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ARDUINO INTRODUCTION



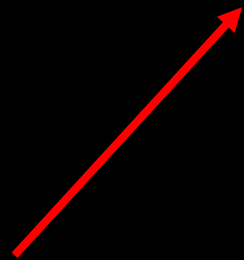
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STEAM PROGRAMS



Art without Engineering is dreaming. Engineering without Art is calculating.

- Steven K. Roberts



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ARDUINO INTRODUCTION



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NEW WORDS...

- Microprocessor
- Microcontroller
- Arduino
- Open-source



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PC NEEDS A MICROPROCESSOR TO RUN, RIGHT?



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WHAT ABOUT THESE...



Did you know they are built with a Microprocessor or Microcontroller too?



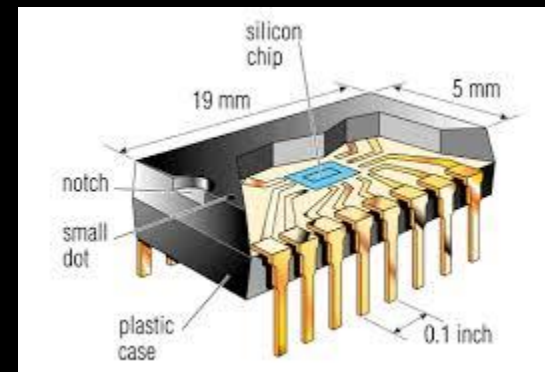
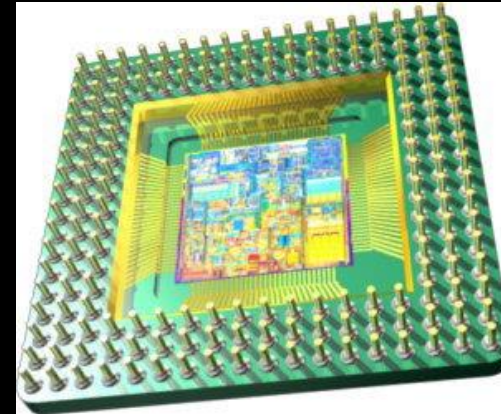
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WHAT IS A MICROPROCESSOR?

WHAT'S THE DIFFERENCE BETWEEN A MICROPROCESSOR AND A MICROCONTROLLER?

- A microprocessor, like the Intel Or AMD processors, contains
 - a CPU, but needs help from other components to make it function, components like DRAM and hard drives
- A microcontroller, like the Arduino, is a standalone single-chip that contains
 - a CPU, read-only memory to store the program, RAM to store variables used in the execution of the program.

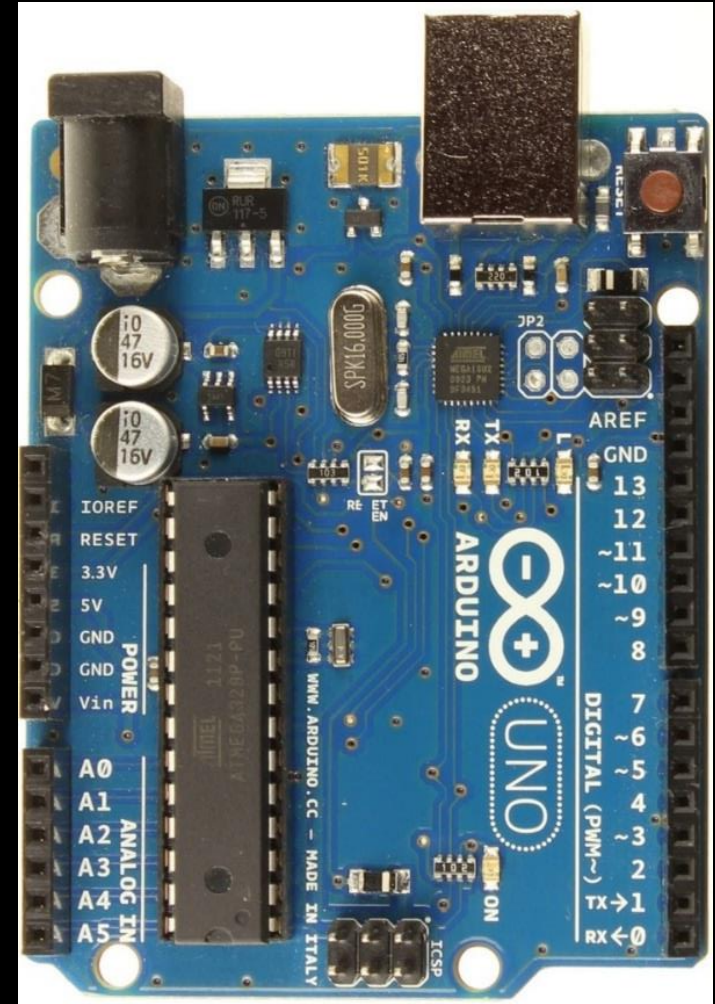


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DID YOU SAY "ARDUINO"?

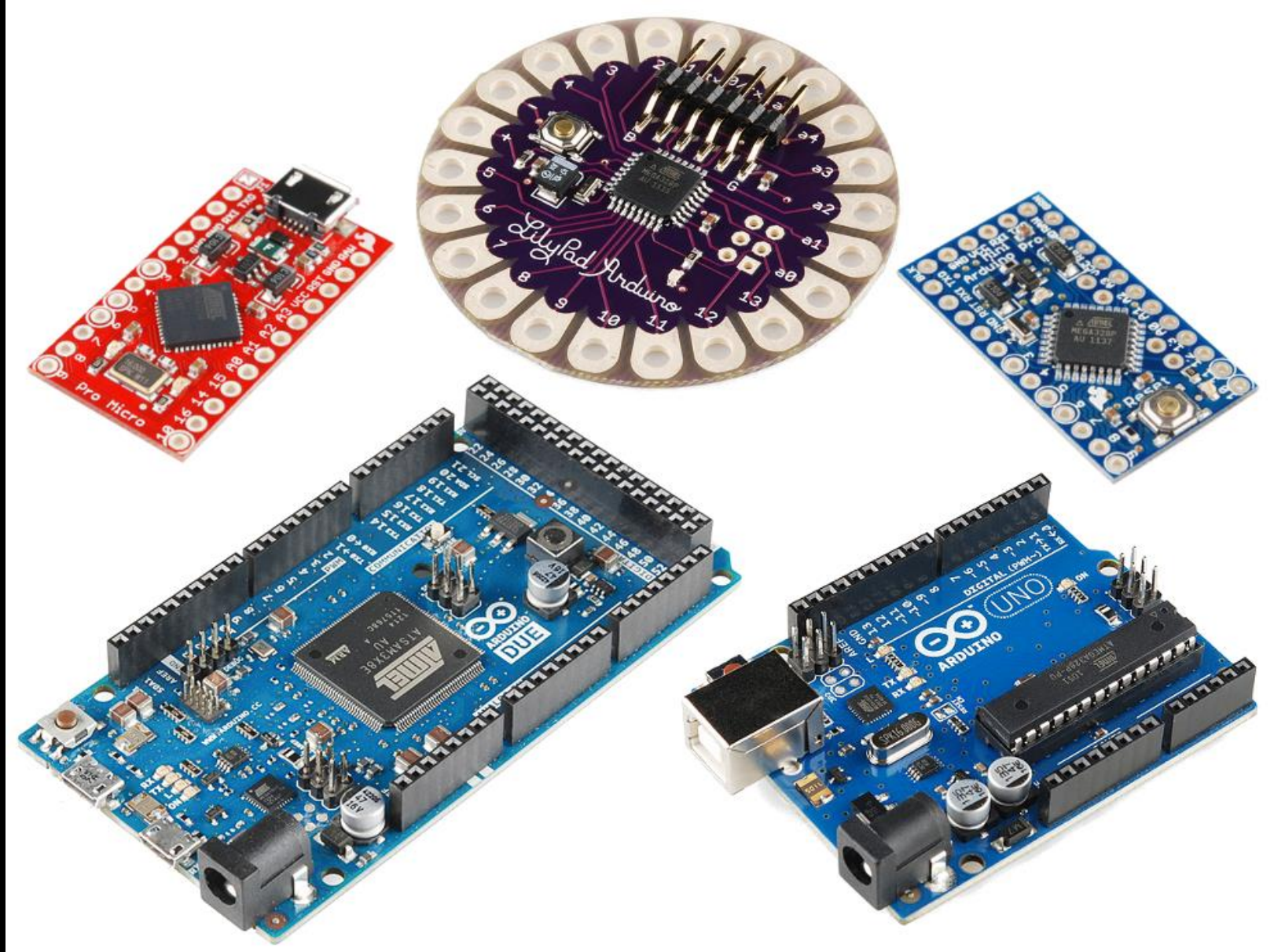
- Arduino Is An Open-source Electronics Platform
 - With easy to use hardware & software.
 - Intended for anyone making interactive projects
- Arduino Can Sense & Control It's Environment
 - Receiving information from sensors on input pins
 - Affecting it's surroundings by controlling lights, motors, actuators, etc on output pins
- You Tell Your Arduino What To Do
 - Writing code in the Arduino programming language
 - Using the Arduino development environment



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THERE ARE MANY TYPES OF ARDUINOS

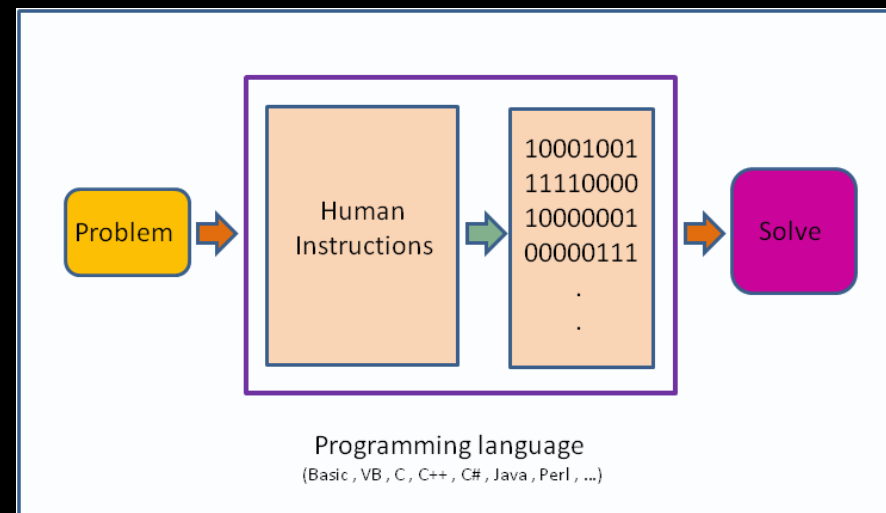


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WHAT'S A PROGRAMING LANGUAGE?

- A programming language is
 - A formal constructed language designed to communicate instructions to a machine, particularly a computer
 - Programming languages can be used to create programs to control the behavior of a machine or to express algorithms.
- The Arduino uses C++



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BLINK - FIRST SKETCH → C++

Defines Variables
Like I/O Pin
Connected to LED

Setup Loop

Main Loop

Turns LED ON

Delay 1 sec

Turns LED OFF

Delay 1 sec

```
12 // -----
13 // define variables that will be used in the sketch
14 // -----
15 int led = 13; // LED on pin 13
16
17 // -----
18 // the setup function runs once when you press reset or power the board
19 void setup() {
20     // initialize digital pin 13 as an output.
21     pinMode(led, OUTPUT); // LED on pin 13
22 }
23 // -----
24 // the loop function runs over and over again forever
25 void loop() {
26     digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage level)
27     delay(1000);             // wait for a second
28     digitalWrite(led, LOW);  // turn the LED off by making the voltage LOW
29     delay(1000);             // wait for a second
30 }
```



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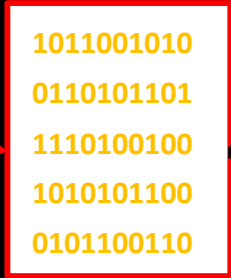
GO FROM A SKETCH TO BLINKING AN LED

Host Computer

Source Code



Executable



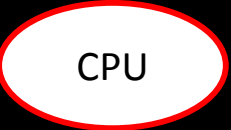
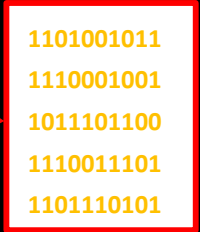
Compiler
& Linker

Library Files



Arduino

Flash Program Memory



USB
Download
Cable

Blinking
LED



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IS IT POSSIBLE TO GET HELP?

- Git Hub – See Steam Clown's Files Search for “STEAM Clown” on www.github.org
- <http://www.arduino.cc/> ← Official Arduino Site
- <http://www.arduinobook.com/>
- Google Is Your Friend...
 - Google Arduino Getting Started
 - Google Arduino Tutorials
 - Google Arduino Sketches
- PDF books
 - Arduino Programmers Notebook
 - Arduino in a Nutshell
 - Introduction to Arduino - A piece of cake!
- YouTube
 - Arduino: Your First Arduino Sketch
 - Tutorial 01 for Arduino: Getting Acquainted with Arduino



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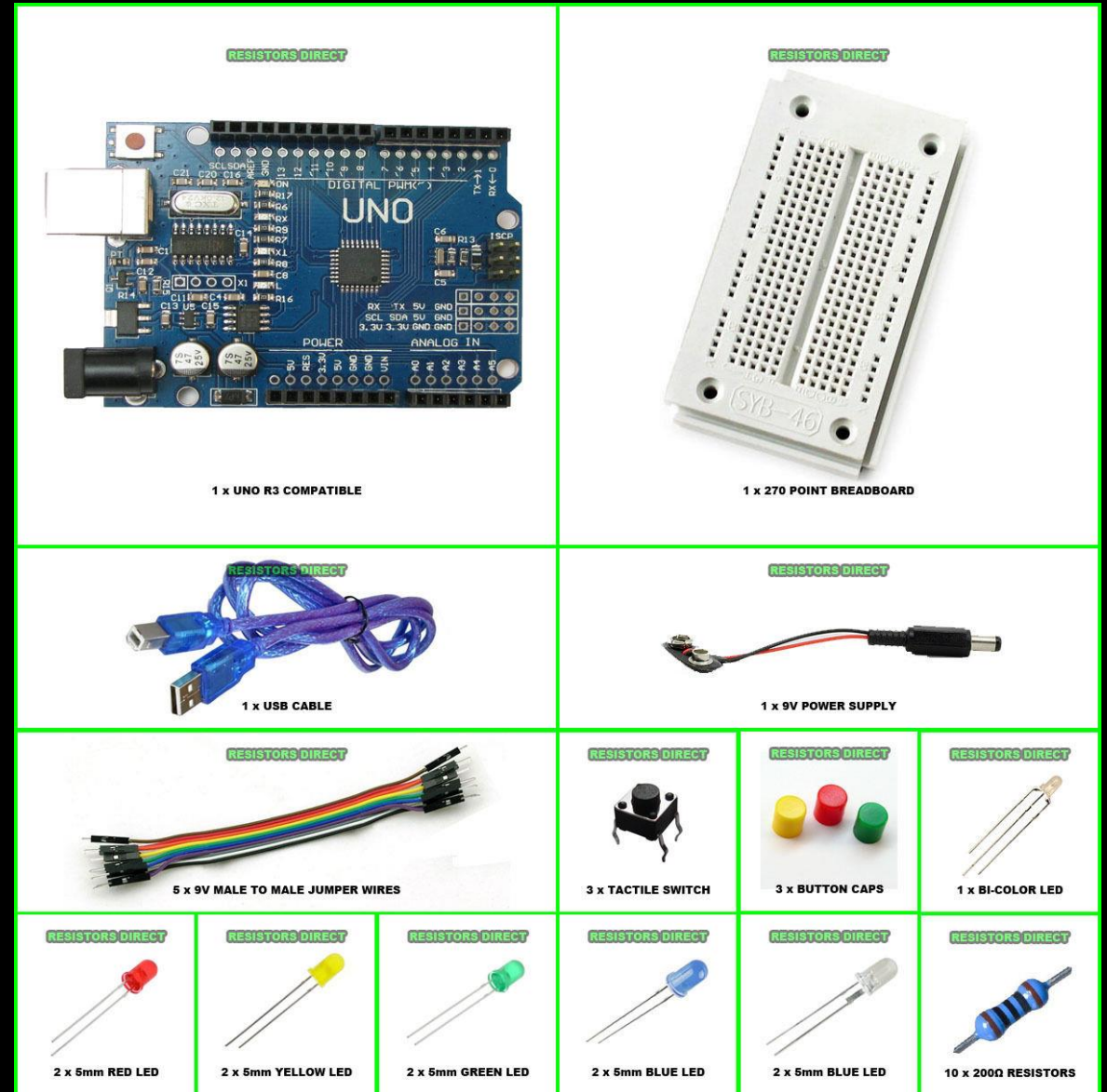
KIT AND INSTALL OF TOOLS



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WHAT IN YOUR KIT

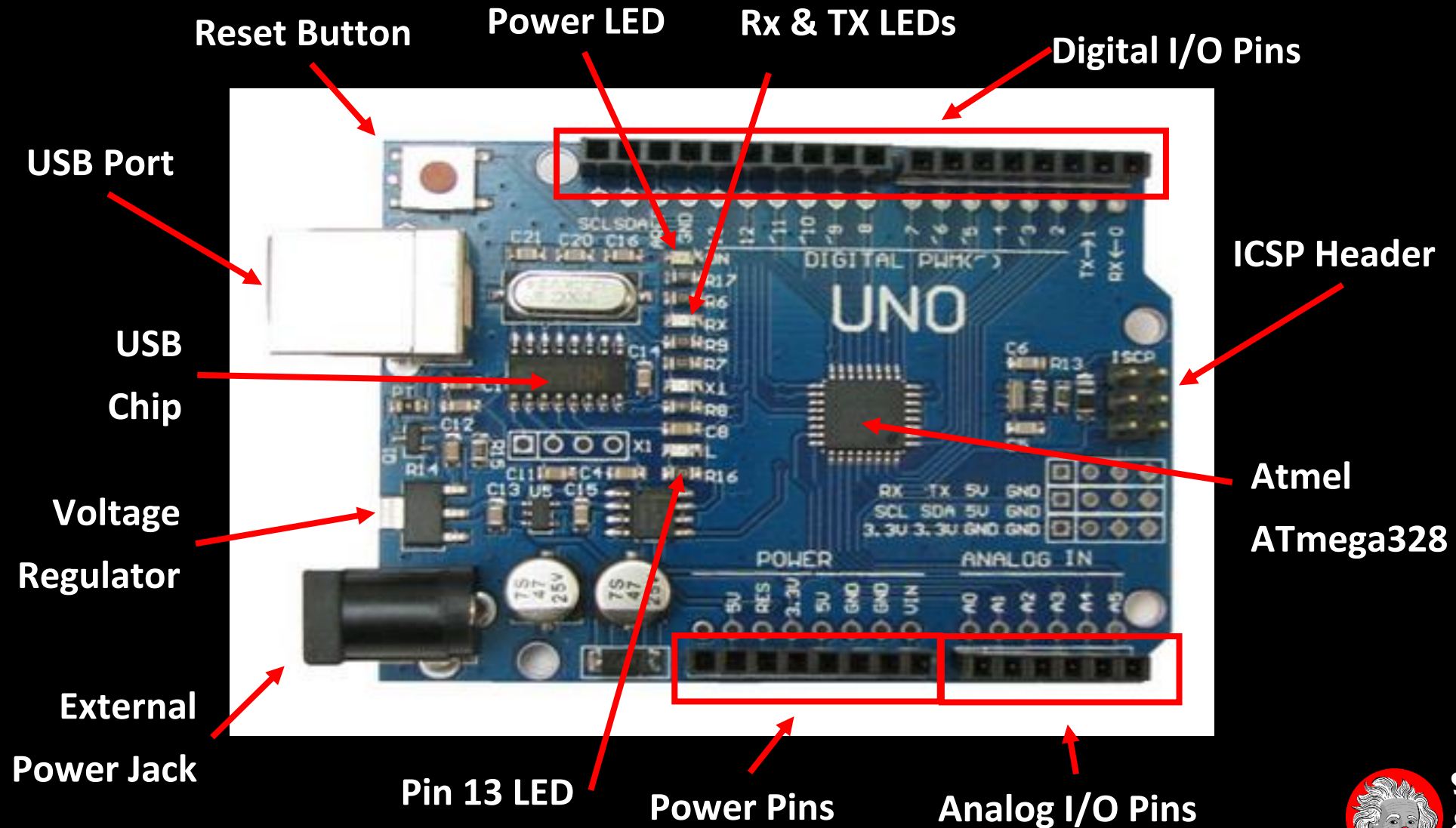
- Arduino Uno (clone)
- USB Cable
- Breadboard
- Jumper Wires
- Some Buttons
- LEDs
- Resistors



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LET ME INTRODUCE YOU TO ARDUINO...

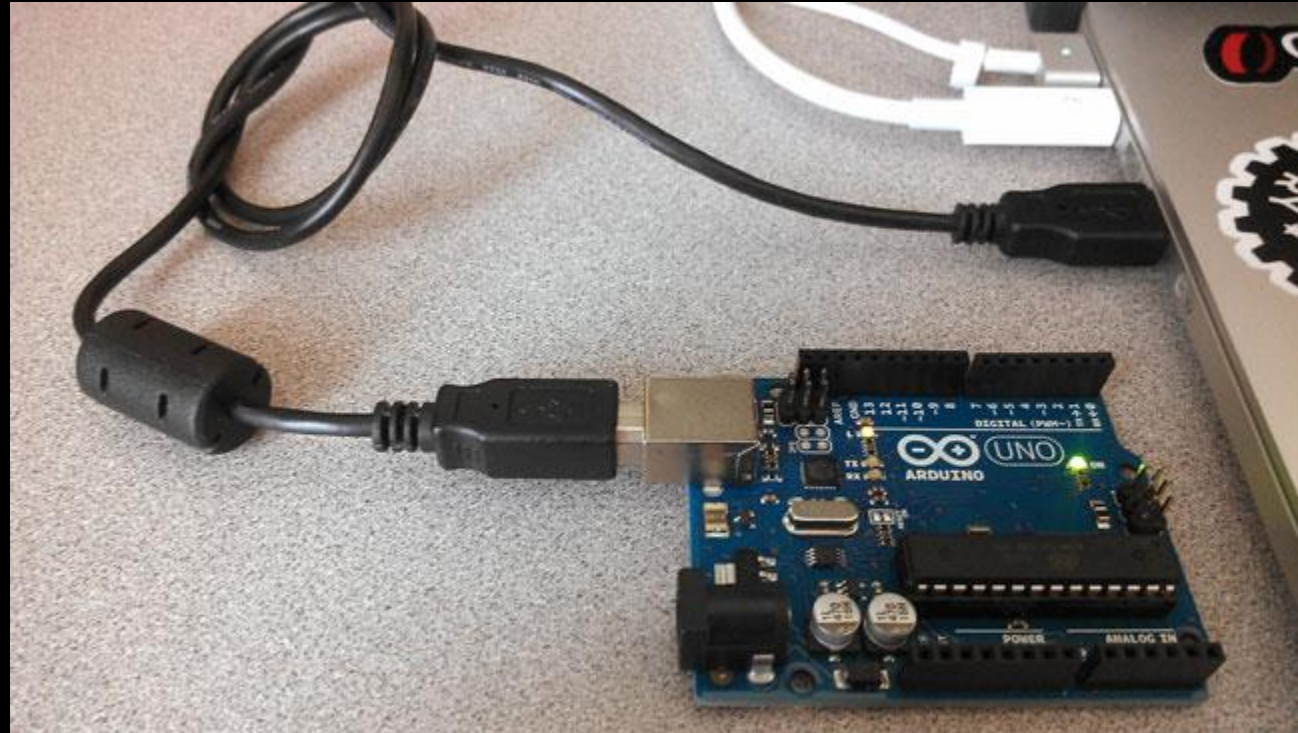


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POWERING YOUR ARDUINO UP FOR THE FIRST TIME

- Connect the USB cable from your PC to the Arduino



- Power “good” LED will turn on, you will see a bunch of Blinking on the RX/TX LED, and LED 13 should start Blinking



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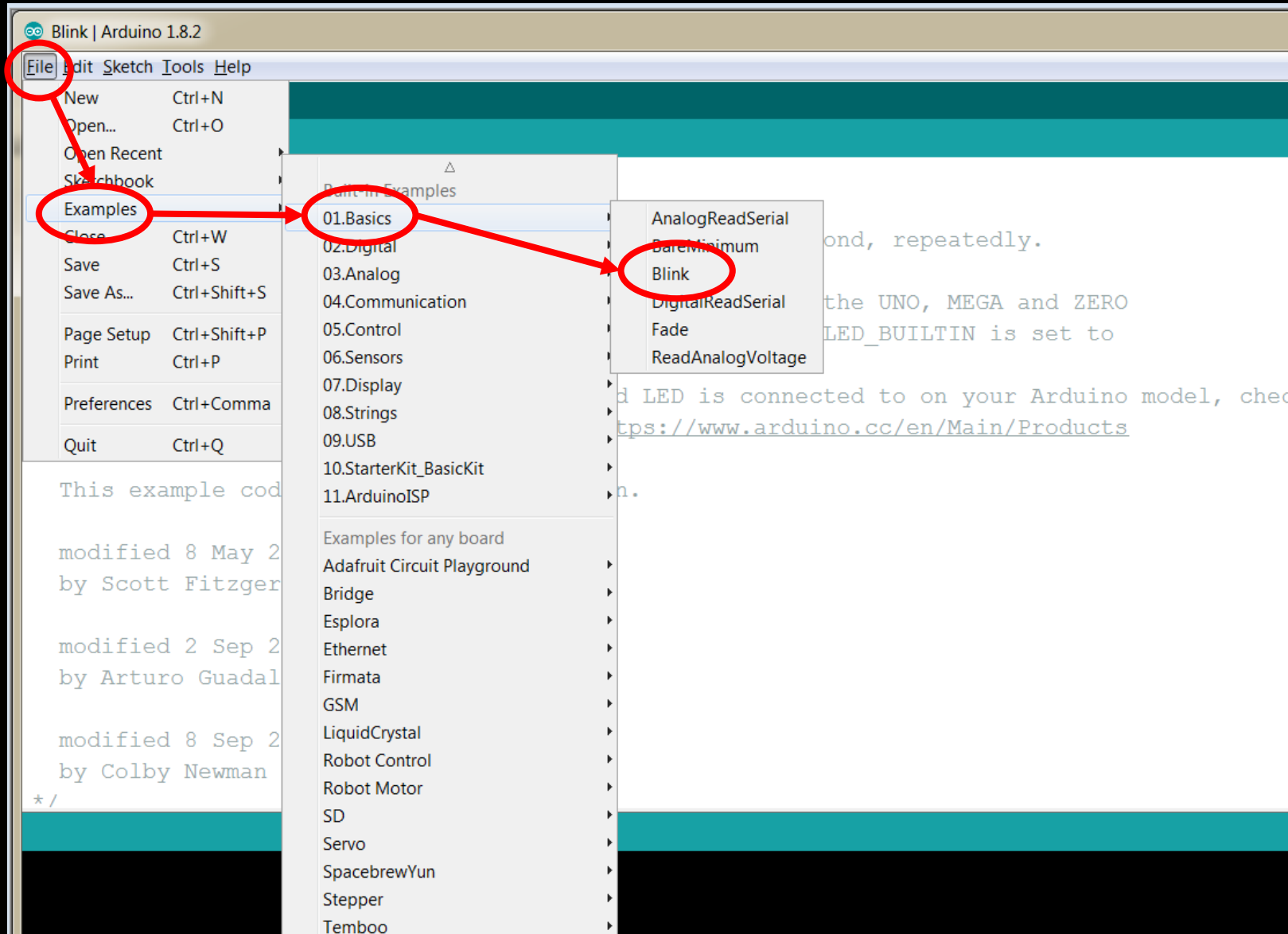
BLINK - FIRST SKETCH



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BLINK



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BLINK - FIRST SKETCH

Setup Function

In Setup, Define Pin
Direction

Main Loop

Turns LED ON

Delay 1 sec

Turns LED OFF

Delay 1 sec

```
// the setup function runs once when you press reset or power the b
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is th
  delay(1000); // wait for a second
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making
  delay(1000); // wait for a second
}
```



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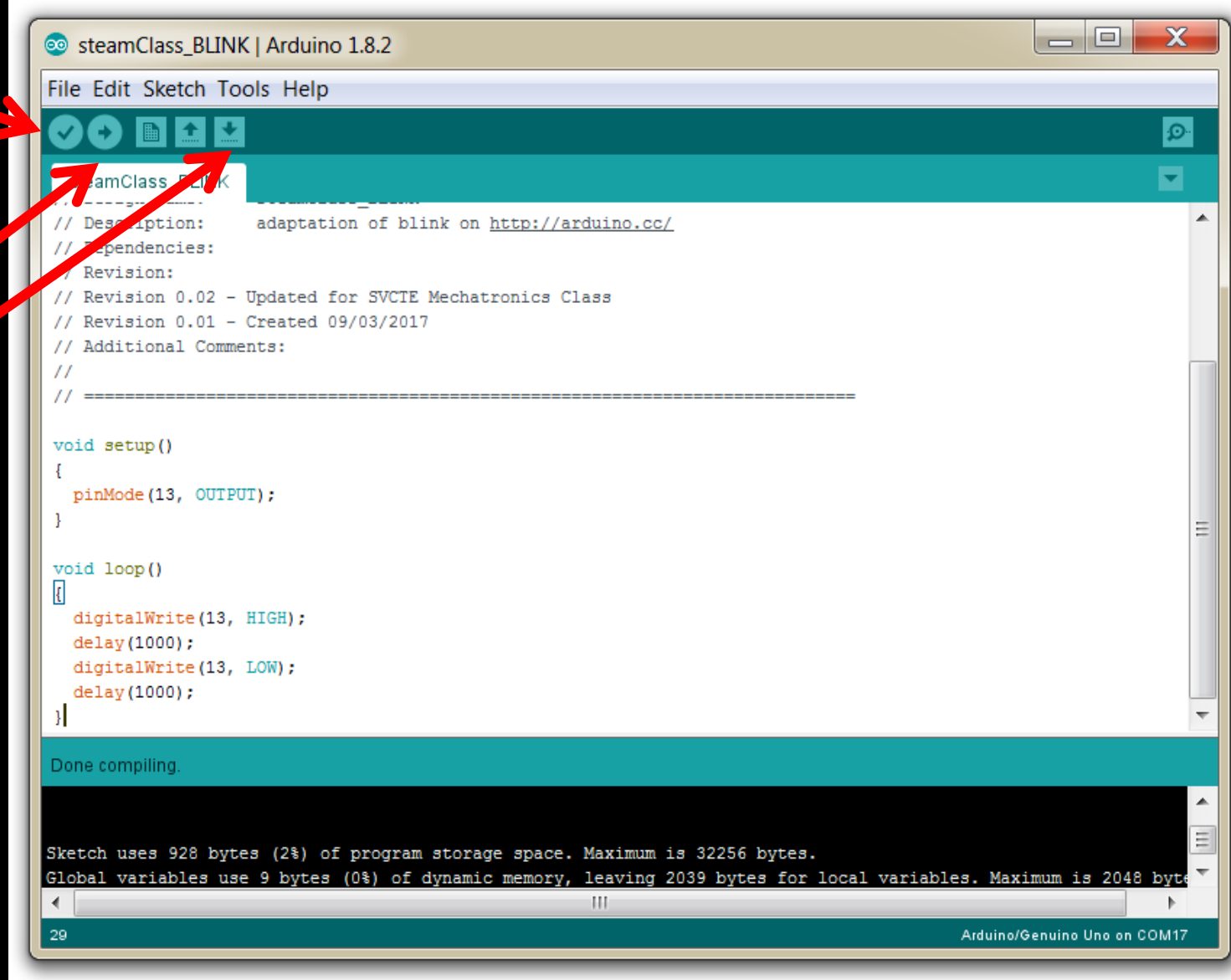
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BLINK FASTER: VERIFY, SAVE, RUN

1 Verify

3 Upload & Run

2 Save

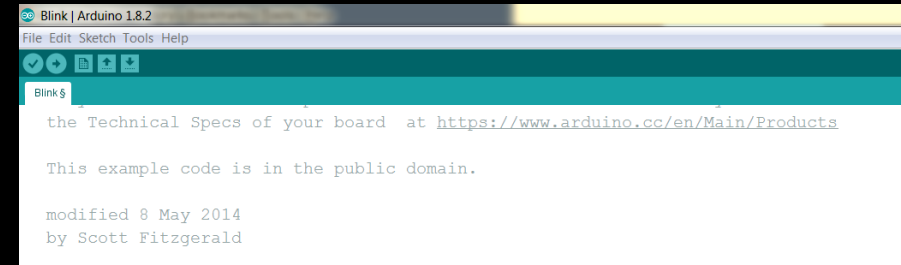


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HOW DO YOU CHANGE THE BLINK RATE?

- Change the number in the delay(1000)
- Delay is measured in ms
- (1000 ms = 1 second)



```
// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH); //
  delay(250); // wait for a second
  digitalWrite(LED_BUILTIN, LOW); //
  delay(250); // wait for a second
}
```

**Change from 1000
to something like 500 or
250 or 100**

What can happen in 500 ms?



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REFERENCE SLIDES



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APPENDIX B: ATTRIBUTION FOR SOURCES USED

- <http://arduino.cc/>
 - Has Software to download
 - Video, tutorials, labs, etc

RESOURCES

- Arduino Official Site - <http://arduino.cc/>
 - Has Software to download
 - Video, tutorials, labs, etc
- YouTube
 - <https://www.youtube.com/watch?v=5F054MNB1QI>