



## CHAPTER 3

# Console Input and Output

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# `System.out.println` for console output

---

- ❑ `System.out` is an object that is part of the Java language
  - ❑ `println` is a method invoked by the `System.out` object that can be used for *console output*
    - The data to be output is given as an argument in parentheses
    - A plus sign is used to connect more than one item
    - Every invocation of `println` ends a line of output
- ```
System.out.println("The answer is " + 42);
```



# println Versus print

---

- ❑ Another method that can be invoked by the `System.out` object is `print`
- ❑ The `print` method is like `println`, except that it does not end a line
  - With `println`, the next output goes on a new line
  - With `print`, the next output goes on the same line



# Formatting Output with `printf`

---

- ❑ Starting with version 5.0, Java includes a method named `printf` that can be used to produce output in a specific format
- ❑ The Java method `printf` is similar to the `print` method
  - Like `print`, `printf` does not advance the output to the next line
- ❑ `System.out.printf` can have any number of arguments
  - The first argument is always a *format string* that contains one or more *format specifiers* for the remaining arguments
  - All the arguments except the first are values to be output to the screen



# printf Format Specifier

---

- ❑ The code

```
double price = 19.8;  
System.out.print("$");  
System.out.printf("%6.2f", price);  
System.out.println(" each");
```

will output the line

```
$ 19.80 each
```

- ❑ The format string **"%6.2f"** indicates the following:
  - End any text to be output and start the format specifier (**%**)
  - Display up to 6 right-justified characters, pad fewer than six characters on the left with blank spaces (i.e., *field width* is **6**)
  - Display exactly 2 digits after the decimal point (**.2**)
  - Display a floating point number, and end the format specifier (i.e., the *conversion character* is **f**)



# Right and Left Justification in `printf`

- ❑ The code

```
double value = 12.123;  
System.out.printf("Start%8.2fEnd", value);  
System.out.println();  
System.out.printf("Start%-8.2fEnd", value);  
System.out.println();
```

will output the following

```
Start   12.12End  
Start12.12   End
```

- ❑ The format string **"Start%8.2fEnd"** produces output that is right justified with three blank spaces before the **12.12**
- ❑ The format string **"Start%-8.2fEnd"** produces output that is left justified with three blank spaces after the **12.12**



# Multiple arguments with `printf`

---

- ❑ The following code contains a `printf` statement having three arguments

- The code

```
double price = 19.8;
String name = "magic apple";
System.out.printf("$%6.2f for each %s.",
    price, name);
System.out.println();
System.out.println("Wow");
```

will output

```
$ 19.80 for each magic apple.
Wow
```

- Note that the first argument is a format string containing two format specifiers (`%6.2f` and `%s`)
- These format specifiers match up with the two arguments that follow (`price` and `name`)



# Line Breaks with `printf`

---

❑ Line breaks can be included in a format string using `%n`

❑ The code

```
double price = 19.8;  
String name = "magic apple";  
System.out.printf("$%6.2f for each %s.%n",  
    price, name);  
System.out.println("Wow");
```

will output

```
$ 19.80 for each magic apple.  
Wow
```





# Format Specifiers for `System.out.printf`

**Display 2.1** Format Specifiers for `System.out.printf`

| CONVERSION CHARACTER | TYPE OF OUTPUT                                                         | EXAMPLES    |
|----------------------|------------------------------------------------------------------------|-------------|
| d                    | Decimal (ordinary) integer                                             | %5d<br>%d   |
| f                    | Fixed-point (everyday notation) floating point                         | %6.2f<br>%f |
| e                    | E-notation floating point                                              | %8.3e<br>%e |
| g                    | General floating point (Java decides whether to use E-notation or not) | %8.3g<br>%g |
| s                    | String                                                                 | %12s<br>%s  |
| c                    | Character                                                              | %2c<br>%c   |



# Lab

## Display 2.2 The printf Method

---

```
1 public class PrintfDemo
2 {
3     public static void main(String[] args)
4     {
5         String aString = "abc";

6         System.out.println("String output:");
7         System.out.println("START1234567890");
8         System.out.printf("START%sEND %n", aString);
9         System.out.printf("START%4sEND %n", aString);
10        System.out.printf("START%2sEND %n", aString);
11        System.out.println();
```

(continued)



# Lab

## Display 2.2 The printf Method

---

```
12      char oneChracter = 'Z';

13      System.out.println("Character output:");
14      System.out.println("START1234567890");
15      System.out.printf("START%cEND %n", oneCharacter);
16      System.out.printf("START%4cEND %n", oneCharacter);
17      System.out.println();

18      double d = 12345.123456789;

19      System.out.println("Floating-point output:");
20      System.out.println("START1234567890");
21      System.out.printf("START%fEND %n", d);          //12345.123457
22      System.out.printf("START%.4fEND %n", d);        //12345.1235
23      System.out.printf("START%.2fEND %n", d);        //12345.12
24      System.out.printf("START%12.4fEND %n", d);      //  12345.1235
25      System.out.printf("START%eEND %n", d);          //1.234512e+04
26      System.out.printf("START%12.5eEND %n", d);      // 1.23451e+04
27  }
28 }
```

(continued)



## Formatting Money Amounts with `printf`

---

- ❑ A good format specifier for outputting an amount of money stored as a double type is `%.2f`
- ❑ It says to include exactly two digits after the decimal point and to use the smallest field width that the value will fit into:

```
double price = 19.99;
```

```
System.out.printf("The price is $%.2f each.")
```

produces the output:

```
The price is $19.99 each.
```



# Money Formats

---

- ❑ Using the **NumberFormat** class enables a program to output amounts of money using the appropriate format
  - The **NumberFormat** class must first be *imported* in order to use it

```
import java.text.NumberFormat
```
  - An object of **NumberFormat** must then be created using the **getCurrencyInstance()** method
  - The **format** method takes a floating-point number as an argument and returns a **String** value representation of the number in the local currency



# Importing Packages and Classes

---

❑ Libraries in Java are called *packages*

- A package is a collection of classes that is stored in a manner that makes it easily accessible to any program
- In order to use a class that belongs to a package, the class must be brought into a program using an *import* statement
- Classes found in the package **java.lang** are imported automatically into every Java program

```
import java.text.NumberFormat;  
// import theNumberFormat class only  
import java.text.*;  
//import all the classes in package java.text
```



# Money Formats

```
import java.text.NumberFormat;

public class CurrencyFormatDemo
{
    public static void main(String[] args)
    {
        System.out.println("Default location:");
        NumberFormat moneyFormater =
            NumberFormat.getCurrencyInstance();

        System.out.println(moneyFormater.format(19.8));
        System.out.println(moneyFormater.format(19.81111));
        System.out.println(moneyFormater.format(19.89999));
        System.out.println(moneyFormater.format(19));
        System.out.println();
    }
}
```



# Money Formats

---

❑ Output of the previous program

Default location:

\$19.80

\$19.81

\$19.90

\$19.00





# Specifying Locale

---

- ❑ Invoking the `getCurrencyInstance()` method without any arguments produces an object that will format numbers according to the default location
- ❑ In contrast, the location can be explicitly specified by providing a location from the `Locale` class as an argument to the `getCurrencyInstance()` method
  - When doing so, the `Locale` class must first be imported

```
import java.util.Locale;
```



# Specifiying Locale

```
import java.text.NumberFormat;  
import java.util.Locale;
```

```
public class CurrencyFormatDemo  
{  
    public static void main(String[] args)  
    {  
        System.out.println("US as location:");  
        NumberFormat moneyFormater2 =  
            NumberFormat.getCurrencyInstance(Locale.US);  
  
        System.out.println(moneyFormater2.format(19.8));  
        System.out.println(moneyFormater2.format(19.81111));  
        System.out.println(moneyFormater2.format(19.89999));  
        System.out.println(moneyFormater2.format(19));  
    }  
}
```



# Specifying Locale

---

❑ Output of the previous program

US as location:

\$19.80

\$19.81

\$19.90

\$19.00



# Locale Constants for Currencies of Different Countries

---

## Display 2.4    Locale Constants for Currencies of Different Countries

---

|                |                                                     |
|----------------|-----------------------------------------------------|
| Locale.CANADA  | Canada (for currency, the format is the same as US) |
| Locale.CHINA   | China                                               |
| Locale.FRANCE  | France                                              |
| Locale.GERMANY | Germany                                             |
| Locale.ITALY   | Italy                                               |
| Locale.JAPAN   | Japan                                               |
| Locale.KOREA   | Korea                                               |
| Locale.TAIWAN  | Taiwan                                              |
| Locale.UK      | United Kingdom (English pound)                      |
| Locale.US      | United States                                       |



# Lab

```
import java.text.NumberFormat;
import java.util.Locale;

public class CurrencyFormatDemo
{
    public static void main(String[] args)
    {
        System.out.println("Taiwan as location:");
        NumberFormat moneyFormater2 =
            NumberFormat.getCurrencyInstance(Locale.TAIWAN);

        System.out.println(moneyFormater2.format(19.8));
        System.out.println(moneyFormater2.format(19.81111));
        System.out.println(moneyFormater2.format(19.89999));
        System.out.println(moneyFormater2.format(19));
    }
}
```



# Output

---

Taiwan as location:

NT\$19.80

NT\$19.81

NT\$19.90

NT\$19.00



# The DecimalFormat Class

---

- ❑ Using the **DecimalFormat** class enables a program to format numbers in a variety of ways
  - The **DecimalFormat** class must first be *imported*
  - A **DecimalFormat** object is associated with a pattern when it is created using the `new` command
  - The object can then be used with the method **format** to create strings that satisfy the format
  - An object of the class **DecimalFormat** has a number of different methods that can be used to produce numeral strings in various formats



# The DecimalFormat Class

## (Part 1 of 3)

### Display 2.5 The DecimalFormat Class

```
1  import java.text.DecimalFormat;

2  public class DecimalFormatDemo
3  {
4      public static void main(String[] args)
5      {
6          DecimalFormat pattern00dot000 = new DecimalFormat("00.000");
7          DecimalFormat pattern0dot00 = new DecimalFormat("0.00");

8          double d = 12.3456789;
9          System.out.println("Pattern 00.000");
10         System.out.println(pattern00dot000.format(d));
11         System.out.println("Pattern 0.00");
12         System.out.println(pattern0dot00.format(d));

13         double money = 19.8;
14         System.out.println("Pattern 0.00");
15         System.out.println("$" + pattern0dot00.format(money));
16
17         DecimalFormat percent = new DecimalFormat("0.00%");
```

(continued)





# The DecimalFormat Class

## (Part 2 of 3)

### Display 2.5 The DecimalFormat Class

```
18      System.out.println("Pattern 0.00%");
19      System.out.println(percent.format(0.308));

20      DecimalFormat eNotation1 =
21          new DecimalFormat("#0.###E0");//1 or 2 digits before point
22      DecimalFormat eNotation2 =
23          new DecimalFormat("00.###E0");//2 digits before point

24      System.out.println("Pattern #0.###E0");
25      System.out.println(eNotation1.format(123.456));
26      System.out.println("Pattern 00.###E0");
27      System.out.println(eNotation2.format(123.456));

28      double smallNumber = 0.0000123456;
29      System.out.println("Pattern #0.###E0");
30      System.out.println(eNotation1.format(smallNumber));
31      System.out.println("Pattern 00.###E0");
32      System.out.println(eNotation2.format(smallNumber));
33  }
34 }
```

(continued)



# The DecimalFormat Class

## (Part 3 of 3)

### Display 2.5 The DecimalFormat Class

#### SAMPLE DIALOGUE

Pattern 00.000

12.346

Pattern 0.00

12.35

Pattern 0.00

\$19.80

Pattern 0.00%

30.80%

Pattern #0.###E0

1.2346E2

Pattern 00.###E0

12.346E1

Pattern #0.###E0

12.346E-6

Pattern 00.###E0

12.346E-6

*The number is always given, even if this requires violating the format pattern.*



# Lab

```
public class DecimalFormatDemo {  
  
    public static void main(String[] args) {  
        DecimalFormat df = new DecimalFormat("00.000");  
        String str = df.format(1.23);  
        System.out.println(str);  
  
        DecimalFormat df2 = new DecimalFormat("#0.###");  
        String str2 = df2.format(1.23);  
        System.out.println(str2);  
    }  
}
```

Output:

01.230

1.23



# Console Input Using the Scanner Class

---

- ❑ Starting with version 5.0, Java includes a class for doing simple keyboard input named the **Scanner** class
- ❑ In order to use the **Scanner** class, a program must include the following line near the start of the file:  
`import java.util.Scanner`
- ❑ This statement tells Java to
  - Make the **Scanner** class available to the program
  - Find the **Scanner** class in a library of classes (i.e., Java *package*) named **java.util**



# Console Input Using the Scanner Class

---

- ❑ The following line creates an object of the class **Scanner** and names the object **keyboard** :  
`Scanner keyboard = new Scanner(System.in);`
  
- ❑ Once a **Scanner** object has been created, a program can then use that object to perform keyboard input using methods of the **Scanner** class



# Console Input Using the Scanner Class

---

- ❑ The method **nextInt** reads one **int** value typed in at the keyboard and assigns it to a variable:

```
int numberOfPods = keyboard.nextInt();
```

- ❑ The method **nextDouble** reads one **double** value typed in at the keyboard and assigns it to a variable:

```
double d1 = keyboard.nextDouble();
```

- ❑ Multiple inputs must be separated by *whitespace* and read by multiple invocations of the appropriate method

- Whitespace is any string of characters, such as blank spaces, tabs, and line breaks that print out as white space



## Console Input Using the Scanner Class

---

- ❑ The method `next` reads one string of non-whitespace characters delimited by whitespace characters such as blanks or the beginning or end of a line

- ❑ Given the code

```
String word1 = keyboard.next();  
String word2 = keyboard.next();
```

and the input line

```
jelly beans
```

The value of `word1` would be `jelly`, and the value of `word2` would be `beans`



# Console Input Using the Scanner Class

---

- ❑ The method `nextLine` reads an entire line of keyboard input
- ❑ The code,  

```
String line = keyboard.nextLine();
```

reads in an entire line and places the string that is read into the variable `line`
- ❑ The end of an input line is indicated by the escape sequence `'\n'`
  - This is the character input when the **Enter** key is pressed
  - On the screen it is indicated by the ending of one line and the beginning of the next line
- ❑ When `nextLine` reads a line of text, it reads the `'\n'` character, so the next reading of input begins on the next line
  - However, the `'\n'` does not become part of the string value returned (e.g., the string named by the variable `line` above does not end with the `'\n'` character)





# Keyboard Input Demonstration (Part 1 of 2)

Display 2.6 Keyboard Input Demonstration

```
1  import java.util.Scanner;
2  public class ScannerDemo
3  {
4      public static void main(String[] args)
5      {
6          Scanner keyboard = new Scanner(System.in);
7
8          System.out.println("Enter the number of pods followed by");
9          System.out.println("the number of peas in a pod:");
10         int numberOfPods = keyboard.nextInt();
11         int peasPerPod = keyboard.nextInt();
12
13         int totalNumberOfPeas = numberOfPods*peasPerPod;
14
15         System.out.print(numberOfPods + " pods and ");
16         System.out.println(peasPerPod + " peas per pod.");
17         System.out.println("The total number of peas = "
18                             + totalNumberOfPeas);
19     }
20 }
```

*Makes the Scanner class available to your program.*

*Creates an object of the class Scanner and names the object keyboard.*

*Each reads one int from the keyboard*

(continued)



# Keyboard Input Demonstration

## (Part 2 of 2)

### Display 2.6 Keyboard Input Demonstration

#### SAMPLE DIALOGUE 1

Enter the number of pods followed by  
the number of peas in a pod:

22 10 ←

22 pods and 10 peas per pod.

The total number of peas = 220

*The numbers that are  
input must be  
separated by  
whitespace, such as  
one or more blanks.*

#### SAMPLE DIALOGUE 2

Enter the number of pods followed by  
the number of peas in a pod:

22

10 ←

22 pods and 10 peas per pod.

The total number of peas = 220

*A line break is also  
considered whitespace and  
can be used to separate the  
numbers typed in at the  
keyboard.*



# Lab

## Display 2.7 Another Keyboard Input Demonstration

```
1  import java.util.Scanner;

2  public class ScannerDemo2
3  {
4      public static void main(String[] args)
5      {
6          int n1, n2;
7          Scanner scannerObject = new Scanner(System.in);

8          System.out.println("Enter two whole numbers");
9          System.out.println("seperated by one or more spaces:");

10         n1 = scannerObject.nextInt();
11         n2 = scannerObject.nextInt();
12         System.out.println("You entered " + n1 + " and " + n2);

13         System.out.println("Next enter two numbers.");
14         System.out.println("Decimal points are allowed.");
```

*Creates an object of the class **Scanner** and names the object **scannerObject**.*

*Reads one **int** from the keyboard.*

(continued)



# Lab

## Display 2.7 Another Keyboard Input Demonstration

```
15  double d1, d2;
16  d1 = scannerObject.nextDouble();
17  d2 = scannerObject.nextDouble();
18  System.out.println("You entered " + d1 + " and " + d2);

19  System.out.println("Next enter two words:");

20  String word1 = scannerObject.next();
21  String word2 = scannerObject.next();
22  System.out.println("You entered \"" +
23                      word1 + "\" and \"" + word2 + "\"");

24  String junk = scannerObject.nextLine(); //To get rid of '\n'

25  System.out.println("Next enter a line of text:");
26  String line = scannerObject.nextLine();
27  System.out.println("You entered: \"" + line + "\"");
28  }
29  }
```

*Reads one double from the keyboard.*

*Reads one word from the keyboard.*

*This line is explained in the Pitfall section "Dealing with the Line Terminator, '\n'".*

*Reads an entire line.*

(continued)



# Lab

## Display 2.7 Another Keyboard Input Demonstration

### SAMPLE DIALOGUE

Enter two whole numbers  
separated by one or more spaces:

42 43

You entered 42 and 43  
Next enter two numbers.  
A decimal point is OK.

9.99 57

You entered 9.99 and 57.0  
Next enter two words:

jelly beans

You entered "jelly" and "beans"  
Next enter a line of text:

Java flavored jelly beans are my favorite.

You entered "Java flavored jelly beans are my favorite."



## Pitfall: Dealing with the Line Terminator, ' \n '

- ❑ The method `nextLine` of the class `Scanner` reads the remainder of a line of text starting wherever the last keyboard reading left off
- ❑ This can cause problems when combining it with different methods for reading from the keyboard such as `nextInt`
- ❑ Given the code,

```
Scanner keyboard = new Scanner(System.in);  
int n = keyboard.nextInt();  
String s1 = keyboard.nextLine();  
String s2 = keyboard.nextLine();
```

and the input,

```
2
```

```
Heads are better than
```

```
1 head.
```

what are the values of `n`, `s1`, and `s2`?



## Pitfall: Dealing with the Line Terminator, ' \n '

---

- ❑ Given the code and input on the previous slide
    - `n` will be equal to `"2"`,
    - `s1` will be equal to `" "`, and
    - `s2` will be equal to `"heads are better than"`
  - ❑ If the following results were desired instead
    - `n` equal to `"2"`,
    - `s1` equal to `"heads are better than"`, and
    - `s2` equal to `"1 head"`
- then an extra invocation of `nextLine` would be needed to get rid of the end of line character (`' \n '`)



# Lab

```
public class ScannerDemo {  
  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        int num = scanner.nextInt();  
        System.out.println("num="+num);  
  
        scanner.nextLine();  
  
        String line2 = scanner.nextLine();  
        System.out.println("line="+line2);  
    }  
}
```

Console:

12

num=12

Hello World

line=Hello World





# Lab

---

```
public class ScannerDemo {  
  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
  
        String line1 = scanner.nextLine();  
        int num = Integer.valueOf(line1);  
        System.out.println("num="+num);  
  
        String line2 = scanner.nextLine();  
        System.out.println("line:"+line2);  
    }  
}
```

Console:

12

num=12

Hello World

line=Hello World



# Methods in the Class Scanner

## (Part 1 of 3)

### Display 2.8 Methods of the Scanner Class

The Scanner class can be used to obtain input from files as well as from the keyboard. However, here we are assuming it is being used only for input from the keyboard.

To set things up for keyboard input, you need the following at the beginning of the file with the keyboard input code:

```
import java.util.Scanner;
```

You also need the following before the first keyboard input statement:

```
Scanner Scanner_Object_Name = new Scanner(System.in);
```

The *Scanner\_Object\_Name* can then be used with the following methods to read and return various types of data typed on the keyboard.

Values to be read should be separated by whitespace characters, such as blanks and/or new lines. When reading values, these whitespace characters are skipped. (It is possible to change the separators from whitespace to something else, but whitespace is the default and is what we will use.)

```
Scanner_Object_Name.nextInt()
```

Returns the next value of type `int` that is typed on the keyboard.

(continued)



# Methods in the Class Scanner

## (Part 2 of 3)

### Display 2.8 Methods of the Scanner Class

*Scanner\_Object\_Name.nextLong()*

Returns the next value of type `long` that is typed on the keyboard.

*Scanner\_Object\_Name.nextByte()*

Returns the next value of type `byte` that is typed on the keyboard.

*Scanner\_Object\_Name.nextShort()*

Returns the next value of type `short` that is typed on the keyboard.

*Scanner\_Object\_Name.nextDouble()*

Returns the next value of type `double` that is typed on the keyboard.

*Scanner\_Object\_Name.nextFloat()*

Returns the next value of type `float` that is typed on the keyboard.

(continued)



# Methods in the Class Scanner

## (Part 3 of 3)

### Display 2.8 Methods of the Scanner Class

*Scanner\_Object\_Name*.next()

Returns the String value consisting of the next keyboard characters up to, but not including, the first delimiter character. The default delimiters are whitespace characters.

*Scanner\_Object\_Name*.nextBoolean()

Returns the next value of type boolean that is typed on the keyboard. The values of true and false are entered as the strings "true" and "false". Any combination of upper- and/or lowercase letters is allowed in spelling "true" and "false".

*Scanner\_Object\_Name*.nextLine()

Reads the rest of the current keyboard input line and returns the characters read as a value of type String. Note that the line terminator '\n' is read and discarded; it is not included in the string returned.

*Scanner\_Object\_Name*.useDelimiter(*New\_Delimiter*);

Changes the delimiter for keyboard input with *Scanner\_Object\_Name*. The *New\_Delimiter* is a value of type String. After this statement is executed, *New\_Delimiter* is the only delimiter that separates words or numbers. See the subsection "Other Input Delimiters" for details.



# Programming Tip: Prompt for Input

---

- ❑ A program should always prompt the user when he or she needs to input some data:

```
System.out.println(  
    "Enter the number of pods followed by");  
System.out.println(  
    "the number of peas in a pod:");
```



# Programming Tip: Echo Input

---

- ❑ Always echo all input that a program receives from the keyboard
- ❑ In this way a user can check that he or she has entered the input correctly
  - Even though the input is automatically displayed as the user enters it, echoing the input may expose subtle errors (such as entering the letter "O" instead of a zero)



# The Empty String

---

- ❑ A string can have any number of characters, including zero characters
  - "" is the empty string
- ❑ When a program executes the **nextLine** method to read a line of text, and the user types nothing on the line but presses the **Enter** key, then the **nextLine** Method reads the empty string



# Other Input Delimiters

---

- ❑ The delimiters that separate keyboard input can be changed when using the **Scanner** class
- ❑ For example, the following code could be used to create a **Scanner** object and change the delimiter from whitespace to **"##"**

```
Scanner keyboard2 = new Scanner(System.in);  
Keyboard2.useDelimiter("##");
```

- ❑ After invocation of the **useDelimiter** method, **"##"** and not whitespace will be the only input delimiter for the input object **keyboard2**





# Changing the Input Delimiter

## (Part 1 of 3)

### Display 2.10 Changing the Input Delimiter

---

```
1  import java.util.Scanner;

2  public class DelimiterDemo
3  {
4      public static void main(String[] args)
5      {
6          Scanner keyboard1 = new Scanner(System.in);
7          Scanner keyboard2 = new Scanner(System.in);
8          keyboard2.useDelimiter("##");
9          //Delimiter for keyboard1 is whitespace.
10         //Delimiter for keyboard2 is ##.
```

(continued)



# Changing the Input Delimiter

## (Part 2 of 3)

### Display 2.10 Changing the Input Delimiter

---

```
11      String word1, word2;
12      System.out.println("Enter a line of text:");
13      word1 = keyboard1.next();
14      word2 = keyboard1.next();
15      System.out.println("For keyboard1 the two words read are:");
16      System.out.println(word1);
17      System.out.println(word2);
18      String junk = keyboard1.nextLine(); //To get rid of rest of line.
19
20      System.out.println("Reenter the same line of text:");
21      word1 = keyboard2.next();
22      word2 = keyboard2.next();
23      System.out.println("For keyboard2 the two words read are:");
24      System.out.println(word1);
25      System.out.println(word2);
26  }
27 }
```

(continued)



# Changing the Input Delimiter (Part 3 of 3)

---

## Display 2.10 Changing the Input Delimiter

---

### SAMPLE DIALOGUE

Enter a line of text:

**one two##three##**

For keyboard1 the two words read are:

one

two##three##

Reenter the same line of text:

**one two##three##**

For keyboard2 the two words read are:

one two

three



# Lab

---

```
public class ScannerDemo {  
  
    public static void main(String[] args) {  
        Scanner scanner = new Scanner(System.in);  
        scanner.useDelimiter("##");  
  
        int a = scanner.nextInt();  
        int b = scanner.nextInt();  
        System.out.println(a);  
        System.out.println(b);  
    }  
}
```

**Input :**

12##13##

**Output :**

12

13



# Introduction to File Input/Output

---

- ❑ The Scanner class can also be used to read from files on the disk
- ❑ Here we only present the basic structure of reading from text files
  - By covering the basics here your programs can work with real-world data that would otherwise be too much work to type into your program every time it is run



# Text Input

---

- ❑ Import the necessary classes in addition to **Scanner**

```
import java.io.FileInputStream;  
import java.io.FileNotFoundException;
```

- ❑ Open the file inside a **try/catch** block
  - If an error occurs while trying to open the file then execution jumps to the catch block
- ❑ Use **nextInt()**, **nextLine()**, etc. to read from the Scanner like reading from the console, except the input comes from the file



# Try/Catch Block

---

```
Scanner fileIn = null ; // initializes fileIn to empty
try
{
    // Attempt to open the file
    fileIn = new Scanner( new FileInputStream("PathToFile"));
}
catch (FileNotFoundException e)
{
    // If the file could not be found, this code is executed
    // and then the program exits
    System.out.println("File not found.");
    System.exit(0);
}
... Code continues here
```



# Text File to Read

---

Display 2.11 Sample Text File, `player.txt`, to Store a Player's High Score and Name

---

```
100510  
Gordon Freeman
```

---

This file should be stored in the same folder as the Java program in the following display





# Program to Read a Text File

Display 2.12 Program to Read the Text File in Display 2.11

```
1 import java.util.Scanner;
2 import java.io.FileInputStream;
3 import java.io.FileNotFoundException;
4
5 public class TextFileDemo
6 {
7     public static void main(String[] args)
8     {
9         Scanner fileIn = null; // Initializes fileIn to empty
10        try
11        {
12            // Attempt to open the file
13            fileIn = new Scanner(
14                new FileInputStream("player.txt"));
15        }
16        catch (FileNotFoundException e)
17        {
18            // This block executed if the file is not found
19            // and then the program exits
20            System.out.println("File not found.");
21            System.exit(0);
22        }
```

try and catch is explained in more detail in Chapter 9.

The file player.txt should be in the same directory as the Java program. You can also supply a full pathname to the file.



# Program to Read a Text File

```
24      // If the program gets here then
25      // the file was opened successfully
26      int highscore;
27      String name;
28
29      System.out.println("Text left to read? " +
30          fileIn.hasNextLine());
31      highscore = fileIn.nextInt();
32      fileIn.nextLine(); // Read newline left from nextInt()
33      name = fileIn.nextLine();
34
35      System.out.println("Name: " + name);
36      System.out.println("High score: " + highscore);
37      System.out.println("Text left to read? " +
38          fileIn.hasNextLine());
39      fileIn.close();
40  }
41 }
```

*This line is explained earlier  
in this chapter in the  
Pitfall section "Dealing with  
the Line Terminator '\n'"*

## Sample Dialogue

```
Text left to read? true
Name: Gordon Freeman
High score: 100510
Text left to read? False
```



# Lab

```
import java.io.FileInputStream;
import java.util.Scanner;
public class FileTest {
    public static void main(String[] args) {
        try{
            Scanner scanner = new Scanner(new FileInputStream("d:\\test.txt"));
            String name = scanner.nextLine();
            String id = scanner.nextLine();
            String school = scanner.nextLine();

            System.out.println("Name:"+name);
            System.out.println("ID:"+id);
            System.out.println("School:"+school);
        }catch(Exception e){
            e.printStackTrace();
        }
    }
}
```



## Lab

---

Which statement or group of statements produces the output:

Java programming is fun!

- (a)     `System.out.print(Java programming);`  
         `System.out.print(is fun!);`
- (b)     `System.out.println(Java programming is fun!);`
- (c)     `System.out.println("Java programming");`  
         `System.out.println(" is fun!");`
- (d)     `System.out.print("Java programming")`  
         `System.out.println(" is fun!");`



## Lab

---

The statement: `System.out.printf("%6.2f", 597.7231);` displays:

- (a) 597.723
- (b) 597.72
- (c) 000597.72
- (d) None of the above



## Lab

---

Standard code libraries in Java are called:

- (a) Methods
- (b) Classes
- (c) Packages
- (d) Statements



## Lab

---

What does the following code output?

```
DecimalFormat percent = new DecimalFormat("0.00%");  
System.out.println(percent.format(0.308));
```

- (a) 3.080%
- (b) 30.80%
- (c) .0308%
- (d) 308.0%



# Lab

```
import java.util.Scanner;

public class ConsoleMultiply
{
    public static void main(String[] args)
    {
        //Create the scanner object for console input
        Scanner keyboard = new Scanner(System.in);

        //Prompt the user for the first number
        System.out.print("Enter the first integer: ");

        //Read the input
        int firstNumber = keyboard.nextInt();

        //Prompt the user for the second number
        System.out.print("Enter the second integer: ");

        //Read the second number
        int secondNumber = keyboard.nextInt();

        System.out.println(firstNumber + "*" + secondNumber + " is "
            + firstNumber * secondNumber);
    }
}
```





# Lab

---

```
public class ScannerDemo {  
  
    public static void main(String[] args) {  
        try{  
            Scanner scanner = new Scanner(new FileInputStream("d:\\test.txt"));  
  
            while(scanner.hasNextLine()){  
                String line = scanner.nextLine();  
                System.out.println(line);  
            }  
        }catch(Exception e){  
            e.printStackTrace();  
        }  
    }  
}
```



## Reference

---

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- ❑ “Java How to Program”. Paul Deitel and Harvey Deitel. Prentice Hall; 9 edition. 2011.
- ❑ “A Programmers Guide To Java SCJP Certification: A Comprehensive Primer 3rd Edition”. Khalid Mughal, Rolf Rasmussen. Addison-Wesley Professional. 2008