Homework # 1

01286131 Object-Oriented Programming

Software Engineering Program,

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By

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Object-Oriented Programming Homework #1 **Jan 20th, 2023**

Introduction to C++

1. Write a program that reads names for four heroes (Warrior, Mage, Ninja, and Fighter) and draws frames around these names. All frames must have equal width and height.

1.1) Draw frames using `'*'` like the example output shown on the right:

*Program Output (for **1.1**)*

```
****************************************
*                  *                   *
* Warrior: Squall  * Mage:    Rinoa    *
*                  *                   *
****************************************
*                  *                   *
* Ninja:   Selphie * Fighter: Zell     *
*                  *                   *
****************************************
```

1.2) Draw frames using `'+'`, `'-'`, `'='`, and `'|'` like the example output shown on the right:

*Program Output (for **1.2**)*

```
+==================+==================+
|                  |                  |
| Warrior: Squall  | Mage:    Rinoa   |
|                  |                  |
+------------------+------------------+
|                  |                  |
| Ninja:   Selphie | Fighter: Zell    |
|                  |                  |
+==================+==================+
```

2. From the Fahrenheit to Celsius formula `°C = (5/9)(°F - 32)`, write programs to print the following tables:

2.1)

```
Fahr Celcius
  0    -17.8
 20     -6.7
 40      4.4
 .....
260    126.7
280    137.8
300    148.9
```

2.2)

```
Fahr Celcius
  0    -17.8
 40      4.4
 80     26.7
 .....
200     93.3
240    115.6
280    137.8
```

2.3)

```
Fahr Celcius
300    148.9
280    137.8
260    126.7
 .....
 40      4.4
 20     -6.7
  0    -17.8
```

You must draw a flow chart or write pseudocode before writing real programs.

3. Write a program that takes a value `N`, then draws `N` random number from range `[0, 1]`. Calculate the **mean squared error** (MSE) of the number drawn against `0.5`. You must draw a flowchart or write pseudocode before writing a real program.

1.1

```
#include <iostream>
#include <string>
using std::cout, std::cin, std::endl, std::string;

void addChar(int amt, string str){
    for(int i = 0; i < amt; i++){
        cout << str;
    }
}

int main(){
    string warrior;
    string mage;
    string ninja;
    string fighter;

    cout << "Enter warrior name: ";
    cin >> warrior;
    cout << "Enter mage name: ";
    cin >> mage;
    cout << "Enter ninja name: ";
    cin >> ninja;
    cout << "Enter fighter name: ";
    cin >> fighter;
    cout << endl;

    warrior = "Warrior: " + warrior;
    mage = "Mage: " + mage;
    ninja = "Ninja: " + ninja;
    fighter = "Fighter: " + fighter;

    const int pad = 1;
    const string::size_type max = std::max(std::max(std::max(warrior.size(), mage.size()), ninja.size()), fighter.size());
    const string::size_type col = max * 2 + pad * 4 + 2;
    const int row = pad * 4 + 5;

    for(int r = 0; r != row; r++){
        string::size_type c = 0;

        while(c <= col){
            if(r == 2){
                if(c == pad + 1){
                    cout << warrior;
                    c += warrior.size();
                    if (warrior.size() - max > 0){
                        addChar(warrior.size() - max, " ");
                        c += warrior.size() - max + 2;
                    }
                }
                else if(c == pad + 3 + max + pad){
                    cout << mage;
                    c += mage.size();
                    if (mage.size() - max > 0){
                        addChar(mage.size() - max, " ");
                        c += mage.size() - max + 3;
                    }
                }
                else if(c == 0 || c == col - 1 || c == pad + 2 + max){
                    cout << "*";
                    c++;
                }
                else{
                    cout << " ";
                    c++;
                }
            }
```

```
            else if(r == 6){
                if(c == pad + 1){
                    cout << ninja;
                    c += ninja.size();
                    if (ninja.size() - max > 0){
                        addChar(ninja.size() - max, " ");
                        c += ninja.size() - max + 1;
                    }
                }
                else if(c == pad + 3 + max + pad){
                    cout << fighter;
                    c += fighter.size();
                    if (fighter.size() - max > 0){
                        addChar(fighter.size() - max, " ");
                        c += fighter.size() - max + 2;
                    }
                }
                else if(c == 0 || c == col || c == pad + 2 + max){
                    cout << "*";
                    c++;
                }
                else{
                    cout << " ";
                    c++;
                }
            }

            else if(r == 0 || r == row - 1 || c == 0 || c == col || r == 4 || c == pad + 2 + max){
                cout << "*";
                c++;
            }

            else{
                cout << " ";
                c++;
            }
        }
        cout << endl;
    }

    return 0;
}
```

```
Enter warrior name: dffff
Enter mage name: ffff
Enter ninja name: drtyse
Enter fighter name: sdfge

*************************************
*                   *               *
* Warrior: dffff * Mage: ffff      *
*                   *               *
*************************************
*                   *               *
* Ninja: drtyse   * Fighter: sdfge *
*                   *               *
*************************************
PS D:\Main\Work\KMITL\Yr1 Sem2\OOP\doinC++>
```

1.2

```
#include <iostream>
#include <string>
using std::cout, std::cin, std::endl, std::string;

void addChar(int amt, string str){
    for(int i = 0; i < amt; i++){
        cout << str;
    }
}

int main(){
    string warrior;
    string mage;
    string ninja;
    string fighter;

    cout << "Enter warrior name: ";
    cin >> warrior;
    cout << "Enter mage name: ";
    cin >> mage;
    cout << "Enter ninja name: ";
    cin >> ninja;
    cout << "Enter fighter name: ";
    cin >> fighter;
    cout << endl;

    warrior = "Warrior: " + warrior;
    mage = "Mage: " + mage;
    ninja = "Ninja: " + ninja;
    fighter = "Fighter: " + fighter;

    const int pad = 1;
    const string::size_type max = std::max(std::max(std::max(warrior.size(), mage.size()), ninja.size()), fighter.size());
    const string::size_type col = max * 2 + pad * 4 + 2;
    const int row = pad * 4 + 5;

    for(int r = 0; r != row; r++){

        string::size_type c = 0;

        while(c <= col){

            if(r == 2){
                if(c == pad + 1){
                    cout << warrior;
                    c += warrior.size();
                    if (warrior.size() - max > 0){
                        addChar(warrior.size() - max, " ");
                        c += warrior.size() - max + 2;
                    }
                }
                else if(c == pad + 3 + max + pad){
                    cout << mage;
                    c += mage.size();
                    if (mage.size() - max > 0){
                        addChar(mage.size() - max, " ");
                        c += mage.size() - max + 3;
                    }
                }
                else if(c == 0 || c == col - 1 || c == pad + 2 + max){
                    cout << "|";
                    c++;
                }
                else{
                    cout << " ";
                    c++;
                }
            }
            else if(r == 6){
                if(c == pad + 1){
                    cout << ninja;
                    c += ninja.size();
                    if (ninja.size() - max > 0){
                        addChar(ninja.size() - max, " ");
                        c += ninja.size() - max + 1;
                    }
                }
```

```
else if(c == pad + 3 + max + pad){
                cout << fighter;
                c += fighter.size();
                if (fighter.size() - max > 0){
                    addChar(fighter.size() - max, " ");
                    c += fighter.size() - max + 2;
                }
            }
            else if(c == 0 || c == col || c == pad + 2 + max){
                cout << "|";
                c++;
            }
            else{
                cout << " ";
                c++;
            }
        }
        else if(r == 0 || r == row - 1 || c == 0 || c == col || r == 4 || c == pad + 2 + max){
            if ((c == 0 && r == 0) || (c == 0 && r == 4) || (c == 0 && r == row - 1) || (c == col && r == 0) || (c == col && r == 4) || (c == col && r
== row - 1) || (c == pad + 2 + max && r == 0) || (c == pad + 2 + max && r == 4) || (c == pad + 2 + max && r == row - 1)){
                cout << "+";
                c++;
            }else if(c == 0 || c == col || c == pad + 2 + max){
                cout << "|";
                c++;
            }
            else if(r == 4){
                cout << "-";
                c++;
            }
            else{
                cout << "=";
                c++;
            }
        }
        else{
            cout << " ";
            c++;
        }
    }
    cout << endl;
}

return 0;
}
```

```
Enter warrior name: fgrhd
Enter mage name: rtyu
Enter ninja name: edgjkh
Enter fighter name: hjkyu

+================+================+
|                |                |
| Warrior: fgrhd | Mage: rtyu     |
|                |                |
+----------------+----------------+
|                |                |
| Ninja: edgjkh  | Fighter: hjkyu |
|                |                |
+================+================+
PS D:\Main\Work\KMITL\Yr1 Sem2\OOP\doinC++>
```

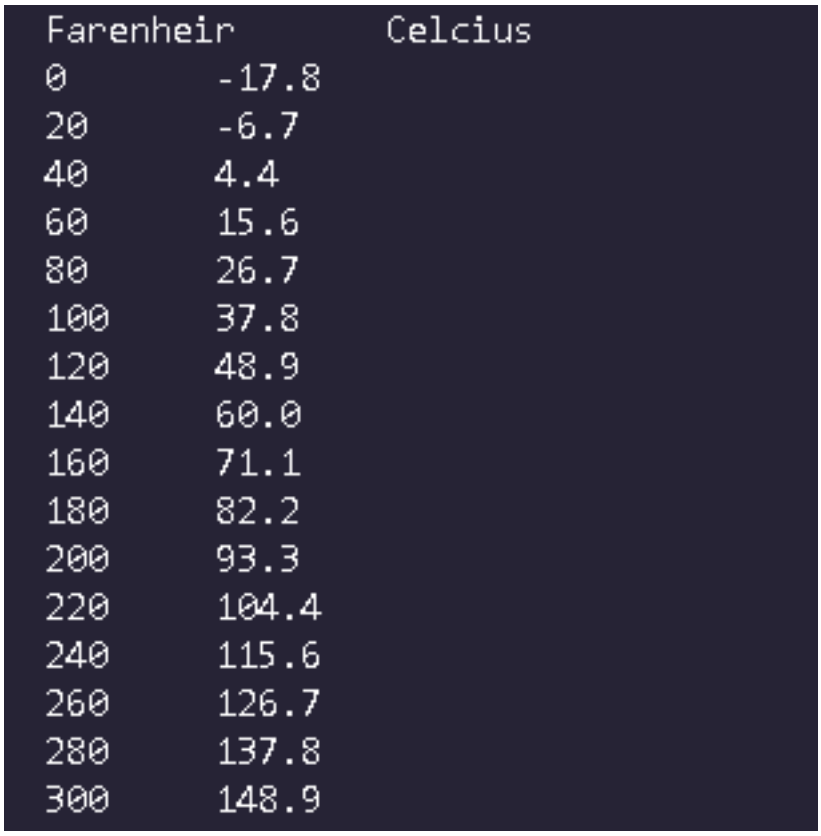
2.1

```
#include <iostream>
#include <string>
#include <iomanip>

using std::cout, std::cin, std::endl, std::string;

double F2C(double fh){
    return (fh - 32) * 5 / 9;
}

int main(){
    int fh = 0;
    cout << std::fixed << std::setprecision(1) << "Farenheir\tCelcius" << endl;
    while(fh <= 300){
        cout << fh << "\t" << F2C(fh) << endl;
        fh += 20;
    }
    return 0;
}
```



```
Farenheir       Celcius
0       -17.8
20      -6.7
40      4.4
60      15.6
80      26.7
100     37.8
120     48.9
140     60.0
160     71.1
180     82.2
200     93.3
220     104.4
240     115.6
260     126.7
280     137.8
300     148.9
```

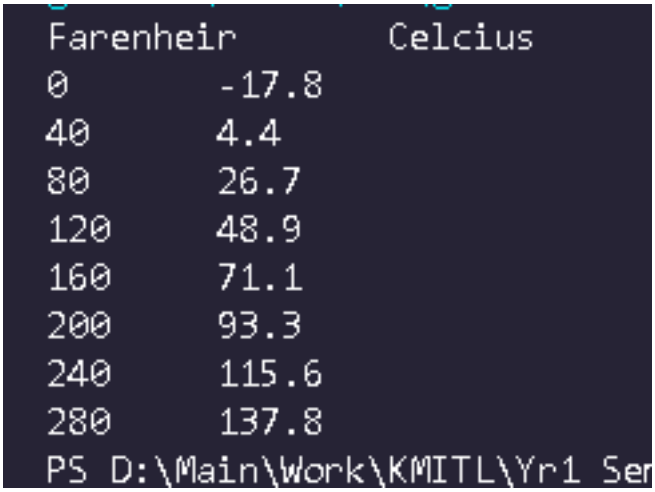
2.2

```
#include <iostream>
#include <string>
#include <iomanip>

using std::cout, std::cin, std::endl, std::string;

double F2C(double fh){
    return (fh - 32) * 5 / 9;
}

int main(){
    int fh = 0;
    cout << std::fixed << std::setprecision(1) << "Farenheir\tCelcius" << endl;
    while(fh <= 300){
        cout << fh << "\t" << F2C(fh) << endl;
        fh += 40;
    }
    return 0;
}
```



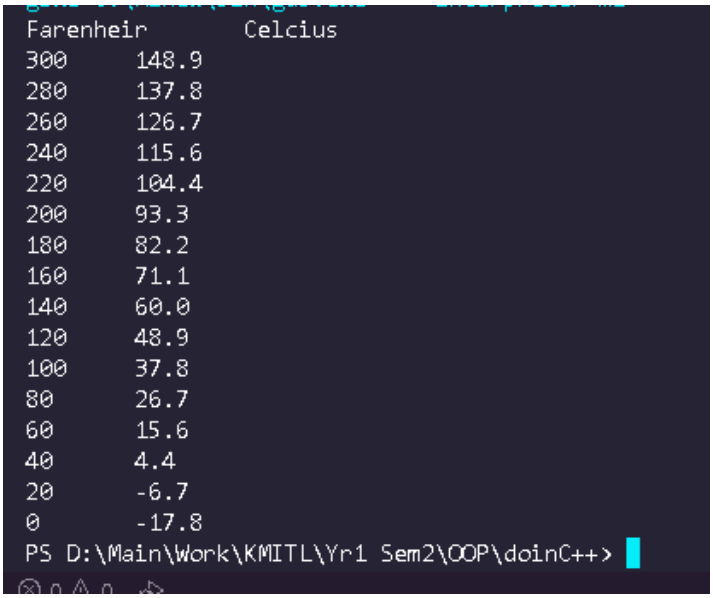
2.3

```
#include <iostream>
#include <string>
#include <iomanip>

using std::cout, std::cin, std::endl, std::string;

double F2C(double fh){
    return (fh - 32) * 5 / 9;
}

int main(){
    int fh = 300;
    cout << std::fixed << std::setprecision(1) << "Farenheir\tCelcius" << endl;
    while(fh >= 0){
        cout << fh << "\t" << F2C(fh) << endl;
        fh -= 20;
    }
    return 0;
}
```



3

```cpp
#include <iostream>
#include <string>
#include <random>

using std::cout, std::cin, std::endl, std::string;

int main() {
    std::mt19937 rng;
    rng.seed(std::random_device()());
    std::uniform_real_distribution<double> dist{0, 1};

    int N;
    int i = 0;
    double sum = 0;

    cout << "Enter the N value: ";
    cin >> N;

    while(i < N){
        double x = dist(rng);

        double err = x - 0.5;
        sum += (err * err);
        i++;
    }

    double mean_squared_err = sum / N;

    cout << "Mean Squared Error: " << mean_squared_err << endl;
}
```