3. Input/Output :: Formatting Output with the *printf*() Method

The *java.io.PrintStream* (*System.out* is an instance of *PrintStream*) and *java.io.PrintWriter* classes contain a method named *printf*() that can be used can be used to format output. For example, suppose an input text named *scores-in.txt* file contains three exam scores for a student on each line:

Contents of scores-in.txt

```
80 90 70
40 60 80
100 93 87
```

and we wish to send the exam average for each student to an output file named *scores-out.txt* formatted like this:

```
Exam 1  Exam 2  Exam 3  Exam Avg
------  ------  ------  --------
    80      90      70      80.0
    40      60      91      63.7
   100      93      87      93.3
```

3. Input/Output :: Formatting Output with the *printf*() Method (continued)

The syntax of *printf*() is:

```
printf(String format, [ value, ... ])
```

where *format* is a *String* that contains **format specifiers** that tell *printf*() how to format the values being printed. Common format types are:

- `d` formats a decimal integer (**int**)
- `f` formats a floating point number (**double**)
- `s` formats a string

A format specifier has this syntax:

1. It starts with **%**.
2. The % is followed by **optional format flags**. A **hyphen** – causes the value to be printed **left-justified** in a field of a specific width (see 3 below); if – is not present the value is printed right- justified in the field. A **comma** causes commas to be displayed in the printed number.
3. If a value is to be printed in a field of a specific width, the **field width** appears next. For controlling the number of digits after the decimal point in a floating point number the syntax is *width.numofdigits*.
4. It ends with the **format type**.

3. Input/Output :: Formatting Output with the *printf*() Method (continued)

For example,

```
int x = 123, y = 456789;
double a = 3.14159265, b = 2.7182818;
String first = "Wilma", last = "Flintstone";
System.out.printf("%6d %-,8d\n", x, y);
System.out.printf("%5.2f %-7.4f\n", a, b);
System.out.printf("first = [%s] last = [%12s]\n", first, last);
```

The output will be:

3. Input/Output :: ExamAvg Application

```
//*************************************************************************
// CLASS: ExamAvg (ExamAvg.java)
//*************************************************************************
import java.io.File;
import java.io.FileNotFoundException;
import java.io.PrintWriter;
import java.util.Scanner;

public class ExamAvg {
  public static void main(String[] args) throws FileNotFoundException {
    // Open "scores-in.txt" for reading.
    Scanner in = new Scanner(new File("scores-in.txt"));

    // Open "scores-out.txt" for writing.
    PrintWriter out = new PrintWriter(new File("scores-out.txt"));

    // Print the column headers.
    out.println("Exam 1  Exam 2  Exam 3  Exam Avg");
    out.println("------  ------  ------  --------");
```

3. Input/Output :: ExamAvg Application (continued)

```
    // Read the exam scores from "scores-in.txt", calculate the exam average, and
    // print the formatted output to the output file.
    while (in.hasNext()) {
      int e1 = in.nextInt();
      int e2 = in.nextInt();
      int e3 = in.nextInt();
      double avg = (e1 + e2 + e3) / 3.0;
      out.printf("%6d  %6d  %6d  %8.1f\n", e1, e2, e3, avg);
    }

    // Close the input file.
    in.close();

    // Close the output file.
    out.close();
  }
}
```