



UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING
COMPUTER SCIENCE DEGREE PROGRAMME
FIRST YEAR
SCS 1202 - Programming Using C
Tutorial 03

1. Write C programs to display the following outputs.

(a)

```
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****  
*****
```

(b)

```
 *  
 **  
 ***  
 ****  
 *****  
 ****  
 ***  
 **  
 *
```

(c)

```
*****  
****  
***  
**  
*  
* *  
* * *  
* * * *  
* * * * *  
* * * * * *  
* * * * * * *  
* * * * * * * *
```

(d)

```
*****  
* * * * *  
* * * * *  
* * * * *  
* * * * *  
* * * * *  
* * * * *  
*****
```

(e)

```
 * * * * *  
 * * * * *  
 * * * * *  
 * * * * *  
 * * * * *  
 * * * * *  
 * * * * *  
 *
```

(f)

```
 *  
 **  
 ***  
 ****  
 *****  
 ****  
 ***  
 **  
 *
```

2. Write a function which checks whether page of a book is in left side or right side when page number is given. Note that numbering starts from the very first page.

3. Write a program to check if a number is even or odd.
4. Write a program called **PrintNumberInWord** which prints "ONE", "TWO", ..., "NINE", "OTHER" if the int variable "number" is 1, 2, ..., 9, or other, respectively. Use a "nested-if" statement.
5. Given the float variables x_1 , x_2 , y_1 , y_2 write a code segment to find the slope of a line through the two points (x_1, y_1) and (x_2, y_2) . Note that you have to check whether slope is undefined.
6. Write a C program to calculate the **revenue** from a sale based on the unit price and quantity of a product input by the user.

The discount rate is 15% for the **quantity purchased** between 120 and 160 units, and 20% for the quantity purchased greater than 160 units. If the quantity purchased is less than 120 units, the discount rate is 0%.

7. Print "Uppercase", "Lowercase", or "Not a letter" depending on whether the character input by the user is an uppercase alphabetic character, a lowercase alphabetic character, or not an alphabetic character at all.
8. Create a program to print a list of all the divisors of a given number.
9. Find the maximum consecutive 1's in a string of 0's and 1's.
Eg: 00110001001110 - Output :3 [Max number of consecutive 1's is 3]
10. Write C program to check whether a given year is a leap year.
*(Hint: Every year that is exactly divisible by four is a **leap year**, except for years that are exactly divisible by 100, but these centurial years are leap years if they are exactly **divisible** by 400. ... The years 1600, 2000 and 2400 are leap years, while 1700, 1800, 1900, 2100, 2200 and 2300 are not leap years)*
11. Body constitution is measured using BMI (Body Mass Index) which depends only on the height and weight of a person. It can be defined by,

$$\text{BMI} = \text{weight} / \text{height}^2$$

Where weight is taken in kilograms and height in meters. Four general grades are proposed such that,

Underweight : $\text{BMI} < 18.5$

Normal weight : $18.5 \leq \text{BMI} < 25.0$

Overweight : $25.0 \leq \text{BMI} < 30.0$

Obesity : $30.0 \leq \text{BMI}$

Write a C program to output user's body constitution grade when he/she inputs body weight (kg) and the height (m).

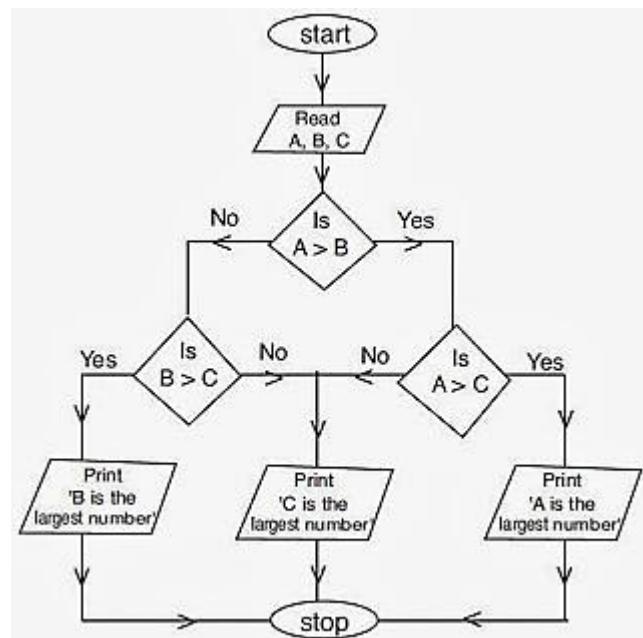
12. Write a method to count the number of 2s in given range of integers.

Eg: 10,11,12 ,13,14,15,16,17,18,19, 20

13. Implement the following game using while loop.

User will have a number between 0 and 100 in his or her head. Write a C program to guess that number. Program will guess a number and users will say whether it is too high, too low, or that's the number. At the end, print how many guesses it took to get right number. Note: You will have to choose how your program will strategically guess. A naïve **strategy** can be to simply start the guessing at 1, and keep going (2, 3, 4, etc.) until you hit the number. But that's not an **optimal** guessing strategy. You need to provide an optimized solution.

14. Convert the following flow chart into a C program.



15. Following pseudocode shows how to find all the roots of a quadratic equation $ax^2+bx+c=0$.
Convert it to a C program.

```
Step 1: Start
Step 2: Read A, B, C as integer
Step 3: Declare disc, deno, x1, x2 as float
Step 4: Assign disc = (B * B) - (4 * A * C)
Step 5: Assign deno = 2 * A;
Step 6: if( disc > 0 )
begin
    Print "THE ROOTS ARE REAL ROOTS"
    Assign x1 ← (-B / deno) + (sqrt(disc) / deno)
    Assign x2 ← (-B / deno) - (sqrt(disc) / deno)
    Print x1, x2
end
else if(disc = 0)
begin
    Print " THE ROOTS ARE REPEATED ROOTS"
    Assign x1 ← -B / deno
    Print x1
end
else Print "THE ROOTS ARE IMAGINARY ROOTS"
```

Step7: Stop

Hint: Nature of roots of quadratic equation can be known from the quadrant = b^2-4ac

If $b^2-4ac > 0$ then roots are real and unequal

If $b^2-4ac = 0$ then roots are real and equal

If $b^2-4ac < 0$ then roots are imaginary