```
import components.simplereader.SimpleReader;
import components.simplereader.SimpleReader1L;
import components.simplewriter.SimpleWriter;
import components.simplewriter.SimpleWriter1L;

/**
 * Project #2: Compute Roots Using Newton's Iteration.
 *
 * @author Danny Kan (kan.74@osu.edu)
 * @version 01272022
 */
public final class Newton4 {

  /**
   * Private constructor so this utility class cannot be instantiated.
   */
  private Newton4() {
  }

  /**
   * Computes estimate of square root of x to within relative error 0.01%.
   *
   * @param x
   *          a non-negative number to compute the square root of.
   * @param error
   *          the relative error tolerance for computing the square root
   *          function.
   * @return the estimate of the square root if x is positive, zero if x is
   *       zero, and x if x is negative.
   */
  private static double sqrt(double x, double error) {
    double r = x; // estimate of the square root of x.

    if (x > 0) {
      while ((Math.abs(Math.pow(r, 2) - x)) / x >= Math.pow(error, 2)) {
        r = (r + (x / r)) / 2;
      }
    }

    return r;
  }

  /**
   * Main method.
```

```
     *
     * @param args
     *          the command line arguments
     */
    public static void main(String[] args) {
        SimpleReader in = new SimpleReader1L();
        SimpleWriter out = new SimpleWriter1L();

        out.println("Project #2: Compute Roots Using Newton Iteration");

        // assume the user DOES NOT enter a negative value.
        out.print(
                "Enter a positive value of type double to calculate the square root: ");
        double userVal = Double.parseDouble(in.nextLine());

        // prompt the user to enter the relative error tolerance.
        out.print("Enter the relative error tolerance: ");
        double relError = Double.parseDouble(in.nextLine());

        // method call:
        out.print(sqrt(userVal, relError) + "\n");

        boolean valid = true;
        while (valid) {
            out.print(
                    "Enter a positive value of type double to calculate the square root: ");
            userVal = Double.parseDouble(in.nextLine());

            if (userVal < 0) {
                valid = false;
            } else {
                // method call:
                out.print(sqrt(userVal, relError) + "\n");
            }

        }

        // close input and output streams.
        in.close();
        out.close();
    }
}
```