

```
1 import components.simplereader.SimpleReader;
2 import components.simplereader.SimpleReader1L;
3 import components.simplewriter.SimpleWriter;
4 import components.simplewriter.SimpleWriter1L;
5
6 /**
7  * prompt users to type the number which could not be 0 to find the square root
8  * of number, the relative would be the number that the users type.
9  *
10 * @author Yiming Cheng
11 *
12 */
13 public final class Newton3 {
14
15     /**
16      * Private constructor so this utility class cannot be instantiated.
17      */
18     private Newton3() {
19     }
20
21     /**
22      * Computes estimate of square root of x to within relative error 0.01%.
23      *
24      * @param x
25      *         positive number to compute square root of
26      * @param a
27      *         relative error that users would accept
28      * @return estimate of square root
29      */
30     private static double sqrt(double x, double a) {
31         double r = x;
32         /*
33          * set r that is equal x as the initial value
34          */
35         while (Math.abs(r * r - x) / x > a * a) {
36             r = (r + x / r) / 2;
37             /*
38              * calculate the right number of the square root within  $\epsilon^2$ 
39              */
40         }
41         return r;
42     }
43
44     /**
45      * Main method.
46      *
47      * @param args
48      *         the command line arguments
49      */
50     public static void main(String[] args) {
51         SimpleReader in = new SimpleReader1L();
52         SimpleWriter out = new SimpleWriter1L();
53         /*
54          * Put your main program code here; it may call myMethod as shown
55          */
56         out.println("Calculate the square root of the number");
57         String answer = in.nextLine();
58
59         while (!(answer.equals("y"))) {
60             out.println("Calculate the square root of the number");
61             answer = in.nextLine();
62         }
63     }
64 }
```

```
63
64     out.println("Type a positive number");
65     double number = in.nextDouble();
66     while (number == 0) {
67         /*
68          * the number could not be 0
69          */
70         out.println("Type a positive number");
71         number = in.nextDouble();
72     }
73     out.println("Type a relative error");
74     double error = in.nextDouble();
75     /*
76      * prompt the users to type the relative errors that they could accept
77      */
78     /*
79      * get the right answer of the square root
80      */
81     out.println(sqrt(number, error));
82
83     /*
84      * Close input and output streams
85      */
86     in.close();
87     out.close();
88 }
89
90 }
91
```