

<http://www.cs.arizona.edu/classes/cs227/spring07/>

Program #1: Your First Java Programs

Due Date: January 19th, 2007, at the start of class (10:00 a.m. MST)

Overview: Often the hardest part of learning a new programming language is learning how to convince the computer to accept, run, and show you the result of your first program. That's why we're starting simple: In this assignment you'll just type in one simple program, and will write another simple program from scratch. At the same time, this assignment will give you some experience using the computers in our lab(s).

Assignment: This assignment has two parts: The type-in exercise, and the write-a-program-from-scratch exercise.

- (a) **The Quadratic Formula:** You probably remember that the quadratic formula is used to find the roots of a quadratic equation. That is, the roots of the quadratic $ax^2 + bx + c = 0$ are $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

On the last page of this handout is a complete Java program that determines the roots of a quadratic equation specified by the user. Here's what you are to do with it:

- (1) If you haven't yet done so, go up to the 9th floor of the Gould-Simpson building to get your lab access card and run the "apply" program. You can do both at the same place. Follow the signs. After a day or so, your account will be ready.
 - (2) Visit the Gould-Simpson 228 lab, preferably during a time when a section leader is on duty. (That's so you can get help if you need it.) Following the directions in Section B of the "Using the Windows PCs..." handout you received in section, log in to a Windows machine. Start TextPad and, following the steps I demonstrated in class, type in the quadratic formula program you'll find on the last page of this handout, exactly as you see it. Save it as a Java program under the name `Prog1A.java` (the capitalization is important) on your "H:" drive. Compile and run the program to make sure it's working correctly. Then, print your program on the lab printer. You'll get a printed copy of the program on a page with a 'watermark' border around the edges. Hold onto this, and turn it at the start of class on the due date.
- (b) **Body Mass Index (BMI):** Having completed that first task, you'll be ready for this one: Write a complete (with documentation like you see in the quadratic formula program) Java program named `Prog1B.java` that computes a person's Body Mass Index (BMI). The BMI is a simple calculation often used by health care professionals to help determine if a person is over-weight.

To compute a person's BMI, we need the user to tell us the person's weight in pounds and their height (which most people know in feet and inches, e.g. 6 feet, 2 inches). Your program will need to convert pounds to kilograms (there are about 0.4536 kilograms in a pound) and feet and inches to meters (there are 0.0254 meters in an inch). To compute the BMI, just divide the weight (in kilograms) by the square of the height (in meters). Finally, tell the user what the computed BMI is. Give your output in the form of a complete sentence, as the quadratic formula program does.

We want to see both a paper and an electronic submission of this part of the assignment:

- (1) Produce a printout of your completed program in the lab, so that we get a printout with the watermark.
- (2) Go to <http://lectura.cs.arizona.edu/turnin> in a web browser. Type a folder name of the form:

[section leader first name]_S[your section #]_P[program #]_[your last name]_[your first name]

For example, if you are in Alex's section (Section 1) and your name is John Doe, your folder name will be

`Alex_S1_P1_Doe_John`

Then select your class (CSC 227) and indicate that you have one file to submit. Continue to the next screen, where you can browse to find your `Prog1B.java` file. Enter your CS login name and password, and click the Upload Files button.

We recommend that you print the confirmation page, so that if you accidentally submitted to the wrong class, for example, you can prove to your SL that you did submit the assignment. We can't simply take your word for it.

You can write, test, and electronically submit the program at home, but bring it to the lab and print it from TextPad on the lab printer. We want to see that watermark.

Turn In: You can use the 'turnin' page to electronically submit your BMI program at any time. Just be sure to do so before the due date and time so that you don't lose a late day. As for the two printouts, bring them to class on the due date and hand them to the section leader(s) collecting them in the back of the room.

Grading Criteria:

Points	
8	Quadratic Formula program entered correctly
2	Prog1A.java printout correctly produced in lab
10	BMI program documentation
8	BMI input prompting is clear and correct
10	BMI calculations performed correctly
8	BMI output meets specifications
2	Prog1B.java printout correctly produced in lab
2	Prog1B.java correctly submitted via 'turnin'
50	Total Possible

Other Requirements and Hints:

- Normally, assignments in this class will be due on Monday nights. As we don't have class on the 15th (MLK Jr. Day), we're making an exception just this once.
- For most assignments, we will not be requiring any printouts from the lab printers. We're requiring them this time so that we know that you know how to complete assignments in the lab.
- Be sure to take the time to verify the output of your programs. Your SL will be visually checking your programs, looking for common errors that would cause you program to, for example, compute the BMI incorrectly. There are lots of BMI calculators on the web; you should have no trouble finding one against which you can compare your program's answers.
- For those of you who are a little more cautious, you can establish a more secure connection to the turnin web pages by adding an "s" to the "http" of the URL. (That is, `https://...`). You'll have an extra window to two to deal with, but when you enter your password, it will be encrypted. Either is fine; use the one you're most comfortable with.
- Remember that late programs will be accepted, but at a cost of some/all of your late days, and/or big portions of your score. The policies are detailed in the class syllabus.
- Also remember that this is an individual assignment; write your own BMI program. But, do feel free to help each other figure out how to use TextPad, how to use the turnin web pages, how to interpret Java error messages, etc.
- Finally, but most importantly: Start early! There are lots of little things that need to be done to complete this assignment, and any one of them could trip you up. You are not likely to be able to complete all of them in time if you wait until the hour before class to get started.

Here is the quadratic formula program that we want you to type in as the first part of this assignment. **Other than replacing the names, type this in exactly as you see it here!**

```
/*=====
|   Assignment:  Program #1(a): The Quadratic Formula
|   Author:     YOUR NAME
|   Sect. Leader: YOUR SECTION LEADER'S NAME
|
|   Course:     CSc 227
|   Instructor: L. McCann
|   Due Date:   January 19, 2007, at the beginning of class
|
|   Description: This program requests from the user the coefficients
|                 a, b, and c of the quadratic equation  $ax^2 + bx + c = 0$ 
|                 and displays to the terminal the roots of the equation.
|                 Note that this program doesn't check for invalid input.
|
|   Deficiencies: None; this program meets specifications.
|=====*/

import java.util.*; // Gives easy access to Java API's "util" package

public class Prog1A
{
    static double INCHES_TO_METERS = 0.0254; // 1 in. = 0.0254 meters
    static double POUNDS_TO_KG = 0.4536; // 1 lb. ~ 0.4536 kilograms

    public static void main (String [] args)
    {
        double a, // coefficient of the x^2 term
               b, // coefficient of the x^1 term
               c, // coefficient of the x^0 term
               discriminant, // b^2 -4ac
               root1, root2; // the roots of the quadratic equation

        Scanner keyboard = new Scanner (System.in);

        System.out.println("\nThis program will find the roots of the"
            + " quadratic equation\n $ax^2 + bx + c = 0$ ,"
            + " assuming that a is not zero and that"
            + " the discriminant\nis not negative.");

        System.out.print("\nEnter the value of a in the equation: ");
        a = keyboard.nextDouble();

        System.out.print("Enter the value of b in the equation: ");
        b = keyboard.nextDouble();

        System.out.print("Enter the value of c in the equation: ");
        c = keyboard.nextDouble();

        discriminant = Math.sqrt(b * b - 4 * a * c);
        root1 = (-b + discriminant) / (2*a);
        root2 = (-b - discriminant) / (2*a);

        System.out.println("\nThe roots of the quadratic equation\n"
            + "(" + a + ")x^2 + (" + b + ")x + (" + c + ")\n"
            + "are " + root1 + " and " + root2 + ".\n");
    } // main
} // class Prog1A
```
