PROJECT 4: RGB

In project 3, you got to use a potentiometer, which varies resistance based on the twisting of a knob. In this circuit, you'll be using a photoresistor, which changes resistance based on how much light the sensor receives. Using this sensor you can make a simple night-light that turns on when the room gets dark and turns off when it is bright.

Parts Needed

Grab the following quantities of each part listed to build this circuit:

NEW COMPONENTS

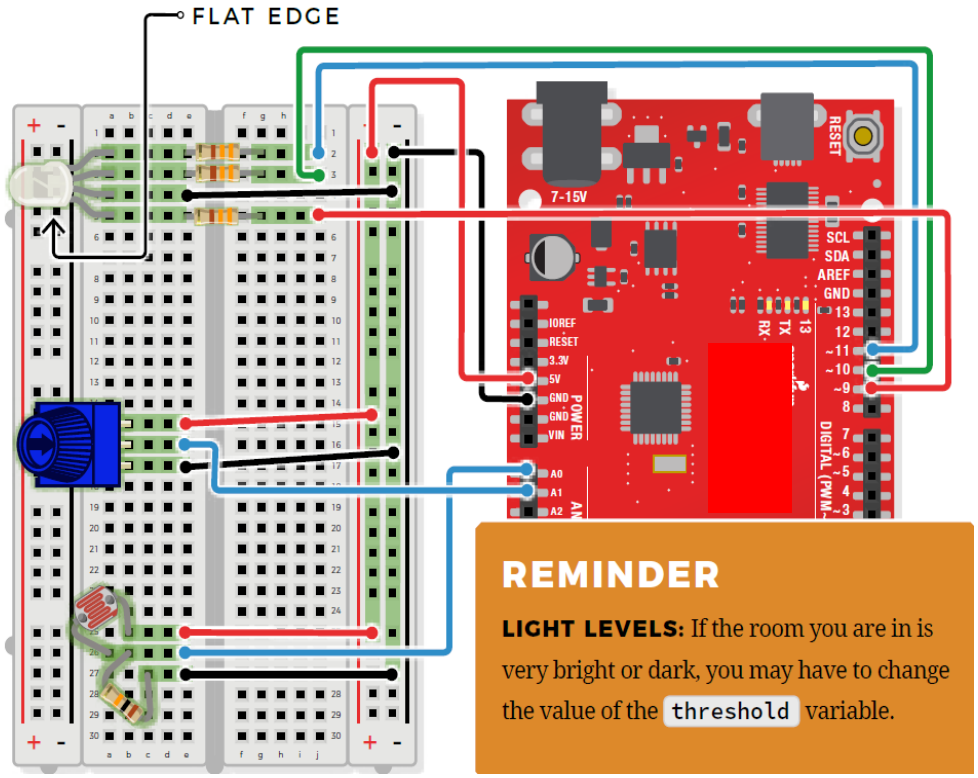
RGB LED: An RGB LED is actually three small LEDs — one red, one green and one blue — inside a normal LED housing. This RGB LED has all the internal LEDs share the same ground wire, so there are four legs in total. To turn on one color, ensure ground is connected, then power one of the legs just as you would a regular LED. Don't forget the current-limiting resistors. If you turn on more than one color at a time, you will see the colors start to blend together to form a new color.

NEW CONCEPTS

ANALOG OUTPUT (PULSE-WIDTH MODULATION): The digitalWrite() command can turn pins on (5V) or off (0V), but what if you want to output 2.5V? The analogWrite() command can output 2.5 volts by quickly switching a pin on and off so that it is only on 50 percent of the time (50% of 5V is 2.5V). By doing this, any voltage between 0 and 5V can be produced. This is what is known as Pulse-Width Modulation (PWM). It can create many different colors on the RGB LED.

NEW IDEAS

PWM PINS: Only a few of the pins on the MICROCONTROLLER have the circuitry needed to turn on and off fast enough for PWM. These are pins 3, 5, 6, 9, 10 and 11. Each PWM pin is marked with a ~ on the board. Remember, you can only use analogWrite() on these pins.



REMINDER

LIGHT LEVELS: If the room you are in is very bright or dark, you may have to change the value of the `threshold` variable.

SOURCE CODE:

```
//project4.ino
//Full Name:"Creator"
//COURSE SECTION:
```

```
int photoresistor = A0;        //variable for storing the photoresistor value
int potentiometer = A1;        //this variable will hold a value based on the position of the knob
int threshold = 700;           //if the photoresistor reading is lower than this value the light will turn on

//LEDs are connected to these pins
int RedPin = 9;
int GreenPin = 10;
int BluePin = 11;

void setup() {
  Serial.begin(9600);          //start a serial connection with the computer
```

```
  //set the LED pins to output
  pinMode(RedPin, OUTPUT);
  pinMode(GreenPin, OUTPUT);
  pinMode(BluePin, OUTPUT);
}

void loop() {

  photoresistor = analogRead(A0);        //read the value of the photoresistor
  potentiometer = analogRead(A1);

  Serial.print("Photoresistor value:");
  Serial.print(photoresistor);         //print the photoresistor value to the serial monitor
  Serial.print("  Potentiometer value:");
  Serial.println(potentiometer);         //print the potentiometer value to the serial monitor

  if (photoresistor < threshold) {
     //if it's dark (the photoresistor value is below the threshold) turn the LED on
    //These nested if statements check for a variety of ranges and
    //call different functions based on the current potentiometer value.
    //Those functions are found at the bottom of the sketch.
    if (potentiometer > 0 && potentiometer <= 150)
      red();
    if (potentiometer > 150 && potentiometer <= 300)
      orange();
    if (potentiometer > 300 && potentiometer <= 450)
      yellow();
    if (potentiometer > 450 && potentiometer <= 600)
      green();
    if (potentiometer > 600 && potentiometer <= 750)
      cyan();
    if (potentiometer > 750 && potentiometer <= 900)
```

```
    blue();
  if (potentiometer > 900)
    magenta();
 }
 else {                          //if it isn't dark turn the LED off

  turnOff();                     //call the turn off function

 }

 delay(100);                     //short delay so that the printout is easier to read
}

void red () {

 //set the LED pins to values that make red
 analogWrite(RedPin, 100);
 analogWrite(GreenPin, 0);
 analogWrite(BluePin, 0);
}
void orange () {

 //set the LED pins to values that make orange
 analogWrite(RedPin, 100);
 analogWrite(GreenPin, 50);
 analogWrite(BluePin, 0);
}
void yellow () {

 //set the LED pins to values that make yellow
 analogWrite(RedPin, 100);
 analogWrite(GreenPin, 100);
```

```
  analogWrite(BluePin, 0);
}
void green () {
```



```
  //set the LED pins to values that make green
  analogWrite(RedPin, 0);
  analogWrite(GreenPin, 100);
  analogWrite(BluePin, 0);
}
void cyan () {

  //set the LED pins to values that make cyan
  analogWrite(RedPin, 0);
  analogWrite(GreenPin, 100);
  analogWrite(BluePin, 100);
}
void blue () {

  //set the LED pins to values that make blue
  analogWrite(RedPin, 0);
  analogWrite(GreenPin, 0);
  analogWrite(BluePin, 100);
}
void magenta () {

  //set the LED pins to values that make magenta
  analogWrite(RedPin, 100);
  analogWrite(GreenPin, 0);
  analogWrite(BluePin, 100);
}
void turnOff () {
```

```
//set all three LED pins to 0 or OFF
analogWrite(RedPin, 0);
analogWrite(GreenPin, 0);
analogWrite(BluePin, 0);}
```