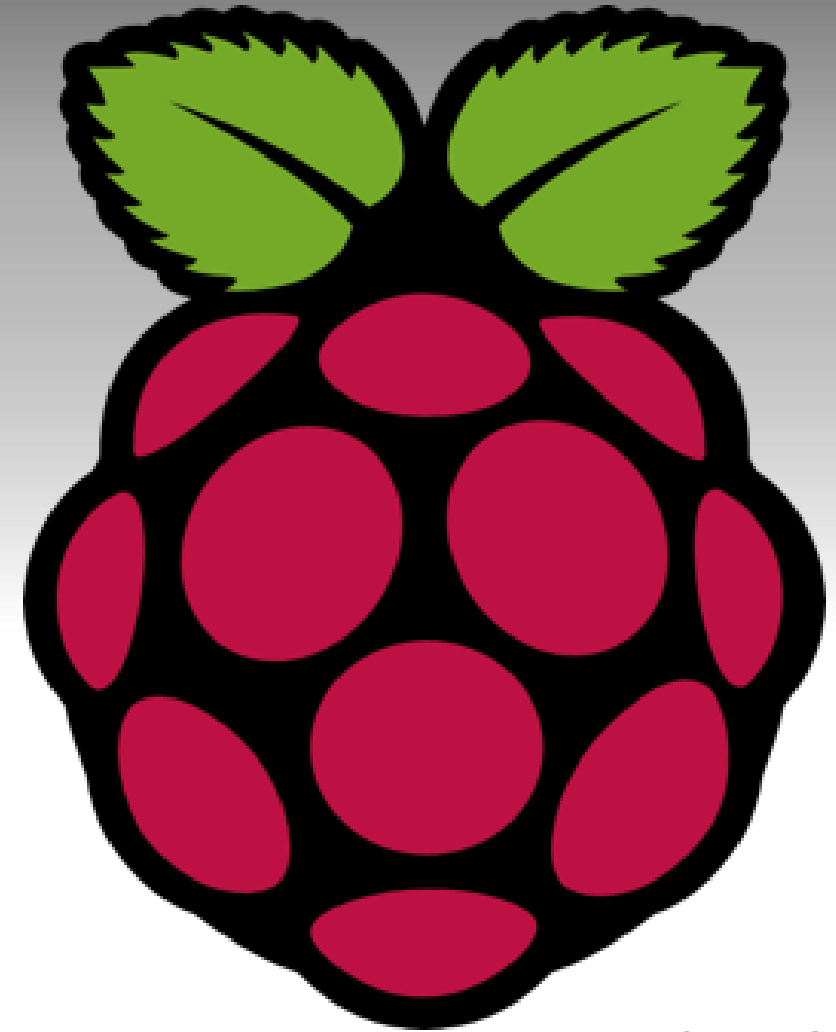


RASPBERRY PI

Lets Blink Some LEDs

COME GET A KIT



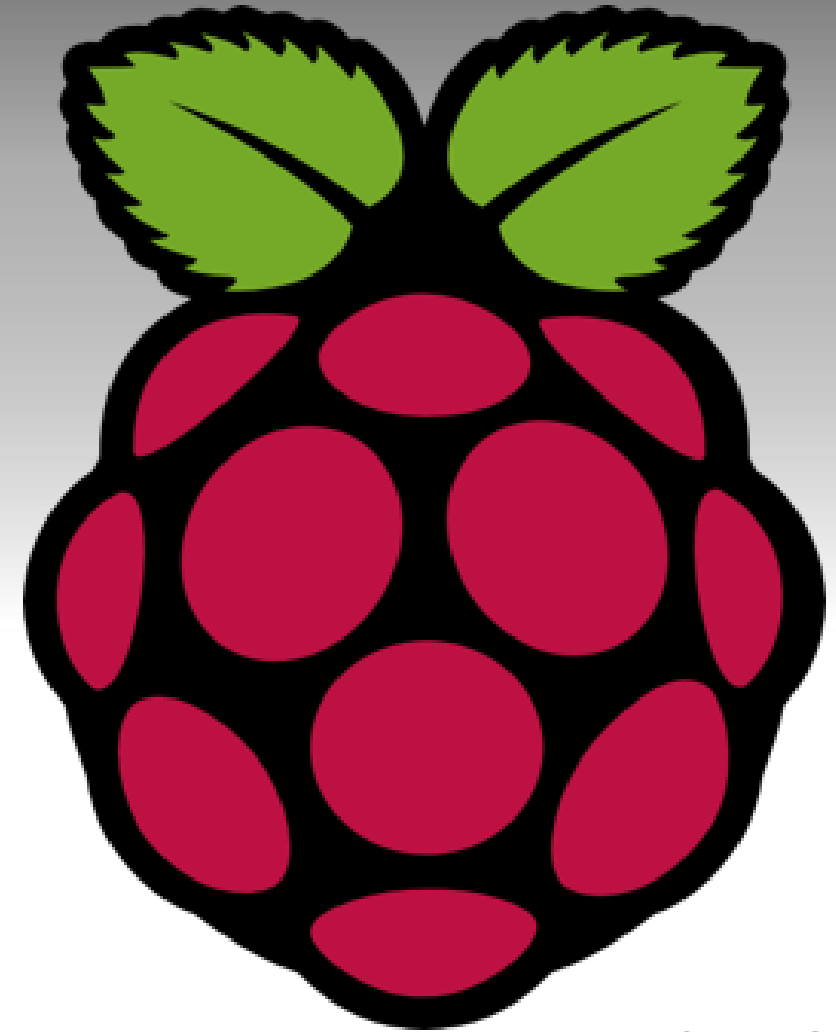
COME GET A KIT & OTHER STUFF

- Come pick up a kit
- Don't open it yet... STOP... quit messing with it...
- I want to make sure we go step by step
- Make sure you have:
 - Raspberry Kit
 - 15 inch monitor (DVI) & a HDMI2DVI cable
 - USB keyboard and mouse
 - 2 ZIP Ties

LET'S LABEL YOUR KITS

- While I'm lecturing...
- Use labeler to print your name... your real name...
- When you are done, pass it on...

RASPBERRY PI INTRODUCTION

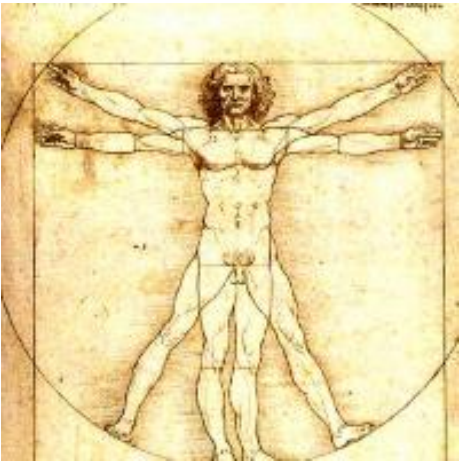


WHAT I KNOW ABOUT PI

I HAVE NO SPECIAL
TALENTS. I AM ONLY
PASSIONATELY
CURIOUS.

-ALBERT EINSTEIN

Letter to [Carl Seelig](#) (11 March 1952), Einstein Archives 39-013



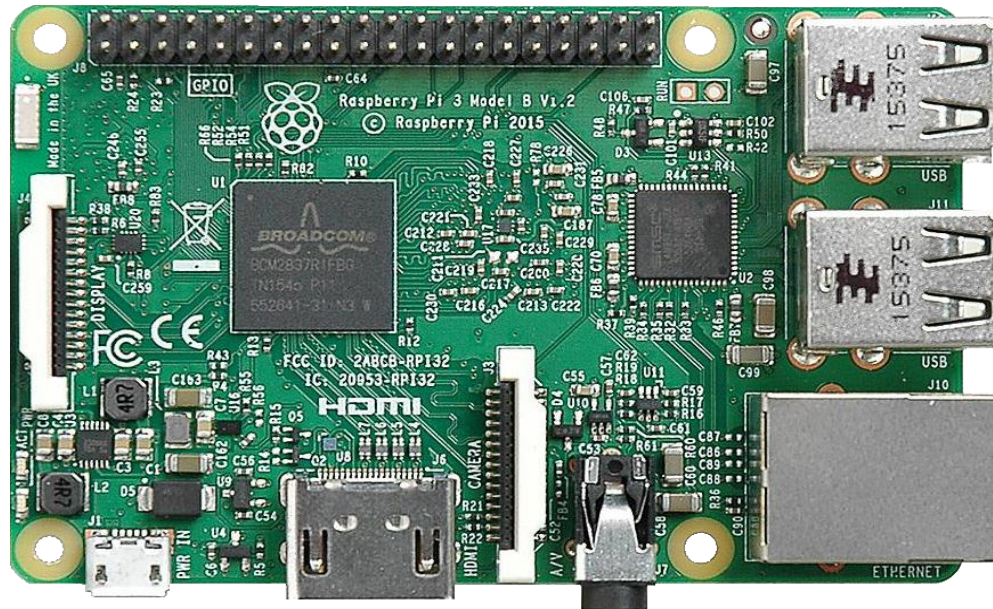
**I have been impressed with the urgency of doing.
Knowing is not enough;
we must apply.
Being willing is not enough;
we must do.**

Leonardo Da Vinci



WHAT IS A RASPBERRY PI?

- Low cost credit card sized computer designed to promote the study of basic computer science in schools & to develop interest in technology among kids and adults

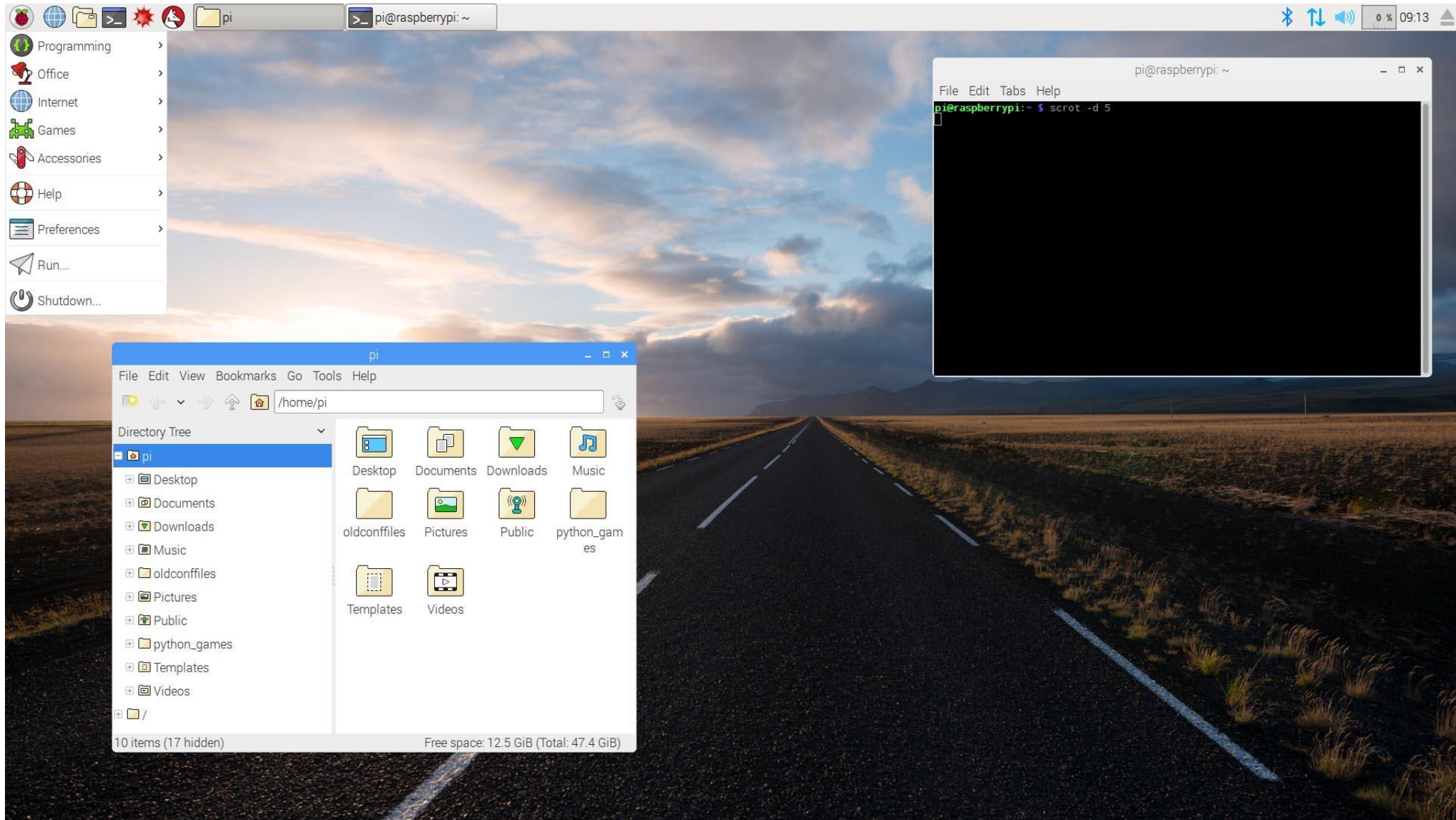


WHY USE THE RASPBERRY PI?

- Low Cost - \$35 for the new Raspberry PI Model 3 B+
- Fun to play with, learn with, explore with, build with.
- Easily accessible by all Age Groups
 - K-12, College Undergraduates, Professional Developers, Programmers, Engineers
- Supported by an amazing community of educators, makers, technologist.

www.raspberrypi.org

RASPIAN PIXEL & DEBIAN+PIXEL

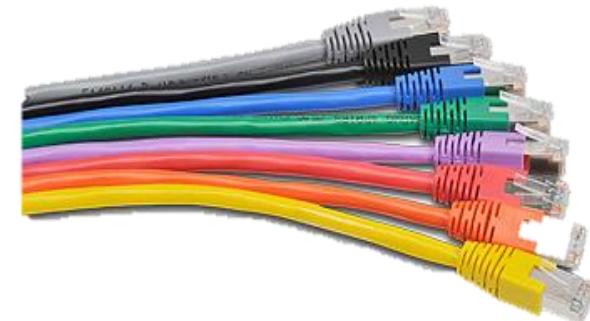


TEACHING STEAM WITH THE RASPBERRY PI

- Computing
- Programming
- Math
- Science
- Engineering
- Music
- IOT
- And a whole bunch more...

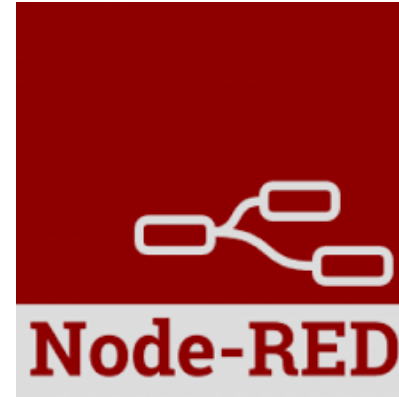
COMPUTING...

- Linux (GUI/CLI)
- Networking
 - Configuration
 - DNS/DHCP and other network services
 - Remote Connectivity - SSH/RealVNC
- LibreOffice – Digital Literacy
- Routing/Firewalls/TOR
- File Sharing
- Cyber Security – Kali Linux



PROGRAMMING...

SCRATCH

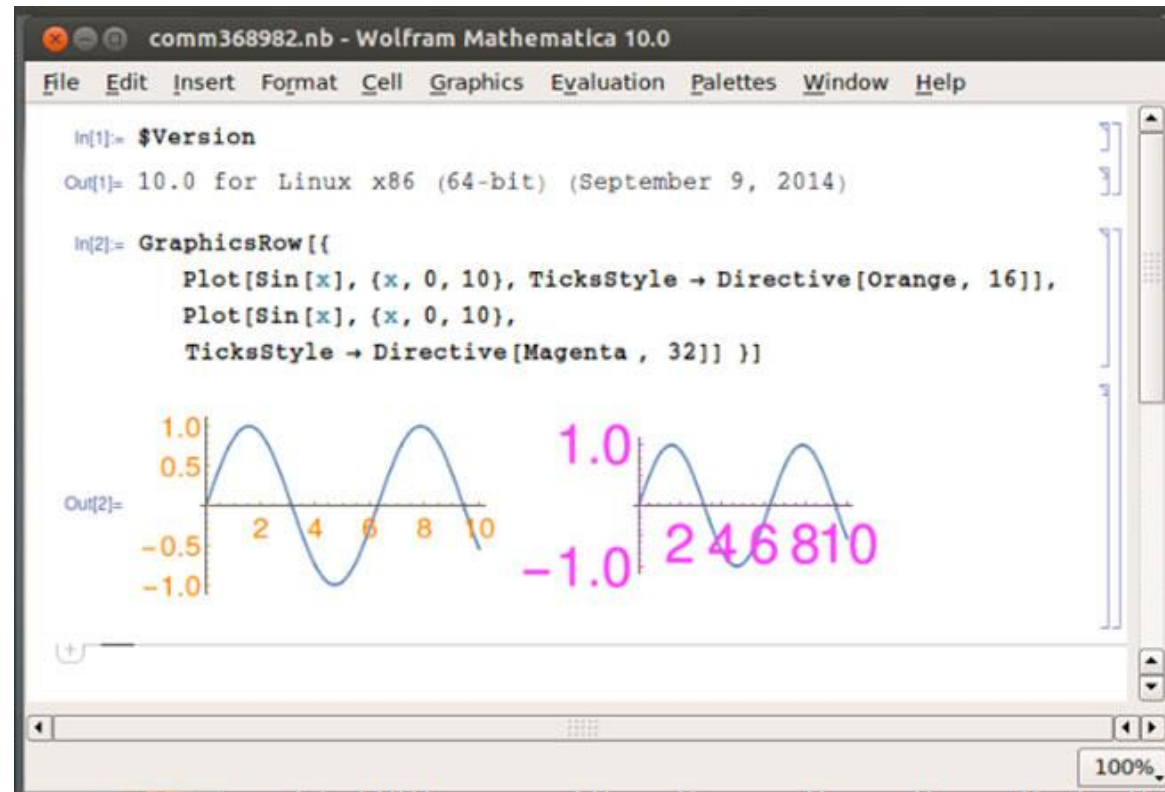
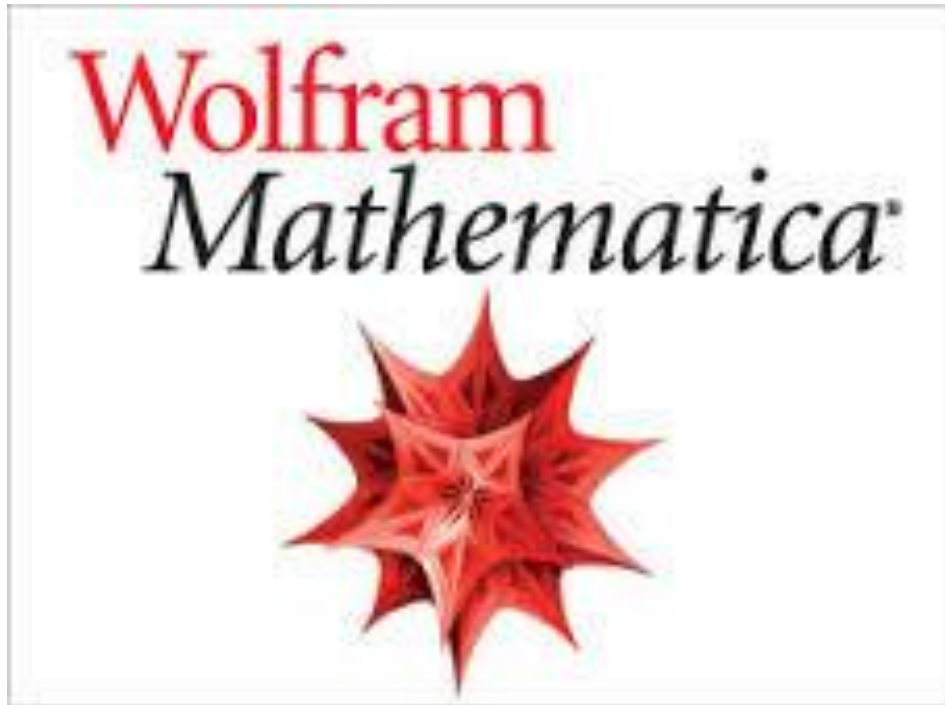


Sonic Pi



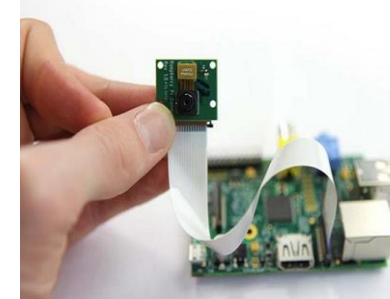
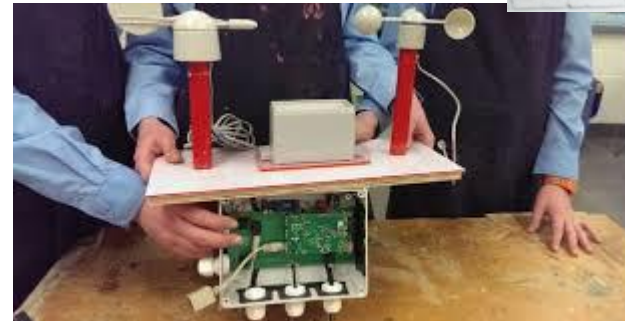
MATH...

- Wolfram Mathematica is included for FREE on the Raspberry Pi



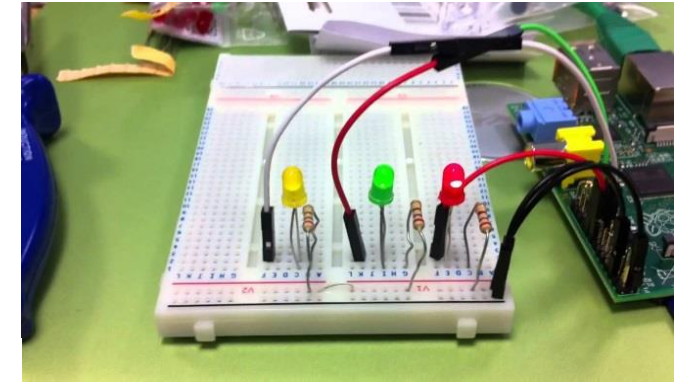
SCIENCE...

- SenseHat
 - Temp/Hum/Pressure
 - Gyro/Accelerometer
 - Magnetometer
 - 8x8 LED
- Pikon Telescope
- PiCamera
- Oracle Weather Station
- Sensor inputs



ENGINEERING...

- Physical Computing
- Robotics
- Servo Control – CNC/3D Printing
- Build a Super Computer



MUSIC...



```
Sonic Pi
Run Stop Save Rec
Size Size Align Info Help Prefs

1 use_bpm 399
2
3 #load_sample "009c1ap.wav"
4 load_sample :drum_tom_lo_soft
5 load_sample :drum_tom_mid_soft
6
7 clapping = [1, 1, 1, 0, 1, 1, 0, 1, 0, 1, 1, 0]
8
9 19.times do |cycle|
10   puts "Cycle: #{cycle}"
11   4.times do |reps|
12     12.times do |beat|
13       sample :drum_tom_lo_soft, pan: -0.5 if clapping[beat] == 1
14       sample :drum_tom_mid_soft, attack: 0.05, pan: 0.5 if clapping[(cycle + beat)]
15     end
16   end
17 end
18 end
```

```
Log
[Run 1, Time 5.6]
|- sample :drum_tom_lo_soft, {pan: -0.5}
+ sample :drum_tom_mid_soft, {attack: 0.05, pan: 0.5}
[Run 1, Time 5.8]
|- sample :drum_tom_lo_soft, {pan: -0.5}
+ sample :drum_tom_mid_soft, {attack: 0.05, pan: 0.5}
[Run 1, Time 6.2]
|- sample :drum_tom_lo_soft, {pan: -0.5}
+ sample :drum_tom_mid_soft, {attack: 0.05, pan: 0.5}
[Run 1, Time 6.6]
|- sample :drum_tom_lo_soft, {pan: -0.5}
+ sample :drum_tom_mid_soft, {attack: 0.05, pan: 0.5}
[Run 1, Time 6.8]
|- sample :drum_tom_lo_soft, {pan: -0.5}
+ sample :drum_tom_mid_soft, {attack: 0.05, pan: 0.5}
-> Stopping all runs...
-> Completed run 1
```

Workspace 1 Workspace 2 Workspace 3 Workspace 4 Workspace 5 Workspace 6 Workspace 7 Workspace 8

Help

Tutorial

- 7.1 Controlling Running Synths
- 7.2 Controlling FX
- 7.3 Sliding Parameters

8 Data Structures

- 8.1 Lists
- 8.2 Chords
- 8.3 Scales
- 8.4 Rings

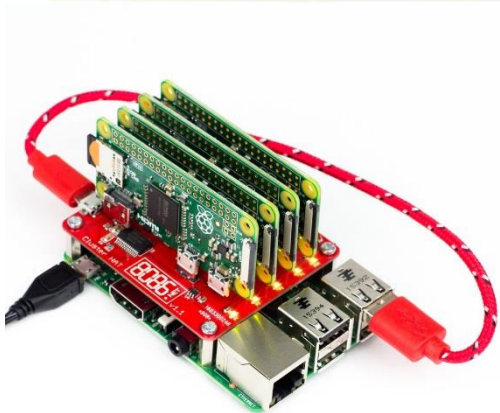
Examples

```
Once we have s, we can start controlling it via the control function:
```

```
s = play 60, release: 5
sleep 0.5
control s, note: 65
sleep 0.5
control s, note: 67
sleep 3
control s, note: 72
```

[Sam Aaron Live Coding](#)

HATS - HARDWARE ATTACHMENT ON TOP



AND A WHOLE BUNCH MORE...



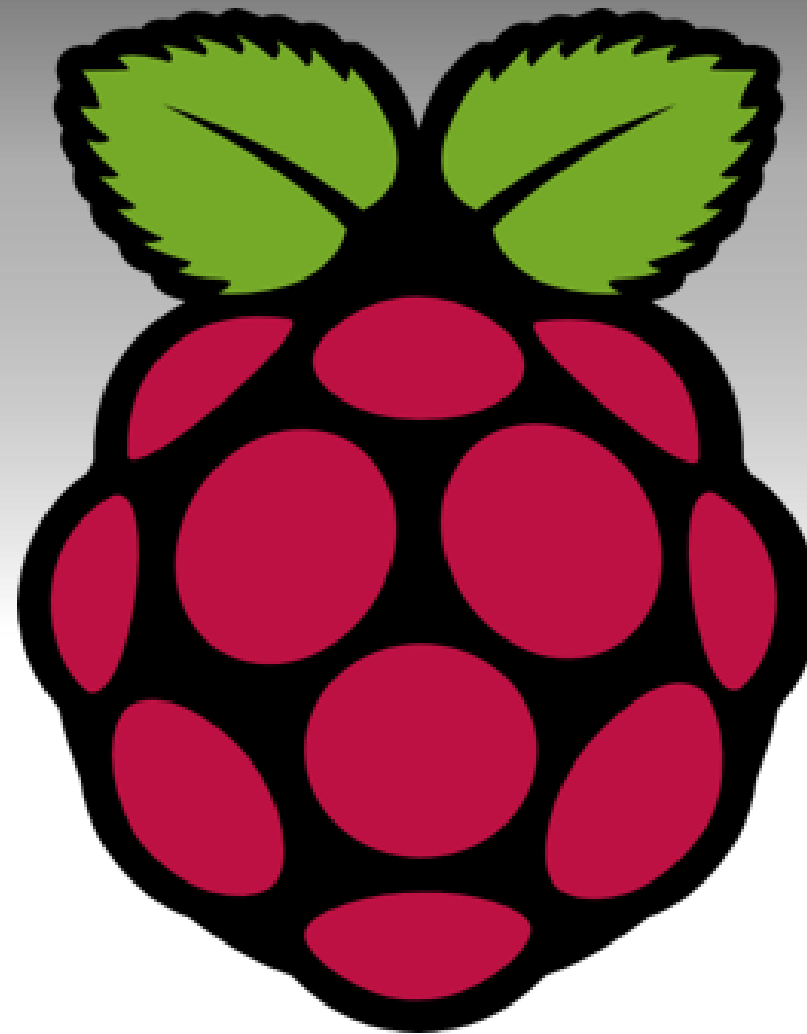
MINECRAFT



STEAM CLOWN™
& **Squeaky Hinge**
PRODUCTIONS

© Copyright 2016 STEAM Clown™

SETUP



2b Connect display

If *not* using HDMI,
plug in your analogue
TV or display

3 Connect input

Plug in a USB keyboard
and mouse

4 Connect network

Connect to your wired
network [optional]

1 Insert SD card

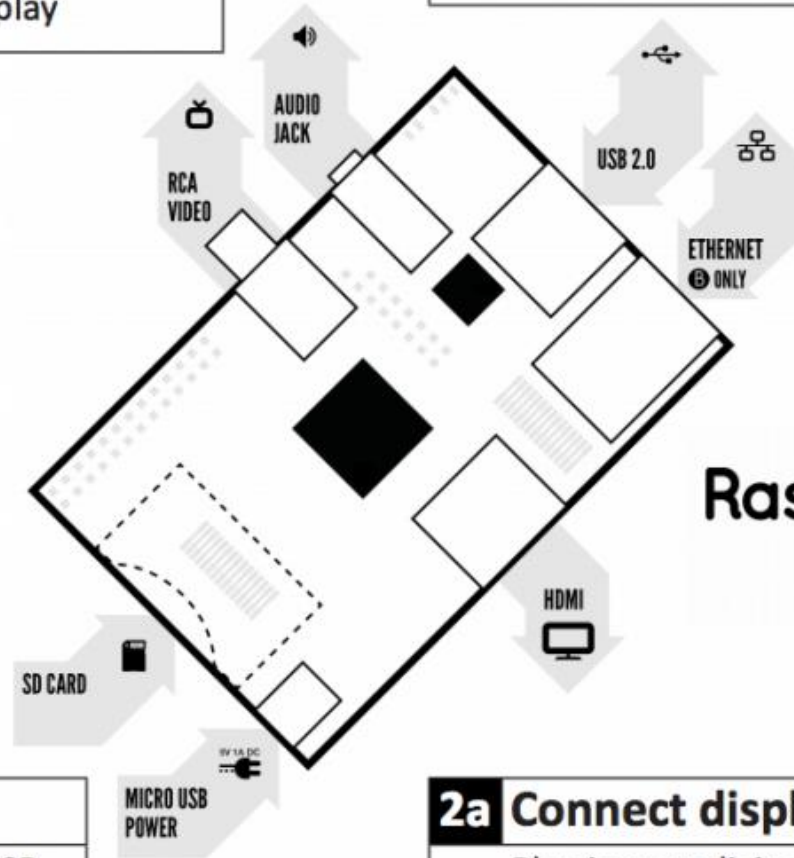
See page 3 for how to
prepare the SD card

5 Power up

Plug in the micro USB
power supply

2a Connect display

Plug in your digital TV
or monitor

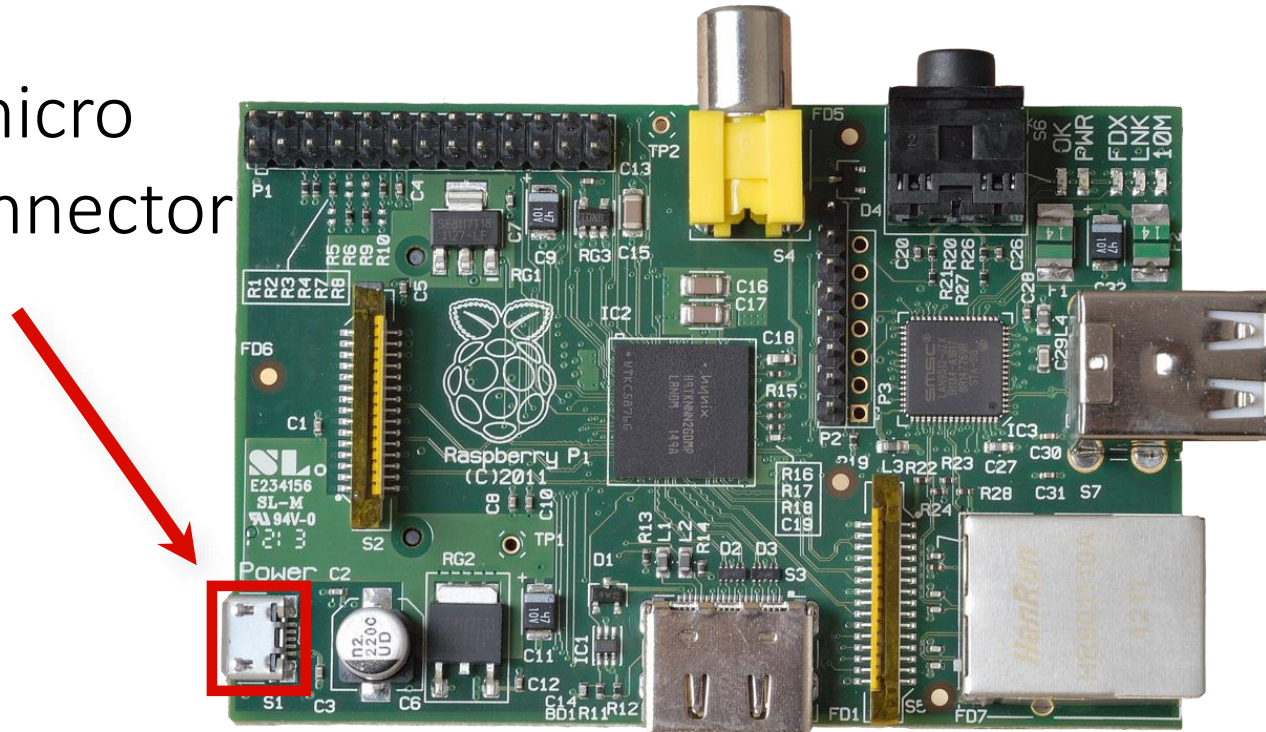


Raspberry Pi
Quick start



POWER

5v micro
USB connector

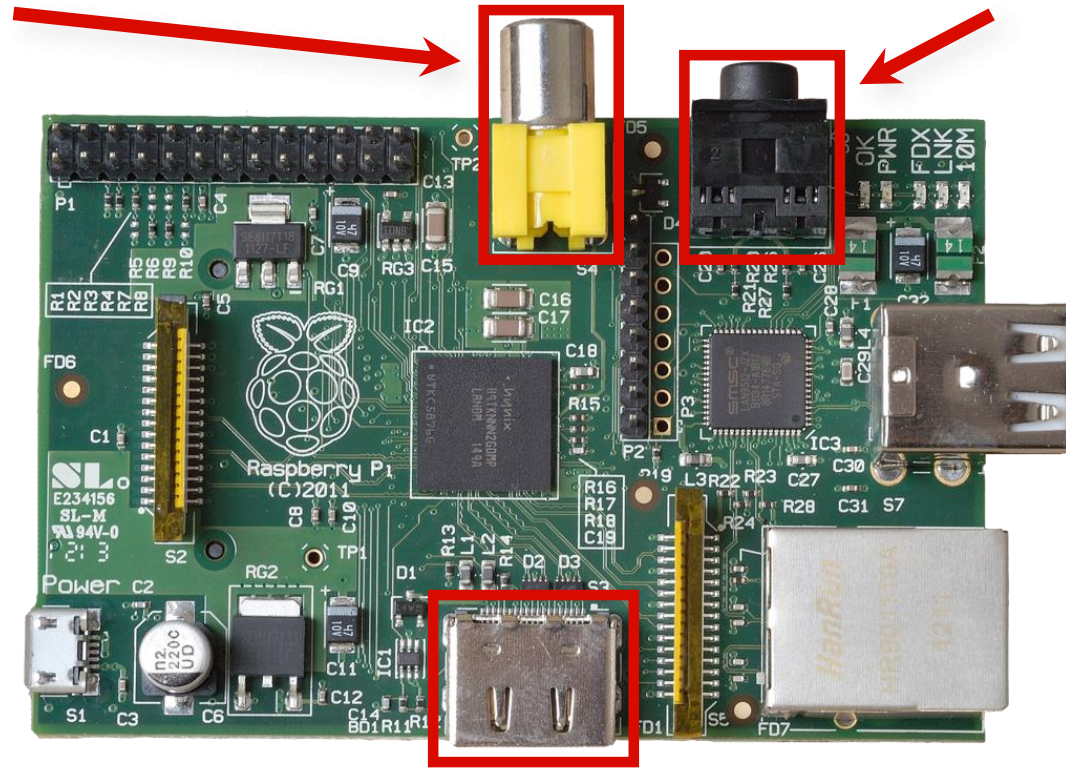


(Similar to the one on a lot of mobile phones!)

A/V (AUDIO/VIDEO)

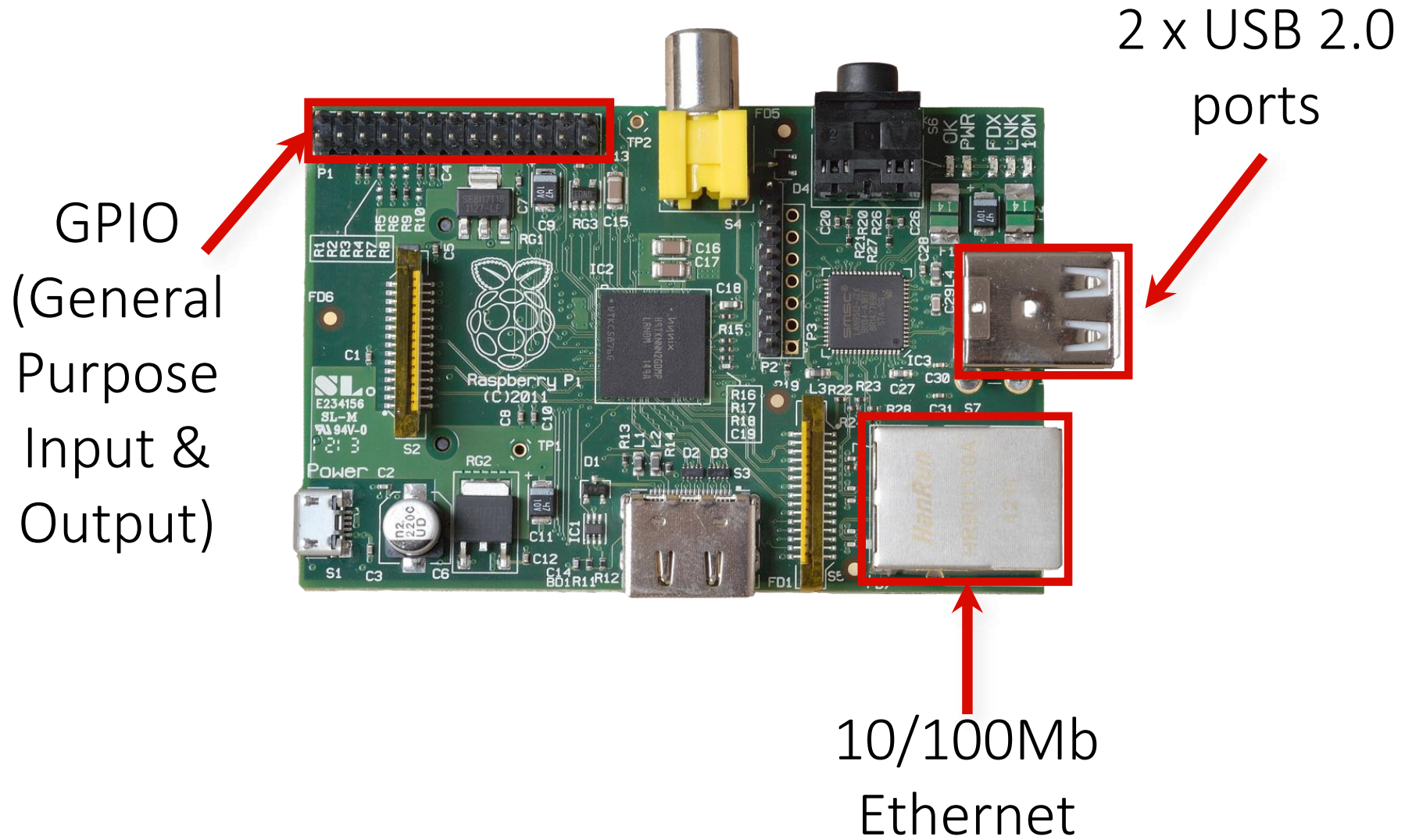
RCA Video
(works with most
older TVs)

3.5mm Audio
Standard
headphone
socket

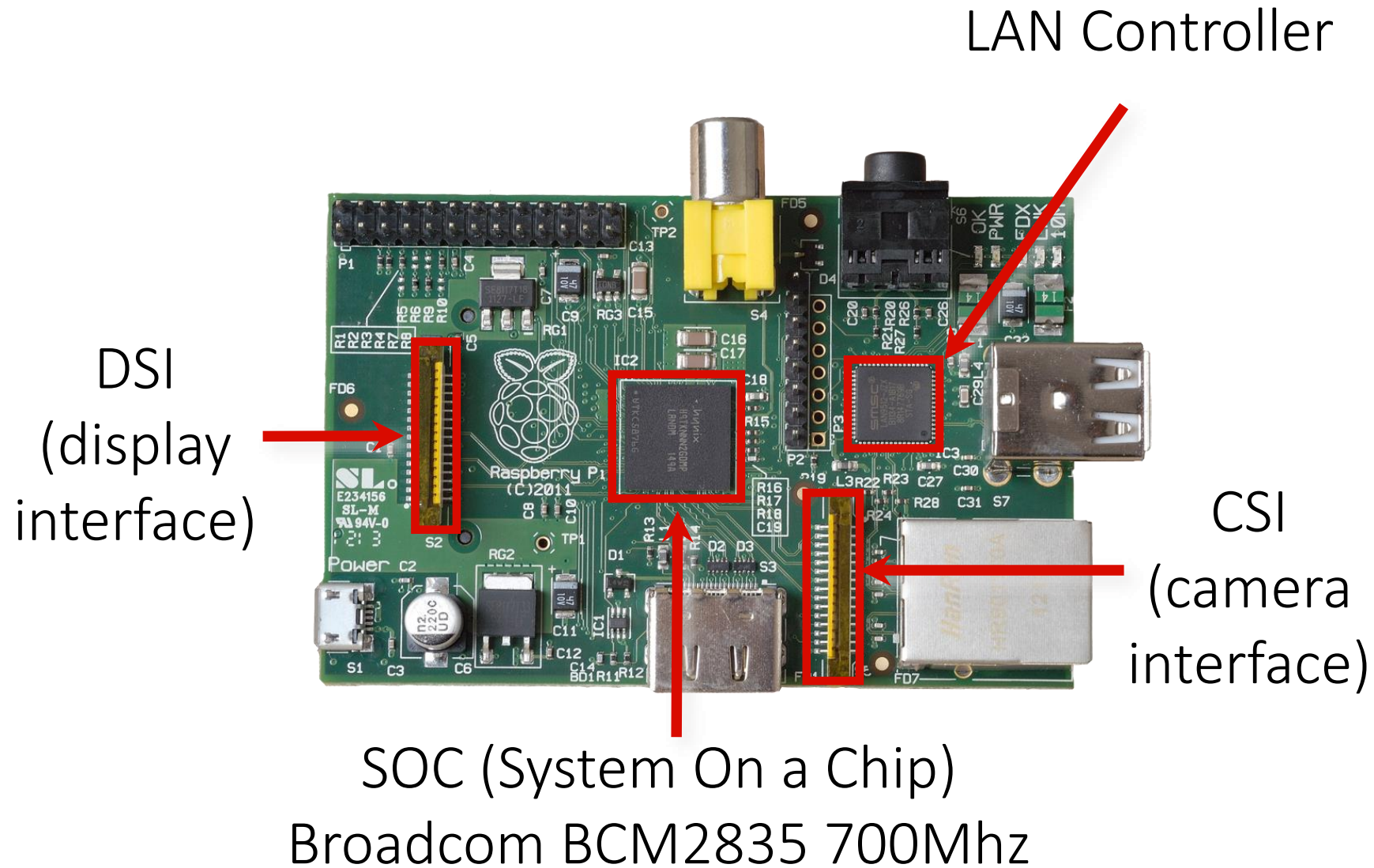


HDMI Audio & Video
(works with modern TVs and DVI monitors)

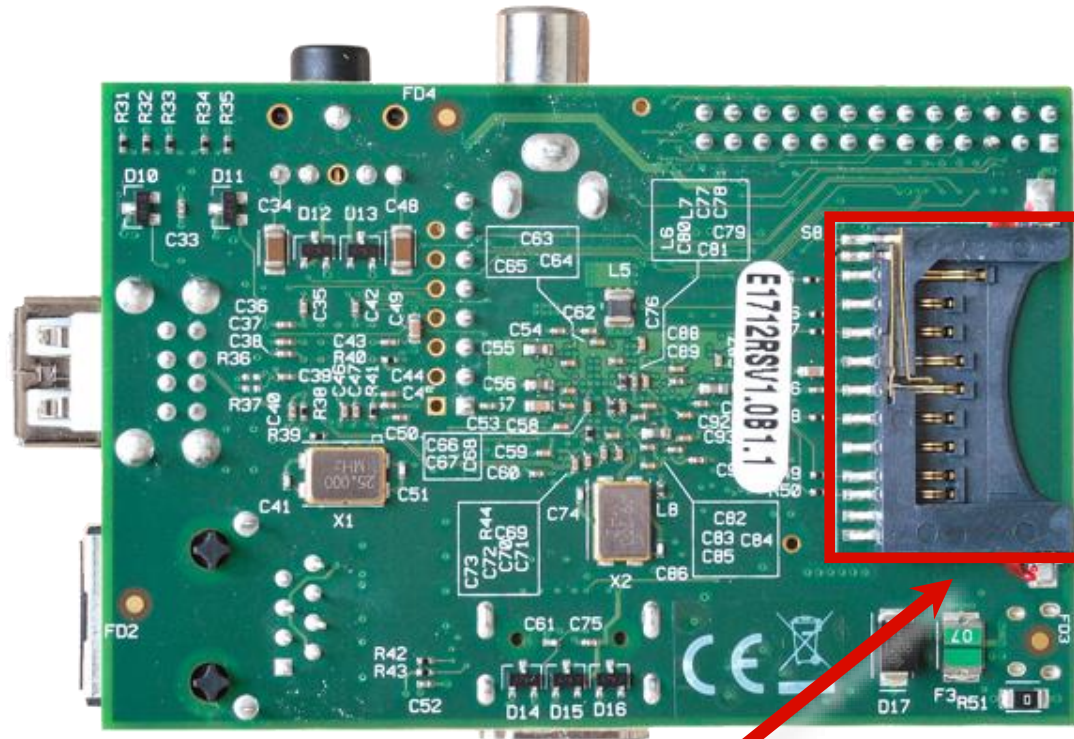
CONNECTIVITY



INTERNALS

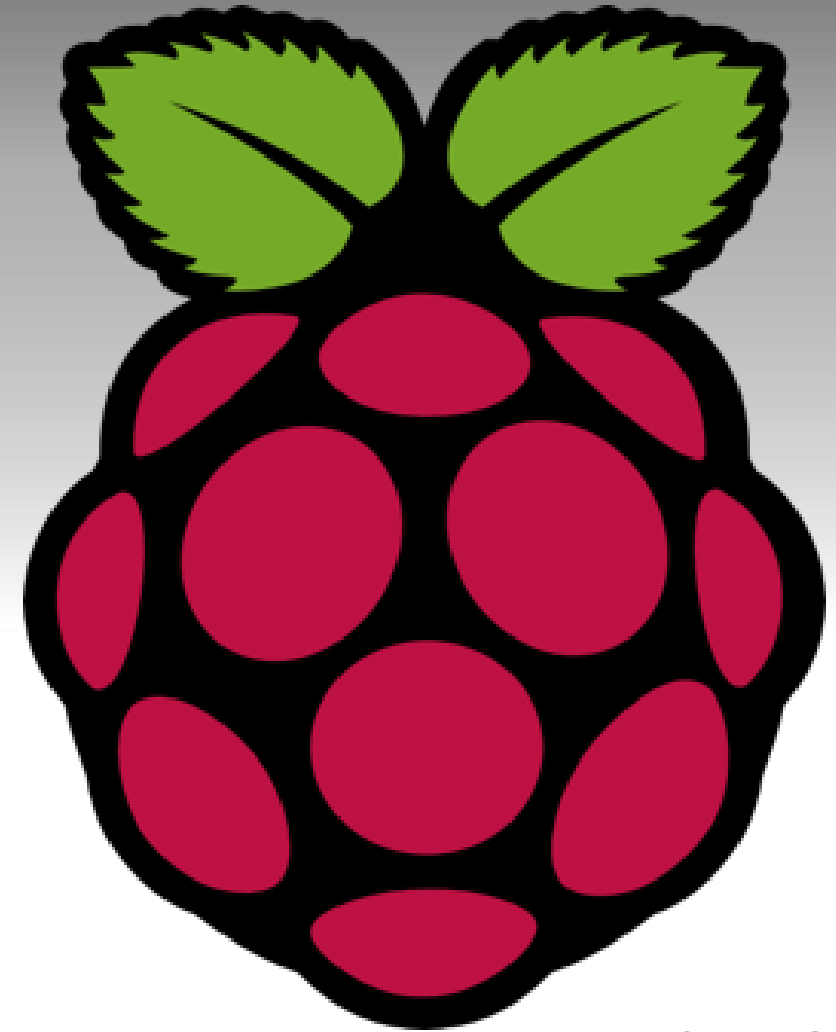


STORAGE



SD Card Slot
(supports SD cards up to 32GB)

SETUP KIT...

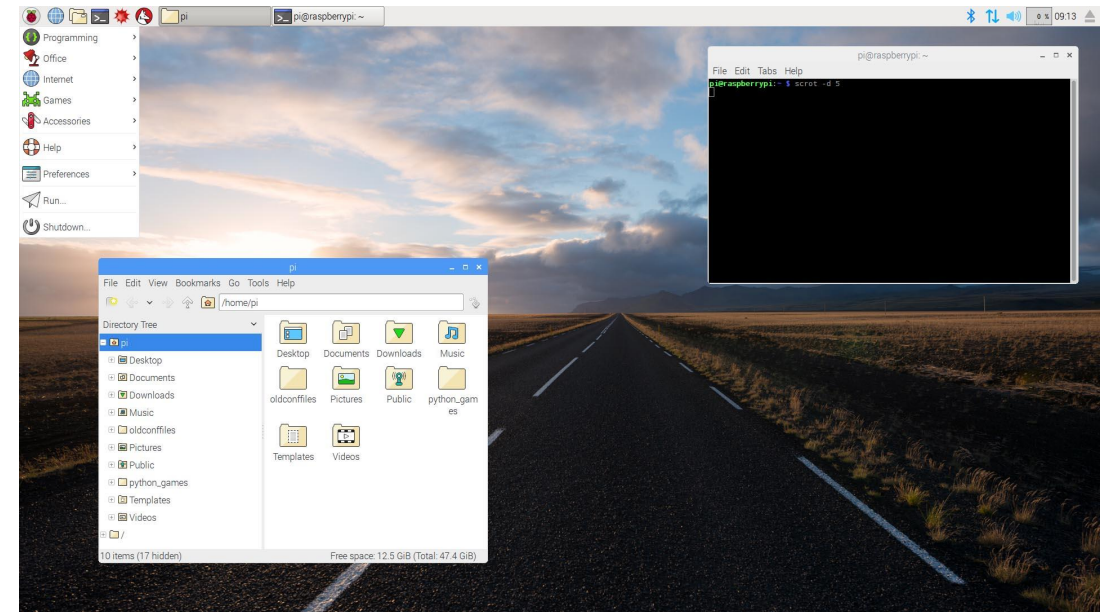


WHAT IS IN YOUR KIT... AND WHAT DO WE NEED TODAY

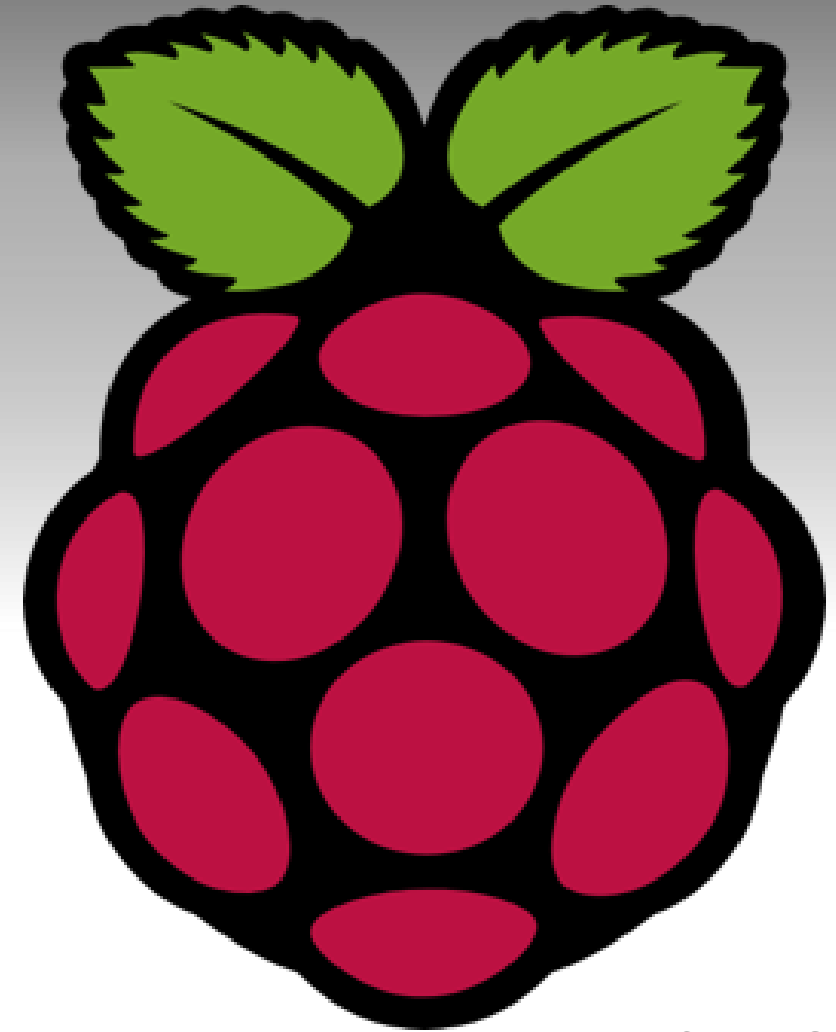
- What we need:
 - Raspberry PI & Clear Case
 - Power supply
 - Keyboard & Mouse
 - Monitor & HDMI2DVI
- What we don't need
 - Breadboard and other wires and components
 - Put them back in the box and close it...

POWER UP AND VERIFY PI IS WORKING

- Make sure SD card is plugged in
- Put Raspberry PI into the Clear Case
- Connect HDMI
- Connect Keyboard and Mouse
- Power on Raspberry PI
- Verify it boots



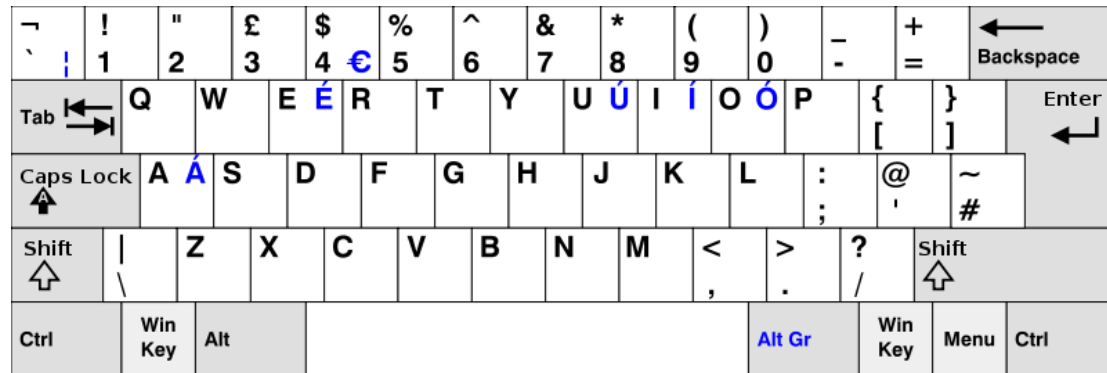
**OK THE US IS NOT
THE CENTER OF THE
UNIVERSE...**



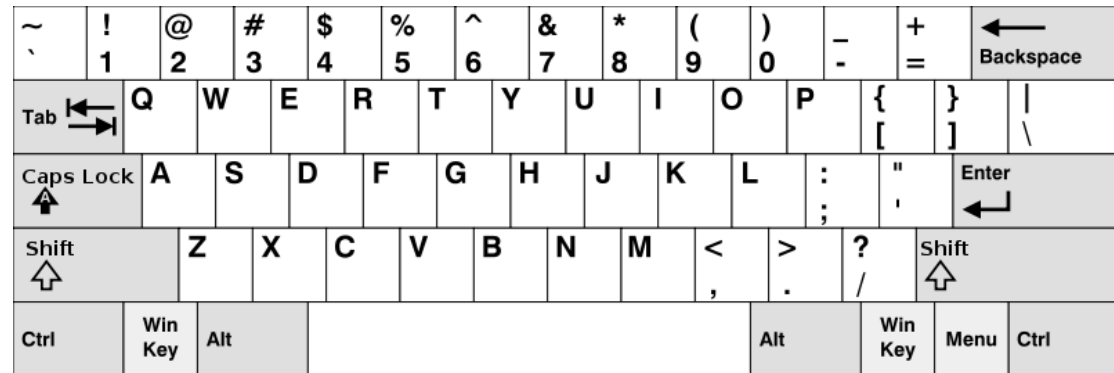
SOME HOUSE KEEPING...

- The Raspberry Pi default Keyboard setting is default British “gb”
 - See this by opening a command window, and typing “#” ... you will see “£”

UK

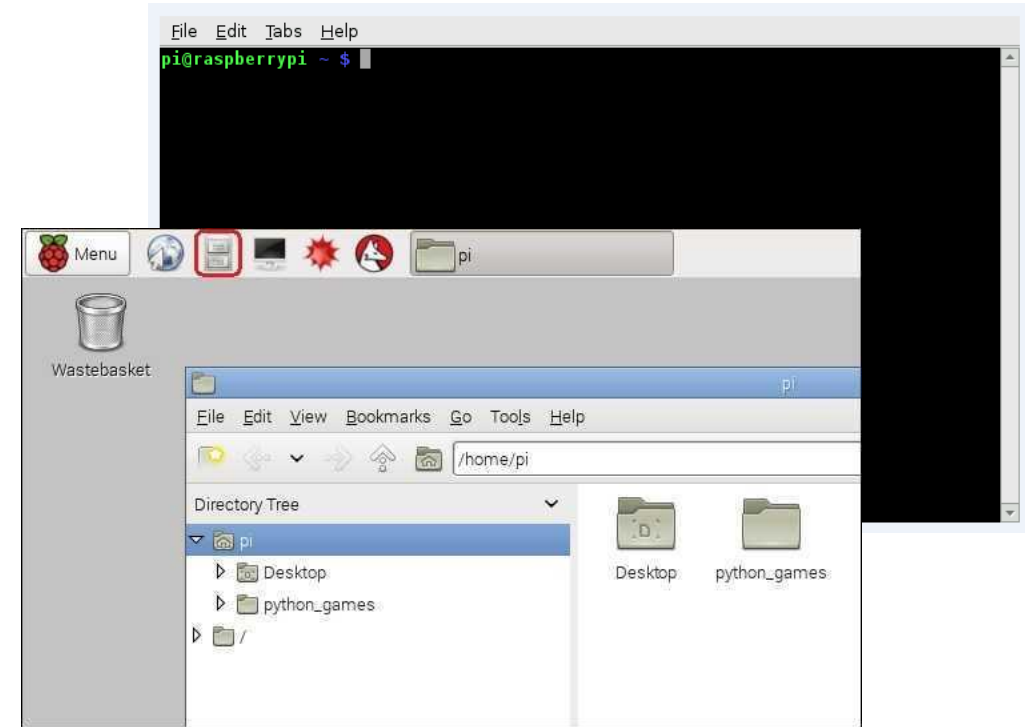


US



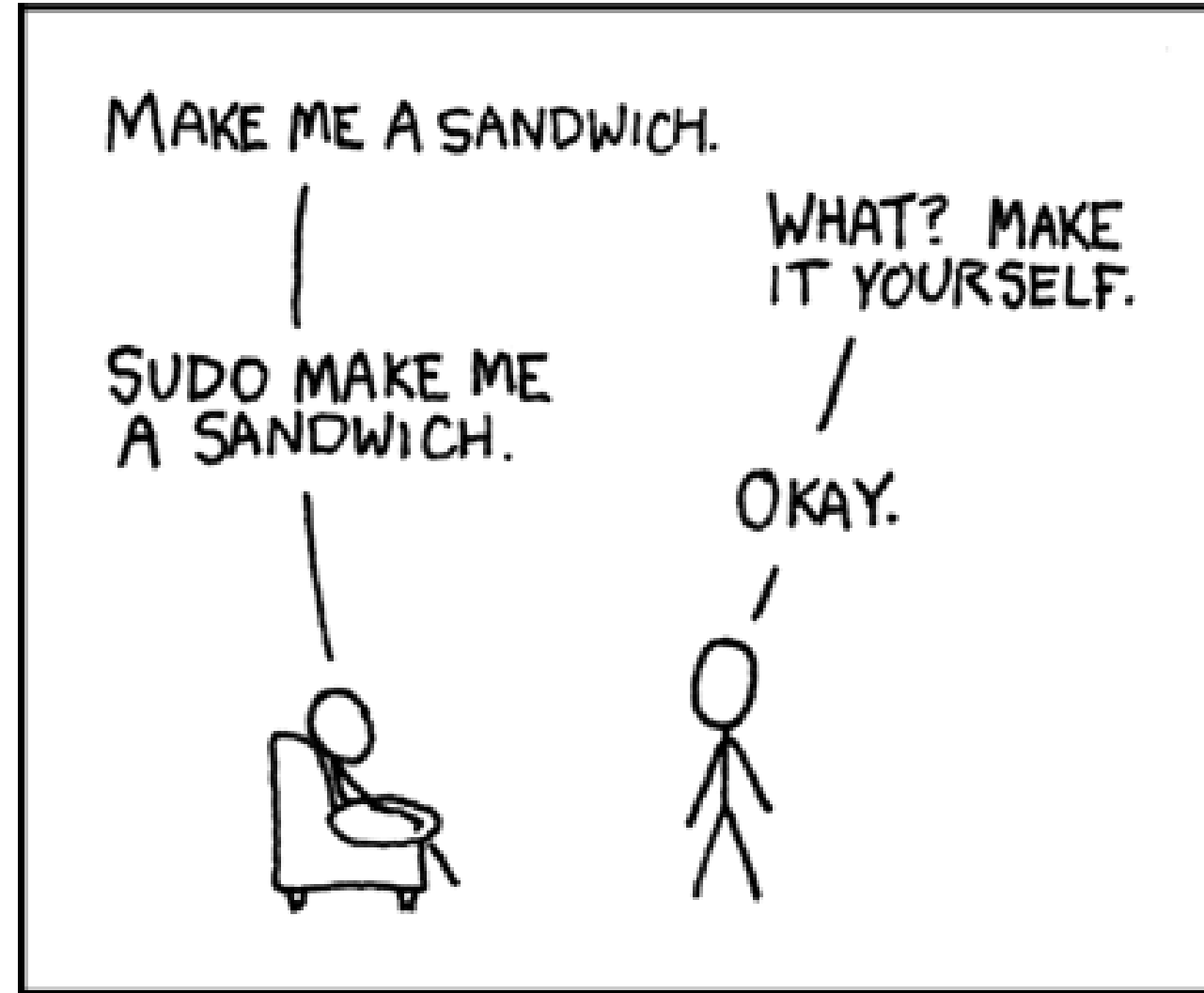
LET'S FIX THAT

- Open a File Manager
 - See the “/” folder
 - Open and go to “/etc/default
 - See the file called keyboard?
- Open a command window
 - Type `cd ../../etc/default`
 - Type `pwd` and see that you are in the right directory
 - Type `ls key*` and see there is a file called `keyboard`



SUDO

- Most times when editing system files you will need to use the `sudo` command
- Preface any commands with `sudo` to become a super user



LETS EDIT KEYBOARD SETTINGS


- Type `sudo vi keyboard`
- Scroll to the “g” in “gb”
- Type “i” to enter inset mode
- Type “us”
- Hit the “Esc” to get to command mode
- Scroll to the “g” in “usgb” then hit “x” twice to delete “gb”
- Type `<SHIFT>ZZ` to save file
- You can check by `sudo vi keyboard` and then `:q` to exit

```
# KEYBOARD CONFIGURATION FILE

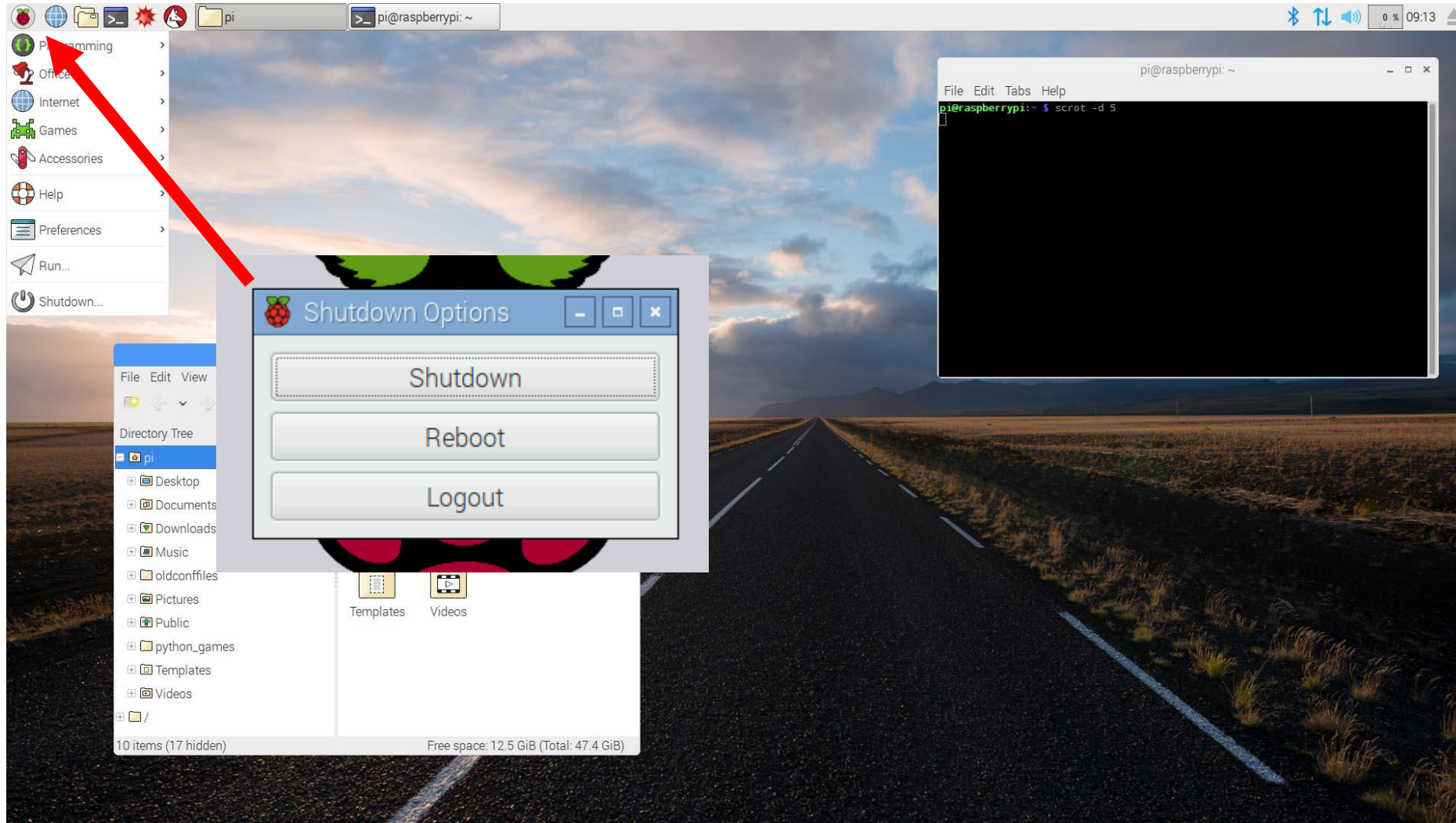
# Consult the keyboard(5) manual page

XKBMODEL="pc105"
XKBLAYOUT="gb"
XKBVARIANT=""
XKBOPTIONS=""

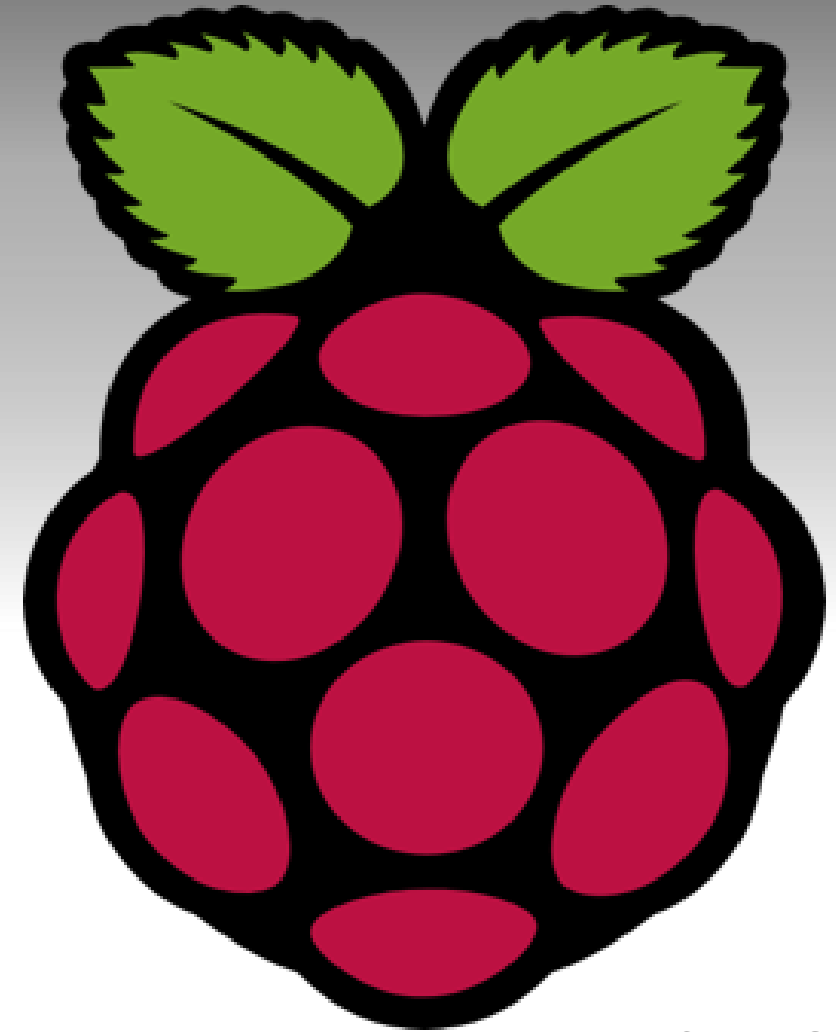
BACKSPACE="guess'
```



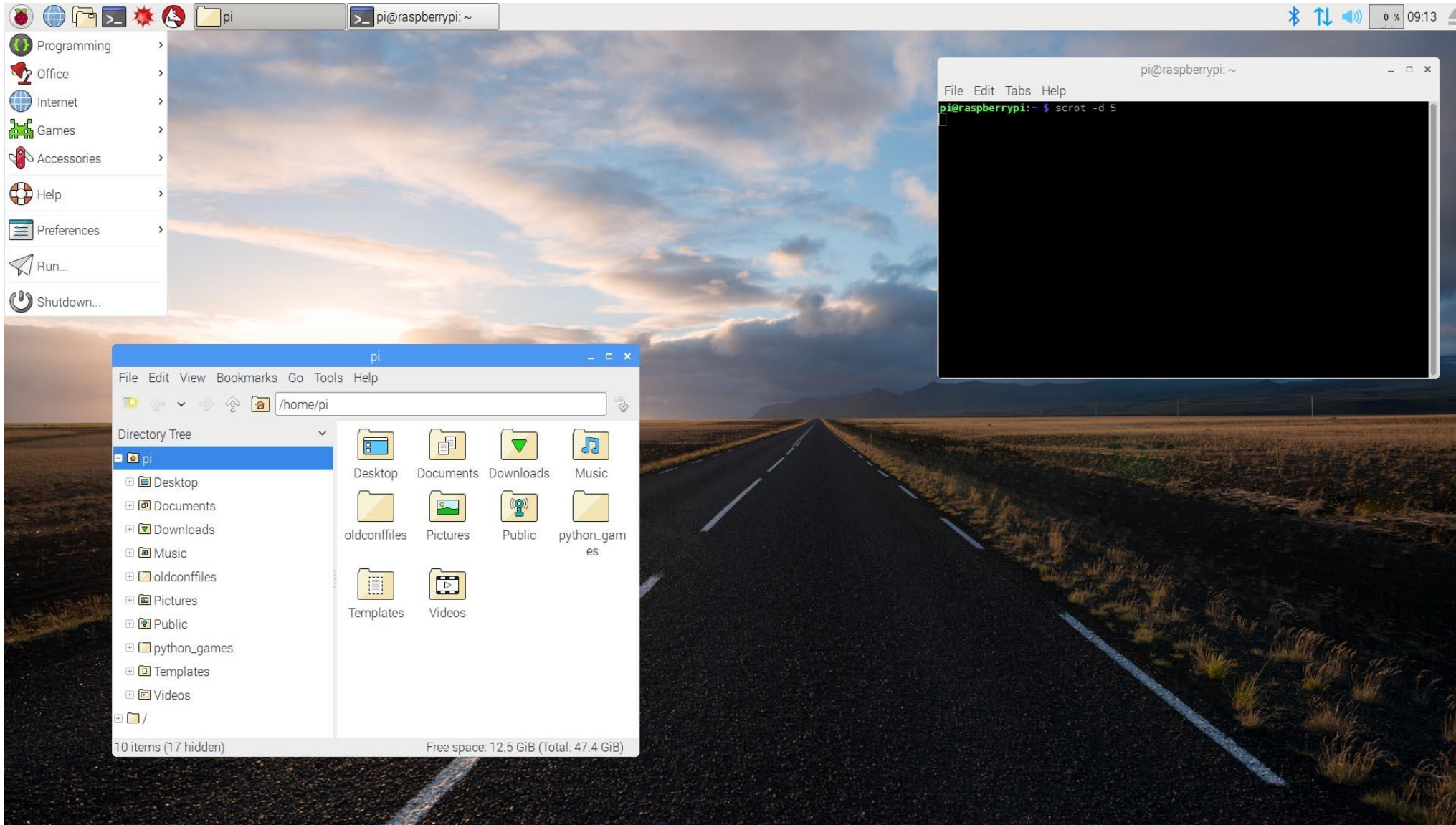
DON'T FORGET TO REBOOT



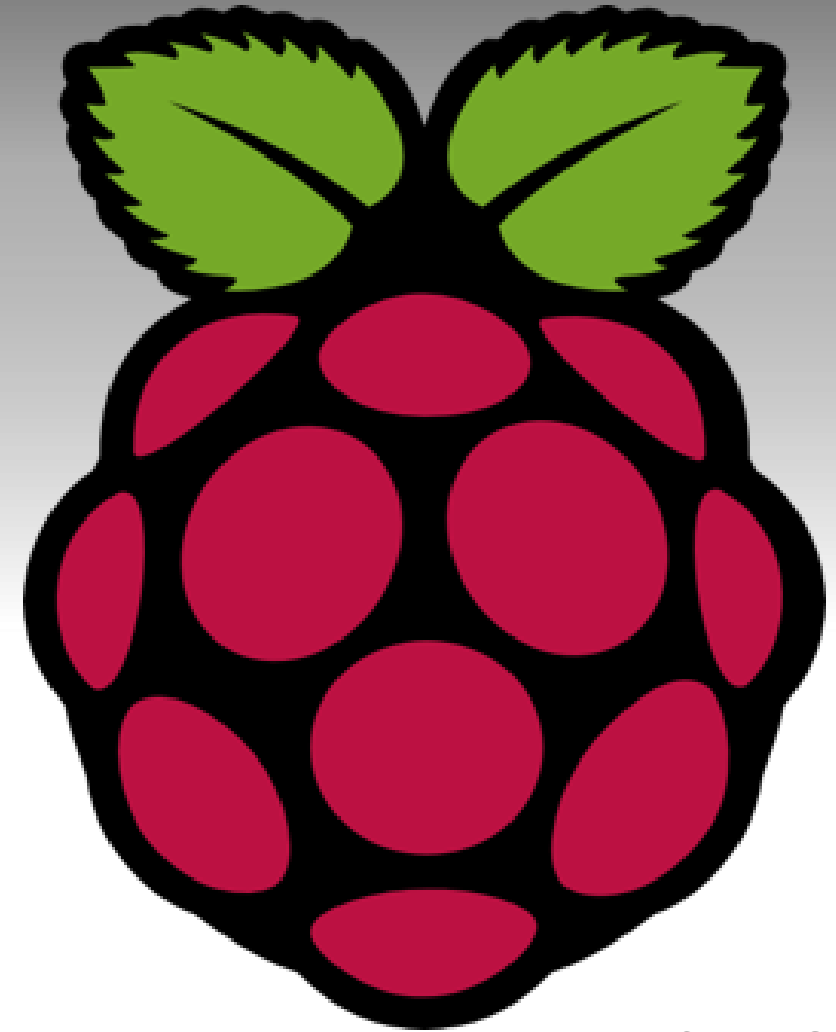
EXPLORING THE ENVIRONMENT...



WHAT'S ON THE DESKTOP?



**DOING
SOMETHING...**



LET'S TAKE A QUICK PEEK AT PYTHON3

- Open a command prompt
- Type `Python` and see what version it is... Then `<Ctrl>d`
- Type `Python3` and see what version it is... Then `<Ctrl>d`
- Where are we?
 - Now type `pwd`
 - Now type `ls`
- Let's go to the Desktop
 - How do we do that?

LET'S SETUP A DIRECTORY FOR OUR CODE

- Type `cd Desktop`
- Type `mkdir piCode`
- Type `cd piCode`
- Type `pwd`

MY FIRST PI CODE

- Type `cat > myFirstPiCode.py`
my first Pi Code
X=3
Y=2
print(x*y)
<enter enter>

RUN IT

- Type `python3 myFirstPiCode.py`
- Now Let's Edit it
- In the file manager open your piCode directory
 - You should see it on the desktop
- Select your `myFirstPiCode.py` file and right mouse click
 - See Python 2 (IDLE) ... don't click on that
 - Select Open With and find Python 3 (IDLE) under the Programming file tree and set as default action

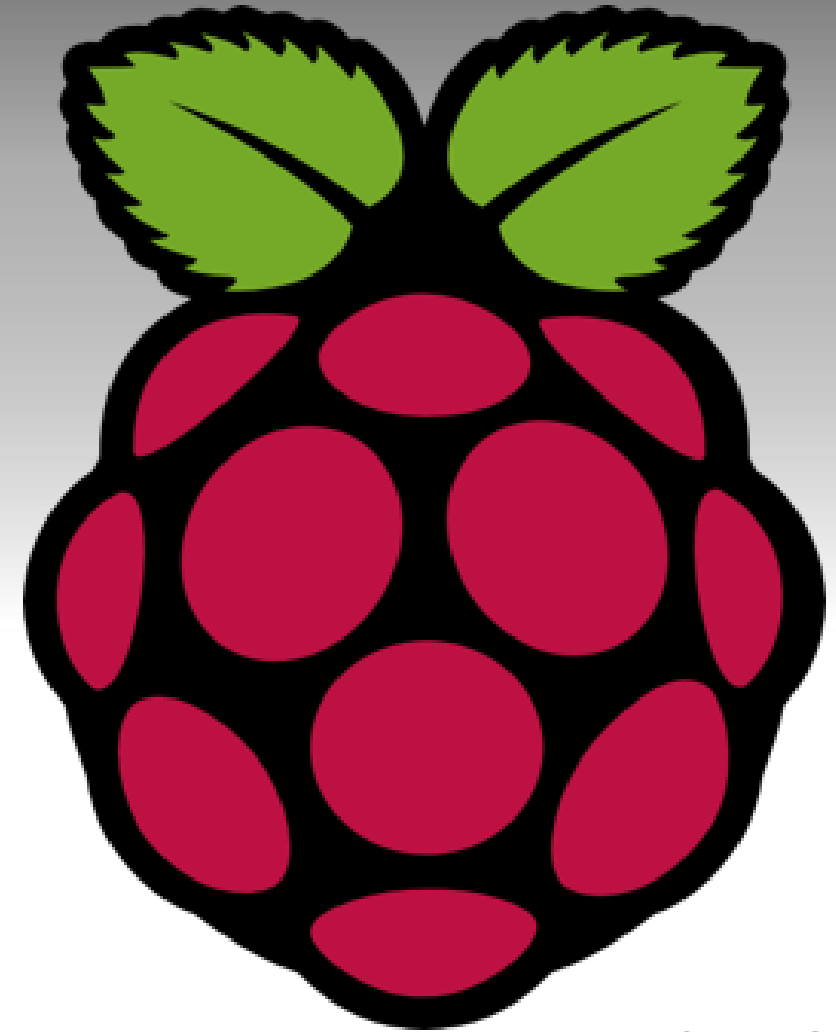
LET'S GRAB SOME GITHUB EXAMPLES

- In your command prompt, get back to your desktop by typing `cd ..`
- Verify you are there by typing `pwd`
 - You should see `pi@raspberrypi:~Desktop $`
- Make sure your wifi is on and connected
- In the command prompt type
`sudo git clone https://github.com/simonmonk/prog_pi_ed2.git`
- This will copy a new directory on your Desktop with example code

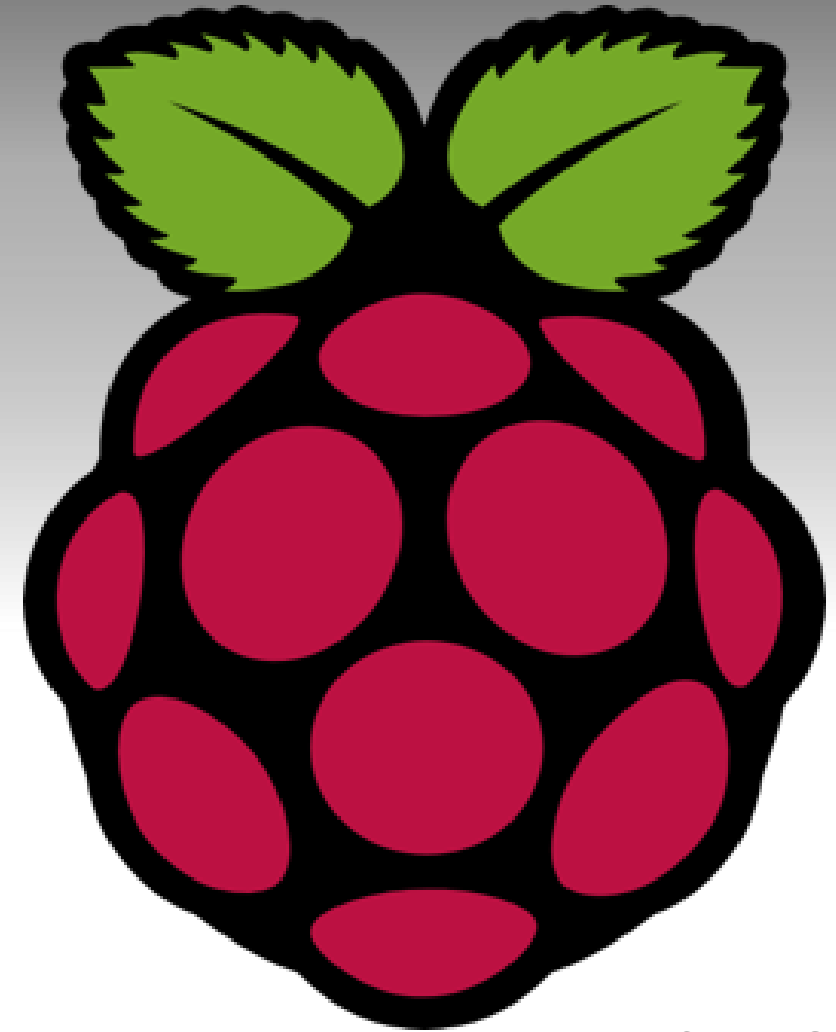
I'M GOING TO WALK AROUND...

- Modify your myFirstPiCode.py with some python code we have been learning... How about implement some code:
- `for` loop
- `while` loop
- Conditional `if/elif/else...`
- Strings and math...

REFERENCE & APPENDIX SLIDES



WANT TO FLASH AN LED?



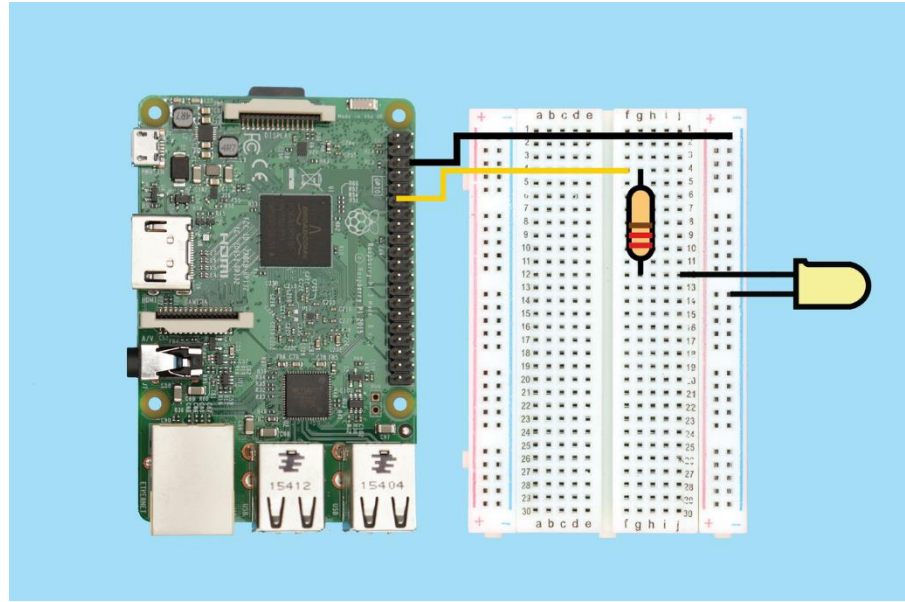
LET'S FLASH SOME LEDS

- Find the `09_blink.py` file in the `prog_pi_ed2` directory
 - on your desktop if you followed my instructions
- Copy it to your `myPiCode` directory
- Open the version in your `myPiCode` directory

```
#09_blink.py
import RPi.GPIO as GPIO
import time
# Configure the Pi to use the BCM (Broadcom) pin names,
#rather than the pin positions
GPIO.setmode(GPIO.BCM)
led_pin = 18
GPIO.setup(led_pin, GPIO.OUT)

try:
    while True:
        GPIO.output(led_pin, True) # LED on
        time.sleep(0.5) # delay 0.5 seconds
        GPIO.output(led_pin, False) # LED off
        time.sleep(0.5) # delay 0.5 seconds

finally:
    print("Cleaning up")
    GPIO.cleanup()
```

AWESOME RESOURCES

- <https://www.raspberrypi.org/education/>
- <https://www.raspberrypi.org/magpi/issues/>
- <https://www.codeclubworld.org/>

SOURCES & ATTRIBUTION

- Kerry A. Bruce - He is a guy I met at Winter ICT, who seems to know a lot about playing and teaching Raspberry PI
 - kbruce@cnm.edu – <http://myitinstructor.com>

SOURCES & ATTRIBUTION