BARSicle

1. Arduino

Complete course to build a shack Signal Generator
15 example Arduino sketches included!

Sections

KIT-1

1. Arduino - setup, basic sketch
2. Arduino - Nano, 1st sketches
3. Arduino - OLED
4. Arduino - Encoder
5. Arduino - RTC
6. Arduino - DDS, SIGGEN
   Build

KIT-2

7. Power - RF volts / power
   Build

KIT-3

8. BPFs - design, test
9. DCRX - design
   Build

Kit - 1

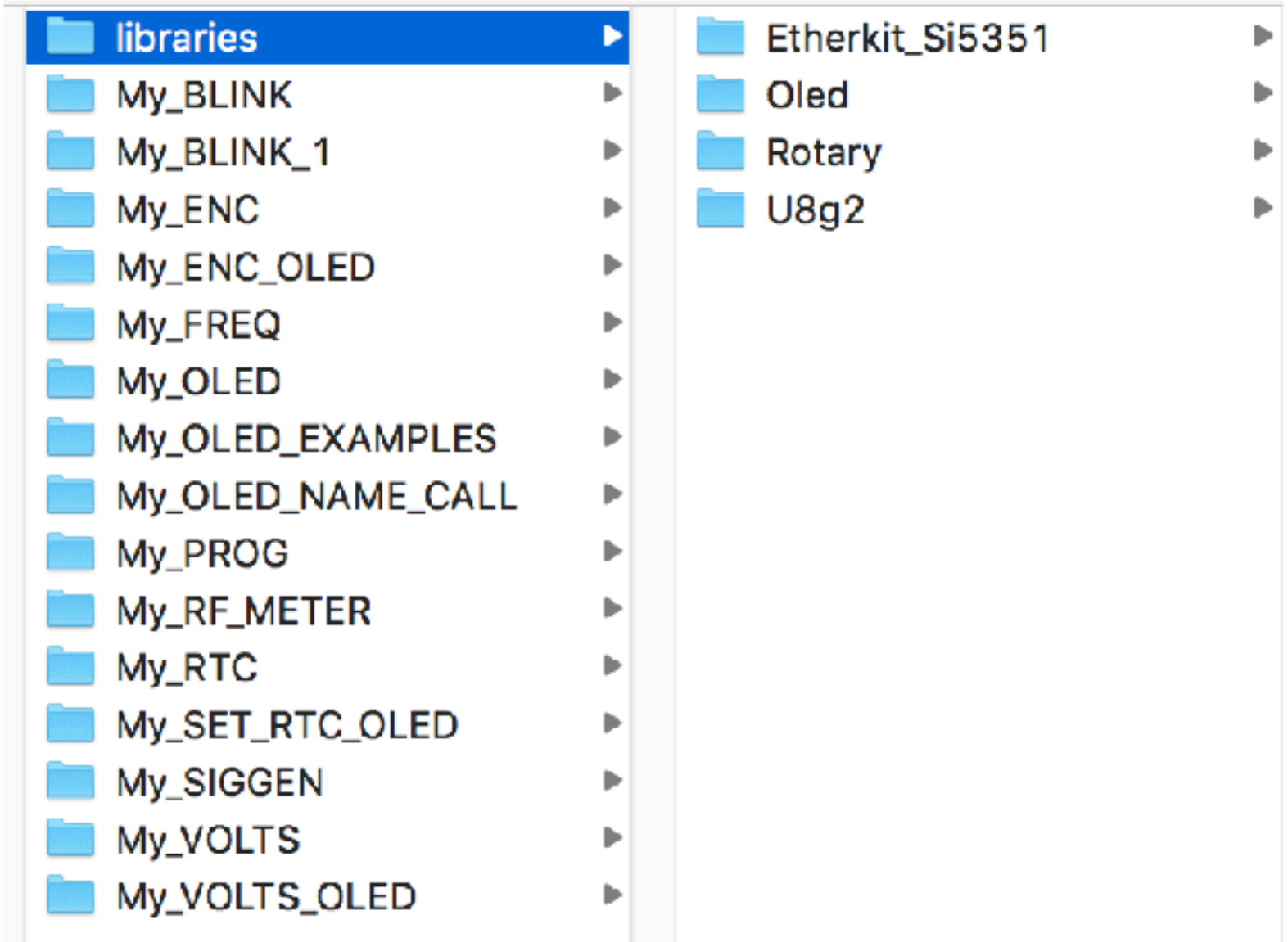
100kHz-150MHz SIGGEN

Beginners

Part	URL	Qty	Price	Total
Nano & USB	http://hobbycomponents.com/development-boards/98-arduino-compatible-nano-v30-with-free-usb-cable?search_query=nano&results=7	1	7.98	
Si5351 inc SMAs	https://www.ebay.co.uk/itm/Si5351A-I2C-IIC-25MHZ-Generator-Clock-Breakout-Module-3-3-5V-8KHz-160MHz-BSG/123006835963?hash=item1ca3c75cfb:g:2-gAAOSwPzhaQY1v	1	5.67	
RTC module	https://www.ebay.co.uk/itm/DS3231-Clock-Module-IIC-Interface-CR1220-SMD-Battery-Holder-High-Precision/401295201156?hash=item5d6f0ed384:g:9UQAAOSw8RZaaG8B	1	1.99	
ENC	http://hobbycomponents.com/sensors/502-ky-040-rotary-encoder-module?search_query=rotary+encoder&results=1	1	2.49	
OLED	https://www.amazon.co.uk/SODIAL-Display-Interface-Module-Arduino-blue/dp/B0746JRHSM?SubscriptionId=AKIAILSHYYTFIVPWUY6Q&tag=duckduckgo-osx-uk-21&linkCode=xm2&camp=2025&creative=165953&creativeASIN=B0746JRHSM	1	4.14	
LED 100 pcs	http://hobbycomponents.com//131-100pcs-led-3mm-and-5mm-led-light-emitting-diode-in-red-green-and-yellow?search_query=led&results=85	1		
220R/0.5W 50pcs	http://hobbycomponents.com/resistors/728-14w-wire-ended-resistors-choose-value-and-quantity?search_query=resistors&results=16	1		
M-M Wires	http://hobbycomponents.com/cables/650-male-to-male-dupont-cable-10cm	1	2.10	
Breadboard 700	http://hobbycomponents.com/prototyping/221-breadboard-700-point-solderless-pcb?search_query=breadboard&results=31		3.00	
KIT 1				27.37

Cost of PCB/Box and few other bits for final build TBA

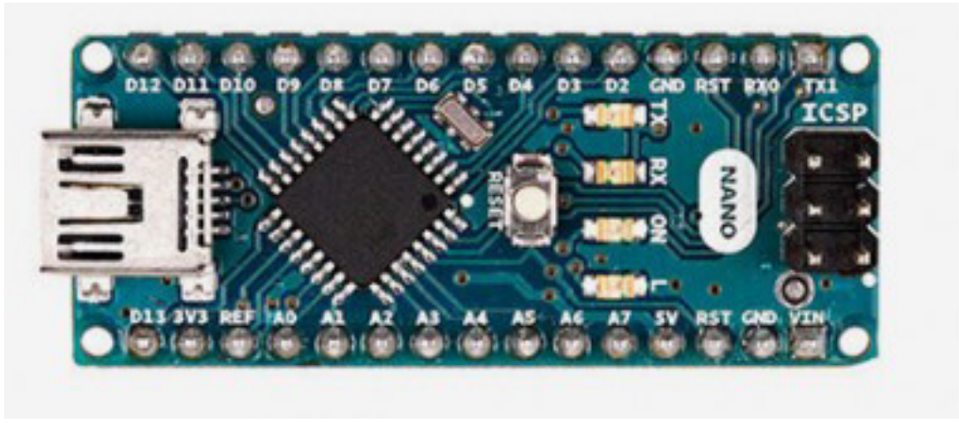
Code provided



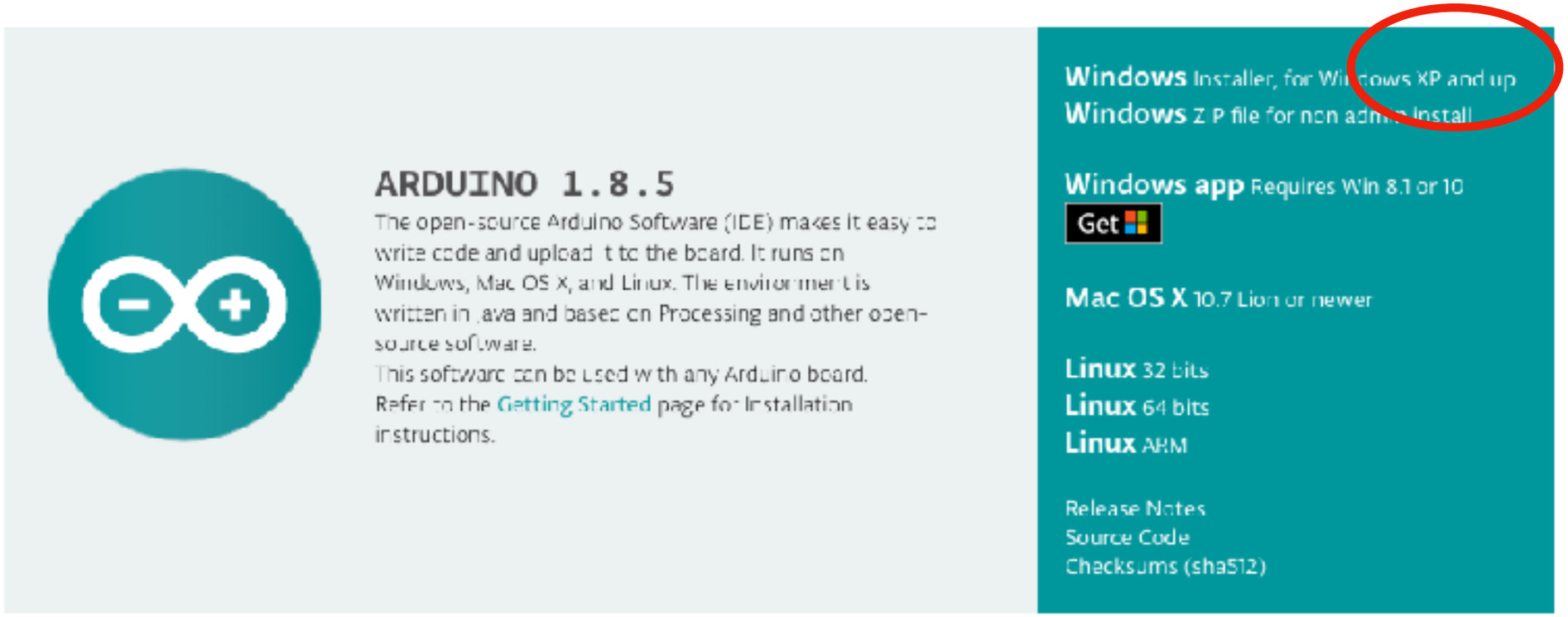
Learn to code

This is an Arduino Nano

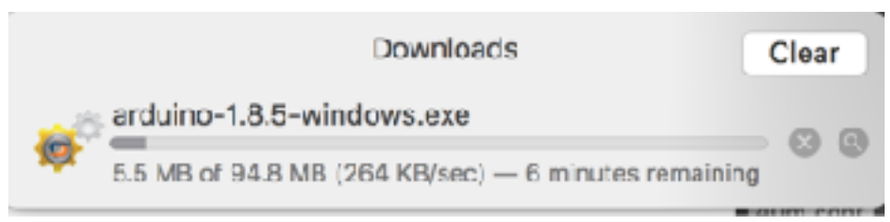
- A small 16MHz microcomputer
  - USB 5V/20mA
  - Can be powered on 12V
    - 2kB RAM, 32kB Flash
    - 22 I/O, 8 analog, 6 PWM
- USB-A to USB-Mini cable
- Take care USB CH340 (no) or **FTDI (yes)**



Install the IDE



- Login-in to the BARS WiFi
- *www.arduino.cc > Software > Download*
- *arduino-1.8.5-windows.exe*

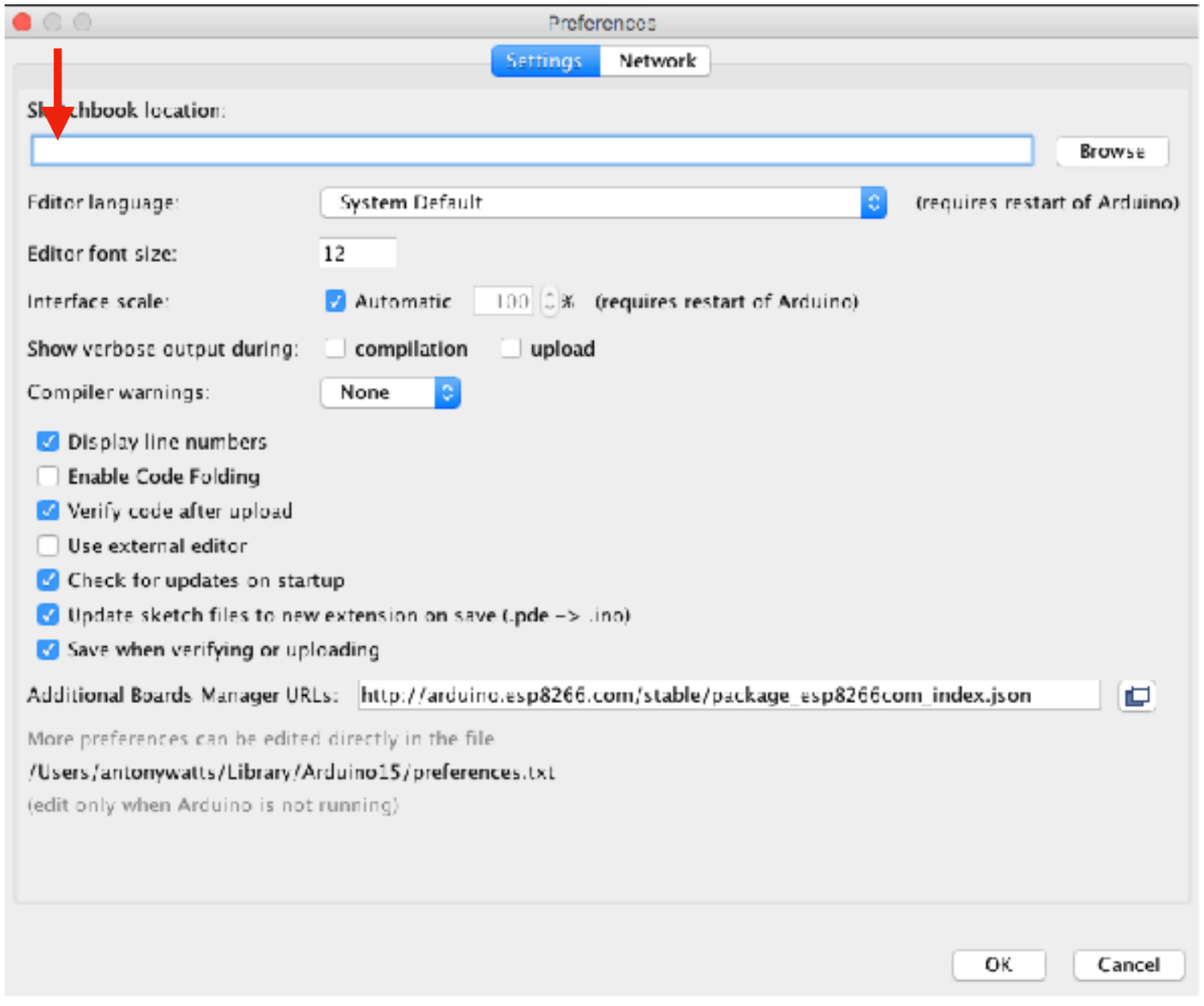


IDE Preferences

- On install, IDE will create folder *Documents > Arduino*

- This is where you keep your *code*, called *sketches*

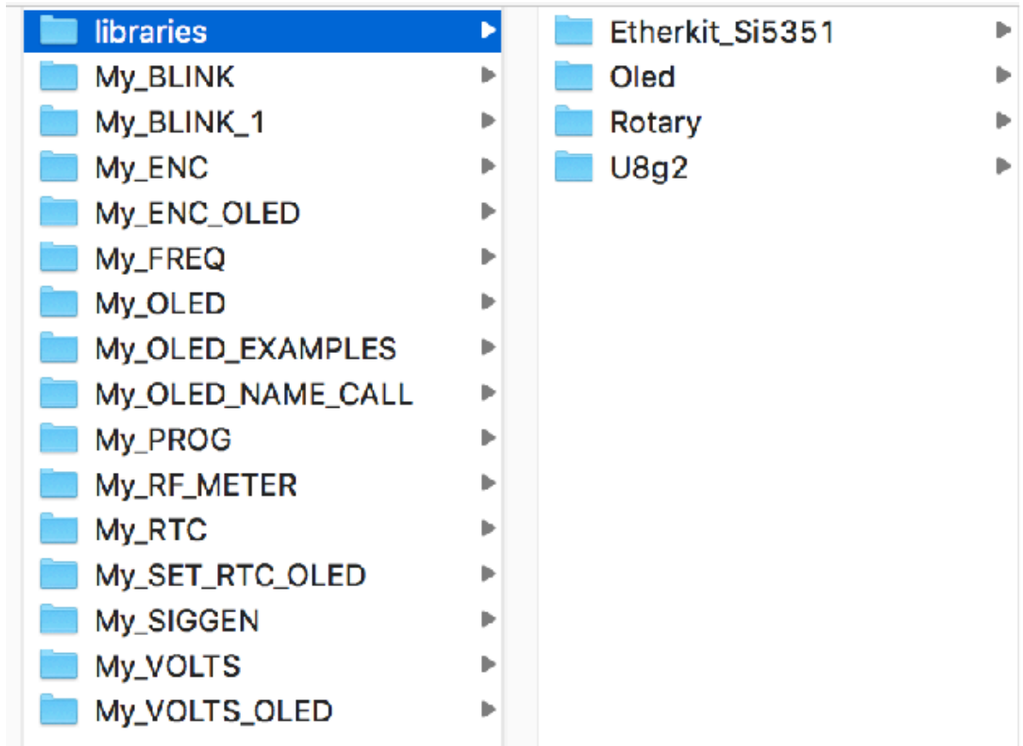
- *Browse* or *Enter* the *Sketchbook Location*



Copy files

- Copy all the files and folders from the USB stick to

  Documents >Arduino



RE-START THE IDE

Three steps

Integrated Development Environment

- **Enter & edit code**
- **Compile to machine language**
- **Upload to Nano and run**


```
if( x > 5) step = 1000;
```

```
0100101000110010001
```

Using the IDE

Integrated Development Environment

Buttons →

Your code →

Errors →

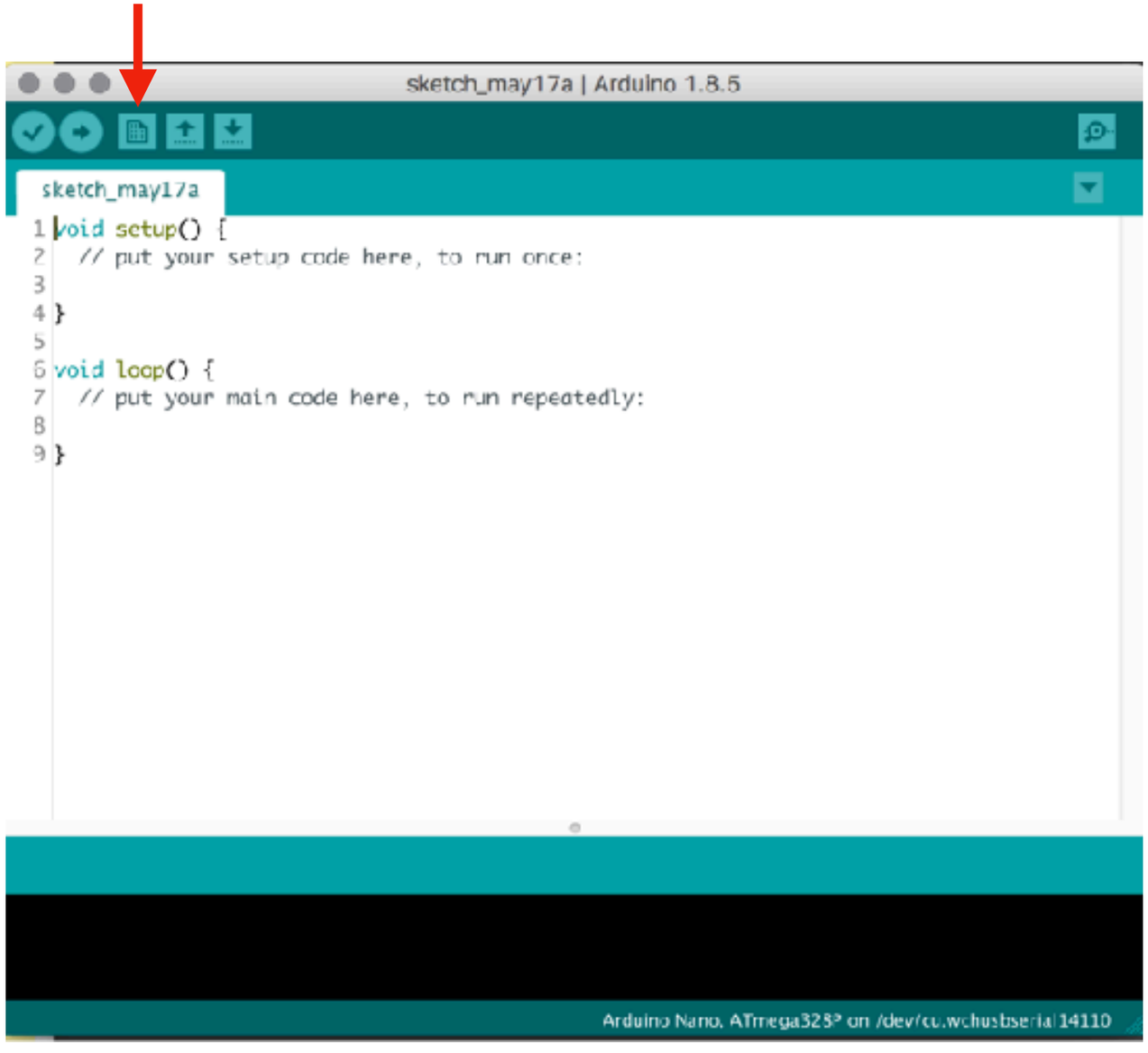
← Monitor

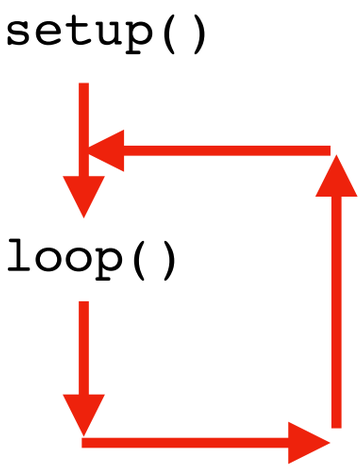
← Connection

Writing sketches

Flow chart

- Start Arduino IDE
- *File > New*

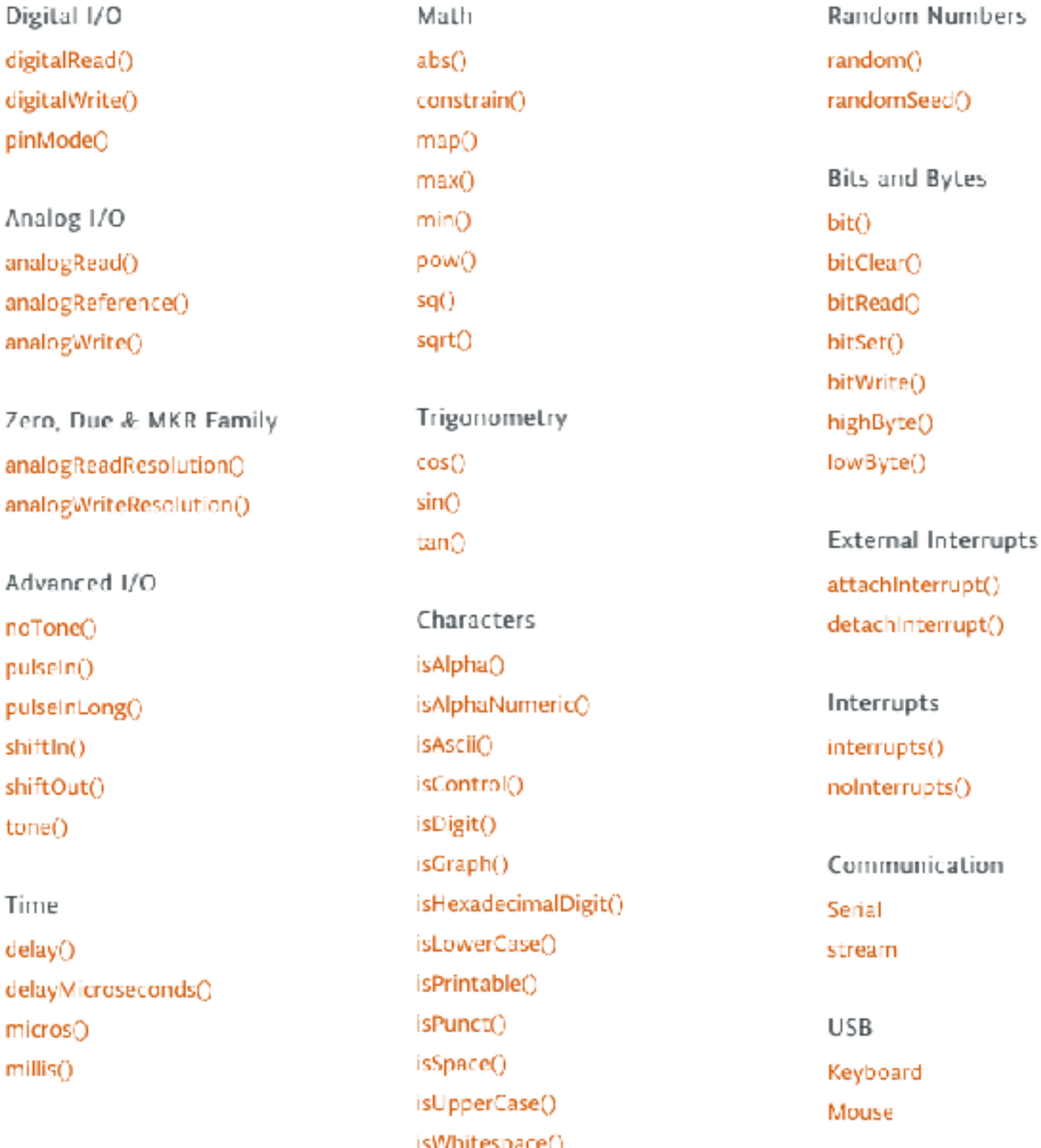




Statements

www.arduino.cc/reference/en /

- `arduino.cc > Resources > Reference`
- Arduino programming statements
- Click on anyone to find out more



Digital I/O
digitalRead()
digitalWrite()
pinMode()

Analog I/O
analogRead()
analogReference()
analogWrite()

Zero, Due & MKR Family
analogReadResolution()
analogWriteResolution()

Advanced I/O
noTone()
pulseIn()
pulseInLong()
shiftIn()
shiftOut()
tone()

Time
delay()
delayMicroseconds()
micros()
millis()

Math
abs()
constrain()
map()
max()
min()
pow()
sq()
sqrt()

Trigonometry
cos()
sin()
tan()

Characters
isAlpha()
isAlphaNumeric()
isAscii()
isControl()
isDigit()
isGraph()
isHexadecimalDigit()
isLowerCase()
isPrintable()
isPunct()
isSpace()
isUpperCase()
isWhitespace()

Random Numbers
random()
randomSeed()

Bits and Bytes
bit()
bitClear()
bitRead()
bitSet()
bitWrite()
highByte()
lowByte()

External Interrupts
attachInterrupt()
detachInterrupt()

Interrupts
interrupts()
noInterrupts()

Communication
Serial
stream

USB
Keyboard
Mouse

What is a function

www.arduino.cc/reference/en /

- You can see that a sketch has two functions `setup( )` and `loop( )`
- How do functions work?

```
void loop() {
  int answer;

  // calculate product
  answer = product(30, 55);

}
```

```
int product(int a, int b) {
  int mult;

  mult = a x b;
 return mult;
}
```

Important

;

All statements must end with “;”

//

Comments are any line that starts with “//“

Variables

www.arduino.cc/reference/en /

Constants

Floating Point Constants

Integer Constants

HIGH | LOW

INPUT | OUTPUT | INPUT_PULLUP

LED_BUILTIN

true | false

Conversion

byte()

char()

float()

int()

long()

word()

Data Types

String

String()

array

bool

boolean

byte

char

double

float

int

long

short

unsigned char

unsigned int

unsigned long

void

word

Variable Scope & Qualifiers

const

scope

static

volatile

Utilities

PROGMEM

sizeof()

Globals

- Globals - defined outside any function
- Apply everywhere

```
// global

#include "si5351.h" // include library

Si5351 dds;         // create object called ads

uint64_t freq;      // global variable

freq = 700000000;   //ini to 7MHz

void setup() {
  output(freq);
}

void loop() {
  // if D4 HIGH change to 14MHz
  if (digitalRead(D4) == HIGH) {
    freq = 1400000000;
    output(freq);
  }
}

void output(uint64_t f) {
  dds.setFreq(f, CLK0);
}
```

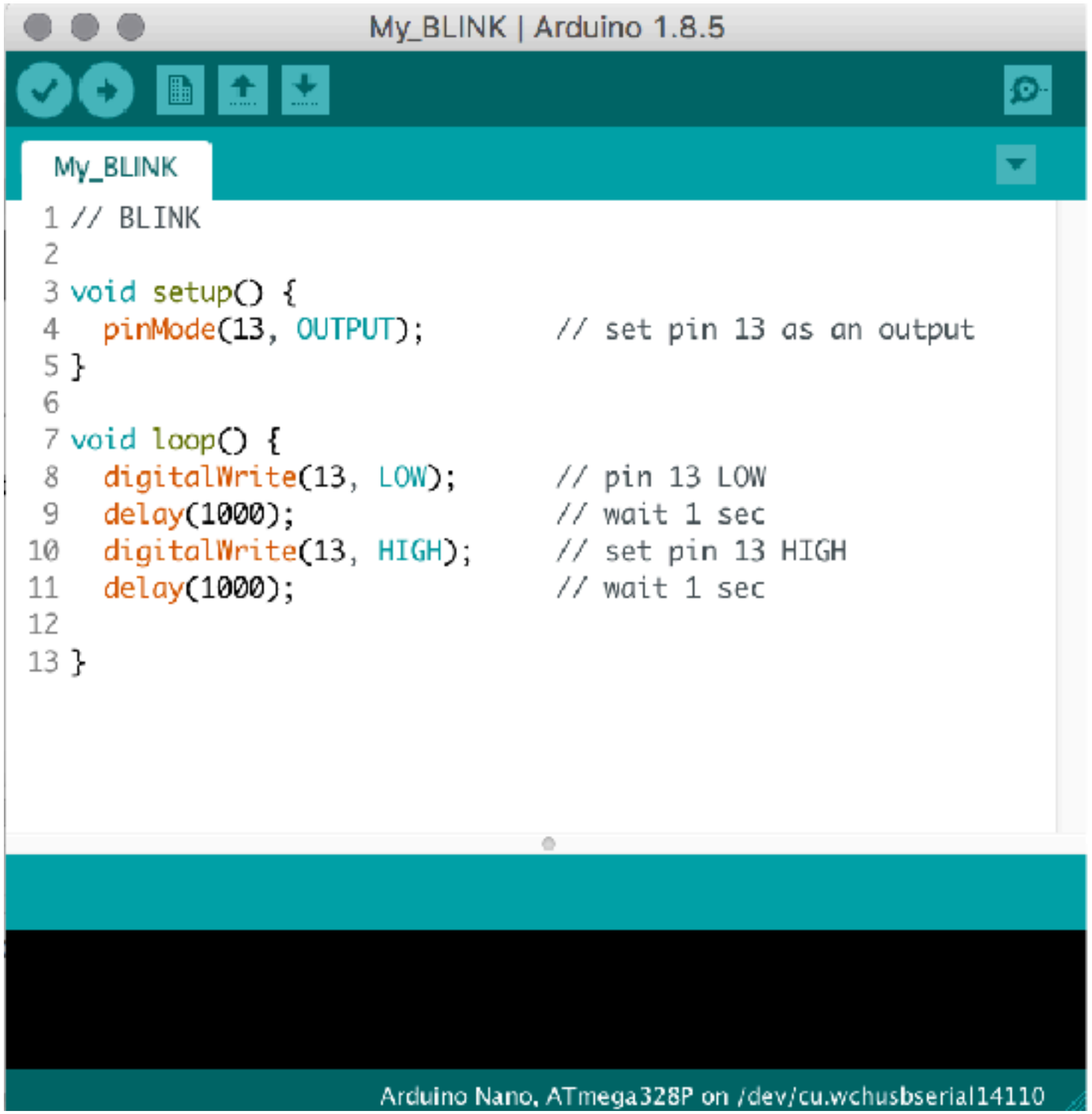
A real sketch

- Let's sketch

  File > Sketchbook > My_Blink

- Compile: checks code

- Upload: sends to Nano and runs



End of 1.