Intro to Raspberry Pi

ECE 196
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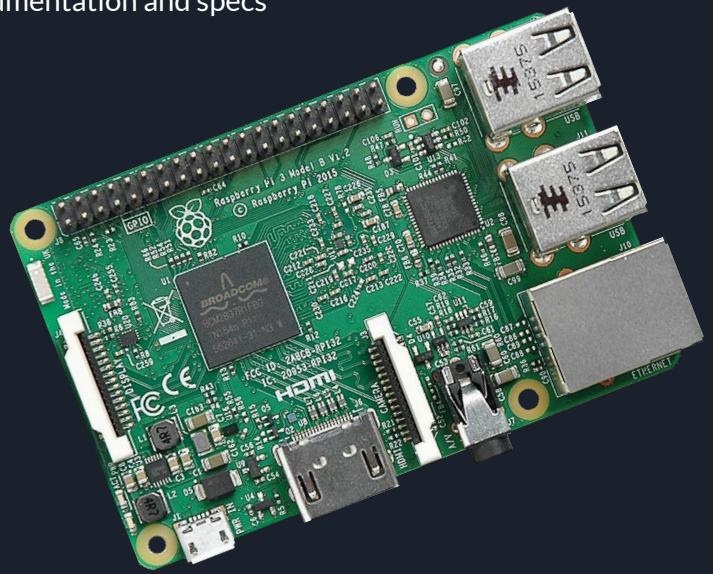
Agenda

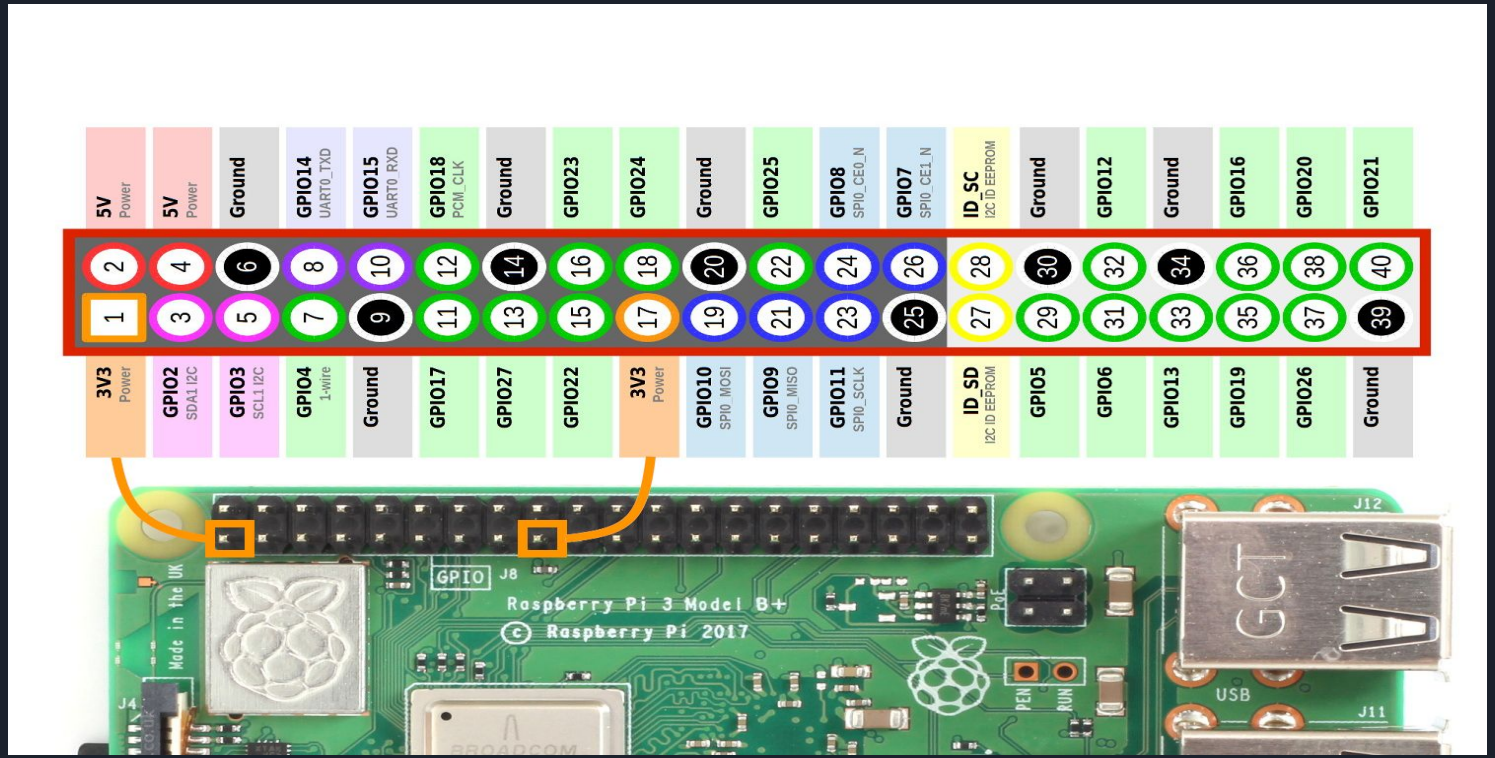
- Use the following link for RPi setup
- What if Raspberry Pi?
- “Hello World” of Circuits in RPi
- RGB LED
- DHT22 Sensor

What is Raspberry Pi?

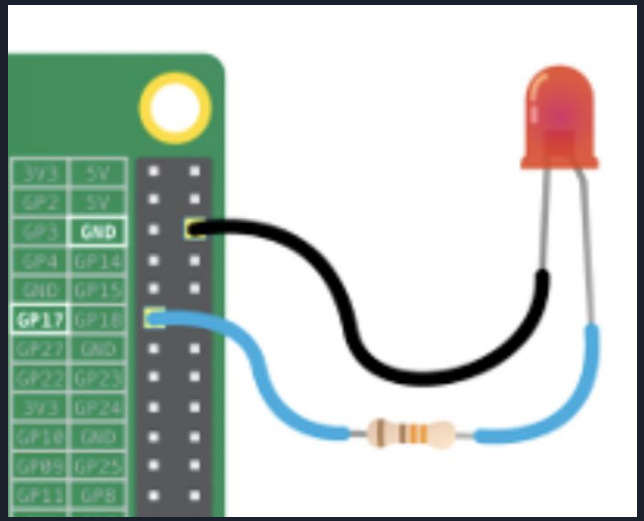
- RPi is a “low cost, credit-card sized computer”
- Does need a power supply, keyboard, and potentially a monitor
  - Refer to the following link for the official documentation and specs
- It can be used to learn how to program



Raspberry Pi Pinout



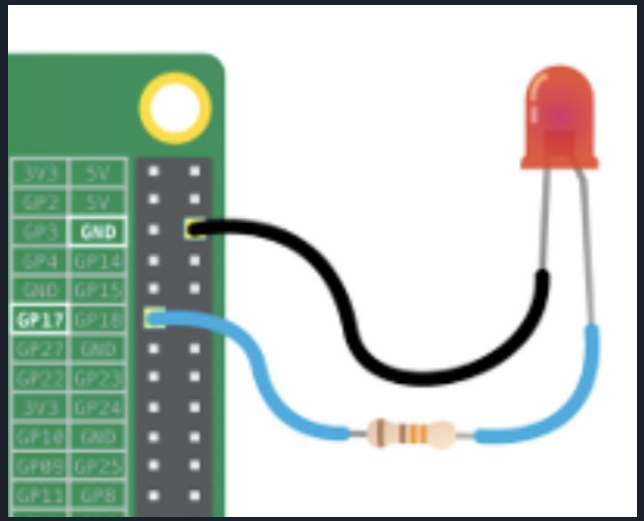
“Hello World” of Circuits



LED Circuit

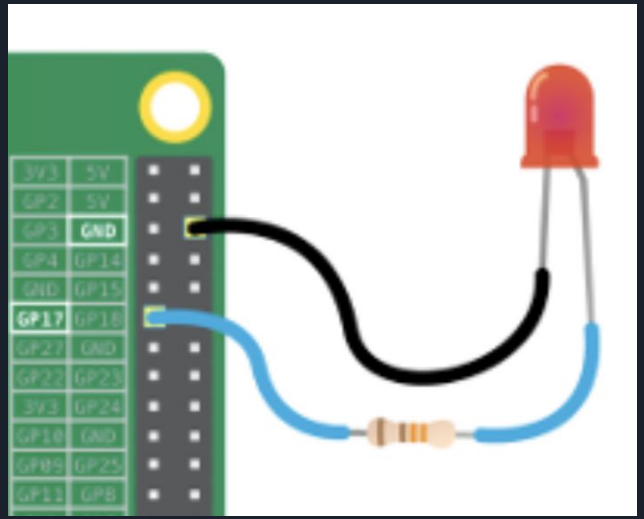
- Cathode (-) → Ground
- Anode (+) → One end of Resistor
- Resistor → GPIO Pin

“Hello World” of Circuits -- Python Code



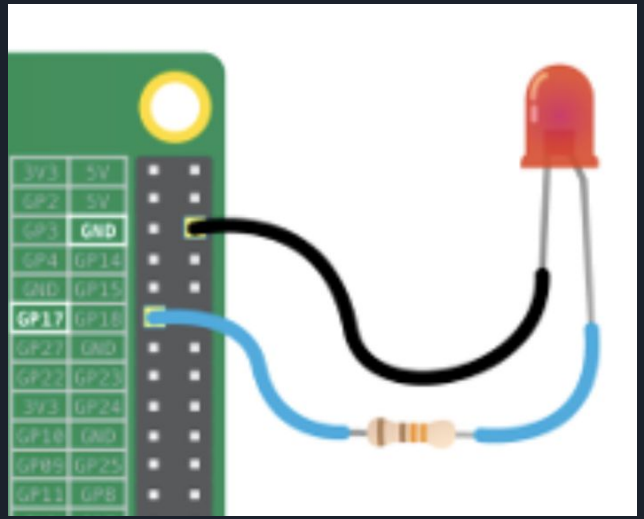

```
import RPi.GPIO as GPIO

import time

GPIO.setmode( GPIO.BCM )

GPIO.setwarnings( False )

GPIO.setup( 17, GPIO.OUT )

GPIO.output( 17, GPIO.HIGH )

time.sleep( 1 )

GPIO.output( 17, GPIO.LOW )
```

Challenge 1



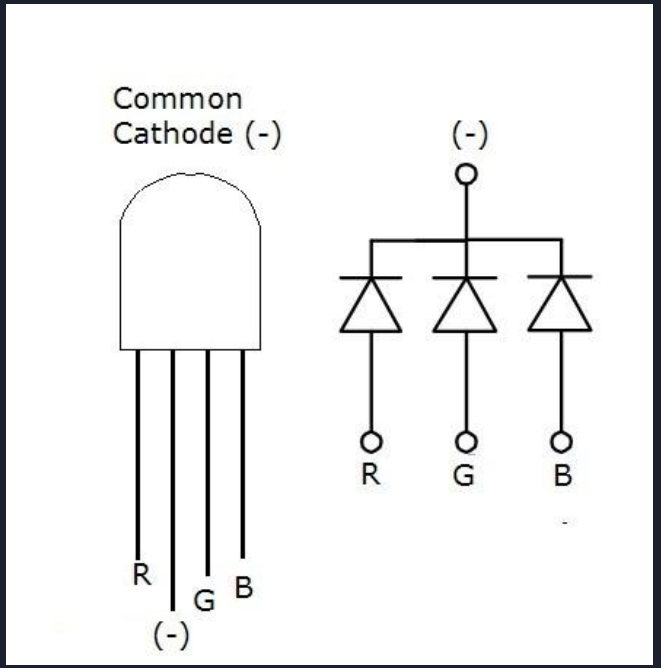
Modify the code so that LED blinks indefinitely every half a second.

Challenge 1: Solution

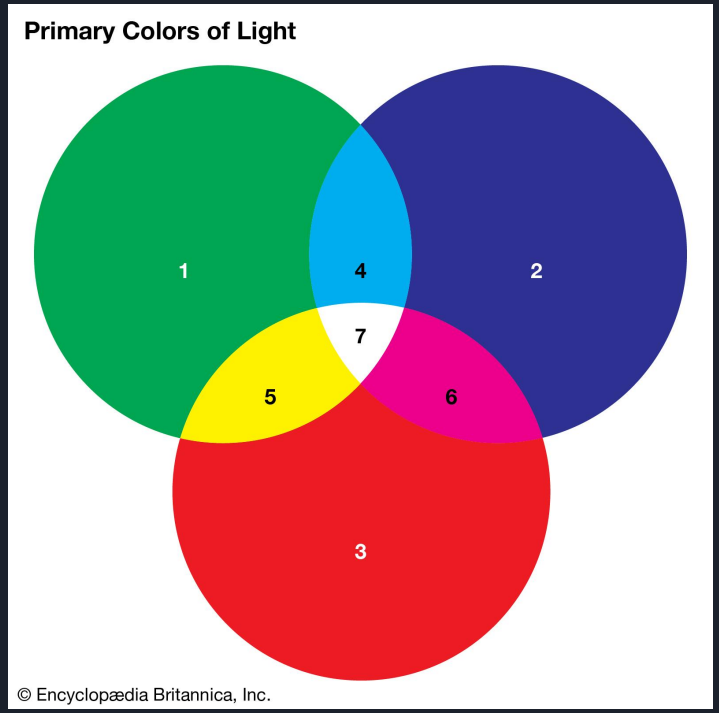


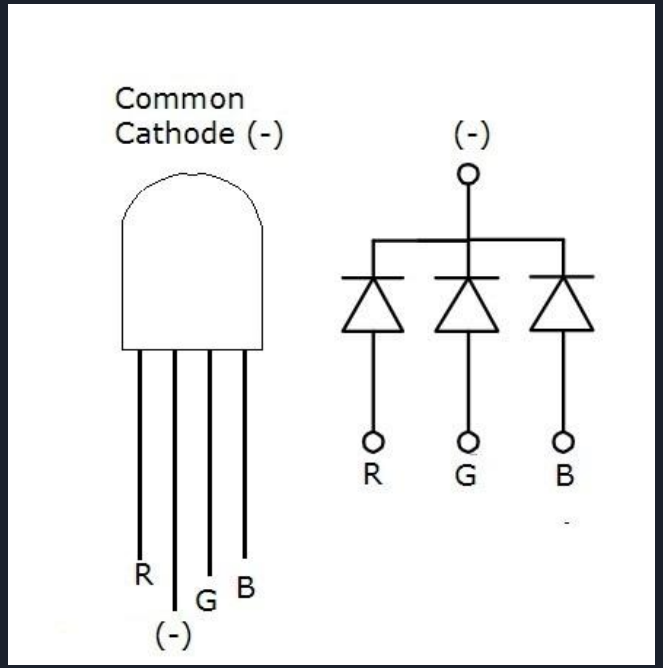

```
while 1:
        GPIO.output( 17, GPIO.HIGH )
        time.sleep( 0.5 )
        GPIO.output( 17, GPIO.LOW )
        time.sleep( 0.5 )
```

RGB LED

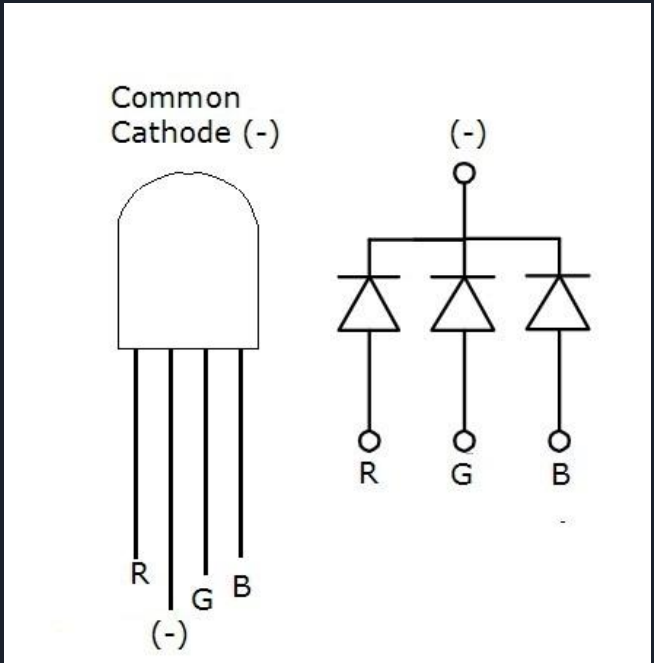


RGB LED -- Color Spectrum





Challenge 2



Write a python script that blinks through all possible spectrum of colors. Do so in the following order:

> Red → yellow → green → cyan → blue → magenta → white

Have a 1 sec delay between each transition.

NOTE: don't forget the resistor before each of the RGB terminals

Challenge 2 -- Solution

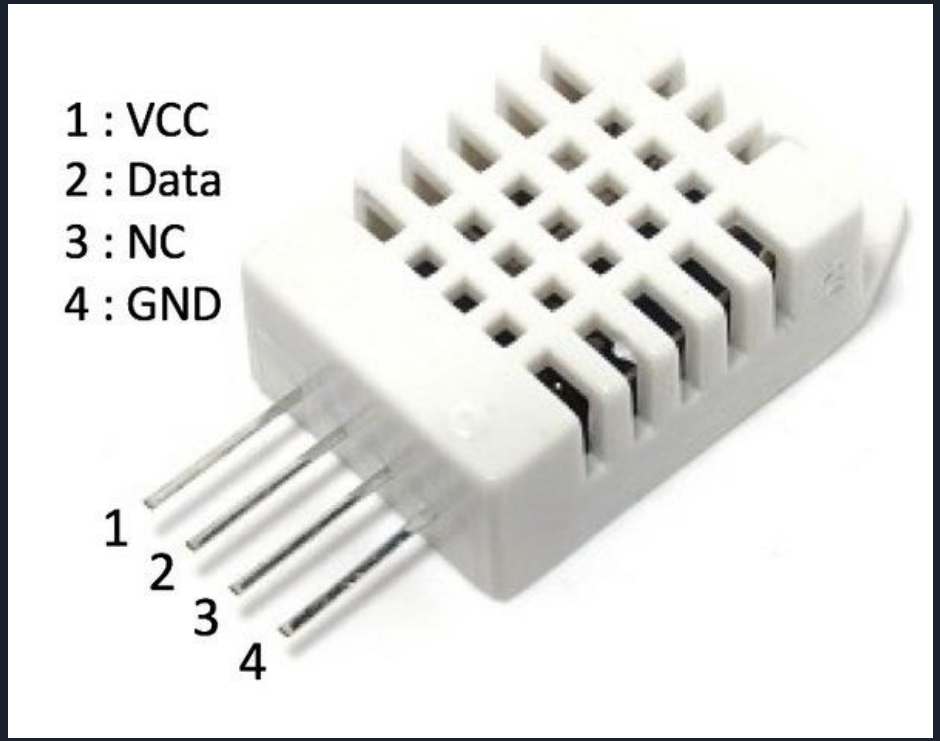
```
import RPi.GPIO as GPIO
import time

GPIO.setmode( GPIO.BCM )
GPIO.setwarnings( False )

RED_PIN = 17
GREEN_PIN = 27
BLUE_PIN = 22

GPIO.setup( RED_PIN, GPIO.OUT )
GPIO.setup( GREEN_PIN, GPIO.OUT )
GPIO.setup( BLUE_PIN, GPIO.OUT )
```

```
def blink( red, green, blue ):
        GPIO.output( RED_PIN, red )
        GPIO.output( GREEN_PIN, green )
        GPIO.output( BLUE_PIN, blue )

        time.sleep( 1 )
        GPIO.output( RED_PIN, GPIO.LOW )
        GPIO.output( GREEN_PIN, GPIO.LOW )
        GPIO.output( BLUE_PIN, GPIO.LOW )
        time.sleep( 1 )
```

Challenge 2 -- Solution Cont.

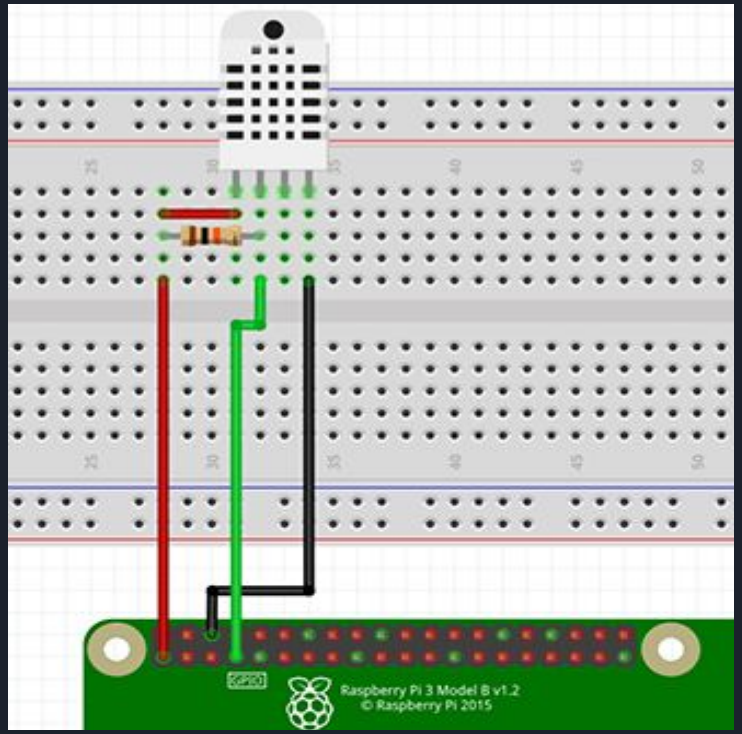
```
blink( GPIO.HIGH, GPIO.LOW, GPIO.LOW )      ## Red
blink( GPIO.HIGH, GPIO.HIGH, GPIO.LOW )     ## Yellow
blink( GPIO.LOW, GPIO.HIGH, GPIO.LOW )      ## Green
blink( GPIO.LOW, GPIO.HIGH, GPIO.HIGH )     ## Cyan
blink( GPIO.LOW, GPIO.LOW, GPIO.HIGH )      ## Blue
blink( GPIO.HIGH, GPIO.LOW, GPIO.HIGH )     ## Magenta
blink( GPIO.HIGH, GPIO.HIGH, GPIO.HIGH )    ## White
```

DHT22 Sensor



DHT22 sensor is primarily used as a humidity and temperature sensor.

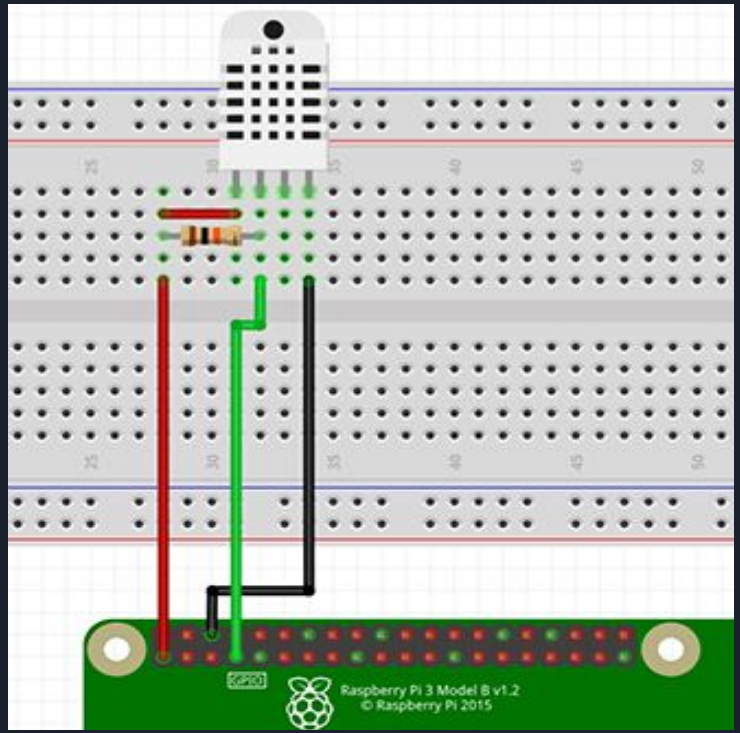
DHT22 Circuit




```
import Adafruit_DHT

DHT_SENSOR = Adaruit_DHT.DHT22
DHT_PIN = 4

hum, temp = Adaruit_DHT.read_retry(
                                    DHT_SENSOR, DHT_PIN )

print( “Humidity =”, hum )
print( “Temperature =”, temp)
```

NOTE: 10K resistor was used here

Challenge 3



Modify the code to read the temperate and humidity every 10 sec.

Challenge 3 -- Solution

```
import Adafruit_DHT

DHT_SENSOR = Adaruit_DHT.DHT22
DHT_PIN = 4

while 1:
        hum, temp = Adaruit_DHT.read_retry( DHT_SENSOR, DHT_PIN )

        print( “Humidity =”, hum )
        print( “Temperature =”, temp)

        time.sleep( 10 )
```