Programming in C and C++
Constructor University Bremen
Dr. Kinga Lipskoch

Course: CH-230-A
September 10th, 2024

Assignment 2 - Reading from the Keyboard, Using Pointers, Conditions and Loops

- The problems of this assignment must be solved in C or C++ (instruction in each problem).
- The TAs are grading solutions to the problems according to the following criteria: Grading Criteria

Problem 2.1 *Reading from the keyboard*

(1 point)

Presence assignment, due by 11:00 AM today **Graded manually**
Language: C
Write a program which does the following:

1. reads two doubles from the keyboard,
2. prints the sum of the two doubles,
3. prints the difference of the two doubles (first minus second),
4. prints the square of the first double,
5. reads two integers from the keyboard,
6. computes the sum and product of the two integers,
7. prints the sum and product of the integers,
8. reads two chars from the keyboard,
9. computes the sum and product of the two chars,
10. prints the sum and product of the chars as decimal values and as chars.

You can assume that the input will be correct.

Testcase 2.1: input

```
1.2
3.6
2
5
(
)
```

Testcase 2.1: output

```
sum of doubles=4.800000
difference of doubles=-2.400000
square=1.440000
sum of integers=7
product of integers=10
sum of chars=81
product of chars=1640
sum of chars=Q
product of chars=h
```

Problem 2.2 *Decimal, octal and hexadecimal numbers*

(1 point)

Due by Monday, September 16th, 23:00 **Graded manually**
Language: C
Write a program which does the following:

1. reads a char from the keyboard,
2. and prints the char as character as well as in decimal, octal and hexadecimal notation.

You can assume that the input will be correct.

Testcase 2.2: input

```
{
```

Testcase 2.2: output

```
character={
decimal=123
octal=173
hexadecimal=7b
```

Problem 2.3 *Time calculation* (1 point)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

Write a program where you can enter integer numbers for weeks, days and hours as input from the keyboard. Your program should compute and output by printing on the screen the total number of hours.

You can assume that the input will be correct.

Problem 2.4 *Area computations* (1 point)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

Write a program that reads from the keyboard three float values for the variables `a`, `b` and `h`. Compute and print on the screen the areas of: the square with the side `a`, the rectangle with the length `a` and the width `b`, a triangle with the base `a` and the height `h`, and a trapezoid with the bases `a`, `b` and the height `h`.

You can assume that the input will be correct.

Testcase 2.4: input

```
10
14.5
5
```

Testcase 2.4: output

```
square area=100.000000
rectangle area=145.000000
triangle area=25.000000
trapezoid area=61.250000
```

Problem 2.5 *Pointers and their content* (1 point)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

Write a program which reads an integer variable `a` from the keyboard and prints the value on the screen. Then declare and initialize a pointer `ptr_a` pointing to `a`, print the address contained in the pointer variable on the screen, increase the value of `a` by `5` by using the pointer variable and print the modified value and the address of the variable on the screen as well.

You can safely assume that the input will be correct.

Problem 2.6 *Multiple pointers to same data* (1 point)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

Write a program which reads two double variables `x` and `y` from the keyboard. Then declare and initilize three pointers `ptr_one`, `ptr_two` and `ptr_three` such that `ptr_one` and `ptr_two` will both point to the variable `x` and `ptr_three` will point to `y`. By using `printf` show that `ptr_one` and `ptr_two` contain the same memory address and `ptr_three` contains a different address.

You can assume that the input will be correct.

Problem 2.7 *Infinite loop by bad coding* (1 point)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

The program below prints

```
i is 8
i is 8
...
```

until you stop the execution by pressing `Ctrl-C`. Fix the program such that it prints `8`, `7`, `6`, `5` and `4` as values for `i`.

```
#include <stdio.h>
int main()
{
    int i = 8;
    while (i >= 4)
        printf("i is %d\n", i);
        i--;
    printf("That's it.\n");
    return 0;
}
```

Problem 2.8 *Divisible by 2 and 7?* (1 point)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

Write a program, where you can enter an integer from the keyboard. Determine whether the number is divisible by both 2 and 7. Then either print on the screen
"`The number is divisible by 2 and 7`" or
"`The number is NOT divisible by 2 and 7`".
You can safely assume that the input will be valid.

Testcase 2.8: input

```
56
```

Testcase 2.8: output

```
The number is divisible by 2 and 7
```

Problem 2.9 *Categorization of characters* (1 point)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

Write a program where you can enter a character from the keyboard. Then determine whether the character is a digit or a letter or some other symbol and print a corresponding message on the screen.
You can safely assume that the input will be valid.

Testcase 2.9: input

```
!
```

Testcase 2.9: output

```
! is some other symbol
```

Problem 2.10 *Days and hours* (2 points)

Due by Monday, September 16th, 23:00 **Graded manually**

Language: C

Write a program where you can enter an integer `n` from the keyboard. Then a conversion table for 1 to `n` days should be printed on the screen as in the example below. Make sure that the integer value you entered for `n` is valid (positive and non-zero). If an invalid integer `n` was entered then repeat the entering until a valid value will be entered.
Use a `while` loop in your solution.

```
1 day = 24 hours
2 days = 48 hours
3 days = 72 hours
...
```

How to submit your solutions

- Your source code should be properly indented and compile with `gcc` or `g++` depending on the problem without any errors or warnings (You can use `gcc -Wall -o program program.c` or `g++ -Wall -o program program.cpp`). Insert suitable comments (not on every line ...) to explain what your program does.
- Name the programs according to the suggested filenames (they should match the description of the problem) in Teams.
  Each program **must** include a comment on the top like the following:

```
/*
   CH-230-A
   a2_p1.[c or cpp or h]
   Firstname Lastname
   myemail@constructor.university
*/
```

- You have to submit your solutions via *Teams*.
  If there are problems (but **only** then) you can submit the programs by sending mail to `klipskoch@constructor.university` **with a subject line that begins with CH-230-A**.
  It is important that you do begin your subject with the coursenumber, otherwise I might have problems to identify your submission.
- Note, that after the deadline it will not be possible to submit any solutions. It is useless to send late solutions by mail, because they will not be accepted.

This assignment is due by Monday, September 16th, 23:00.