School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering

CS-114 - Fundamentals of Programming

Lab Manual # 5

Course Instructor: Dr Talha Shahid

Lab Instructor: Muhammad Affan

Student Name: AMINA SHAHID

CMS ID: 479106

DATE: 27/10/2023

LAB TASKS

1. Convert the following while loop to a do-while loop:

int x = 1;

while (x > 0)

{cout << "enter a number: ";

   cin >> x;

   }

```cpp
// Online C++ compiler to convert while to do-while
#include <iostream>
using namespace std;

int main() {
    int x;//declaring
    do //loop
    {
        cout<<"Enter a number:"<<endl; //output
        cin>>x;
    }
    while (x>0); //condition for termination

    return 0;
}
```

Output

```
/tmp/FONVQKeoua.o
Enter a number:
9
Enter a number:
7
Enter a number:
4
Enter a number:
3
Enter a number:
7
Enter a number:
10
Enter a number:
2
Enter a number:
-1
```

2. Use a do while loop to make a simple calculator for two numbers. Insert buttons for it to ask again and for termination.

```cpp
main.cpp                                    Run

1  // Online C++ compiler to run C++ program online
2  #include <iostream>
3  #include <math.h>
4  using namespace std;
5
6  int main() {
7      double a,b,r; //initialising, declaring
8      char opr,repeat,c;
9      cout<<"The operator buttons are:"<<endl<<"addition:+"<<endl
          <<"subtraction: -"<<endl<<"multiplication: *"<<endl<<"division: /"
          <<endl<<"remainder: %"<<endl<<"exponential: ^"<<endl; //key for
          user
10     do
11     {
12         do
13         {
14             //taking inputs
15             cout<<endl;
16             cout<<"Insert first number:";
17             cin>>a;
18             cout<<"Operator:";
19             cin>>opr;
20             cout<<"Insert second number:";
21             cin>>b;
22             cout<<endl<<a<<opr<<b<<"=?"<<endl;
23             cout<<"Is this your equation?(Y/N)"<<endl;
24             cin>>c;//to confirm
25         }
26         while (c=='n'||c=='N');
27
28         switch (opr) //switch cases: equations for every operation
29         {
30             case '+':
31             r=a+b;
32             cout<<a<<"+"<<b<<"="<<r<<endl;
33             break;
34
35             case '-':
36             r=a-b;
37             cout<<a<<"-"<<b<<"="<<r<<endl;
38             break;
39
40             case '*':
41             r=a*b;
42             cout<<a<<"*"<<b<<"="<<r<<endl;
43             break;
44
45             case '/':
46             r=a/b;
47             cout<<a<<"/"<<b<<"="<<r<<endl;
48             break;
49
50             case '%':
51             r=fmod(a,b);
52             cout<<a<<"%"<<b<<"="<<r<<endl;
53             break;
54
55             case '^':
56             r=pow(a,b);
57             cout<<a<<"-"<<b<<"="<<r<<endl;
58             break;
59
60             default:
61             cout<<"Error"<<endl;
62         }
63         cout<<"Do you want to reuse the calculator? (y/n)"<<endl; //asking
                to repeat or terminate
64     cin>>repeat;
65     }
66     while (repeat=='y'||repeat=='Y');
67     return 0;
68 }
```

```
Output                                      Clear

/tmp/RdnvInDUOT.o
The operator buttons are:
addition:+
subtraction: -
multiplication: *
division: /
remainder: %
exponential: ^

Insert first number:8
Operator:-
Insert second number:9
8-9=?
Is this your equation?(Y/N)
n
Insert first number:9
Operator:+
Insert second number:8
9+8=?
Is this your equation?(Y/N)
y
9+8=17
Do you want to reuse the calculator? (y/n)
n
```

3: Write programs with while or do while loops that compute:

a. The sum of all even numbers between 2 and 100 (inclusive).

```cpp
// Online C++ compiler to add all even numbers until
      100
#include <iostream>
using namespace std;

int main() {
    int x=2,sum=0;//initialising,declaring
    cout<<x;
    while (x<100) //loop
    {
        sum=sum+x;
        x=x+2;
        cout<<"+"<<x;
    }
    cout<<"="<<sum;//output
    return 0;

}
```

Output
```
/tmp/bNNdr0ukip.o
2+4+6+8+10+12+14+16+18+20+22+24+26+28+30+32+34+36+38+40+42+44
   +46+48+50+52+54+56+58+60+62+64+66+68+70+72+74+76+78+80+82
   +84+86+88+90+92+94+96+98+100=2450
```

b. The sum of all squares between 1 and 100 (inclusive).

```cpp
// Online C++ compiler to add all squares until 100
#include <iostream>
#include <math.h>
using namespace std;

int main() {
    double x,p,sum=0; //declaring, initialising
    x=1;
    cout<<x;
    do
    {
        x++;
        p=pow(x,2); //exponential equation
        sum=sum+p;
        cout<<"+"<<p;
    }
    while (p<100);
    cout<<"="<<sum; //output

    return 0;
}
```

Output
```
/tmp/UiYOjSLZaG.o
1+4+9+16+25+36+49+64+81+100=384
```

4: Write programs with while or do while loops that compute:

a. All powers of 2 from 2^0 up to 2^{20}.

```cpp
// Online C++ compiler to print all powers of 2, 0-20
#include <iostream>
#include <math.h>
using namespace std;

int main() {
    double x,p; //declaring initialising
    x=0;
    cout<<"The powers of 2 from 0-20:"<<endl;
    while (x<21)
    {
        p=pow(2,x); //exponential eq
        cout<<p<<endl; output of each square
        x++; //increment
    }

    return 0;
}
```

Output:
```
/tmp/E73VGXCWuj.o
The powers of 2 from 0-20:
1
2
4
8
16
32
64
128
256
512
1024
2048
4096
8192
16384
32768
65536
131072
262144
524288
1.04858e+06
```

b. The sum of all odd numbers between a and b (inclusive), where a and b are inputs.

```cpp
// Code to sum all odd numbers in an interval
#include <iostream>
using namespace std;
int main() {
    int a,b,x=0,sum;//initialising,declaring
    sum=0;
    cout<<"Enter first number:";
    cin>>a;//user input
    cout<<"Enter second number:";
    cin>>b;//user input
if (a>b)
    cout<<"Error"; // to ensure interval is input correctly only
else if (a%2==0)//if starts from even number
{   a++;
//do-while loop
do
{
    sum=sum+a;
    a=a+2;
}
while (a<b+1);
    cout<<"Sum of all odd numbers in the interval= "<<sum;
}
    return 0;
}
```

Output:
```
/tmp/AenwprGQrm.o
Enter first number:2
Enter second number:8
Sum of all odd numbers in the interval= 15
```