//RGB LEDs have 3 diodes inside and typically share either a common power or common ground wire. You can often tell by looking at the shape of the component inside the epoxy case. The big part is always attached to the ground wire.

//set up circuit with RGB LED

//how do we pick which resistor to use?

We use V = IR
We need to solve for R to find the resistor value, but first we have to know what values to put in for the other two (V and I).

I is almost always 20mA when we are calculating for 1 LED. That the max current for most small LEDs. Remember, I is in amps. 1 amp = 1000mA so 20mA is equal to .02 amps

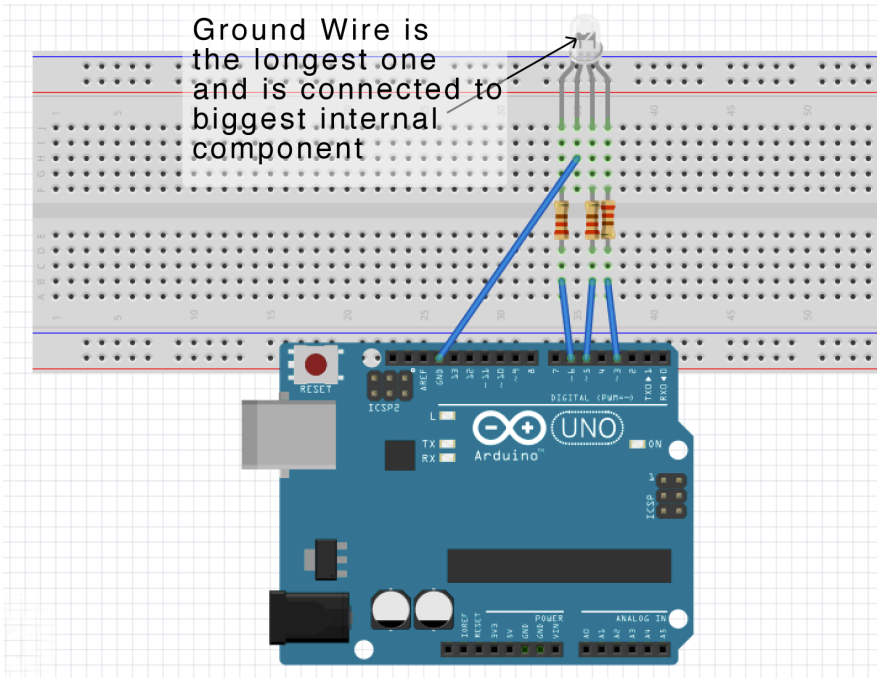
Start with the voltage drop for the LED (red, green or blue) requiring the least voltage

Since we don't know which one is which, we should err on the side of caution. Red is the most sensitive, requiring only 1.8 volts to go on. Its vF ("forward voltage") is 1.8. Blue and Green are often higher (usually around 3).

V is the amount of voltage we need to remove with the resistor to make the LED not overheat. Since the Arduino puts out 5v, and we need 1.8v for the red LED, 5-1.8=3.2 is the amount of V we need to get rid of. So we solve for the below to get R.

3.2 = .02 * R
R = 3.2/.02, R = 160

Our resistors must be 160 ohms or greater. A 220ohm or 330ohm resistor will work fine, although the LEDs may not be as bright as they could be.




**most basic sketch - turn on and off a single LED**

```
int ledPin = 3;

void setup(){

  Serial.begin(9600);
  pinMode(ledPin, OUTPUT);

}

void loop(){

  digitalWrite(ledPin, HIGH);
  Serial.println("High");
  delay(1000);
  digitalWrite(ledPin, LOW);
  Serial.println("low");
  delay(1000);

}
```

**fade a single LED with a for loop**

```
int ledPin = 3;

void setup(){

  Serial.begin(9600);
  pinMode(ledPin, OUTPUT);

}
```

```
void loop(){

for(int i=0; i<255; i++){
  analogWrite(ledPin, i);
  Serial.println(i);
  delay(10);
}

for(int i=255; i>0; i--){
  analogWrite(ledPin, i);
  Serial.println(i);
  delay(10);
}

}
```

**fade an RGB LED with a for loop**

```
int rPin = 3;
int gPin = 5;
int bPin = 6;


void setup(){

  Serial.begin(9600);
pinMode(rPin, OUTPUT);
pinMode(gPin, OUTPUT);
pinMode(bPin, OUTPUT);

}

void loop(){

for(int i=0; i<255; i++){
  analogWrite(rPin, i);
  Serial.println(i);
  delay(10);
}

for(int i=255; i>0; i--){
  analogWrite(rPin, i);
  Serial.println(i);
  delay(10);
}


for(int i=0; i<255; i++){
  analogWrite(gPin, i);
  Serial.println(i);
  delay(10);
}

for(int i=255; i>0; i--){
  analogWrite(gPin, i);
  Serial.println(i);
  delay(10);
}


for(int i=0; i<255; i++){
  analogWrite(bPin, i);
  Serial.println(i);
  delay(10);
}

for(int i=255; i>0; i--){
  analogWrite(bPin, i);
  Serial.println(i);
  delay(10);
}

}
```

**Fade an RGB LED with functions**

```
int rPin = 3;
int gPin = 5;
int bPin = 6;


void setup(){

Serial.begin(9600);
pinMode(rPin, OUTPUT);
pinMode(gPin, OUTPUT);
pinMode(bPin, OUTPUT);

}

void loop(){

fade(rPin);
fade(gPin);
fade(bPin);

}
```

```
void fade(int pin){

  for(int i=0; i<255; i++){
  analogWrite(pin, i);
  Serial.println(i);
  delay(10);
}

for(int i=255; i>0; i--){
  analogWrite(pin, i);
  Serial.println(i);
  delay(10);
}

}
```

**Fade an RGB LED with functions and also input a time to change the speed**

```
int rPin = 3;
int gPin = 5;
int bPin = 6;

void setup(){

  Serial.begin(9600);
  pinMode(rPin, OUTPUT);
  pinMode(gPin, OUTPUT);
  pinMode(bPin, OUTPUT);

}

void loop(){

  fade(rPin, 1);
  fade(gPin, 10);
  fade(bPin, 30);

}


void fade(int pin, int time){

  for(int i=0; i<255; i++){
    analogWrite(pin, i);
    Serial.println(i);
    delay(time);
  }

  for(int i=255; i>0; i--){
    analogWrite(pin, i);
    Serial.println(i);
    delay(time);
  }

}
```