

School Of Mechanical & Manufacturing Engineering, NUST

Department of Mechanical Engineering



CS-114 - Fundamentals of Programming

Lab Assignment # 1

Course Instructor: Dr Talha Shahid

Lab Instructor: Muhammad Affan

Student Name: AMINA SHAHID

CMS ID: 479106

DATE: 11/10/2023

- **Abstract**

This assignment comprises of C++ codes for problems assigned as the home tasks in Lab Manual # 1, and lab, home tasks in Lab Manual # 2.

LAB MANUAL # 1

- **Home Tasks**

Q 1: Write a C++ program to calculate distance between two points. The values of coordinates should be input by user.

$$d = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

A: To insert exponential function, this formula was written as

$$\text{dist} = ((x_2 - x_1)*(x_2 - x_1) + (y_2 - y_1)*(y_2 - y_1))$$

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 //declaring variables as integers 7 int x1, y1, x2, y2, dist; 8 //to input coordinates, initialising 9 cout<<"insert the x and y coordinate of first point"<<endl; 10 cout<<"X1:"; 11 cin>>x1; 12 cout<<"Y1:"; 13 cin>>y1; 14 cout<<"insert the x and y coordinate of second point"<<endl; 15 cout<<"X2:"; 16 cin>>x2; 17 cout<<"Y2:"; 18 cin>>y2; 19 //formula for calculating distance, initialising dist 20 dist = ((x2-x1)*(x2-x1) + (y2-y1)*(y2-y1)); 21 //output 22 cout<<"the distance between these points is:"<<dist<<endl; 23 return 0; 24 }</pre>	<pre>/tmp/nhj50jZWJw.o insert the x and y coordinate of first point X1:4 Y1:7 insert the x and y coordinate of second point X2:3 Y2:0 the distance between these points is:50</pre>

Q 2: Write a code in C++ to take length from user in centimeter and convert it into meter and kilometer.

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 //declaring all, initialising variable cm as floats 7 float cm, m, km; 8 cout<<"input length in centimeter:"; 9 cin>>cm; 10 //formulas for conversion, initialising m and km 11 m=cm/100; 12 km=cm/100000; 13 //output 14 cout<<"length in meters:"<<m<<endl; 15 cout<<"length in kilometers:"<<km<<endl; 16 return 0; 17 }</pre>	<pre>/tmp/3hJFZznTYT.o input length in centimeter:789 length in meters:7.89 length in kilometers:0.00789</pre>

Q 3: Write a code in C++ that takes values of a and b from the user and displays result of polynomial

$$a^2 + 2ab + b^2$$

A: To simplify code, this polynomial was written as $(a+b)^2 = (a+b)*(a+b)$

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 //declaring as integers, initialising variables by input integers 7 int a, b, res; 8 cout<<"a:"; 9 cin>>a; 10 cout<<"b:"; 11 cin>>b; 12 //polynomial to be solved, simplified 13 res= (a+b)*(a+b); 14 //result 15 cout<<"answer="<<res; 16 return 0; 17 }</pre>	<pre>/tmp/OoBHPKlTWU.o a:7 b:4 answer=121 </pre>

Q 4: Write a program in C++ to convert temperature in Fahrenheit to Celsius.

A: The user would input the value in Fahrenheit, and using the formula:

$$C = (32F - 32) * 5/9$$

temperature in degree Celsius was calculated.

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 // declaring the variables for both values 7 int F, C; 8 //initialising F 9 cout<<"input value of temperature in Fahrenheit:"; 10 cin>>F; 11 //Formula for conversion 12 C = (32*F-32)*5/9; 13 //output 14 cout<<"Temperature in Celsius:"<<C; 15 return 0; 16 }</pre>	<pre>/tmp/H7yFxaT80.o input value of temperature in Fahrenheit:56 Temperature in Celsius:977</pre>

LAB MANUAL # 2

- **Lab Tasks**

Q 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.

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 //declaring, initialising variable age 7 int age; 8 cout<<"Insert age:"; 9 cin>>age; 10 //condition applied 11 if(age >= 18) 12 cout<<"This person is eligible to vote"; 13 else 14 cout<<"This person is NOT eligible to vote"; 15 return 0; 16 }</pre>	<pre>/tmp/3Z5AupRd5b.o Insert age:67 This person is eligible to vote</pre>

Q 2: Write a program that takes an integer as input and checks if it falls within the range [10, 50] using logical operators.

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 // declaring, initialising variable 7 int num1; 8 cout<<"Insert number:"; 9 cin>>num1; 10 //conditions, less than, more than, and equal to operators used 11 if(num1>=10 && num1<=50) 12 cout<<"This number satisfies the range"; 13 else 14 cout<<"This number does NOT satisfy the range"; 15 return 0; 16 }</pre>	<pre>/tmp/UHUhLOW4SA.o Insert number:78 This number does NOT satisfy the range</pre>

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

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 //declaring, initialising variable 7 int num1, num2; 8 cout<<"Input Integer A:"; 9 cin>>num1; 10 cout<<"Input Integer B:"; 11 cin>>num2; 12 //applying conditions, possible results 13 if (num1>num2) 14 cout<<"The maximum value is: "<<num1; 15 else if (num1<num2) 16 cout<<"The maximum value is: "<<num2; 17 else 18 cout<<"Both values are same"; 19 return 0; 20 }</pre>	<pre>/tmp/Uja7Ng1vpq.o Input Integer A:8 Input Integer B:59 The maximum value is: 59</pre>

Q 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).

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 // declaring,initialising variables for score and mean 7 int s1,s2,s3,avg; 8 cout<<"Exam Score 1:"; 9 cin>>s1; 10 cout<<"Exam Score 2:"; 11 cin>>s2; 12 cout<<"Exam Score 3:"; 13 cin>>s3; 14 //formula for mean calculation 15 avg=(s1+s2+s3)/3; 16 //conditions and logical operation 17 if (avg>=60) 18 cout<<"The student has passed"; 19 else 20 cout<<"The student has failed"; 21 return 0; 22 }</pre>	<pre>/tmp/1Ya0PzvxHB.o Exam Score 1:80 Exam Score 2:57 Exam Score 3:60 The student has passed</pre>

● Home Tasks

Q 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

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 // declaring,initialising variables for score 7 int s; 8 cout<<"Student's Score:"; 9 cin>>s; 10 //conditions of grading criteria, output 11 if(s<=100 && s>=90) 12 cout<<"Grade Received: A"; 13 else if (s<90 && s>=75) 14 cout<<"Grade Received: B"; 15 else if (s<75 && s>=60) 16 cout<<"Grade Received: C"; 17 else if (s<60 && s>=45) 18 cout<<"Grade Received: D"; 19 else if (s<45 && s>=0) 20 cout<<"Grade Received: F"; 21 else 22 cout<<"Error"; 23 return 0; 24 }</pre>	<pre>/tmp/EMbdjVjl54.o Student's Score:78 Grade Recieved: B</pre>

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

A: Any number that is divisible by 5 and is even, is a multiple of 10

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 // declare all, initialise variable for number 7 int num1,div1; 8 cout<<"Insert number:"; 9 cin>>num1; 10 //formula for satisfying condition 11 div1=num1%10; 12 //if,else condition for remainder being 0 and outputs 13 if(div1==0) 14 cout<<"This number is even and divisible by 5"; 15 else 16 cout<<"This number does not satisfy both conditions: even number and divisible by 5"; 17 return 0; 18 }</pre>	<pre>/tmp/M08N4nNomW.o Insert number:70 This number is even and divisible by 5</pre>

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

A: A leap year is every 4 years with the exception of centuries. At centuries, leap year repeats every 4 centuries (400 years)

main.cpp	Output
<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 // initialising,declaring variable 7 int y; 8 cout<<"Insert year:"; 9 cin>>y; 10 //condition for leap year and output 11 if(y%4==0 && !(y%100==0)) 12 cout<<"This is a leap year"; 13 else if (y%400==0) 14 cout<<"This is a leap year"; 15 else 16 cout<<"This is not a leap year"; 17 return 0; 18 }</pre>	<pre>/tmp/tNu5UuVnFY.o Insert year:2005 This is not a leap year</pre>

Q 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).

main.cpp	<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 // initialising, declaring variables for gpa and attendance 7 float gpa, attn; 8 cout<<"Insert the student's GPA:"; 9 cin>>gpa; 10 cout<<"Insert the student's attendance percentage:"; 11 cin>>attn; 12 //putting condition for scholarship and output criteria 13 if (gpa>=3.5 && attn>=80) 14 cout<<"This student is eligible for scholarship"; 15 else 16 cout<<"This student is NOT eligible for scholarship"; 17 return 0; 18 }</pre>	Output
		<pre>/tmp/i5Q83pEh3K.o Insert the student's GPA:4.0 Insert the student's attendance percentage:70 This student is NOT eligible for scholarship</pre>

Q 5: Write a program that checks if a given character is a vowel (a, e, i, o, u) or a consonant using logical operators.

main.cpp	<pre>1 // Online C++ compiler to run C++ program online 2 #include <iostream> 3 using namespace std; 4 5 int main() { 6 //declaring, initialising variable 7 char alph; 8 cout<<"Insert an alphabet:"; 9 cin>>alph; 10 //Putting condition and using operator OR 11 if (alph=='a' alph=='e' alph=='i' alph=='o' alph=='u') 12 cout<<"This alphabet is a vowel"; 13 else 14 cout<<"This alphabet is a consonant"; 15 return 0; 16 }</pre>	Output
		<pre>/tmp/x9qSF4YL8F.o Insert an alphabet:y This alphabet is a consonant</pre>

● Conclusion

This assignment dealt with practicing different functions in C++. This included operational functions, if/else functions, logical operators. This also introduced us to the syntax of C++.