School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering

CS-114 - Fundamental of Programing

Lab and Home Tasks – 2
(Lab Manual 2)

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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.

Code explanation:

The program takes an integer value for the age as input, which is stored as the variable age. If the input value is less than 0, it is rejected, and the user is prompted to enter a valid value. If the value is less than 18, the person isn't allowed to vote and receives a message telling them that, and vice versa if the value is greater than or equal to 18.

Code:

```cpp
#include <iostream>

using namespace std;
int main()
{
    //LAB TASK 1
    int age;
    cout<<"Enter your age:"<< endl;
    cin>>age;
    if(age <0){
    cout<<"Please enter a valid age"<<endl; }
    else{
        if(age >= 18){
        cout<<"You are allowed to vote"<<endl;  }
        else{
        cout<<"You are not allowed to vote"<<endl;  }
    }
    return 0;
}
```

Output:

```
Enter your age:
19
You are allowed to vote

--------------------------------
Process exited after 1.555 seconds with return value 0
Press any key to continue . . .
```

Lab 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 explanation:

The program takes an integer value as input, which is stored as the variable num. If the input value is less than 50 or greater than 10, a positive message is given as output, and the opposite if the value is outside or equal to the limits (10,50)

Code:

```
#include <iostream>

using namespace std;
int main()
{
//LAB TASK 2
    int num;
    cout<<"Enter the number:"<< endl;
    cin>>num;
    if(num > 10 && num < 50){
    cout<<"The number falls within the range of 10-50"<<endl;}
    else{
    cout<<"The number does not fall within the range of 10-50"<<endl;}
    return 0;
}
```

Output:

```
Enter the number:
9
The number does not fall within the range of 10-50

--------------------------------
Process exited after 5.083 seconds with return value 0
Press any key to continue . . .
```

Lab Task:

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

Code explanation:

The program takes two integer values as input, which are stored as the variables a and b. It then compares the two integers, and outputs a message telling which number entered is the maximum value.

Code:

```
#include <iostream>

using namespace std;
int main()
{
    //LAB TASK 3
    int a;
    int b;
    cout<<"Enter the first number (a):"<< endl;
    cin>>a;
    cout<<"Enter the second number (b):"<< endl;
    cin>>b;

    if(a > b){
    cout<<"The first number (a) is the maximum value:"<< endl;}
    else{
    cout<<"The second number (b) is the maximum value:"<< endl;}
    return 0;
}
```

Output:

```
Enter the first number (a):
5
Enter the second number (b):
87
The second number (b) is the maximum value:

--------------------------------
Process exited after 4.602 seconds with return value 0
Press any key to continue . . .
```

Lab 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 explanation:

The program takes three float (decimal) values as inputs for the three exam scores, and are assigned to the variables x,y and z. The average is calculated as the variable avg. If the value of avg is greater than 60, a message is displayed that the grade is above the passing grade of 60, and vice versa.

Code:

```cpp
#include <iostream>

using namespace std;
int main()
{
    //LAB TASK 4
    float x;
    float y;
    float z;
    float avg;
    cout<<"Enter the exam scores (out of 100):"<< endl;
    cin>>x;
    cin>>y;
    cin>>z;
    avg = (x+y+z)/3;
    if(avg >= 60){
    cout<<"The average is "<<avg <<", which is above the passing grade" <<endl;}
    else{
    cout<<"The average is "<<avg <<", which is below the passing grade" <<endl;}
    return 0;
}
```

Output:

```
Enter the exam scores (out of 100):
78
56
79
The average is 71, which is above the passing grade

--------------------------------
Process exited after 16.35 seconds with return value 0
Press any key to continue . . .
```

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

Code explanation:

The program takes an integer value as input, which is assigned to a variable score. Using a series of if/else functions, the code determines what bracket of the scoring rubric the input score fits, and outputs the relevant message.

Code:

```
#include <iostream>

using namespace std;
int main()
{
//  HOME TASK 1
    int score;
    cout<<"Please enter the score:"<<endl;
    cin>>score;

    if(score>100 || score<0){
        cout<<"Please enter a valid score";}
    else{
        if(score>=90 && score<=100){
        cout<<"The grade is A"<<endl;}
        else{
            if(score>=75 && score<90){
            cout<<"The grade is B"<<endl;}
            else{
                if(score>=60 && score<75){
                cout<<"The grade is C"<<endl;}
                else{
                    if(score>=45 && score<60){
                    cout<<"The grade is D"<<endl;}
                    else{cout<<"The grade is F"<<endl;
}}}}}
    return 0;
}
```

Output:

```
Please enter the score:
68
The grade is C

--------------------------------
Process exited after 29.38 seconds with return value 0
Press any key to continue . . .
```

Home Task:

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

Code explanation:

The program takes an integer value as input, which is assigned to a variable a. Using an if/else function, the code determines if the remainder of the numbers division by both 5 and 2 is 0. If that is the case, then the code outputs a positive message, and vice versa.

Code:

```
#include <iostream>

using namespace std;
int main()
{
//  HOME TASK 2
    int a;
    cout<<"Please enter the number:"<<endl;
    cin>>a;
    if(a % 5 == 0 && a % 2 == 0){
        cout<<"The number given is both even and divisible by 5";}
    else{cout<<"The number given is NOT both even and divisible by 5";}
    return 0;
}
```

Output:

```
Please enter the number:
70
The number given is both even and divisible by 5
--------------------------------
Process exited after 2.248 seconds with return value 0
Press any key to continue . . .
```

Home Task:

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

Code explanation:

The program takes an integer value as input, which is assigned to a variable y. Using an if/else function, the code determines if the remainder of the numbers division by 4 is 0. If that is the case, then a message is output confirming that the year is a leap year, and vice versa. Also, if the year value is less than 0, it is rejected and the user is prompted to enter a valid year.

Code:

```cpp
#include <iostream>

using namespace std;
int main()
{
//  TASK 3
    int y;
    cout<<"Please enter the year:"<<endl;
    cin>>y;
    if(y<0){
        cout<<"Please enter a valid year";}
        else{
            if(y % 4 == 0){
            cout<<"The year provided is a leap year "<<endl;}
            else{cout<<"The year provided is not a leap year"<<endl;}
    return 0;
}
}
```

Output:

```
Please enter the year:
2013
The year provided is not a leap year

--------------------------------
Process exited after 1.905 seconds with return value 0
Press any key to continue . . .
```

Home 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 explanation:

The program takes two float (decimal) values as inputs for the GPA and attendance percentage, and are assigned to the variables g and a, respectively. If the GPA entered is outside the range of 0-4, or if the attendance percentage is outside the range of 0-100, the values are rejected and the user is prompted to enter valid values.
If both GPA >=3.5 and attendance percentage >=80, a message is output confirming that the student is eligible for a scholarship, and vice versa.

Code:

```
#include <iostream>

using namespace std;
int main()
{
//  HOME TASK 4
    float g;
    float a;
    cout<<"Please enter the GPA and the attendance percentage:"<<endl;
    cin>>g >>a;
    if(g<0 || g>4 || a<0 || a>100){
        cout<<"Please enter valid values";}
        else{
            if(g>=3.5 && a>=80){
            cout<<"The student is eligible for a scholarship"<<endl;}
            else{cout<<"The student is not eligible for a scholarship"<<endl;}}
    return 0;
}
```

Output:

```
Please enter the GPA and the attendance percentage:
3.67
81
The student is eligible for a scholarship

--------------------------------
Process exited after 11.02 seconds with return value 0
Press any key to continue . . .
```

Home 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 explanation:

The program takes a character as input, and this character is assigned the variable l. The code checks if it is one of either a,e,i,o or u and output a message confirming it's a vowel, and if not, then a message confirming it is a consonant.

Code:

```
#include <iostream>

using namespace std;
int main()
{
//  HOME TASK 5
    char l;
    cout<<"Please enter the letter:"<<endl;
    cin>>l;
    if(l=='a' || l=='e' || l=='i' || l=='o'|| l=='u'){
    cout<<"The letter is a vowel"<<endl;}
    else{cout<<"The letter is a consonant"<<endl;}
}
```

Output:

```
Please enter the letter:
i
The letter is a vowel

--------------------------------
Process exited after 2.303 seconds with return value 0
Press any key to continue . . .
```