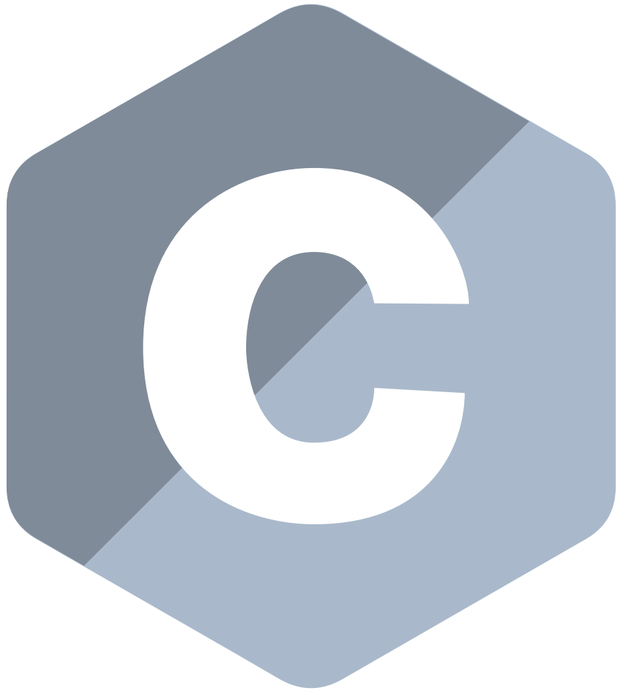
Sub-Programs and Functions In C Programming



01. Introduction

1.What is a Sub-porgram?

- A reusable code block designed for specific tasks.
- Helps divide larger problems into smaller, manageable sub-programs.

2. Why Use Sub-programs?

- Reduces complexity.
- facilitates error detection and modular design.

02. Advantages

- **Clarity and Readability:**
  - Code is easier to understand and maintain.
- **Reusability:**
  - Write once, use multiple times.
- **Error detection:**
  - Simplifies debugging and testing
- **Team Collaboration:**
  - Different features can be implemented by individual team members.
- **Examples of Predefined Sub-programs:**

03. Types of Sub-programs

- Functions:
  - Perform computations and return values.
  - Syntax:

```
functionName(parameters) : returnType
```

- Procedures:
  - Execute commands but do not return values.
  - Syntax:

```
procedureName(parameters)
```

04. Function Syntax

- Components of a Function:
  - Name of the function.
  - Parameters (inputs).
  - Local variables.
  - Return value.
  - Instructions (body of the function).
- **Example:**

```
1   function max(x: integer, y: integer): integer
2       if (x > y) then
3           return x
4       else
5           return y
6   end function
```

05. Exercise

TP10-11 Function

Lab's objectives:

- Using function to separate tasks (code grouping) under a name containing a piece of codes which make our code more readable, reusable and easy to fix bugs

`Deadline: 6 days`

EXCERCISE 1: Create a function in C programming to display all sequence numbers from 1 to n except the number 10, where n is a parameter of this function.

Example:

```
INPUT:
    Enter a number: 20

OUTPUT:
    DIsplay number using function displaySequence(1, 20):
    1 2 3 4 5 6 7 8 9  11 12 13 14 15 16 17 18 19 20
...
INPUT:
    Enter a number: -7

OUTPUT:
    Invalid input number. You are only allowed to input the positive number
greater than 1.
```

EXCERCISE 2: Write a C program to ask a user for 10 numbers. Create a function to find the minimum and maximum. Finally display those values to the user on screen. The signature of this function is:

```
findMinMax(int numbers[ ]){
    // statements
}
```

Example:

```
INPUT:
    Enter 10 numbers: 10  20  -12  9  5  28  11  65  10  -5
OUTPUT:
    Among the input numbers (10  20  -12  9  5  28  11  65  10  -5), we found
that:
    The minimum number is: -12, and the maximum number is 65.
```

EXCERCISE 3: Write a C program to allows the user to be able to perform 5 operations below:

a-Tell a user whether a number is Prime number or not using function

b-Display all odd numbers from 0 to n and display all even numbers from 0 to m using the function, where n and m are the parameters of the function. The signature of this function is:

```
void displayEvenOdd(int n, int m)  {
    // statements
}
```

c-Display all prime numbers between n and m using function, where n and m are the parameters of the function. The signature of this function is:

```
void displayPrimes(int n, int m)  {
    // statements
}
```

d-Compute summation of a suite: `112 + 122 + 132 + … + 1n2` , where n is a user input.

e-Exit program. The program tells the user the number of times that the user has tried the menu. Then, close the program.

Create a function to compute this summation. This function take n as a parameter. This function should return a float number representing the result from the summation.

The signature of this function is:

```
float computeSuite(int n)  {
    // statements
}
```

Test your program in main by creating a menu for the user to test your functions. Make the program running as an infinite loop.

Programming show:

```
/*……Program Menu: ……..*/
    a-Tell a user whether a number is Prime number
    b-Display all odd numbers from 1 to n and display all even numbers from 1
to m
    c-Display all prime numbers between n and m
    d-Compute summation of a suite: 112 +  122 + 132  + … + 1n2
    e-Exit program
…….
```

Example:

```
/*……Program Menu: ……..*/
    a-Tell a user whether a number is Prime number
    b-Display all odd numbers from 1 to n and display all even numbers from 1
to m
    c-Display all prime numbers between n and m
```

```
    d-Compute summation of a suite: 112 +  122 + 132  + … + 1n2
    e-Exit program
…….
INPUT & OUTPUT:
    Enter your choice: b

OUTPUT:
    You choose option b. We are going to display all odd numbers from 1 to n
and display all even numbers from 1 to m.
    Enter number n:  10
    Enter number m: 20

    All odd numbers from 1 to 10:  1  3  5  7  9
    All even numbers from 1 to 20:  2  4  6  8  10  12  14  16  18  20
.................................

/*……Program Menu: ……..*/
    a-Tell a user whether a number is Prime number
    b-Display all odd numbers from 1 to n and display all even numbers from 1
to m
    c-Display all prime numbers between n and m
    d-Compute summation of a suite: 112 +  122 + 132  + … + 1n2
    e-Exit program
…….

INPUT & OUTPUT:
    Enter your choice: b

OUTPUT:
    You chose option c.  Display all prime numbers between n and m using the
function, where n and m are the parameters of the function.
    Enter number n:  2
    Enter number m: 15

    All primes numbers between 2 and 15 are: 2  3  5  7  11  13  17  19
```

06. Homework

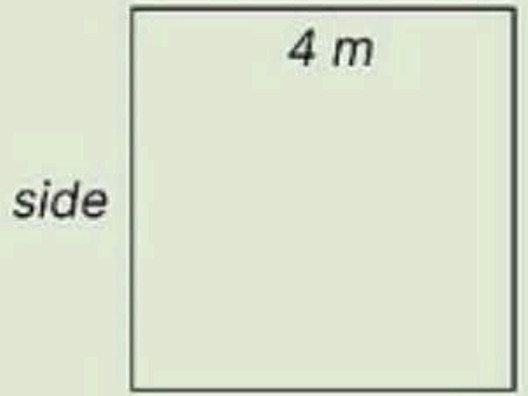
Celsius to Fahrenheit	$°F = \left(\frac{9}{5} \times °C\right) + 32$
Fahrenheit to Celsius	$°C = \frac{5}{9}(°F - 32)$

1. Create a function called sum that takes two integers as arguments and returns their sum. In the main() function, call this function with two numbers and print the result.
2. Find the maximum and minimum number of 20 numbers.
3. Calculate the suite.
4. Write a function to calculate this formula $y=3x^2-2x$, where x is the parameter of the function. The function returns the value of y.
5. Write a function for counting digit of a number.
6. Write two functions for temperature conversion:
   a. Celsius to Fahrenheit
   b. Fahrenheit to Celsius

7. Write function for calculating:
   a. Area of square
   b. Volume of cylinder

$$A = s^2$$

$A = 4 \times 4 = 16 m^2$



$$V = \pi r^2 h$$