# Sidekick Basic Kit for Arduino V2

Introduction

The Arduino Sidekick Basic Kit is designed to be used with your Arduino / Seeeduino / Seeeduino ADK / Maple Lilypad or any MCU board. It contains everything needed for a first-time user to connect his/her computer to an Arduino. It includes many of the most popular accessories for DIY projects : like Breadboard, Jumper wires, Color LEDs, Resistors, Buzzer, etc. All of these coming with its own handy box are easy transport and minimal clutter.

Kit Contents
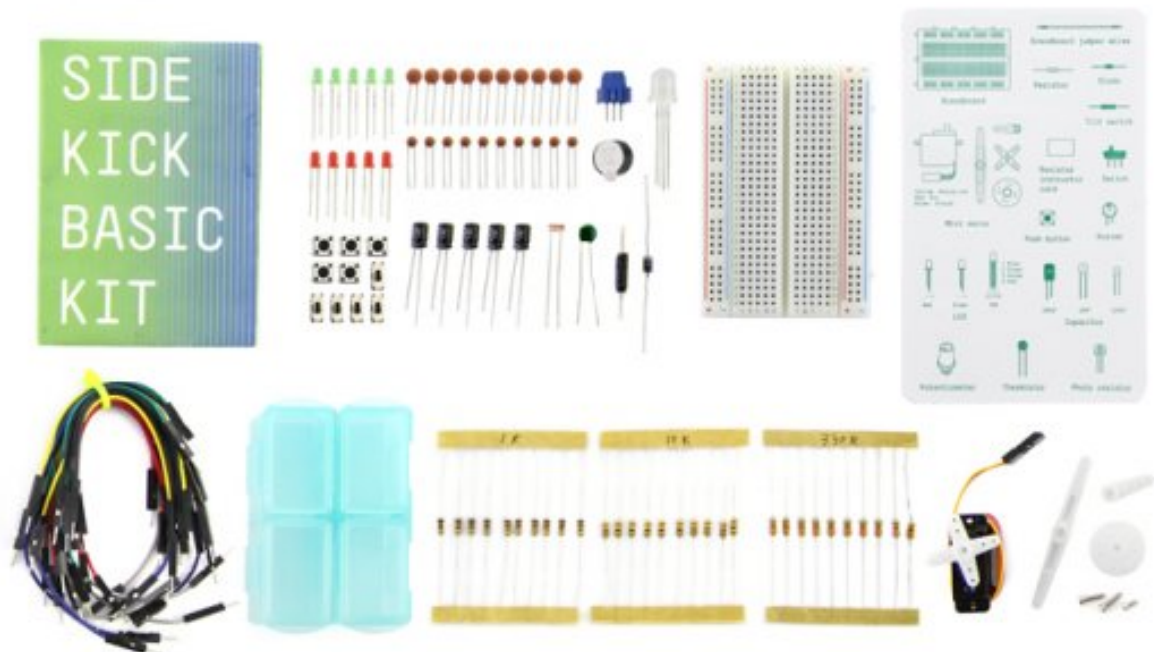
1. Breadboard x 1
2. Green LED x 5
3. Red LED x 5
4. RGB Common Anode LED x 1
5. Ceramic Capacitor(10nF x 10+100nF x 10)
6. Aluminum capacitor(100uF x 5)
7. Resistor(330R x 10+1k x 10+10k x 10)
8. Tilt switch x 1
9. Thermistor x 1
10. Photo resistor x 1
11. Diode x 1
12. Buzzer x 1
13. Button x 5
14. Switch x 5
15. Mini Servo x 1
16. Potentiometer with knob x 1
17. Breadboard jumper wire x 25（5x long, 20 x short） Breadboard x 1
18. Box x 4

Basic Electronics Refresher

Current and Voltage

Current is the rate of flowing electric charge in a conductor. Voltage is the potential difference (electric driving force) applied between two points to conduct current. Current is expressed in terms of Amperes (A) and Voltage is in terms of Volts (V).

Resistor

Resistors are obstacles of the flowing current in a conductor. They are used to limit the flow of current to an electronic device like lamp. The resistance to the flowing current is expressed in Ohms (Ω).They are divided into *Fixed resistor* and *variable resistor (POT)* .

Connecting Resistors

Resistors can be connected in two different types: In parallel or in series with each other.

Resistors In Series

When the resistors are connected in series, the total equivalent resistance will be equal to the sum of all the values of resistors in series.

Resistors In Parallel

In parallel, the reciprocal of the total equivalent resistance is equal to the sum of each resistor's reciprocal.

Ohm's Law

The relations among Current, Voltage and Resistance are governed by Ohm's Law - which states that "The current through a conductor (I Amperes) between two points is directly proportional to the potential difference or voltage across the two points (V Volts), and inversely proportional to the resistance between them (R Ohms)" i.e $I = V / R$. Hence $V = IR$ or $R = V / I$. The following Ohm's Law triangle can be used to remember the relationship between V, I and R. The vertical line indicates multiplication operation and horizontal line indicates division operation.
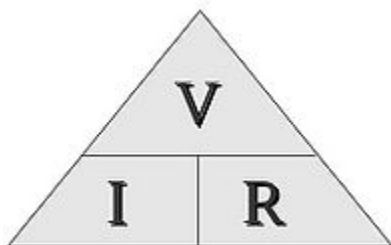

eg: Hence to know current I, we divide V by R.

Breadboard
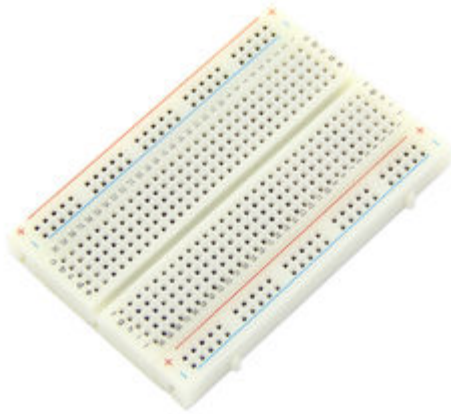
Breadboard is a prototyping device for electronic circuits. It is very useful to connect electronic components and to make a circuit without soldering. Breadboard consists of rows and columns of holes with metal contacts to insert components. The breadboard supplied with Arduino Sidekick Basic Kit is arranged of **2 X 30 five-hole** columns and **4 X twenty five-hole** rows. These holes are connected internally in a manner as illustrated below.
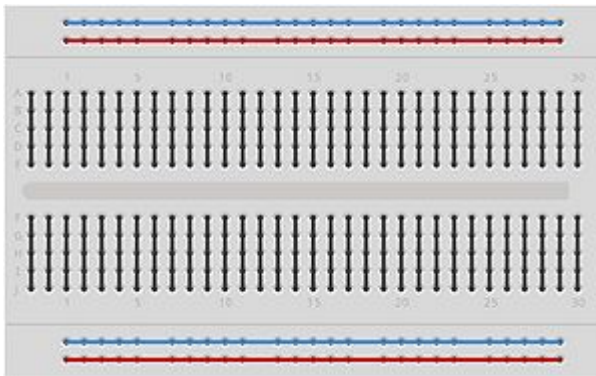
Fixed Resistors

The resistors supplied with Basic Kit are made of carbon and have fixed value type. The value of resistance is marked by the colored bands. You can get the value from the resistor color code sheet.

- The *first band* indicates the **first digit** of the resistance value.
- The *second band* indicates the **second digit**.
- The *third band* indicates the **multiplier** value of the resistor.
- The *fourth band* denotes the **Tolerance value**.

Potentiometer (POT)

POT is a variable resistor whose resistance can be changed by rotating the knob. It has three terminals - the terminals on the ambilateral sides of the resistor are connected to ends of conductor which is made of resistive material. The middle terminal is connected to a slider which moves over the resistive material. The value of resistance changes proportionally to the position of the knob.

Thermistors

Thermistors are special resistors whose resistance will be changed with the temperature around it. They provide very useful and convenient way to sense the temperature difference.

Light Dependent Resistors (LDR)

LDR will change the resistance when the intensity of light falling on them changes. They are also called photocell. It offers maximum resistance when there is no light falling on it and gives minimum resistance when exposed to bright light. It is made up of photo sensitive material like Cadmium Sulphide and can be connected to the circuit. It can be used as a light sensing element.
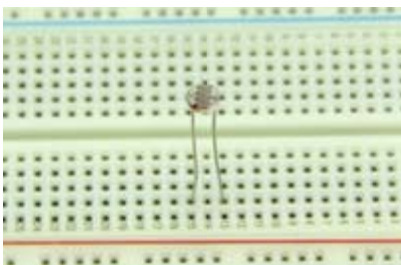
Light Emitting Diodes

LEDs emit will light up when it is forward biased. They are encapsulated in a transparent casing and come in various colors like red, green and blue. LEDs are made of gallium arsenide phosphide, and by altering the proportions of arsenic and phosphorus, different colors can be

obtained. Monocolor LEDs have two leads Anode(+ve) and Cathode (-ve). Tricolor LEDs have 4 Leads - one anode and 3 cathodes for each color.The LEDs can be used in display boards.

Switch

The switches are used to close or open the circuit. The switches supplied with Basic kit have two types - Push button switch and Slide Switch.

Push Button Switch

The circuit will be closed as long as you press the push button switch.

Slide Switch

Slide switch is a simple two positions switch. It can be used to open or close a circuit by setting it to appropriate position.

Tilt Switch

Tilt switch contains two terminals which are connected to the circuit , it *closes* the circuit when it is *tilted horizontally* while *opens* the circuit when *tilted vertically*.

Capacitors

Capacitors are used to store electric charge. They are classified into two different types: Electrolytic and Ceramic disc Capacitor. Capacitors are expressed in terms of micro Farads (uF).
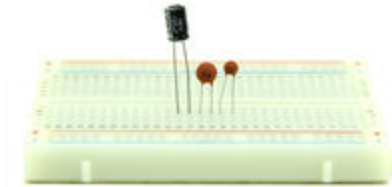
Connecting the Capacitor

Capacitors can be connected in two types of arrangement in a circuit as shown below.

Capacitors In Series

The total equivalent capacitance, when two or more capacitors are connected in series with each other, is equal to the sum of the reciprocal of individual capacitance value.

Capacitors In Parallel

The total equivalent capacitance, when two or more capacitors connected in parallel, is equal to the sum of the individual capacitance.

Electrolytic Capacitors

Electrolytic Capacitors normally have small volume and large volume of capacitance. They are classified into polarized and non-polarized electrolytic capacitors. Metals like aluminum, tantalum , vanadium and bismuth are used to form anode and cathode foils.

Ceramic Disc Capacitors

The Ceramic Capacitors use ceramic dielectric with thin metal films as electrodes bonded to the ceramic. In the Disc type, capacitor silver is fixed on to both sides of ceramic to form conductor plates. The disc capacitors are used only for small value of capacitance.

Buzzer

A buzzer is an audio signaling device, which may be mechanical, electromechanical, or Piezoelectric. It produces various audio signal based on the oscillation of the material used in it. They are commonly used in alarms and timers.

Connect the long pin to the positive voltage, and the short pin to ground.

The buzzer can be connected to digital outputs, and will emit a tone when the output is high. Alternatively, it can be connected to an analog pulse-width modulation output to generate various tones and effects.

Diode

A diode is a semi conducting material that conducts current only in one direction. It starts conducting only after the supply voltage is greater than the *barrier potential*. It acts like a closed switch in forward biased condition and acts like an open switch when it is reverse biased. The diodes are classified based on the semiconducting material and can be used to fabricate,such as PN Junction diode,zener diode,light emitting diode etc.

Biasing a Diode

Applying voltage to a diode is called biasing a diode.The diode gets ***forward biased*** when a **positive supply** voltage is applied across the terminals and starts conducting above *0.7v for a silicon diode* and *0.3v for a germanium diode*.When a **negative voltage** is applied across the terminals of a diode, it is said to be ***reverse biased***. The diode gets damaged when the reverse biasing voltage exceeds breakdown voltage.

Mini Servo

Servos are DC motors with gearing and feedback system.They are used in driving mechanism of robots.
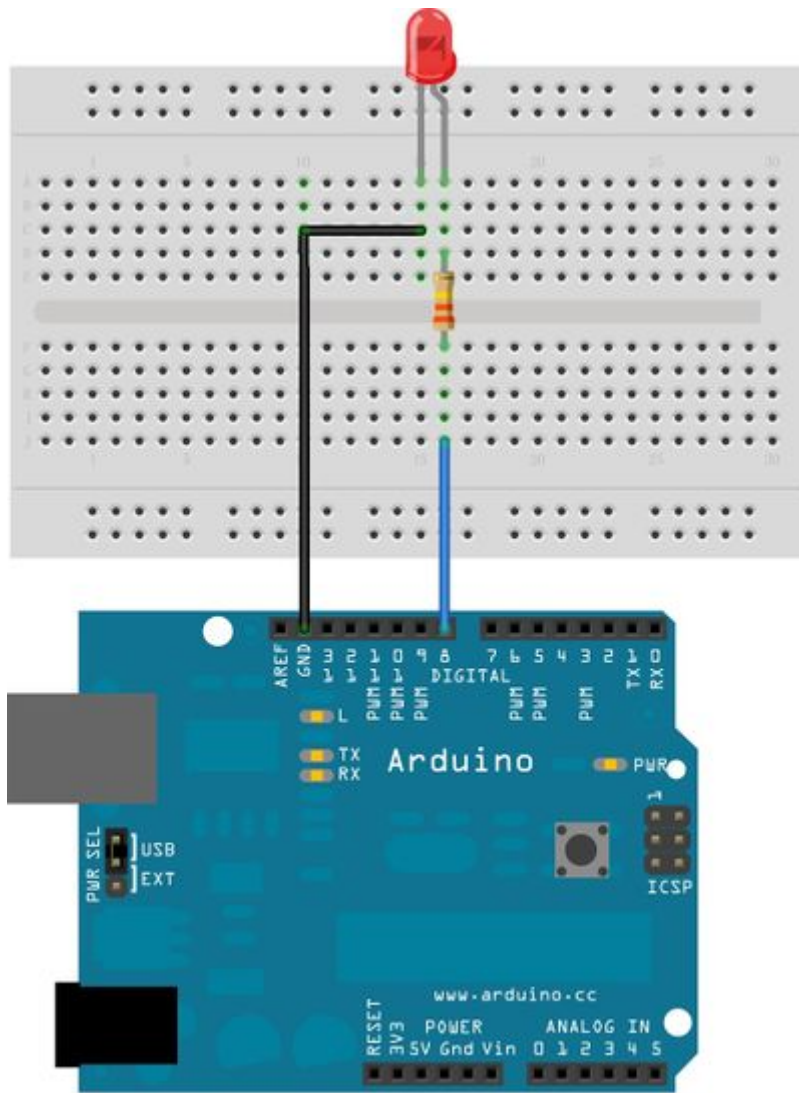
Lessons

Hello World! : The Blinking LED

Circuit

- Connect an LED to Digital Pin 8 as shown below. The 330 Ohm resistor limits the current flowing to the LED.

Program

Compile and upload the following sketch:

```
//Blink a LED connected to Digital Pin 8 via a 330 Ohm resitors.

void setup()    {
  pinMode(8, OUTPUT);        // Initialize Arduino Digital Pin 8 as output
}


void loop()
{
  digitalWrite(8, HIGH);   // Switch On LED
  delay(500);              // Wait for half a second
  digitalWrite(8, LOW);    // Switch Off LED
  delay(500);              // Wait for half a second
}
```
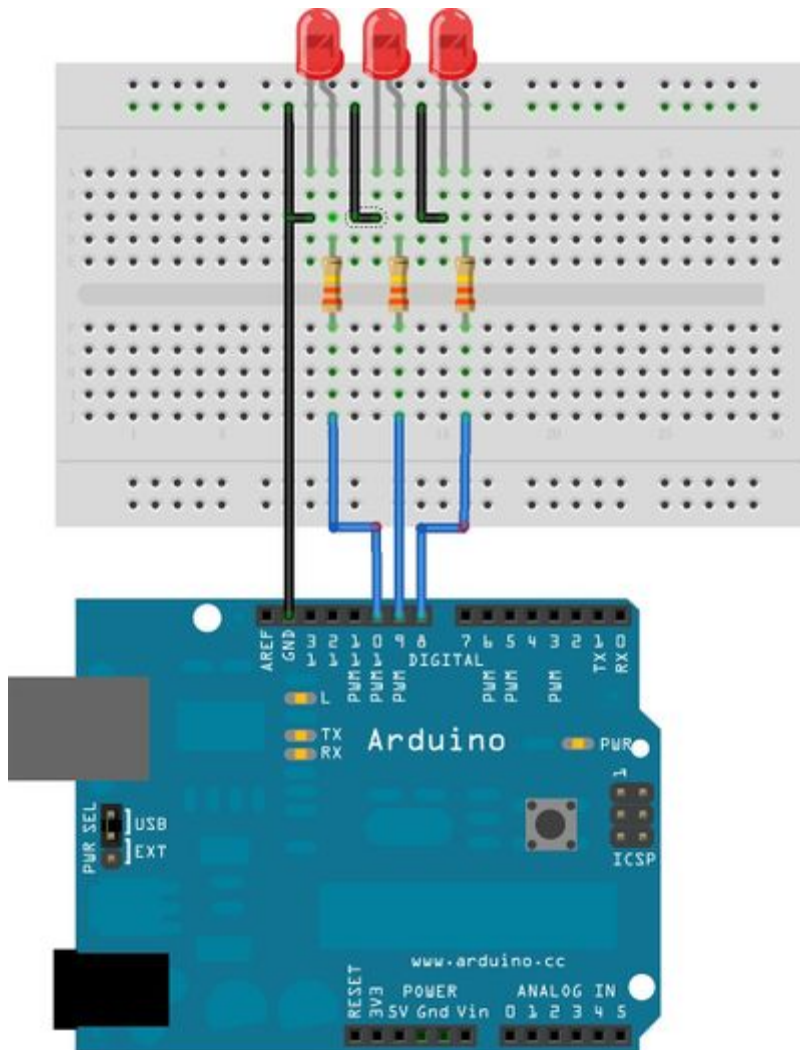
Running LED display

Circuit

- Connect 3 LEDs to Digital Pins 9, 10 and 11 via a 330 Ohms resistor each.

Program

Compile and upload the following sketch:

```
//Running LED display: Three LEDs connected to Digital Pin 9, 10 and 11.

void setup()
{
  pinMode(9, OUTPUT);        // Initialize Arduino Digital Pins 9 as output
  pinMode(10, OUTPUT);       // Initialize Arduino Digital Pins 10 as output
  pinMode(11, OUTPUT);       // Initialize Arduino Digital Pins 11 as output
}


void loop()
{

  digitalWrite(9, LOW);
  digitalWrite(10, LOW);
  digitalWrite(11, HIGH);
  delay(250);                // Wait for quarter of a second
  digitalWrite(9, LOW);
  digitalWrite(10, HIGH);
```

```
digitalWrite(11, LOW);
delay(250);                 // Wait for quarter of a second
digitalWrite(9, HIGH);
digitalWrite(10, LOW);
digitalWrite(11, LOW);
delay(250);                 // Wait for quarter of a second

}
```

Talk to Arduino : Connecting a Pushbutton Switch

Circuit

- Connect an LED to Digital Pin 8 as shown below. The 330 Ohm resistor limits the current flowing to the LED.
- Connect one of Push button switch to Digital Pin 12, and another to GND via a 10K resistor.
- Connect other end of Push button to +5V.
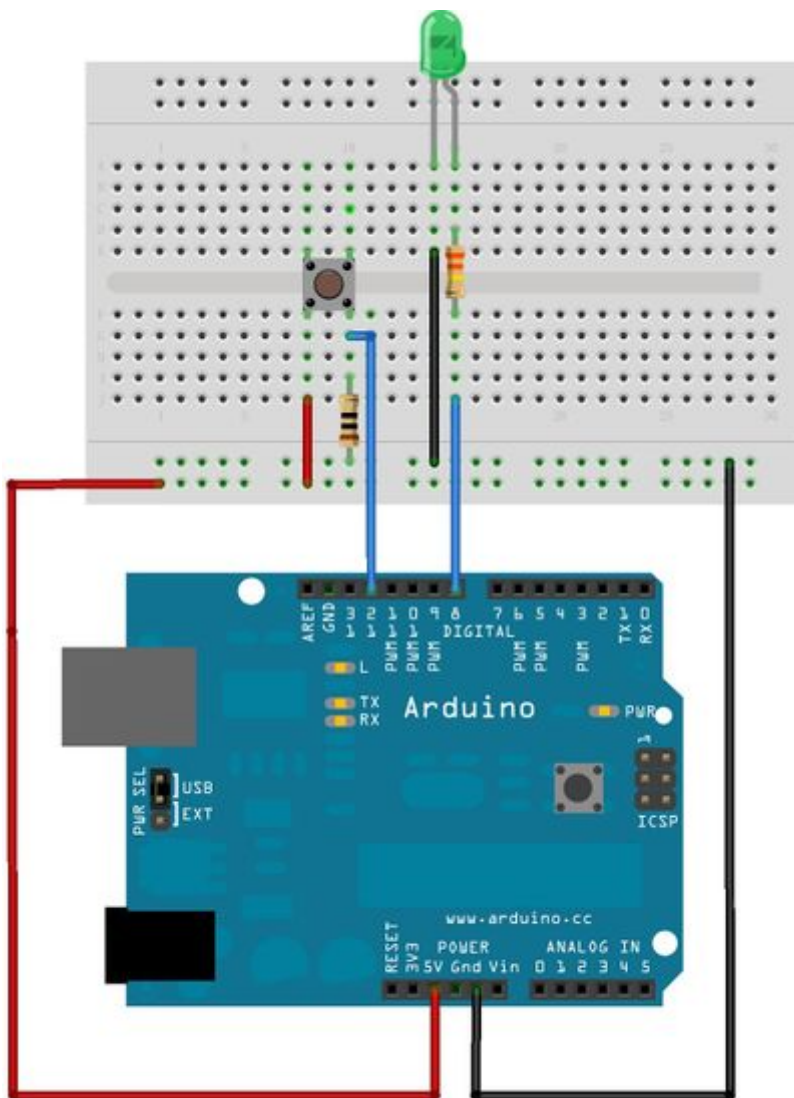
Program

Compile and upload the following sketch:

```
//Pushbutton switch demo: LED is connected to digital pin 8 and Pushbutton is
connected to digital pin 12.
//The LED glows when the button is pressed.

char inputButtonState;

void setup()
{
  pinMode(8, OUTPUT);         // Initialize Arduino Digital Pins 8 as output
for connecting LED
  pinMode(12,INPUT);          // Initialize Arduino Digital Pins 12 as input
for connecting Pushbutton
}


void loop()
{
  inputButtonState = digitalRead(12); //Read the Pushbutton state.

  if (inputButtonState == HIGH)
  {
    digitalWrite(8, HIGH);  //Switch on LED
  }
  else
  {
    digitalWrite(8, LOW);   //Switch off LED
  }

}
```

The above does demonstrate how to send a signal to the Arduino. In fact, you can achieve the same goal without the Arduino. Just press the button to close the circuit, then, let's flip the HIGH/LOW values as follows:

```
void loop()
{
  inputButtonState = digitalRead(12); //Read the Pushbutton state.

  if (inputButtonState == HIGH)
  {
    digitalWrite(8, LOW);  //Switch on LED
  }
  else
  {
    digitalWrite(8, HIGH);   //Switch off LED
  }
}
```

The LED now lights with the circuit open and switches off with the circuit closed.

3 Analog: POT

Circuit

- Connect anode of LED to **PWM** Pins via a 220 Ohms resistor .
- Connect cathode of LED to GND Pin.
- Mount the Pot in the bread board.

- Connect the right leg of the Pot to +5v.
- Connect the middle leg of the Pot to any of the Analog input pins(0-5).
- Connect left leg of the Pot to the Ground Terminal.
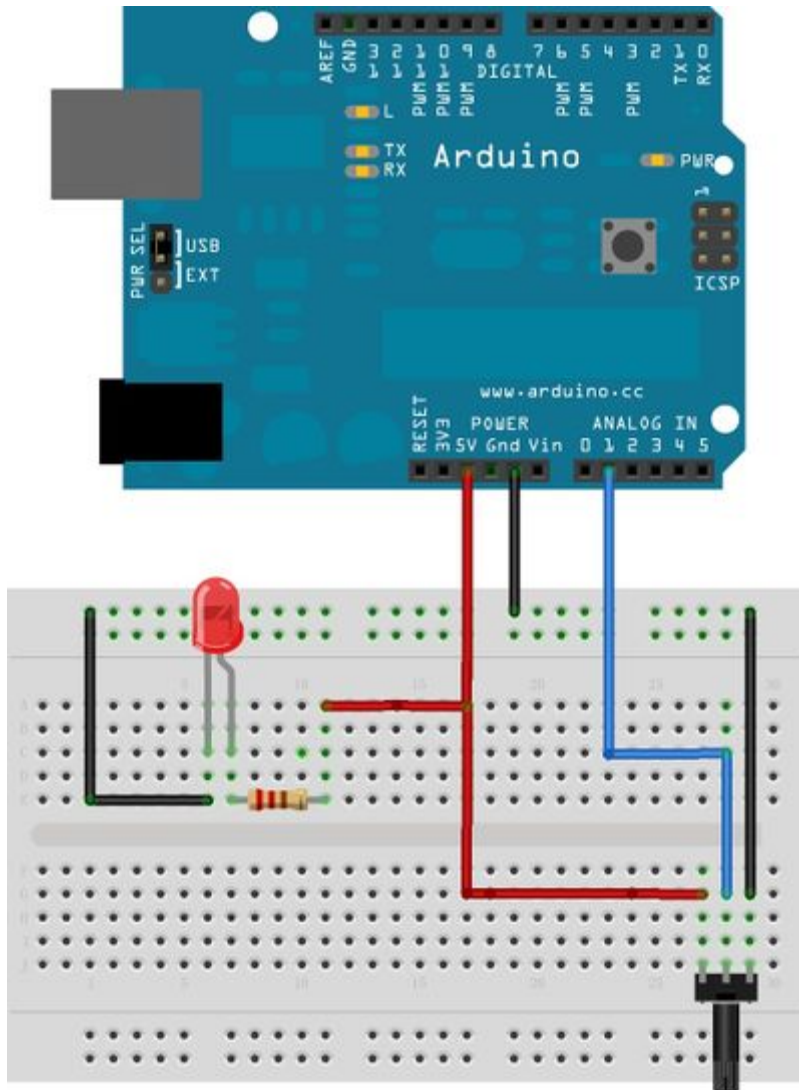
Program

Connect LED annode to digital pin 5 (instead of 5V). Compile and Upload the following sketch:

```
//Varying the brightness of the LED using a Pot
int value=0;
int mval;
void setup()
{
  pinMode(5, OUTPUT);
}
void loop()
{
  value=analogRead(A1); //read analog value from input A1
  // PWM output given to the LED
  mval = map(value, 0, 1023, 0, 100);
  analogWrite(5,mval);

}
```

4 Rainbow On Desk: Tricolor LED

Circuit

RGB LED supplied with the basic kit is common anode type. The longest lead is anode. Other three leads are cathodes for Red, Green and Blue respectively.

- Connect RGB cathodes LEDs to Digital Pins 9, 10 and 11 via a 330 Ohms resistor each.
- Connect Anode to +5v
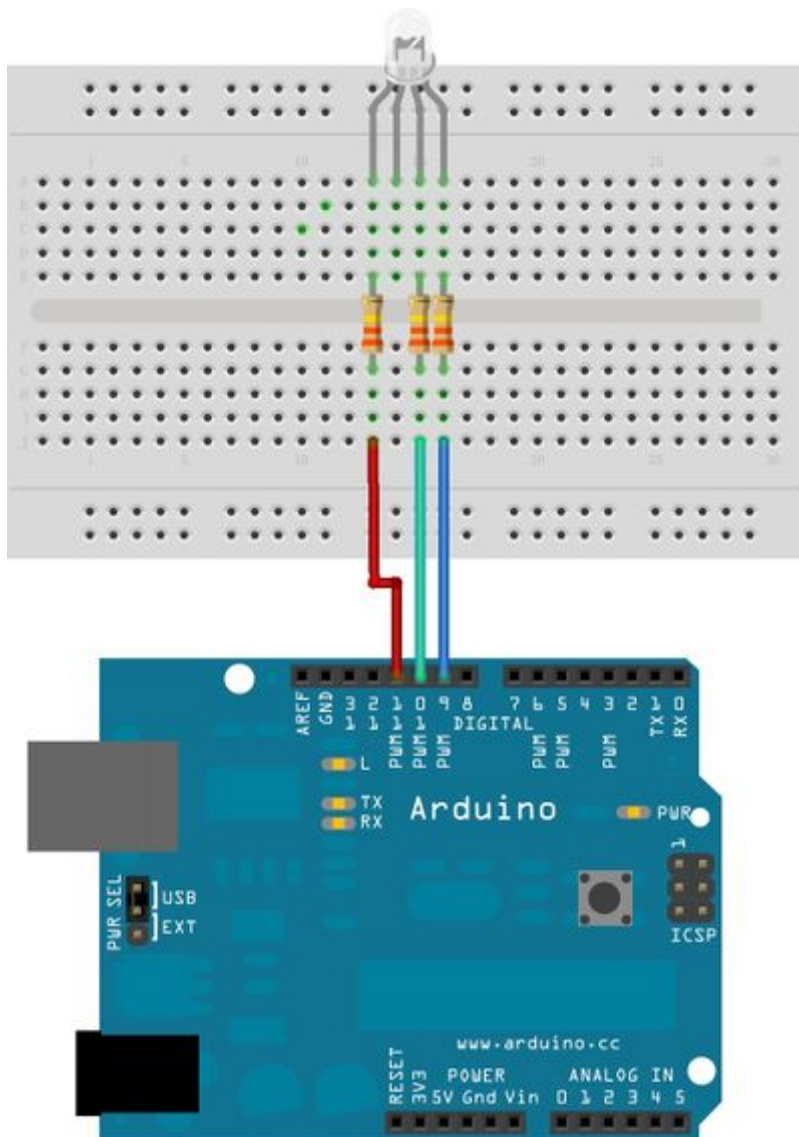
Program

Compile and upload the following sketch:

```
void setup() {

}
void loop() {
```

```
  for(int b = 0 ; b <= 255; b=b+5)
  {
     for(int g = 0 ; g <= 255; g=g+5)
   {
     for(int r= 0 ; r <= 255; r=r+5)
      {
       analogWrite(9, b);
       analogWrite(10, g);
       analogWrite(11, r);
       delay(10);

     }
    }
   }

}
```

5 Music:

Circuit

- Connect buzzer anode to Digital Pins 11.
- Connect buzzer negative to GND
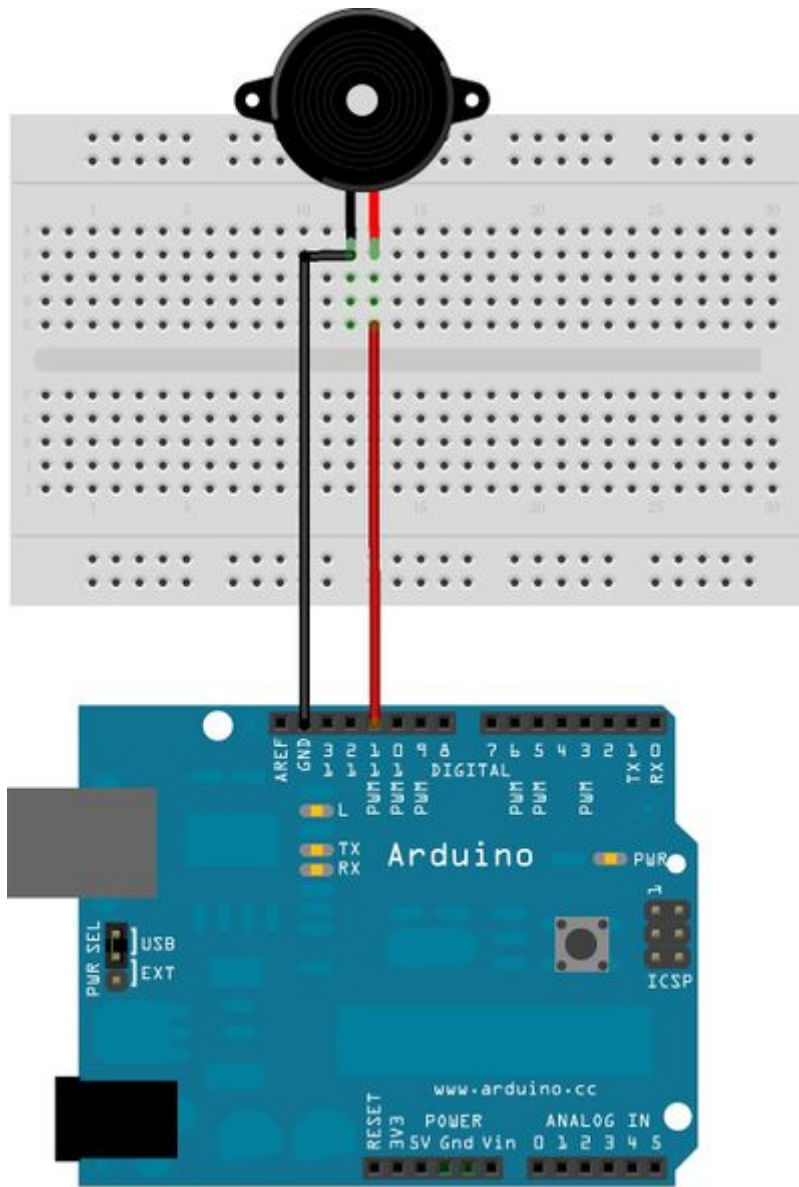
Program

Compile and upload the following sketch:

```
#define NOTE_D0 98
#define NOTE_D1 294
#define NOTE_D2 330
#define NOTE_D3 350
#define NOTE_D4 393
#define NOTE_D5 441
#define NOTE_D6 495
#define NOTE_D7 556
#define NOTE_DL1 147
#define NOTE_DL2 165
#define NOTE_DL3 175
#define NOTE_DL4 196
#define NOTE_DL5 221
#define NOTE_DL6 248
#define NOTE_DL7 278
#define NOTE_DH1 589
#define NOTE_DH2 661
```

```
#define NOTE_DH3 700
#define NOTE_DH4 786
#define NOTE_DH5 882
#define NOTE_DH6 990
#define NOTE_DH7 112

#define WHOLE 1
#define HALF 0.5
#define QUARTER 0.25
#define EIGHTH 0.125
#define SIXTEENTH 0.625

// notes in the melody:
int tune[] =
{
    NOTE_D0,NOTE_D1,NOTE_D2,NOTE_D3,NOTE_D4,NOTE_D5,NOTE_D6,NOTE_D7,
    NOTE_DL1,NOTE_DL2,NOTE_DL3,NOTE_DL4,NOTE_DL5,NOTE_DL6,NOTE_DL7,
    NOTE_DH1,NOTE_DH2,NOTE_DH3,NOTE_DH4,NOTE_DH5,NOTE_DH6,NOTE_DH7,
};
/* note durations: 1 = one note*/

float duration[]=
{1,1,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1,1,1,1,1,};
int length;
int tonePin=11;                  // buzzer pin
void setup()
{ Serial.begin(9600);
    pinMode(tonePin,OUTPUT);   //  initialize the digital pin as an output
    length = sizeof(tune)/sizeof(tune[0]);
}
void loop()
{
    for(int x=1;x<length;x++)
    {tone(tonePin,tune[x]);
        delay(400*duration[(x%100)]);    // to distinguish the notes, set a
minimum time between them.

        noTone(tonePin); // stop the tone playing:
    }
}
```

6 Mini Servo:

Circuit

- Connect the Red colored wire of the servo motor to +5v supply.
- Connect the black colored wire of the servo to ground.
- Connect the yellow wire of the servo to any of the PWM pin in the Arduino.
- Connect the right leg of the Pot to +5v.
- Connect the middle leg of the Pot to any of the Analog input pins(0-5).
- Connect the left leg of the Pot to the Ground Terminal.

Program

Compile and Upload the following sketch:

```
// Controlling a servo position using a potentiometer (variable resistor)
// by Michal Rinott <http://people.interaction-ivrea.it/m.rinott>

#include <Servo.h>

Servo myservo;  // create servo object to control a servo

int potpin = 1;  // analog pin used to connect the potentiometer
int val;    // variable to read the value from the analog pin

void setup()
{
  myservo.attach(5);  // attaches the servo on pin 5 to the servo object
  Serial.begin(19200); // some servos doesn't work without Serial
}

void loop()
{
  val = analogRead(potpin);           // reads the value of the
potentiometer (value between 0 and 1023)
  val = map(val, 0, 1023, 0, 179);    // scale it to use it with the servo
(value between 0 and 180)
```

```
  myservo.write(val);                    // sets the servo position according
to the scaled value
  delay(15);                             // waits for the servo to get there
}
```

Usage

- There is a solderless breadboard, therefore, there is no need to purchase a soldering iron or to learn how to solder.
- There are plenty of jumper wires which are long and flexible with rigid tips. These jumper wires are much better than the fixed length solid wire jumpers of the past.
- There are plenty of LEDs and resistors for your first project, including a RGB LED which is a single LED package with three primary colored LEDs inside. By adjusting the intensity of the different primary colored LEDs, the colors will mix together and produce all the colors of the rainbow.
- There is even an educational how-to card to read the resistor values.
- The tilt switch is a very simple device with a small metal ball inside. If the device is tilted to one side the metal ball will touch electrical contacts. This sensor is useful for a variety of projects like a DIY burglar alarm.
- The thermistor is useful for projects when you want to detect the temperature.
- The photo resistor can detect light,and it works with light bulbs and sunlight. Photo resistors are commonly used for detecting when it's dark and turning lights on at night.
- The buzzer in the kit works especially well for playing the Mario Brothers theme song.
- There is a Mini Servo motor. You can use it to open and close a deadbolt, lightswitch or valve. You could even use it to make a mini catapult.
- The potentiometer is a great input device. You can use it to control the angle of the Servo arm or the intensity of LEDs.

Support

If you have questions or other better design ideas, you can go to our forum or wish to discuss.