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COSC 211 : Object Oriented Programming I - LAB09

Objectives:

To gain experience with:

- Reading input from a text file
- Writing/Appending output to text files
- String processing (breaking a string into tokens)

1. Reading Input from a file.

To read input from a file, we make use of the following classes all of which are in the **java.io** package:

FileReader: This is used to create an object that can be used to read one character at a time from a file. The format is:

```
FileReader reader = new FileReader("inputfile.txt");
```

Notes:

- If the file does not exists, a **FileNotFoundException** is thrown.
- If the file is not in the current folder, the full path of the file must be specified.
- When specifying the full path of the file, it is better to use forward slash. Example:
  `"C:/workarea/inputfile.txt"`
- The back slash can also be used, but double slash must be used for each slash. Example:
  `"C:\\workarea\\inputfile.txt"`
  However, if the file name is being read from the user using a string variable, then only single slash is used.
- The important methods of the FileReader object are:

read()	returns an integer corresponding to the character read or –1 if there is no more data in the file.
close()	this closes the file. Always close a files after you finish reading from it.

Exampe 1: The following example reads one character at a time from a file and prints it on the screen.

```
import java.io.*;
class TestFileReader {
   public static void main(String[] args) throws IOException {
      char c;
      int input;
      FileReader in = new FileReader("inputfile.txt");
      while ((input=in.read()) != -1) {
         c = (char) input;
         System.out.print(c);
      }
      System.out.println();
      in.close();
   }
}
```

BufferedReader: This can be used together with a FileReader object to read one line at a time from a text file.

```
BufferedReader in = new BufferedReader(new FileReader("inputfile.txt"));
```

As we all know, the BufferedReader object has a **readLine()** that returns a string. When used to read a file, the readLine() method returns a whole line. It returns null if there is no more data in the file.

Exampe 2: The following example reads one line at a time from a file and prints it on the screen.

```
import java.io.*;
class TestBufferedReader {
   public static void main(String[] args) throws IOException {
      String s;
```

```
      BufferedReader in = new BufferedReader(new FileReader("inputfile.txt"));
      while ((s=in.readLine()) != null)
         System.out.println(s);

      in.close();
   }
}
```

2. Writing/Appending output to text files.

To write or append output to a file, we make use of the following classes of the **java.io** package:

FileWriter: This is used to create an object that can be used to write one character at a time to a file. The format is:

```
FileWriter writer = new FileWriter("ouputfile.txt");  //for writing
      or
FileWriter writer = new FileWriter("ouputfile.txt", true);  //for appending
```

Notes:

- Unlike the case of FileReader object, If the file does not exists, it is created automatically. However, if there is no writing access to the file or its folder, a **FileNotFoundException** is thrown.
- The main methods of the FileWriter object are:

write(int c)	writes the given character to the file.
close()	this closes the file. It is even more important to close an output file after its use.

Exampe 3: The following example reads one character at a time from an input file and prints it to an output file.

```
import java.io.*;

class TestFileReader {
   public static void main(String[] args) throws IOException {
      char c;
      int input;

      FileReader in = new FileReader("inputfile.txt");
      FileWriter out = new FileWriter("outputfile.txt");
      while ((input=in.read()) != -1) {
         c = (char) input;
         out.write(c);
      }
      System.out.println();
      in.close();
      out.close();
   }
}
```

PrintWriter: The problem with the **write()** method of the FileWriter object is that it can only write one character at a time. To be able to write/append strings, we create a PrintWriter object, making use of a FileWriter object as a parameter:

```
PrintWriter out = new PrintWriter(new FileWriter("result.txt"));
      or
PrintWriter out = new PrintWriter(new FileWriter("result.txt", true));
```

The PrintWriter object has **print()** and **println()** methods that behave in exactly the same manner as those of System.out object.

Exampe 4: The following example reads one line at a time from an input file and prints it to an output file.

```
import java.io.*;

class TestPrintWriter {
   public static void main(String[] args) throws IOException {
      String s;

      BufferedReader in = new BufferedReader(new FileReader("inputfile.txt"));
      PrintWriter out = new PrintWriter(new FileWriter("outputfile.txt"));
      while ((s=in.readLine()) != null)
         out.println(s);

       in.close();
       out.close();
   }
```

```
}
```

3. String Processing (StringTokenizer class).

The **readLine()** method of the **BufferedReader** object reads an entire line at a time. However, there are many situations where we would like to break the line into individual **tokens** for further processing. For example, if we read the string:

```
"996502     10    15    20"
```

we would like to break the string into the following:

```
"996502"    "10"  "15"  "20"
```

so that we can call the appropriate parser method to convert the tokens to numbers.

To achieve this, Java provides the class, **StringTokenizer** in the **java.util** package.
To use this class, we need to first create its object using one of its constructors.

The following table shows the constructors and the important methods of the **StringTokenizer** class.

constructors and methods	description
`StringTokenizer(String str)`	Assumes white space as delimiters `(" \t\n\r")`
`StringTokenizer(String str, String delim)`	Uses the characters in the second argument as delimiters.
`StringTokenizer(String str, String delim, boolean returnDelims)`	If the third argument is true, include the delimiters are counted as part of the tokens.
`String nextToken()`	Returns the next token from this tokenizer's string
`boolean hasMoreTokens()`	Tests if there are more tokens from this tokenizer's string
`int countTokens()`	Returns the number of tokens remaining in this tokenizer's string.

Example 5: The following example reads ID numbers, names and grades of students in three quizzes contained in a file, **quizdata.txt** and computes the average of each student. It prints the output on both the screen and the file, **result.txt**.

```
import java.io.*;
import java.util.StringTokenizer;

class ProcessQuiz {
   static final int QUIZ_COUNT = 3;
    public static void main(String[] args) throws IOException {
        BufferedReader in = new BufferedReader(new FileReader("quizdata.txt"));
        PrintWriter out = new PrintWriter(new FileWriter("result.txt"));

        String s, name, iDNumber;
        double[] quiz = new double[3];
        StringTokenizer st;

        while ( (s = in.readLine()) != null) {
            st = new StringTokenizer(s, "|");
            iDNumber = st.nextToken();
            name = st.nextToken();
            System.out.print(iDNumber+"\t"+name+"\t");
            out.print(iDNumber+"\t"+name+"\t");

           double sum = 0;
           for (int i = 0; i<quiz.length; i++) {
               quiz[i] = Double.parseDouble(st.nextToken().trim());
               sum += quiz[i];
               System.out.print(quiz[i]+"\t");
               out.print(quiz[i]+"\t");
           }

           System.out.println(sum/QUIZ_COUNT);
           out.println(sum/QUIZ_COUNT);
       }
       in.close();
```

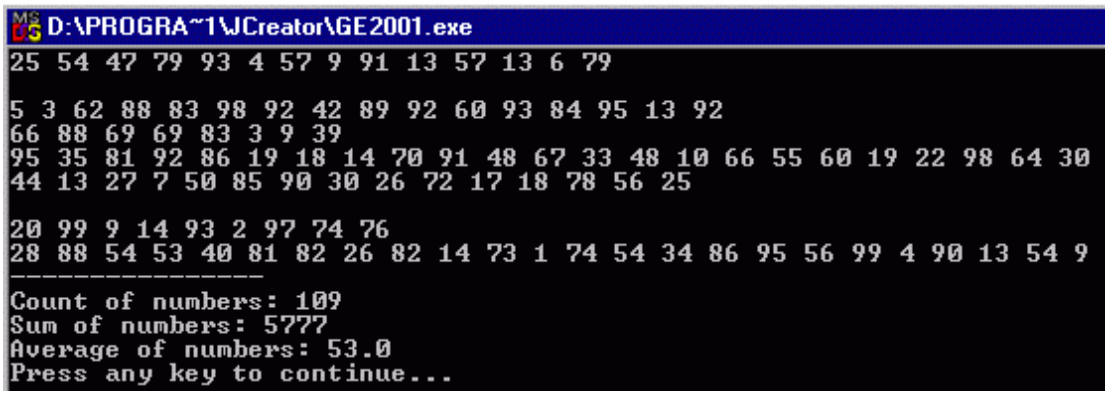
```
        out.close();
    }
}
```

Example 6: The following example uses the data from the file, **quizdata.txt,** to create an array of Student objects. It then sends the output in two files, **good.txt** containing students whose average is equal or greater than the overall average and **poor.txt** containing students whose grades is below the overall average. The Student class is the same as the one used in lab09, except it has been updated to include an instance variable **name**.

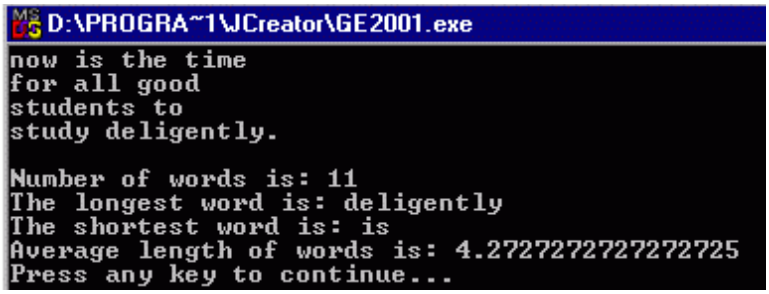
```
import java.io.*;
import java.util.StringTokenizer;

class GoodAndPoor {
   static final int QUIZ_COUNT = 3,  MAX_STUDENT_COUNT = 30;

    public static void main(String[] args) throws IOException {
        BufferedReader in = new BufferedReader(new FileReader("quizdata.txt"));
        PrintWriter good = new PrintWriter(new FileWriter("good.txt"));
        PrintWriter poor = new PrintWriter(new FileWriter("poor.txt"));
        Student[] student = new Student[MAX_STUDENT_COUNT];
        double [] quiz;

        String s, name;
        int iDNumber, actualStudentCount = 0;
        StringTokenizer st;
        double sum=0, average;

        while ( (s = in.readLine()) != null) {
            st = new StringTokenizer(s, "|");
            iDNumber = Integer.parseInt(st.nextToken().trim());
            name = st.nextToken();
            quiz = new double[QUIZ_COUNT];
            for (int i=0; i<quiz.length; i++)
              quiz[i] = Double.parseDouble(st.nextToken().trim());

            student[actualStudentCount] = new Student(iDNumber, name, quiz);
            sum += student[actualStudentCount].average();
            actualStudentCount++;
        }
        average = sum/actualStudentCount;

        good.println("The class average is: "+average);
        good.println("\r\nStudents with grades equal or above average are:\r\n");

        poor.println("The class is: "+average);
        poor.println("\r\nStudents with grades equal or above average are:\r\n");

        for (int i=0; i<actualStudentCount; i++)
          if (student[i].average() >= average)
              good.println(student[i]);
          else
              poor.println(student[i]);

        in.close();
        good.close();
        poor.close();
    }
}
```

4. Assignments

1. The file **integerdata.txt** contains integer numbers randomly arranged. Write a program that reads the data and prints the numbers as they appear in the file both on the screen and in the file, **result2.txt**. You program should also print the count of the numbers, their sum and their average



2. Write a program that reads data from the file **message.txt** and display on the screen, the content of the file, the number of words, the longest word, the shortest word and the average length of the words in the file. You should not count the punctuation characters ",.;:?!" as part of the a word.



3. Use the class BankAccount to write a program that creates an array of BankAccount objects using the data contained in the file **accounts.txt**. Your program then prints all those customers whole balance is greater than 10,000.00 into a file **richcustomers.txt**