NOTE: This worksheet can be used with **Raspberry Pi model A, B or B+** using **GPIO connections** with or without the **HapPi add-on**

Hardware needed to Blink an LED

Two pages -
This first page shows **three ways** of using the **HapPi add-on**
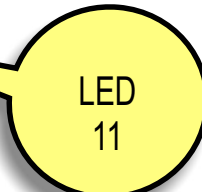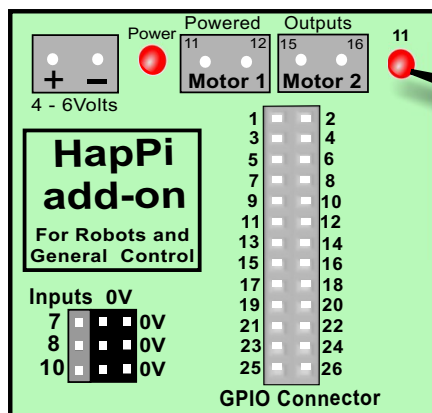The second page provides the **Python code** needed to blink the LED

You need

 A working Raspberry Pi and a **HapPi add-on** or similar.

You can use either of the methods shown

(1) Use just the HapPi add-on

 This uses the **test LED11** provided on the **HapPi add-on**.
Just plug the **HapPi add-on** onto **the Raspberry Pi** and you are ready to go.

LED 11

The test LED 11 is ready to use
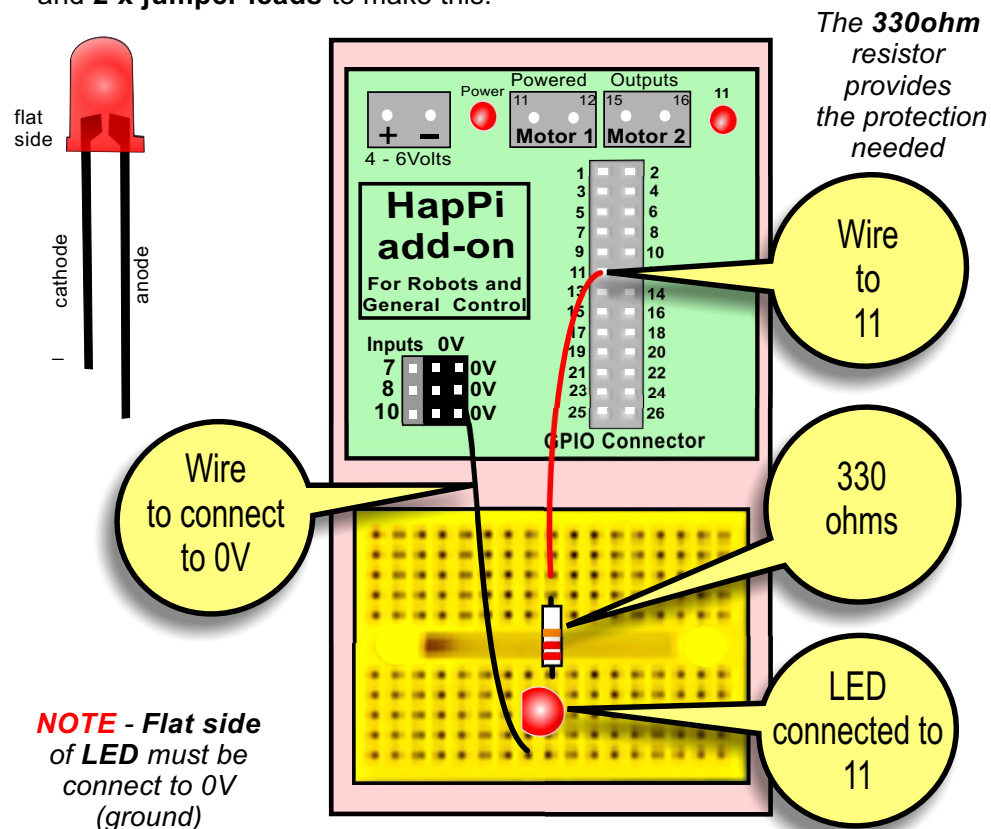
*Using the **HapPi add-on** on its own*

IMPORTANT
Do not connect directly to the **Raspberry Pi GPIO** connections unless the connectors are protected. The **HapPi add-on** has **output protection** on the **11,12,15** &**16 powered connectors** and **input protection** on **7,8** and **10.**

(2) Connecting your own LED

The **LED** is placed on a **breadboard** with **jumper wires** connect to **connector 11** on the **GPIO.**
(NOTE - The **HapPi add-on GPIO** is laid out the same as the **Raspberry Pi GPIO**)
You will also need **1 x LED**, **1 x 330ohm resistor 1 x breadboard** and **2 x jumper leads** to make this.

*The **330ohm** resistor provides the protection needed*

flat side

cathode

anode

Wire to 11

Wire to connect to 0V

330 ohms

LED connected to 11

NOTE - *Flat side of **LED** must be connect to 0V (ground)*

*Using **HapPi add-on** and a **breadboard***

Extra LEDs can be added using this method to 11,12, 15 and 16 with all OV wires all going to the 0v connector
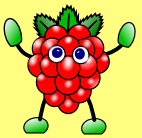
Coding Instructions

NOTE
See page 1 of 2 for hardware details

Coding

(1) Open **text editor** called **IDLE3** then create a **New Window.**

(*To do this click on **File** (in top left of **IDLE3**) then open **New Window**)*

(2) Carefully **copy the code** into **IDLE3**
   NOTES
   a) As you type coloured text appears by itself for commands.
   b) Take care to include capital letters and spaces as shown.

(3) Check the **code** copied is correct then

(4) Save **program** by clicking **File** then save as **blinky.py** in **Documents** folder.

To Run the Program

(a) Open up the **LXTerminal** program
(b) type **cd Documents** then
(b) type **sudo python3 blinky.py**
(c) it will then **run** or give an **error message**

To Stop it Running

Press **Ctrl + C** keys together to **stop** program at any time while program is running.

Note Screen will show the print message
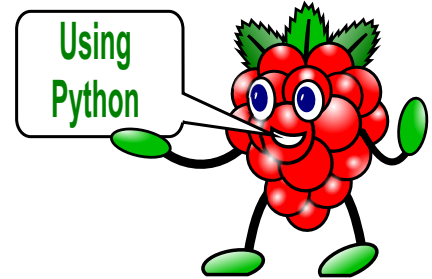*watch LED flash as the program runs*

IDLE3
This is the **text editor** we use, if you choose other text editors instead the code may vary slightly from that given below.

LXTerminal
This is used to **run the code** (program).

LXTerminal

Using Python

Code to type (in IDLE3)

```python
import time
import RPi.GPIO as GPIO
GPIO.setwarnings(False)
GPIO.cleanup()
GPIO.setmode(GPIO.BOARD)
GPIO.setup(11,GPIO.OUT)
while True:
    GPIO.output(11,GPIO.HIGH)
    time.sleep(1)
    GPIO.output(11,GPIO.LOW)
    time.sleep(1)
    print("watch LED flash")
```

set-up

automatic line indent

- *Imports the **time library***
- *Imports the **GPIO library***
- *Stops the GPIO warnings*
- *Clears any current settings*
- *Sets the **GPIO library** connectors*
- *Sets **GPIO 11** as an output*
- ***Loop** while condition is True*
- ***Turns on** pin 11 (LED)*
- *Wait for **1 second***
- ***Turns off** pin 11 (LED)*
- *Wait for **1 second***
- *Puts message on screen*

Challenges

Using Python
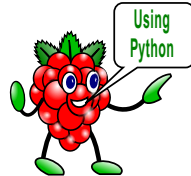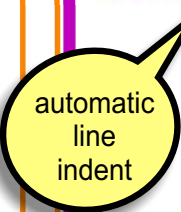
(a) Alter the speed of the blinking **LED** and alter the print **message.**
(b) Get three LEDs to flash randomly by using 11, 12 and 15 connectors
   Note - You will need 3 x LEDs, 3 x 330ohm resistors and a breadboard for (b)