

Lab 1 – Basic Elements of C++

Topics to be covered:

- Data types: int, char, float, double
- Assignment statements '=' and arithmetic operators '+', '-', '*', '/', and '%'
- Basic type castings.
- Debugger

Example code (BasicElements.cpp)

```
#include <iostream>
using namespace std;

void main ()
{
    //Variable declarations.
    int x, y, sum, modulus;
    char ch;
    double division, z = 4.3;

    cout << "Enter two numbers with space or enter in between: \n";
    //Prompt the user to input two numbers.
    cin >> x >> y;

    //Assignment and arithmetic operator '+'.
    sum = x + y;
    modulus = x % y;

    //Implicit type casting.
    division = z / y;
    cout << z << " / " << y << " = " << division << endl;

    //Basic output to the screen.
    cout << x << " + " << y << " = " << sum << endl;
    cout << x << " - " << y << " = " << x - y << endl;
    cout << x << " * " << y << " = " << x * y << endl;
    cout << x << " / " << y << " = " << x / y << endl;
    cout << x << " % " << y << " = " << modulus << endl;

    //Different type casting to get more precise answer of division.
    cout << "Use (double) (x / y) : " << x << " / " << y << " = " <<
        (double) (x / y) << endl;
    cout << "Use (double) x / y : " << x << " / " << y << " = " <<
        (double) x / y << endl;
    cout << "Use x / (double) y : " << x << " / " << y << " = " << x /
        (double) y << endl;
    cout << "Use (double) x / (double) y : " << x << " / " << y << " = "
        << (double) x / (double) y << endl;
}
```

Exercise #1

Write a **defining diagram and pseudocode** for the following problem:

Prompt for and read in the base and height of a triangle and the radius of a circle. Output (display):

- the base, height, and area of the triangle
- the area and circumference of the circle

NOTES: (Lab **exercises** are defining diagram and pseudocode only – not a C++ program. Hand in a typed up solution with the below programming assignments in your lab folder.)

Assignment #1a

Write a **defining diagram and pseudocode** for this problem. (turn in with assignment)

Write a **complete C++ program** to calculate and display the orbital weight, i.e. the pull of gravity, on an astronaut aboard the space shuttle. Your program will need to prompt for sea-level weight of the astronaut (in pounds) and the height of the space shuttle above the earth's surface (in miles). The equation used to calculate orbital-weight given these two inputs is:

$$\text{orbital} - \text{weight} = \text{sea} - \text{level} - \text{weight} \left(\frac{\text{radius} - \text{of} - \text{earth}}{\text{radius} - \text{of} - \text{orbit}} \right)^2$$

NOTES: Use the constant (3960 miles) for the radius of the earth. Radius of the orbit is calculated as radius of earth + height of the shuttle above the earth's surface.

Sample Input: 180 200

Sample Output: The sea level weight of the astronaut: 180

The height of the shuttle: 200

The orbital weight of the astronaut: 163.108358

Assignment #1b

Write a **complete C++ program** that accepts two integer values and displays the integral part and the remainder of this division* (i.e. the number of times the second integer divides into the first, and also the remainder). For example:

9/2 2 divides into 9: 4 times with a remainder of 1

5/8 8 divides into 5: 0 times with a remainder of 5

Also, complete the division displaying the result as a real number. For example:

9/2 is 4.5

5/8 is 0.625

Sample Input: 9 2

Sample Output:

2 divides into 9: 4 times with a remainder of 1

9/2 is 4.5

*You do not have to worry about checking for a zero dominator at this time – though if you want to give it a shot – go for it! (If statement).