Scanner objects
Interactive programs

- We have written programs that print console output.
- It is also possible to read *input* from the console.
  - The user types the input into the console.
  - The program uses the input to do something.
  - Such a program is called an *interactive program*.
Scanner

- Constructing a `Scanner` object to read the console:
  
  ```java
  Scanner <name> = new Scanner(System.in);
  ```

- Example:
  
  ```java
  Scanner console = new Scanner(System.in);
  ```
Some methods of `Scanner`:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>nextInt()</code></td>
<td>reads and returns user input as an int</td>
</tr>
<tr>
<td><code>nextDouble()</code></td>
<td>reads and returns user input as a double</td>
</tr>
<tr>
<td><code>next()</code></td>
<td>reads and returns user input as a String</td>
</tr>
</tbody>
</table>

Each of these methods pauses your program until the user types input and presses Enter.
- Then the value typed is *returned* to your program.
Using a Scanner object

- Example:

```
System.out.print("How old are you? ");  // prompt
int age = console.nextInt();
System.out.println("You'll be 40 in " + (40 - age) + " years.");
```

- **prompt**: A message printed to the user, telling them what input to type.
Input tokens

- **token**: A unit of user input, as read by the **Scanner**.
  - Tokens are separated by whitespace (spaces, tabs, new lines).
  - How many tokens appear on the following line of input?
    23  John Smith  42.0  "Hello world"

- When the token doesn't match the type the **Scanner** tries to read, the program crashes.
  - Example:
    ```java
    System.out.print("What is your age? ");
    int age = console.nextInt();
    ```

**Sample Run:**
What is your age? **Timmy**
InputMismatchException:
    at java.util.Scanner.throwFor(Unknown Source)
    at java.util.Scanner.next(Unknown Source)
    at java.util.Scanner.nextInt(Unknown Source)
    at java.util.Scanner.nextInt(Unknown Source)
    ...

Importing classes

- **Java class libraries**: A large set of Java classes available for you to use.
  - Classes are grouped into *packages*.
  - To use the classes from a package, you must include an *import declaration* at the top of your program.
  - **Scanner** is in a package named `java.util`.

- **Import declaration, general syntax**:
  ```java
  import <package name>.*;
  ```

- **To use** **Scanner**, put this at the start of your program:
  ```java
  import java.util.*;
  ```
A complete program

```java
import java.util.*;  // so that I can use Scanner

public class ReadSomeInput {
    public static void main(String[] args) {
        Scanner console = new Scanner(System.in);

        System.out.print("What is your first name? ");
        String name = console.next();

        System.out.print("And how old are you? ");
        int age = console.nextInt();

        System.out.println(name + " is " + age + ". That's quite old!");
    }
}

Sample Run:
What is your first name? Marty
How old are you? 12
Marty is 12. That's quite old!
import java.util.*; // so that I can use Scanner

public class Average {
    public static void main(String[] args) {
        Scanner console = new Scanner(System.in);

        System.out.print("Please type three numbers: ");
        int num1 = console.nextInt();
        int num2 = console.nextInt();
        int num3 = console.nextInt();

        double average = (num1 + num2 + num3) / 3.0;
        System.out.println("The average is "+average);
    }
}

Sample Run:
Please type three numbers: 8 6 13
The average is 9.0

Notice that the Scanner can read multiple values from one line.