Arduino IDE

- Download and install instructions – https://arduino.cc
- Single one-stop, editor, compiler and library for Arduino Systems
- Board
  - UNO board, UNO-clones using CH340 USB-serial interfaces
  - Processors ATMega 328 (DIP, Quad-pack SMD)
  - Experiment, test using UNO, prototype using Nano
  - Require USB on laptop, USB cable for interfacing/power
- Language for programming (Reference)
  - Based on Processing
  - Quite similar to C++

Language Nuances (percularities)

- Case-sensitive, each statement terminated with a “;”
- Good programming practices
  - One statement on one line
  - Use tabulation/indentation to show nesting
  - Full CAPS for constants, use const instead of #define
  - Start all Class/objects with Capital letter
  - All other variables start with lower case (camelCase recommended)
  - Use /*..*/ and // for comments
- Define all functions before setup() and loop()

setup() - required

- A function, which is run only once
- Put all initialization and configuration statements here
  - Configure for Input/Output
  - Serial speed
  - Initialization of global variables
  - Setup of devices

loop() - required

- Also a function
- Runs without stopping
- When function ends, it restarts at the beginning
- All variable declared within the function are local

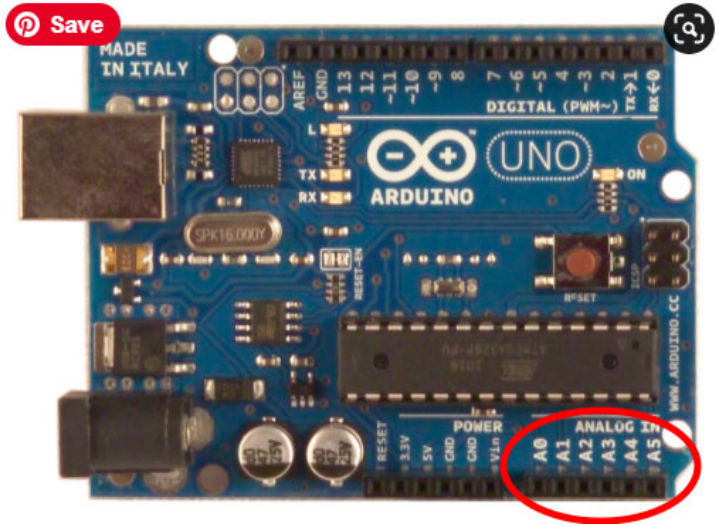
Processing statements

- Copious library of functions
- Also plenty of 3rd party libraries (sometimes too many)
- Condition statement
  - If-then-else
  - switch – case
- Loops
  - for used for definitive number of loops (e.g. n times)
  - while used for in-determinate number of loops (0, 1, or n times)
  - do..while used for in-determinate number of loops, at least once (1,..n times)

Digital Input/Output

- Digital – values are only LOW (0V), or HIGH (5V)
- Initialise/configure our Pins (0..13)
  - pinMode (<pinNumber>, <MODE>)
    - INPUT - digital input pin (reads LOW, HIGH)
    - OUTPUT – digital output pin (outputs LOW, HIGH)
    - INPUT_PULLUP – same as INPUT but connects an internal 20K resistor
- Input / Output
  - digitalRead(<pinNumber>)
    - Returns an integer based on the port reading value (LOW, HIGH)
  - digitalWrite(<pinNumber>, <LOW|HIGH>)
    - Outputs a LOW or HIGH to the pin

Analog Input



- Analog = variable voltage levels
- Inputs using only A0..A5
- Returns a value from 0..1023 based on
  - Vref
  - Voltage applied at the analog pin
- Example, if 3.1V is applied at A1
  - Value = analogRead(A1)
    - Value returned = 3.1 * 1024/5 = nnn

Analog Output

- **NO** direct analog output
- ATMega328 uses Pulse-Width Modulation (PWM)
- Voltage is proportional to the duty-cycle
- analogWrite(<pwm pin>)

Serial IO Library

- A neat way of troubleshooting your Arduino code.
- Uses the Uno's Tx and Rx pin to send data back to the IDE using the USB interface
- Serial Library
  - Serial.begin(<speed>) sets up comms speed (9600)
  - Serial.print(), Serial.println() sends data back to the host
- Use the Serial Monitor to check your answers