

(DASF004) Basis and Practice in Programming
Homework Assignment #1

Instructor: Hyungjoon Koo (kevin.koo@g.skku.edu)

Your Name : _____

Student ID : _____

The homework assignment must be submitted on an individual basis. The following states several rules for both submission and grading policy. Please read the descriptions of each exercise carefully before you make a final submission.

- You must submit a single zipped file via **iCampus**. The submission file name should be your student ID with the file extension of **.zip**.
- We will consider the last submission only in case of multiple submissions.
- You write a program per each question where a naming rule is the question number with the file extension of **.c**. For example, the program name of the first question would be **1.c**.
- You have (up to) two days for a late submission with a 25% delay penalty per day.
- If your program fails to be compiled, no point would be given. This is a strict rule.
- You may obtain partial points based on test sets, which will be judged by the TAs.
- You must follow code of conduct. Keep in mind that any activity of copying, publishing, sharing your code with others is *not allowed*. Violating code ethics may lead to failing this course.

Exercise 1.**(10 Points)**

Write a program to display a multiplication table in a vertical way as Listing 1, taking a number by a user.

- An input ranges from 1 to 15
- Each multiplication table should be displayed from 1 to 9 vertically.
- You may write your own function if needed.

```
1 // Skeleton code
2 int main()
3 {
4     int n;
5     printf("Enter a number for a multiplication table: ");
6     scanf("%d",&n);
7
8     // Write your code below
9
10    return 0;
11 }
12
13 // Output example (1)
14 Enter a number for a multiplication table: 1
15 1x1=1
16 1x2=2
17 1x3=3
18 1x4=4
19 1x5=5
20 1x6=6
21 1x7=7
22 1x8=8
23 1x9=9
24
25 // Output example (2)
26 Enter a number for a multiplication table: 4
27 1x1=1, 2x1=2, 3x1=3, 4x1=4
28 1x2=2, 2x2=4, 3x2=6, 4x2=8
29 1x3=3, 2x3=6, 3x3=9, 4x3=12
30 1x4=4, 2x4=8, 3x4=12, 4x4=16
31 1x5=5, 2x5=10, 3x5=15, 4x5=20
32 1x6=6, 2x6=12, 3x6=18, 4x6=24
33 1x7=7, 2x7=14, 3x7=21, 4x7=28
34 1x8=8, 2x8=16, 3x8=24, 4x8=32
35 1x9=9, 2x9=18, 3x9=27, 4x9=36
```

Listing 1: Skeleton code and its output examples for Exercise 1.

Exercise 2.

(20 Points) A palindrome is defined as a sequence of characters (including a number, word or phrase) that reads the same backward as forward. In this exercise, you write a program that determines whether a certain number is a palindrome or not. For example, the number “12321” is a palindrome whereas the number “12345” is not. Listing 2 shows a main function prototype and its output examples.

- Your program name should be 2.c.
- You may assume that the number to be entered will be an unsigned integer type.
- An input is an unsigned integer type.
- An output is either “True” or “False”.
- You may write your own function if needed.

```
1 // Skeleton code
2 int main() {
3     unsigned int n;
4     printf("Enter an integer: ");
5     scanf("%d", &n);
6
7     // Write your code below
8
9     return 0;
10 }
11
12 // Output examples
13 Enter an integer: 101
14 True
15 Enter an integer: 1234321
16 True
17 Enter an integer: 23247861
18 False
19 Enter an integer: 369369
20 False
```

Listing 2: Skeleton code and its output examples for Exercise 2.

Exercise 3.

(30 points) In algebra, a quadratic equation can be represented with three coefficients as the following standard form.

$$ax^2 + bx + c = 0 \text{ where } a \neq 0 \quad (1)$$

Write a program that outputs the solution of a quadratic equation by taking three integers as coefficients as in Listing 3. We know that a discriminant, $D = b^2 - 4ac$, determines the number of solutions as follow:

$$x = \frac{-b}{2a} \text{ where } D = 0 \quad (2)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \text{ where } D > 0 \quad (3)$$

$$\text{No solution where } D < 0 \quad (4)$$

- Your program name should be 3.c.
- You should implement a function named `solve_quadratic_equation()`.
- Note that all inputs range from -1000 to 1000 .
- Use a `float` type for calculation.
- The skeleton code will be given, which should not be modified.
- Use a `sqrt` function by including the `math.h` header file.
- You may assume $a \neq 0$.
- You should round up a solution to three decimal places (e.g., $3.141592 \rightarrow 3.142$)

```

1 // Skeleton code
2 void solve_quadratic_equation(int, int, int); // Function prototype
3
4 int main(void) {
5     int a, b, c;
6     printf("a = ");    scanf("%d", &a);
7     printf("b = ");    scanf("%d", &b);
8     printf("c = ");    scanf("%d", &c);
9
10    solve_quadratic_equation(a, b, c);
11    return 0;
12 }
13 // Write your code below
14 ...
15
16 // The following shows the examples of each case after running your program
17 // (1) [D > 0] Two solutions
18 a = -2
19 b = 3
20 c = 8
21 x1 = -1.386, x2 = 2.886
22
23 // (2) [D = 0] One solution
24 a = 3
25 b = -30
26 c = 75
27 x = 5.000
28
29 // (3) [D < 0] No solution
30 a = 3
31 b = -5
32 c = 75
33 No solution available!

```

Listing 3: Skeleton code and its output examples for Exercise 3.

Exercise 4.

(40 Points) Write a program that converts a decimal into a hexadecimal. Listing 4 shows a main function prototype and its output examples.

- Your program name should be 4.c.
- You may assume that an input ranges from 1 to $2^{32} - 1 = 4,294,967,295$
- The output must start with 0x that indicates a hexadecimal.
- The output must be written in capital letters but 0x.
- You may write your own function if needed.

```
1 int main() {
2     long int n;
3     printf("Enter a decimal number (0 < n < 2^32): ");
4     scanf("%ld", &n);
5
6     // Write your code below
7
8     return 0;
9 }
10
11 // Output examples
12 Enter a decimal number (0 < n < 2^32): 32
13 0x20
14 Enter a decimal number (0 < n < 2^32): 100
15 0x64
16 Enter a decimal number (0 < n < 2^32): 123456789
17 0x75BCD15
18 Enter a decimal number (0 < n < 2^32): 2147483647
19 0x7FFFFFFF
20 Enter a decimal number (0 < n < 2^32): 4294967295
21 0xFFFFFFFF
```

Listing 4: Skeleton code and its output examples for Exercise 4.