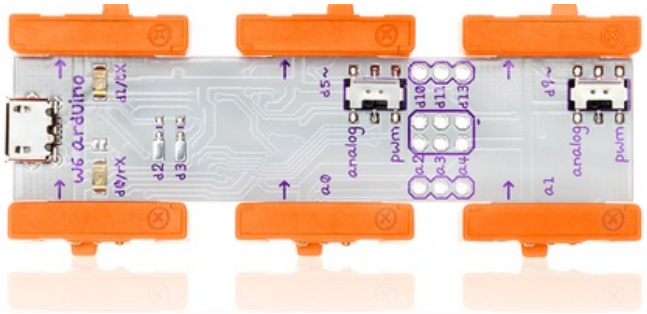
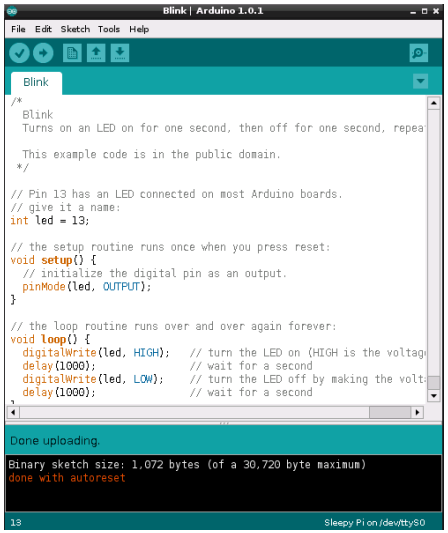
Arduino Workshop

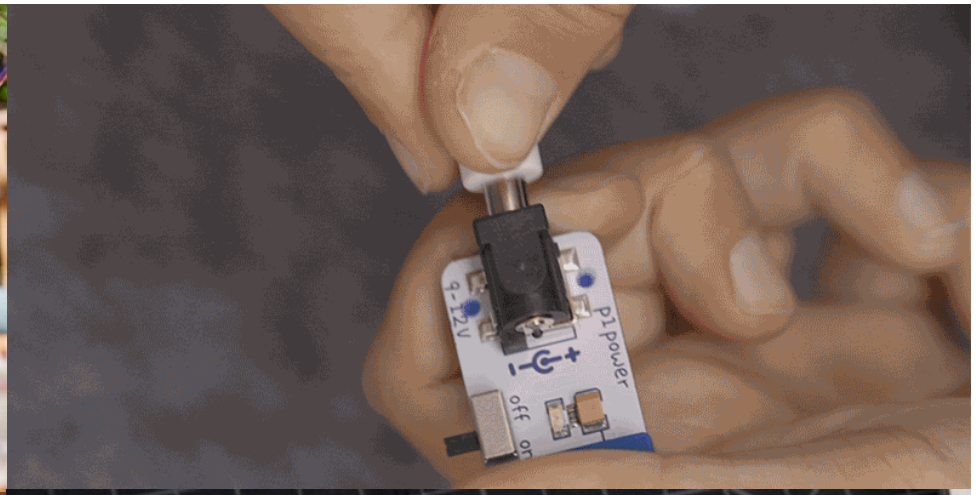
Part 1
Introduction

What is Arduino?

- Open-source prototyping platform
- Building digital devices and interactive objects that sense, control physical devices
- Hardware: Arduino I/O board (microcontroller)
- Software: Arduino IDE (Integrated Development Environment)
- Able to read inputs – sensors, button etc. and turn it into outputs - activating a motor, turning on an LED
- Can run independently or communicate with computer

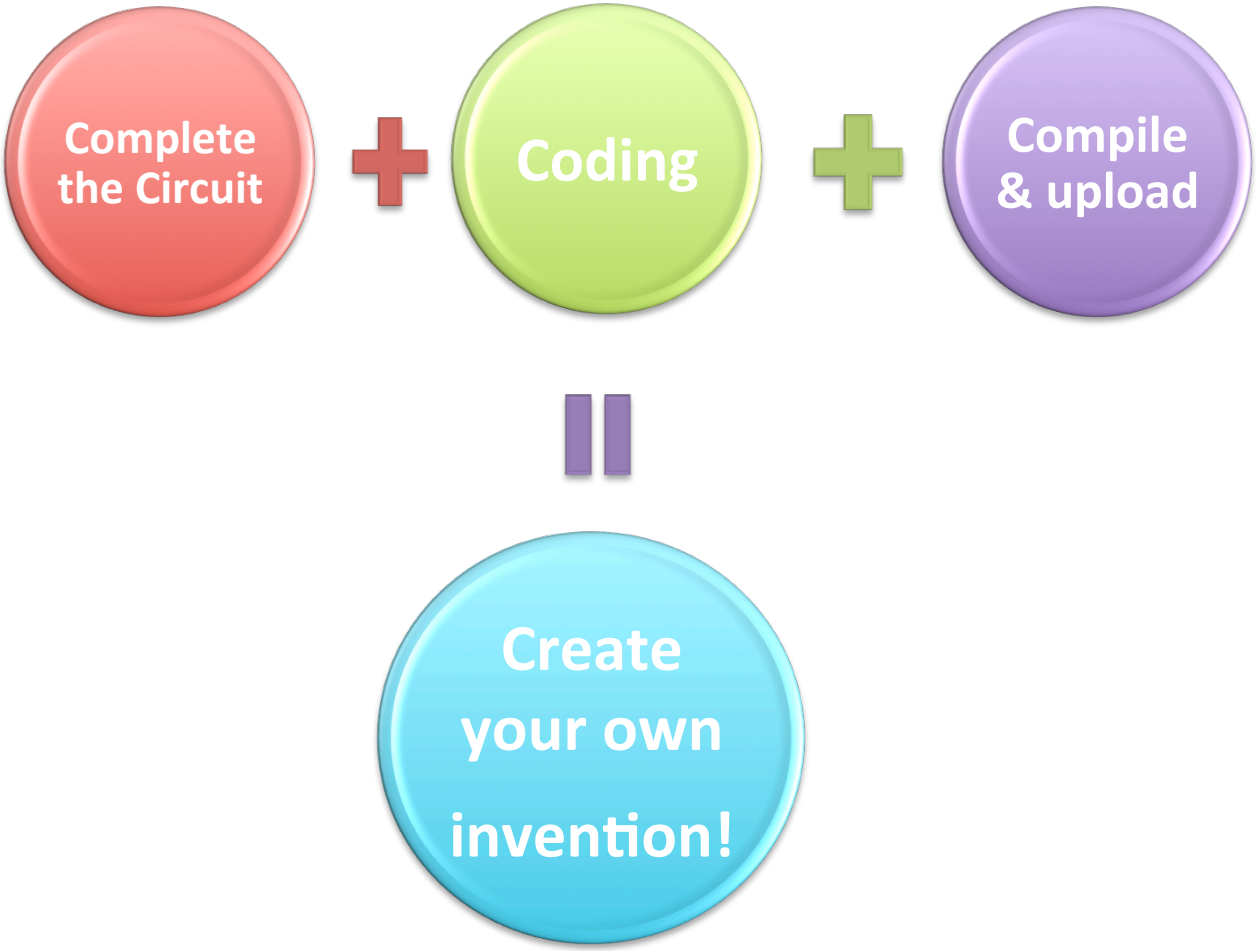


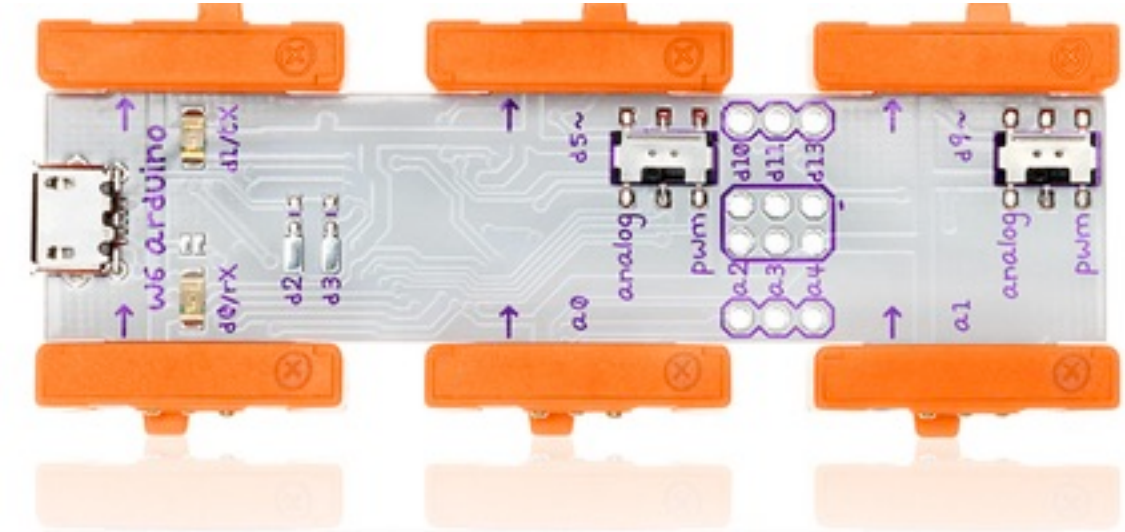



9-12V
power
off
on


littleBits
POWER

How it works?

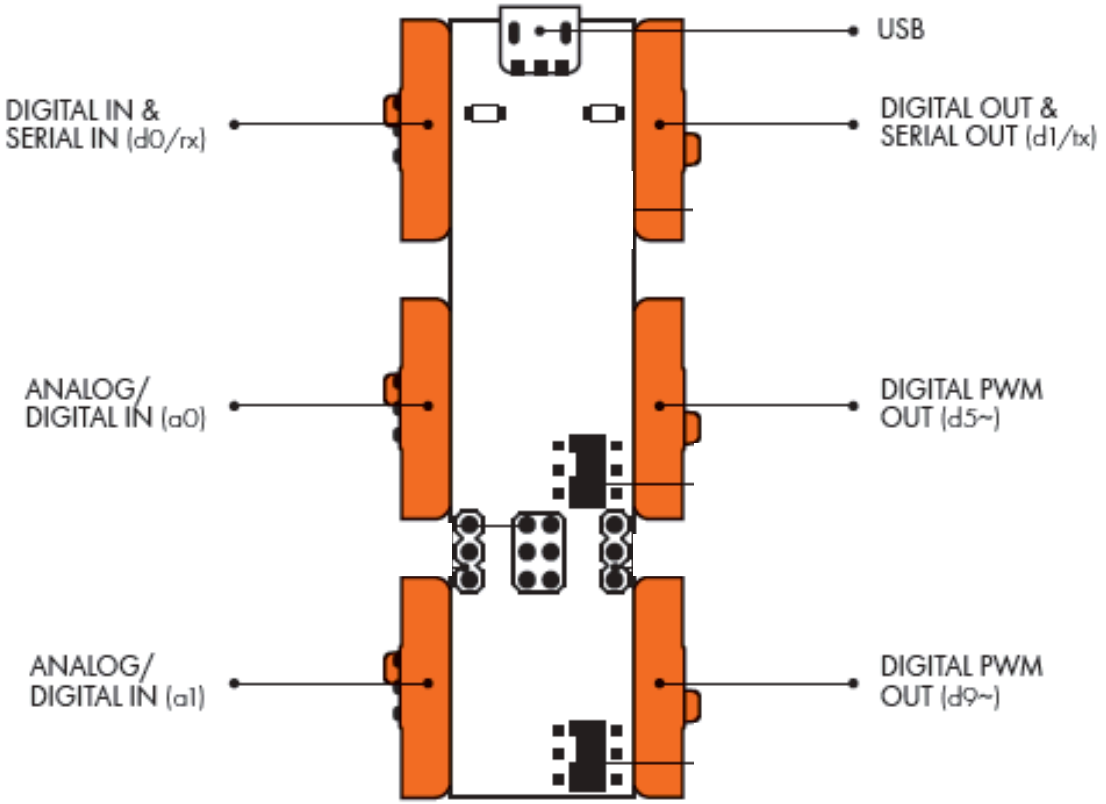

Complete the Circuit
Coding
Compile & upload
Create your own invention!



Arduino Leonardo

Structure of the board

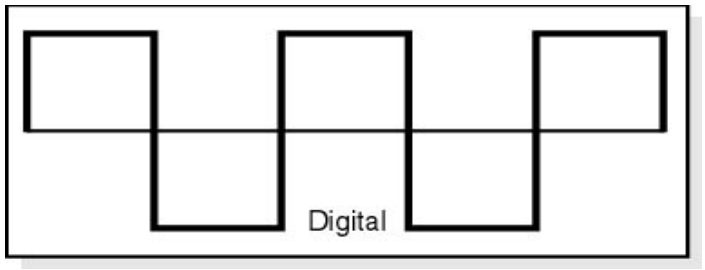
3 Input pins

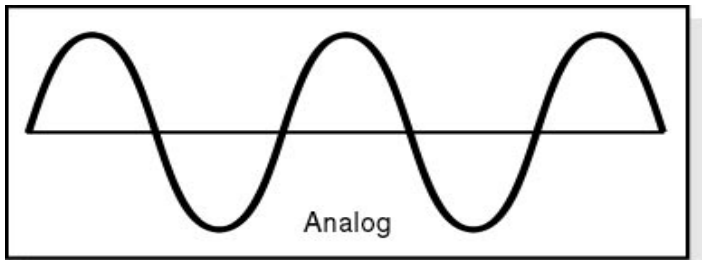


3 Output pins

Digital vs Analog

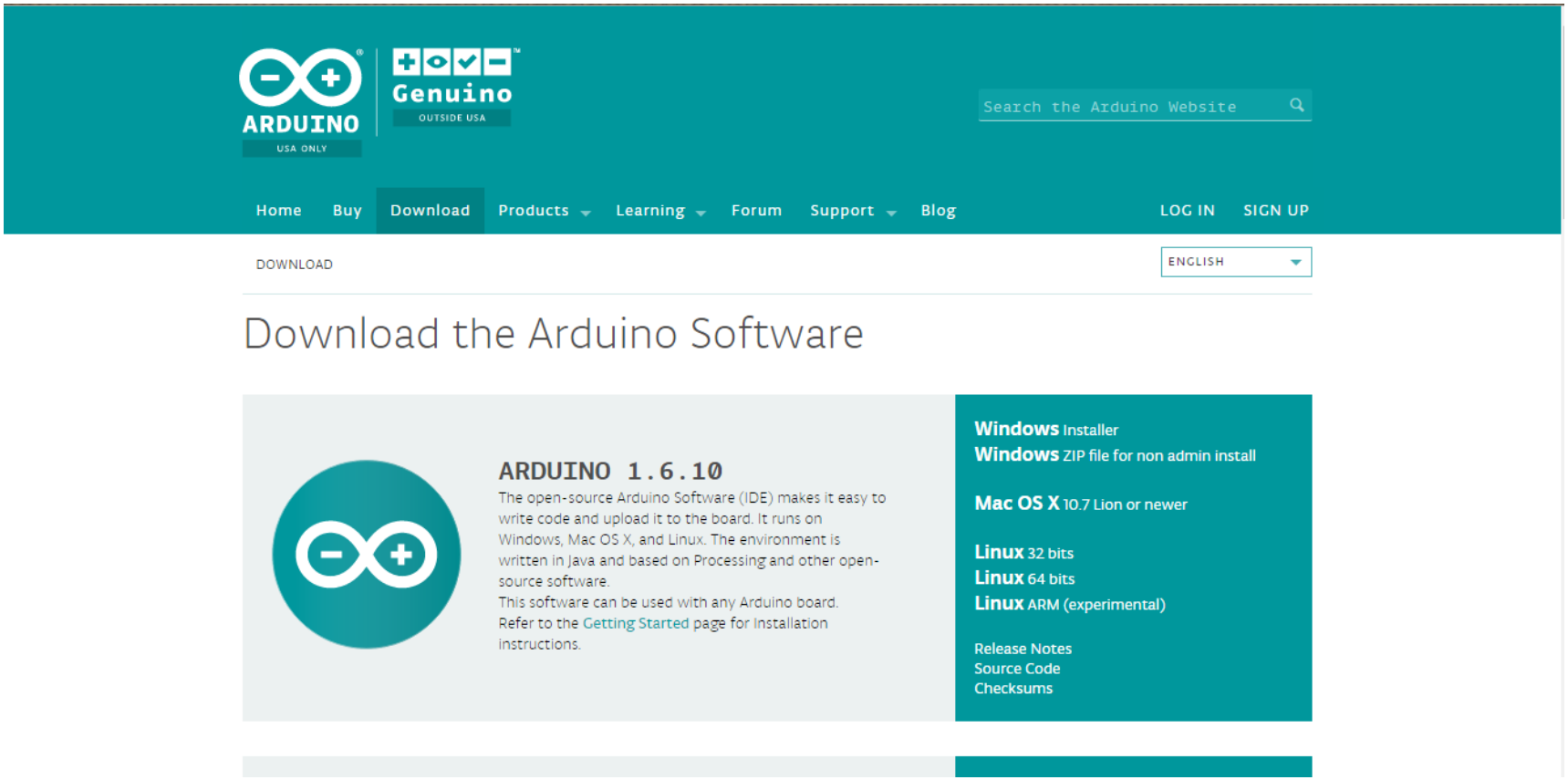
Signal:	• **Only have 2 state (discrete) 1 (5V) or 0 (0V) OR HIGH or LOW**	• **Varying number between 0V to 5V**
Functionality:	• Digital input AND output (general purpose input/output (GPIO) pins)	• Mainly to read analog sensors • Analog Input AND output • Can be used as GPIO pins

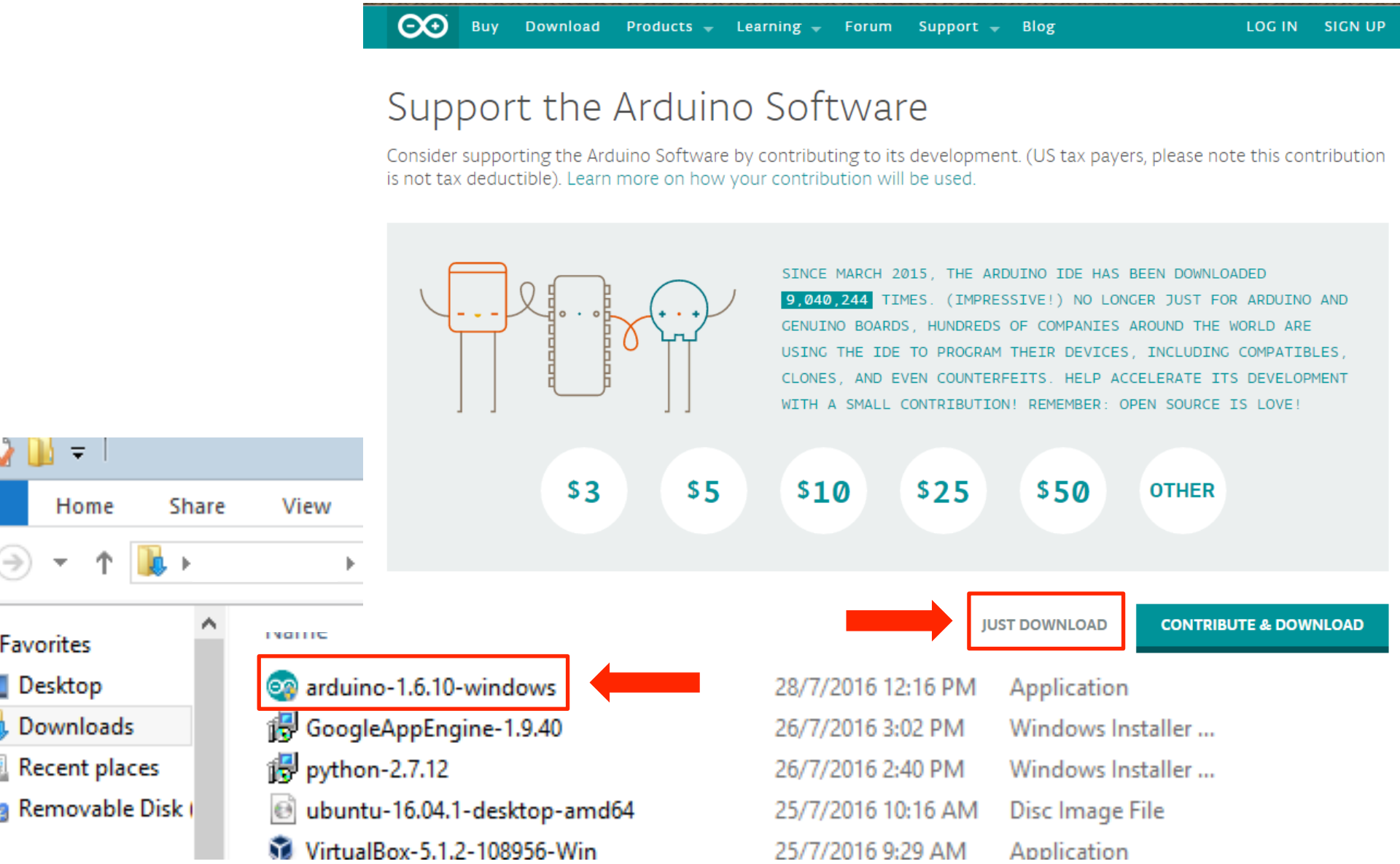




Set up IDE

https://www.arduino.cc/en/Main/Software

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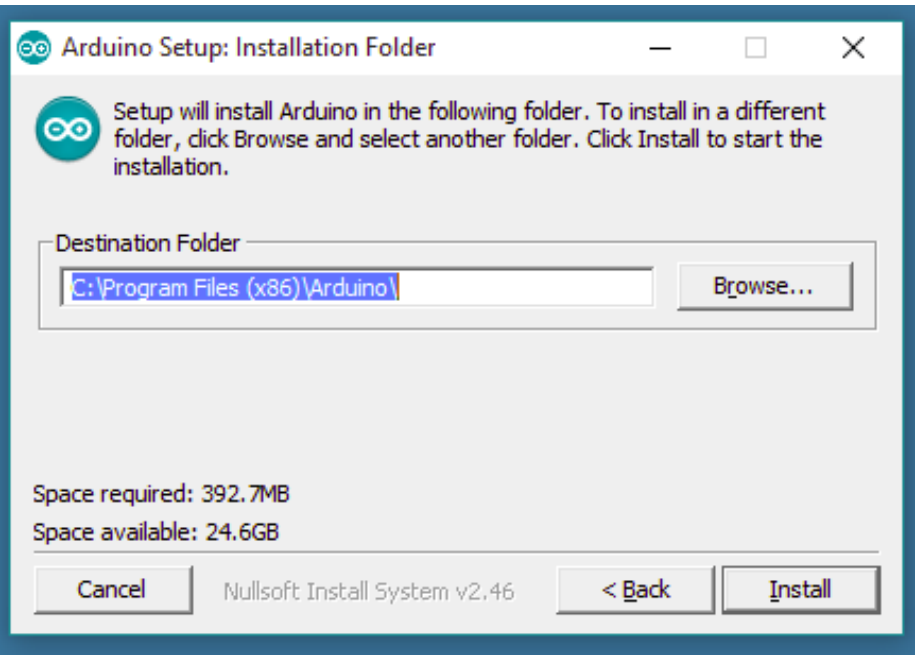
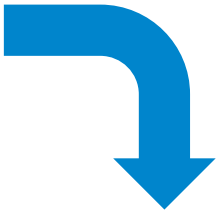
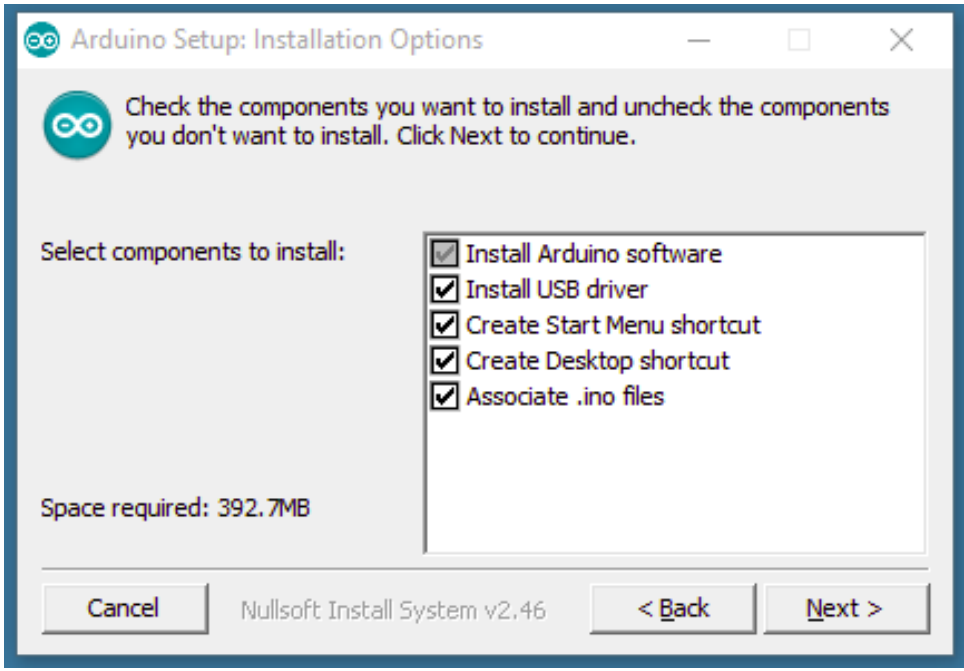
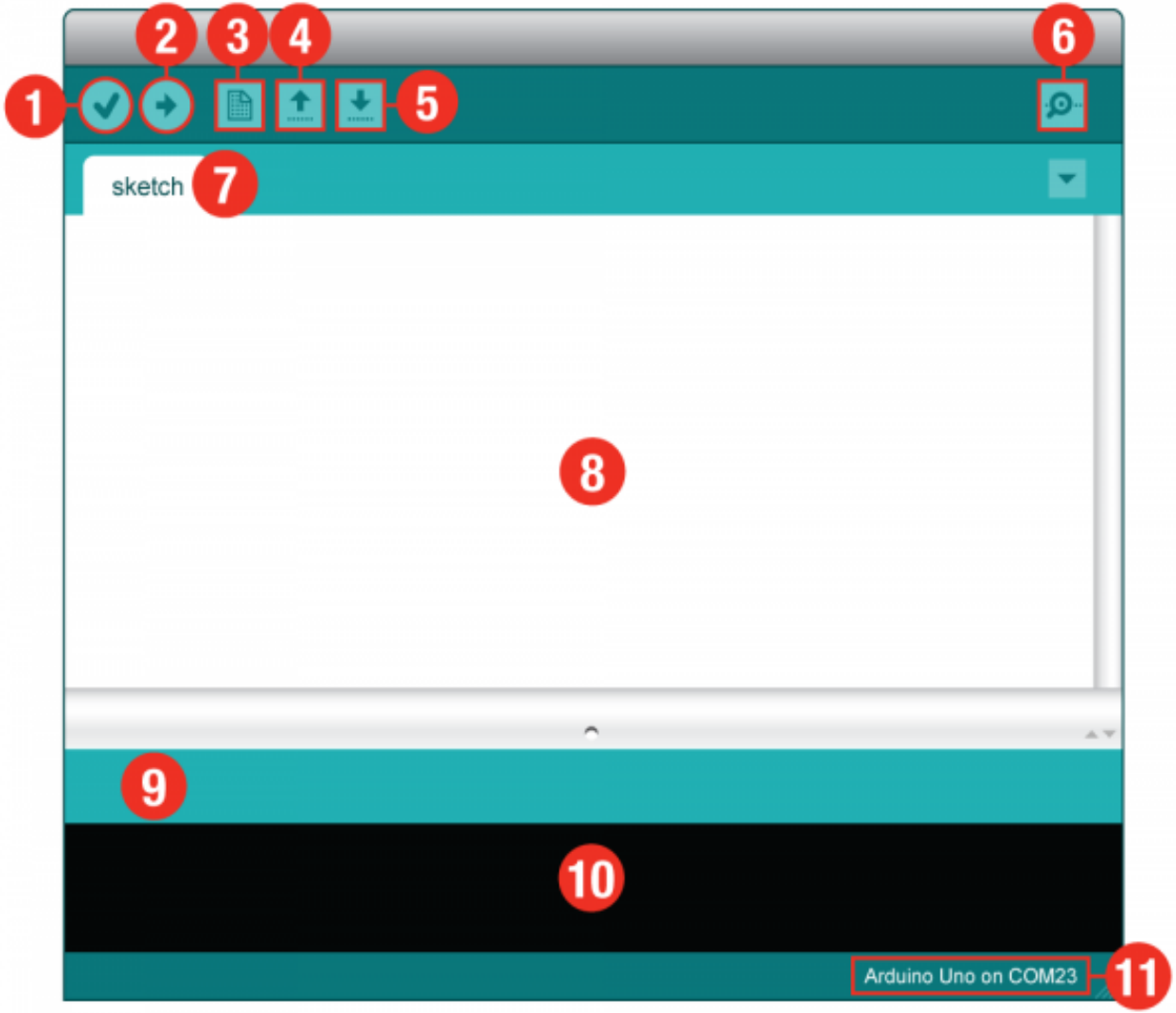
Support the Arduino Software
Consider supporting the Arduino Software by contributing to its development. (US tax payers, please note this contribution is not tax deductible). Learn more on how your contribution will be used.
SINCE MARCH 2015, THE ARDUINO IDE HAS BEEN DOWNLOADED 9,040,244 TIMES. (IMPRESSIVE!) NO LONGER JUST FOR ARDUINO AND GENUINO BOARDS, HUNDREDS OF COMPANIES AROUND THE WORLD ARE USING THE IDE TO PROGRAM THEIR DEVICES, INCLUDING COMPATIBLES, CLONES, AND EVEN COUNTERFEITS. HELP ACCELERATE ITS DEVELOPMENT WITH A SMALL CONTRIBUTION! REMEMBER: OPEN SOURCE IS LOVE!
$3
$5
$10
$25
$50
OTHER
JUST DOWNLOAD
CONTRIBUTE & DOWNLOAD
Home
Share
View
Favorites
Desktop
Downloads
Recent places
Removable Disk
arduino-1.6.10-windows
GoogleAppEngine-1.9.40
python-2.7.12
ubuntu-16.04.1-desktop-amd64
VirtualBox-5.1.2-108956-Win
28/7/2016 12:16 PM
Application
26/7/2016 3:02 PM
Windows Installer ...
26/7/2016 2:40 PM
Windows Installer ...
25/7/2016 10:16 AM
Disc Image File
25/7/2016 9:29 AM
Application


Arduino Setup: Installation Folder
Setup will install Arduino in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.
Destination Folder
C:\Program Files (x86)\Arduino\
Browse...
Space required: 392.7MB
Space available: 24.6GB
Cancel
Nullsoft Install System v2.46
< Back
Install

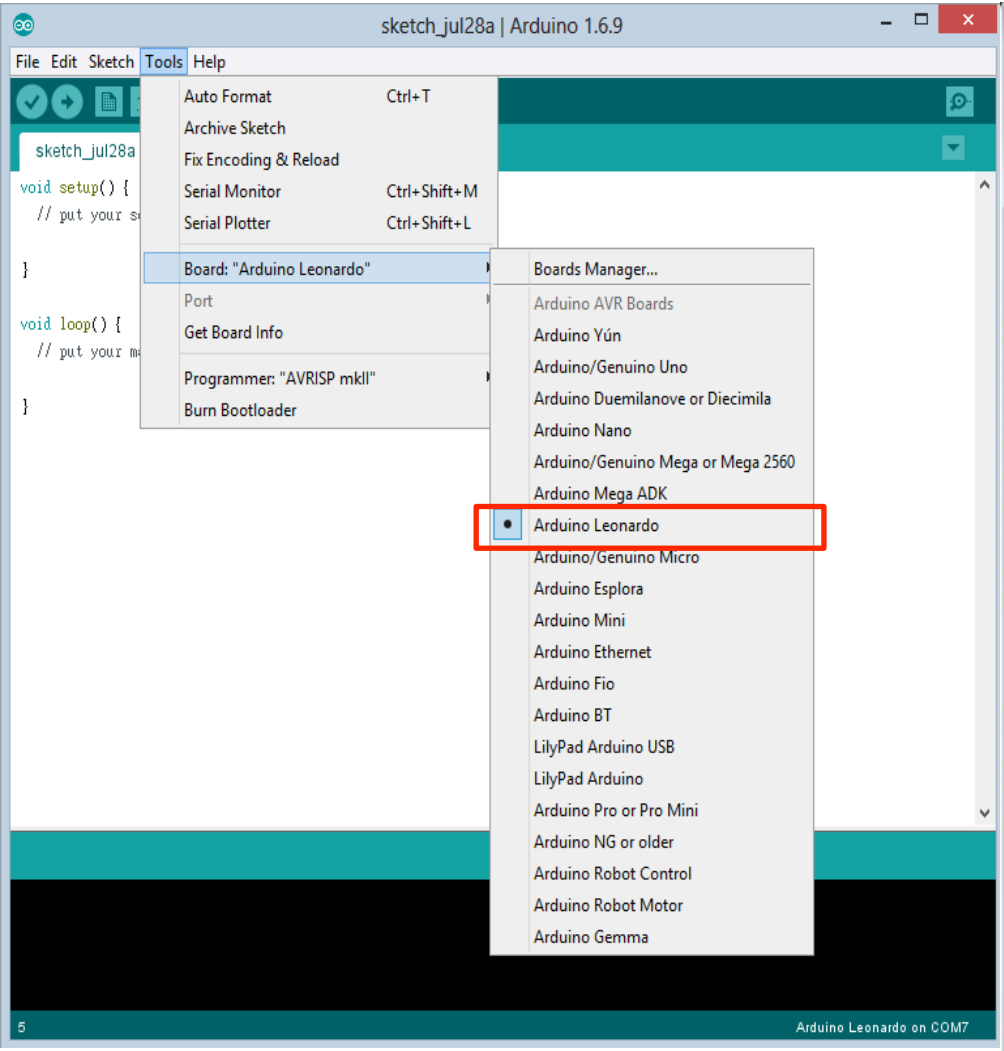


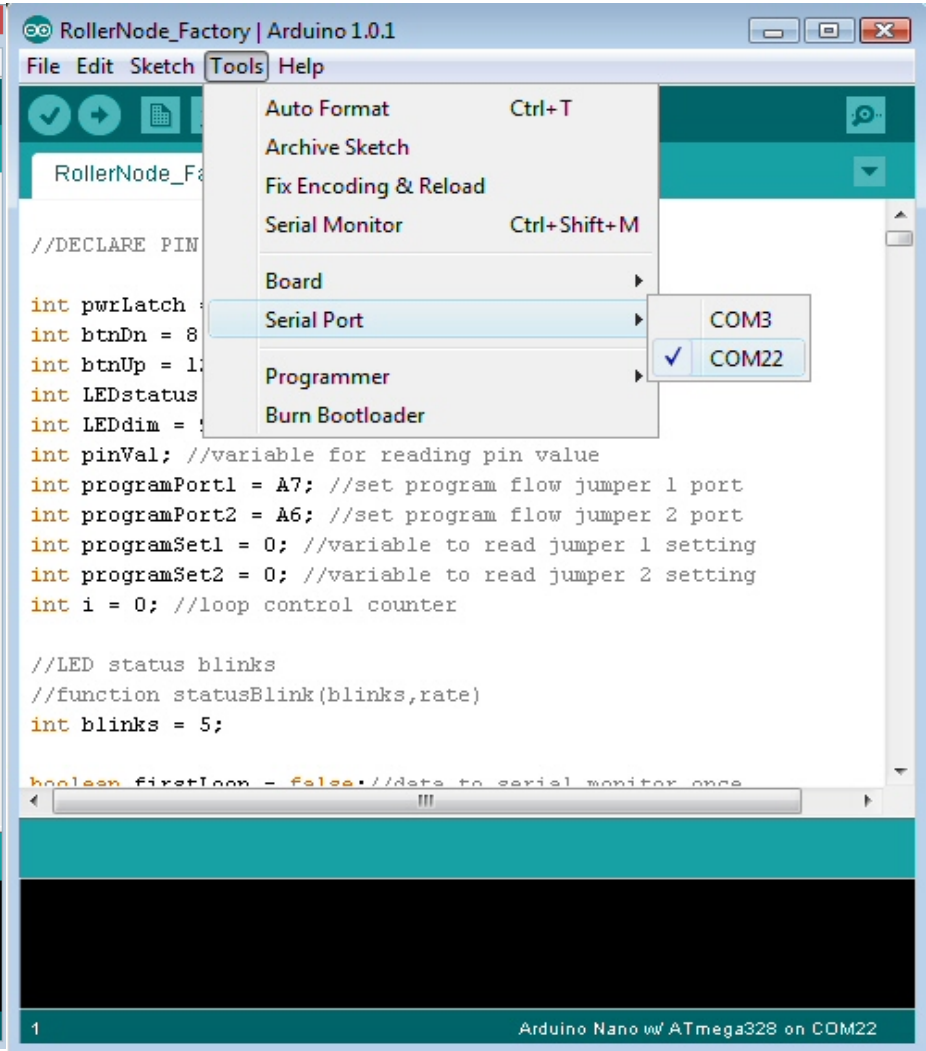

Arduino Setup: Installation Options
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select components to install:
Install Arduino software
Install USB driver
Create Start Menu shortcut
Create Desktop shortcut
Associate .ino files
Space required: 392.7MB
Cancel
Nullsoft Install System v2.46
< Back
Next >


Arduino


1
2
3
4
5
6
sketch
7
8
9
10
Arduino Uno on COM23
11

Choose the correct Arduino board setting & Serial Port





Part 2
Programming Basics

Basic structure

```
void setup(){                    // initialization (run once only)
    some statement here…
}

void loop(){                     // Main program (run repeatedly)
    some statement here…
}
```

Functions

```
Func_type func_Name (parameters){    // declaration
    some statements here……
}
```

!!IMPORTANT!!

{} curly braces ; semicolon Upper & Lower case commands

Missing these would cause compilation error!

/*……..*/ block comments // line comments

Basics commands

- pinMode(pin, mode); // Initialize the pin mode as INPUT or OUTPUT
- digitalRead(pin); // Read input value from digital pin
- digitalWrite(pin, value); // Output value from digital pin
- analogRead(pin); // Read input value from analog pin
- analogWrite(pin, value); // Output value from analog pin
- delay(value); // Pauses the program for time in milliseconds

Arithmetic & Comparatives

```
y = y + 3;
x = x - 7;
i = j * 6;
r = r / 5;
z = z % 2; //mod
x ++; //x = x + 1
x --;   //x = x - 1
```

```
x == y;  // x is equal to y
x != y;  // x is not equal to y
x < y;   // x is less than y
x > y;   // x is greater than y
x <= y; // x is less than or equal to y
x >= y;  // x is greater than or equal to y
```

Logics

TRUE or **FALSE**

Logical **AND**:

```
(x > 0 && x < 5)     // True only if both conditions are true
```

Logical **OR**:

```
(x > 0 || y > 0)     // True if either condition is true
```

Logical **NOT**:

```
(! x > 0)            // true if condition is false
```

Part 3
Let’s get started !

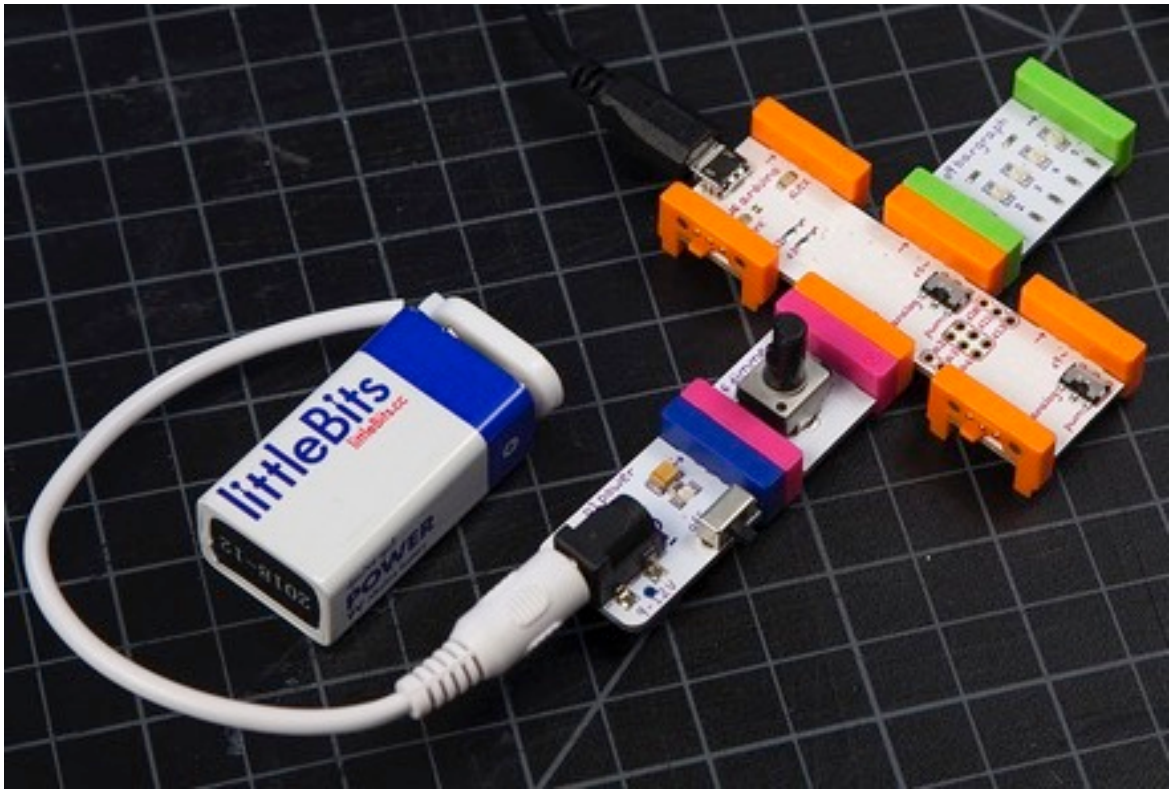
If….. else

```
if (Logic){
    statements;
}else{
    another statements;
}
```

- else if

Example 1 (Fading LED)

Slide Dimmer



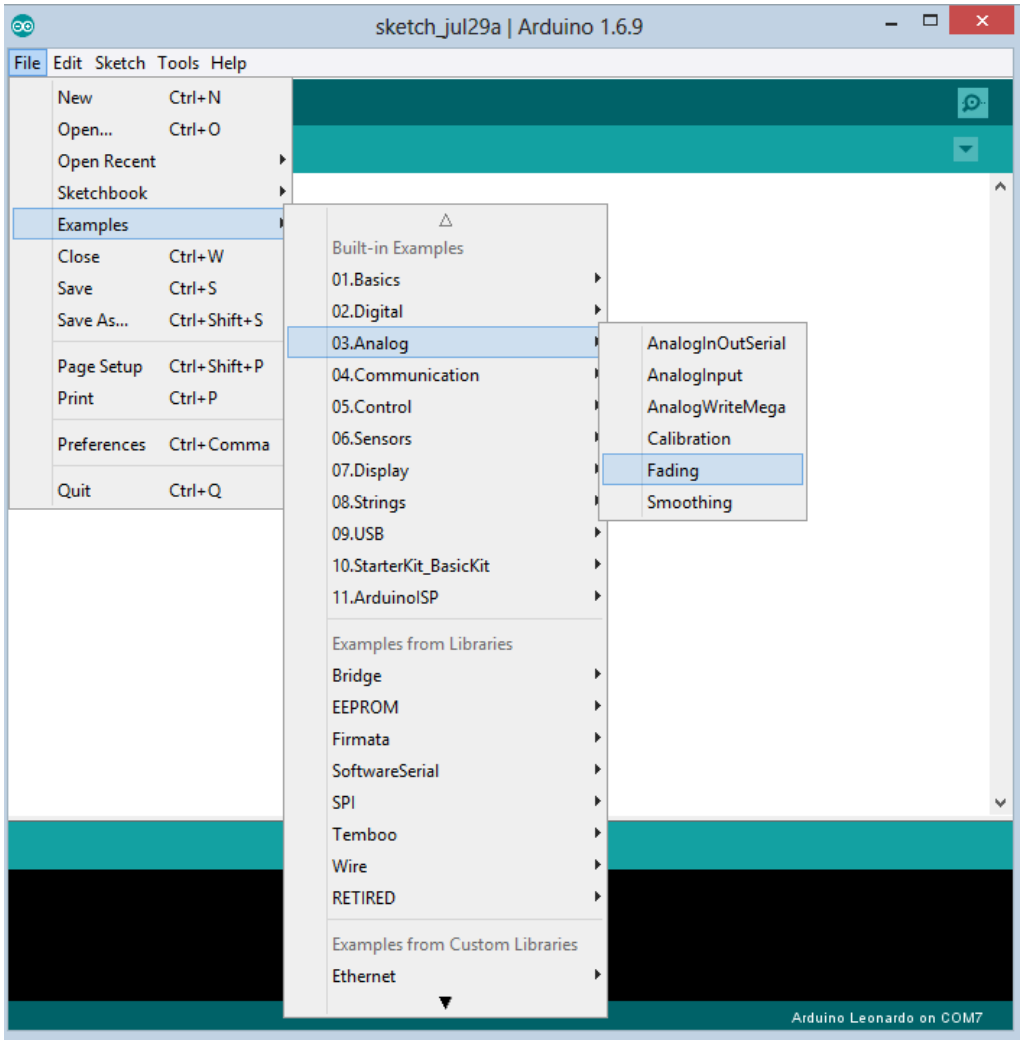
Power & Battery & Slide Dimmer at a0 pin
Bargraph at d5 pin

[File]

[Examples]

[03.Analog]

[Fading]



Understanding the code

```
Int ledPin = 5;    // Declare that LED is at Pin D5
void setup(){
}              // nothing happens in setup
void loop(){
        // This will act as the inhale for the PWM value starting from zero to a max value of 255
 for(int fadeValue = 0; fadeValue <= 255; fadeValue ++){
        analogWrite(ledPin, fadeValue);
        delay( (1034 - analogRead(A0)) / 10 );   // wait for a moment before moving forward
        }
        // This will act as the exhale for the PWM value starting from 255 to a min value of 0
 for(int fadeValue = 255; fadeValue >= 0; fadeValue --){
        analogWrite(ledPin, fadeValue);
        delay( (1034 - analogRead(A0)) / 10 );   // wait for a moment before moving forward
        }
}
```

Variables

- Naming & storing number value for later use

  e.g. Int ledPin = 5; // declared a variable named ledPin and assigned the value 5

  inputVariable = analogRead(2); // set variable to value of analog pin 2

- Can test variables to see if it meets certain conditions (Logics)

  e.g. (inputVariable < 100) // tests variable if it is less than 100

- Global vs Local variables
  - **Global:** can be used and seen by all functions & statements
  - **Local:** defined inside a function or loops, only used inside the function it declared

Data type

- int (integers)
  - int someVariable = 1500; // assigned 1500 integer value
- long (long integers)
  - long someVariable = 90000; // assigned 90000 integer value
- char (character value)
  - char someChar = 'A'; // assigned letter A value
- boolean (true or false)
  - bool condition = false; // assigned false value