row1, int col1, int row2, int col2){
```

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```
return boardData[row1][col1] == boardData[row2][col2];  
  
}
```

```
string getElement(int row, int col){  
  
return boardData[row][col];  
  
}
```

```
void loadAllThemeWords() {  
  
ifstream fin;  
  
string line;
```

```
if (theme == "c") {  
  
fin.open("/Users/pippo/Desktop/Week 18 Final Project/Cars.txt");  
  
}  
  
else if (theme == "e") {  
  
fin.open("/Users/pippo/Desktop/Week 18 Final Project/Atoms.txt");  
  
}  
  
else if (theme == "f") {  
  
fin.open("/Users/pippo/Desktop/Week 18 Final Project/Fruit.txt");  
  
}
```

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```
int i = 0;

while (!fin.eof()) {

    getline(fin, line);

    allThemeWords[i] = line;

    i++;

}

}

void printBoard(string guessedThemeWords[], int rowGuess1, int columnGuess1, int
rowGuess2, int columnGuess2) {

    int uniqueWordCount = boardSize * boardSize / 2;

    for (int i = 1; i < 100; i++) {

        cout << endl;

    }

    for(int row = 0; row < boardSize; row++){

        for(int column = 0; column < boardSize; column++){

            if (contains(guessedThemeWords, uniqueWordCount, boardData[row][column])){

                cout << setw(10) << boardData[row][column];

            }

        }

    }

}
```


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```
        else if ((row == rowGuess1 && column == columnGuess1) || (row == rowGuess2
&& column == columnGuess2)){

            cout << setw(10) << boardData[row][column];

        }

        else {

            cout << setw(10) << "X";

        }

    }

    cout << endl;

}

}

void initializeBoard(){

    // select random theme words

    int count = 0;

    int uniqueWordCount = boardSize * boardSize / 2;

    string selectedThemeWords[32];

    srand(time(0));

    loadAllThemeWords();

    while (count < uniqueWordCount) {
```

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```
// pick a random theme word

int index = rand() % 50;

if (allThemeWords[index] != "") {

    selectedThemeWords[count] = allThemeWords[index];

    allThemeWords[index] = "";

    count++;

}

}

string doubleSelectedThemeWords[64];

for(int i = 0; i < uniqueWordCount; i++){

    doubleSelectedThemeWords[i] = selectedThemeWords[i];

    doubleSelectedThemeWords[i+uniqueWordCount] = selectedThemeWords[i];

}

shuffleArray(doubleSelectedThemeWords, 16);

// assign words into board

int i = 0;

for(int row = 0; row < boardSize; row++){

    for(int column = 0; column < boardSize; column++){
```

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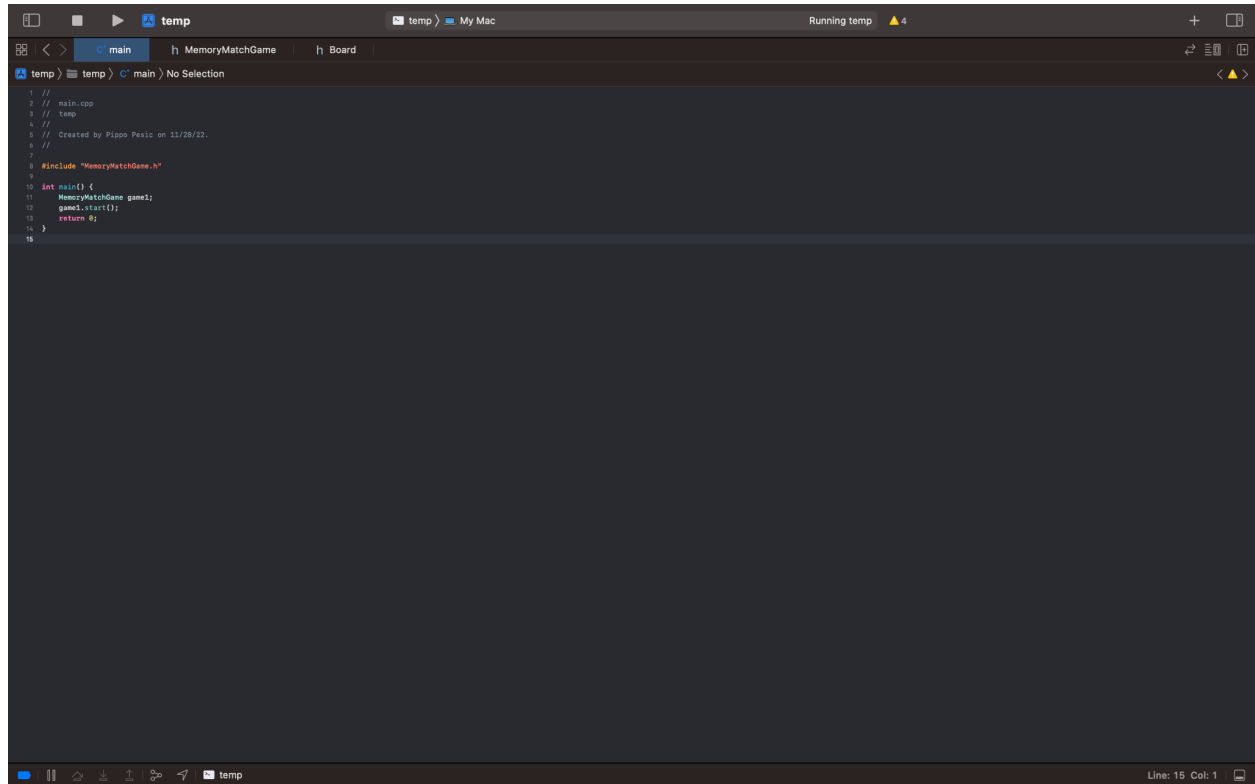
```
        boardData[row][column] = doubleSelectedThemeWords[i];  
        i++;  
    }  
}  
}  
};  
  
#endif /* Board_h */
```

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The image shows a screenshot of a C++ IDE window titled 'temp'. The window has a dark theme and displays a file named 'main.cpp'. The code is as follows:

```
1 //  
2 // main.cpp  
3 // temp  
4 //  
5 // Created by Philip Pesic on 11/28/22.  
6 //  
7  
8 #include "MemoryMatchGame.h"  
9  
10 int main() {  
11     MemoryMatchGame game1;  
12     game1.start();  
13     return 0;  
14 }  
15
```

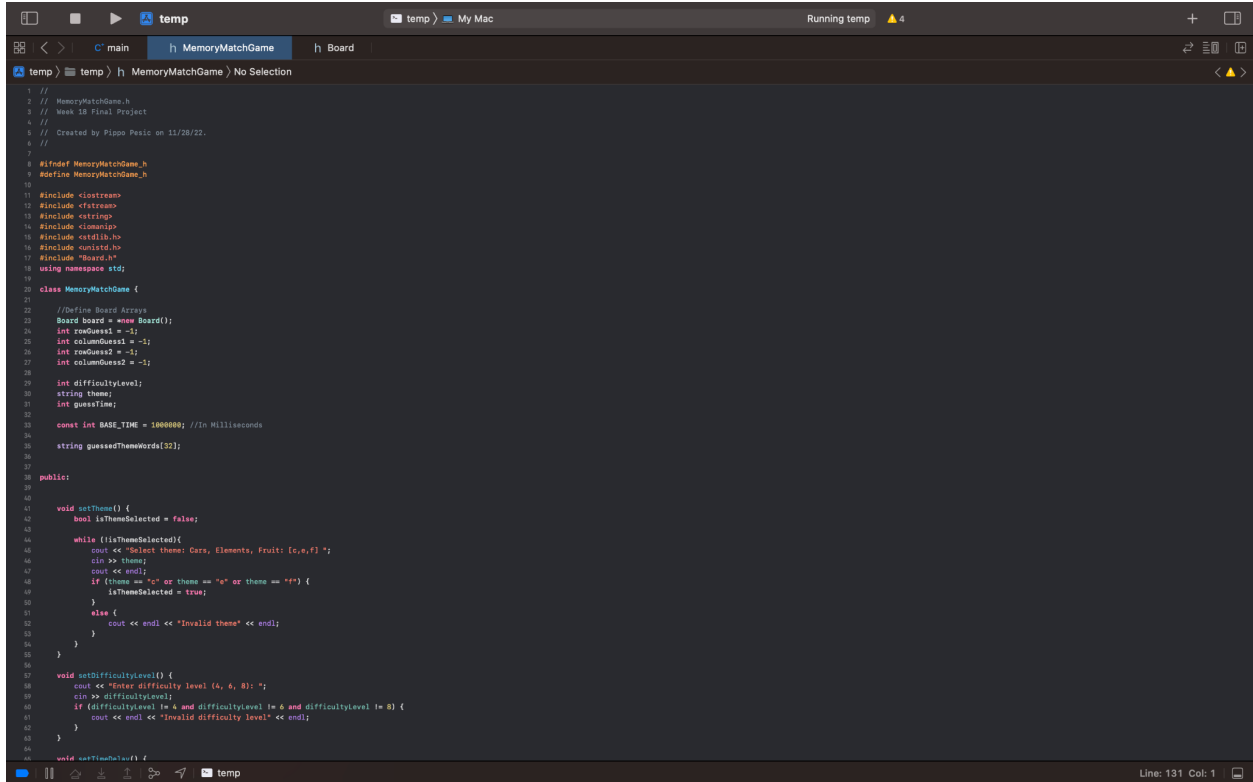
The IDE interface includes a top toolbar with icons for file operations, a breadcrumb trail 'temp > main', and a status bar at the bottom indicating 'Line: 15 Col: 1'.

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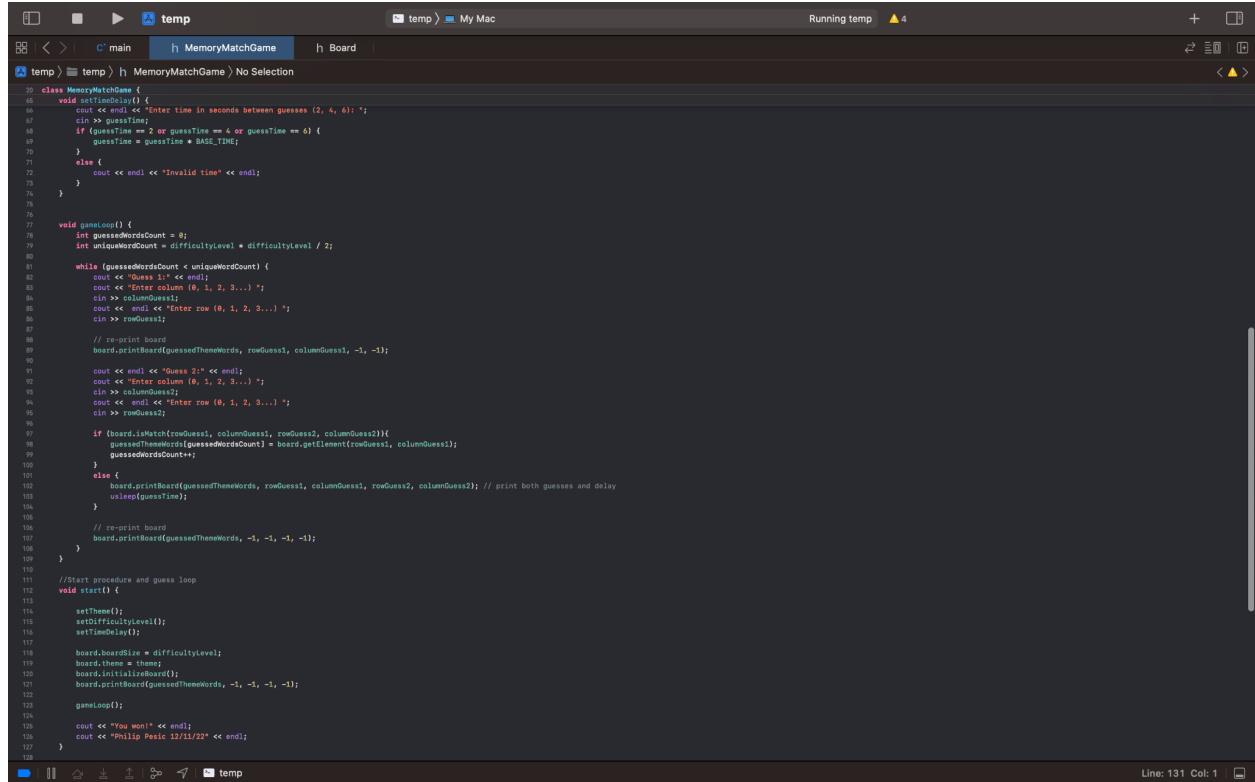
```
1 //
2 // MemoryMatchGame.h
3 // Week 18 Final Project
4 //
5 // Created by Philip Pesic on 11/28/22.
6 //
7
8 #ifndef MemoryMatchGame_h
9 #define MemoryMatchGame_h
10
11 #include <iostream>
12 #include <fstream>
13 #include <string>
14 #include <vector>
15 #include <map>
16 #include <string.h>
17 #include <string>
18 #include <string.h>
19 using namespace std;
20
21 class MemoryMatchGame {
22
23     //Define Board Arrays
24     Board board = new Board();
25     int rowGuess1 = -1;
26     int columnGuess1 = -1;
27     int rowGuess2 = -1;
28     int columnGuess2 = -1;
29
30     int difficultyLevel;
31     string theme;
32     int guessTime;
33
34     const int BASE_TIME = 1000000; //In Milliseconds
35
36     string guessedThemeWords[32];
37
38 public:
39
40     void setTheme() {
41         bool isThemeSelected = false;
42
43         while (!isThemeSelected) {
44             cout << "Select Theme: Cars, Elements, Fruit: [c,e,f] ";
45             cin >> theme;
46             cout << endl;
47             if (theme == "c" or theme == "e" or theme == "f") {
48                 isThemeSelected = true;
49             }
50             else {
51                 cout << endl << "Invalid theme" << endl;
52             }
53         }
54     }
55
56     void setDifficultyLevel() {
57         cout << "Enter difficulty level (4, 6, 8): ";
58         cin >> difficultyLevel;
59         if (difficultyLevel != 4 and difficultyLevel != 6 and difficultyLevel != 8) {
60             cout << endl << "Invalid difficulty level" << endl;
61         }
62     }
63
64     void setThemeWords() {
65
66     }
```

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```
1  temp
2  temp > My Mac
3  Running temp 4
4  main MemoryMatchGame Board
5  temp > temp > MemoryMatchGame > No Selection
6
7  class MemoryMatchGame {
8  public:
9      void setTimeDelay() {
10         cout << endl << "Enter time in seconds between guesses (2, 4, 6): ";
11         cin >> guessTime;
12         if (guessTime == 2 or guessTime == 4 or guessTime == 6) {
13             guessTime = guessTime * BASE_TIME;
14         }
15         else {
16             cout << endl << "Invalid time" << endl;
17         }
18     }
19
20     void gameLoop() {
21         int guessedWordsCount = 0;
22         int uniqueWordsCount = difficultyLevel * difficultyLevel / 2;
23
24         while (guessedWordsCount < uniqueWordsCount) {
25             cout << "Guess 1:" << endl;
26             cout << "Enter column (0, 1, 2, 3...): ";
27             cin >> columnGuess1;
28             cout << endl << "Enter row (0, 1, 2, 3...): ";
29             cin >> rowGuess1;
30
31             // re-print board
32             board.printBoard(guessedTheWords, rowGuess1, columnGuess1, -1, -1);
33
34             cout << endl << "Guess 2:" << endl;
35             cout << "Enter column (0, 1, 2, 3...): ";
36             cin >> columnGuess2;
37             cout << endl << "Enter row (0, 1, 2, 3...): ";
38             cin >> rowGuess2;
39
40             if (board.isMatch(rowGuess1, columnGuess1, rowGuess2, columnGuess2)) {
41                 guessedTheWords[guessedWordsCount] = board.getElement(rowGuess1, columnGuess1);
42                 guessedWordsCount++;
43             }
44             else {
45                 board.printBoard(guessedTheWords, rowGuess1, columnGuess1, rowGuess2, columnGuess2); // print both guesses and delay
46                 usleep(guessTime);
47             }
48
49             // re-print board
50             board.printBoard(guessedTheWords, -1, -1, -1, -1);
51         }
52     }
53
54     //Start procedure and guess loop
55     void start() {
56         setTime();
57         setDifficultyLevel();
58         setTimeDelay();
59
60         board.boardSize = difficultyLevel;
61         board.theme = theme;
62         board.initializeBoard();
63         board.printBoard(guessedTheWords, -1, -1, -1, -1);
64
65         gameLoop();
66
67         cout << "You won!" << endl;
68         cout << "Philip Pesic 12/11/22" << endl;
69     }
70 }
```

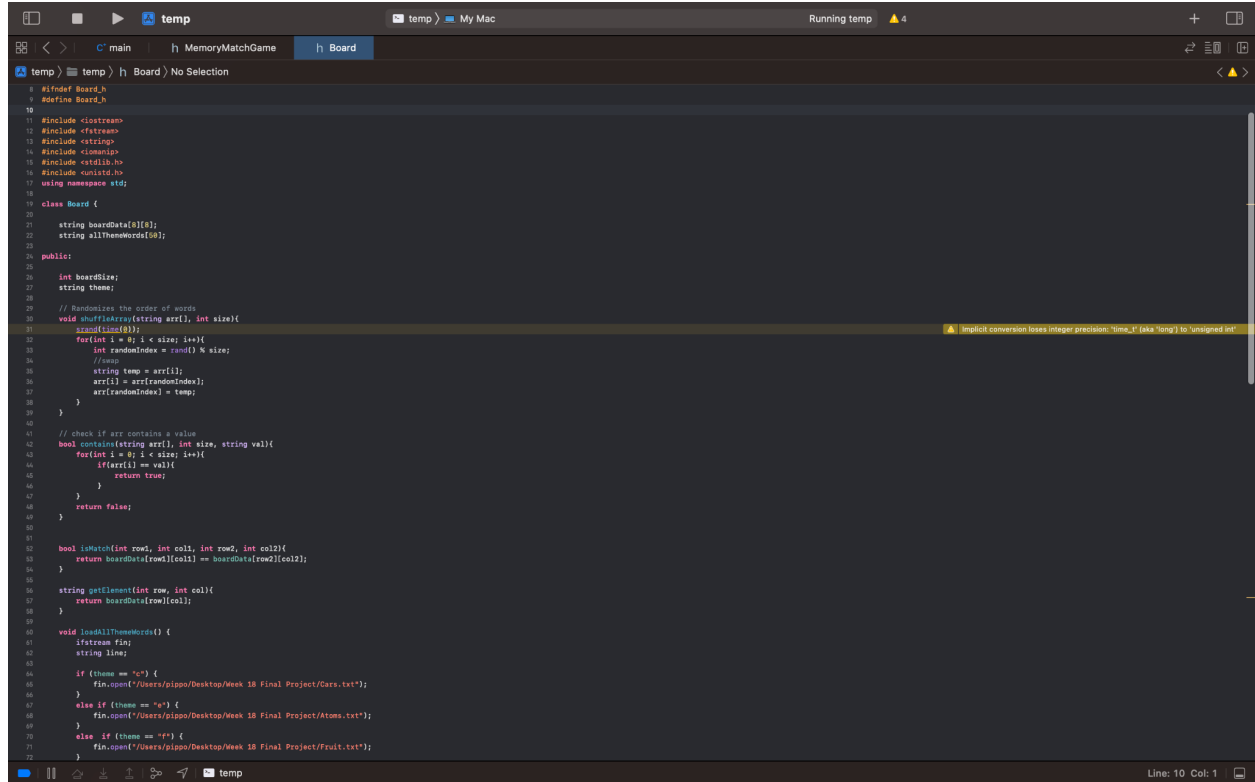
Line: 131 Col: 1

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```
1 #ifndef Board_h
2 #define Board_h
3
4 #include <iostream>
5 #include <fstream>
6 #include <string>
7 #include <memory>
8 #include <stdlib.h>
9 #include <unistd.h>
10 using namespace std;
11
12 class Board {
13
14     string boardData[8][8];
15     string allTheWords[50];
16
17 public:
18     int boardSize;
19     string theme;
20
21     // Randomizes the order of words
22     void shuffleArray(string arr[], int size){
23         srand(time(0));
24         for(int i = 0; i < size; i++){
25             int randomIndex = rand() % size;
26             //swap
27             string temp = arr[i];
28             arr[i] = arr[randomIndex];
29             arr[randomIndex] = temp;
30         }
31     }
32
33     // check if arr contains a value
34     bool contains(string arr[], int size, string val){
35         for(int i = 0; i < size; i++){
36             if(arr[i] == val){
37                 return true;
38             }
39         }
40         return false;
41     }
42
43     bool isMatch(int row, int col, int row2, int col2){
44         return boardData[row][col] == boardData[row2][col2];
45     }
46
47     string getElement(int row, int col){
48         return boardData[row][col];
49     }
50
51     void loadAllTheWords() {
52         ifstream fin;
53         string line;
54
55         if (theme == "c") {
56             fin.open("/Users/pippo/Desktop/Week 18 Final Project/Cars.txt");
57         }
58         else if (theme == "a") {
59             fin.open("/Users/pippo/Desktop/Week 18 Final Project/Atoms.txt");
60         }
61         else if (theme == "f") {
62             fin.open("/Users/pippo/Desktop/Week 18 Final Project/Fruit.txt");
63         }
64     }
65 }
```

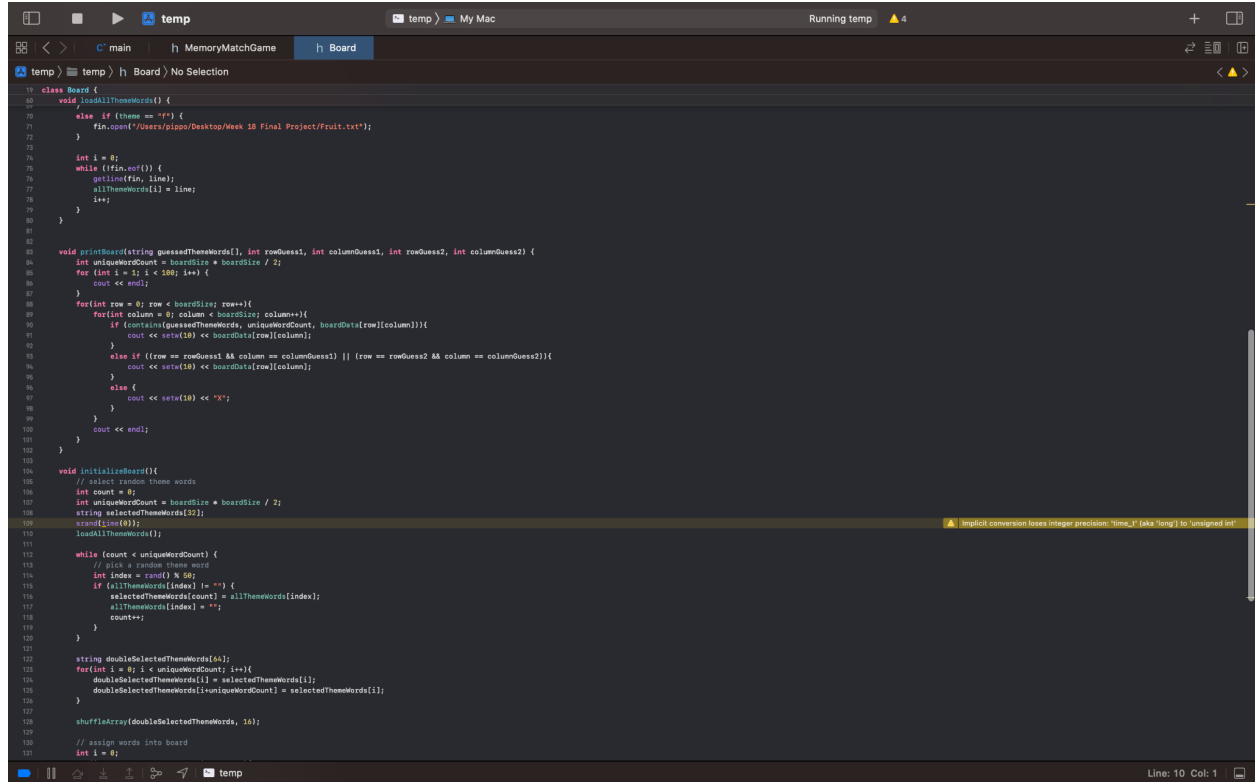
Line: 10 Col: 1

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```
10 class Board {
11     void loadAllThemeWords() {
12         // if theme == "" {
13             // fin.open("/Users/sippo/Desktop/Week 18 Final Project/Fruit.txt");
14         }
15         int i = 0;
16         while (i < fin.eof()) {
17             getline(fin, line);
18             allThemeWords[i] = line;
19             i++;
20         }
21     }
22     void printBoard(string guessedThemeWords[], int rowGuess1, int columnGuess1, int rowGuess2, int columnGuess2) {
23         int uniqueWordCount = boardSize * boardSize / 2;
24         for (int i = 1; i < 100; i++) {
25             cout << endl;
26         }
27         for (int row = 0; row < boardSize; row++) {
28             for (int column = 0; column < boardSize; column++) {
29                 if (contains(guessedThemeWords, uniqueWordCount, boardData[row][column])) {
30                     cout << setw(10) << boardData[row][column];
31                 }
32                 else if ((row == rowGuess1 && column == columnGuess1) || (row == rowGuess2 && column == columnGuess2)) {
33                     cout << setw(10) << boardData[row][column];
34                 }
35                 else {
36                     cout << setw(10) << "X";
37                 }
38             }
39             cout << endl;
40         }
41     }
42     void initializeBoard() {
43         // select random theme words
44         int count = 0;
45         int uniqueWordCount = boardSize * boardSize / 2;
46         string selectedThemeWords[32];
47         srand(time(0));
48         loadAllThemeWords();
49         while (count < uniqueWordCount) {
50             // pick a random theme word
51             int index = rand() % 50;
52             if (allThemeWords[index] != "") {
53                 selectedThemeWords[count] = allThemeWords[index];
54                 allThemeWords[index] = "";
55                 count++;
56             }
57         }
58         string doubleSelectedThemeWords[64];
59         for (int i = 0; i < uniqueWordCount; i++) {
60             doubleSelectedThemeWords[i] = selectedThemeWords[i];
61             doubleSelectedThemeWords[i + uniqueWordCount] = selectedThemeWords[i];
62         }
63         shuffleArray(doubleSelectedThemeWords, 16);
64         // assign words into board
65         int i = 0;
66     }
67 }
```

temp

Running temp 4

temp > temp > h Board > No Selection

Line: 10 Col: 1

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```
      X      X      X      X
Subaru      X      X      X
      X  Porsche  X      X
      X      X      X      X
```

```
      X      X      X      X
      X      X      X      X
      X      X      X      X
      X      X      X      X
Guess 1:
Enter column (0, 1, 2, 3...)
```

I learned: how to use OOP principles to create a memory match game with file io, recursion, and class elements