## **Arduino Tutorial**

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### Arduino

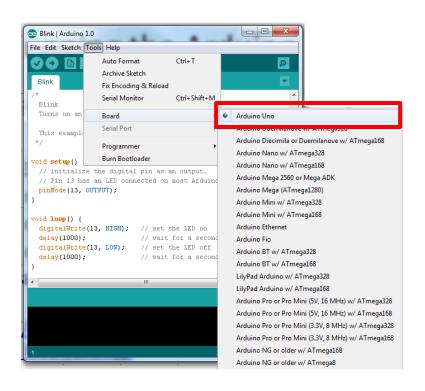
- Uses Atmel AVR
- Hardware contains everything you need
- Simple high-level C/C++ based programming language
- Very easy to use
- Example code and projects
- Large online forums for support
- Can also write to AVR registers for low-level functionality



Arduino UNO

## Running the Arduino IDE

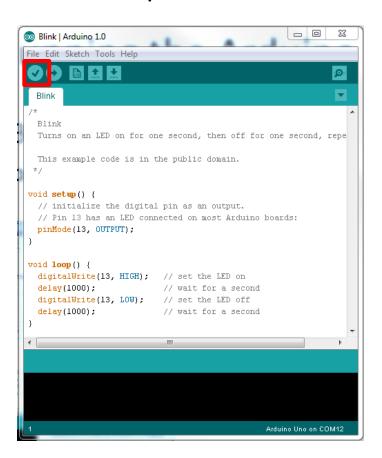
- Select Board
- Select Port



```
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oo Blink | Arduino 1.0
File Edit Sketch Tools Help
  Blink
  Turns on an LED on for one second, then off for one second, repe
  This example code is in the public domain.
void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
void loop() {
  digitalWrite(13, HIGH);
                             // set the LED on
                             // wait for a second
  delay(1000);
  digitalWrite(13, LOW);
                             // set the LED off
  delay(1000);
                             // wait for a second
                                                   Arduino Uno on COM12
```

## Running the Arduino IDE

Compile Code



Download Code to Board

```
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                                                        on Blink | Arduino 1.0
File Edit Sketch Tools Help
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                                                  Arduino Uno on COM12
```

# Arduino Code (Hello World)

#### Can define constants just like in C/C++

```
/* constants */
                              // number of milliseconds between LED toggles
#define BLINK DELAY
                      500
/* pin definitions */
#define LED
              13
                              // LED is on pin 13
/* initialization code */
void setup() {
   pinMode(LED, OUTPUT); // set LED pin as an output
/* mainloop - runs forever */
void loop() {
   digitalWrite(LED, HIGH); // turn LED on
   delay(BLINK_DELAY);  // wait before turning it off
   digitalWrite(LED, LOW); // turn LED off
   delay(BLINK DELAY);  // wait before turning it back on
                              // now return to the top of the loop
```

# Arduino Code (Hello World)

```
/* constants */
#define BLINK DELAY
                    500 // number of milliseconds between LED toggles
/* pin definitions */
                             void setup() — code that runs once at startup
#define LED
              13
/* initialization code */
void setup() {
   pinMode(LED, OUTPUT); // set LED pin as an output
/* mainloop - runs forever */
void loop() {
   digitalWrite(LED, HIGH); // turn LED on
   delay(BLINK_DELAY);  // wait before turning it off
   digitalWrite(LED, LOW); // turn LED off
   delay(BLINK DELAY);  // wait before turning it back on
                              // now return to the top of the loop
```

# Arduino Code (Hello World)

```
/* constants */
#define BLINK DELAY 500 // number of milliseconds between LED toggles
/* pin definitions */
#define LED
              13
                            // LED is on pin 13
/* initialization code */
void setup() {
   pinMode(LED, OUTPUT); // set LED pin as an output
           void loop() – code that runs continuously in a loop (mainloop)
/* mainloop - runs forever */
void loop() {
   digitalWrite(LED, HIGH); // turn LED on
   delay(BLINK_DELAY);  // wait before turning it off
   digitalWrite(LED, LOW); // turn LED off
   delay(BLINK DELAY);  // wait before turning it back on
                              // now return to the top of the loop
```

### **Arduino Demos**

### Hello World

Blinks an LED

### Interrupts

Switch toggles blinking LED (switch press triggers ISR)

#### PWM

LED brightness changes continuously using PWM

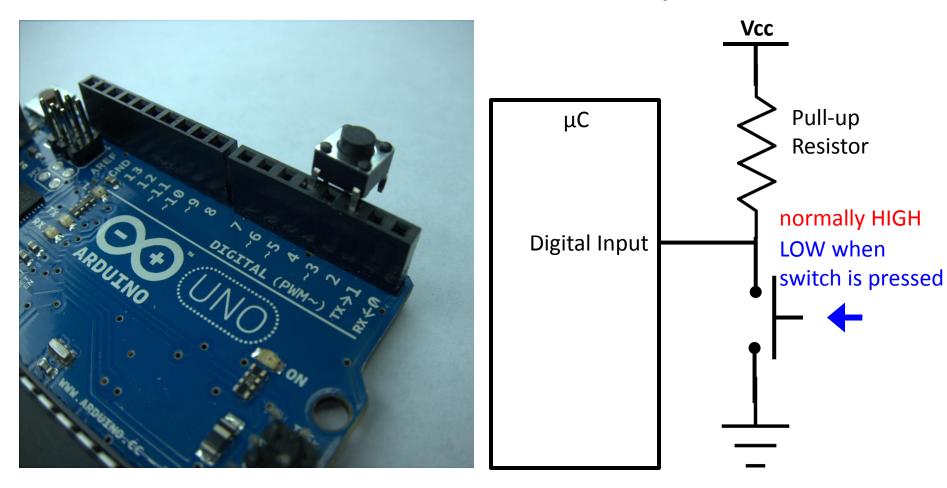
#### ADC

Periodically samples voltage across light sensor and outputs brightness level using the LED

Code Available at: <a href="www.gabeacohn.com/teaching/micro">www.gabeacohn.com/teaching/micro</a>

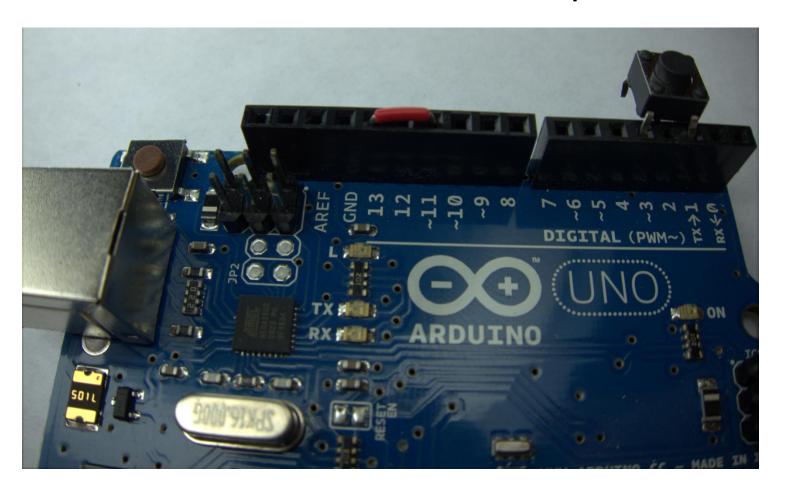
## Arduino Interrupts Demo

Need to connect switch between pins 2 and 4



## Arduino PWM Demo

Need to connect a wire between pins 11 and 13



## Arduino ADC Demo

 Need to connect photo-resistor between pin A0 and GND

