Belajaritma

# Algoritma dan Pemrograman

## Sesi VI: Pengenalan Function dan Recursion (PDF Example)

## Definition of Function

Function is a specific block of code that performs a specific task.

For example, a function for finding the radius of a circle, or finding a maximum number in an array.

## Types of Functions

There are 2 types of functions in C,

- Standard Library Function, which are built-in to C (for example, functions in `<stdio.h>`, `<string.h>`, `<math.h>`).

  Example : printf(), scanf(), pow(), strcpy().

- User-defined function, which are functions that are defined and created by the user itself. An example of user-defined functions would be :

```c
#include <stdio.h>

int addNumbers(int a, int b)         // function definition
{
    int result;
    result = a+b;
    return result;                  // return statement
}
int main()
{
    int n1,n2,sum;

    printf("Enters two numbers: ");
    scanf("%d %d",&n1,&n2);

    sum = addNumbers(n1, n2);        // function call
    printf("sum = %d",sum);

    return 0;
}
```

In this program, the main function gives the integers n1 and n2, as the `addNumbers` function needs 2 integers `(int a,int b)` as parameters.

If you need to write the main function first, you need a Function Prototype for it to function. This will give an example of a Function Prototype.

```c
#include <stdio.h>
int addNumbers(int a, int b);         // function prototype

int main()
{
    int n1,n2,sum;

    printf("Enters two numbers: ");
    scanf("%d %d",&n1,&n2);

    sum = addNumbers(n1, n2);         // function call
    printf("sum = %d",sum);

    return 0;
}

int addNumbers(int a, int b)          // function definition
{
    int result;
    result = a+b;
    return result;                   // return statement
}
```

Remember, this function prototype is not needed if the user-defined function is defined before the main() function.

The type of arguments passed to a function and the formal parameters must match, otherwise, the compiler will throw an error.

If n1 is of char type, a also should be of char type. If n2 is of float type, variable b also should be of float type.

## Recursion

A function that calls itself is called a Recursive Function. A basic structure of recursion is :

```
void recurse()
{
    ... .. ...
    recurse();
    ... .. ...
}

int main()
{
    ... .. ...
    recurse();
    ... .. ...
}
```

The recursion continues until some condition is met to prevent it. (if-else statement, for example). An example of recursion :

```
#include <stdio.h>
int sum(int n);

int main()
{
    int number, result;

    printf("Enter a positive integer: ");
    scanf("%d", &number);

    result = sum(number);

    printf("sum = %d", result);
    return 0;
}

int sum(int n)
{
    if (n != 0)
        // sum() function calls itself
        return n * sum(n-1);
    else
        return n;
}
```

If the user inputs "5", then the program will run 5 + 4 +3 +2 +1 until n=0, then returns the value (15), as pictured below.