



# **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.  $i \leq 10$ )

For example:

1. Starting at 0;
2. Increment by 1 in each execution
3. Exit condition:  $i \leq 15$

From 0 to 15 (including 15), increment by 1  
 $\Rightarrow$  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)

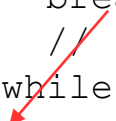
```
for(;;)
{ // loop body task
  if(x == -1)
    break;
  // loop body task
}
```



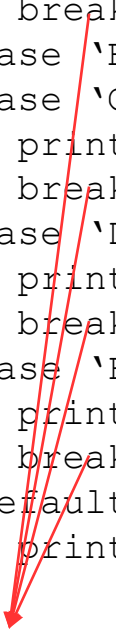
```
while()
{ // loop body task
  if(x == -1)
    break;
  // loop body task
}
```



```
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