Writing your First Java Program in Eclipse

Step 0: Launch Eclipse

1. Launch Eclipse by running "`eclipse.exe`" from the Eclipse installed directory.
2. Choose an appropriate directory for your *workspace*, i.e., where you would like to save your files (e.g., `d:\myproject\eclipse` for Windows)
3. If the "Welcome" screen shows up, close it by clicking the "cross" button next to the "Welcome" title.

Step 1: Create a new Java Project

For each Java application, you need to create a *project* to keep all the source files, classes and relevant resources.

To create a new Java project:

1. Choose "File" menu ⇒ "New" ⇒ "Java project".
2. The "New Java Project" dialog pops up.
    a. In "Project name", enter "`FirstProject`".
    b. Check "Use default location".
    c. In "JRE", select "Use default JRE (currently 'JDK1.8.xx')". But make sure that your JDK is 1.5 and above.
    d. In "Project Layout", check "Use project folder as root for sources and class files"

    Push "Finish" button.

Step 2: Write a Hello-world Java Program

1. In the "Package Explorer" (left pane) ⇒ Right-click on "`FirstProject`" (or use the "File" menu) ⇒ New ⇒ Class.
2. The "New Java Class" dialog pops up.
    a. In "Source folder", keep the "FirstProject"
    b. In "Package", delete the content if it is not empty
    c. In "Name", enter "`Hello`"
    d. Check "`public static void main(String[] args)`"
    e. Don't change the rest.

    Push "Finish" button.

    The source file "`Hello.java`" opens on the editor panel (the center pane). Enter the following codes:

```
public class Hello {
   public static void main(String[] args) {
      System.out.println("Hello, world!");
   }
}
```

Step 3: Compile & Execute the Java Program

1. There is no need to *compile* the Java source file in Eclipse explicitly. It is because Eclipse performs the so-called *incremental compilation*, i.e., the Java statement is compiled as and when it is entered.
2. To run the program, right-click anywhere on the source file "`Hello.java`" (or choose "Run" menu) ⇒ Run As ⇒ Java Application.
3. The output "Hello, world!" appears on the Console panel (the bottom pane).

NOTES:

- You should create a NEW Java project for EACH of your Java application.
- Nonetheless, Eclipse allows you to keep more than one programs in a project, which is handy for writing toy programs (such as your tutorial exercises). To run a particular program, open and right-click on the source file ⇒ Run As ⇒ Java Application.
- Clicking the "Run" button (with a "Play" icon) runs the recently-run program (based on the previous configuration). Try clicking on the "down-arrow" besides the "Run" button.

3. Read the Eclipse Documentation

At a minimum, you SHOULD browse through Eclipse's "**Workbench User Guide**" and "**Java Development User Guide**" - accessible via the Eclipse's "Welcome" page or "Help" menu. This will save you many agonizing hours trying to figure out how to do somethings later.

4. Debugging Programs in Eclipse

Able to use a graphics debugger to debug program is crucial in programming. It could save you countless hours guessing on what went wrong.

Step 0: Write a Java Program

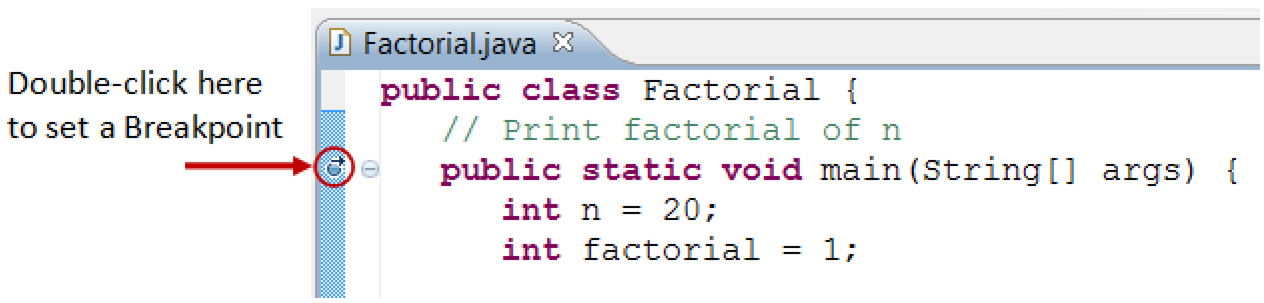
The following program computes and prints the factorial of *n* (=`1*2*3*...*`*n*). The program, however, has a logical error and produce a wrong answer for *n*=`20` ("`The Factorial of 20 is -2102132736`" - a negative number?!).

```
/** Compute the Factorial of n, where n=20.
 *    n! = 1*2*3*...*n
 */
public class Factorial {
   public static void main(String[] args) {
      int n = 20;          // To compute factorial of n
      int factorial = 1;   // Init the product to 1

      int i = 1;
      while (i <= n) {
            factorial = factorial * i;
            i++;
        }
        System.out.println("The Factorial of " + n + " is " + factorial);
    }
}
```

Let's use the graphic debugger to debug the program.

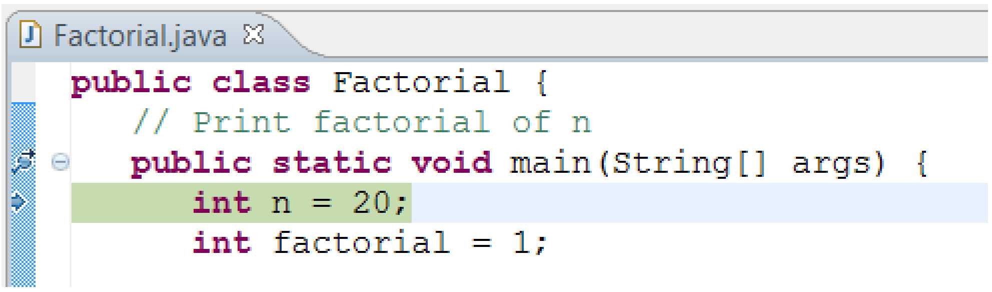
Step 1: Set an Initial Breakpoint



```
public class Factorial {
   // Print factorial of n
   public static void main(String[] args) {
      int n = 20;
      int factorial = 1;
```

A *breakpoint* suspends program execution for you to examine the internal states (e.g., value of variables) of the program. Before starting the debugger, you need to set at least one breakpoint to suspend the execution inside the program. Set a breakpoint at `main()` method by double-clicking on the *left-margin* of the line containing `main()`. A *blue circle* appears in the left-margin indicating a breakpoint is set at that line.

Step 2: Start Debugger

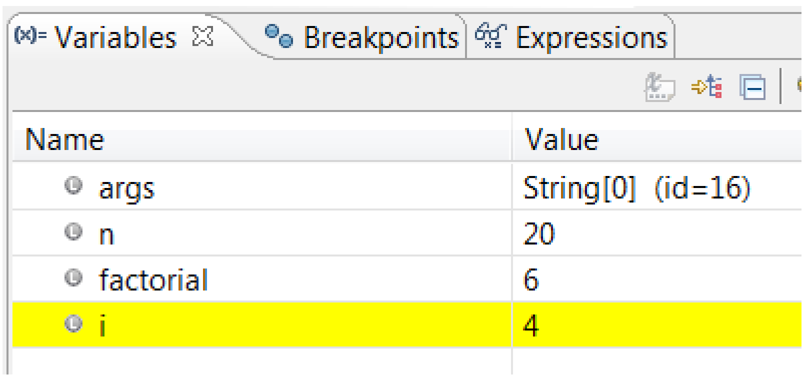


```
public class Factorial {
   // Print factorial of n
   public static void main(String[] args) {
      int n = 20;
      int factorial = 1;
```

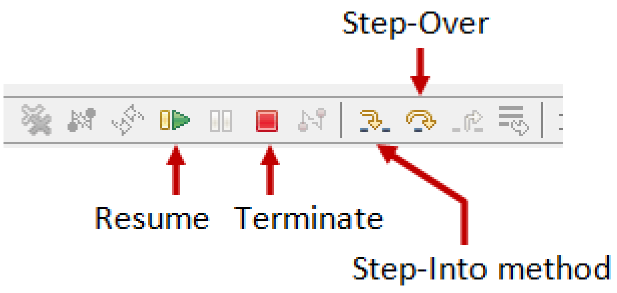
Right click anywhere on the source code (or from the "Run" menu) ⇒ "Debug As" ⇒ "Java Application" ⇒ choose "Yes" to switch into "Debug" perspective (A *perspective* is a particular arrangement of panels to suits a certain development task such as editing or debugging). The program begins execution but suspends its operation at the breakpoint, i.e., the `main()` method.

As illustrated in the following diagram, the highlighted line (also pointed to by a blue arrow) indicates the statement to be executed in the *next* step.

Step 3: Step-Over and Watch the Variables and Outputs



Name	Value
args	String[0] (id=16)
n	20
factorial	6
i	4



Click the "Step Over" button (or select "Step Over" from "Run" menu) to *single-step* thru your program. At each of the step, examine the value of the variables (in the "Variable" panel) and the outputs produced by your program (in the "Console" Panel), if any. You can also place your cursor at any variable to inspect the content of the variable.
Single-stepping thru the program and watching the values of internal variables and the outputs produced is the *ultimate* mean in debugging programs - because it is exactly how the computer runs your program!

Step 4: Breakpoint, Run-To-Line, Resume and Terminate

As mentioned, a breakpoint *suspends* program execution and let you examine the internal states of the program. To set a breakpoint on a particular statement, double-click the left-margin of that line (or select "Toggle Breakpoint" from "Run" menu).

"Resume" continues the program execution, up to the next breakpoint, or till the end of the program.

"Single-step" thru a loop with a large count is time-consuming. You could set a breakpoint at the statement immediately outside the loop (e.g., Line 11 of the above program), and issue "Resume" to complete the loop.

Alternatively, you can place the cursor on a particular statement, and issue "Run-To-Line" from the "Run" menu to continue execution up to the line.

"Terminate" ends the debugging session. Always terminate your current debugging session using "Terminate" or "Resume" till the end of the program.

Step 5: Switching Back to Java perspective

Click the "Java" perspective icon on the upper-right corner to switch back to the "Java" perspective for further programming (or "Window" menu ⇒ Open Perspective ⇒ Java).

Important: I can't stress more that mastering the use of debugger is crucial in programming. Explore the features provided by the debuggers.