School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering

CS-114 - Fundamentals of Programming

Lab Report # 02

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DATE:
10-10-23

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Lab Report # 02
Relational and Logical Operators

Objectives:

The objective of this lab is to understand the use of Relational and Logical Operators in C++ Language. In addition, to use these operators and make useful conditions.

Lab Tasks:

Task 1:

Write a program that determines if a person is eligible to vote based on their age (e.g., 18 years or older) using logical operators.

Code:

```
#include <iostream>
using namespace std;

int main()
{
    int age;

    cout<<"Enter your age: ";
    cin>>age;
    cout<<endl;

    if (age>=0)
    {
        if(age>=18)
        {
            cout<<"You are eligible to vote."<<endl;
        }
        else
        {
            cout<<"You are ineligible to vote."<<endl;
        }
    }
    else
    {
        cout<<"The age entered is negative, hence invalid."<<endl;
    }
    return 0;
}
```

Output:

```
Enter your age: 18

You are eligible to vote.

--------------------------------
Process exited after 5.523 seconds with return value 0
Press any key to continue . . .
```

```
Enter your age: 17

You are ineligible to vote.

--------------------------------
Process exited after 7.252 seconds with return value 0
Press any key to continue . . .
```

```
Enter your age: -1

The age entered is negative, hence invalid.

--------------------------------
Process exited after 7.173 seconds with return value 0
Press any key to continue . . .
```

Task 2:

Write a program that takes an integer as input and checks if it falls within the range [10, 50] using logical operators.

Code:

```cpp
#include <iostream>
using namespace std;

int main()
{
    int i;

    cout<<"Enter an integer: ";
    cin>>i;
    cout<<endl;

    if(i>=10 && i<=50)
    {
        cout<<"The integer falls in the range [10, 50]"<<endl;
    }
    else
    {
        cout<<"The integer does not fall in the range [10, 50]"<<endl;
    }
    return 0;
}
```

Output:

```
Enter an integer: 46

The integer falls in the range [10, 50]

--------------------------------
Process exited after 7.278 seconds with return value 0
Press any key to continue . . .
```

```
Enter an integer: 52

The integer does not fall in the range [10, 50]

--------------------------------
Process exited after 8.592 seconds with return value 0
Press any key to continue . . .
```

Task 3:

Write a C++ program to compare two integers and find the maximum value.

Code:

```cpp
{
    int x, y;
    cout<<"Enter the first integer: ";
    cin>>x;
    cout<<endl;
    cout<<"Enter the second integer: ";
    cin>>y;
    cout<<endl;


    if(x==y)
    {
        cout<<"Both are equal."<<endl;
    }
    else if(x>y)
        {
        cout<<x<<" is greater than "<<y<<endl;
        }
    else
    {
        cout<<y<<" is greater than "<<x<<endl;
    }

    return 0;
}
```

Output:

```
Enter the first integer: 5

Enter the second integer: 3

5 is greater than 3

--------------------------------
Process exited after 4.413 seconds with return value 0
Press any key to continue . . .
```

```
Enter the first integer: 7

Enter the second integer: 56

56 is greater than 7

--------------------------------
Process exited after 8.174 seconds with return value 0
Press any key to continue . . .
```

```
Enter the first integer: 5

Enter the second integer: 5

Both are equal.

--------------------------------
Process exited after 2.311 seconds with return value 0
Press any key to continue . . .
```

Task 4:

Write a C++ program to calculate the average of three exam scores and determine if it's above a passing grade (e.g., average >= 60).

Code:

```
{
    float a,b,c,avg;
    cout<<"Enter the first exam score: ";
    cin>>a;
    cout<<endl;

    cout<<"Enter the second exam score: ";
    cin>>b;
    cout<<endl;

    cout<<"Enter the third exam score: ";
    cin>>c;
    cout<<endl;
    avg = (a+b+c)/3;

    if(a>=0 && b>=0 && c>=0)
    {
        cout<<"The average of the scores entered is: "<<avg<<endl;
        if(avg>=60)
        {
            cout<<"Congratulations! You have a passing grade."<<endl;
        }
        else
        {
            cout<<"Unfortunately, you do not have a passing grade."<<endl;
        }
    }
    else
    {
        cout<<"The scores entered are negative, hence invalid."<<endl;
    }


    return 0;
}
```

Output:

```
Enter the first exam score: 30

Enter the second exam score: 40

Enter the third exam score: 20

The average of the scores entered is: 30
Unfortunately, you do not have a passing grade.

--------------------------------
Process exited after 9.515 seconds with return value 0
Press any key to continue . . .
```

```
Enter the first exam score: 40

Enter the second exam score: 60

Enter the third exam score: 80

The average of the scores entered is: 60
Congratulations! You have a passing grade.

--------------------------------
Process exited after 8.138 seconds with return value 0
Press any key to continue . . .
```

```
Enter the first exam score: 0

Enter the second exam score: 30

Enter the third exam score: -20

The scores entered are negative, hence invalid.

--------------------------------
Process exited after 11.37 seconds with return value 0
Press any key to continue . . .
```

Home Tasks:

Task 1:

Create a program that takes a student's score as input and assigns a grade based on predefined criteria using logical operators (e.g., A, B, C, D, F).

A-Grade: 90-100 Marks

B-Grade: 75-90 Marks

C-Grade: 60-75 Marks

D-Grade: 45-60 Marks

F-Grade: 0-45 Marks

Code:

```
int main()
{
    float score;
    cout<<"Enter your score: ";
    cin>>score;

    if(score>=0)
    {
        if(score>=90 && score<=100)
        {
            cout<<"Your grade is A."<<endl;
        }
        else if(score>=75 && score<90)
        {
            cout<<"Your grade is B."<<endl;
        }
        else if(score>=60 && score<75)
        {
            cout<<"Your grade is C."<<endl;
        }
        else if(score>=45 && score<60)
        {
            cout<<"Your grade is D."<<endl;
        }
        else
        {
            cout<<"Your grade is F."<<endl;
        }

    }
    else
    {
        cout<<"The score entered is negative, hence invalid."<<endl;
    }

    return 0;
}
```

Output:

```
Enter your score: 58
Your grade is D.

--------------------------------
Process exited after 6.617 seconds with return value 0
Press any key to continue . . .
```

```
Enter your score: -20
The score entered is negative, hence invalid.

--------------------------------
Process exited after 4.854 seconds with return value 0
Press any key to continue . . .
```

Task 2:

Write a program that takes an integer as input and determines if it is both even and divisible by 5.

Code:

```cpp
#include <iostream>
using namespace std;

int main()
{
    int i;
    cout<<"Enter an integer: ";
    cin>>i;


    if(i%2==0 && i%5==0)
    {
        cout<<"The integer is both even and divisible by 5."<<endl;
    }
    else if(i%2==0)
    {
        cout<<"The integer is even but indivisible by 5."<<endl;
    }
    else
    {
        cout<<"The integer is odd but divisible by 5."<<endl;
    }
    return 0;
}
```

Output:

```
Enter an integer: 20
The integer is both even and divisible by 5.

--------------------------------
Process exited after 2.143 seconds with return value 0
Press any key to continue . . .
```

```
Enter an integer: 4
The integer is even but indivisible by 5.

--------------------------------
Process exited after 2.67 seconds with return value 0
Press any key to continue . . .
```

```
Enter an integer: 15
The integer is odd but divisible by 5.

--------------------------------
Process exited after 2.529 seconds with return value 0
Press any key to continue . . .
```

Task 3:

Create a C++ program that checks if a user-provided year is a leap year.

Code:

```cpp
#include <iostream>
using namespace std;

int main()
{
    int y;
    cout<<"Enter a year: ";
    cin>>y;

    if(y%4==0 && y%100!=0)
    {
        cout<<"It is a leap year."<<endl;
    }
    else if(y%400==0)
    {
        cout<<"It is a leap year."<<endl;
    }
    else
    {
        cout<<"It is not a leap year."<<endl;
    }
    return 0;
}
```

Output:

```
Enter a year: 2000
It is a leap year.

--------------------------------
Process exited after 5.607 seconds with return value 0
Press any key to continue . . .
```

```
Enter a year: 1900
It is not a leap year.

--------------------------------
Process exited after 2.62 seconds with return value 0
Press any key to continue . . .
```

Task 4:

Create a C++ program that determines if a student is eligible for a scholarship based on their GPA (must have GPA >= 3.5) and attendance (must have attended at least 80% of classes).

Code:

```cpp
#include <iostream>
using namespace std;

int main()
{
    float x, y;
    cout<<"Enter your GPA: ";
    cin>>x;
    cout<<"Enter your attendance: ";
    cin>>y;

    if(x>=3.5 && y>=80)
    {
        cout<<"Congratulations! You are eligible for scholarship."<<endl;
    }
    else
    {
        cout<<"Unfortunately, you are ineligible for scholarship."<<endl;
    }
    return 0;
}
```

Output:

```
Enter your GPA: 3.71
Enter your attendance: 81%
Congratulations! You are eligible for scholarship.

--------------------------------
Process exited after 8.552 seconds with return value 0
Press any key to continue . . .
```

```
Enter your GPA: 3.62
Enter your attendance: 79%
Unfortunately, you are ineligible for scholarship.

--------------------------------
Process exited after 15.31 seconds with return value 0
Press any key to continue . . .
```

Task 5:

Write a program that checks if a given character is a vowel (a, e, i, o, u) or a consonant using logical operators.

Code:

```
4   int main()
5   {
6       char c;
7       cout<<"Enter a character: ";
8       cin>>c;
9       if(c == 'a' || c == 'e' || c == 'i' || c == 'o' || c == 'u')
10      {
11          cout<<"The character is a vowel."<<endl;
12      }
13      else
14      {
15          cout<<"The character is a consonant."<<endl;
16      }
17      return 0;
18  }
```

Output:

```
Enter a character: p
The character is a consonant.

--------------------------------
Process exited after 4.338 seconds with return value 0
Press any key to continue . . .
```

```
Enter a character: i
The character is a vowel.

--------------------------------
Process exited after 3.589 seconds with return value 0
Press any key to continue . . .
```

Conclusion:

In this lab, I learnt how to use relational and logical operators along with if-else statements to write various useful programs. I also learnt about the datatype char and how to use it in C++.