Program 4
CSCI 111 – Fall 2022

The two roots of a quadratic equation $ax^2 + bx + c = 0$ can be obtained using the following formula:

$$r_1 = \frac{-b+\sqrt{b^2-4ac}}{2a} \quad \text{and} \quad r_2 = \frac{-b-\sqrt{b^2-4ac}}{2a}$$

$\boldsymbol{b^2 - 4ac}$ is called the *discriminant* of the quadratic equation, and its value determines the number of roots as follows:

- $b^2 - 4ac > 0$, two real roots: r1 and r2
- $b^2 - 4ac = 0$, one real root: r
- $b^2 - 4ac < 0$, no real roots

Write a method called **roots** that takes in 3 parameters – coefficient a, coefficient b, and coefficient c, and the **return value** for the method expects one of three values as shown below:

0: no roots	[$b^2 - 4ac < 0$]
1: one root	[$b^2 - 4ac = 0$]
2: two roots	[$b^2 - 4ac > 0$]

Use the following method header: **public static int roots(int a, int b, int c)**

Within the method, determine the number of roots and return the corresponding number (0 , 1, or 2). Also write how this method would be called in your main method. Name your program **RootsTestYourLastName.java**

In the main method, prompt the user for coefficients a, b, and c. Based on the number of roots, determine and output the root values, if there are any (you can use an if-statement for this determination).

Include header comments formatted exactly as shown below but with your name, student ID, and section number (i.e., these comments should be the FIRST LINES in your script). Be sure to include the Honor Code statement. Your electronic submission of the program file will represent your endorsement of the Honor Code Statement.

```
/* Course: CSCI 111, Section 1
   Student Name:  Jane Doe
   Student ID: 12345678
   Program 4
   Due Date:

   In keeping with the Honor Code of UM, I have neither given nor received
   inappropriate assistance from anyone other than the TA or the instructor.

  Program Description:
*/
```

Cont'd on next page →

Before each significant step, provide a comment explaining the step (do not comment every line of code).

Sample Output (3 examples) (2 decimal places to the output)

```
Enter the A coefficient: 1
Enter the B coefficient: 3
Enter the C coefficient: 1
1, 3, and 1 coefficients have two real roots:
        r1 = -0.38
        r2 = -2.62
>>
Enter the A coefficient: 1
Enter the B coefficient: 2
Enter the C coefficient: 1
1, 2, and 1 coefficients have one real root:
        r = -1.00
>>
Enter the A coefficient: 5
Enter the B coefficient: 5
Enter the C coefficient: 5
5, 5, and 5 coefficients have no real roots
>>
```