LIGHTS 2
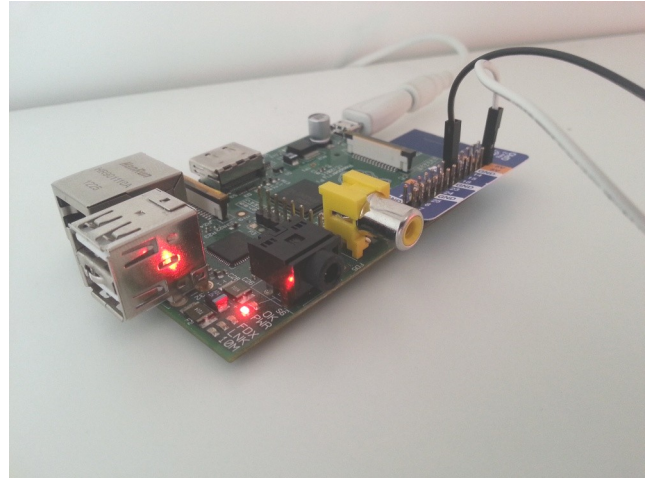# TRAFFIC LIGHTS

LEVEL: **BEGINNER**

COMPUTING PoS KS1:
• Understand what algorithms are
• Create and debug simple programs
• Use logical reasoning to predict the behaviour of simple programs

COMPUTING PoS KS2:
• Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems
• Use sequence, selection, and repetition in programs
• Use logical reasoning to explain how some simple algorithms work

PROGRESSION PATHWAYS:
• I know what an algorithm is and I can express simple algorithms using symbols
• I can create a simple program
• I can run, check and change programs

PERFORM

What is the sequence for traffic lights?
(Red; Red/Amber; Green; Amber; repeat)
Find actual lights or video to record sequence.

Equipment: Double sided A4 cards: Red/Amber/ Green bulb on/off; 3 actors: Red/Amber/Green Lightbulbs

Act Out:

1) Lightbulb actors stand next to each other – Red on – Amber & Green off
2) Amber actor turns light on.
3) Red and Amber off
4) Green Off – Amber on
5) Repeat 1) through 4)

PLAN

Can you write the pseudocode for the traffic light sequence?

Pseudocode:

```
Start
    Repeat
        Turn Red On; Amber Off; Green Off
        Wait 1 Second
        Turn Amber On
        Wait 1 Second
        Turn Green On; Red off; Amber Off
        Wait 1 Second
        Turn Amber On; Green Off
        Wait 1 second
```

Flow Diagram:

START → RED ON; AMBER OFF; GREEN OFF → WAIT 1 SEC → AMBER ON → WAIT 1 SEC → AMBER OFF; GREEN ON → WAIT 1 SEC → AMBER ON; GREEN OFF → WAIT 1 SEC → (back to RED ON; AMBER OFF; GREEN OFF)
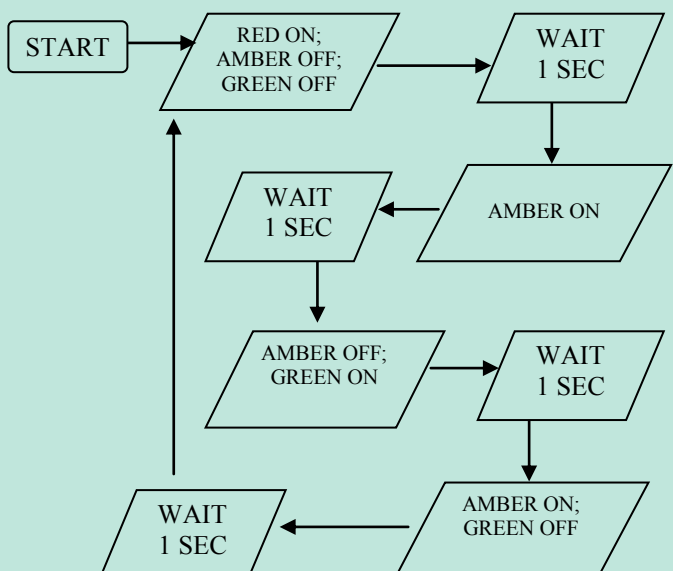
LIGHTS 2
TRAFFIC LIGHTS

PROGRAM: SCRATCH

Equipment: Raspberry Pi; 3 x LEDs (Red, Amber, Green); 2 x Female to Female Jumper Leads; or use 1 x Pi-Stop; Pi Leaf (Optional)

Using pseudocode/flow diagram what blocks in Scratch will we need to use?

Method:
1) Attach +ve (long) leg of Red LED to Pin 26 of the Raspberry Pi using one of jumper leads; Amber LED to Pin 24; Green LED to Pin 22
2) Attach -ve (short) leg of Red LED to Pin 20 (Ground) of the Raspberry Pi; Amber LED to Pin 25 (Ground); Green LED to Pin 6 (Ground)
(If using Pi-Stop then use Pins 20, 22, 24 and 26 ensure Ground is Pin 20.)

You need to use Scratch GPIO
See http://cymplecy.wordpress.com/scratchgpio/ for details.

To buy Pi-Stops use 4tronix
http://4tronix.co.uk/store/index.php?rt=product/product&product_id=390
To use Pi-Stops see detailed information here
https://github.com/PiHw/Pi-Stop

Code:

PROGRAM: PYTHON3

Equipment: Raspberry Pi; 3 x LEDs (Red, Amber, Green); 2 x Female to Female Jumper Leads; or use 1 x Pi-Stop; Pi Leaf (Optional)

Method:
) Attach +ve (long) leg of Red LED to Pin 26 of the Raspberry Pi using one of jumper leads; Amber LED to Pin 24; Green LED to Pin 22
2) Attach -ve (short) leg of Red LED to Pin 20 (Ground) of the Raspberry Pi; Amber LED to Pin 25 (Ground); Green LED to Pin 6 (Ground)
(If using Pi-Stop then use Pins 20, 22, 24 and 26 ensure Ground is Pin 20.)

You need to download and install the RPi GPIO library – see http://pythonhosted.org/RPIO/ for instructions

Code:

```python
import RPi.GPIO as GPIO      #GPIO Library
import time                  #for "sleep"

#set up Pins
GPIO.setmode(GPIO.BOARD)     #use Board numbering
GPIO.setup(22, GPIO.OUT)     #pin 22 to output
GPIO.setup(24, GPIO.OUT)     #pin 24 to output
GPIO.setup(26, GPIO.OUT)     #pin 26 to output
#repeat
For i in range(0,10):        #ten times
    GPIO.output(26, true)     #red ON
    GPIO.output(24, false)    #amber OFF
    GPIO.output(22, false)    #green OFF
    time.sleep(1)             #1 sec
    GPIO.output(24, true)     #amber ON
    time.sleep(1)             #1 sec
    GPIO.output(26, false)    #red OFF
    GPIO.output(24, false)    #amber OFF
    GPIO.output(22, true)     #green ON
    time.sleep(1)             #1 sec
    GPIO.output(24, true)     #amber ON
    GPIO.output(22, false)    #green OFF
    time.sleep(1)             #1 sec

GPIO.cleanup()
```

EXTENSION:

How would a second set lights interact with this one at a junction? Or opposite side of a bridge? What should be on opposite light if green is displayed on one?

PERFORM the two sets of lights.
Create associated pseudocode and flow diagram as your PLAN.
Then PROGRAM for Scratch and/or Python3.