物件導向設計

Console Input and Output

授課教師:陳錫民
Email: hsiminc@fcu.edu.tw

`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

Self-Test(1)

- What output is produced by the following lines?

```
String s = "Hello" + "Joe";
System.out.println(s);
```

Self-Test(2)

- What is the output produced by the following lines?

```
System.out.println(2 + " " + 2);
System.out.println(2 + 2);
```

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 %d
f	Fixed-point (everyday notation) floating point	%6.2f %f
e	E-notation floating point	%8.3e %e
g	General floating point (Java decides whether to use E-notation or not)	%8.3g %g
s	String	%12s %s
c	Character	%2c %c

The `printf` Method (Part 1 of 3)

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)

The `printf` Method (Part 2 of 3)

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);
22          System.out.printf("START%.4fEND %n", d);
23          System.out.printf("START%.2fEND %n", d);
24          System.out.printf("START%12.4fEND %n", d);
25          System.out.printf("START%eEND %n", d);
26          System.out.printf("START%12.5eEND %n", d);
27      }
28  }
```

(continued)

The `printf` Method (Part 3 of 3)

Display 2.2 The `printf` Method

SAMPLE DIALOGUE

```
String output:
START1234567890
STARTabcEnd
START abcEnd
STARTabcEnd

Character output:
START1234567890
STARTZEND
START   ZEND

Floating-point output:
START1234567890
START12345.123457END
START12345.1235END
START12345.12END
START  12345.1235END
START1.234512e+04END
START 1.23451e+04END
```

The value is always output. If the specified field width is too small, extra space is taken.

Note that the output is rounded, not truncated, when digits are discarded.

Self-Test(3)

- What output is produced by the following code?

```
String aString = "Jelly beans";
System.out.println("START1234567890");
System.out.printf("START%sEND %n", aString);
System.out.printf("START%4sEND %n", aString);
System.out.printf("START%13sEND %n", aString
```

Self-Test(4)

- What output is produced by the following code? For each output line, describe whether the line begins or ends with a blank or blanks.

```
String aString = "Jelly beans";
double d = 123.1234567890;
System.out.println("START1234567890");
System.out.printf("START%sEND %n %9.4f %n", aString, d);
```

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.
```

Legacy Code

- Code that is "old fashioned" but too expensive to replace is called *legacy code*
- Sometimes legacy code is translated into a more modern language
- The Java method **`printf`** is just like a C language function of the same name
- This was done intentionally to make it easier to translate C code into Java

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

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

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
```

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  }
```

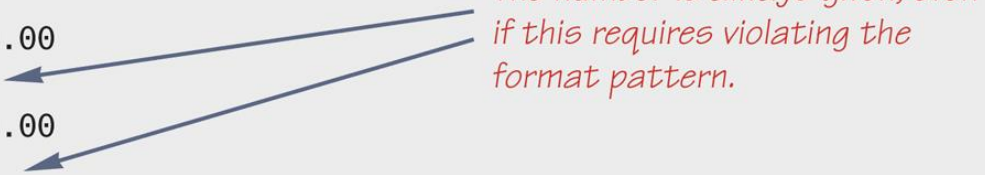
(continued)

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
```



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);
```

- Although a name like **`keyboard`** is often used, a **`Scanner`** object can be given any name
  - For example, in the following code the **`Scanner`** object is named **`scannerObject`**

```
Scanner scannerObject = 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        System.out.println("Enter the number of pods followed by");
8        System.out.println("the number of peas in a pod:");
9        int numberOfPods = keyboard.nextInt();
10       int peasPerPod = keyboard.nextInt();

11       int totalNumberOfPeas = numberOfPods*peasPerPod;

12       System.out.print(numberOfPods + " pods and ");
13       System.out.println(peasPerPod + " peas per pod.");
14       System.out.println("The total number of peas = "
15                                          + totalNumberOfPeas);
16    }
17 }
```

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.

Another Keyboard Input Demonstration (Part 1 of 3)

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)

Another Keyboard Input Demonstration (Part 2 of 3)

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)

Another Keyboard Input Demonstration (Part 3 of 3)

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'`)

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

The *Scannner_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.)

Scannner_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

Scannner_Object_Name.`nextLong()` Returns the next value of type `long` that is typed on the keyboard.
Scannner_Object_Name.`nextByte()` Returns the next value of type `byte` that is typed on the keyboard.
Scannner_Object_Name.`nextShort()` Returns the next value of type `short` that is typed on the keyboard.
Scannner_Object_Name.`nextDouble()` Returns the next value of type `double` that is typed on the keyboard.
Scannner_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

Scannner_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.

Scannner_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)

Self-Service Checkout Line (Part 1 of 2)

Display 2.9 Self-Service Check Out Line

```
1   import java.util.Scanner;

2   public class SelfService
3   {
4       public static void main(String[] args)
5       {
6           Scanner keyboard = new Scanner(System.in);

7           System.out.println("Enter number of items purchased");
8           System.out.println("followed by the cost of one item.");
9           System.out.println("Do not use a dollar sign.");

10          int count = keyboard.nextInt();
11          double price = keyboard.nextDouble();
12          double total = count*price;

13          System.out.printf("%d items at $%.2f each.%n", count, price);
14          System.out.printf("Total amount due $%.2f.%n", total);

15          System.out.println("Please take your merchandise.");
16          System.out.printf("Place $%.2f in an envelope %n", total);
17          System.out.println("and slide it under the office door.");
18          System.out.println("Thank you for using the self-service line.");
19      }
20  }
21
```

The dot after %.2f is a period in the text, not part of the format specifier.

(continued)

Self-Service Checkout Line (Part 2 of 2)

Display 2.9 Self-Service Check Out Line

SAMPLE DIALOGUE

```
Enter number of items purchased
followed by the cost of one item.
Do not use a dollar sign.
  10   19.99
10 items at $19.99 each.
Total amount due $199.90.
Please take your merchandise.
Place $199.90 in an envelope
and slide it under the office door.
Thank you for using the self-service line.
```

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

Self-Test(5)

- Write a line of code that creates a Scanner object named frank to be used for obtaining keyboard input.

Self-Test(6)

- Write a line of code that uses the object frank from the previous exercise to read in a word from the keyboard and store the word in the String variable named w.

Self-Test(7)

- Something could go wrong with the following code. Identify and fix the problem.

```
Scanner keyboard = new Scanner(System.in);
System.out.println("Enter your age.");
int age = keyboard.nextInt();
System.out.println("Enter your name.");
String name = keyboard.nextLine();
System.out.println(name + ",you are " + age + " years old.");
```

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
```

Self-Test(8)

- Suppose your code creates an object of the class Scanner named keyboard (as described in this chapter). Write code to change the delimiter for keyboard to a comma followed by a blank.

Self-Test(9)

- Continue with the object keyboard from Self-Test Exercise 16. Consider the following input:

  one,two three, four, five

  What values will the following code assign to the variables word1 and word2?

  String word1 = keyboard.next();

  String word2 = keyboard.next();

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
  - Some keywords are introduced without full explanation
  - More detail in Chapter 10
  - 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
  - This is discussed in more detail in Chapter 9
- 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
```