Programming Fundamentals

Week 03 - Lab Manual

Introduction

Welcome to your favorite programming Lab. In this lab manual, we shall work together to learn and implement new programming concepts

Skills to be learned:

- Identifying the Variables and Datatypes for any given problem.
- Write a complete program that converts input into the required output.

Let's do some coding.

Skill: Identify the Variables and Datatypes for any given problem.

Introduction

Variables are the containers that are used to store different values. Recall the constraints of having valid variable names from the class.

- The names can not have spaces
- The names can not start with Numbers
- The names can not have any special Characters

Datatypes are the **labels** that are associated with **each container** that are used to store different values.

The following table lists the data types that are used to store different values.

Datatype	**Description**
int	This datatype is used to store integer values.
float	This datatype is used to store floating point values.
char	This datatype is used to store single-character values.
string	This datatype is used to store a string of character values.

Examples:

Valid Example	**Invalid Examples**	**Description**

Skill: Identifying the Variables and Datatypes for any given problem.

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`#include<iostream>`
`using namespace std;`
`main()`
`{`
`  int number;`
`}`
	`#include<iostream>`
	`using namespace std;`
	`main()`
	`{`
	`  Int number;`
	`}`
		C++ is a case-sensitive language. **Int and int** are two different words and represent different things.

`#include<iostream>`
`using namespace std;`
`main()`
`{`
`  int roll_no;`
`}`
	`#include<iostream>`
	`using namespace std;`
	`main()`
	`{`
	`  int roll no;`
	`}`
		Spaces are not allowed in the variable names.

`#include<iostream>`
`using namespace std;`
`main()`
`{`
`  string session2023;`
`}`
	`#include<iostream>`
	`using namespace std;`
	`main()`
	`{`
	`  string 2023session;`
	`}`
		The variable names **can not start with numbers**.

Following are a few examples of how to declare, initialize, and assign values for different types of variables.		

`#include<iostream>`
`using namespace std;`
`main()`
`{`
`  string name = "irzam";`
`  cout << name;`
`}`
	`D:\PF codes>c++ test.cpp -o test.exe`
	
	`D:\PF codes>test.exe`
	`irzam`
	`D:\PF codes>`
		Declaring and initializing a string type variable

`#include<iostream>`
`using namespace std;`
`main()`
`{`
`  char alphabet = 'a';`
`  cout << alphabet;`
`}`
	`D:\PF codes>c++ test.cpp -o test.exe`
	
	`D:\PF codes>test.exe`
	`a`
	`D:\PF codes>_`
		Declaring and initializing a character type variable

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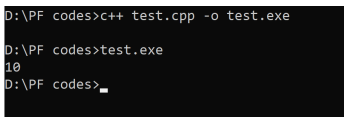
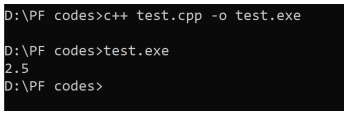
`#include<iostream>`
`using namespace std;`
`main()`
`{`
`  int number;`
`  number = 10;`
`  cout << number;`
`}`
		Declaring and printing an int type variable

`#include<iostream>`
`using namespace std;`
`main()`
`{`
`  float number = 2.5;`
`  cout << number;`
`}`
		Declaring and printing a float type variable

Skill: Identifying the Variables and Datatypes for any given problem.

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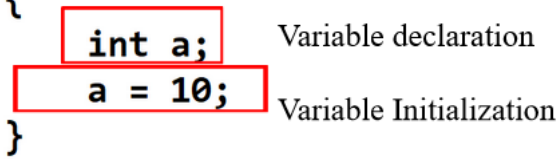
Skill: Write a complete program that converts input into the required output

In class, you have studied variable declaration that is used to declare a variable of fixed size in memory. Additionally, the assignment operator is used to assign a value to the declared variable.

Look at the attached example for recalling these concepts.	

Tasks

- Declare a string-type variable and assign it your name and print it on the screen.
- Declare an integer type variable and assign it your roll number and print it on the console screen
- Initialize a float type variable with your aggregate value and print it on the console screen.
- Initialize a character type variable with your section and print it on the screen.
- Now, write a program where you take all these values and print them on the screen like below.

Now, let's learn to take input from the user.

consider the following problem.

Task01(WP): Write a program that **takes a number from the user(console screen)** in dollars and converts it into rupees. 1 Dollar = 200 rupees

Let's code this one out.
We need the following: • A variable for storing the value of one dollar • A variable for storing the value of value entered by the user • A variable to store the converted value in rupees

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- An expression that converts the dollars into rupees and stores it into the third variable

```
#include <iostream>
using namespace std;
main() {
    int rupee = 200;
    int inputValue = 10;
    int convertedValue;
    cout << "$1= " << rupee << " rupees" << endl;
    convertedValue = rupee * inputValue;
    cout << convertedValue;
}
```

```
G:\Semesters\Programming Fundamentals
$1= 200 rupees
2000
```

Can you point out 🔎 the problem for the above code?

Yes, in this program, **the input value is not entered by the user** rather it is set by the programmer just like the dollar value.

We need the user to enter the value of dollars that he wants to convert into rupees.
We have just the right command for this.

Syntax:
cin >> variablename;

Let's put this into code.

```
#include<iostream>
using namespace std;
main()
{
    int rupee = 200;
    int inputValue;
    int convertedValue;
    cout << "$1= " << rupee << " rupees" << endl;
    cin >> inputValue;
    convertedValue = rupee * inputValue;
    cout << convertedValue;
}
```

```
D:\PF codes>c++ coverter.cpp -o convert.exe

D:\PF codes>convert.exe
$1= 200 rupees
5
1000
D:\PF codes>
```

We have slightly modified the code and made the above-mentioned changes and now it is working according to our requirements.

Great Work Students! You have added another skill to your skillset

Conclusion

Variable	Variables are the containers that are used to store different values

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Data Type	Datatype defines the label according to the type of data that is stored in the variables.
cin >> variable;	It is used to take input from the console.

Task 01(CL): Write a C++ program that inputs from the user his name, roll number, aggregate, and section and prints it on screen.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter your name: Maida
Enter your roll number: 151
Enter your aggregate: 82.1
Enter your section: D
Student Information:
Name: Maida
Roll Number: 151
Aggregate: 82.1
Section: D
```

```
Enter your Name: Maida
Enter your roll no: 121
Enter your aggregate: 43.2
Enter your section: C
Student Information:
Name: Maida
Roll No: 121
Aggregate: 43.2
Section: C
```

Task 02(OP): Write a C++ program that converts the weights from lbs (Pounds) to kgs (Kilograms). 1lb = 0.45 Kgs

Note: The user enters weights in lbs and the program prints it in kgs.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter weight in pounds: 400
400 pounds is equal to 180 kilograms.
```

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Task 03(OP): Write a C++ program that takes the length and width of the rectangle from the user and prints its area. Area = length * width

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter the length of the rectangle: 5
Enter the width of the rectangle: 5
The area of the rectangle is: 25
```

Task 04(CP): Write a C++ program that takes charge (Q) and time (t) as input from the user and prints the current (I) on the console. Current(I) = Charge (Q)/Time(t)

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter the charge (Q) in Coulombs: 94
Enter the time (t) in seconds: 3
The current (I) is: 31.3333 Amperes
```

Task 05(CP): Write a C++ program that takes the name, matric (out of 1100), intermediate(out of 550), and Ecat (out of 400) marks of the student and print their aggregate score for UET. Ecat = 50% & intermediate = 40% & Matric = 10%

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter the student's name: Mirza
Enter matriculation marks (out of 1100): 1020
Enter intermediate marks (out of 550): 510
Enter Ecat marks (out of 400): 313
Aggregate score for Mirza in UET is: 85.4886%
```

Task 06(OP): Write a C++ program that takes the megabytes from the user and converts them into bits and prints the value on the screen. 1MB = 1024 Kb & 1KB = 1024 Bytes & 1Bytes = 8 Bits

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter the size in megabytes (MB): 1024
1024 MB is equivalent to 8.58993e+009 bits.
```

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Task 07(OP): You are developing a C++ program for a time-tracking application. The program needs to take an integer input representing hours and convert it to seconds to accurately record the time in seconds.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter the number of hours: 24
24 hours is equivalent to 86400 seconds.
```

Task 08(OP): You are developing a C++ program for an electrical engineering application. The program needs to calculate power (in watts) given voltage (in volts) and current (in amperes) as input.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter voltage (in volts): 45
Enter current (in amperes): 2.4
The power is 108 watts.
```

Task 09(OP): You are building a C++ program for a health and wellness application. To calculate certain health-related statistics, you need to take a user's age in years as input and convert it into their age in days.

Notes

- Use **365 days** as the length of a year for this challenge.
- Ignore leap years and days between last birthday and now.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter your age in years: 21
Your age in days is approximately 7665 days.
```

Task 10(OP): You are developing a C++ program to keep track of a cricket team's performance in the Asia Cup tournament. The program needs to take the number of wins, draws, and losses as input and calculate the number of points the cricket team has obtained so far, based on the following rules:

- Wins get 3 points.
- Draws get 1 point.

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- Losses get 0 points.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter the name of the cricket team: Pakistan
Enter the number of wins: 3
Enter the number of draws: 2
Enter the number of losses: 2
Pakistan has obtained 11 points in the Asia Cup tournament.
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>
```

Task 11(OP): Scientists have discovered that in four decades, the world will EXPLODE! It will also take three decades to make a spaceship to travel to a new planet that can hold the entire world population.

You must calculate the number of people there will be in three decades from now.

Make a variable **population** and take input from the user that is the world population now. Assume that every month, someone gives birth to n more people. Also take **n** from the user as input. Calculate the number of people there will be when the spaceship is created.

```
G:\Semesters\Programming Fundamentals (Fall 2023)\Week 3\Lab Tasks>task.exe
Enter the current world population: 256
Enter the monthly birth rate (number of births per month): 2
The population in three decades will be: 976
```

Good Luck and Best Wishes !!

Happy Coding ahead :)

Skill: Write a complete program that converts input into the required output