

COSC 501

Lab 1

Program 1: Exploring data types

Write a C++ program to explore different data types and answer the questions.

You will use this program:

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// *****
// COSC 501                                LAB #1
// YOUR NAME                              DUE-DATE
// PROGRAM-NAME: Lab1_1
// A simple description of the program
//*****

#include <iostream>
#include <string>
#include <climits>
using namespace std;

int main()
{
    int i = 7, j = 3;
    float f1 = 7.0, f2 = 3.0;
    char c1 = '7', c2 = '3', c3 = 'A';
    bool flag = true;
    string s1 = "7", s2 = "3", s3 = "A";

    cout << "\n *****Properties of a variable*****\n";
    cout << "Name: i\tType: int\tValue:" << i << "\tMemory Location: "
         << &i << endl;

    cout << "\n *****A. Integer Type*****\n";
    cout << "i+j = " << i+j << endl;
    cout << "i-j = " << i-j << endl;
    cout << "i*j = " << i*j << endl;
    cout << "i/j = " << i/j << endl;
    cout << "i%j = " << i%j << endl;

    cout << "\n *****B. ++ operator*****\n";
    cout << "i++ = " << i++ << endl;
    cout << "++i = " << ++i << endl;

    cout << "\n *****C. Float Type*****\n";
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cout << "f1+f2 = " << f1+f2 << endl;
cout << "f1-f2 = " << f1-f2 << endl;
cout << "f1*f2 = " << f1*f2 << endl;
cout << "f1/f2 = " << f1/f2 << endl;

cout << "\n *****D. Character Type*****\n";
cout << "the integer value of char " << c1 << " = " << int(c1)
    << endl;
cout << "the integer value of char " << c2 << " = " << int(c2)
    << endl;

cout << "\n *****E. String Type*****\n";
cout << "7+3 = " << s1+s2 << endl;

cout << "\n *****F. Memory Allocation Type*****\n";
cout << "memory allocation for integer type (short): "
    << sizeof(short) << " bytes\n";
cout << "memory allocation for integer type: " << sizeof(int)
    << " bytes\n";
cout << "memory allocation for Unsigned type: "
    << sizeof(unsigned) << " bytes\n";
cout << "memory allocation for long integer type: "
    << sizeof(long int) << " bytes\n";
cout << "memory allocation for long long integer type: "
    << sizeof(long long int) << " bytes\n";
cout << "memory allocation for float type: " << sizeof(float)
    << " bytes\n";
cout << "memory allocation for float type (double): "
    << sizeof(double) << " bytes\n";
cout << "memory allocation for char type: " << sizeof(char)
    << " bytes\n";
cout << "memory allocation for boolean type: " << sizeof(bool)
    << " bytes\n";
cout << "memory allocation for char A: " << sizeof(c3)
    << " bytes\n";
cout << "memory allocation for string A: " << sizeof(s3)
    << " bytes\n";
cout << "memory allocation for A " << sizeof("A") << " bytes\n";

cout << "\n *****G. Constant Values*****\n";
cout << "*** the actual value depends on the particular system
and library implementation.***" << endl;
cout << "Minimum value for an object of type int: " << INT_MIN
    << endl;
cout << "Maximum value for an object of type int: " << INT_MAX
    << endl;
cout << "Maximum value for an object of type unsigned int: "

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        << UINT_MAX << endl;
    cout << "Minimum value for an object of type long int: "
        << LONG_MIN << endl;
    cout << "Maximum value for an object of type long int: "
        << LONG_MAX << endl;
    cout << "Maximum value for an object of type unsigned long int: "
        << ULONG_MAX << endl;
    cout << "Minimum value for an object of type long long int: "
        << LLONG_MIN << endl;
    cout << "Maximum value for an object of type long long int: "
        << LLONG_MAX << endl;
    cout << "Maximum value for an object of type unsigned long long
int: " << ULLONG_MAX << endl;

    return 0;
}

```

Lab questions: (5 points each)

1. Why the results are different between int division in part A and float division in part C?
2. Explain the result of the operations in Part B
3. What is the integer value of a character?
4. Is there any correlation between the memory size and the maximum value of an object of that type? Explain your answer.
5. What is an integer overflow? Give an example.

Program 2: (30 points)

Write a C++ program to calculate diameter, area and circumference of any circle. Your program should ask the user to enter the radius of a circle and then calculate and display the result on the screen as follow:

Formula:

$$\pi = 3.14$$

$$\text{Diameter} = 2 * \text{radius}$$

$$\text{Circumference} = 2 * \pi * \text{radius}$$

Sample Output: Red colored texts are user inputs. Other texts are the output of the program.

Please enter a value for the radius of a circle:

10

Diameter = 20

Area = 314

Circumference = 62.8

Program 3: (45 points)

Write a C++ program to be used by a vending machine. Your program should ask the user to enter the paid amount and purchased amount and then calculate and display denominations of coins for the change. Below is a Sample run:

Sample Output: Red colored texts are user inputs. Other texts are the output of the program.

Please enter total paid amount: 4.12

Please enter total purchased amount: 3.15

Quarters: 3

Dimes: 2

Nickels: 0

Pennies: 2

Submission:

You should submit your source files (.cpp) for programs 2 and 3. Please name you files to include the lab number and program number, e.g. Lab0Program1.cpp. Also create a word or pdf document for the answers to the lab questions and screenshots of running result of programs.