DASF004: Basic and Practice in Programming

- Lab 3: Program Sequencing and Control

In this lab ...

- Three kinds of loop in C language:
  - `while` loop
  - `for` loop
  - `do … while` loop
- `switch` statement
- `break` statement and `continue` statement

  – What you need to submit in this lab (Lab #3):
    - » Lab Exercise #3 before today 11:59 pm
    - » Lab Assignment #3 by Tuesday 11:59 pm

Two kinds of loop

1. Counter-controlled Loop
    - Counter variable: A variable counting how many times the loop has executed
    - Increment/Decrement of the counter variable in each iteration

2. Sentinel-controlled Loop
    - The loop is repeating until a condition is fulfilled

Three kinds of loop in C Language

1. `while` loop
2. `for` loop
3. `do … while` loop

`while` loop and `do` … `while` loop

```
while(condition)
{
}
```

Example (Counter-controlled loop):

```
int i = 1;
while(i<=10)
{ printf("Counter: %d\n",i);
  i++;
}
```

```
do
{
} while(condition)
```

Example (Counter-controlled loop):

```
int i = 1;
do
{ printf("Counter: %d\n",i);
  i++;
} while(i<=10)
```

`for` loop

```
for(initialization; condition; increment)
{
}
```

Example (Counter-controlled loop):

```
for(int i=1; i<=10; i++)
{ printf("Counter: %d\n",i);
}
```

Counter-controlled Loop

You need to be able to count how many times the loop will be executed. And it is determined by 3 factors:

1. Variable starting at x
2. Increment/Decrement by y in each execution
3. Exit condition (e.g. i <= 10)

For example:
1. Starting at 0;
2. Increment by 1 in each execution
3. Exit condition: i <= 15

From 0 to 15 (including 15), increment by 1
=> 16 times

Implementation of Sentinel-controlled loop

Pseudo code:

```
Ask for user input
Loop (if user input != a specific value) // e.g. input != -1
{ Perform the loop body task
  Ask for user input again
}
```

C Code using `while` loop:

```
int x;                          // Variable for user input
printf("Enter value: ");        // Ask for user input
scanf("%d",&x);                  // Store user input in variable x

while(x != -1)                  // Loop while user does not enter -1
{ printf("Value: %d",x);         // Perform the loop body task

  printf("Enter value: ");// Ask for user input
  scanf("%d",&x);               // Store user input in variable x
}
```

Implementation of Sentinel-controlled loop

C Code using `do … while` loop:

```
int x;                          // Variable for user input

do
{ printf("Enter value: ");// Ask for user input
  scanf("%d",&x);           // Store user input in variable x

  printf("Value: %d",x);        // Perform the loop body task
} while (x != -1);          // Loop while user does not input -1
```

Implementation of Sentinel-controlled loop

C Code using `for` loop:

```
int x;                          // Variable for user input
printf("Enter value: ");        // Ask for user input
scanf("%d",&x);                  // Store user input in variable x

for(;x != -1;)                  // Loop while user does not input -1
{ printf("Value: %d",x);         // Perform the loop body task

  printf("Enter value: ");// Ask for user input
  scanf("%d",&x);               // Store user input in variable x
}
```

The 3 kinds of loop in C Language

- Generally speaking:
  - `while` loop is a generic repetition logic
  - `for` loop is good for implementing counter-controlled loop
  - `do … while` loop is good for implementing sentinel-controlled loop when user enter an input for terminating the loop

- All repetition logic can be implemented using any one of the three kinds of loop

Try it yourself…

- Write a program to perform the following task:
  - Implement the repetition logic using a `for` loop
  - Create a loop asking for user input (integer) 10 times
  - Calculate and display the average value of the 10 input numbers

Try it yourself ...

- Write a program to perform the following task:
  - Implement the repetition logic using a `do … while` loop
  - Create a loop asking for user input
    - » This loop will terminate when user enter “-1”
  - Calculate and display the average value of all input numbers

Lab Exercise 3

- Write a program to perform the following task:
  - Implement the repetition logic **using a `for` loop**
  - Create a loop asking for user input
  - This loop will terminate when user enter the value -1
  - Calculate and display the average value of all input numbers
- Deadline: Before the end of today 23:59 pm

`switch` statement

- Use for implementing multiple selection
- For example:

```
switch(grade)          // Variable grade is char
{ case 'A':            // if grade == 'A'
    printf("Excellent\n");
    break;
  case 'B':            // if grade == 'B' or 'C'
  case 'C':
    printf("Well done\n");
    break;
  case 'D':            // if grade == 'D'
    printf("Pass\n");
    break;
  case 'F':            // if grade == 'F'
    printf("Fail\n");
    break;
  default:             // for everything else
    printf("Invalid grade\n");
}
```

`break` statement

- Jump outside of the loop (or `switch` statement)

```
for(;;)
{   // loop body task
  if(x == -1)
    break;
    // loop body task
}
```

```
while()
{     // loop body task
  if(x == -1)
    break;
    // loop body task
}
```

```
do
{     // loop body task
  if(x == -1)
    break;
    // loop body task
} while();
```

```
switch(grade)
{ case 'A':
    printf("Excellent\n");
    break;
  case 'B':
  case 'C':
    printf("Well done\n");
    break;
  case 'D':
    printf("Pass\n");
    break;
  case 'F':
    printf("Fail\n");
    break;
  default:
    printf("Invalid grade\n");
}
```

`continue` statement

- Jump to the end of the loop

```
for(;;)
{   // loop body task
  if(x == -1)
    continue;
   // loop body task
}

while()
{    // loop body task
  if(x == -1)
    continue;
   // loop body task
}

do
{    // loop body task
  if(x == -1)
    continue;
   // loop body task
} while();
```

Lab Assignment #3: Sequence Control

Write a program to perform the task:

- Your program will prompt the user to enter an option (1 for USD, 2 for Euro, 3 for Yen, 4 for RMB and 5 for quit).
- You should use `switch` statement to implement your multiple selection.

```
Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option:
```

Lab Assignment #3: Sequence Control

Write a program to perform the task:

- Your program will prompt the user to enter an option (1 for USD, 2 for Euro, 3 for Yen, 4 for RMB and 5 for quit).
  - If an invalid option was entered, an error message will be displayed, and the program will prompt the user to enter an option again

```
Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 6
You entered an invalid input.

Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option:
```

Lab Assignment #3: Sequence Control

Write a program to perform the task:

- Your program will prompt the user to enter an option (1 for USD, 2 for Euro, 3 for Yen, 4 for RMB and 5 for quit).
  - If a correct option was entered, the foreign exchange amount will be calculated and displayed
  - And the program will prompt the user to enter an option again

```
Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 1
Enter the amount in Korean Won: 10000
10000 Won equals to 9.050000 USD

Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option:
```

Lab Assignment #3: Sequence Control

Write a program to perform the task:

- Your program will continue to prompt the user to enter an option, until the user enter 5 for quit.

Lab Assignment #3: Sequence Control

Sample output 1:

```
Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 1
Enter the amount in Korean Won: 10000
10000 Won equals to 9.050000 USD

Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 2
Enter the amount in Korean Won: 10000
10000 Won equals to 8.073509 Euro

Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 5
```

Lab Assignment #3: Sequence Control

Sample output 2:

```
Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 6
You entered an invalid input.

Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 3
Enter the amount in Korean Won: 10000
10000 Won equals to 919.061646 Yen

Please choose which currency you want to convert:
1 - Korean Won to US Dollar (Exchange Rate: 0.000905)
2 - Korean Won to Euro (Exchange Rate: 0.000807350908)
3 - Korean Won to Japanese Yen (Exchange Rate: 0.0919061643)
4 - Korean Won to Chinese RMB (Exchange Rate: 0.00603703605)
5 - Quit
Enter your option: 5
```

Lab Assignment #3: Sequence Control

Submit your source code on iCampus before Tuesday 11:59 pm