TINKER ACADEMY

Programming Using Java

Handout 1: Welcome & Getting Started

Note your Student ID. You will need to use it throughout the Course.

Connecting to the Network

1. Select “Cupertino Community Center” if your Student ID is divisible by 2. Else choose “Cupertino Community Center 3”.
2. Open a browser (preferably Chrome, Safari or Firefox)
3. Type in “www.google.com” (without the quotes). Type in *exactly* as indicated. If nothing shows up, check again, did you include the 2 “dots”? Did you spell www google and com correctly.
4. You should be taken to a Cupertino Parks and Recreation. Accept the agreement and click the required buttons to activate the network.

Installing the Virtual Machine (VM)

1. Borrow the USB drive from your Tinker Academy instructor
2. Create the folder “tinkeracademy” (without the quotes) under Documents using Finder or Windows Explorer. Type it in *exactly* as indicated.
3. Copy the folder “installers” from the USB drive to under “tinkeracademy” using Finder or Windows Explorer
4. Eject the USB Drive and hand it back to the Tinker Academy instructor
5. Locate the VirtualBox installer under “tinkeracademy” using Finder or Windows Explorer
6. Install the VirtualBox application
7. Congratulations, You completed a major milestone. Give yourself a pat on the back :)

Importing the Virtual Machine (VM)

1. Locate the Virtual Machine “tinkeracademy.ova” under “tinkeracademy”
2. Double click on “tinkeracademy.ova”. You should get the import screen in VirtualBox with an “Import” Button. Click on the “Import” button to Import the Virtual Machine.

Starting the Virtual Machine (VM)

1. Once the Import is complete and successful, you should see the VM “TinkerAcademy” in the side panel in VirtualBox.
2. If it says “Powered Off” click on the Start Button (Green Arrow) in the VirtualBox Toolbar. This will start the VM.

3. If it says “Running” click on the Show Button (Green Arrow) in the VirtualBox Toolbar. This should display the VM window.
4. Once the VM starts up you will be presented with a login screen. Type in “password” without the quotes. Type it in exactly as indicated and hit “Enter”.
5. Once the login is completed you should see a Desktop with a few icons. The Screen might go fuzzy for a few seconds before displaying the Desktop. *That is ok.*
6. Congratulations. You are now running Linux within your laptop.
7. Double click on the “Firefox” icon in the Sidebar. This should launch Firefox. Verify you have network access. Close “Firefox”

Launching the Virtual Machine in Full Screen

1. Use the VirtualBox menu View->Switch to Fullscreen to switch the VM to fullscreen mode
2. Use the same VirtualBox menu View->Switch to Fullscreen to switch the VM back out of fullscreen mode

Registering the Virtual Machine

1. Identify the “Home Folder” among the icons in the left side bar. *It’s not that difficult.* Look for the “Home Icon”. This will launch Nautilus, the file browser for Ubuntu Linux. Nautilus works pretty much the same way as Windows Explorer or Finder.
2. Locate “Bookmarks” in the Nautilus sidebar. Click “Setup” which will open up the “Setup” folder.
3. Locate the file “tinker academy.config”. We are now going to edit the file. Right click, select “Open with Sublime Text 2”. This will launch the text editor. You should see a single line which looks something like this

   StudentId=2014000

4. Replace 2014000 with your Student Id. *Yes, you can do it*. *Make sure you don’t add any extra spaces or other characters, just your student id*. For example if your Student Id is 2014004, you should have

   StudentId=2014004

5. Hover the mouse pointer near the top of the document and you should see the “Sublime Text 2” application menu. Select File->Save to save the file. Alternatively use Ctrl S to save the file.

Shutting Down the Virtual Machine

1. Click on the red close window button (to the top left on a Mac, top right in Windows).
2. You will prompted with a confirmation message asking if you want to “Power Off” the machine. Click the button to confirm power off.
3. In a few minutes the VM will shut down and you should see the VirtualBox side panel with the “Tinker academy” VM indicating “Powered Off”

Restarting the Virtual Machine

1. Start VirtualBox
2. Click on the VM “TinkerAcademy” in the VirtualBox side panel
3. Click on the Start Button (Green Arrow) in the VirtualBox Toolbar. This will start the VM.
4. Once the VM startup you will be presented with a login screen.

Right Click in VM on Mac

1. Open System Preferences, Trackpad
2. Enable “Secondary Click”, Toggle the small arrow to the right and select “Click with two fingers”.

Updating the Course

1. Click the “Setup” folder in “Nautilus” under “Bookmarks”
2. Double click “Course Update”. Choose “Run”. Notify an Instructor if you see a window popup with the message “update course failed”. *You messed up. No, just kidding :). We’ll fix it for you.*
   If you are doing this after class hours:
   Hop onto Skype, and request help in the class chat group.
2. Click the “Courses” folder under “Bookmarks”. Navigate to the TA-JAV-1 and locate the “Quiz0.odt” under “quiz0” (which is under “quiz”). Select the file.
3. Double click Quiz0.odt to open it in LibreOffice 3
4. Answer the 5 questions in the Quiz. Once you are done, navigate to the top to see the menu and select File->Save. Alternatively use Ctrl S

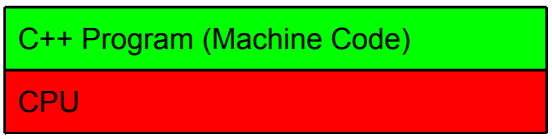
Submitting Homework

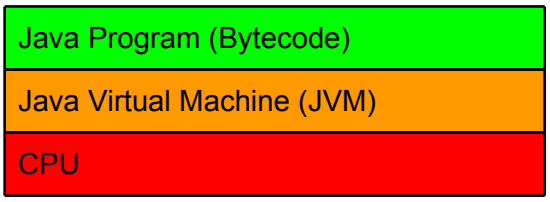
1. Click the “Setup” folder in “Nautilus” under “Bookmarks”
2. Double click “Course Submit”. Choose “Run”. Notify an Instructor if you see a window popup with the message “submit course failed”.

The Origins and History of Java

Java was invented by James Gosling et al at Sun Microsystems in the early 1990’s. At that time, programs were written for specific CPUs. So for example your program in C or C++ written for your IBM PC (using the Intel CPU) would not run on a NeXT Workstation (using the Motorola CPU). This was turning out to be a major headache for programmers as they would have to maintain separate versions or configurations of the program to run on various operating systems and CPUs.

The inventors of Java came up with the idea of placing a virtual machine in between the program and the CPU. The program would then run on the virtual machine instead of the CPU. The virtual machine would then translate any instructions in the program to instructions that the CPU could understand





Java's Magic: The Java Virtual Machine

The magic of Java is in its Virtual Machine. The Virtual Machine acts like a virtual computer and understands Java bytecode. The Java bytecode is a set of highly optimized instructions generated by the Java Compiler from a Java Program. These instructions are called bytecode since each instruction is just 1 byte. Since 1 byte has 8 bits there are 256 (2^8) possible instructions possible, of which 198 are currently in use.

Getting Started with Java

We are going to write our first Java Program. Along the way, we will learn enough to get a Java program up and running. We will use Eclipse to create our Java programs.

About Eclipse
We will be creating our Java programs using Eclipse. As you will soon see, Eclipse is a powerful IDE (Integrated Development Environment) for Java.

Import the Project

1. Click the "Setup" folder in "Nautilus" under "Bookmarks"
2. Double click "Course Update". Choose "Run".
3. Click the "Courses" folder under "Bookmarks". Navigate to the TA-JAV-1 and locate the "StarterPack1.zip" under "starterpack1" (which is under "starterpack"). Select the file. Right click and select "Extract Here". You should see a new folder "StarterPack1" created.
4. Click the "Desktop" folder in "Nautilus" under "Computer". Double click the "Start Eclipse" icon to launch Eclipse. Eclipse will startup and display its workbench.
5. The Eclipse Workbench contains various parts. To the left is the "Package Explorer". The "Package Explorer" is where you will create your projects. The top half of the middle part is the "Editor". The "Editor" is where you will write your Java code. The bottom half of the middle part has a bunch of panes. The important one for now is the "Console"

pane (which should be visible by default)

6. Right button click over the “Package Explorer”. Select “Import…” which will bring up the “Import” window. We are now going to import the StarterPack1 you had extracted earlier into Eclipse as a Java Project. Select “Existing Projects into Workspace”. Click “Next”. In the next screen, click “Browse” to browse to “starterpack1” and select “StarterPack1”. *Remember to select the extracted folder and not the zip file.*
7. Click “Finish”. Eclipse will now create a new project for you called “StarterPack1”.
8. Congratulations. You just successfully imported a project into Eclipse.

Run the Java Program

1. Toggle open the “StarterPack1” project in “Package Explorer”
2. Toggle open “src”. You should see a single file “HelloWorld.java” under “(default package)”. Double click to open the file in the Editor.
3. *Welcome to the World of Java*. What you are seeing in the Editor a Java program. Don’t worry if you don’t understand any or much of it.
4. We are now going to run the Java Program. This program does nothing. In the next phase you will add some code to print to the Console. For now, right click over the project “StarterProject1”, select “Run As”-> Java Application. You should see the “Console” pane briefly flicker and the words show up

   ```
   <terminated> HelloWorld [Java Application] /home/student/Documents/jdk1.7.0_67/bin
   ```

5. The program actually ran but it did not do anything useful. In the next phase we will modify the program to print the traditional “Hello World” to the console.

About the Hello World Program Tradition

It has been the accepted practice among computer programmers to introduce students to a new language using a very simple program called the “Hello World” program. The program just prints “Hello World” to the output.

Modify the Java Program to print “Hello World”

1. Open the “HelloWorld.java”. You should see code that looks similar to the one below

```
public static void main(String[] args) {
        // TODO (Add your code below)
}
```

2. Add the code below the TODO. *Type in exactly as you see below. Use “Ctrl Z” to undo*

```
System.out.println(“Hello World”);
```

Dont miss out the dots or the semicolon or the double quotes.
Use the same uppercase or lowercase as appropriate.
Eclipse will try to “help you” by providing closing quotes etc.

3. Save the file. You may need to hover over the top to see the menu. Choose File->Save or use Ctrl S to save the file. If you see a asterisk (*) before the file name in the Editor it means you did not save the file.
4. Run the program again. You should see the Console output the text

   “Hello World”

5. Congratulations! You have successfully written your first Java Program. *High five your nearest Tinkerer who has also completed. If you are the first, give yourself a pat on the back and ask to High five the Instructor!*

Quiz 1: Welcome & Getting Started

Import the Quiz

1. Run the “Course Update” script under “Setup”
2. Open Quiz1.odt under “Courses” TA-JAV-1 “quiz” “quiz1”
3. Attempt each question. Type in the answers in the “Answer:” box.

Submitting the Quiz
Open Nautilus. Run “Course Submit” under “Setup” to submit the quiz. Notify an Instructor if you see a window popup with the message “submit course failed”. Else, logon to skype and ping the class chat for help.

Homework 1: Welcome & Getting Started

Overview

In this homework you will print a some more text to the Console.

Import the Project

4. Run the “Course Update” script under “Setup”
5. Extract Homework1.zip under “Courses” TA-JAV-1 “homework” “homework1” as “Homework1”

6. Import the project into Eclipse.
7. Open “Homework1.java” under the project “Homework1” “src” “(default package)” “Homework1.java”

Modify the program Part 1

1. Add the following code under TODO. *Type in exactly as shown. Use Ctrl Z to undo.*

```
System.out.println(“This is a long string ” + “that I will concatenate using the plus character.  ”);
```

2. Save the file. Run the program. If all is well you should see the text

```
This is a long string that I will concatenate using the plus character.
```

3. If you see red cross marks or red underlines, it means there is some error in your code. Do the following
    a. Hover over the red cross mark or the underline. A tooltip should popup indicating the issue.
    b. If you see “Syntax error on token” it means that you have a typo in your program. Double check that you typed in exactly as indicated above. Retype in the double quotes using the keyboard.
    c. If all fails, logon to skype and ping the class chat for help.

Modify the program Part 2

1. Add the following code under TODO. *Type in exactly as shown. Use Ctrl Z to undo.*

```
System.out.println(“Java can concatenate ” + 2 + “ strings together.  ”);
```

3. Save the file. Run the program. If all is well you should see the text

```
Java can concatenate 2 strings together.
```

4. If you see red cross marks or red underlines, it means there is some error in your code. Do the following
    a. Hover over the red cross mark or the underline. A tooltip should popup indicating the issue.
    b. If you see “Syntax error on token” it means that you have a typo in your program. Double check that you typed in exactly as indicated above
    c. If all fails, logon to skype and ping the class chat for help.

Submitting Homework

Make sure you are on WiFi. Open Nautilus. Run “Course Submit” under “Setup” to submit the homework.Notify an Instructor if you see a window popup with the message “submit course failed”. Else, logon to skype and ping the class chat for help.