School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering

CS-114 - Fundamental of Programing

Course Instructor: Dr Jawad Khan

Lab Instructor: Muhammad Affan

Student Name: Juveriah Waqqas

CMS ID: 460510

LAB REPORT # 2

LAB TASKS

Lab 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.
2. Write a program that takes an integer as input and checks if it falls within the range [10, 50] using logical operators.
3. Write a C++ program to compare two integers and find the maximum value.
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).

SUMMARY:

Through these tasks I learnt how to use logical operators and conditional statements and physically applying those in various questions deepened my understanding of them

LAB TASK 1

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 = 0;

    cout<<"The persons age is : ";
    cin>>age;
    if (age>=0){
    if (age >= 18)
    { cout<<"The person is eligeible to vote";
    }

    else
    { cout<<"The person is not eligible to vote";
    }}

    else{cout<<"ERROR!! age cant be negative";
    }

    return 0;
}
```

EXECUTION (example)

```
The persons age is : 17
The person is not eligible to vote
--------------------------------
Process exited after 3.775 seconds with return value 0
Press any key to continue . . .
```

```
The persons age is : 25
The person is eligeible to vote
--------------------------------
Process exited after 1.92 seconds with return value 0
Press any key to continue . . .
```

LAB TASK 2

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 integer = 0;

    cout<<"Your given Integer is : ";
    cin>>integer;

    if (integer>=10 && integer<=50)
    {cout<<"Your given integer falls within the range of [10-50]";}

    else { cout<<"Your given integer does not fall within the range of [10-50]";
    }
    return 0;
}

```

EXECUTION (example)

```
Your given Integer is : 5
Your given integer does not fall within the range of [10-50]
--------------------------------
Process exited after 3.165 seconds with return value 0
Press any key to continue . . .
```

```
Your given Integer is : 25
Your given integer falls within the range of [10-50]
--------------------------------
Process exited after 2.212 seconds with return value 0
Press any key to continue . . .
```

```
Your given Integer is : -5
Your given integer does not fall within the range of [10-50]
--------------------------------
Process exited after 2.395 seconds with return value 0
Press any key to continue . . .
```

LAB TASK 3

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

CODE

```cpp
#include<iostream>
using namespace std;
int main()
{
    int x=0;
    int y=0;

    cout<<"Enter the value of x: ";
    cin>>x;
    cout<<"Enter the value of y: ";
    cin>>y;

    if(x>y){ cout<<"The maximum number is x = "; cout<<x;
    }

    else if(y>x){ cout<<"The maximum number is y = "; cout<<y;}

    else{ cout<<"Both numbers are equal";
    }
    return 0;
}

```

EXECUTION (example)

```
Enter the value of x: 5
Enter the value of y: 6
The maximum number is y = 6
--------------------------------
Process exited after 2.671 seconds with return value 0
Press any key to continue . . .
```

```
Enter the value of x: 7
Enter the value of y: 7
Both numbers are equal
--------------------------------
Process exited after 0.9968 seconds with return value 0
Press any key to continue . . .
```

```
Enter the value of x: 25
Enter the value of y: -1
The maximum number is x = 25
--------------------------------
Process exited after 3.146 seconds with return value 0
Press any key to continue . . .
```

LAB TASK 4

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

```cpp
#include<iostream>
using namespace std;
int main()
{
    float s1=0;
    float s2=0;
    float s3=0;
    float average=0;


    cout<<"The score in the first exam is = ";
    cin>>s1;
    cout<<"The score in the second exam is = ";
    cin>>s2;
    cout<<"The score in the third exam is = ";
    cin>>s3;

    if(s1>0 && s2>0 && s3>0) {
    average = (s1+s2+s3)/3;
    cout<<"The average is = "<<average<<endl;

    if(average>=60){ cout<<"The average scores are more than the passing marks, Therefore the student has passed";
    }

    else { cout<<"The average scores are less than the passing marks, Therefore the student has failed";
    }
    }

    else{ cout<<"ERROR!! Exam scores can't be negative";
    }

    return 0;
}
```

EXECUTION (example)

```
The score in the first exam is = 60
The score in the second exam is = 50
The score in the third exam is = 90
The average is = 66.6667
The average scores are more than the passing marks, Therefore the student has passed
--------------------------------
Process exited after 6.836 seconds with return value 0
Press any key to continue . . .
```

```
The score in the first exam is = 50
The score in the second exam is = 20
The score in the third exam is = 55
The average is = 41.6667
The average scores are less than the passing marks, Therefore the student has failed
--------------------------------
Process exited after 4.681 seconds with return value 0
Press any key to continue . . .
```

```
The score in the first exam is = -50
The score in the second exam is = 70
The score in the third exam is = 90
ERROR!! Exam scores can't be negative
--------------------------------
Process exited after 5.759 seconds with return value 0
Press any key to continue . . .
```

HOME TASKS

Home 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
2. Write a program that takes an integer as input and determines if it is both even and divisible by 5.
3. Create a C++ program that checks if a user-provided year is a leap year.
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).
5. Write a program that checks if a given character is a vowel (a, e, i, o, u) or a consonant using logical operators.

SUMMARY:

Through the home tasks I got a deeper understanding of operators and conditional statements. Using them in actual codes also lead me to discovering my weak areas and mistakes and gave me an even better understanding of them.

HOME TASK 1

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

```
#include<iostream>
using namespace std;
int main()
{
    int grade = 0;
    cout<<"The score obtained by the sudent is = ";
    cin>>grade;

// Check the score using logical operators and assign the grade
    if (grade>0){
    cout<<"Thus the corresponding grade is =";
    if (grade<=100 && grade>=90){ cout<<" A ";
    }

    else if (grade<90 && grade>=75){ cout<<" B ";
    }

    else if (grade<75 && grade>=60){ cout<<" C ";
    }

    else if (grade<60 && grade>=45){ cout<<" D ";
    }

    else if (grade<45 && grade>=0){ cout<<" F ";
    }}
//Alternate output in case if negative grade is input
    else { cout<<"Error! score cant be neagative";
    }
    return 0;
}
```

EXECUTION (example) EXPLAINATION

```
The score obtained by the sudent is = 76
Thus the corresponding grade is = B
--------------------------------
Process exited after 1.705 seconds with return value 0
Press any key to continue . . .
```

```
The score obtained by the sudent is = 25
Thus the corresponding grade is = F
--------------------------------
Process exited after 0.6211 seconds with return value 0
Press any key to continue . . .
```

EXPLANATION

The user is asked to enter their score and based on this score logical operators are used to display which grade range the users score falls into. If and else operators are also used in case the user enters an invalid score, i.e. negative

HOME TASK 2

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

CODE

```
#include<iostream>
using namespace std;
int main()
{
    int num = 0; int div2 = 0; int div5 = 0;

    cout<<"Your Given Integer is = ";
    cin>>num;

 // Check if the number is even and divisible by 5
    if (num % 2 == 0 and num % 5 == 0){
    div2 = num/2;  div5 = num/5;

    cout<<"This Integer is Divisible by Both 2 and 5 ! "

// Value of integer afer being divided bt 2 and 5
    <<endl; cout<<"Integer divided by 2 = "<<div2<<endl; cout<<"Integer divided by 5 = "<<div5;
    }

    else{ cout<<"This Integer is NOT Divisible by 2 and 5";
    }

    return 0;

}
```

EXECUTION (example)

```
Your Given Integer is = 50
This Integer is Divisible by Both 2 and 5 !
Integer divided by 2 = 25
Integer divided by 5 = 10
--------------------------------
Process exited after 2.649 seconds with return value 0
Press any key to continue . . .
```

```
Your Given Integer is = -25
This Integer is NOT Divisible by 2 and 5
--------------------------------
Process exited after 4.277 seconds with return value 0
Press any key to continue . . .
```

EXPLANATION

The user is asked to enter an integer. Using if and else conditional and the logical and operator different outputs are decided for if the user inputs a number divisible by both 5 and 2 or if any other number is written

It is also shown in what ways the integer is divisible by 5 and 2 if it is.

HOME TASK 3

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 year = 0;
//input year from the user

    cout<<"Input The Year = ";
    cin>>year;

    if (year>0)
    {if ((year % 4 == 0 && year % 100 != 0) || (year % 400 ==0 )){cout<<"The year IS a leap year";
    }
    else{cout<<"The year IS NOT a leap year";
    }
    }
//incase negative or zero is input as the year
    else{cout<<"ERROR! Years cant be negative or zero";
    }

    return 0;
}
```

EXECUTION (example)

```
Input The Year = 2021
The year IS NOT a leap year
--------------------------------
Process exited after 1.469 seconds with return value 0
Press any key to continue . . .
```

```
Input The Year = 2060
The year IS a leap year
--------------------------------
Process exited after 5.777 seconds with return value 0
Press any key to continue . . .
```

```
Input The Year = 1600
The year IS a leap year
--------------------------------
Process exited after 2.647 seconds with return value 0
Press any key to continue . . .
```

```
Input The Year = 2100
The year IS NOT a leap year
--------------------------------
Process exited after 1.97 seconds with return value 0
Press any key to continue . . .
```

```
Input The Year = -2024
ERROR! Years cant be negative or zero
--------------------------------
Process exited after 3.172 seconds with return value 0
Press any key to continue . . .
```

EXPLANATION

The user is asked to enter a year. It is checked year is divisible by 4 and if it is not divisible by 100 which is when it would be a leap year, or if the year is just divisible by 400 when it would also be a leap year. This is done using if and else conditionals and ‘and’ and ‘or’ logical operators. Different outputs are also decided in case an invalid value is input.

HOME TASK 4

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 GPA = 0; float att = 0;

    cout<<"Enter the students GPA = "; cin>>GPA;
    cout<<"Enter the students Attendance Percentage = "; cin>>att;
// Check that the GPA and attendance are valid i.e withtin the valid range
    if (GPA >= 0 && GPA <= 4 && att >= 0 && att <= 100) {

// Check if the student is eligible for the scholarship based on GPA and attendance
    if (GPA >= 3.5 && GPA <= 4.0 && att >= 80){ cout<<"The student is Elligible for Scholarship";
    }
    else { cout<<"The student is NOT Elligible for Scholarship";
    }
}
    else { cout<<"Invalid GPA or Attendance entered"; }
    return 0;
}
```

EXECUTION (example)

```
Enter the students GPA = 3.8
Enter the students Attendance Percentage = 90
The student is Elligible for Scholarship
--------------------------------
Process exited after 4.745 seconds with return value 0
Press any key to continue . . .
```

```
Enter the students GPA = 3.2
Enter the students Attendance Percentage = 81
The student is NOT Elligible for Scholarship
--------------------------------
Process exited after 4.856 seconds with return value 0
Press any key to continue . . .
```

```
Enter the students GPA = 7
Enter the students Attendance Percentage = 90
Invalid GPA or Attendance entered
--------------------------------
Process exited after 4.266 seconds with return value 0
Press any key to continue . . .
```

```
Enter the students GPA = 3.6
Enter the students Attendance Percentage = -44
Invalid GPA or Attendance entered
--------------------------------
Process exited after 12.01 seconds with return value 0
Press any key to continue . . .
```

EXPLANATION

The user is asked to input the relevant GPA and attendance. Using if-else conditionals the valid range of GPA (0-4) and attendance (0-100) is decided and different outputs are made in case these things are not in the valid range. Then again if-else conditionals are used for different outputs in case the GPA/attendance fall in the scholarship range

HOME TASK 5

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

```
#include<iostream>
using namespace std;
int main()
{
//define alphabet and make the user input it
    char alp;
    cout<<"Enter an alphabet = ";
    cin>>alp;

    if( alp>='a' && alp<='z'){
    if(alp == 'a' || alp == 'e' || alp == 'i' || alp == 'o' || alp == 'u'){cout<<"The alphabet is a VOWEL";
    }
    else{cout<<"The alphabet is a CONSONANT";
    }
    }
//incase of if the user inputs something that is not an alphabet
    else{cout<<"ERROR! Invalid input";
    }
    return 0;
}
```

EXECUTION (example)

```
Enter an alphabet = i
The alphabet is a VOWEL
--------------------------------
Process exited after 0.6465 seconds with return value 0
Press any key to continue . . .
```

```
Enter an alphabet = z
The alphabet is a CONSONANT
--------------------------------
Process exited after 0.5825 seconds with return value 0
Press any key to continue . . .
```

```
Enter an alphabet = -1
ERROR! Invalid input
--------------------------------
Process exited after 0.9691 seconds with return value 0
Press any key to continue . . .
```

EXPLANATION

The user is asked to input the alphabet using the char data type, if-else conditionals are used for different outputs in case of if the user enters something that is not an alphabet or if the user enters an alphabet that is a consonant or a vowel.