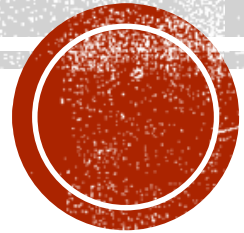
EXERCISES

For- if-else



REMARK

- Using of instructions of selections (if, if-else) ?
- Using of a Loop (for, while, do while) ?

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- **Using of if, if-else ?**
  - To control the execution of an instruction/block of instruction (execution one time/non-execution at all).

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  - Case 1: To repeat many times the execution of instruction/block of instructions.

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- Using of if, if-else
  - To control the execution of an instruction/block of instruction (execution one time/non-execution at all).
- **Using of a Loop ?**
  - Case 1: To repeat many times the execution of instruction/block of instructions.
  - Case 2: To generate a sequence of specific numbers

EXERCISE 1 –PART A

Write a program that calculates the factorial N! = 1*2*3*...*(N-1)*N of an integer N respecting that 0!=1.

EXERCISE 1- PART A - SOLUTION

Write a program that calculates the factorial N! = 1*2*3*...*(N-1)*N of an integer N respecting that 0!=1.

```
#include<iostream>
using namespace std;
int main()
{
int N,i,f;
cout<<"enter the value of N : " ;
cin>>N;
for (i=1, f=1; i<=N; i++)
    f=f*i;
cout<<N<<"!="<<f;
return 0;
}
```

```
enter the value of N : 3
3!=6
--------------------------------
Process exited after 10.6 seconds with return value 0
Press any key to continue . . .
```

```
enter the value of N : 0
0!=1
--------------------------------
Process exited after 4.212 seconds with return value 0
Press any key to continue . . .
```

Loop is required to generate 1,2,3,…N (case 2: To generate a sequence of specific numbers)

EXERCISE 1- PART B

Modify the previous program that calculates the factorial N! = 1*2*3*...*(N-1)*N of an integer N respecting that 0!=1 **and factorial of a negative number doesn't exist**.

```
#include<iostream>
using namespace std;
int main()
{
int N,i,f;
cout<<"enter the value of N : " ;
cin>>N;
for (i=1, f=1; i<=N; i++)
    f=f*i;
cout<<N<<"!="<<f;
return 0;
}
```

```
enter the value of N : -4
-4!=1
--------------------------------
Process exited after 2.986 seconds with return value 0
Press any key to continue . . .
```

If we use the previous program, we get an incorrect answer in case of N <0, therefore we need to modify the program accordingly.

EXERCISE 1- PART B- SOLUTION

Write a program that calculates the factorial N! = 1*2*3*...*(N-1)*N of an integer N respecting that 0!=1 **and factorial of a negative number doesn't exist**.

```
#include<iostream>
using namespace std;
int main()
{
int N,i,f;
cout<<"enter the value of N : " ;
cin>>N;
if(N>=0)
{
    for (i=1, f=1; i<=N; i++)
    f=f*i;
    cout<<N<<"!="<<f;
}
else
    cout<<N<<"<0, " << N<<"! doesn't exist";
return 0;
}
```

```
enter the value of N : -4
-4<0, -4! doesn't exist
--------------------------------
Process exited after 2.479 seconds with return value 0
Press any key to continue . . .
```

```
enter the value of N : 5
5!=120
--------------------------------
Process exited after 1.389 seconds with return value 0
Press any key to continue . . .
```

```
enter the value of N : 0
0!=1
--------------------------------
Process exited after 1.421 seconds with return value 0
Press any key to continue . . .
```

EXERCISE 2

Write a program that reads an integer n and prints the value of S. the program prints 0 if n≤0

$$S = \begin{cases} \frac{1}{5} + \frac{1}{10} + \frac{1}{15} + \cdots + \frac{1}{n} \ if\ n\ divisible\ by\ 5 \\ 1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{n} \text{ elsewhere} \end{cases}$$

EXERCISE 2

Write a program that reads an integer n and prints the value of S. the program prints 0 if n≤0

$$S = \begin{cases} \frac{1}{5} + \frac{1}{10} + \frac{1}{15} + \cdots + \frac{1}{n} & if\ n\ divisible\ by\ 5 \\ 1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{n} & \text{elsewhere} \end{cases}$$

```
#include<iostream>
using namespace std;
int main()
{
    int n,i;
    float S;
    cout<<" enter the value of n: ";
    cin>>n;
    if(n<=0)
        S=0;
    else
        if(n%5==0)
            for(i=5, S=0;i<=n;i=i+5)
                S=S+1.0/i;
        else
            for(i=1,S=0;i<=n;i=i+1)
                S=S+1.0/i;
    cout<<"S= "<<S;
return 0;
}
```

```
 enter the value of n: 0
S= 0
--------------------------------
Process exited after 1.676 seconds with return value 0
Press any key to continue . . .
```

```
 enter the value of n: -5
S= 0
--------------------------------
Process exited after 5.243 seconds with return value 0
Press any key to continue . . .
```

```
 enter the value of n: 2
S= 1.5
--------------------------------
Process exited after 1.194 seconds with return value 0
Press any key to continue . . .
```

```
 enter the value of n: 10
S= 0.3
--------------------------------
Process exited after 1.746 seconds with return value 0
Press any key to continue . . .
```

```
 enter the value of n: 19
S= 3.54774
--------------------------------
Process exited after 4.007 seconds with return value 0
Press any key to continue . . .
```

Loop is required to generate 1,2,3,…n and 5,10,15,…n (case 2: To generate a sequence of specific numbers)

EXERCISE 3

Write a program that reads 20 numbers and prints the maximum value of the entered numbers.

EXERCISE 3-SOLUTION

Write a program that reads 20 numbers and prints the maximum value of the entered numbers.

```
#include<iostream>
using namespace std;
int main()
{
    float x,max;
    int i;
for(i=1;i<=20;i++)
{
    cout<<" enter value "<<i<<"\n";
    cin>>x;
    if(i==1)
        max=x;
    else
        if(max<x)
            max=x;
}
    cout<<" maximum ="<<max;
    return 0;
}
```

```
 enter value 1
3
 enter value 2
8
 enter value 3
19
 enter value 4
-5
 enter value 5
18
 enter value 6
6
 enter value 7
89
 enter value 8
24
 enter value 9
5
 enter value 10
48
 enter value 11
2
 enter value 12
3
 enter value 13
46
 enter value 14
28
 enter value 15
5
 enter value 16
4
 enter value 17
99
 enter value 18
61
 enter value 19
2
 enter value 20
4
 maximum =99
--------------------------------
Process exited after 62.89 seconds with return value 0
Press any key to continue . . .
```

EXERCISE 3-SOLUTION

Write a program that reads 20 numbers and prints the maximum value of the entered numbers.

```
#include<iostream>
using namespace std;
int main()
{
    float x,max;
    int i;
for(i=1;i<=20;i++)
{
    cout<<" enter value "<<i<<"\n";
    cin>>x;
    if(i==1)
        max=x;
    else
        if(max<x)
            max=x;
}
    cout<<" maximum ="<<max;
    return 0;
}
```

Loop is required to allow the reading of 20 numbers (Case 1: To repeat many times the execution of some instructions)

EXERCISE 4

Write a program that calculates the N-th term U_N of the following sequence given by the recurrence relation: $U_1 = 1, U_N = 2 * U_{N-1} + 1\ (N > 1)$

EXERCISE 4-SOLUTION

Write a program that calculates the N-th term U_N of the following sequence given by the recurrence relation: $U_1 = 1, U_N = 2 * U_{N-1} + 1\ (N > 1)$

```
#include<iostream>
using namespace std;
int main()
{
    int N,i, U, A;
    cout<<" enter N ";
    cin>>N;
for(i=1,A=1;i<=N-1;i++)
{
    U=2*A+1;
    A=U;
}
if (N<=0)
    cout<<" U"<<N<<" doesn't exist";
else
    if(N==1)
        cout<<" U"<<N<<"="<<1;
    else
        cout<<" U"<<N<<"="<<U;
    return 0;
}
```

```
enter N -9
U-9 doesn't exist
--------------------------------
Process exited after 3.109 seconds with return value 0
Press any key to continue . . .
```

```
enter N 0
U0 doesn't exist
--------------------------------
Process exited after 3.188 seconds with return value 0
Press any key to continue . . .
```

```
enter N 1
U1=1
--------------------------------
Process exited after 2.572 seconds with return value 0
Press any key to continue . . .
```

```
enter N 2
U2=3
--------------------------------
Process exited after 1.46 seconds with return value 0
Press any key to continue . . .
```

```
enter N 4
U4=15
--------------------------------
Process exited after 4.021 seconds with return value 0
Press any key to continue . . .
```

Loop is required to repeat the execution of the equation of general Term U a specific numbers of times (Case 1: To repeat many times the execution of some instructions)

EXERCISE 5

Write a program that calculates the N-th term U_N of the FIBONACCI sequence that is given by the recurrence relation: $U_1 = 1, U_2 = 1, U_N = U_{N-1} + U_{N-2}$ $(N > 2)$

EXERCISE 5- SOLUTION

Write a program that calculates the N-th term U_N of the FIBONACCI sequence that is given by the recurrence relation: $U_1 = 1, U_2 = 1, U_N = U_{N-1} + U_{N-2}\ (N > 2)$

```
#include<iostream>
using namespace std;
int main()
{
    int N,i, U, A, B;
    cout<<" enter N ";
    cin>>N;
for(i=1,A=1,B=1;i<=N-2;i++)
{
    U=A+B;
    B=A;
    A=U;
}
if (N>2)
    cout<<" U"<<N<<"="<<U;
else
    if(N==1 || N==2)
        cout<<" U"<<N<<"="<<1;
    else
        cout<<"N<=0, U"<<N<<" doesn't exist";
return 0;
}
```

```
 enter N -3
N<=0, U-3 doesn't exist
--------------------------------
Process exited after 1.805 seconds with return value 0
Press any key to continue . . .
```

```
 enter N 0
N<=0, U0 doesn't exist
--------------------------------
Process exited after 3.208 seconds with return value 0
Press any key to continue . . .
```

```
 enter N 1
 U1=1
--------------------------------
Process exited after 1.424 seconds with return value 0
Press any key to continue . . .
```

```
 enter N 2
 U2=1
--------------------------------
Process exited after 0.8978 seconds with return value 0
Press any key to continue . . .
```

```
 enter N 3
 U3=2
--------------------------------
Process exited after 6.107 seconds with return value 0
Press any key to continue . . .
```

```
 enter N 10
 U10=55
--------------------------------
Process exited after 1.158 seconds with return value 0
Press any key to continue . . .
```

Loop is required to repeat the execution of the equation of general Term U a specific numbers of times (Case 1: To repeat many times the execution of some instructions)