



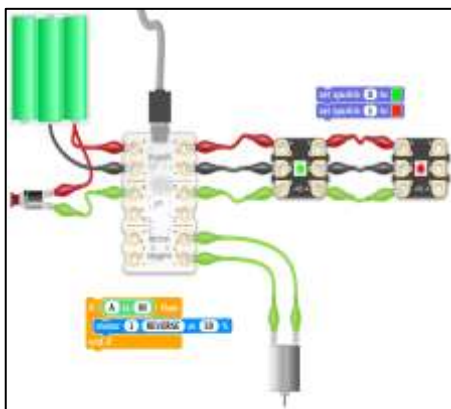
# COMPUTING: PROGRAMMING

## KNOWLEDGE ORGANISER



### Overview

#### Selection in Physical Computing



- Programming is when we make and input a set of instructions for computers to follow.
- Microcontrollers are devices that can be programmed to control output devices that are connected to them.
- We use algorithms which we can plan, model, trial and debug, in order to create accurate command sequences, involving multiple output devices (e.g. LEDs and motors).

### Programming Commands

- For programming, we should use the microcontroller software.
- Crumble uses command blocks (like Scratch).

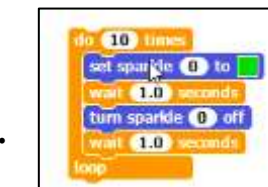
- **Adding/Removing Commands:** To add a command block, drag it from the menu towards the program. When the grey arrow appears, the command will snap into the program. To remove a command block, drag it away from the program and back to the menu.



- **Modifying Commands:** Clicking on the colour square in the command block allows us to change the Sparkle's colour. To change the time of commands, click on the value. Delete the current value and type in the new value. Press enter after completed.



- **Count Controlled Loops:** These allow us to put programs on a loop. Count Controlled Loops are found in the 'Control' options. Drag the desired program into the Count Controlled Loop command block. 'Do until' loops allow commands to happen until a condition is met.



### Microcontrollers, LEDs and Motors

- **Microcontrollers:** A microcontroller is a small device that can be programmed to control devices that are connected to it.



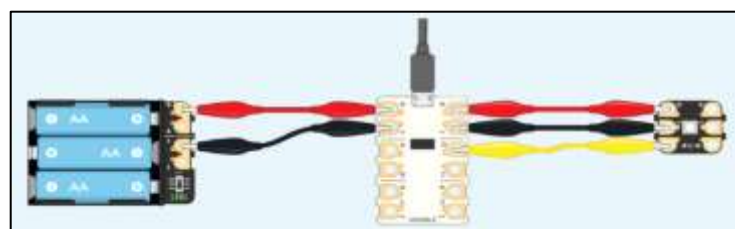
- One brand of widely used microcontroller is called a Crumble controller, which can be used to control many things, e.g. LEDs and motors.

#### LEDs:

- LEDs are output devices that emit light. When electricity is passed through an LED it produces light. One type of LED light, controlled by a Crumble controller, is called a Sparkle.



#### Creating Circuits:



- The USB port connects the microcontroller to a computer. Crocodile clips pass electricity and data through to the LED/motor.

- The + and - power pads on the Crumble should be connected with the + and - power pads on the Sparkle and battery box. The D pads on the Crumble and Sparkle should also be connected.

#### Motors:

- Motors are another output device. A motor can start, stop, spin forwards, spin backwards, and go at different speeds.



### Sequencing and Algorithms

- A **sequence** is a pattern or process in which one thing follows another.

- We design **algorithms** (sets of instructions for performing a task) to help us program sequences involving multiple output devices (e.g. LEDs and motors).



- **Programming** is the process of keying in the code recognized by the computer into the software (using your algorithm).

### Trialling and Debugging

- Programmers do not put their computer programs straight to work. They **trial** them first to find any errors:



- **Sequence errors:** An instruction in the sequence is wrong or in the wrong place.

- **Keying errors:** Typing in the wrong code.

- **Logical errors:** Mistakes in plan/thinking.

- If your algorithm does not work correctly the first time, remember to **debug** it.

### Important Vocabulary

Programming

Circuit

Electricity

Microcontroller

Code

LED

Algorithm

Motor

Modify

Debugging