Name: _____

An tSraith Shóisearach do Mhúinteoirí

Junior CYCLE for teachers

Elective Webinar 2020/2021

'Supporting Mechatronics in Engineering'

Specification

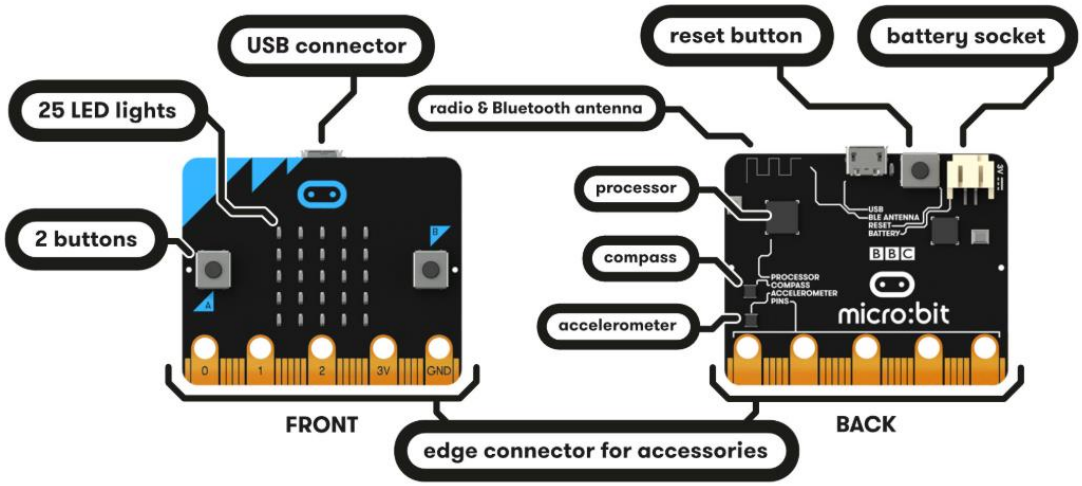
Ionad Oideachais Mhuineacháin

An Roinn Oideachais agus Scileanna
Department of Education and Skills

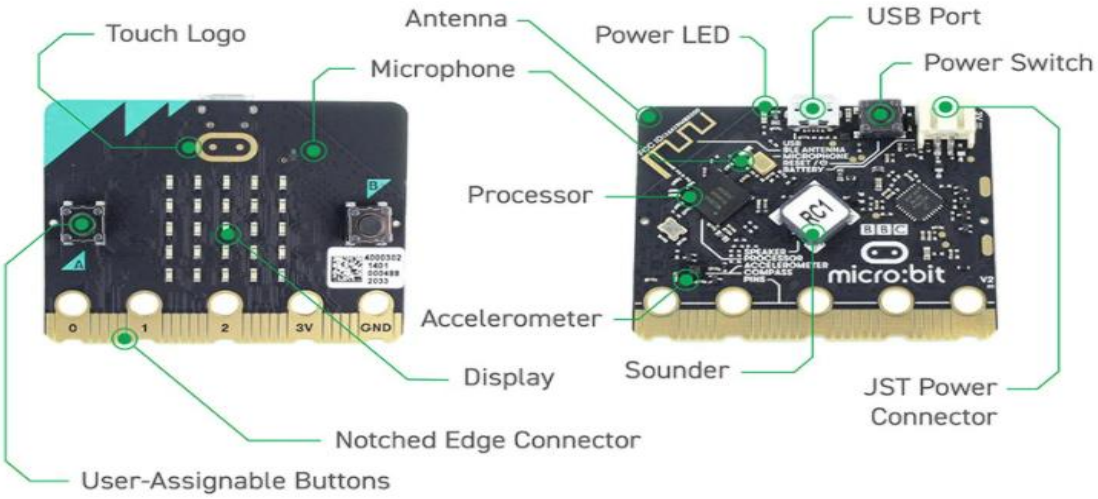
Micro:bit Microcontroller Board

What is it? Why would we use it?

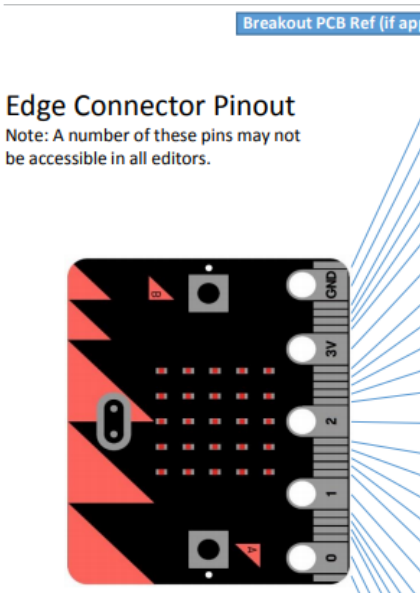
- Stimulus to drive learning
- It is a pocket-sized computer
- Pre-populated and pre-soldered
- Multiple inputs/outputs
- Options for break-out boards and additional soldering
- Free coding software
- Many students will have prior knowledge



The new micro:bit (due November/December)

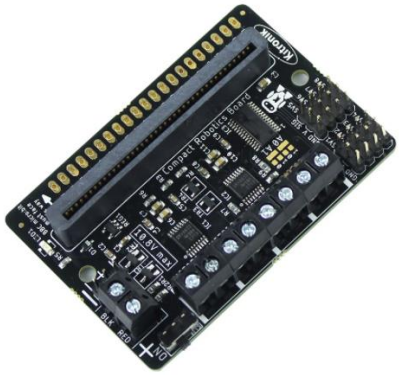


Edge Connector Pin Description



Breakout PCB Ref (if applicable)	Name	Description
22	0V	0V / ground
0V	0V	0V / ground
21	0V	0V / ground
20	SDA	Serial data pin connected to the magnetometer & accelerometer
19	SCL	Serial clock pin connected to the magnetometer & accelerometer
18	3V	3V / positive supply
3V	3V	3V / positive supply
17	3V	3V / positive supply
16	DIO	General purpose digital IO **(P16 in editors)**
15	MOSI	Serial connection - Master Output / Slave Input
14	MISO	Serial connection - Master Input / Slave Output
13	SCK	Serial connection - Clock
2	PAD2	General purpose digital / analogue IO **(P2 in editors)**
12	DIO	General purpose digital IO **(P12 in editors)**
11	BTN_B	Button B – Normally high, going low on press **(Button B in editors)**
10	COL3	Column 3 on the LED matrix
9	COL7	Column 7 on the LED matrix
8	DIO	General purpose digital IO **(P8 in editors)**
1	PAD1	General purpose digital / analogue IO **(P1 in editors)**
7	COL8	Column 8 on the LED matrix
6	COL9	Column 9 on the LED matrix
5	BTN_A	Button A – Normally high, going low on press **(Button A in editors)**
4	COL2	Column 2 on the LED matrix
0	PAD0	General purpose digital / analogue IO **(P0 in editors)**
3	COL1	Column 1 on the LED matrix

All-in-One Robotics Board

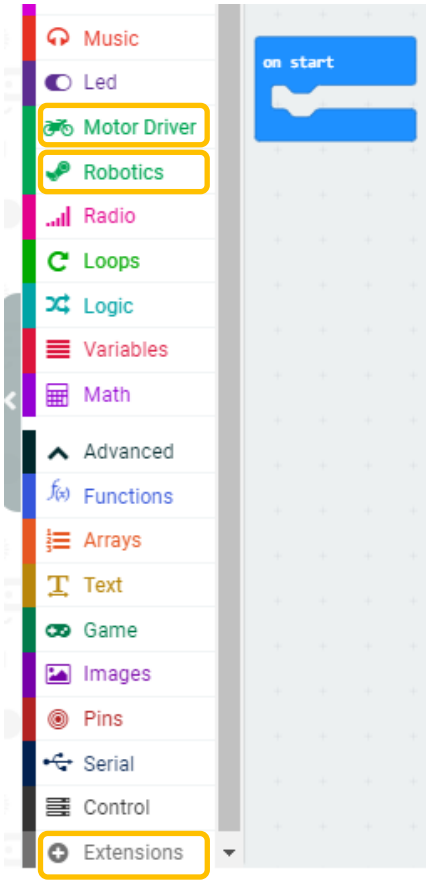


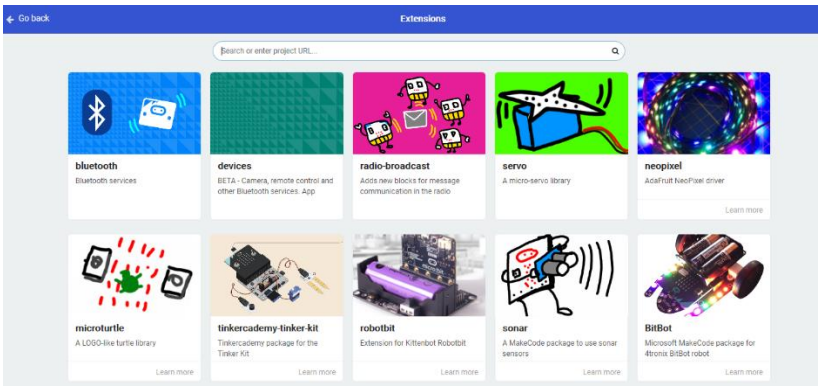
- It can drive 4 motors (or 2 stepper motors) and 8 servos.
- All the usable pins of the micro:bit are broken out to a 2.54mm link header.
- The 17 available I/O pins allow other input devices, such as sensors, or output devices, such as ZIP LEDs, to be added to the board.
- Power is provided via either a terminal block or servo-style connector.

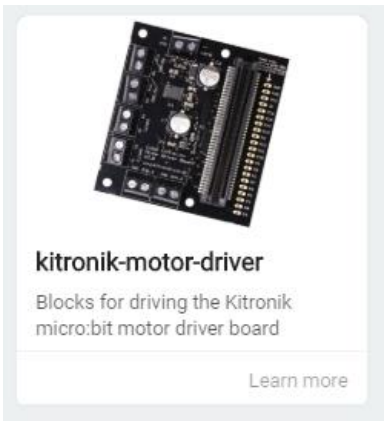
Video: https://youtu.be/EVowN8RN8nU

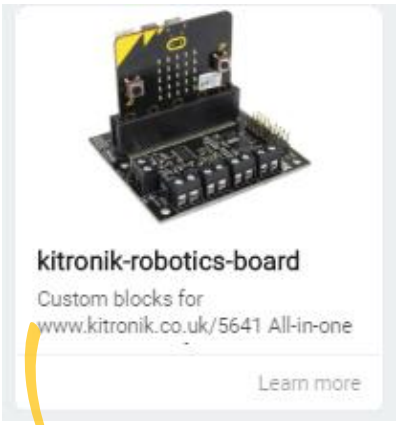
Adding Extensions

Additional extensions can be added to use different breakout boards.
Simply click on ‘advanced’ and select ‘extensions’ at the bottom of the coding branch.

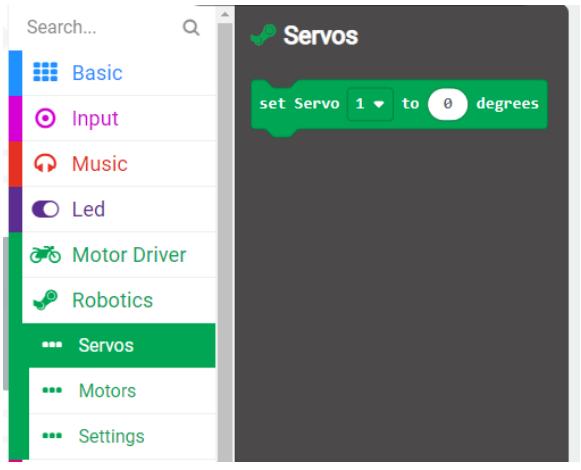








Search for ‘All-in-one-robotics-board’ and click on the ‘Kitronik-robotics-board’ to add it to the branch.



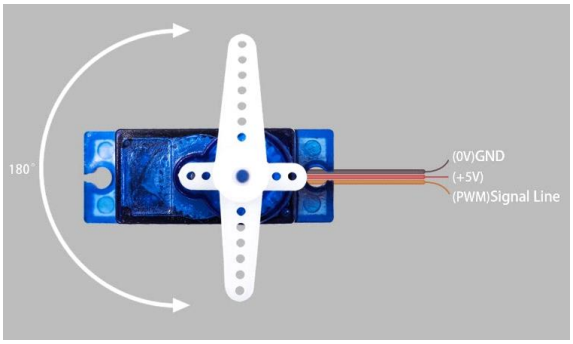
Using a Servo Motor

Why?

- Encourages creative thinking and problem solving
- Safe failure experience for students

- High level of control
- Continuous rotation or limited range- e.g. 0°-180°

Angular Servo:
Set range, e.g. 0° to 180°

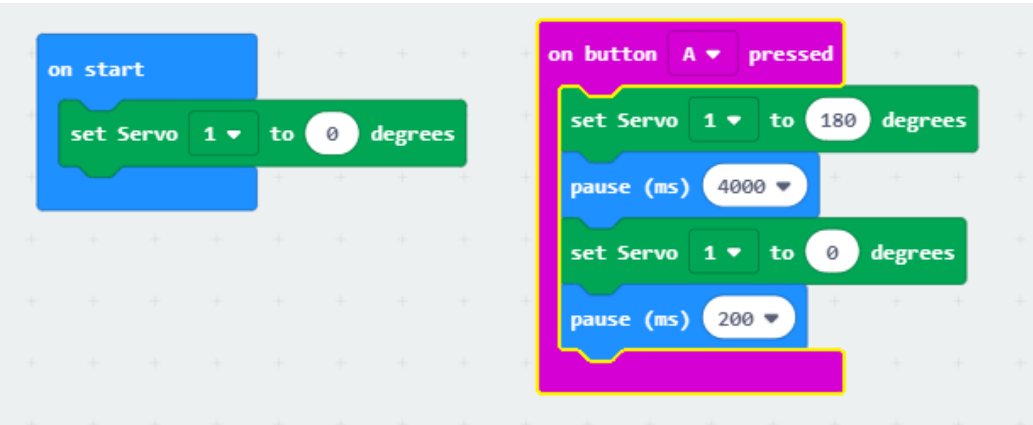


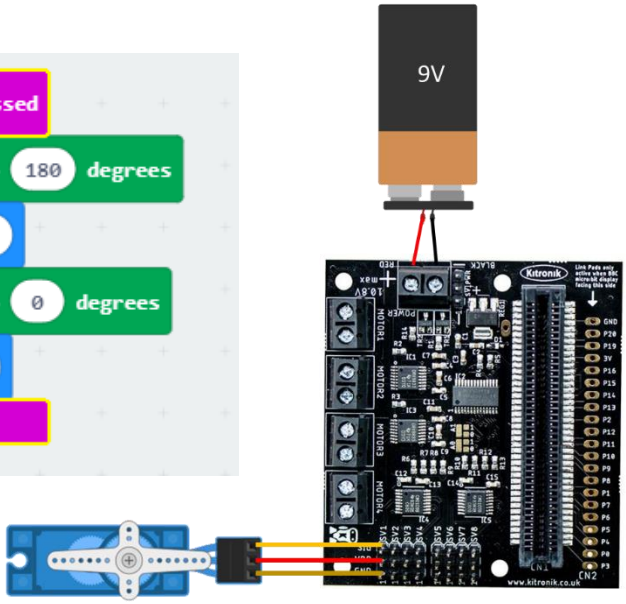
Continuous Servo:
You cannot stop a continuous servo at a particular degree i.e. 256° but, the direction and variable speed can be controlled, however, through trial and error you can stop it at a set degree.

Coding an Angular Servo to any Degree

Micro:bit activity:

Introduction activity: moving a servo





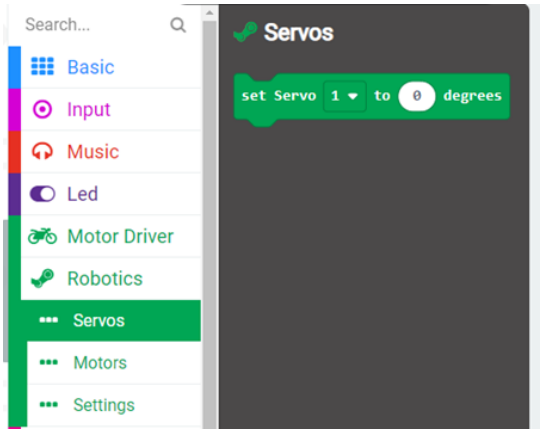
All colour blocks refer to a specific command in make code

Blue is for Basic

Pink is for Input

Red is for Music

Green is for Robotics or Motor Driver



Steps

1. Using the 'Basic' tab, select the 'on start' block in the coding section, and drop 'set servo 1 to 0 degrees' in the gap to create a chain
2. Using the 'Basic' tab, place an 'on button pressed' block and choose which input you want, A, B or A+B pressed
3. Using the 'Robotics' tab, place the 'set servo 1 to 0 degrees' and change the number to 180 or any other number
4. Using the 'Basic' tab, place 'the pause (ms) 0' block and change it to '4000'
5. Using the 'Robotics' tab, place the 'set servo 1 to 0 degrees' and change the number to 0
6. Using the 'Basic' tab. place 'the pause (ms) 0' block and change it to '200'

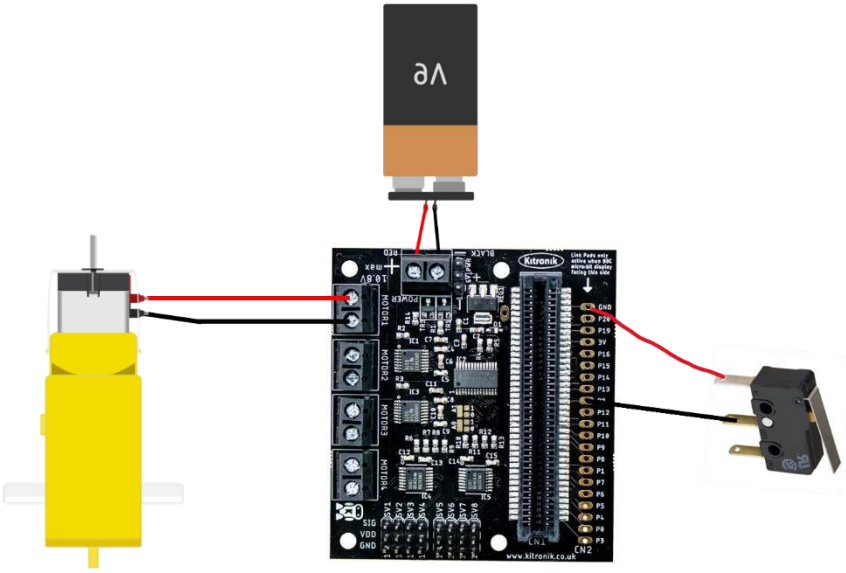
Coding an External Switch to Function

The ‘limit switch’ is soldered into two connection points on the track pad:

COM leg – GND
NO leg - P2

Why?

From page 3 of the learning log we can see that P2 is an input but we could also use P0 or P1. If we have more than one switch, we could include them on those inputs. Connecting it to ‘GND’ completes the circuits like any simple circuit



All colour blocks refer to a specific command in make code

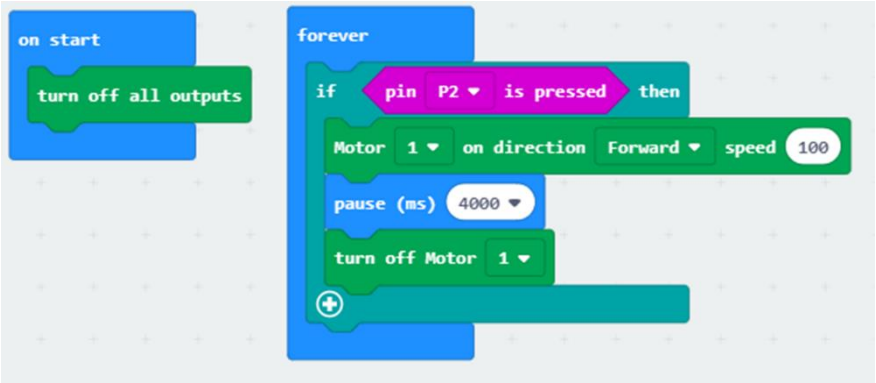
Blue is for Basic

Pink is for Input

Red is for Music

Green is for Robotics or Motor Driver

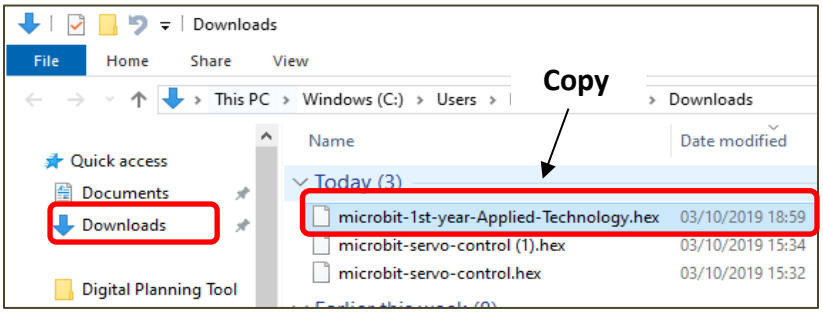
Aqua is for Logic

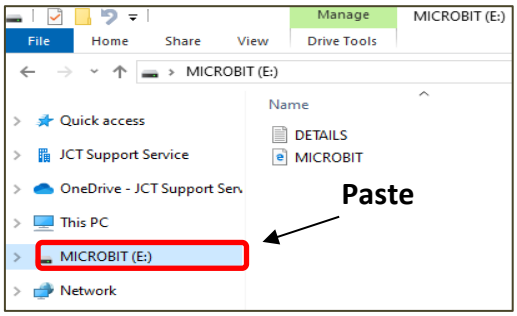


1. Using the ‘Basic’ tab, place ‘on start’ into the code screen and add ‘turn off all outputs’ to the middle of it.
2. Using the ‘Basic’ tab, ‘forever’ loop button to be brought out, it means that this program will run always until a new one is put on the micro:bit
3. From the ‘Logic’ tab, bring out the ‘if true then’ option
4. From the ‘Input’ tab, bring out the ‘pin P0 is pressed’ option that looks like the diagram and drag it and place it over the true option on the ‘if true then’ block
5. Using the drop-down button change P0 to P2 (where we soldered in the limit switch)
6. From the ‘Robotics’ tab, bring ‘out motor 1 on direction forward speed 0’ you can use the drop down to change the direction of rotation of the motor and a value of 1-100 for the speed of the motor 100 being the fastest
7. From the ‘Basic’ tab, bring out the ‘pause (ms) 0’ block, change the seconds to control the length of time the motor will run
8. Finally, from the ‘Robotics’ tab, bring the ‘turn off motor 1’ to the chain

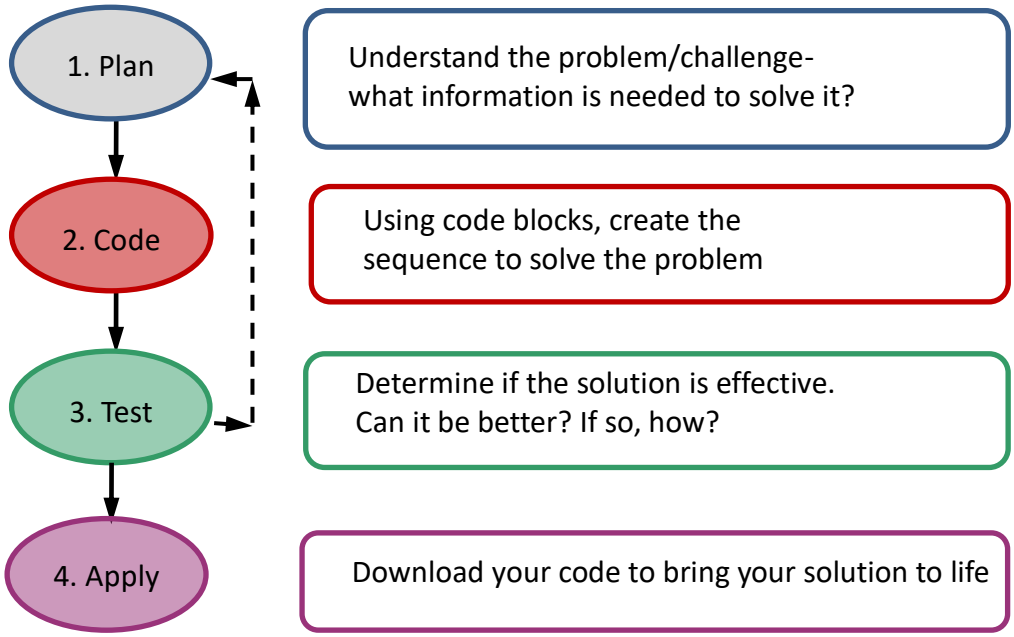
To Transfer the HEX File to the Micro:bit

Once the file is downloaded, 'copy' the file from the Downloads folder and 'paste' it into the micro:bit drive.





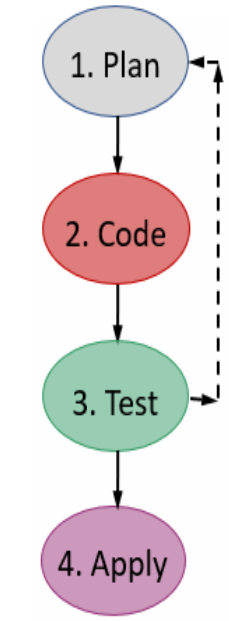
Planning for Skills Development in Coding



Create an electronically controlled model of an adjustable shelving unit.

It should be used in order to minimise the amount of reaching and lifting in an Engineering room.

Planning Process



What is the problem?

What does the code have to do?

What components and code blocks would be useful here?

An tSraith Shóisearach do Mhúinteoirí

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