Assignment 6

Linux and C Programming (62558)

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Contents

Feedback

Your header files should not include source code, but only function prototypes, data types and macros. And I couldn't get 11.2 to compile with either g++ or gcc. The code looks fine, but it is expected that it is solved using plain c and not cpp.

Original Submission

```
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#include <stdio.h>
#include "factorial.h"
#include "weekTemp.h"
```

```c
void ex11_1();
void ex11_2();

int main(void)
{
    int selectVar = 0;

    puts("************************");
    puts("Welcome to Assignment 6");
    puts("************************");

    while (selectVar != 3)
    {
        puts("");
        puts("**********");
        puts("Main menue");
        puts("**********");
        printf("1: Exercise 11.1\n2: Exercise 11.2\n3: Close program\nPlease choose option: ");
        scanf("%1d", &selectVar);
        getchar();

        switch (selectVar)
        {
            case 1:
                puts("");
                puts("**************");
                puts("Exercise 11.1");
                puts("**************");
                ex11_1();
                break;
            case 2:
                puts("");
                puts("**************");
                puts("Exercise 11.2");
                puts("**************");
                ex11_2();
                break;
            default:
                break;
        }
    }
    puts("");
    puts("Closing program...");
}

void ex11_1()
{
    int selectVar = 0;
    WeekTemp week;
    int demoWeek[] = {18, 16, 14, 13, 14, 17, 17};
    int newWeek[7];
```

```
while (selectVar != 6)
{
    printf("1: Load demo week.\n2: Load new week.\n3: Compute mean temperature.\n4: Compute media
    scanf("%1d", &selectVar);
    getchar();

    switch (selectVar)
    {
        case 1:
        {
            puts("");
            week.loadWeek(demoWeek);
            break;
        }
        case 2:
        {
            puts("");
            for (int i = 0; i < 7; i++)
            {
                printf("Enter temperature for day %d: ", i + 1);
                scanf("%d",&newWeek[i]);
                getchar();
            }
            week.loadWeek(newWeek);
            puts("");

            break;
        }
        case 3:
        {
            puts("");
            printf("Mean temperature: %.1f", week.meanTemp());
            puts("");
            puts("");

            break;
        }
        case 4:
        {
            puts("");
            printf("Median temperature: %d", week.medianTemp());
            puts("");
            puts("");

            break;
        }
        case 5:
        {
            puts("");
            printf("Standard deviation: %.1f", week.SD());
            puts("");
```

```
                puts("");

                break;
            }
            default:
                break;
        }
    }
}

void ex11_2()
{
    int selectVar = 0;
    unsigned long input;
    while (selectVar != 2)
    {
        printf("1: Compute factorial\n2: Exit exercise 11.2\nPlease choose option: ");
        scanf("%d", &selectVar);
        getchar();

        if (selectVar == 1)
        {
            puts("");
            printf("Enter positive integer: ");
            scanf("%lu", &input);
            getchar();

            printf("%lu! = %lu", input, factorial(input));
            puts("");
            puts("");
        }
    }
}
```

Updates

In the updated submission listed below, I have separated out the function definitions from the header files. Function definitions are now located in the files factorial.cpp, weekTemp.cpp, ex11_1.cpp and ex11_2.cpp.

Header Files

factorial.h

```
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#ifndef FACTORIAL
```

```
#define FACTORIAL

// Computes the factorial.
unsigned long factorial(unsigned long n);

#endif
```

weekTemp.h

```
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#ifndef WEEKTEMP
#define WEEKTEMP

// A class for storing temperatures for a week.
class WeekTemp {
    private:
        // Array of week temperatures.
        int weekTemps[7];
        // Array of sorted week temperatures.
        int sortedWeekTemps[7];
    public:
        // Constructor.
        WeekTemp();
        // Load week function
        int loadWeek(int *weekTempArr);
        // Function to compute mean temperature.
        float meanTemp();
        // Function to compute median temperature.
        int medianTemp();
        // Function to compute the standard deviation.
        float SD();
        // Returns a pointer to a copy of WeekTemps in heap.
        int *getWeek();
};

#endif
```

ex11_1.h

```
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/
```

```c
#ifndef EX11_1
#define EX11_1

// Function for running exercise 11.1
void ex11_1();

#endif
```

ex11_2.h

```c
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#ifndef EX11_2
#define EX11_2

// Function for running exercise 11.2
void ex11_2();

#endif
```

Source Files

main.cpp

```c
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#include <stdio.h>
#include "ex11_1.h"
#include "ex11_2.h"

int main(void) {
    int selectVar = 0;
    puts("************************");
    puts("Welcome to Assignment 6");
    puts("************************");

    while (selectVar != 3) {
        puts("\n**********");
        puts("Main menu");
        puts("**********");
        printf("1: Exercise 11.1\n2: Exercise 11.2\n3: Close program\nPlease choose option: ");
        scanf("%1d", &selectVar);
        getchar();
```

```
        switch (selectVar) {
            case 1:
                puts("\n**************");
                puts("Exercise 11.1");
                puts("**************");
                ex11_1();
                break;
            case 2:
                puts("\n**************");
                puts("Exercise 11.2");
                puts("**************");
                ex11_2();
                break;
            default:
                break;
        }
    }

    puts("\nClosing program...");
    return 0;
}
```

factorial.cpp

```
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#include "factorial.h"

unsigned long factorial(unsigned long n) {
    unsigned long f = 1;
    for (unsigned long i = 1; i <= n; i++) {
        f = f * i;
    }
    return f;
}
```

weekTemp.cpp

```
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#include <algorithm>
```

```cpp
#include <cmath>
#include "weekTemp.h"

WeekTemp::WeekTemp(){}

int WeekTemp::loadWeek(int *weekTempArr) {
    int i;
    for (i = 0; i < 7; i++) {
        weekTemps[i] = weekTempArr[i];
    }
    std::copy(weekTemps, weekTemps + 7, sortedWeekTemps);
    std::sort(sortedWeekTemps, sortedWeekTemps + 7);
    return i;
}

float WeekTemp::meanTemp() {
    int sum = 0;

    for (int i = 0; i < 7; i++) {
        sum += weekTemps[i];
    }
    return sum / 7.0;
}

int WeekTemp::medianTemp() {
    return sortedWeekTemps[3];
}

float WeekTemp::SD() {
    float variance = 0;
    float mean = meanTemp();
    for (int i = 0; i < 7; i++) {
        variance += (weekTemps[i] - mean) * (weekTemps[i] - mean);
    }
    return sqrt(variance / 7);
}

int *WeekTemp::getWeek() {
    int *weekTempsCopy = new int[7];
    std::copy(weekTemps, weekTemps + 7, weekTempsCopy);
    return weekTempsCopy;
}
```

ex11_1.cpp

```cpp
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/
```

```c
#include "weekTemp.h"
#include "ex11_1.h"
#include <stdio.h>

void ex11_1() {
    int selectVar = 0;
    WeekTemp week;
    int demoWeek[] = {18, 16, 14, 13, 14, 17, 17};
    int newWeek[7];

    while (selectVar != 6) {
        printf("1: Load demo week.\n2: Load new week.\n3: Compute mean temperature.\n4: Compute media
        scanf("%1d", &selectVar);
        getchar();

        switch (selectVar) {
            case 1:
                puts("");
                week.loadWeek(demoWeek);
                break;
            case 2:
                puts("");

                for (int i = 0; i < 7; i++) {
                    printf("Enter temperature for day %d: ", i + 1);
                    scanf("%d", &newWeek[i]);
                    getchar();
                }

                week.loadWeek(newWeek);
                puts("");
                break;
            case 3:
                printf("\nMean temperature: %.1f", week.meanTemp());
                puts("\n");
                break;
            case 4:
                printf("\nMedian temperature: %d", week.medianTemp());
                puts("\n");
                break;
            case 5:
                printf("\nStandard deviation: %.1f", week.SD());
                puts("\n");
                break;
            default:
                break;
        }
    }
}
```

ex11_2.cpp

```
/*
Course name: Linux and C Programming (62558)
Student name: Mads Richardt
Student Id: s224849
Date: 17-11-2022
*/

#include <stdio.h>
#include "factorial.h"

void ex11_2() {
    int selectVar = 0;
    unsigned long input;

    while (selectVar != 2) {
        printf("1: Compute factorial\n2: Exit exercise 11.2\nPlease choose option: ");
        scanf("%d", &selectVar);
        getchar();

        if (selectVar == 1) {
            printf("\nEnter positive integer: ");
            scanf("%lu", &input);
            getchar();
            printf("%lu! = %lu", input, factorial(input));
            puts("\n");
        }
    }
}
```