

Write a class `Statistics` to work with the class `Driver` shown below to produce the output shown. Notice that `Driver` an external file called “*numbers.doc*” that contains 100 randomly-determined integers between and 100 inclusive. Your `Statistics` class will read the numbers in “*numbers.doc*” and calculates the average and standard deviation. Your program will also determine the *mode* and *median* of the data. Note that your results are displayed on the screen and also are added, or appended, to “*numbers.doc*”.

The formula to calculate standard deviation,  $\sigma$ , is shown below:

$$\sigma = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n} - \bar{x}^2} \quad \rightarrow \quad \text{“square root of (mean of squares – square of mean)”}.$$

I recommend that before you attempt to program this formula you first use it by hand on a simple set of numbers. This will help you understand how the formula works and will make programming it successfully much easier (and of course gives you a debugging tool).

```
public class driver
{
    public static void main( String[] args )
    {
        String fileName = "numbers.doc";
        FileOutputStream out = new FileOutputStream( fileName );
        int num = 0;
        for( int k = 0; k < 100; k++ )
        {
            num = (int)(Math.random()*101 + 1);
            if( k%10 == 0 && k != 0 )
            {
                System.out.println();
                out.writeEndOfLine();
            }
            System.out.print( num + " " );
            out.writeInt( num );
            out.writeString( " " );
        }
        out.close();
        Statistics fileStats = new Statistics( fileName );
        System.out.print("\n\n");
        System.out.printf("%s%.2f", "The average = ", fileStats.average() );
        System.out.println();
        System.out.printf("%s%.2f", "Standard deviation = ", fileStats.stdDev() );
        System.out.println();
        fileStats.findMode ();
    }
}
```

## OUTPUT

32	31	36	39	62	6	76	89	66	91
9	56	58	40	3	47	75	43	14	60
65	42	82	18	71	43	81	30	21	38
57	19	32	13	66	69	78	86	53	27
55	98	3	6	40	45	15	29	3	35
53	42	48	88	57	99	82	80	10	8
50	75	72	9	22	44	40	83	37	99
94	4	59	30	47	89	69	69	28	89
21	77	96	41	97	71	81	7	89	40
43	38	64	39	53	26	73	84	47	11

The average = 50.27

Standard deviation = 27.66

The mode is(are) --> 40 89

\*The median is . . .

\* To do this you have to sort the data. Do this by using the bubble-sort technique (this is the easiest to understand). Go online and find a bubble-sort routine (you'll find thousands) and incorporate it to your program.