

# COP 2535: Data Structures

## Exercise 02, Geometric Formulas

### 1 Instructions

Write a C++ program. You should use the template below. Your output should be similar to the output shown below. More specific instructions follow.

**circle** Write a block that takes as input an integer as **radius**, computes the area of a circle with that radius and prints the area, and computes the circumference of a circle with that radius and prints the circumference. See the output below. Here are the formulas:

$$\text{Circumference} = 2\pi r$$

$$\text{Area} = \pi r^2$$

**hemisphere** Write a block that takes as input an integer as **radius**, computes the volume of a hemisphere with that radius and prints the volume. See the output below. Here is the formula:

$$\text{Volume} = \frac{\frac{4}{3}\pi r^3}{2}$$

**triangle** Write a block that takes as input three integers as **sideA**, **sideB**, and **sideC**, computes the area of a triangle with the three sides and prints the area. Use See the output below. Use Heron's method. Here is the formula:

$$p = \frac{a + b + c}{2}$$

$$\text{Area} = \sqrt{p(p-a)(p-b)(p-c)}$$

**quadratic** Write a block that takes as input three integers as coefficients A, B, and C for a quadratic equation, computes both the positive and negative solutions if they exist, and prints the solutions. Remember that a quadratic equation may have no solution, one solution, or two solutions. Here are the appropriate formulas:

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Your deliverable is *one* plain text file (that is, it should have a **.txt** extension), with your program source code at the top and the output at the bottom. **Name the file with the exercise number and your last name.** That is, my deliverable would be named **progex02\_carter.txt**. Create a new plain text file using your favorite text editor, copy your source listing and paste it into the file, then copy the output and paste it into the file.

## 2 Template

text

```

/*****
    Name: Exercise02
    Author:
    Date:
    Purpose: geometry calculator
    Input: radius, a, b, c
    Output: circle, sphere, triangle, quadratic
*****/

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

const double PI = 3.1415926;

int main()
{
    int radius;
    int a, b, c;
    double area, circumference, volume;
    double p;
    double posnum, negnum, denom;

    cout << "Geometry Calculator\n" << endl;
    cout << "Calculating area and circumference of a circle" << endl;
    //your code here

    cout << "Calculating area and volume of a heisphere" << endl;
    //your code here

    cout << "Calculating area of a triangle using Heron's method" << endl;
    //your code here

    cout << "Calculating the roots of a quadratic equation" << endl;
    //your code here

    return 0;
}

```

## 3 Output

Your deliverable is a text file that will look similar to this. You should be able to select your output screen, copy it (with Ctl-C), and insert it into the text entry box (Ctl-V).

Geometry Calculator

```

Calculating area and circumference of a circle
Enter the length of the radius as an integer: 1
The area of your circle is 3.14159 and the circumference is 6.28319

```

Calculating area and volume of a sphere  
Enter the length of the radius as an integer: 2  
The area of your sphere is 50.2655 and the volume is 33.5103

Calculating area of a triangle using Heron's method  
Enter the length of side A as an integer: 3  
Enter the length of side B as an integer: 4  
Enter the length of side C as an integer: 5  
The area of your triangle is 6

Calculating the roots of a quadratic equation  
Enter coefficient A as an integer: 1  
Enter coefficient B as an integer: 10  
Enter coefficient C as an integer: 1  
The roots are -0.101021 and -9.89898