

Arduino

PART I

Teaching Circuits to Enhance Curriculum



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Arduino: Teaching Circuits to Enhance Curriculum

PART 1

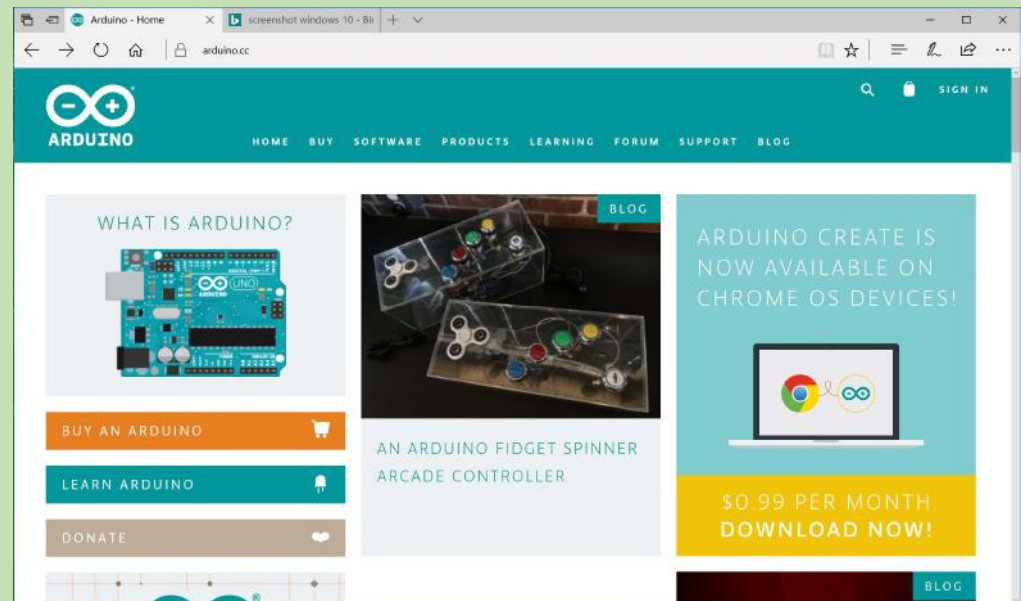
While you are waiting:

1. Download the Arduino Software (arduino.cc)



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2. Follow me! (I'm in a followers race with @frc2056)



Grade 6 Expectations

Overall Expectations:

1. evaluate the impact of the use of electricity on both the way we live and the environment;
2. investigate the characteristics of static and current electricity, and construct simple circuits;
3. demonstrate an understanding of the principles of electrical energy and its transformation into and from other forms of energy.

Grade 6 Expectations

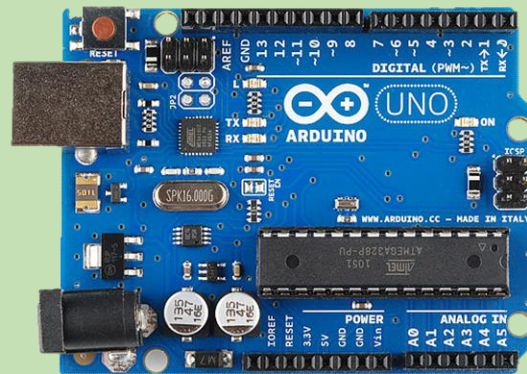
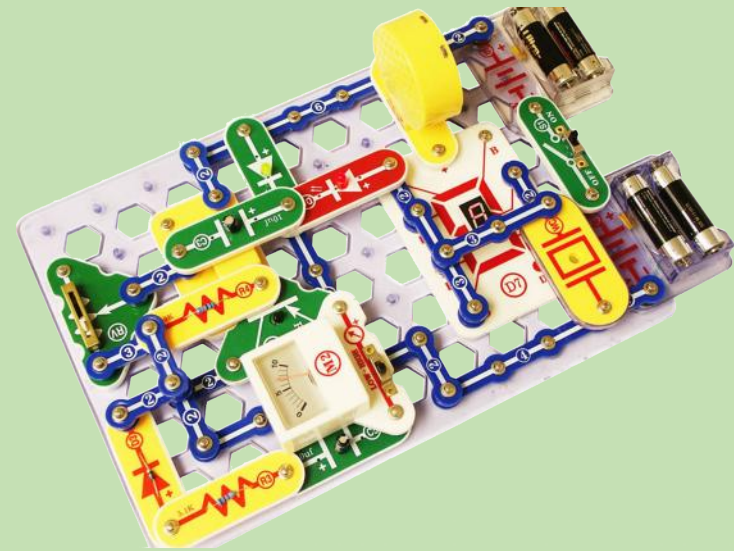
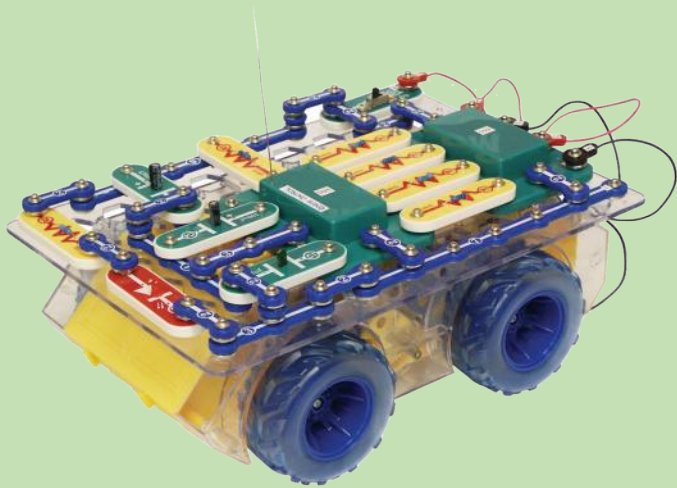
Specific Expectations:

- Design and build series and parallel circuits, draw labelled diagrams identifying the components used in each, and describe the role of each component in the circuit
- Use technological problem-solving skills to design, build, and test a device that transforms electrical energy into another form of energy (*e.g., a device that makes a sound, that moves, that lights up*)
- Explain the functions of the components of a simple electrical circuit (*e.g., a battery is the power source; a length of wire is the conductor that carries the electrical current to the load; a light bulb or motor is the load*)

Basic Principles of Electricity

- An electrical circuit is a circular system (+ to -)
- Power must flow through a circuit before returning to the power source
- You can interact and control a circuit by adding inputs and outputs

Amazing Tools for Circuits

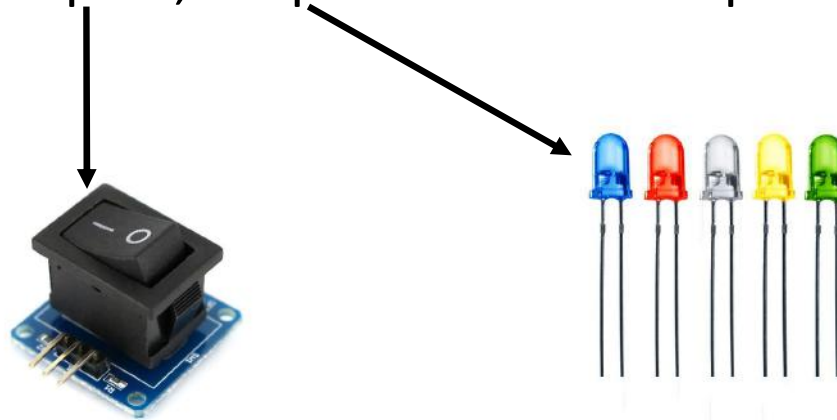


Snap Circuits

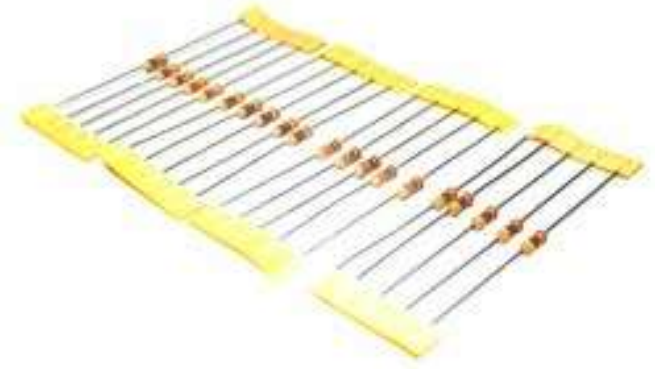
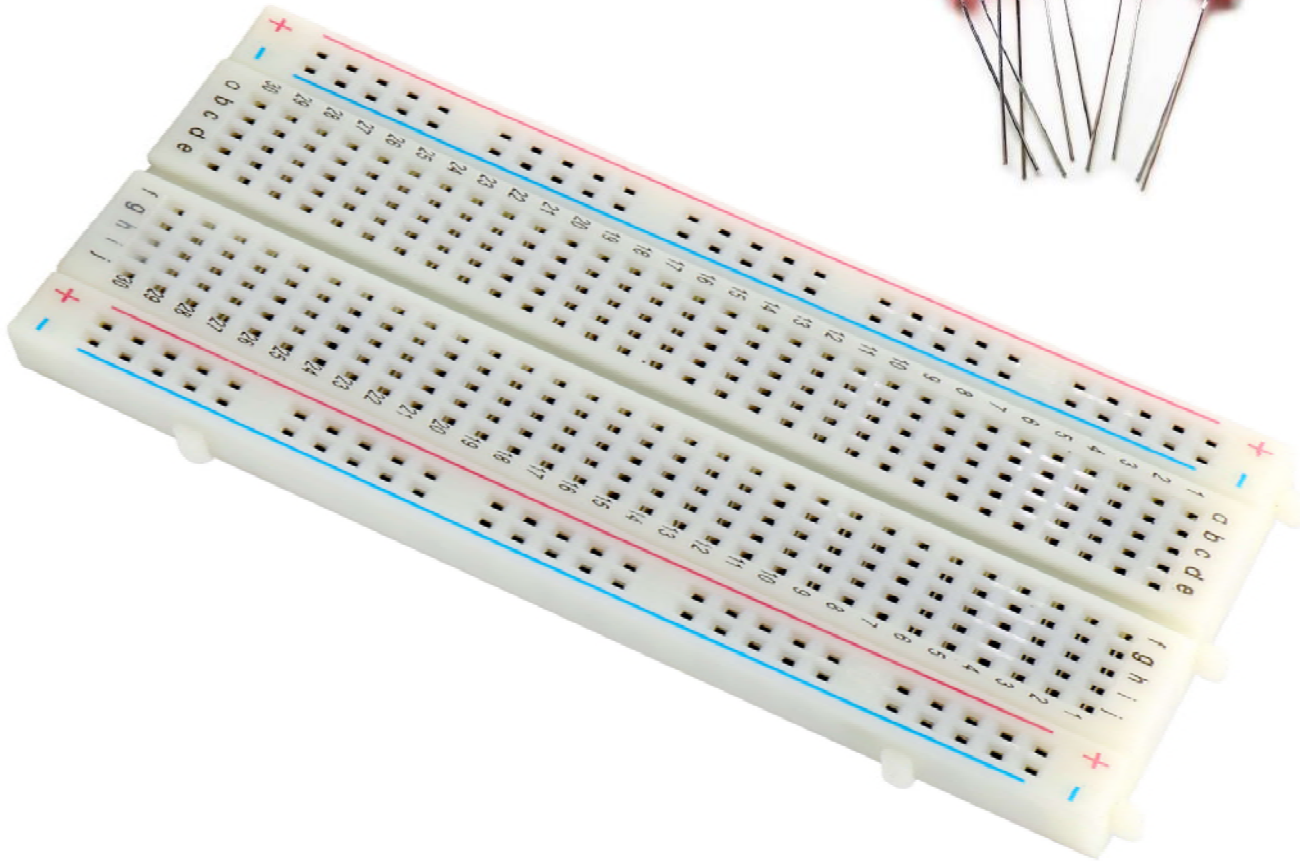


What is Arduino?

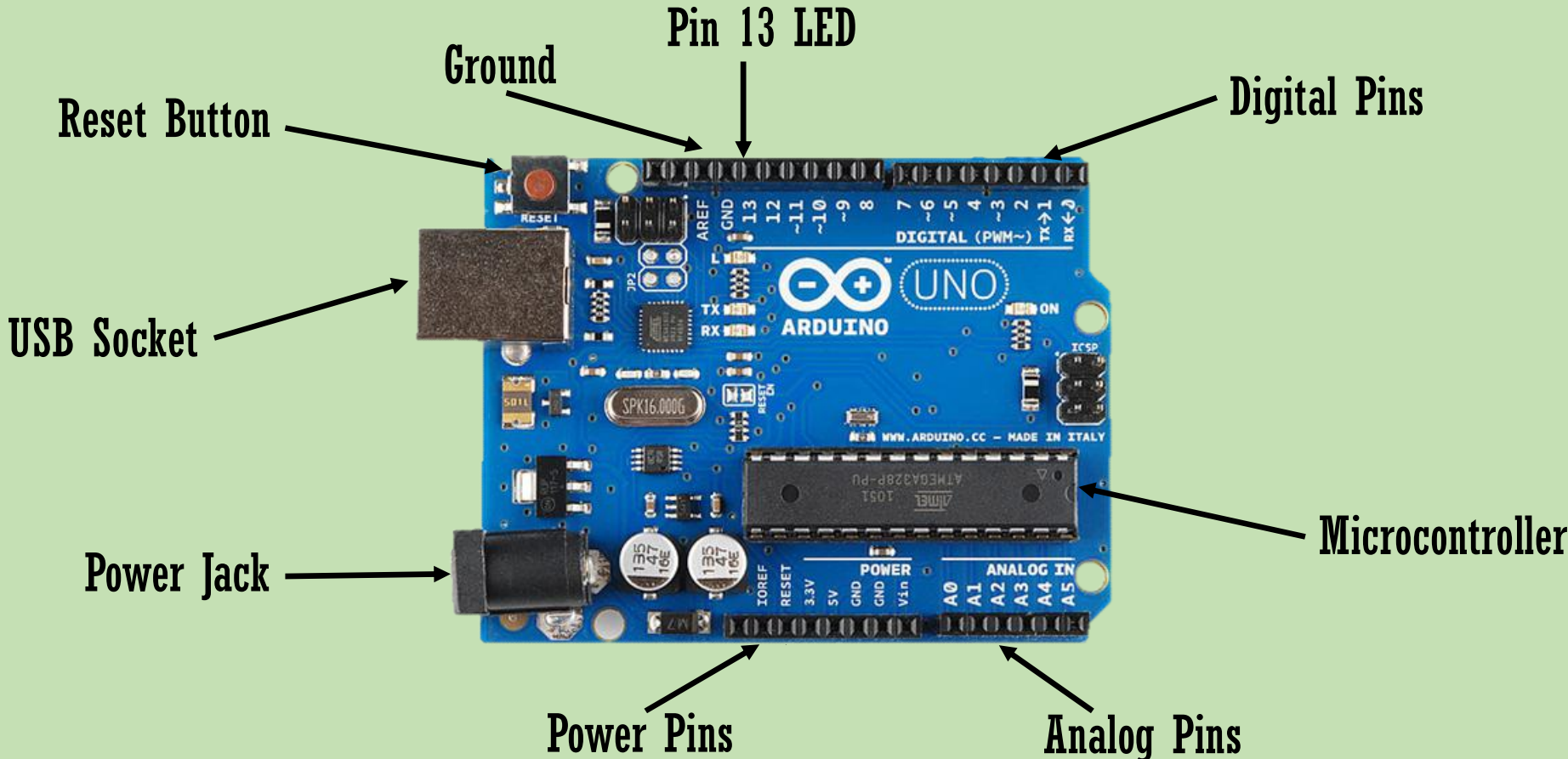
- A printed circuit board (PCB) that has a microcontroller chip
- A microcontroller is a small computer within a computer chip or circuit that can be programmed
- Arduino requires inputs, outputs and code to perform functions



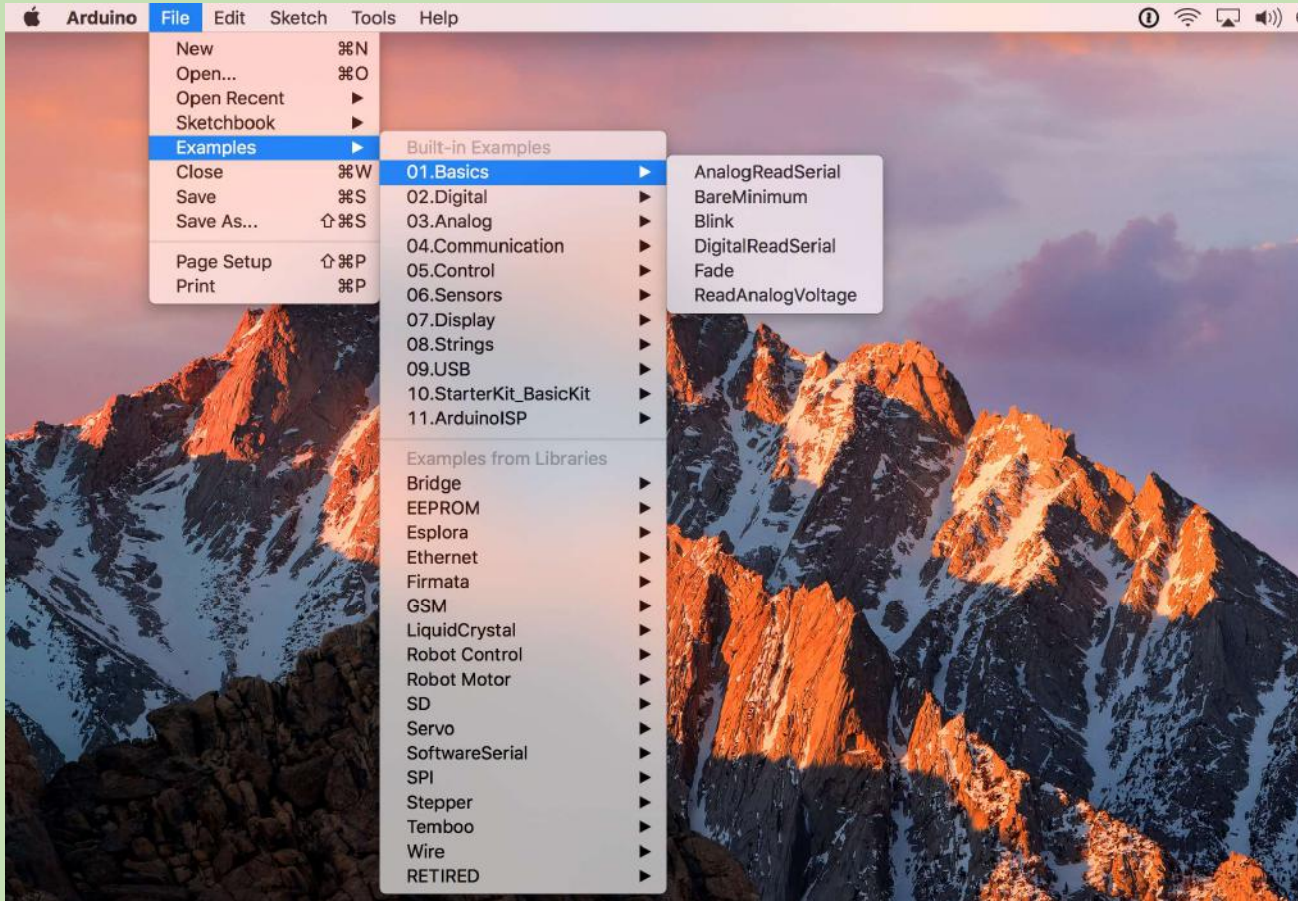
Arduino Start Kits



Parts of the Arduino Uno



Our First Project – “Blink”



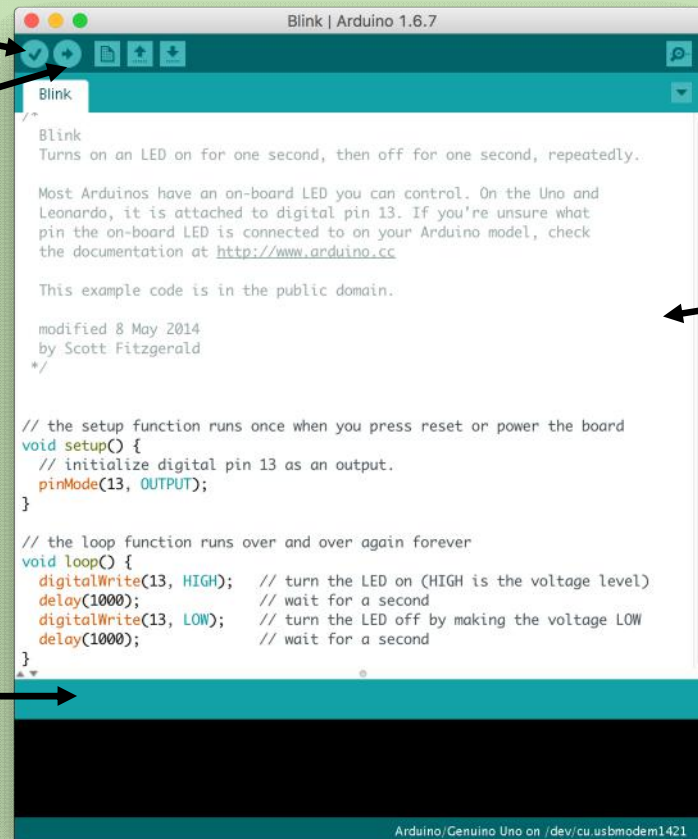
- Select the correct Arduino Board
- Find the connected port
- Find the project “Blink”

Our First Project – “Blink”

Verify

Upload

Message Area



Text Editor

Console

Our First Project – “Blink”

```
// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin 13 as an output.
  pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(13, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000);           // wait for a second
  digitalWrite(13, LOW); // turn the LED off by making the voltage LOW
  delay(1000);           // wait for a second
}
```

Comments (points to the first comment line)

Sets the mode of pin 13 (points to `pinMode(13, OUTPUT);`)

Runs and Repeats loop (points to `void loop() {`)

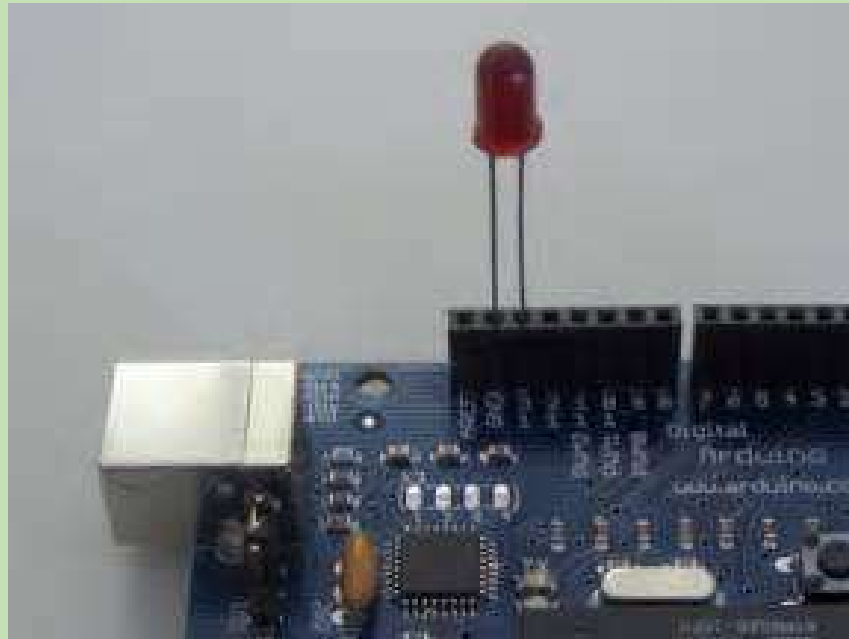
Sends digital value to pin 13 (points to `digitalWrite(13, HIGH);`)

Pauses on/off (points to `delay(1000);`)

Comments (points to the second comment line)

Our First Project – “Blink” Extensions

- Insert an LED light into pin 13 and ground



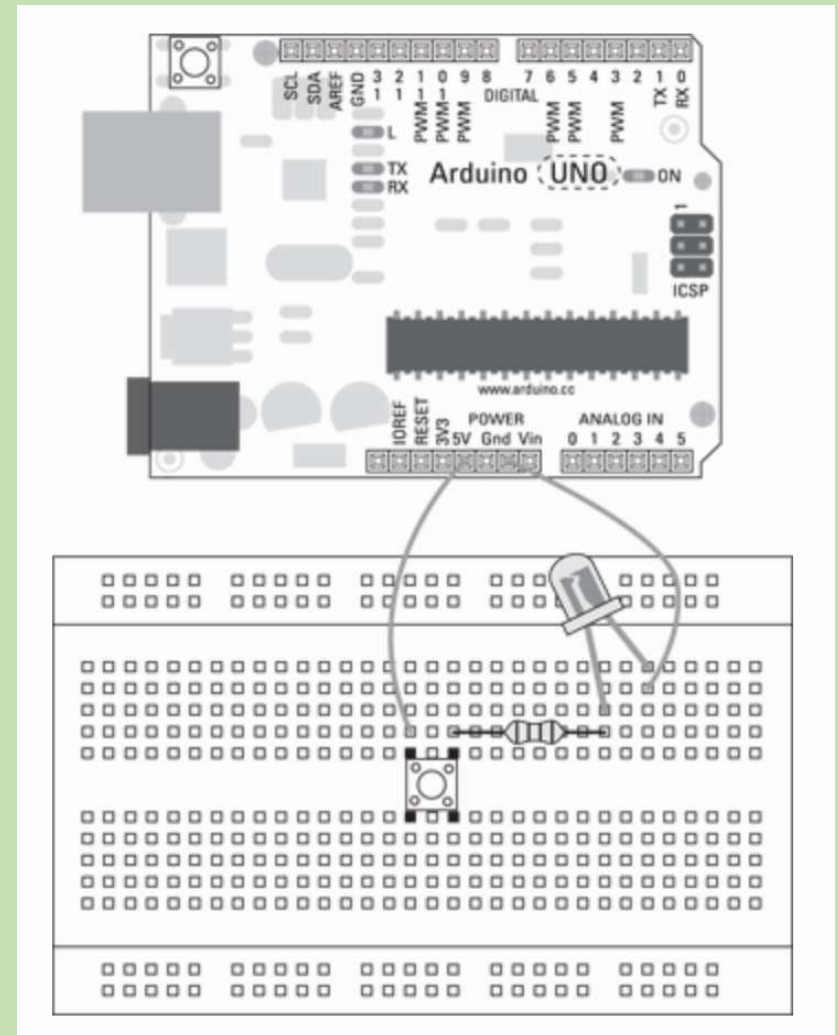
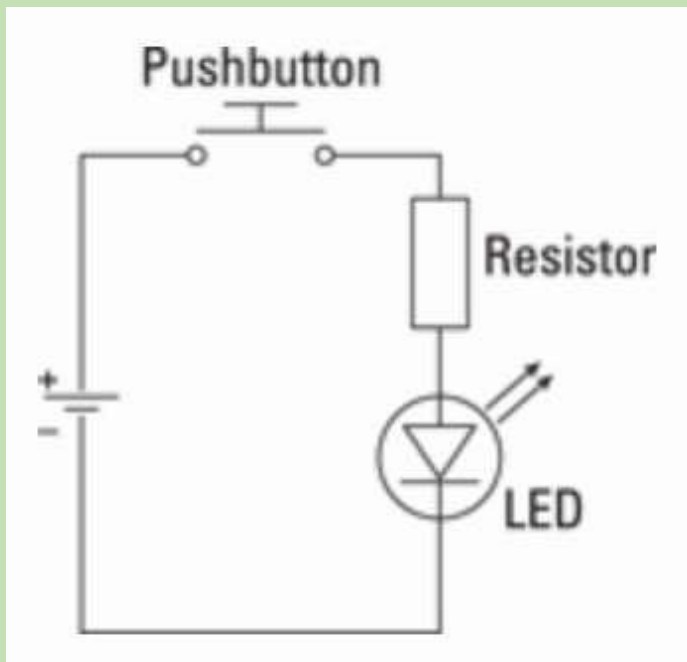
Our First Project – “Blink” Extensions

- Alter sketch so that blinking pattern changes

```
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void setup() {
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  pinMode(13, OUTPUT);
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void loop() {
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  delay(1000);           // wait for a second
}
```

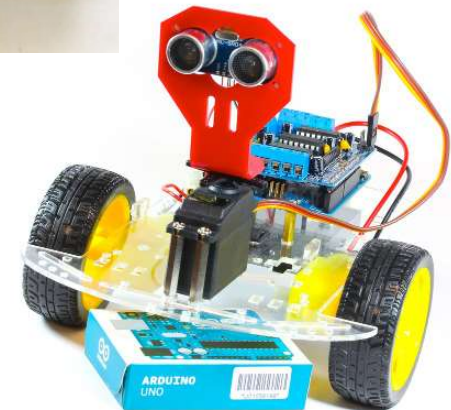
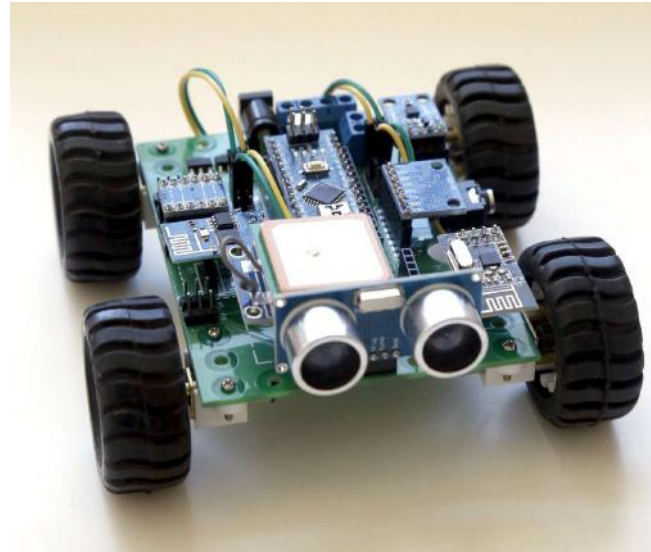

Circuit and Arduino Diagrams



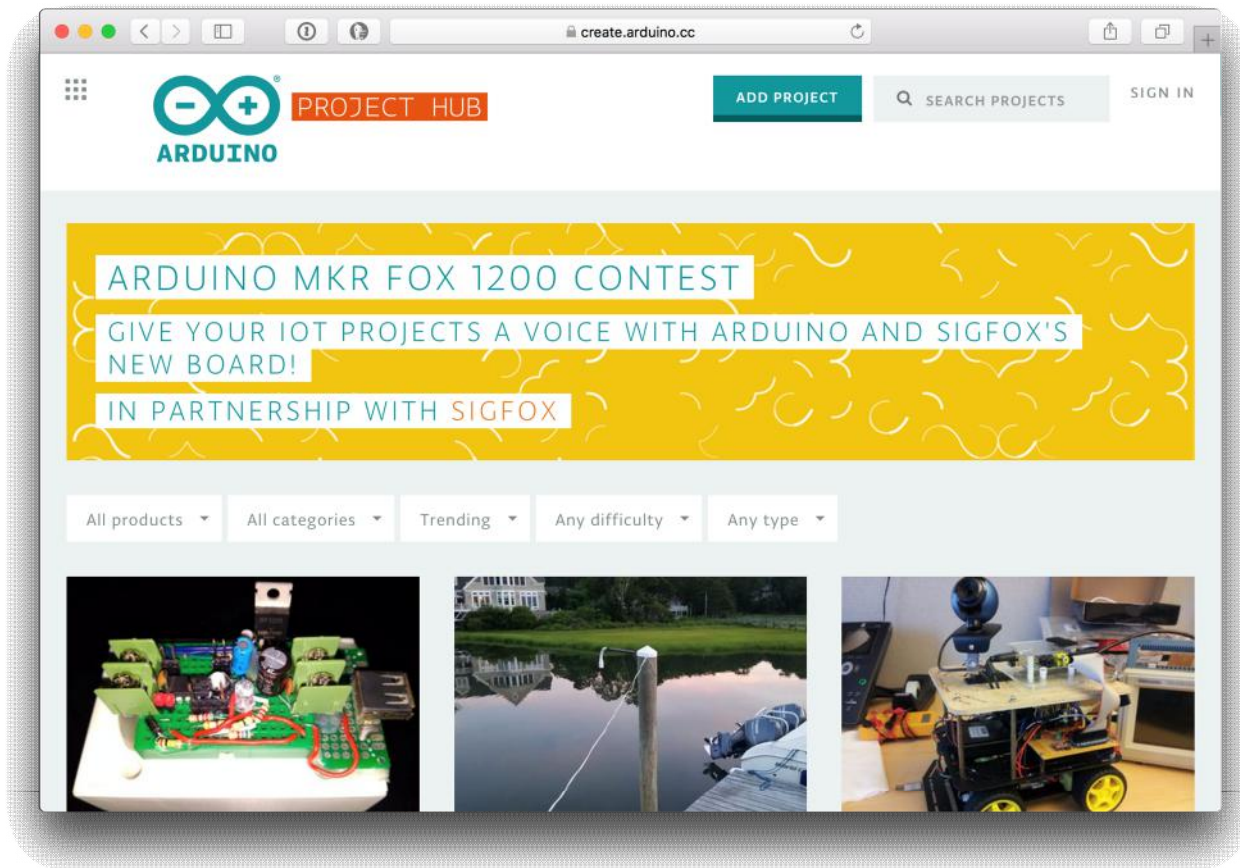
Extensions of Arduino

“Arduinos are used in many of the engineering courses in Secondary such as TEJ2/3/4. They are perfect for interfacing and programming in those courses. They are widely used in the HWDSB and elsewhere. They may be used in science and physics as well.”

~ Mr. Hunter



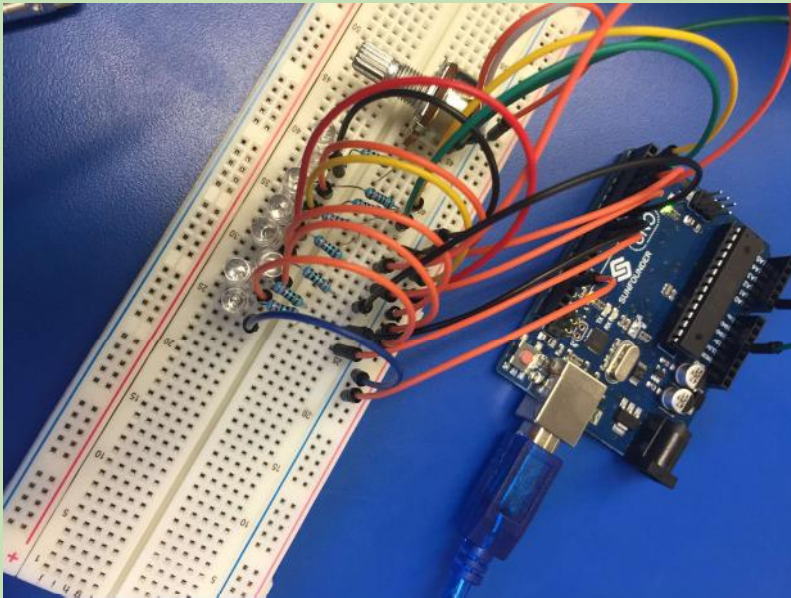
Arduino Website / Education Section



Student Testimony

“Arduino is challenging, but you learn so much after each sketch. Who else knows what PWM is?”

- Taylor



“Without Arduino and Snap Circuits, Learning about this stuff would be so boring. It means a lot to be able to build projects. My dad bought me a starter kit at home. I think I am happy about that.”

- Morgan

“I’m pretty good at setting up the circuit without making mistakes. Mr. Ciardelli usually asks me questions and I am getting better at answering them.”

- Ellery

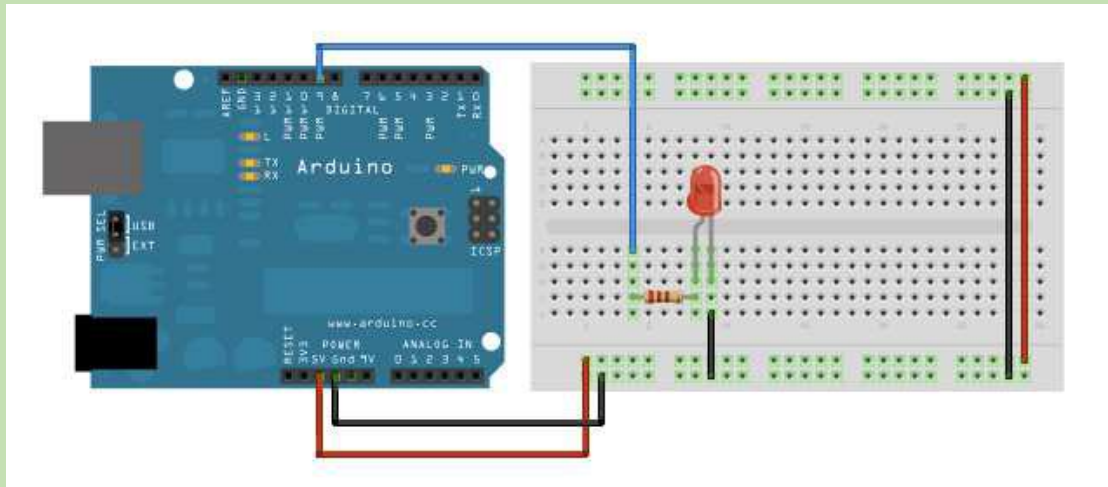
Choose Your Own Adventure

- Explore Snap Circuits
- Start a new Arduino project Controlling an LED with PWM
- Question & Answers



Our Next Project – “Fade”

- Fade uses Pulse-Width Modulation (PWM) to control the luminance of the light



```
Fade | Arduino 1.6.7

Fade

int led = 9;           // the PWM pin the LED is attached to
int brightness = 0;   // how bright the LED is
int fadeAmount = 5;   // how many points to fade the LED by

// the setup routine runs once when you press reset:
void setup() {
  // declare pin 9 to be an output:
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  // set the brightness of pin 9:
  analogWrite(led, brightness);

  // change the brightness for next time through the loop:
  brightness = brightness + fadeAmount;

  // reverse the direction of the fading at the ends of the fade:
  if (brightness == 0 || brightness == 255) {
    fadeAmount = -fadeAmount ;
  }
}
```