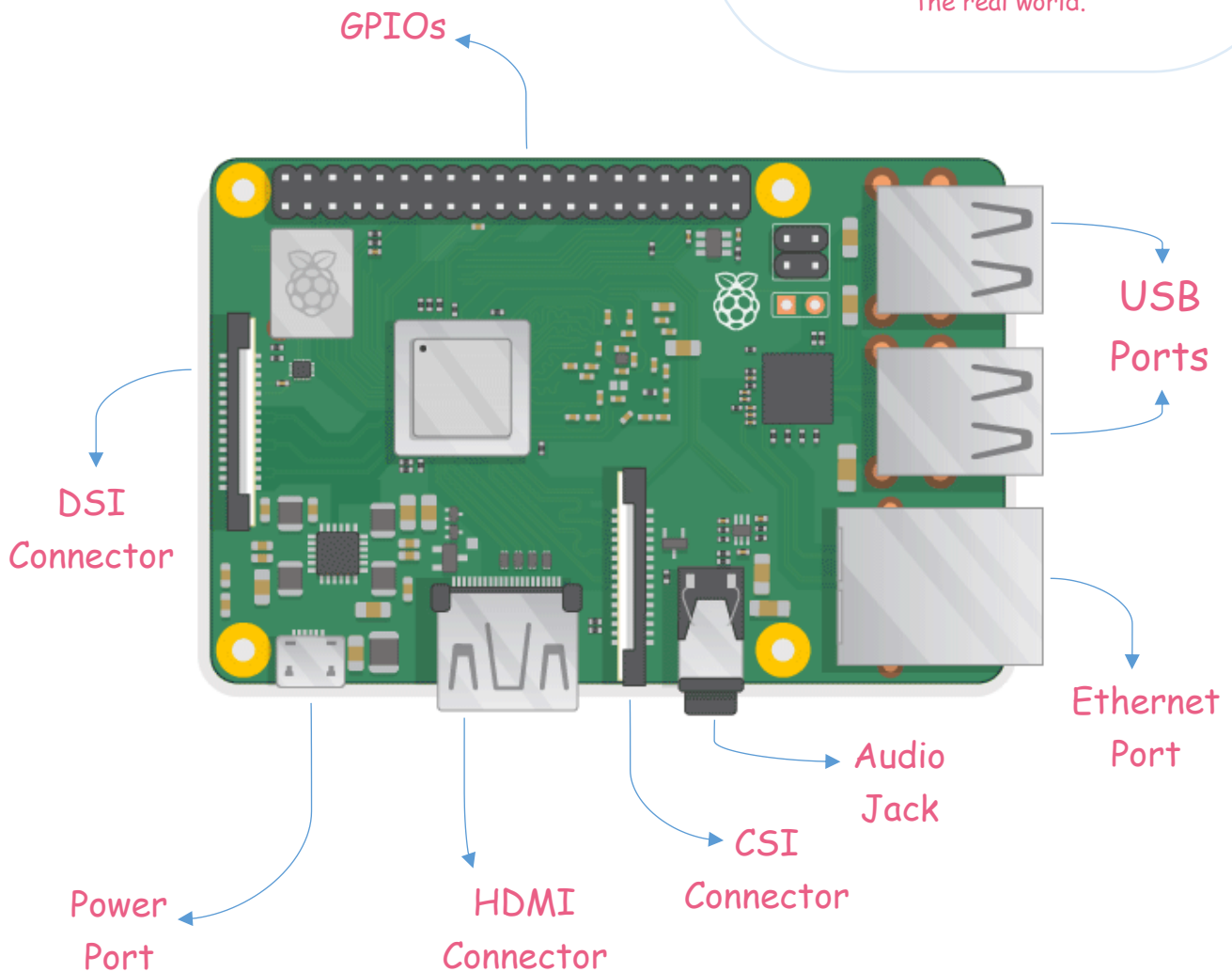# Raspberry Pi

1.1 Introduction

The Raspberry Pi is credit card sized small computer. It has a processor, RAM, USB ports to plug a keyboard and a mouse, HDMI port to plug a TV or monitor, and you can even connect it to the internet.

You can do most things you do with a regular computer like web browsing, document editing, playing games, coding and much more.


The Raspberry Pi has one special feature that normal computer don't: General Purpose Input Output (GPIOs) Pins. Thus, allowing you to connect with the real world.

1.2 Exploring the Raspberry Pi

GPIOs

USB Ports

DSI Connector

Ethernet Port

Audio Jack

CSI Connector

Power Port

HDMI Connector

Here's a glance of what each component of Raspberry Pi does:

- o GPIOs- *Connect devices to interact with the real world, for instance, sensors, LEDs, Motors etc.*
- o USB Port- *to connect a mouse, a keyboard or other peripherals.*
- o Ethernet Port- *to connect to the internet using an Ethernet cable.*
- o Audio Jack- *to connect an audio device.*
- o CSI Connector- *to connect a camera with a CSI ribbon.*
- o HDMI Connector- *to connect a monitor or TV.*
- o Power Port- *to power up your Pi.*
- o DSI Connector- *to connect DSI compatible Display.*

It somewhat looks like this when it's wired up!!
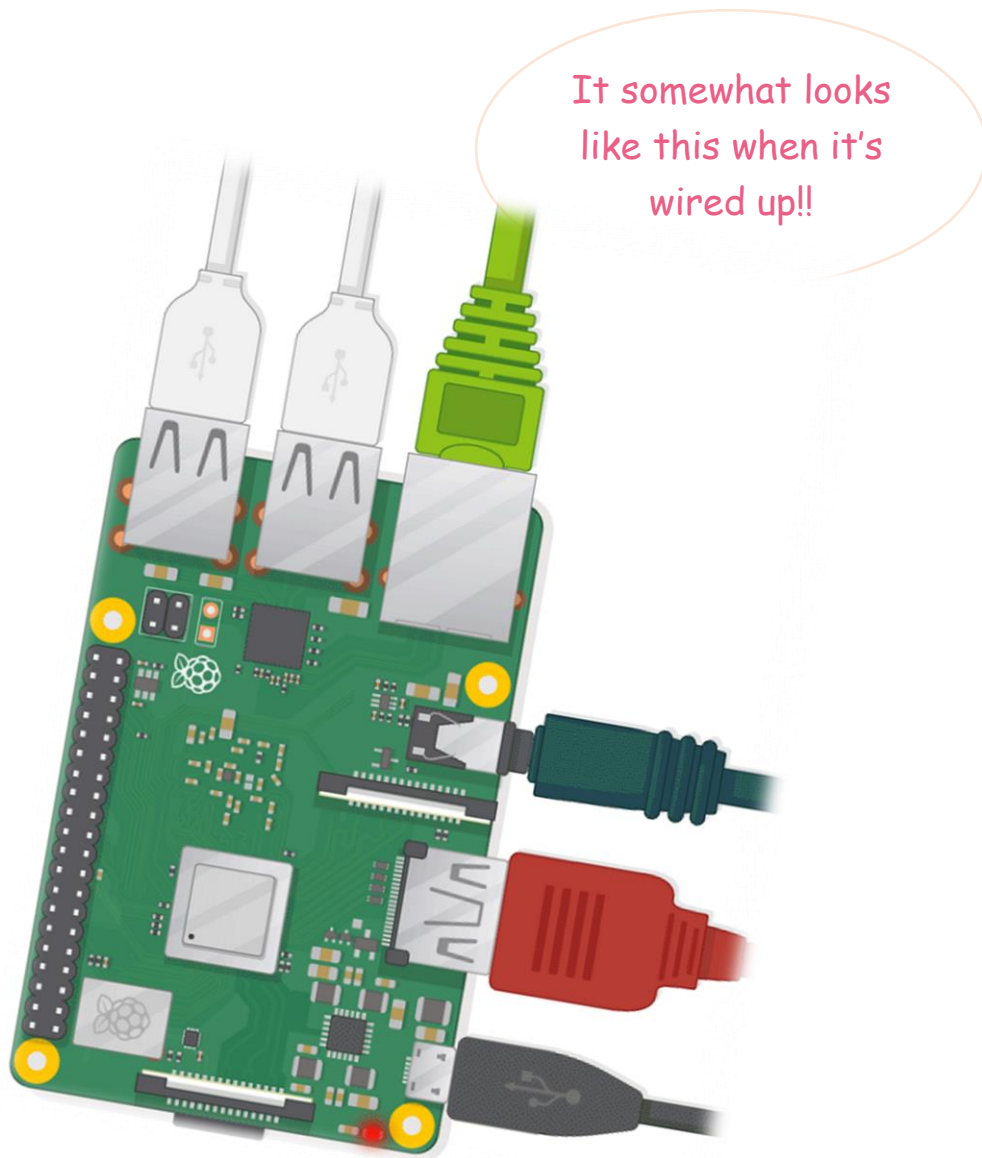
1.5 Raspberry Pi Architecture

Raspberry Pi is an *ARM Architecture Processor* based board. With higher processor speed and 1 GB RAM, the PI can be used for many high profile projects like Image processing and Internet of Things. Raspberry Pi consist of a set of pins which allows it to communicate with the world around.

- o **1.5.1- General Purpose Input Output (GPIO) -** *A powerful feature of Raspberry Pi is the row of GPIO pins along the top edge of the board. GPIO pins allows the raspberry pi to be configured for different purposes, interact with different circuitries and work with several type of electronic component, for instance, sensors, motors, DC drives etc. GPIO pin can simply be use to turn devices on and off.*

The image on the left provides an understanding of the pinout labelling. Raspberry Pi pins are labelled in two ways, i.e. the GPIO pinout labelling and Physical pin labelling. The physical pin labelling are highlighted in different colored circle starting from 1 and ending on 40 in the image. You can also see the GPIO pinout labelling.

- o **1.5.2- Ports -** *Raspberry Pi is equipped with four USB 2.0 Port and one LAN Port.*

  - ✓ *USB port allow USB devices to be connected to each other with and transfer digital data over the USB Cable.*
  - ✓ *The LAN port allows the raspberry pi to connect to a network using a wired connection.*


1.6 First Pi Program

One of the classic electronic analogy to "Hello World" is to make an LED blink. It is one of the very basic tutorial to begin with. To get started, you first of all need to build the circuit on the breadboard; a board for electronic prototyping.

Circuitry of LED blink is pretty simple, you just have to connect the electronic component with raspberry pi properly as shown in the picture.
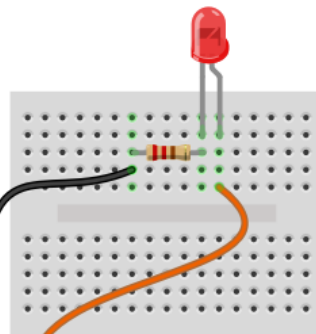
- ✓ Breadboard
- ✓ LED
- ✓ Jumper Wires
- ✓ Resistor: 220Ω/1KΩ

Connect resistor through jumper wire (represented in black color) with PIN 6.
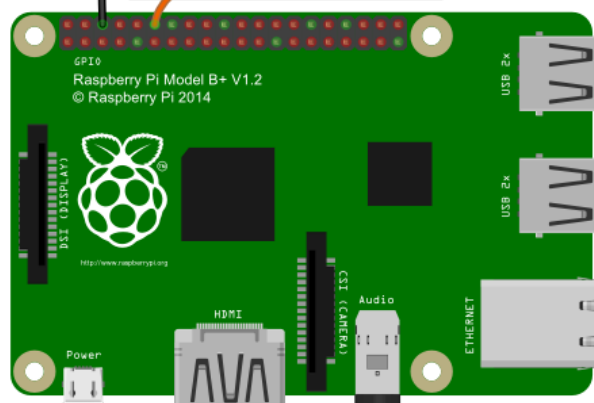
Connect positive leg of LED with PIN 12 (GPIO 18).

Things you need:

Students will design Red Blinking LED Project. Students need Breadboard for prototyping, LEDs, Resistor, Jumper wires, Raspberry pi Power Adapter, Keyboard and Mouse, HDMI connector and cable along with LCD.

How to Build:

The positive anode leg of the LED is connected to pin GPIO18 on the Raspberry Pi. The negative cathode leg is connected to a 100 Ω resistor. The resistor goes to physical pin labelled as 6 ground on the Pi.

Code:

```
Import RPi.GPIO as GPIO
Import time
GPIO.setmode (GPIO.BCM)
GPIO.setwarnings (False)
GPIO.setup (18, GPIO.OUT)
While True:
        GPIO.output (18, True)
        time.sleep (0.5)
        GPIO.output (18, False)
        time.sleep (0.5)
```

Code Function:

The functionality of this code is as simple as switching on and switching off the electric button in real life. In this code we have included two libraries. First is the RPi. GPIO, which allows to use the GPIO pins as in input or output according to the need of project. Second is the time library, which allows to use the time module in python. To achieve the blinking application of an LED, we are switching on or causing the current to flow through GPIO18 on which LED is connected for about 0.5 seconds and then switching it off or causing the current to stop flowing through GPIO18 for about 0.5 seconds. All this is happening in while True loop, which has the functionality of getting executed for infinite time.