National University of Computer and Emerging Sciences

Laboratory Manual

for

Data Structures Lab

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Section	BSCS-1N
Semester	Fall 2021

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Objectives:

In this lab, students will study:

- Data Types:
  - Int
  - Bool
  - Float
  - Double
  - Char
  - String
- Variables
- Arithmetic Operators
  - Operator Precedence
  - Binary Operators
  - Unary Operators
- Declaring and Initializing
- Type Conversion
- Usage of Input Statement "cin"

Reference:

Data Types:

Data Type	Size	Description
int	4 bytes	Stores whole numbers, without decimals
float	4 bytes	Stores fractional numbers, containing one or more decimals. Sufficient for storing 7 decimal digits
double	8 bytes	Stores fractional numbers, containing one or more decimals. Sufficient for storing 15 decimal digits
boolean	1 byte	Stores true or false values
char	1 byte	Stores a single character/letter/number, or ASCII values

Operators:

Operators	Precedence
!, +, - (unary operators)	first
*, /, %	second
+, -	third
<, <=, >=, >	fourth
==, !=	fifth
&&	sixth
||	seventh
= (assignment operator)	last

Questions:

Q 1) Insert appropriate datatypes:

```
_____    Age = 9;
_____    Area = 8.99;
_____    Initials = 'A';
_____    Flag = false;
_____    Message = "Hello World";
```

Q 2) Point out and correct the illegal variables:

a) First name
b) X
c) Three + three
d) 123Four
e) Bye!

Q 3) Solve the following arithmetic expression:

```
(((3 * 7) - 6) + ((2 * 5) / 4)) + 6
```

Q 4) Run the following code and match the output:

```
#include <iostream>
using namespace std;
int main()
{
    cout << "static_cast<int>(7.9) = "
         << static_cast<int>(7.9)
         << endl;
    cout << "static_cast<int>(3.3) = "
         << static_cast<int>(3.3)
         << endl;
    cout << "static_cast<double>(25) = "
         << static_cast<double>(25)
         << endl;
    cout << "static_cast<double>(5 + 3) = "
         << static_cast<double>(5 + 3)
         << endl;
    cout << "static_cast<double>(15) / 2 = "
         << static_cast<double>(15) / 2
         << endl;
    cout << "static_cast<double>(15 / 2) = "
         << static_cast<double>(15 / 2)
         << endl;
    cout << "static_cast<int>(7.8 + static_cast<double>(15) / 2) = "
         << static_cast<int>(7.8 + static_cast<double>(15) / 2)
         << endl;
```

```
    cout << "static_cast<int>(7.8 + static_cast<double>(15 / 2)) = "
         << static_cast<int>(7.8 + static_cast<double>(15 / 2))
         << endl;

    return 0;
}
```

Sample Run:

```
static_cast<int>(7.9) = 7
static_cast<int>(3.3) = 3
static_cast<double>(25) = 25
static_cast<double>(5 + 3) = 8
static_cast<double>(15) / 2 = 7.5
static_cast<double>(15 / 2) = 7
static_cast<int>(7.8 + static_cast<double>(15) / 2) = 15
static_cast<int>(7.8 + static_cast<double>(15 / 2)) = 14
```

Q 4) Run the following code:

```
int x, y;
int sum;
cout << "Type a number: ";
cin >> x;
cout << "Type another number: ";
cin >> y;
sum = x + y;
cout << "Sum is: " << sum;
```

Problems:

Problem 1: Take as input your name Initials in capital letters and display its respective ASCII values.

Example:

Input: S K
Output: 85 75

Problem 2: Take two integers as input , without initializing third variable swap its values: **Example** Input: x= 4, y= 7 Output: x=7, y=4.

Problem 3: Write a program that prompts the user to input five decimal numbers. The program should then add the five decimal numbers, convert the sum to the nearest integer, and print the result.

Problem 4: Write a code that takes as input temperature in Fahrenheit and converts Fahrenheit to Celsius using the following formula. Then print the temperature in Celsius. (Formula $C = 5/9(F - 32)$).