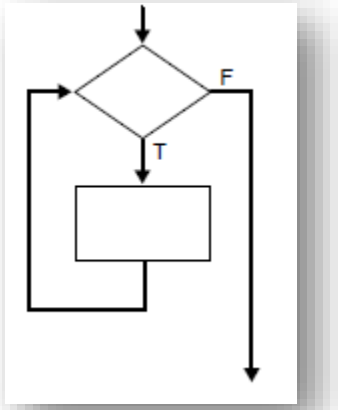
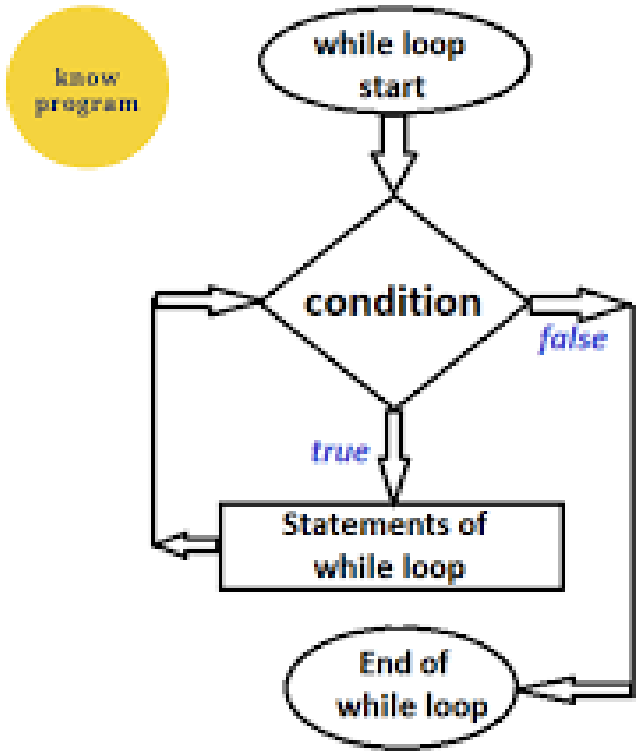
DATA STRUCTURE & PROGRAMMING I

Topic 6- Loop **while**



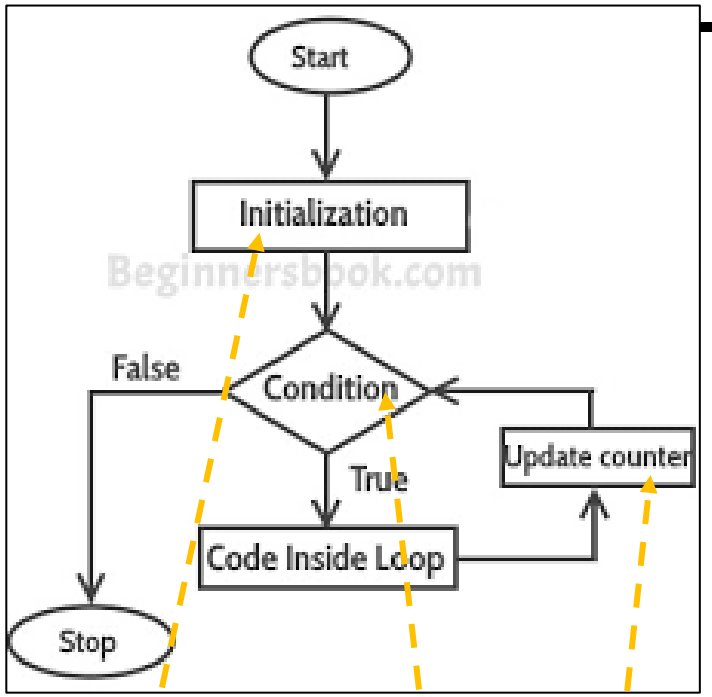
While loop




```
Loop while (condition)
        //body …
        //codes …
        //codes …
End loop while
```

```
while( condition ){
        //body of while loop
        //codes
}
```

Using Loops

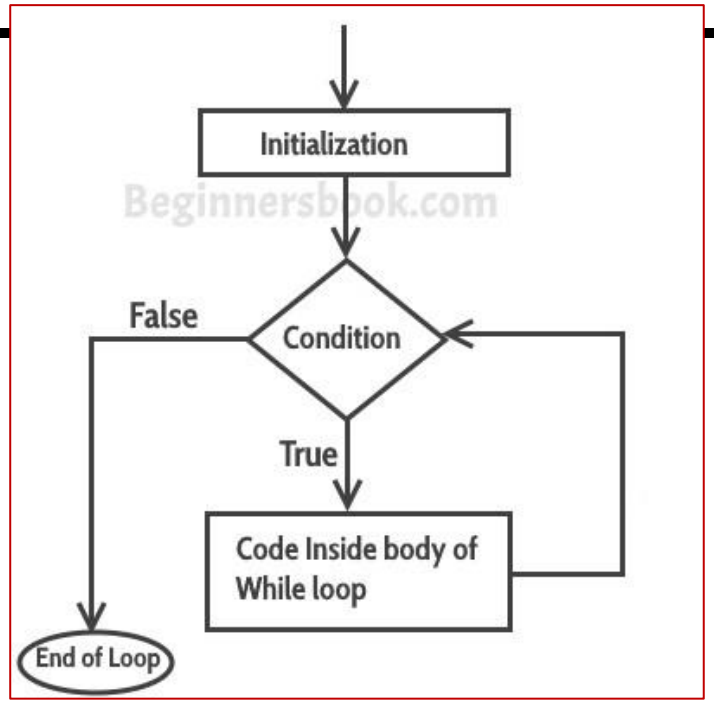


Loop: for

initialization Condition Update

```
for(int k=10; k>0; k=k-1){
    printf("%d", k);
}
```

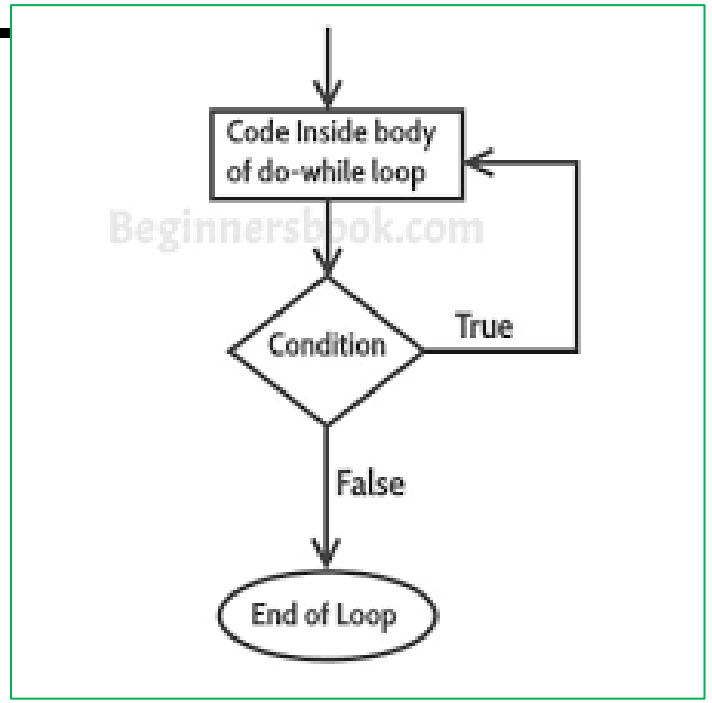
OUTPUT:



Loop: while

```
int k=5;
while( k < 10 ){
    printf("%d", k);
}
```

OUTPUT:



Loop: do ... while

```
int k=20;
do{
    printf("%d", k);
}while( k < 10 );
```

OUTPUT:

While loop

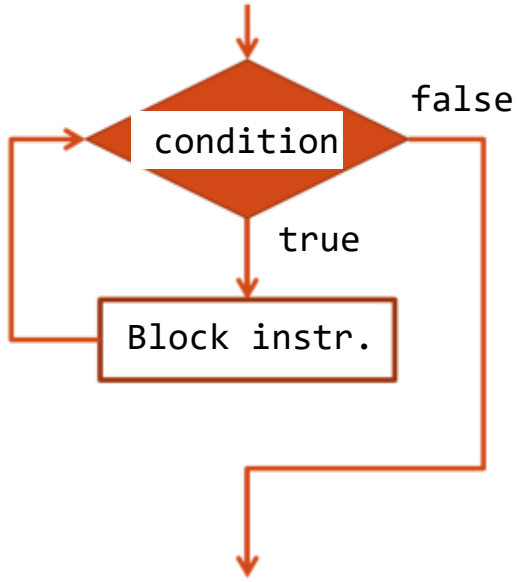
WHILE … DO

WHILE loop

- Syntax:

loopback condition for stopping loop when it turns `false`

```
while(condition) do
    //block instructions
end while
```



- **Block of instructions** is executed when condition is **true**
- Block of instructions is repeated to run until the condition is **false**
- **Note**:
  - Loop can be infinite loop if condition is wrong control
  - Block of instructions can control the `condition`

WHILE … DO

WHILE loop

- Examples:

1

```
var n: integer
begin
    n ← 10
    while(n>0) do
        write(n, “ ”)
        n ← n-2
    end while
end
```

Output: `10 8 6 4 2`

2

```
var n: integer
begin
    n ← 10
    while(n-1>2) do
        write(n+1, “ ”)
        n ← n-2
    end while
end
```

Output: `11 9 7 5`

3

```
var n: integer
begin
    read(n)
    while(n>1) do
        write(n, “ ”)
        n ← n-2
    end while
end
```

Output: `?`

WHILE … DO

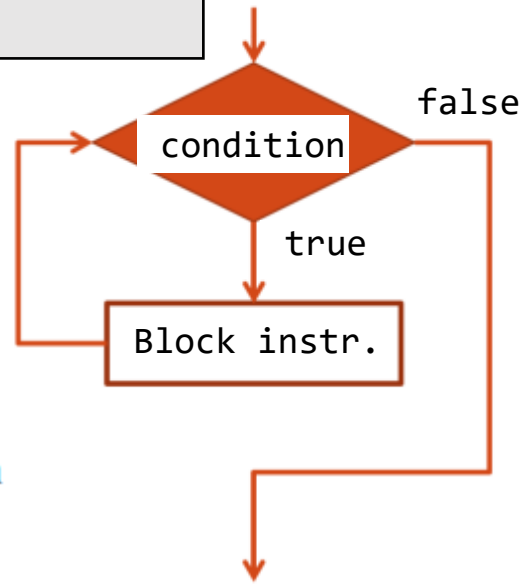
Examples

```
var n: integer
begin
      n ← 1
      while(n!=5) do
            write(++n, “ ”)
      end while
end
```

```
2 3 4 5
```

```
var n: integer
begin
      n ← 1
      while(n!=5) do
            write(n++, “ ”)
      end while
end
```

```
1 2 3 4
```




```
var n: integer
begin
    n ← 0
    while(n==0) do
        write(n, “ ”)
    end while
end
```

Output:

```
0
```

```
var n: integer
begin
    n ← 1
    while(n!=5) do
        write(n+1, “ ”)
        n ← n+1
    end while
end
```

Output:

```
2 3 4 5
```

WHILE … DO

Examples

```
var n: integer
begin
    read(n)
    while(n>1) do
        write(n, “ ”)
        n ← n+2
    end while
end
```

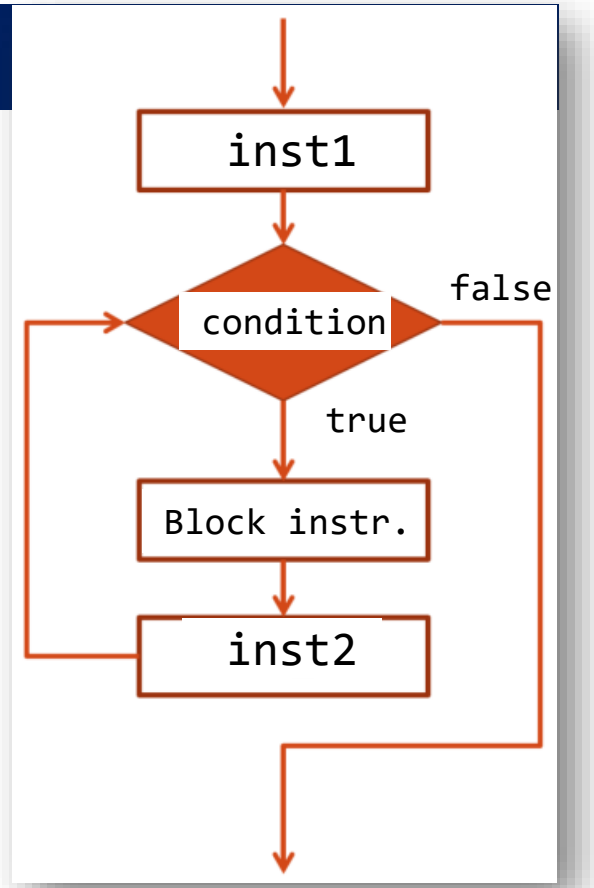
Output:

?

```
var n: integer
begin
    read(n)
    while(n>=1 AND n<50) do
        write(n, “ ”)
        n ← 2*n+1
    end while
end
```

Output:

?



Infinite loop

Notation on infinite loop

- Example:

```
var n : integer
begin
    n ← 10
    while(n>0) do
        write(n, “ ”)
    end while
end
```

Output:

```
10 10 …
```

Break Vs. Continue keyword

`break` statement breaks the loop/switch whereas

`continue` skip the execution of current iteration and continue to the next iteration (it does not break the loop/switch)

Syntax in C Programming

Examples

- A program to sum all numbers input from user until user inputs 0.

while1.c - Code::Blocks 20.03

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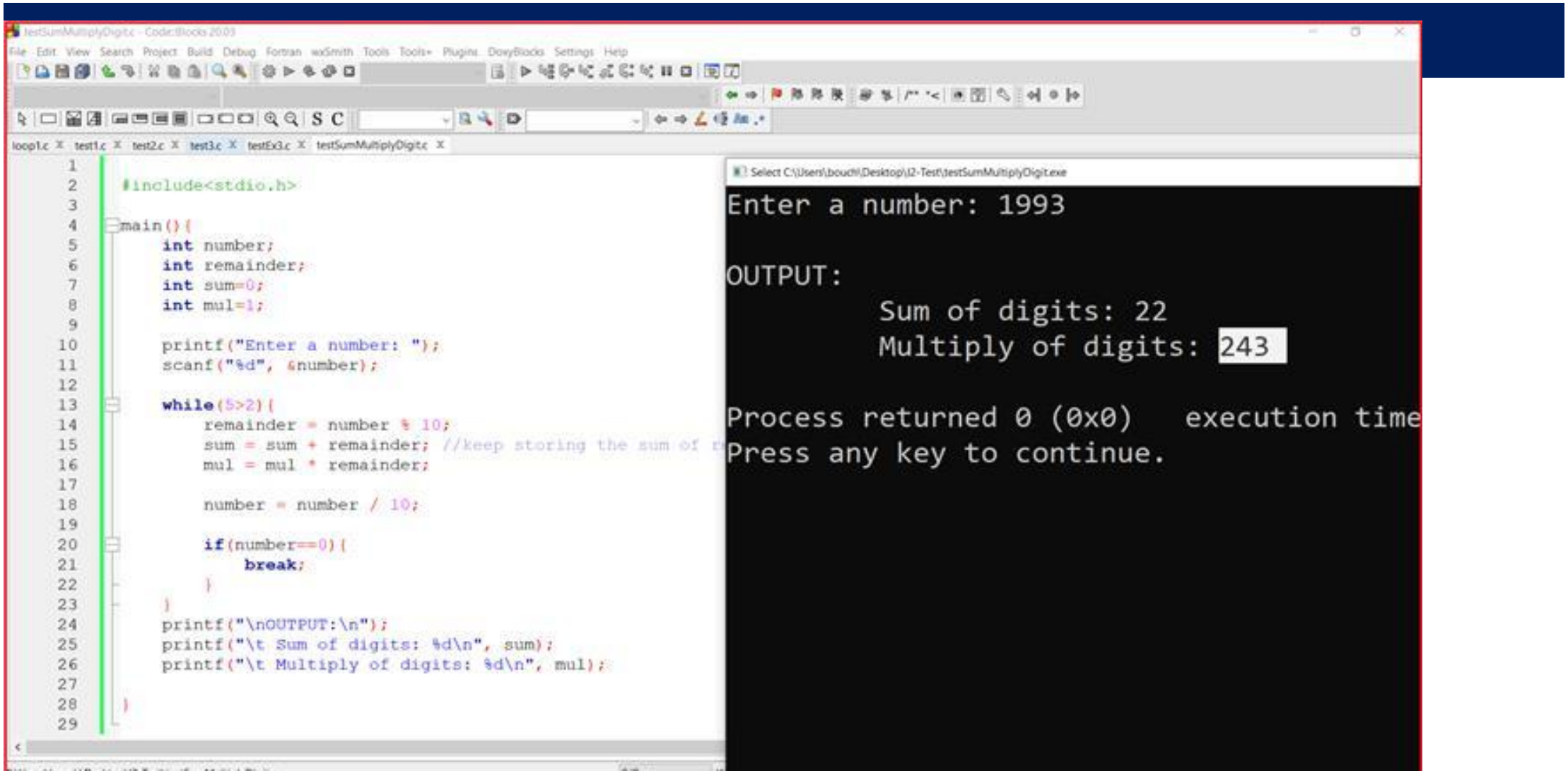
Practice1.c | for-loop.c | while1.c

```c
#include<stdio.h>
main(){
    int n=11;
    int s=0;

    while(n!=0){   //event here
        printf("Enter a number:   ");
        scanf("%d",&n);

        s=s+n;
    }
    printf("\n\tTotal sum for all input numbers: %d\n", s);
}
```

Select C:\Users\bouch\Desktop\while1.exe

```
Enter a number:  78
Enter a number:  1
Enter a number:  -2
Enter a number:  7
Enter a number:  5
Enter a number:  6
Enter a number:  90
Enter a number:  0

        Total sum for all input numbers: 185
```

Sum and multiply of digits for a given number!



```c
#include<stdio.h>

main(){
    int number;
    int remainder;
    int sum=0;
    int mul=1;

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

    while(5>2){
        remainder = number % 10;
        sum = sum + remainder; //keep storing the sum of r
        mul = mul * remainder;

        number = number / 10;

        if(number==0){
            break;
        }
    }
    printf("\nOUTPUT:\n");
    printf("\t Sum of digits: %d\n", sum);
    printf("\t Multiply of digits: %d\n", mul);

}
```

```
Enter a number: 1993

OUTPUT:
         Sum of digits: 22
         Multiply of digits: 243

Process returned 0 (0x0)   execution time
Press any key to continue.
```

Examples: Temperature converter program

Practice1.c - Code::Blocks 20.03

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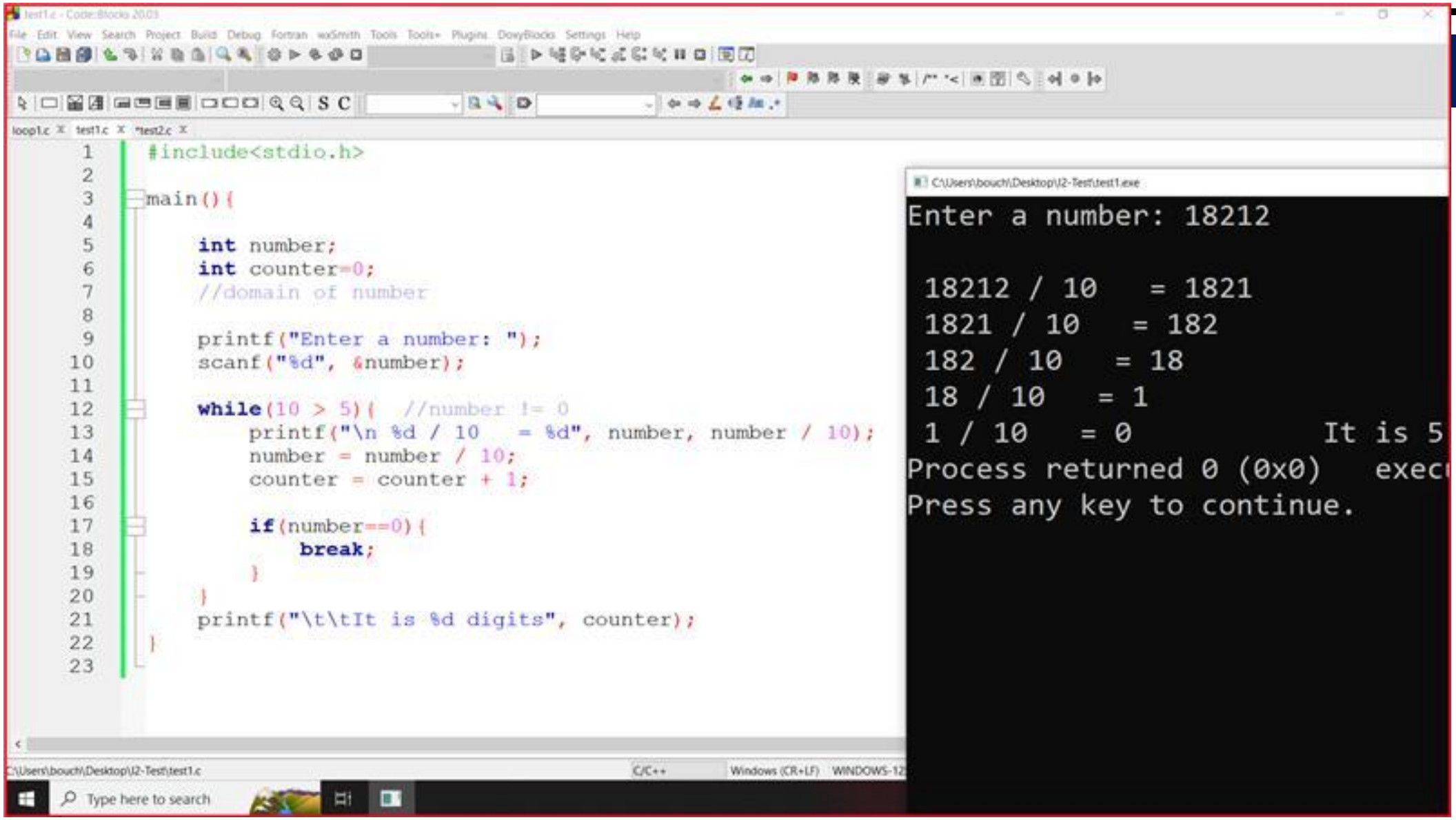
Practice1.c | for-loop.c | while1.c

```c
#include<stdio.h>
main(){
    printf("A program to perform temperature conversion");

    while(10 > 5){
        printf("\n\t\t**Menu\n");
        printf("\t1- Convert temperature in Celsius to Farenheit\n");
        printf("\t2- Convert temperature in Farenheit to Celsius\n\n");

        int menu;
        float celcius;
        float farenheit;

        printf("Enter menu number: ");
        scanf("%d", &menu);

         if(menu==1){
            printf("\tEnter a temperature in Celsius: ");
            scanf("%f", &celcius);
            farenheit = ((9*celcius)/5) + 32;

            printf("\n\t**** Result: %f",farenheit);
            printf("\n-----------------------------------------\n");
            //break;

         }else if(menu==2){
            printf("\tEnter a temperature in Farenheit: ");
            scanf("%f", &farenheit);
            celcius =  ((5*farenheit)/9) - 32;

            printf("\n\t**** Result: %.3f",celcius);
            printf("\n-----------------------------------------\n");
            //break;
        }else{
            printf("\n\t***OOp! Wrong input menu!\n");
            printf("Please try again!!!!!");
        }
    }
}
```

Select "G:\My Drive\Working\CADT\Advance Algo (T3 2022-2023)\Exam\Practice1.exe"

```
A program to perform temperature conversion
                **Menu
        1- Convert temperature in Celsius to Farenheit
        2- Convert temperature in Farenheit to Celsius

Enter menu number: 1
        Enter a temperature in Celsius: 76

        **** Result: 168.800003
-----------------------------------------

                **Menu
        1- Convert temperature in Celsius to Farenheit
        2- Convert temperature in Farenheit to Celsius

Enter menu number: 2
        Enter a temperature in Farenheit: 110

        **** Result: 29.111
-----------------------------------------

                **Menu
        1- Convert temperature in Celsius to Farenheit
        2- Convert temperature in Farenheit to Celsius

Enter menu number: 5

        ***OOp! Wrong input menu!
Please try again!!!!!
                **Menu
        1- Convert temperature in Celsius to Farenheit
        2- Convert temperature in Farenheit to Celsius

Enter menu number:
```

Using while loop to count digits of a number



Assignment

Deadline: **1 week**

Write a program using while loop to …

1. Display all numbers from 99 to 1.
2. Display all numbers from 1 to 100 except the number 50.
3. Display odd numbers between 8 to 1000 except the numbers 11, 17 and 21.
4. Show all integer divisible by 3 between 1 to 100 except 30, 60, and 90.
5. Sum all numbers from 1 to 100 then display the result.
6. Multiply all numbers from 1 to 100 then display the result.

Assignment

Write a program using while loop to …

7. Compute and display the summation of the suit cube number starting from n up to 1, where n is the input number entered by a user, n is greater than 1.
    7. Ex: Suppose the input is 3, then display $3^3 + 2^3 + 1^3 = 36$
8. Check whether an input number is a primary number or not. The program runs indefinitely so that we can always check another input number.
9. Display all primary numbers in between 2 to 500.
10. Read 20 input numbers from a user and then find the maximum number and display it on screen.

Assignment

Write a program using while loop to …

Tip: To generate a random number

```
1   #include<stdio.h>
2   #include<time.h>
3   int main() {
4       srand(time(0));
5       int n;
6       int min=1, max=10000;
7
8       //Random number  [min, max]
9       n=rand()%max + min;
10      printf("%d ", n);
11  }
```

11. Write a C program to guess a number. The computer generate a random number. Then program asks a user to input a number for guessing. The program keeps asking the user to input a number until the user input the correct one compared to the randomized number.

- If the user inputs a number **greater than the randomized number**, tell a user to input another smaller number.
- If the user inputs a number **less than the randomized number**, tell a user to input another bigger number.
- If the user inputs **the correct number (the number is same to the randomized number)**, display "Congratulations! You guess only **n** times to be correct.", where n is the number of attempts the user made to get it right.

```
**********************
**** Number prediction program ***
**********************
Generating a random number ...!
A randomized number has been generated successfully!

        Enter your guess number: 7
Your predicted number is too big
You can try predicting a smaller number

        Enter your guess number: 5
Your predicted number is  too small.
You can try predicting a bigger number.

        Enter your guess number: 6
Congrats!!! You have predict it right in 3 times

Process returned 0 (0x0)   execution time : 12.257 s
```

Tips to generate a random number

```c
#include<stdio.h>
#include<time.h>
int main() {
        srand(time(0));
        int n;
        int min=1, max=10000;

        //Random number  [min, max]
        n=rand()%max + min;
        printf("%d ", n);
}
```