TINKER ACADEMY

SCRATCH Computer Programming Adventure (Beginner)

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-SCR-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”.

What is a Program?

A program is a set of instructions.
These instructions can be for anyone or anything. Consider this

“Wingardium Leviosa”

“Wingardium Leviosa” is an instruction from a student of Hogwarts School of Witchcraft and Wizardry to his or her wand to make objects fly or levitate.

Here the instructions are meant for the wand. If the incantation is correct, the wand “magically” “follows” the instructions and causes the objects pointed to to fly or levitate.

Computers work similarly but instead of spell incantations, they understand a coded set of instructions. Specifically the CPU of a computer can “follows” these instructions (The CPU is the brain of the computer).

Here is the first few instructions of a program that the CPU can understand (Specifically the Intel x86 CPUs). The complete program will displays “Hello World”.

```
cffa edfe 0700 0001 0300 0080 0200 0000
1000 0000 b005 0000 8500 2000 0000 0000
1900 0000 4800 0000 5f5f 5041 4745 5a45
```

These instructions are encoded using special numbers called hexadecimal numbers. But that is not the most important thing to know right now.

The most important thing to know is that we (humans) find it tedious to write programs using these instructions. So we Muggles (being oh, so clever) came up with an Idea!. What if we create another set of instructions that *we* can create more easily. Then (and here is the clever part), we will take these instructions and translate them to the hexadecimal instructions that the CPU can understand.

So we came up with something like this that makes a little bit more sense. The example below is the complete C Program that will display “Hello World”. You can now clearly see the text “Hello World” in the program.

```
include <stdio.h>
int main()
{
   printf("Hello World");
   return 1;
}
```

Its not important that you understand the C program above. What is important is that the C program needs to get translated into the hexadecimal instructions before the CPU can follow them.

When a CPU “follows” an instruction, it means “executes” the instructions.

Scratch is a programming language similar to C but its designed to be easier to use. It uses blocks instead of text. The equivalent program in Scratch would look like this. Pretty simple, eh?

Scratch is the best language to learn as a beginner programmer. It makes you “see” the program very easily.

Origins and History of SCRATCH

SCRATCH was developed by the Lifelong Kindergarten Group at the Massachusetts Institute of Technology (MIT). The current version is version 2.0. We will be using version 2.0 in this course.

You create a Scratch program using the Scratch Graphical User Interface or GUI, which by the way, is a program of its own. So whenever the instructor refers to the Scratch GUI, he or she is referring to the program that is used to create Scratch programs.

Introduction to the Scratch GUI

The Scratch GUI is where you create, edit and run a SCRATCH program. It has the following

The Stage
The Stage (top left) is where all the “action occurs”. Think of the Stage as the stage used in a play.

The Sprite Editor
A Sprite is a just a special name for an “actor”. The Sprite Editor (bottom left) allows you to create a new Sprite, edit an existing Sprite or remove a Sprite.

The Scripts Tab
The Scripts Tab (top right) is where you would create the “scripts” for a sprite. A Script is a “list of instructions”. An instruction is called a “Block” in Scratch.

The Costumes Tab
The Costumes Tab (top right) is where you would create new costumes for a sprite.

The Sounds Tab
The Sounds Tab (top right) is where you can record/import sounds for a sprite. You can record or import as many sounds to a sprite as you like.

Adding a new Sprite

Add a new Sprite using Paintbrush the following steps

1. Click on the “Paintbrush” icon in the Sprite Editor. A new Sprite gets created, the Sprite Costume Editor is opened.
2. Paint your own costume using the Sprite Costume Editor (Have fun, be creative)

Add a new Sprite from the Sprite Library the following steps

1. Click on the “Face” icon in the Sprite Editor. Select the Sprite you want to import.

Rename a Sprite

Rename an existing Sprite using the following steps

1. Click on the Sprite in the Sprite Editor.
2. Click on the Info Icon (i) You can also right click on the mouse and select “Info”
3. Click in the text box and edit the name.
4. Click on the (<) once you are done.

Deleting a Sprite

Delete an existing Sprite using the following steps

1. Click on the Sprite in the Sprite Editor
2. Right Click on the mouse. Select “delete”. You can also select the Scissor (✂) icon at the top menu bar. The mouse pointer will change to a (✂) icon. Now select the Sprite to delete.

Oops! You need to Undelete a Sprite

You Deleted a Sprite by mistake. Now what do you do?

1. Click on the Edit menu on the top menu bar
2. Select “Undelete”

Editing a Sprite’s Costume

Edit an existing Sprite Costume using the following steps

1. Click on the Sprite in the Sprite Editor. Click the Costumes Tab. This should open up the Sprite’s current Costume in the Costume Editor

2. Select the costume you want to edit.
3. Click “Clear” on the Costume Editor tool bar at the top. You can now paint a new costume or “Add” a new costume from the asset library
4. You can flip a costume using the Flip left right or Flip up down in the Costume Editor tool bar
5. If you make a mistake when painting, you can undo by clicking the undo icon ↺ in the Costume Editor tool bar

Add a new Sprite’s costume

Add an existing Sprite Costume using the following steps

1. Click on the Sprite in the Sprite Editor. Click the Costumes Tab. This should open up the Sprite’s current Costume in the Costume Editor
2. You can add a new costume from the asset library by clicking on the “Face” icon in the New Costume menu bar
3. You can add a new costume by clicking on the “Paintbrush” icon on the New Costume menu bar

Delete a Sprite’s costume

Delete an existing Sprite Costume using the following steps

1. Click on the Sprite in the Sprite Editor. Click the Costumes Tab. This should open up the Sprite’s current Costume in the Costume Editor
2. Select the Costume you want to delete
3. Click on the small x on the top right of the arrow or you can right click and select “delete”
4. If you make a mistake you can “undelete” by clicking on Edit in the menu bar and then “Undelete”

Add a new Sound

Add a sound to an existing Sprite using the following steps

1. Click on the Sprite in the Sprite Editor. Click the Sounds Tab. This should open up the sounds available to the Sprite
2. Click on the “sound horn” to select a sound from the Assets Library or Click on the “mike” icon to record a new sound

Delete a Sound

Delete a sound on an existing Sprite using the following steps

1. Click on the Sprite in the Sprite Editor. Click the Sounds Tab. This should open up the sounds available to the Sprite
2. Click on the sound you want to delete.
3. Click on the small x on the top right of the arrow or you can right click and select “delete”
4. If you make a mistake you can “undelete” by clicking on Edit in the menu bar and then “Undelete”

Open and Run a Scratch Program

We are going to open and run your first Scratch Program. This will get you familiar with the Scratch GUI.

Open the Scratch Program

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-SCR-1 and locate the Scratch program “StarterPack1.sb2” under “starterpack1” (which is under “starterpack”). All Scratch 2.0 programs end with the word .sb2
4. Select the file. Right click and select “Open With Scratch 2”. This will open the Scratch Program StarterPack1.sb2 in the Scratch GUI. You should see Scratchy, on the left top half. The left top half is the Stage. To the right you should see a set of “instructions”. These are our program blocks. To the right you will see the blocks stacked together just like lego blocks. This is our program.

Run the Scratch Program

1. Click on the Green Flag. This will execute the program. The program instructs Scratchy to “say” “Hello World” navigate around the Stage and return to the starting position.
2. Congratulations. You just successfully imported a Scratch program and executed it in the Scratch GUI.

Edit the Scratch Program

1. Click on the Sprite1
2. Click on the Costumes tab
3. Add a new costume by importing from the Costume Library

Save the Scratch Program

1. Click File on the menu bar and then Save to save your changes

Quiz 1: Welcome & Getting Started

Import the Quiz

1. Run the “Course Update” script under “Setup”
2. Open Quiz1.odt under “Courses” TA-SCR-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 create a new program

Import the Project

1. Run the “Course Update” script under “Setup”
2. Click the “Courses” folder under “Bookmarks”. Navigate to the TA-SCR-1 and locate the Scratch program “Homework1.sb2” under “homework1” (which is under “homework”). All Scratch 2.0 programs end with the word .sb2
3. Select the file. Right click and select “Open With Scratch 2”. This will open the Scratch Program Homework1.sb2 in the Scratch GUI.

Modify the program Part 1

1. Add a new Costume to Sprite1
2. Save the file

Modify the program Part 2

1. Add a new Sprite from the Sprite Library. You can select any sprite.
2. Rename the Sprite to “Sprite2”
3. Save the file

Modify the program Part 3

1. Add a new Costume to “Sprite2” from the asset library. You can select any costume.
2. Save the file

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.