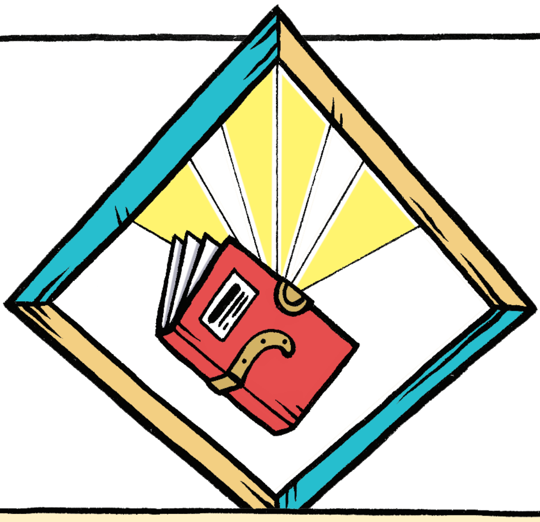
KNOWLEDGE



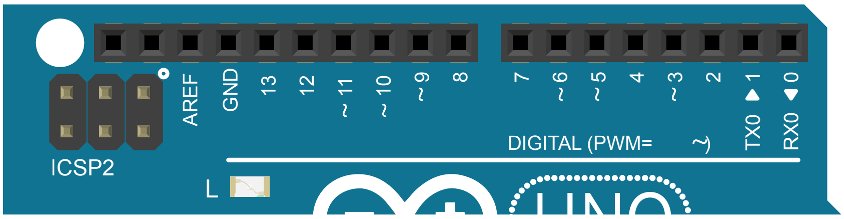
DIGITAL OUTPUTS

How the Arduino board can control
a voltage of 5 volts

ASSOCIATED SHEETS

Inputs & Outputs
Light up a LED

A digital output is a pilotable source of voltage that can only deliver two values LOW (~ GND, 0 V), and HIGH value (~ 5 V).



The Arduino board UNO contains 14 digital ports (called DIGITAL on the board), numbered from 0 to 13. Each of these ports can be declared as being an output in the microcontroller program.
The ports 0 and 1 are reserved for serial communication. You must not use them for anything else.
The port GND is the ground of the board (0 V).
The port 13 is connected to the test LED "L" on the board: when this output is in the HIGH state, the test LED is switched on, in the LOW state, it is switched off.

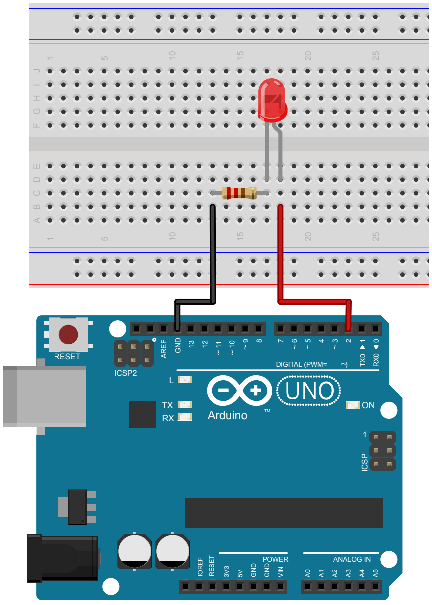
The digital ports 2 à 13 of the board can be used as outputs. If a port is declared as output, it then behaves as a provider of voltage the value of which is controlled by the microcontroller, either 0 or 5 volts.

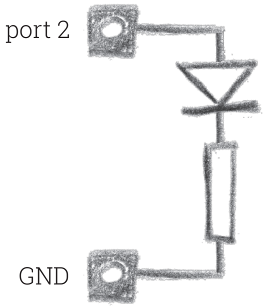
Be careful, the current that a digital port can deliver as output is limited to 40 mA: drawing more can damage the board! This type of situation can happen if a port, declared as output, is directly linked to ground (port GND) with a weak resistance (a wire), and the program switches the output to HIGH (5 V). The opposite is also dangerous (a digital output linked to a 5 V port toggled onto the LOW value). Check the value of the current that flows in your circuits!

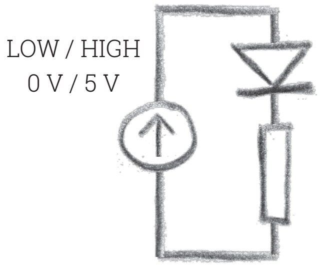
KNOWLEDGE – DIGITAL OUTPUTS

Usage examples

Here is a simple setup to control the state of a LED as well as two equivalent electrical diagrams: port 2 is equivalent to a controlled voltage source that can provide either 0 volts or 5 volts.







To control a LED, the uploaded program on the microcontroller must define the digital port 2 as output (see Challenge sheet "Light up a LED").
When the program flips the value of port 2 to HIGH, the LED switches on.
When the program switches the value of this port to LOW, the LED switches off.

The resistance is used to limit the current that protects both the microcontroller and the LED (which also has a critical current beyond which it smokes). If the LED is mounted in the opposite sense, it will never switch on (it is a diode).

Programming

```
pinMode(2, OUTPUT) ;       // defines digital port 2 as output
                           // put this instruction into the setup()

digitalWrite(2, HIGH) ;    // switches the state of digital port 2 to HIGH (5 V)
digitalWrite(2, LOW) ;     // switches the state of digital port 2 to LOW (0 V)
```