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ARDUINO FOR BEGINNERS

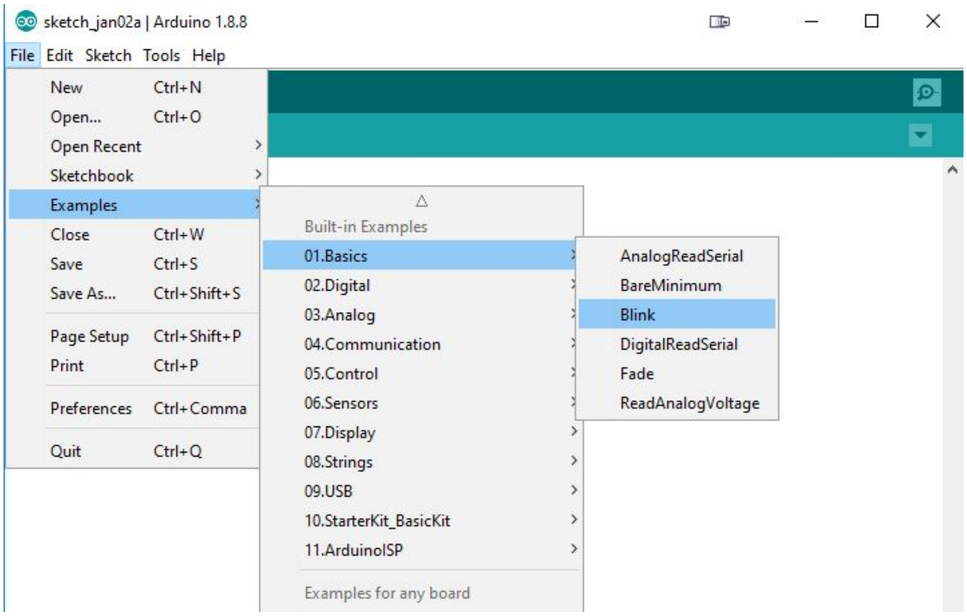
10 Best Starter Projects For Any Maker

With downloadable code examples!!

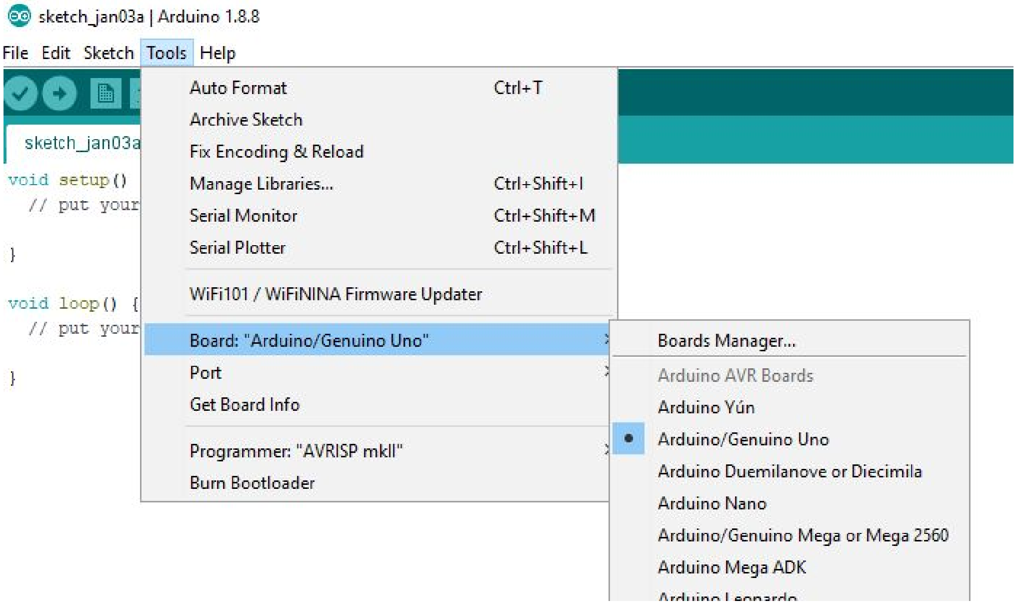
#1 – Getting Started

Before you get started on your coding we need to install the Arduino IDE onto your computer. You may do so by going here and clicking the install for your correct OS. You may install all the code found in this document here

You can open the code for project two by going to File > Examples > 1.Basics > Blink

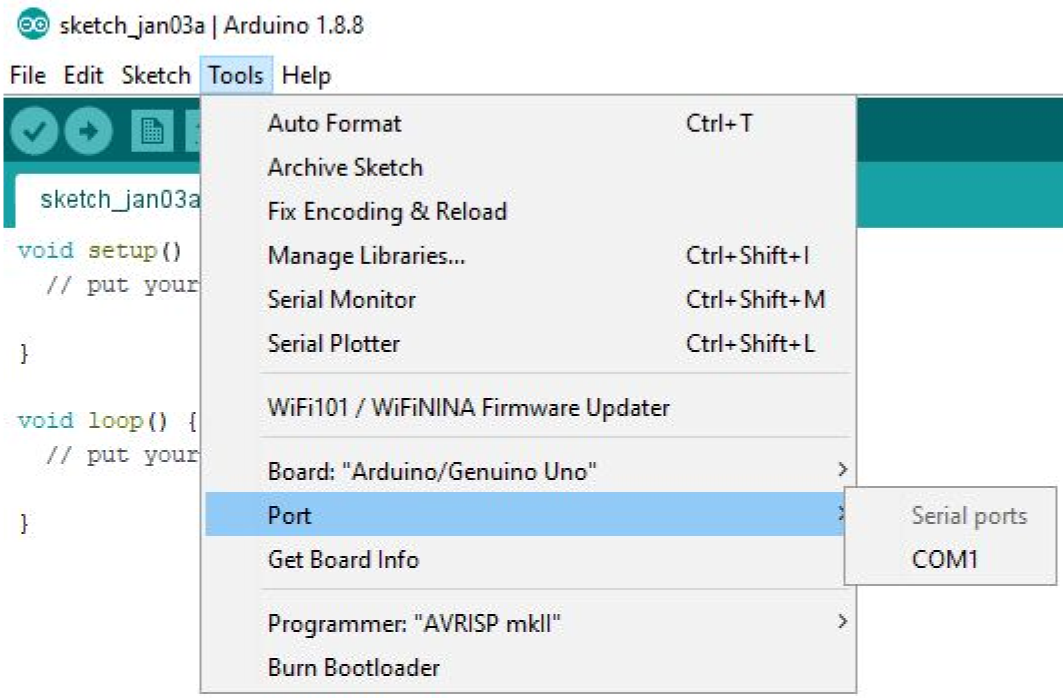


Next we want to select the board that we are using.


sketch_jan03a | Arduino 1.8.8
File
Edit
Sketch
Tools
Help
sketch_jan03a
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Board: "Arduino/Genuino Uno"
Port
Get Board Info
Programmer: "AVRISP mkII"
Burn Bootloader
Boards Manager...
Arduino AVR Boards
Arduino Yún
● Arduino/Genuino Uno
Arduino Duemilanove or Diecimila
Arduino Nano
Arduino/Genuino Mega or Mega 2560
Arduino Mega ADK
Arduino Leonardo

```
void setup()
  // put your

}

void loop() {
  // put your

}
```

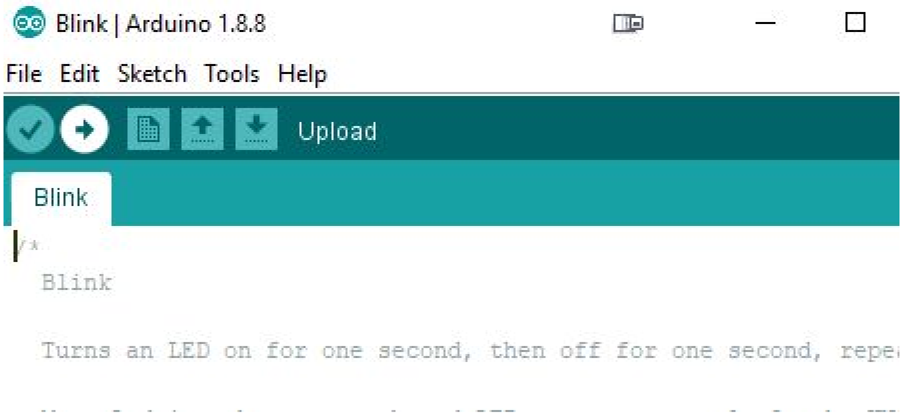
Select the serial / COM port that your UNO is attached to: Tools > Port > COMxx


sketch_jan03a | Arduino 1.8.8
File
Edit
Sketch
Tools
Help
sketch_jan03a
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Board: "Arduino/Genuino Uno"
Port
Get Board Info
Programmer: "AVRISP mkII"
Burn Bootloader
Serial ports
COM1

```
void setup()
  // put your

}

void loop() {
  // put your

}
```

You may see multiple ports shown here. If you are not sure what one your device is connected to, unplug the uno, plug it back in and see what changed.

When you have the code open and the board connected try pressing the upload button.

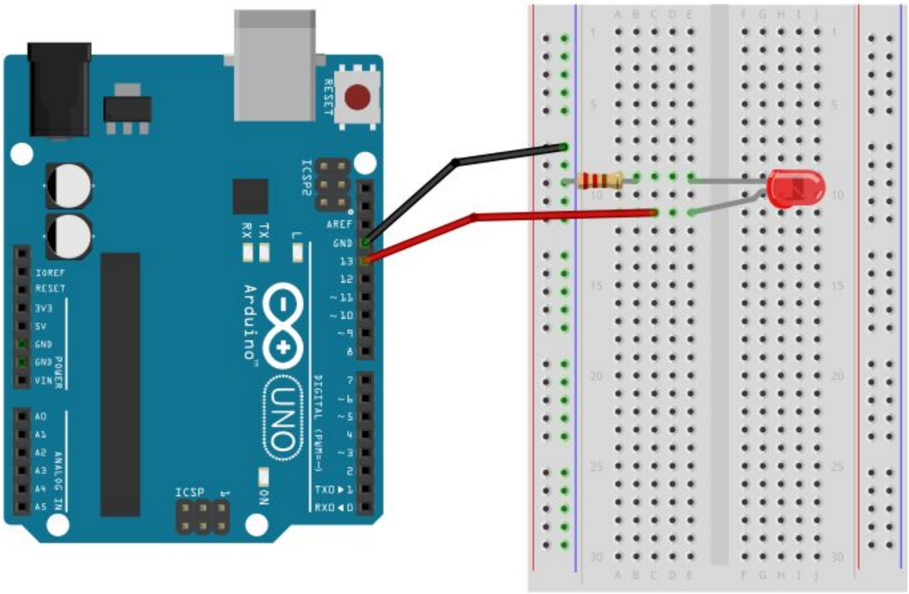


```
/*
  Blink

  Turns an LED on for one second, then off for one second, repe
```

You should see some LED’s flashing on your UNO followed by a message that says “Done Uploading”.

#2 – Blink an LED

Let’s get started with your first Arduino Project! In this simple example we are going to blink an LED.



Assemble Circuit using image above

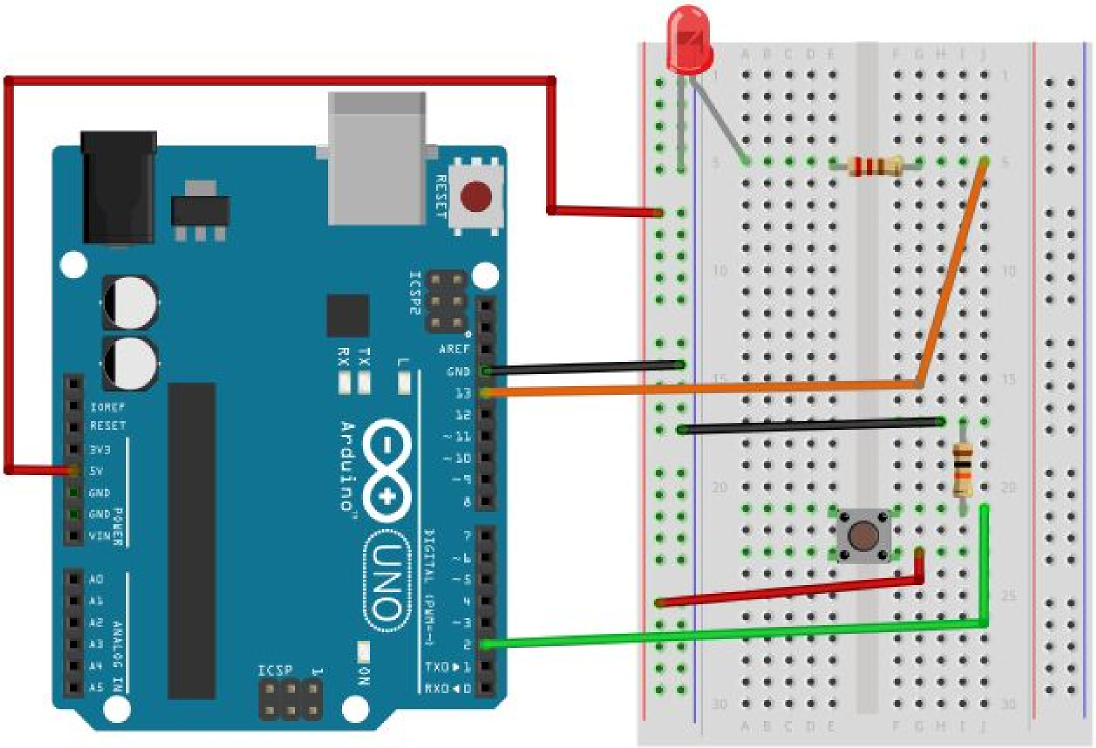
Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- LED
- 220 Ohm Resistor

Uploading the sketch:

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

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the
voltage level)
  delay(500);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the
voltage LOW
  delay(500);                       // wait for a second
}
```

#3 – Push Button



Assemble Circuit using image above

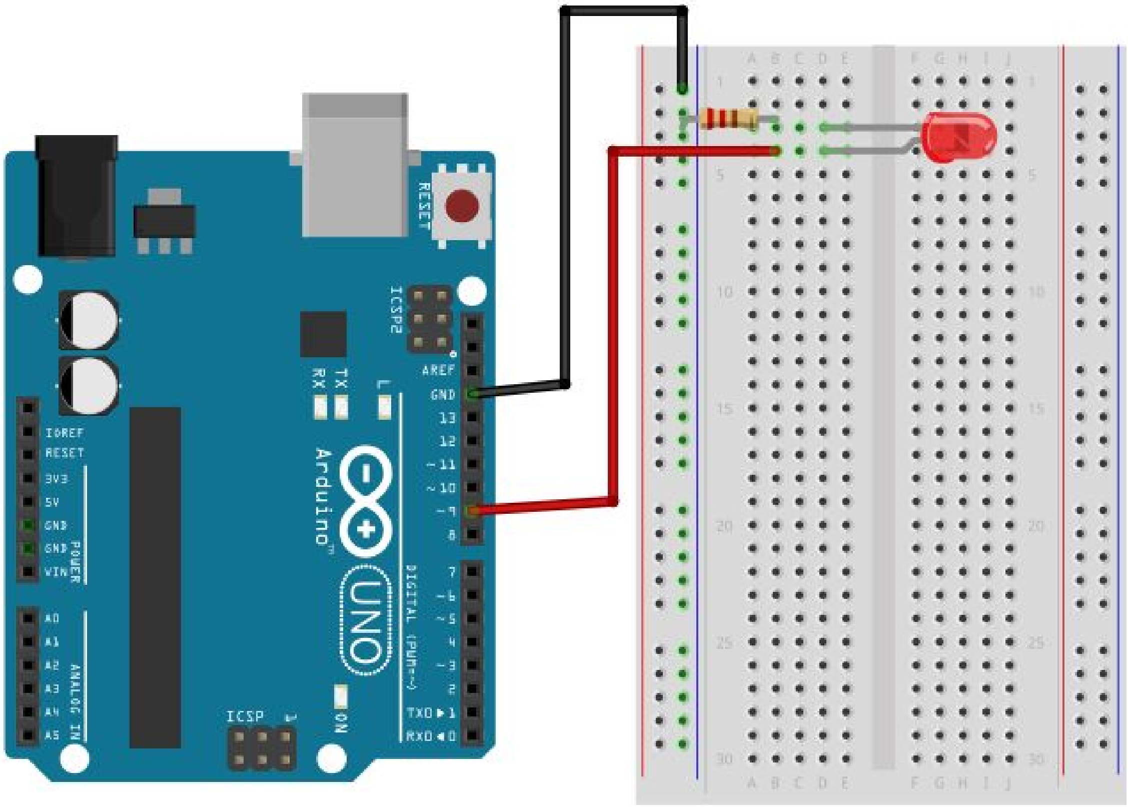
Required Parts:

- Uno R3
- Breadboard
- Jumper Wires
- USB Cable
- LED (5 mm)
- Push Button
- 10k Ohm Resistor
- 220 Ohm Resistor

Uploading the sketch:

```
// constants won't change. They're used here to set pin numbers:
const int buttonPin = 2;     // the number of the pushbutton pin
const int ledPin =  13;      // the number of the LED pin

// variables will change:
int buttonState = 0;         // variable for reading the pushbutton status

void setup() {
  // initialize the LED pin as an output:
  pinMode(ledPin, OUTPUT);
  // initialize the pushbutton pin as an input:
  pinMode(buttonPin, INPUT);
}

void loop() {
  // read the state of the pushbutton value:
  buttonState = digitalRead(buttonPin);

  // check if the pushbutton is pressed. If it is, the buttonState is HIGH:
  if (buttonState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
  } else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}
```

#4 – Fade an LED



Assemble Circuit using image above

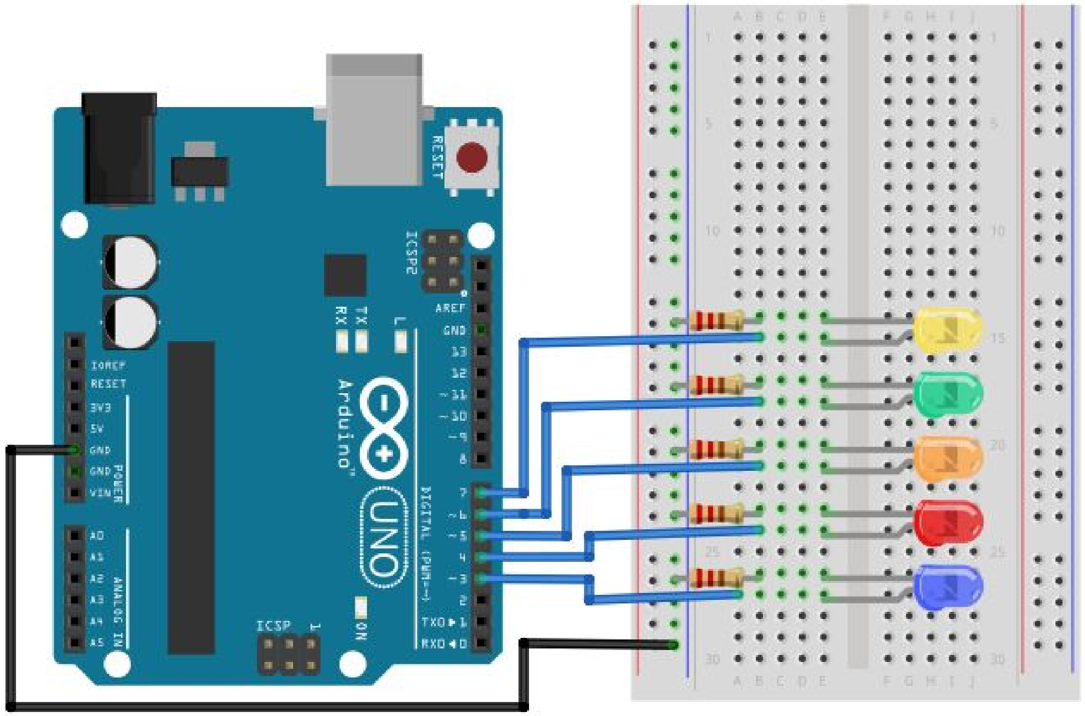
Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- LED
- 220 Ohm Resistor

Uploading the sketch:

```
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;
  }
  // wait for 30 milliseconds to see the dimming effect
  delay(30);
}
```

#5 – Scrolling LED



Assemble Circuit using image above

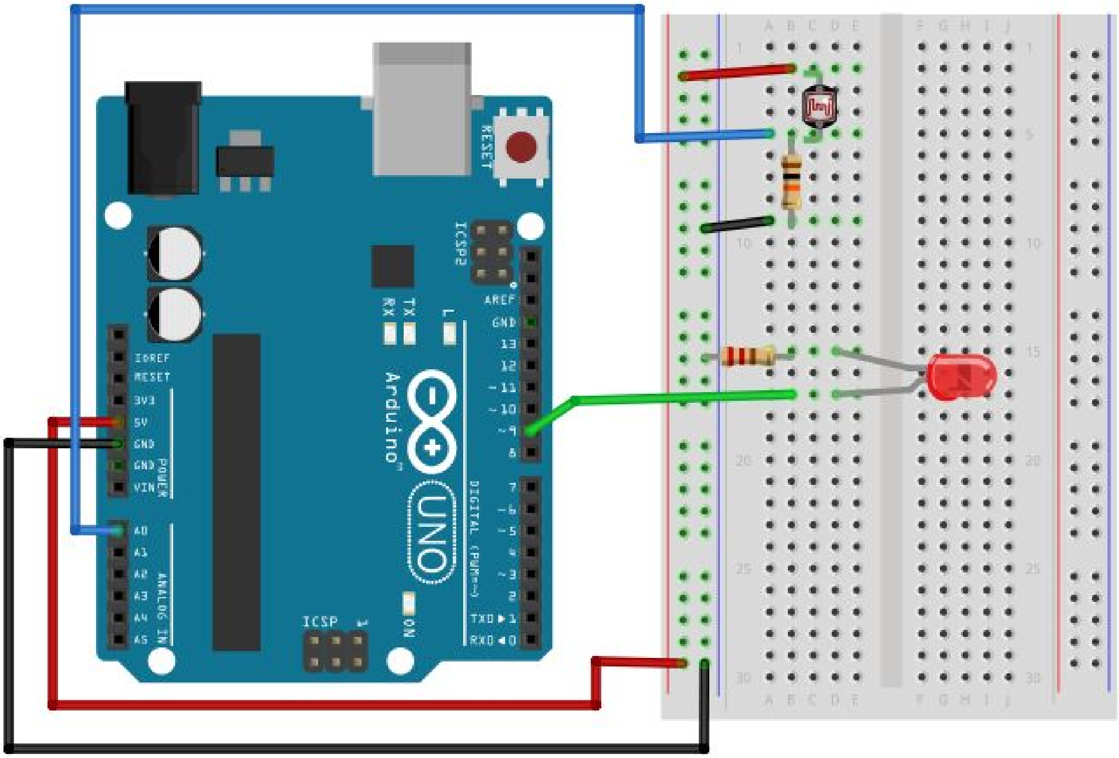
Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- 5x LED
- 5x 220 Ohm Resistor

Uploading the sketch:

```
int timer = 100;           // The higher the number, the slower the timing.

void setup() {
  // use a for loop to initialize each pin as an output:
  for (int thisPin = 3; thisPin < 8; thisPin++) {
    pinMode(thisPin, OUTPUT);
  }
}

void loop() {
  // loop from the lowest pin to the highest:
  for (int thisPin = 3; thisPin < 8; thisPin++) {
    // turn the pin on:
    digitalWrite(thisPin, HIGH);
    delay(timer);
    // turn the pin off:
    digitalWrite(thisPin, LOW);
  }

  // loop from the highest pin to the lowest:
  for (int thisPin = 7; thisPin >= 3; thisPin--) {
    // turn the pin on:
    digitalWrite(thisPin, HIGH);
    delay(timer);
    // turn the pin off:
    digitalWrite(thisPin, LOW);
  }
}
```

#6 – Photoresistor Night light



Assemble Circuit using image above

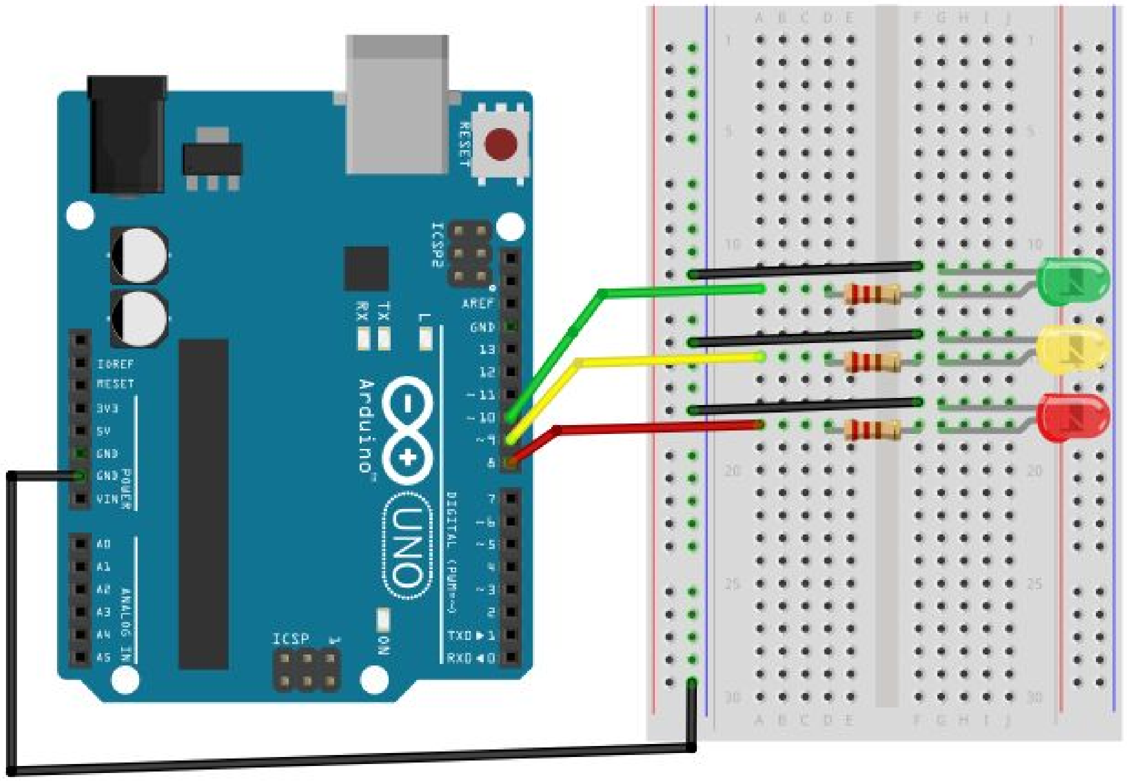
Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- LED
- 220 Ohm Resistor
- 10k Ohm Resistor
- Photoresistor

Uploading the sketch:

```
// Start by naming the pins we will use

const int sensorPin = 0;
const int ledPin = 9;

// We'll also set up some global variables for the light level:
int lightLevel;
int calibratedlightLevel; // used to store the scaled / calibrated
lightLevel
int maxThreshold = 0;     // used for setting the "max" light level
int minThreshold = 1023;   // used for setting the "min" light level

void setup()
{
  pinMode(ledPin, OUTPUT);    // Set up the LED pin to be an output.
  Serial.begin(9600);
}

void loop()
{
  lightLevel = analogRead(sensorPin);  // reads the voltage on the
sensorPin
  Serial.print(lightLevel);
  //autoRange();  // autoRanges the min / max values you see in your room.

  calibratedlightLevel = map(lightLevel, 0, 1023, 0, 255);  // scale the
lightLevel from 0 - 1023 range to 0 - 255 range.
                                                  // the map() function
applies a linear scale / offset.
                                                  // map(inputValue,
fromMin, fromMax, toMin, toMax);
  Serial.print("\t");           // tab character
  Serial.print(calibratedlightLevel);   // println prints an CRLF at the
end (creates a new line after)

  analogWrite(ledPin, calibratedlightLevel);    // set the led level based
on the input lightLevel.
}
/*******************************************************************
 * void autoRange()
 *
 * This function sets a minThreshold and maxThreshold value for the
 * light levels in your setting. Move your hand / light source / etc
 * so that your light sensor sees a full range of values. This will
 * "autoCalibrate" to your range of input values.
/*****************************************************************/

void autoRange()
{
  if (lightLevel < minThreshold)  // minThreshold was initialized to 1023
-- so, if it's less, reset the threshold level.
    minThreshold = lightLevel;

  if (lightLevel > maxThreshold)  // maxThreshold was initialized to 0 --
so, if it's bigger, reset the threshold level.
    maxThreshold = lightLevel;

  // Once we have the highest and lowest values, we can stick them
  // directly into the map() function.
  //
  // This function must run a few times to get a good range of bright and
dark values in order to work.

  lightLevel = map(lightLevel, minThreshold, maxThreshold, 0, 255);
  lightLevel = constrain(lightLevel, 0, 255);
}
```

#7 – Traffic Controller



Assemble Circuit using image above

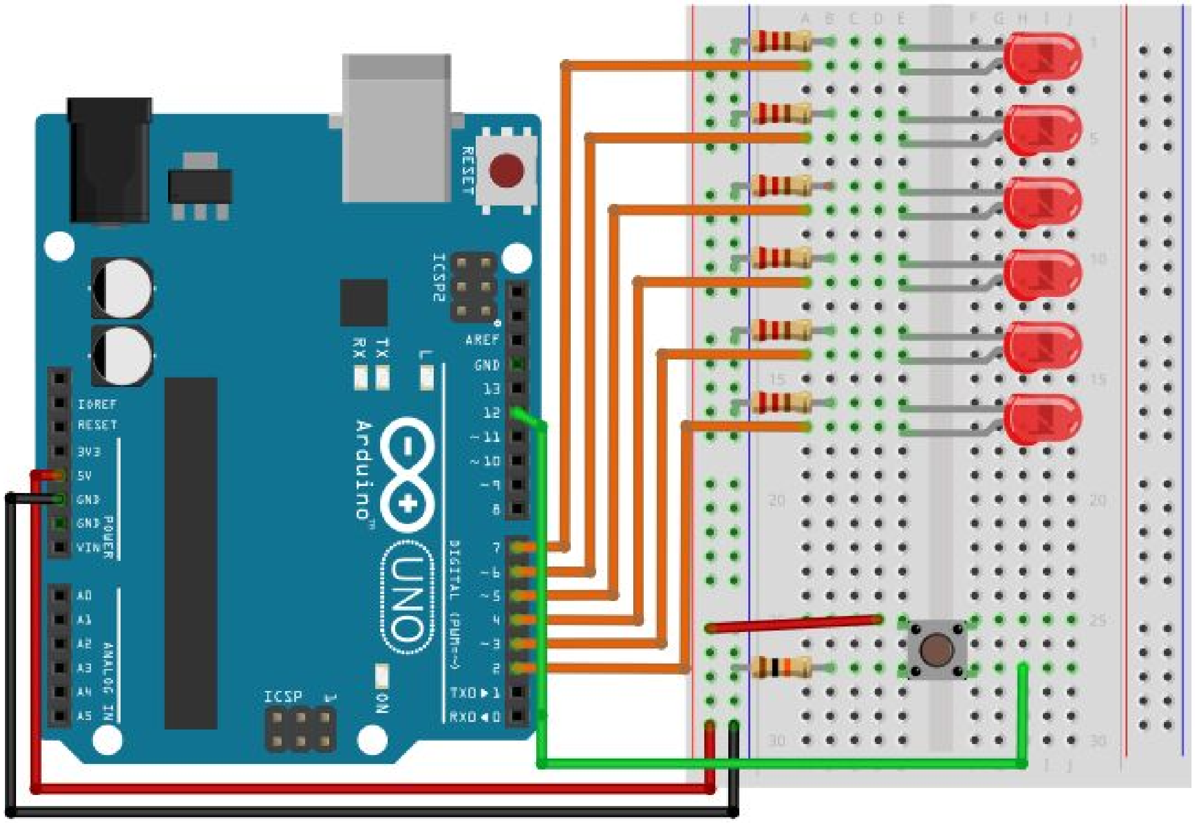
Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- 3x LED
- 3x 220 Ohm Resistor

Uploading the sketch:

```
int red = 10;
int yellow = 9;
int green = 8;

void setup() {
  // put your setup code here, to run once:
    pinMode(red, OUTPUT);
    pinMode(yellow, OUTPUT);
    pinMode(green, OUTPUT);
}

void loop() {
  // put your main code here, to run repeatedly:
    digitalWrite(green, LOW);
    digitalWrite(yellow, HIGH);
    delay(3000);

    // turn off yellow, then turn red on for 5 seconds
    digitalWrite(yellow, LOW);
    digitalWrite(red, HIGH);
    delay(5000);

    // red and yellow on for 2 seconds (red is already on though)
    digitalWrite(yellow, HIGH);
    delay(2000);

    // turn off red and yellow, then turn on green
    digitalWrite(yellow, LOW);
    digitalWrite(red, LOW);
    digitalWrite(green, HIGH);
    delay(3000);
}
```

#8 – LED Dice



Assemble Circuit using image above

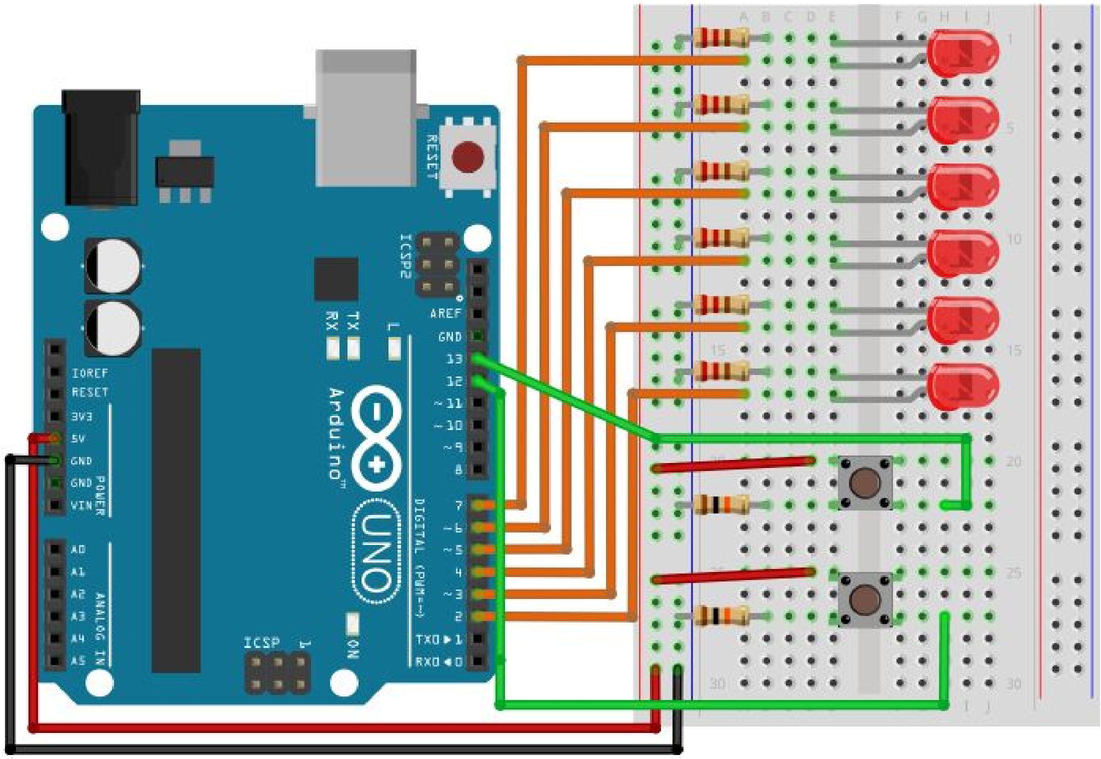
Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- 6x LED
- 6x 220 Ohm Resistor
- 10k Ohm Resistor
- Push Button

Uploading the sketch:

```
// set to 1 if we're debugging
#define DEBUG 0

// 6 consecutive digital pins for the LEDs
int first = 2;
int second = 3;
int third = 4;
int fourth = 5;
int fifth = 6;
int sixth = 7;

// pin for the button switch
int button = 12;
// value to check state of button switch
int pressed = 0;

void setup() {
  // set all LED pins to OUTPUT
  for (int i=first; i<=sixth; i++) {
    pinMode(i, OUTPUT);
  }
  // set buttin pin to INPUT
  pinMode(button, INPUT);

  // initialize random seed by noise from analog pin 0 (should be
unconnected)
  randomSeed(analogRead(0));

  // if we're debugging, connect to serial
  #ifdef DEBUG
    Serial.begin(9600);
  #endif

}

void buildUpTension() {
  // light LEDs from left to right and back to build up tension
  // while waiting for the dice to be thrown
  // left to right
  for (int i=first; i<=sixth; i++) {
    if (i!=first) {
      digitalWrite(i-1, LOW);
    }
    digitalWrite(i, HIGH);
    delay(100);
  }
  // right to left
  for (int i=sixth; i>=first; i--) {
    if (i!=sixth) {
      digitalWrite(i+1, LOW);
    }
    digitalWrite(i, HIGH);
    delay(100);
  }
}

void showNumber(int number) {
  digitalWrite(first, HIGH);
  if (number >= 2) {
    digitalWrite(second, HIGH);
  }
  if (number >= 3) {
    digitalWrite(third, HIGH);
  }
  if (number >= 4) {
    digitalWrite(fourth, HIGH);
  }
  if (number >= 5) {
    digitalWrite(fifth, HIGH);
  }
  if (number == 6) {
    digitalWrite(sixth, HIGH);
  }
}

int throwDice() {
  // get a random number in the range [1,6]
  int randNumber = random(1,7);

  #ifdef DEBUG
    Serial.println(randNumber);
  #endif
  return randNumber;
}

void setAllLEDs(int value) {
  for (int i=first; i<=sixth; i++) {
    digitalWrite(i, value);
  }
}

void loop() {
  // if button is pressed - throw the dice
  pressed = digitalRead(button);

  if (pressed == HIGH) {
    // remove previous number
    setAllLEDs(LOW);

    buildUpTension();
    int thrownNumber = throwDice();
    showNumber(thrownNumber);
  }

}
```

#9 – Binary Counting



Assemble Circuit using image above

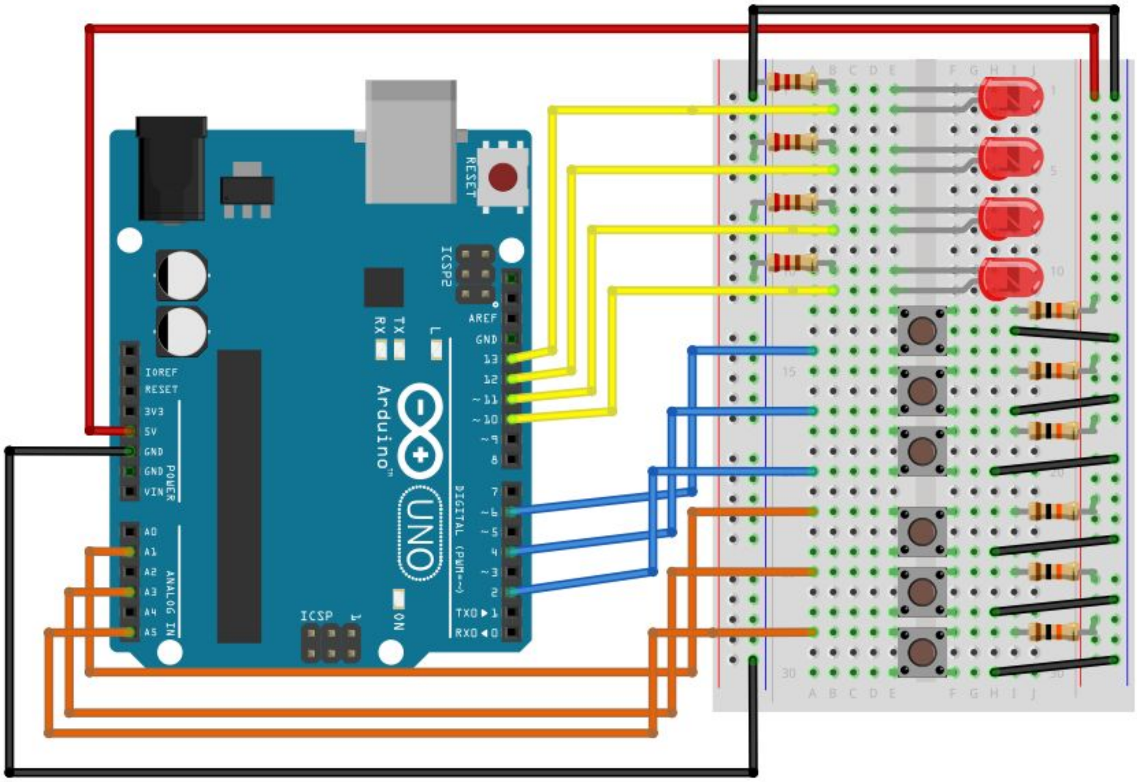
Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- 6x LED
- 6x 220 Ohm Resistor
- 2x 10k Ohm Resistor
- 2x Push Button

Uploading the sketch:

```
//Credit
https://create.arduino.cc/projecthub/p-o-i-n-t/project-1-binary-counting-52
47b7?ref=tag&ref_id=kids&offset=32

int l[]={0,0,0,0,0,0},T=6,a,p;
const int b1=12,b2=13;


void setup() {

pinMode(2,OUTPUT);
pinMode(3,OUTPUT);
pinMode(4,OUTPUT);
pinMode(5,OUTPUT);
pinMode(6,OUTPUT);
pinMode(7,OUTPUT);

pinMode(b1,INPUT);
pinMode(b2,INPUT);


}
void loop() {
p=0;
p=digitalRead(b1) ;
while(digitalRead(b1)!=0)
{

}
delay(100);
a=T-1;
while(a>=0&&p==1)
{
  if(l[a]==1)
  {
    l[a]=0;
    a--;
  }
  else
  {
    l[a]=1;
    p=0;
  }
}
p=digitalRead(b2) ;
while(digitalRead(b2)!=0)
{

}
delay(100);
a=T-1;
while(a>=0&&p==1)
{
  if(l[a]==0)
  {
    l[a]=1;
    a--;
  }
  else
  {
    l[a]=0;
    p=0;
  }
}
a=T-1;
for(int c=0;c<T;c++)
{
    if(l[c]==1)
    digitalWrite(T-c+1,HIGH);
  else
    digitalWrite(T-c+1,LOW);
  a--;
}
}
```

#10 – Binary Calculator



Assemble Circuit using image above

Required Parts:

- Uno R3 Board
- Breadboard
- Wires
- USB Data Cable
- 4x LED
- 4x 220 Ohm Resistor
- 6x 10k Ohm Resistor
- 6x Push Button

Uploading the sketch:

```
//Credit:
https://create.arduino.cc/projecthub/22warehamD/3-bit-binary-calculator-usi
ng-arduino-uno-e9d93b?ref=similar&ref_id=21382&offset=0

int A4pin=A5;   //Set all pins as global variables
int A2pin=A3;
int A1pin=A1;

int B4pin=2;
int B2pin=4;
int B1pin=6;

int out8=10;
int out4=11;
int out2=12;
int out1=13;


void setup() {
  Serial.begin(9600); //turn on serial port
  pinMode(A4pin,INPUT);  //set all input pins to input
  pinMode(A2pin,INPUT);
  pinMode(A1pin,INPUT);

  pinMode(B4pin,INPUT);
  pinMode(B2pin,INPUT);
  pinMode(B1pin,INPUT);


  pinMode(out8,OUTPUT); //set all output pins to output
  pinMode(out4,OUTPUT);
  pinMode(out2,OUTPUT);
  pinMode(out1,OUTPUT);
}

void loop() {
  int A4val=0;   //Set all read values as local variables
  int A2val=0;
  int A1val=0;
  int B4val=0;
  int B2val=0;
  int B1val=0;


  int Aval;  //Set A and B values as local variables
  int Bval;

  int outval; //Set output value as local variable


  A4val = digitalRead(A4pin); //Set the variable of input to read value
  A2val = digitalRead(A2pin);
  A1val = digitalRead(A1pin);

  B4val = digitalRead(B4pin);
  B2val = digitalRead(B2pin);
  B1val = digitalRead(B1pin);

  int A4valcal = A4val;   //setting variables for inverting
  int A2valcal = A2val;
  int A1valcal = A1val;

  int B4valcal = B4val;
  int B2valcal = B2val;
  int B1valcal = B1val;



  if (A4val==0){      //inverting signal
    A4valcal = 1;
  }

  if (A4val==1){
    A4valcal = 0;
  }


  if (A2val==0){
    A2valcal = 1;
  }
```

```
if (A2val==1){
  A2valcal = 0;
}


if (A1val==0){
  A1valcal = 1;
}

if (A1val==1){
  A1valcal = 0;
}



if (B4val==0){
  B4valcal = 1;
}

if (B4val==1){
  B4valcal = 0;
}


if (B2val==0){
  B2valcal = 1;
}

if (B2val==1){
  B2valcal = 0;
}


if (B1val==0){
  B1valcal = 1;
}

if (B1val==1){
  B1valcal = 0;
}
```

```
  A4val = A4valcal;   //setting A and B value to inverted value
  A2val = A2valcal;
  A1val = A1valcal;

  B4val = B4valcal;
  B2val = B2valcal;
  B1val = B1valcal;



  Serial.print("A = ");     //printing binary values of A and B
  Serial.print(A4val);
  Serial.print(A2val);
  Serial.println(A1val);



  Serial.print("B = ");
  Serial.print(B4val);
  Serial.print(B2val);
  Serial.println(B1val);


  Aval=(A4val*4)+(A2val*2)+(A1val*1);  //Changing binary value to decimal
value
  Bval=(B4val*4)+(B2val*2)+(B1val*1);

  outval=Aval+Bval;    //calculate total value

  Serial.println("total = ");   //printing total value in serial port to
check
  Serial.println(outval);
  Serial.println("");

  digitalWrite(out8,LOW);     //reseting output LEDs
  digitalWrite(out4,LOW);
  digitalWrite(out2,LOW);
  digitalWrite(out1,LOW);

  if (outval>=8) {                  //converting from decimal to binary
then output
    digitalWrite(out8,HIGH);
    outval=outval-8;
  }

  if (outval>=4) {
    digitalWrite(out4,HIGH);
    outval=outval-4;
  }

  if (outval>=2) {
    digitalWrite(out2,HIGH);
    outval=outval-2;
  }


  if (outval>=1) {
    digitalWrite(out1,HIGH);
    outval=outval-1;
  }





}
```