LAB #2: ARRAYS, METHODS, FILES

1. Task: Write a Java program using the following methods for a 1-dim array (list):

- A method named `getInt` to get input a valid integer. The method is used to test for type errors in input.
- A method named `initRand` to fill the array with random values: the elements of the array should be random integers between 1 and 100 (declared as class constants).
- A method named `print` to print the elements of the array. Use `printf`.
- A method named `isAllEven` that returns a `boolean` value indicating whether or not all of the values are even numbers.
- A method named `isUnique` that returns a `boolean` value indicating whether or not the values in the array are unique. The values in the list are considered unique if there is no pair of values that are equal.
- A method named `minGap` that returns the minimum 'gap' between adjacent values in the array. The gap between two adjacent values in an array is defined as the second value minus the first value.
- A method named `menu` that prints a list of options and returns a valid option (check the sample output).
- A method named `bubbleSort` that sorts the array in ascending order.
- A method named `copy` that makes a copy of a 1-dim array into another 1-dim array.
- A method named `top_20` that prints the values in the 80%-percentile (top 20%). The method should start with sorting a copy of the array and continue with printing the top 20% from this sorted copy. Keep the original array unsorted.
- A method named `getMean` that returns the average value/array. You may have to overload this method for an array of int/double
- A method named `getVariance` that returns the variance of a list of integers. Assume the parameter/method is an array named `list`. You should create a second array holding the squares of the deviations of a value `(list[i])` from its mean value. The variance is the mean of this second array.
- NOTE: The sample output shows also the standard deviation for option 4. The standard deviation is the square root of the variance. No need for a method.

All methods should take as input parameters the array and its size. Write a driver program to call these methods and get output similar to the sample output below.

SAMPLE OUTPUT:

```
How many elements/list: a
Not an integer! Try again!
How many elements in the list: 3.5
Not an integer! Try again!
How many elements in the list: 16
The list is:
51  7  33  67  33  61  4  100  27  80  1  91  10  94  62 95

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
 5) Print 80% percentile
 0) EXIT
```

```
Please enter your option: 8

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
 5) Print 80% percentile
 0) EXIT
Please enter your option: a
Not an integer! Try again! Please enter your option: 3.5
Not an integer! Try again! Please enter your option: 1
Some values/list are odd.

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
 5) Print 80% percentile
 0) EXIT
Please enter your option: fgfgfd
Not an integer! Try again! Please enter your option: 2
Some values/list appear multiple times

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
 5) Print 80% percentile
 0) EXIT
Please enter your option: 3
The minimum gap between 2 adjacent values is -81

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
```

```
 5) Print 80% percentile
 0) EXIT
Please enter your option: 4
51  7  33  67  33  61  4 100  27  80  1  91  10  94  62  95
The mean for this list is: 51.00
The variance for this list is: 1165.88
The standard deviation for this list is: 34.14

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
 5) Print 80% percentile
 0) EXIT
Please enter your option: 5
The list sorted:
1  4  7  10  27  33  33  51  61  62  67  80  91  94  95 100
80%-percentile from this list:
100  95  94

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
 5) Print 80% percentile
 0) EXIT
Please enter your option: 0
Testing completed.
```

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2. Task (reuse of code at work!): Rewrite the previous program and make it work when the list is populated with values found in an input file. The name of the file should be input from the user. Handle all possible cases (use try/catch statements). Have a constant for max size and read at most these many values from the file. Your output should be similar to the following samples:

SAMPLE OUTPUT #1:

```
Please input the name of the file to be opened: input.tx

--- File Not Found! Exit program! ---
```

SAMPLE OUTPUT #2: For this file holding all values of unwanted types: a nd fdsvfd sdfgvdf 3.5 3.23 sdafs asdasf erqwewr f

```
Please input the name of the file to be opened: input.txt
```

```
      --- The file doesn't contain any integers. Exit program! ---
```

SAMPLE OUTPUT #3:

```
For this file holding mixed types: 34 a 55 18 47 89 b  45 67 59 abbbb
88 37 20 27 10 78 39 21 n m ghff

      Please input the name of the file to be opened: input2.txt

      The list size is: 16
      The list is:
      34  55  18  47  89  45  67  59  88  37  20  27  10  78  39  21

      Your options are:
      -----------------
       1) All even values?
       2) All unique values?
       3) Print min gap between values
       4) Statistics
       5) Print 80% percentile
       0) EXIT
      Please enter your option: 3
      The minimum gap between 2 adjacent values is -51

      Your options are:
      -----------------
       1) All even values?
       2) All unique values?
       3) Print min gap between values
       4) Statistics
       5) Print 80% percentile
       0) EXIT
      Please enter your option: 2
      All values/list are unique values.
      Your options are:
      -----------------
       1) All even values?
       2) All unique values?
       3) Print min gap between values
       4) Statistics
       5) Print 80% percentile
       0) EXIT
      Please enter your option: 1
      Some values/list are odd.

      Your options are:
      -----------------
       1) All even values?
       2) All unique values?
       3) Print min gap between values
       4) Statistics
       5) Print 80% percentile
       0) EXIT
      Please enter your option: m
      Not an integer! Try again! Please enter your option: 5
      The list sorted:
      10  18  20  21  27  34  37  39  45  47  55  59  67  78  88  89
      80%-percentile from this list:
         89   88   78

      Your options are:
      -----------------
       1) All even values?
       2) All unique values?
       3) Print min gap between values
       4) Statistics
```

```
 5) Print 80% percentile
 0) EXIT
Please enter your option: wer
Not an integer! Try again! Please enter your option: 4

Statistics for this list:
34  55  18  47  89  45  67  59  88  37  20  27  10  78  39  21
The mean for this list is: 45.88
The variance for this list is: 584.11
The standard deviation for this list is: 24.17

Your options are:
-----------------
 1) All even values?
 2) All unique values?
 3) Print min gap between values
 4) Statistics
 5) Print 80% percentile
 0) EXIT
Please enter your option: 0
Testing completed.
```

Notes:

A. The lab will NOT be graded, but you have to submit good quality work in order to get credit.

B. The lab should be completed by the start of the next scheduled lab class. E-mail the **.java** files (attachments) to Rohankumar Patel (rpatel27@students.towson.edu)

Very important: Make sure that you have COSC 237.section, your name, and Lab#2 in the *Subject* box of your e-mail.

C. In case you have any problems, contact the TA or the instructor for assistance.