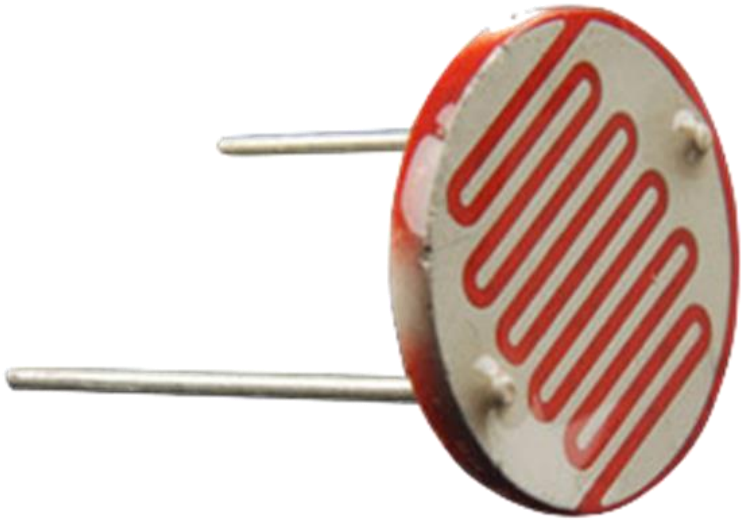
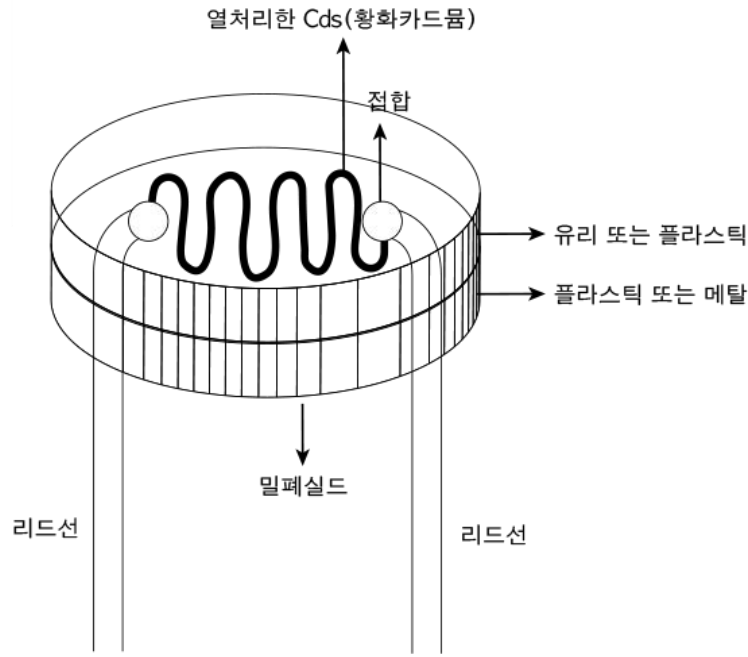
화재 경보기 실험 및 디지털 센서

https://github.com/juhong-rdv/2023_fall_du_sensor

스마트 가로등 제작

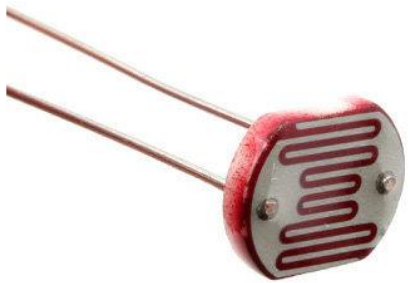


조도센서(Cds)

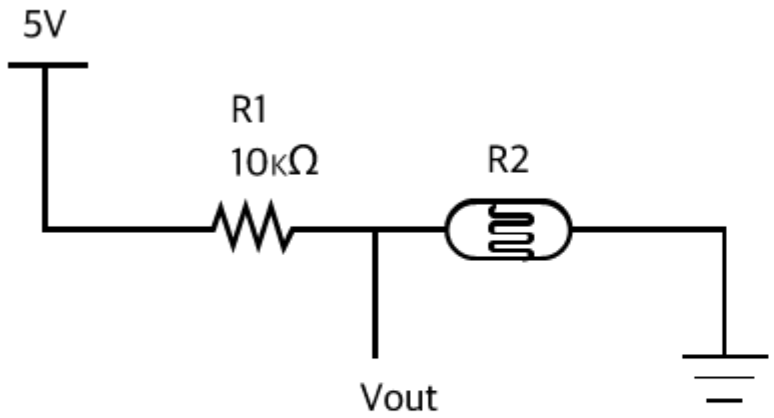


조도센서(Cds) 구조도

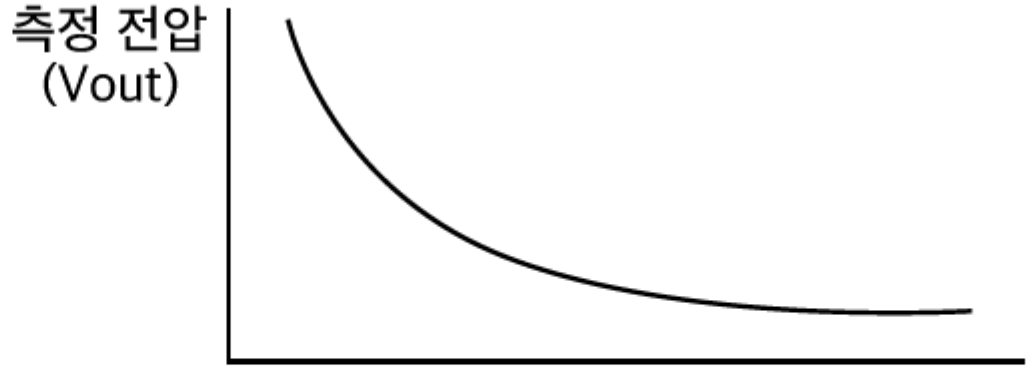
조도센서(CDS cell)



조도센서(CDS cell)



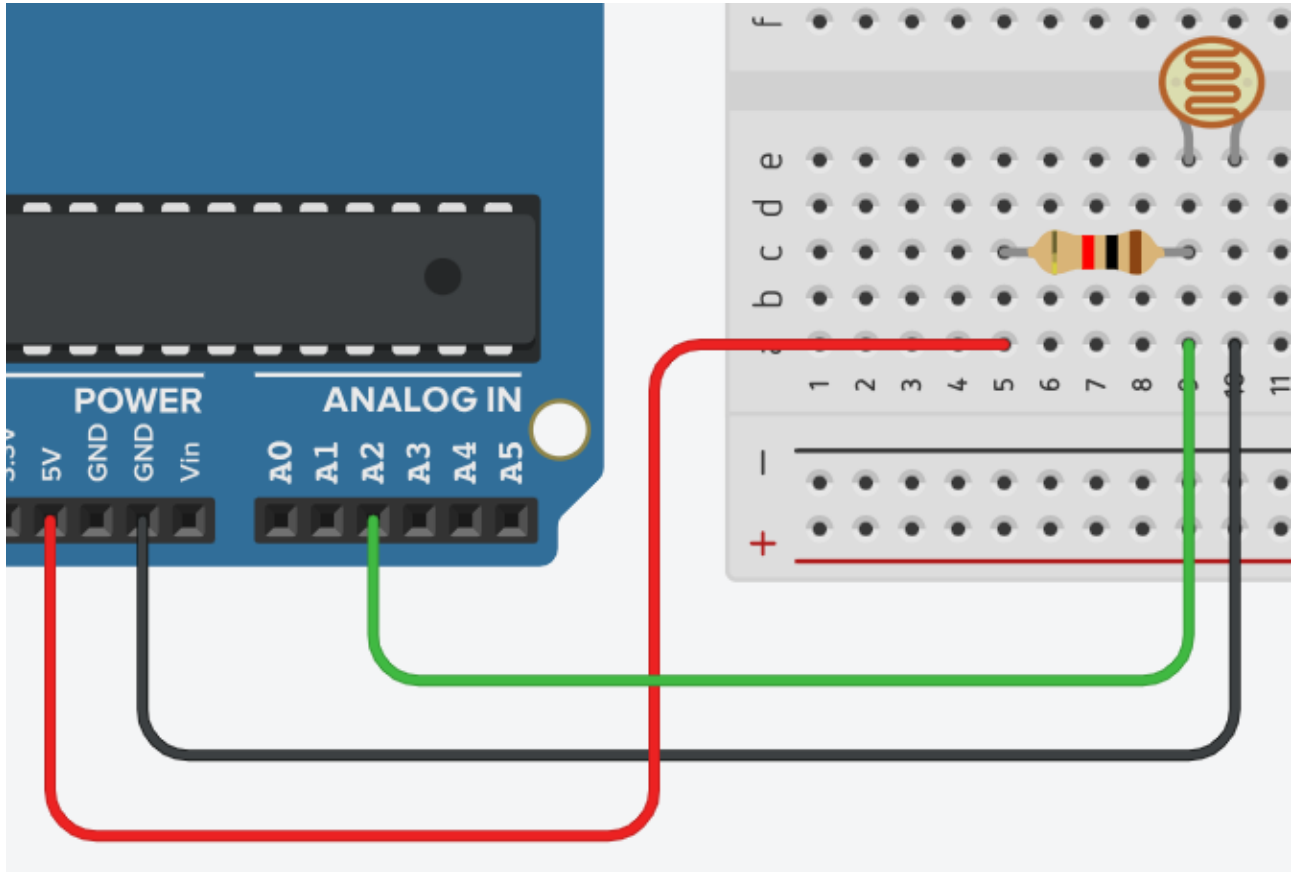
풀업 저항 사용



풀업 저항 사용시 밝기에 대한 측정 전압

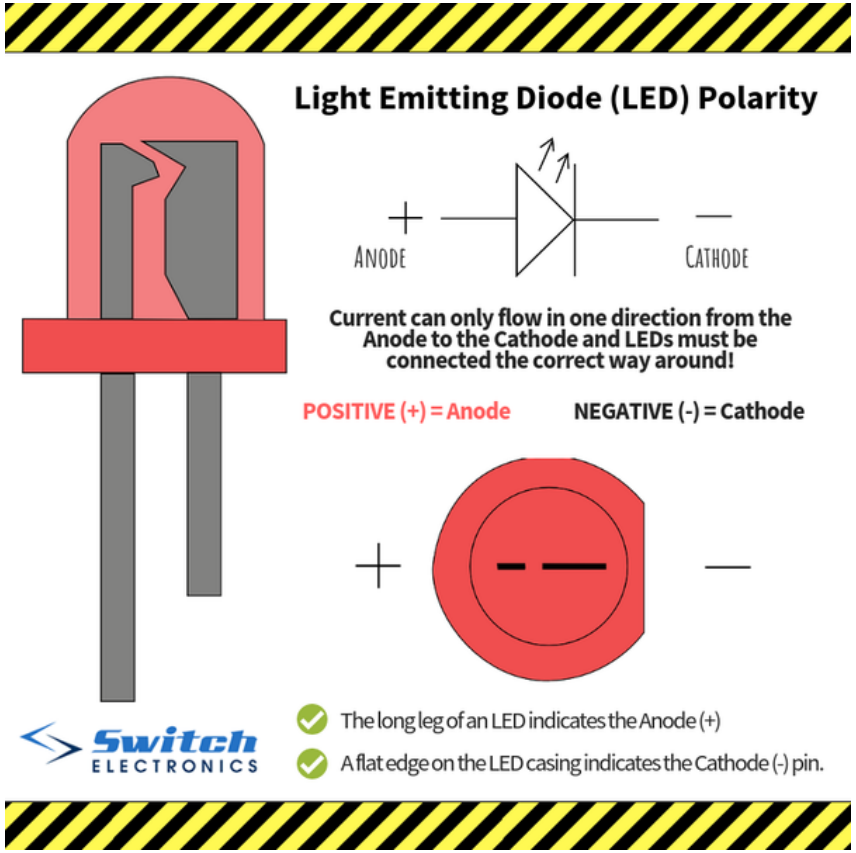
C D S (포토레지스터)

```
void setup (){
  Serial.begin(9600);
}

void loop(){
  int val = analogRead(A2);
  Serial.print("Analog : ");
  Serial.println(val);
}
```



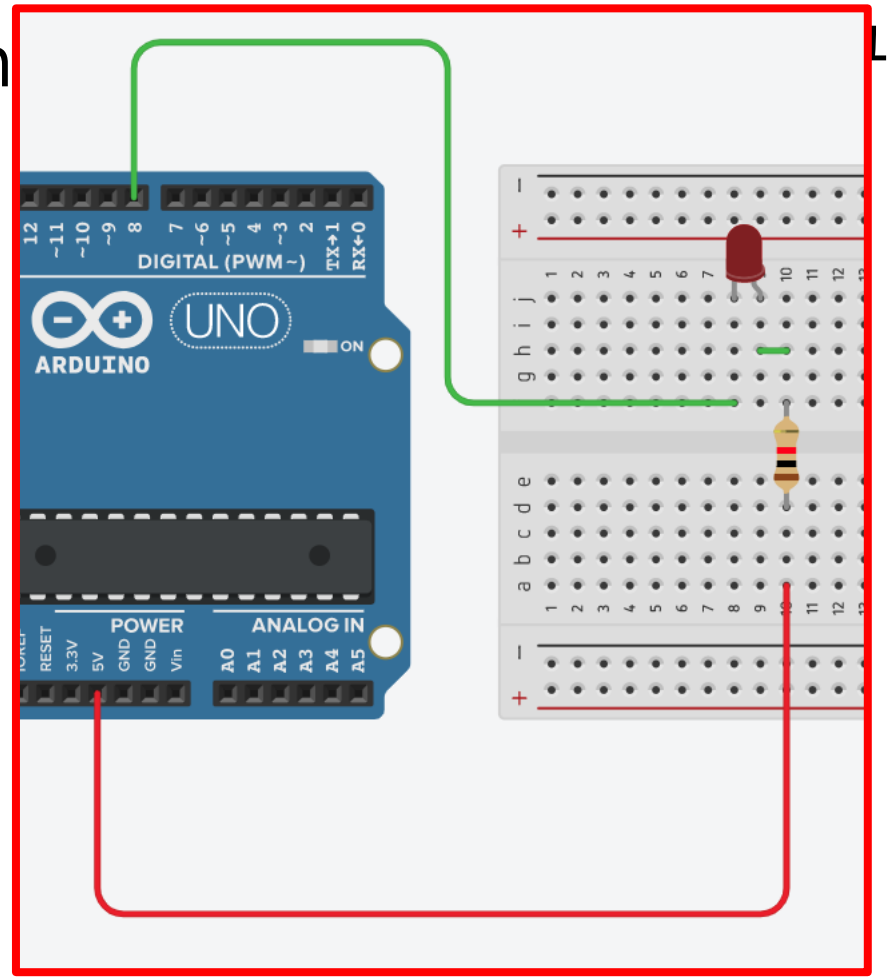
아두이노를 이용한LED 실험

- LED를 이용한 포트 Output 테스트



아두이노를 이용한LED 실험

- tin 성

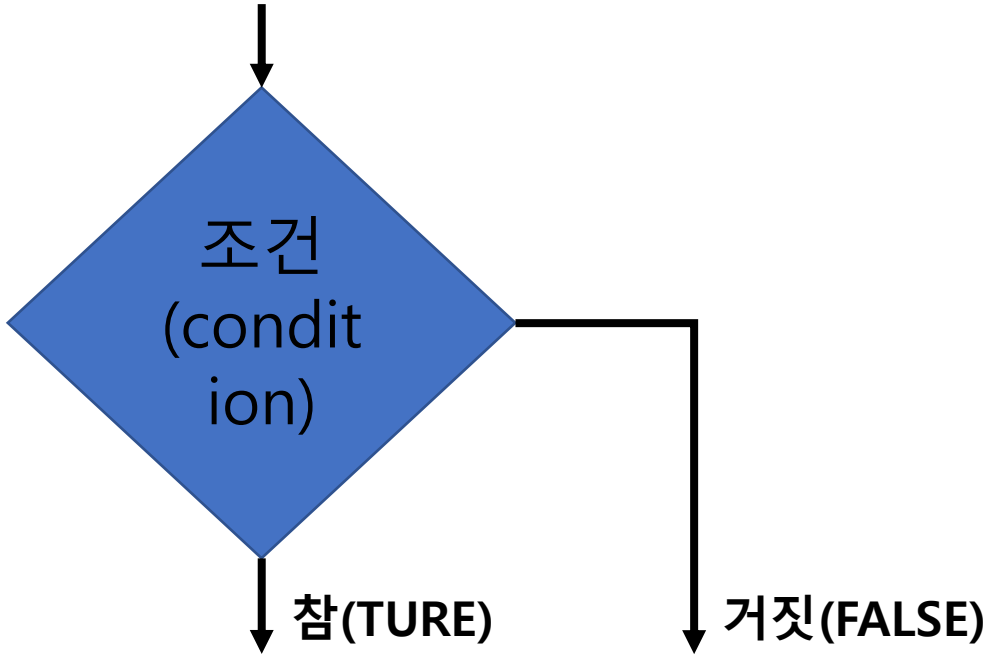



```
// C++ code
//
void setup()
{
  pinMode(8, OUTPUT);
}

void loop()
{
  digitalWrite(8, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(8, LOW);
  delay(1000); // Wait for 1000 millisecond(s)
}
```

특정 조건일때 실행(조건문/분기문)

- if ~ else

```
if( 조건식1 )
{
    //조건식1이 참이면 실행

}
else
{
    //그렇지 않으면(조건식1이 거짓이면) 실행

}
```



센서값이 특정 조건일때 실행

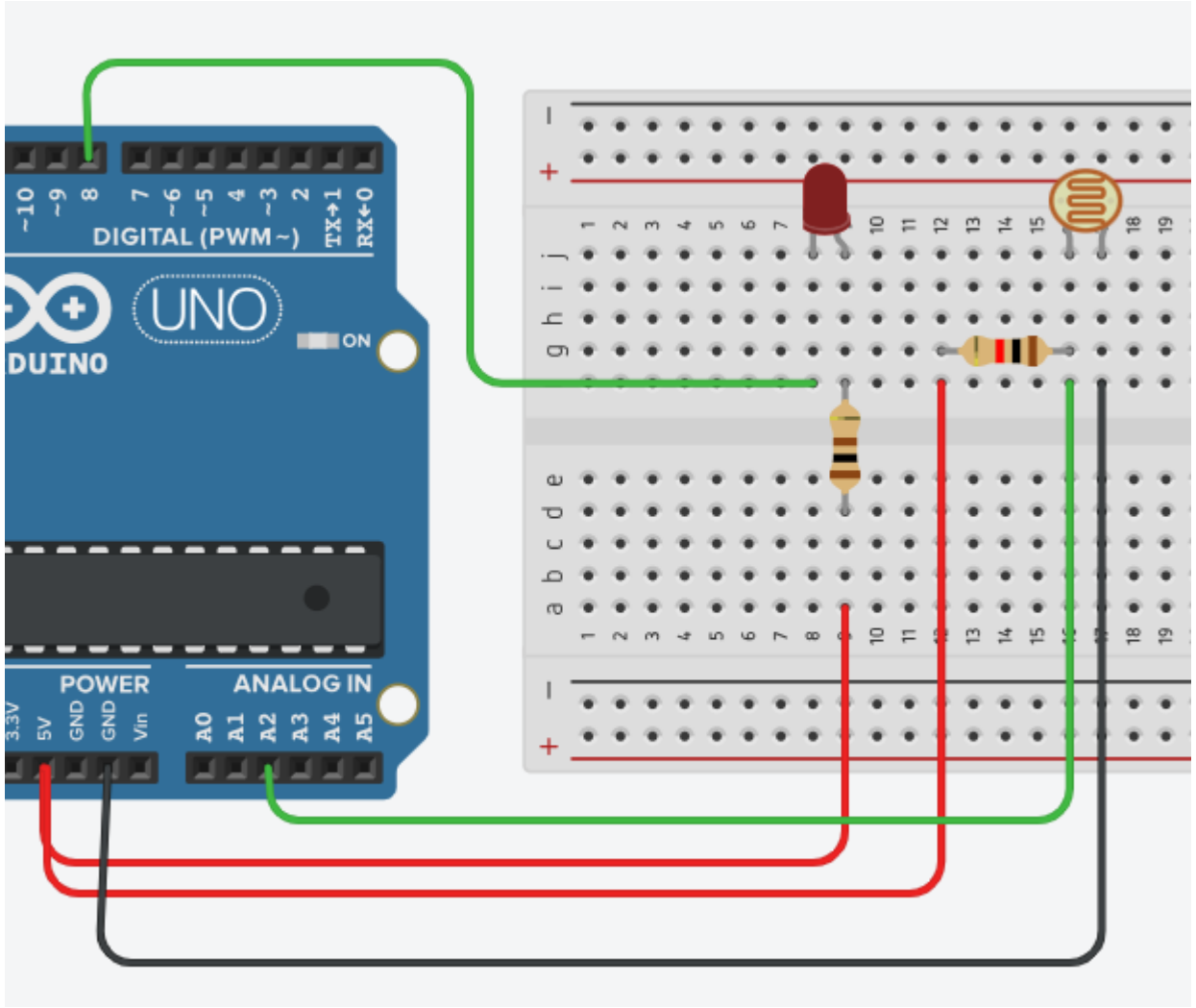
- if ~ else

```
if( 센서값 < 1000 )
{
    //불(LED)를 켜라
}
else
{
   //불(LED)를 꺼라

}
```

조건식

- A == B : A와 B가 같으면 참
- A != B : A와 B가 다르면 참
- A > B : A가 B보다 크면 참
- A < B : A가 B보다 작으면 참
- A >= B : A가 B보다 크거나 같으면 참
- A <= B : A가 B보다 작거나 같으면 참

스마트 가로등 실험

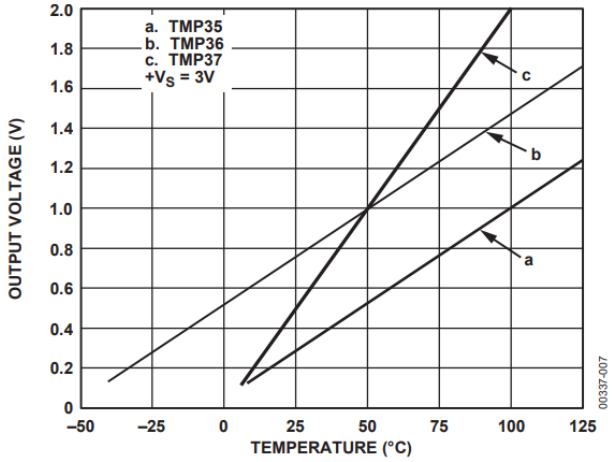


3. CDS로 빛이 어두운 경우 LED를 On 그렇지 않으면 Off 자동 제어

```
void setup () {
  Serial.begin(9600);
  pinMode(8, OUTPUT) ;
}

void loop() {
  int val = analogRead(A2);
  Serial.println(val);

  if( val > [          ] )
  {
      digitalWrite(8, [        ] );
  }
  else
  {
      digitalWrite(8, [         ] );
  }
}
```

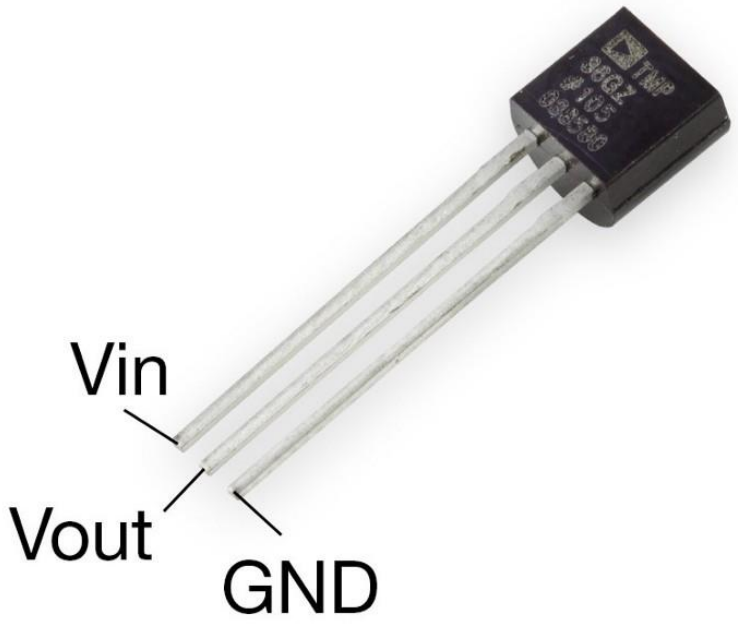
TMP36

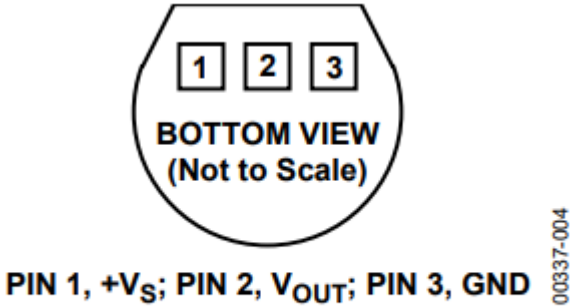
- 온도센서는 온도를 감지해 전기신호로 바꿔주는 센서를 의미
- TMP36
  - 상온에서 대략 750mV를 출력
  - 온도 1 ℃가 변화하면 10mV의 출력 전압이 변화 함
  - 정밀도는 ±1 ℃로 정밀한 온도 감지는 어려움.
  - 사용하기 쉽고 저렴하여 정밀한 온도 감지가 필요 없는 어플리케이션이 많이 사용 됨.



TMP36 데이타시트 : https://www.analog.com/media/en/technical-documentation/data-sheets/TMP35_36_37.pdf

TMP36 핀연결



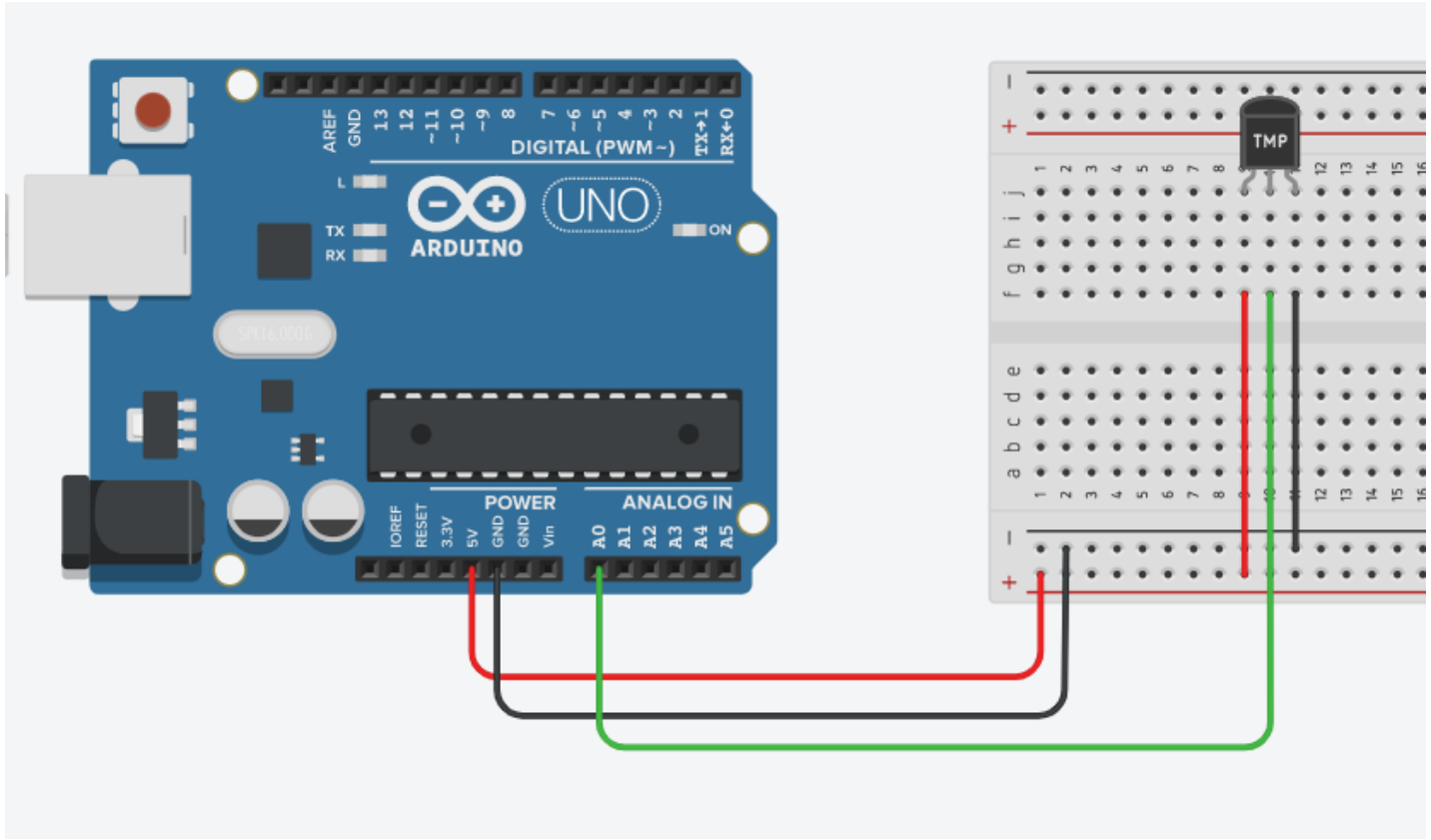


PIN 1, $+V_S$; PIN 2, V_{OUT}; PIN 3, GND

Figure 4. T-3 (TO-92)

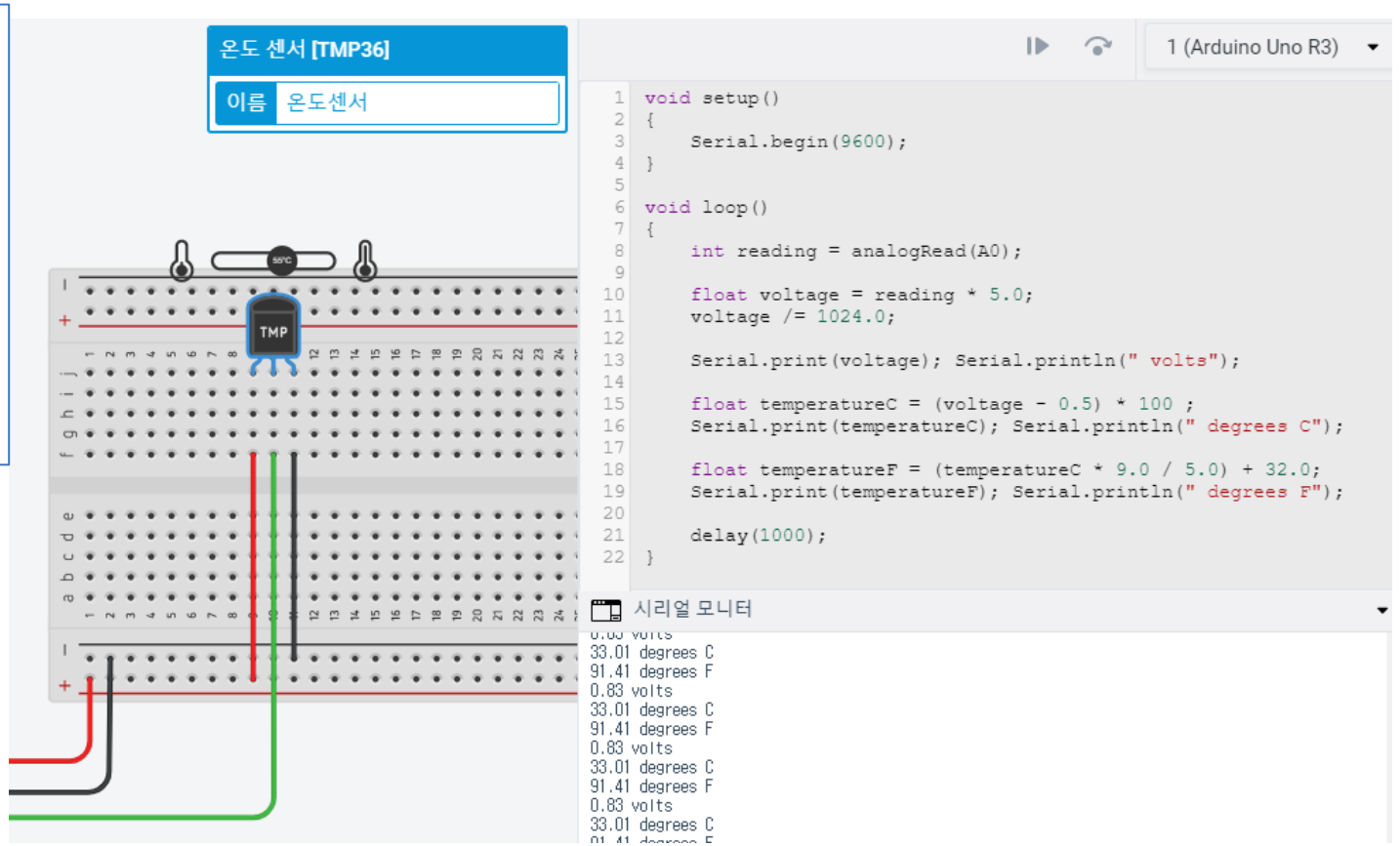
TMP36 + 아두이노 실험

- TMP Vin <> 아두이노 5V
- TMP Vout <> 아두이노 A0
- TMP GND <> 아두이노 GND



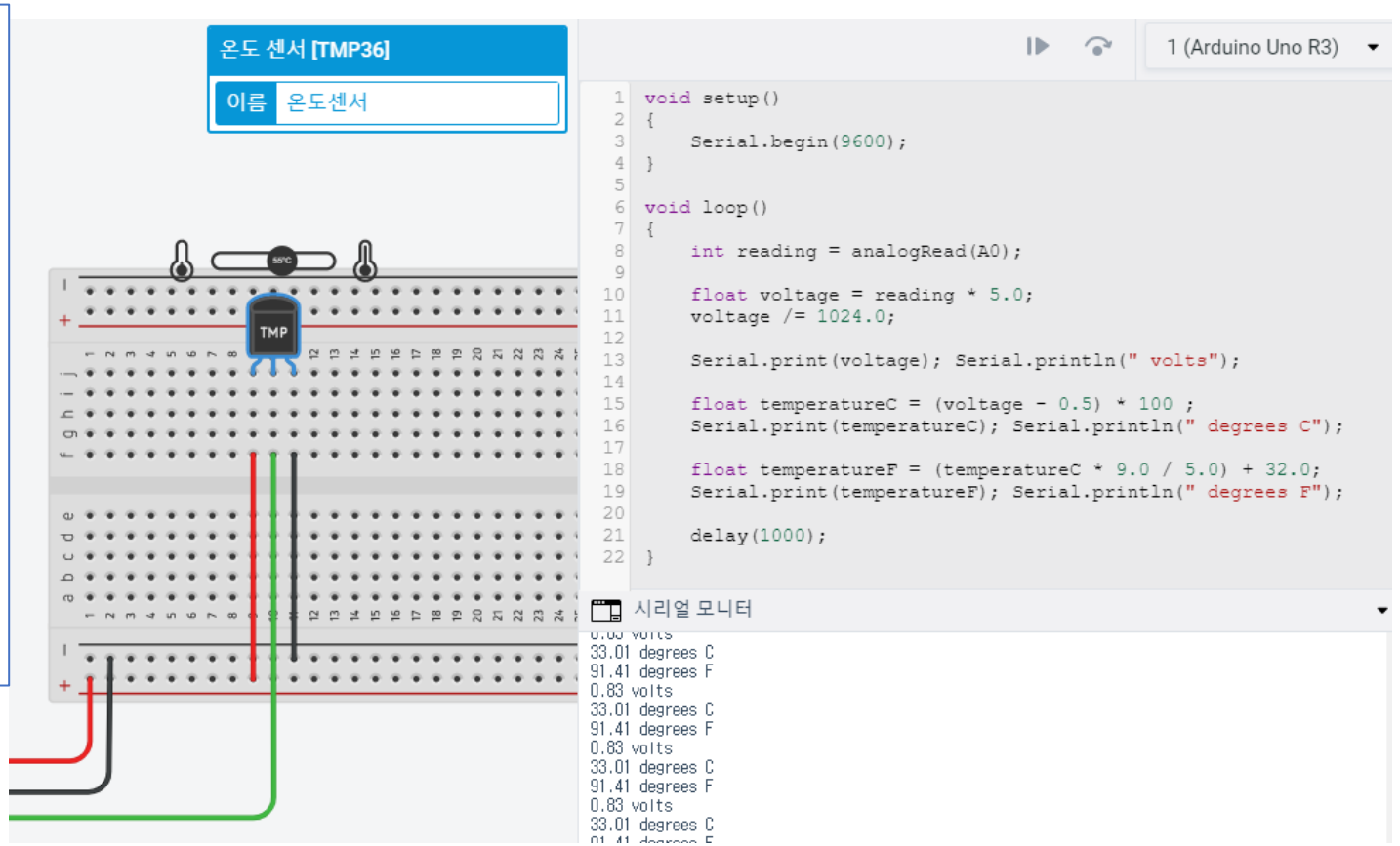
코드 작성

```
void setup()
{
    Serial.begin(9600);
}

void loop()
{
    int reading = analogRead(A0);
    Serial.println(reading) ;
}
```



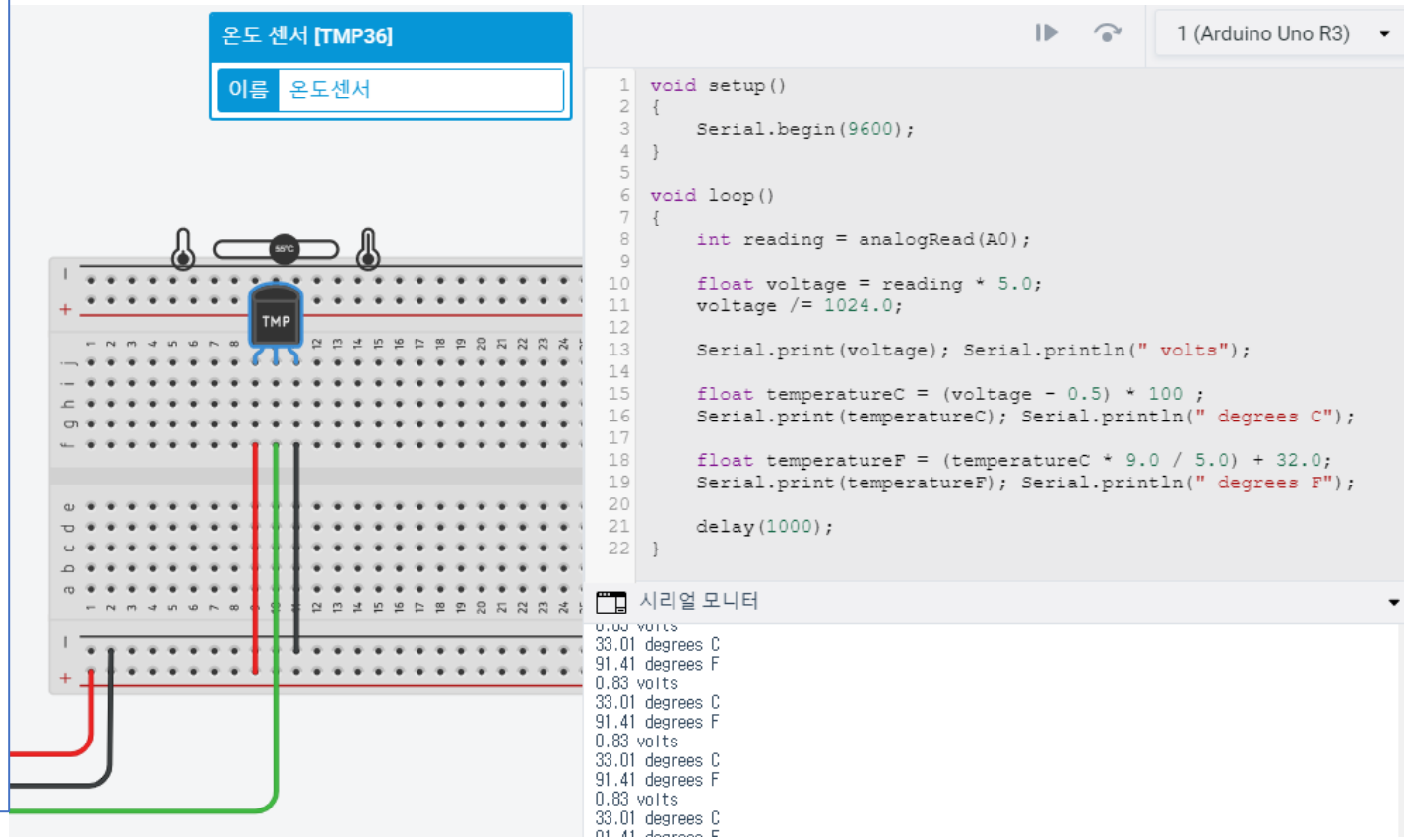
코드 작성

```
void setup()
{
    Serial.begin(9600);
}

void loop()
{
    int reading = analogRead(A0);

    float voltage = (reading / 1024.0)* 5.0;

    Serial.print(voltage); Serial.println(" volts");

    delay(1000);
}
```



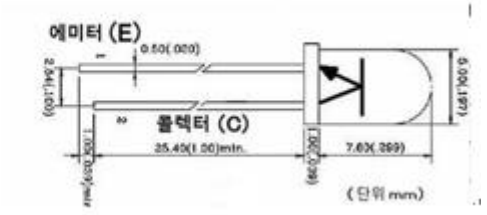
코드 작성

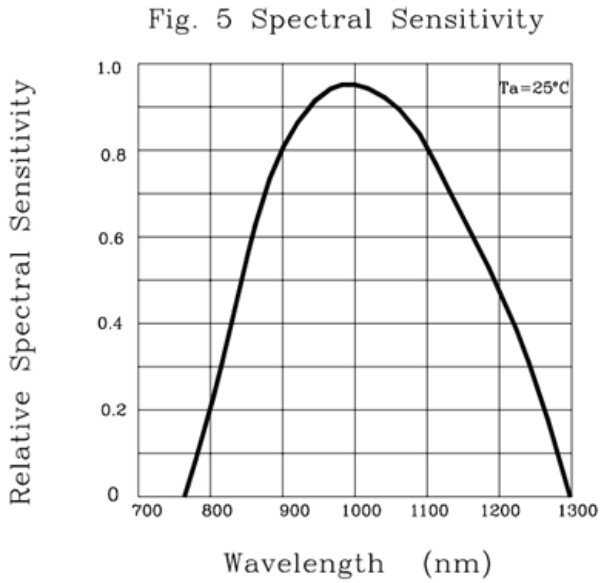
```
void setup()
{
    Serial.begin(9600);
}

void loop()
{
    int reading = analogRead(A0);

    float voltage = (reading / 1024.0)* 5.0;

    Serial.print(voltage); Serial.println(" volts");

    float temperatureC = (voltage - 0.5) * 100 ;
    Serial.print(temperatureC); Serial.println(" degrees C");

    delay(1000);
}
```

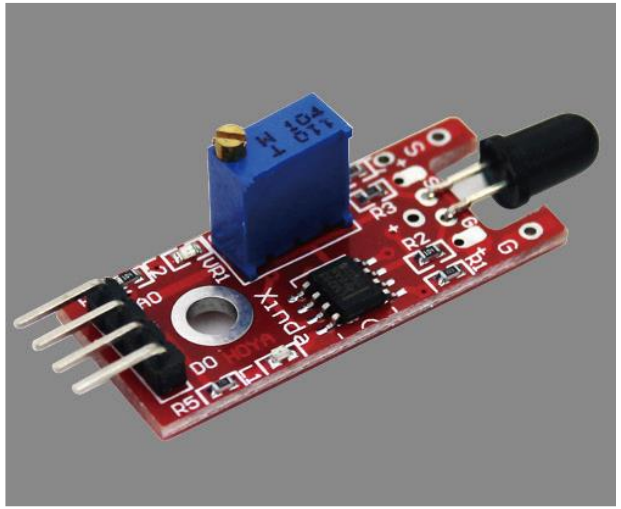


불꽃감지센서 (Flame sensor)

- 불꽃 또는 화염은 사람의 눈으로 확인 할 수 없는 자외선과 적외선의 파장이 발생
- 불꽃감지센서는 적외선 감지센서로서 760nm ~ 1100nm파장을 감지한다.

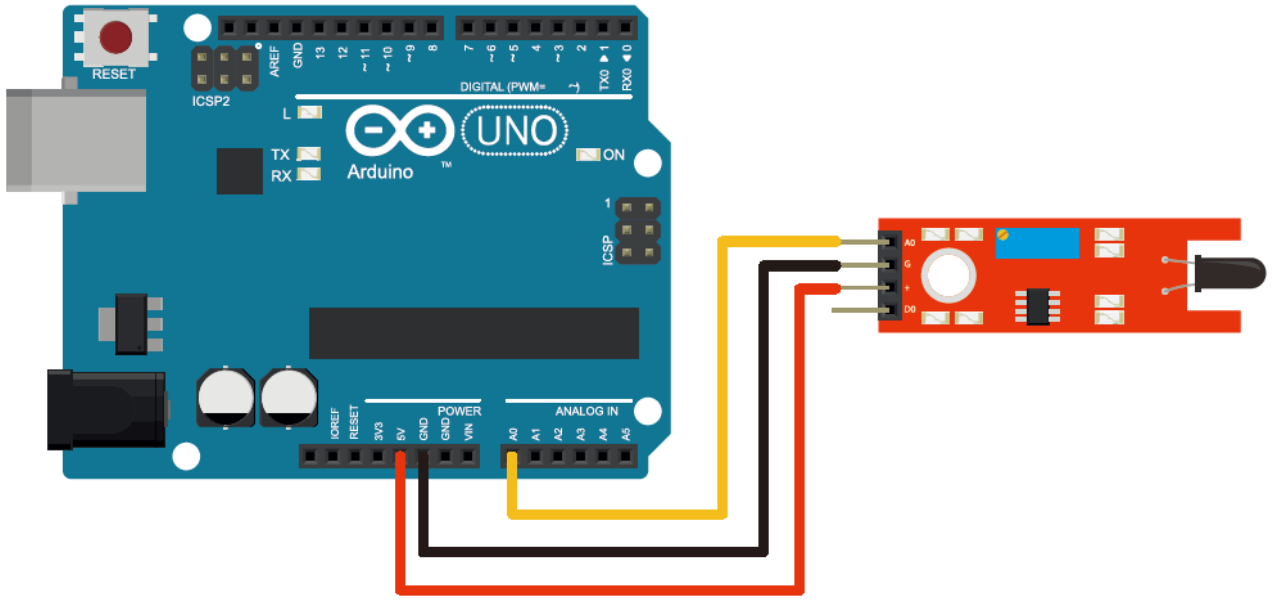






불꽃감지센서 (Flame sensor)

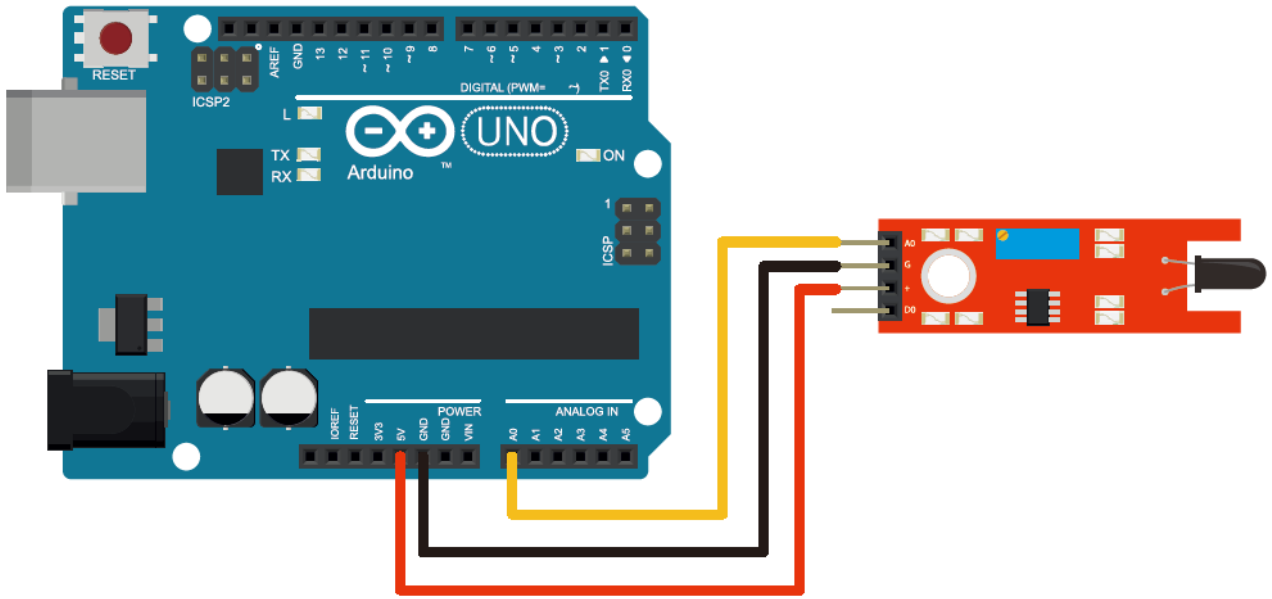
- 불꽃 감지 아두이노 실험 구성
  - 센서모듈 A0 <> 아두이노 A0
  - 센서모듈 G <> 아두이노 GND
  - 센서모듈 + <> 아두이노 5V



불꽃감지센서 (Flame sensor)

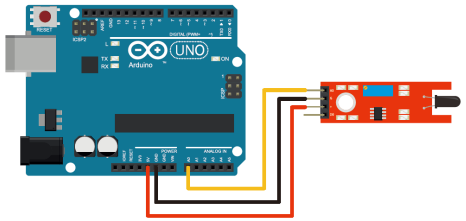
- 불꽃 감지 아두이노 실험 코드 작성

```
void setup()
{
    Serial.begin(9600);
}

void loop()
{
    int analog_value = analogRead(A0);

    Serial.println(analog_value);

    delay(100);
}
```



불꽃감지센서를 이용한 화재감지 응용

- 불꽃이 감지 되면 자동으로 경고를 발생시키자!



불꽃감지센서를 이용한 화재감지 응용

- 부저(소리) 출력 실험
  - 능동부저:전원을공급하면단음(삐)소리가출력
  - 수동부저:진동을만들어특정주파수의소리를출력(다양한소리를출력할수있음,멜로디)

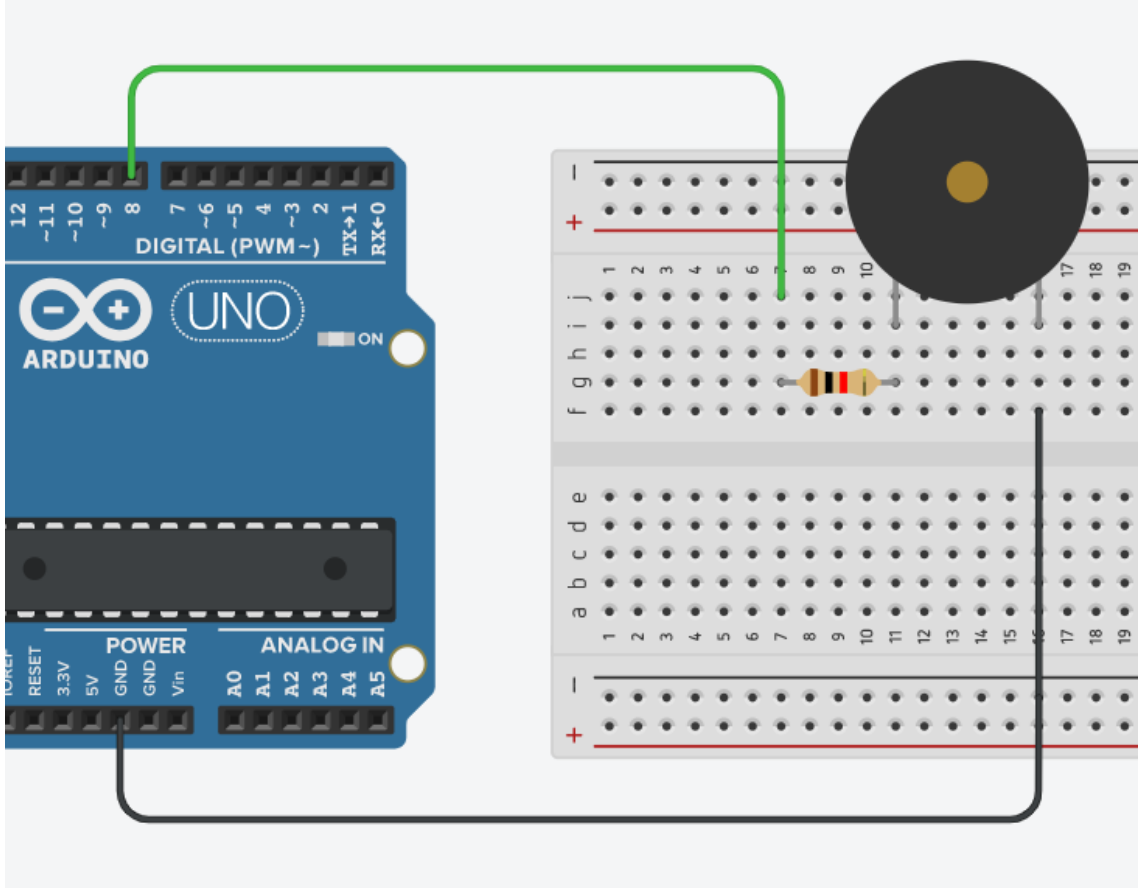
(단위 : Hz)

옥타브 / 음계	1	2	3	4	5	6	7	8
C(도)	32.7032	65.4064	130.8128	261.6256	523.2511	1046.502	2093.005	4186.009
C#	34.6478	69.2957	138.5913	277.1826	554.3653	1108.731	2217.461	4434.922
D(레)	36.7081	73.4162	146.8324	293.6648	587.3295	1174.659	2349.318	4698.636
D#	38.8909	77.7817	155.5635	311.1270	622.2540	1244.508	2489.016	4978.032
E(미)	41.2034	82.4069	164.8138	329.6276	659.2551	1318.510	2637.020	5274.041
F(파)	43.6535	87.3071	174.6141	349.2282	698.4565	1396.913	2793.826	5587.652
F#	46.2493	92.4986	184.9972	369.9944	739.9888	1479.978	2959.955	5919.911
G(솔)	48.9994	97.9989	195.9977	391.9954	783.9909	1567.982	3135.963	6271.927
G#	51.9130	103.8262	207.6523	415.3047	830.6094	1661.219	3322.438	6644.875
A(라)	55.0000	110.0000	220.0000	440.0000	880.0000	1760.000	3520.000	7040.000
A#	58.2705	116.5409	233.0819	466.1638	932.3275	1864.655	3729.310	7458.620
B(시)	61.7354	123.4708	246.9417	493.8833	987.7666	1975.533	3951.066	7902.133

- 도:261.6256Hz
- 레:293.1826Hz
- 미:329.6276 Hz
- 파:349.2282 Hz
- 솔:391.9954 Hz
- 라:440.0000 Hz
- 시:466.1638 Hz
- 도:523.2511 Hz

불꽃감지센서를 이용한 화재감지 응용

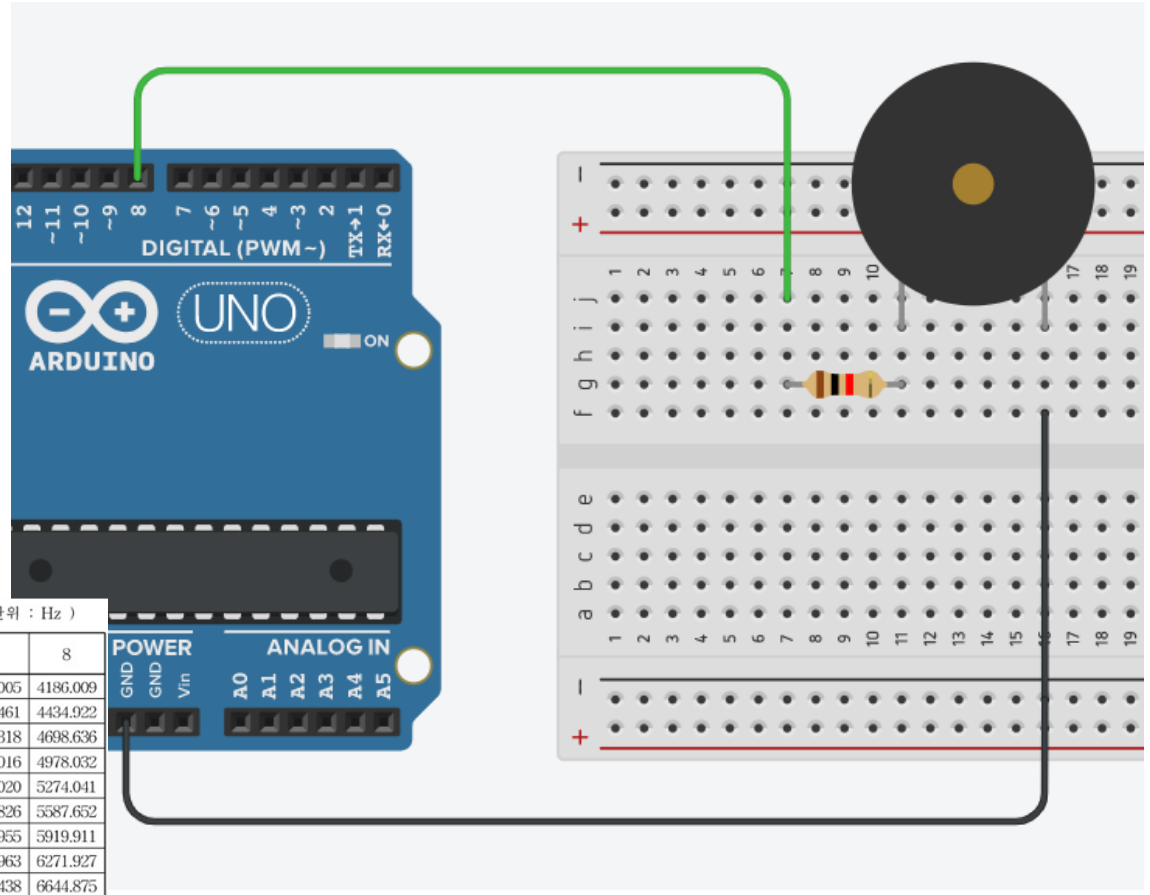
- 부저(소리) 출력 실험
  - 부저 + <> 아두이노 8번핀
  - 부저 - <> 아두이노 GND



불꽃감지센서를 이용한 화재감지 응용

- 부저(소리) 출력 실험

```
void setup()
{
    pinMode(8, OUTPUT);
}

void loop()
{
    tone(8, 262, 500);
    delay(500);
}
```



(단위 : Hz)

옥타브 / 음계	1	2	3	4	5	6	7	8
C(도)	32.7032	65.4064	130.8128	261.6256	523.2511	1046.502	2093.005	4186.009
C#	34.6478	69.2957	138.5913	277.1826	554.3653	1108.731	2217.461	4434.922
D(레)	36.7081	73.4162	146.8324	293.6648	587.3295	1174.659	2349.318	4698.636
D#	38.8909	77.7817	155.5635	311.1270	622.2540	1244.508	2489.016	4978.032
E(미)	41.2034	82.4069	164.8138	329.6276	659.2551	1318.510	2637.020	5274.041
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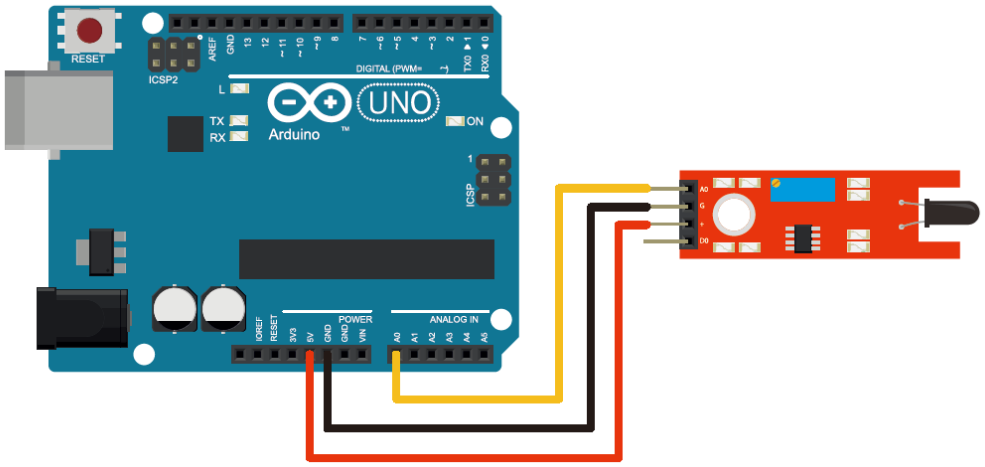
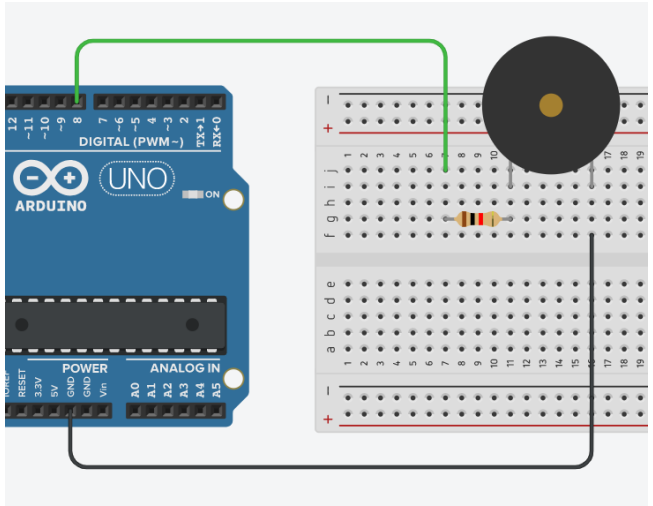
G#	51.9130	103.8262	207.6523	415.3047	830.6094	1661.219	3322.438	6644.875
A(라)	55.0000	110.0000	220.0000	440.0000	880.0000	1760.000	3520.000	7040.000
A#	58.2705	116.5409	233.0819	466.1638	932.3275	1864.655	3729.310	7458.620
B(시)	61.7354	123.4708	246.9417	493.8833	987.7666	1975.533	3951.066	7902.133

불꽃감지센서를 이용한 화재감지 응용

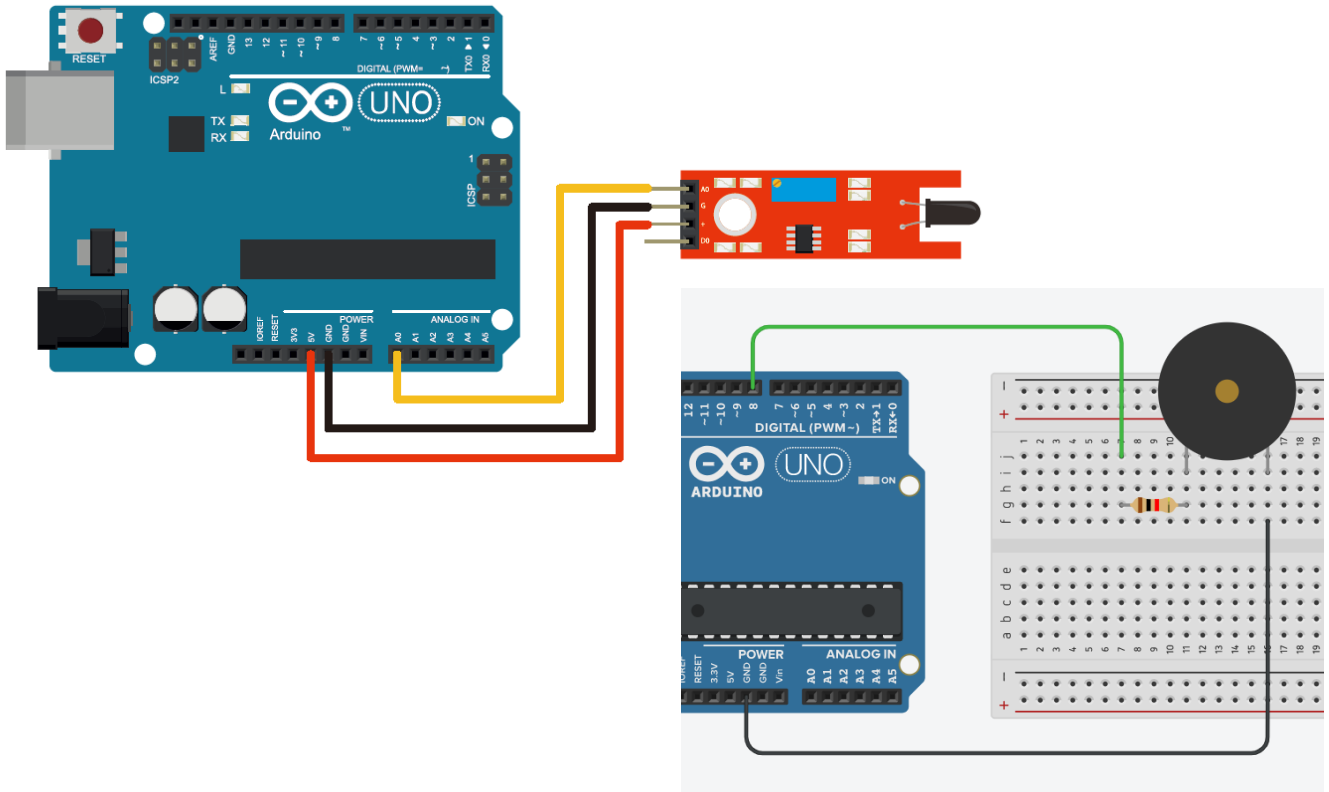
- 실험
  - 불꽃이 감지 되면 부저(소리)가 출력하는 회로와 코드를 작성 하시오





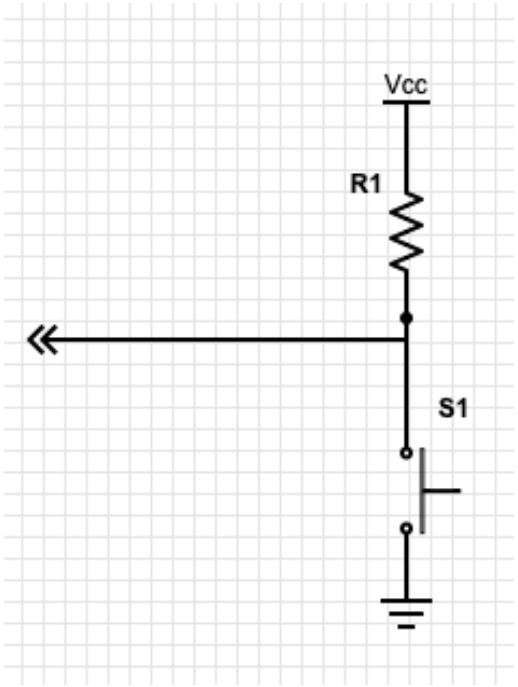
불꽃감지센서를 이용한 화재감지 응용

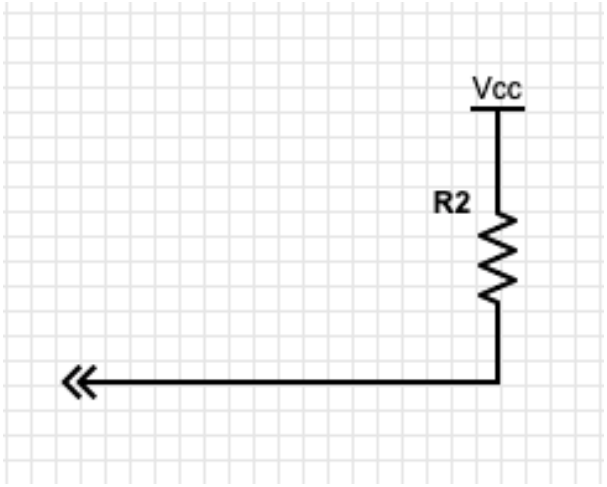
- 실험
  - 불꽃이 감지 되면
  - 부저(소리)가 출력하는 회로와 코드를 작성 하시오

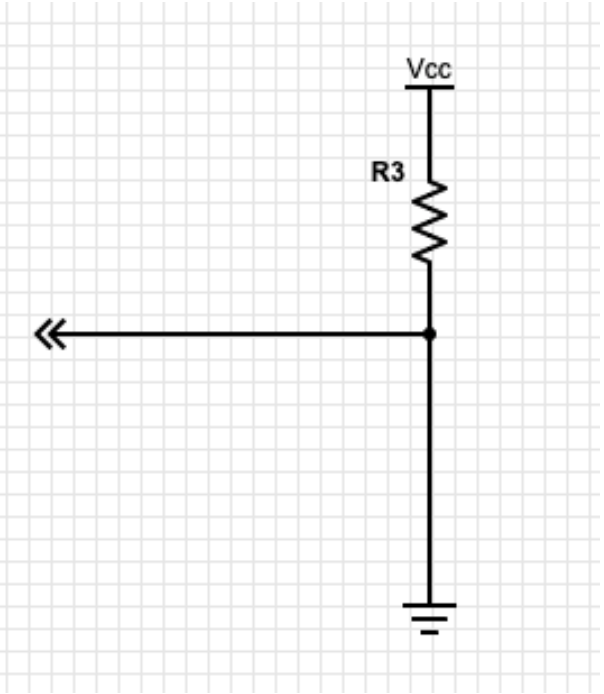



```
void setup()
{
    Serial.begin(9600);
    pinMode(8, OUTPUT);
}

void loop()
{
    int analog_value = analogRead(A0);
     Serial.println(analog_value);

     if( analog_value < [              ] )
     {
       tone(8, 262, 500);
       delay(500);
     }
     else
     {
       tone(8, 0, 500);
       delay(500);
     }
}
```

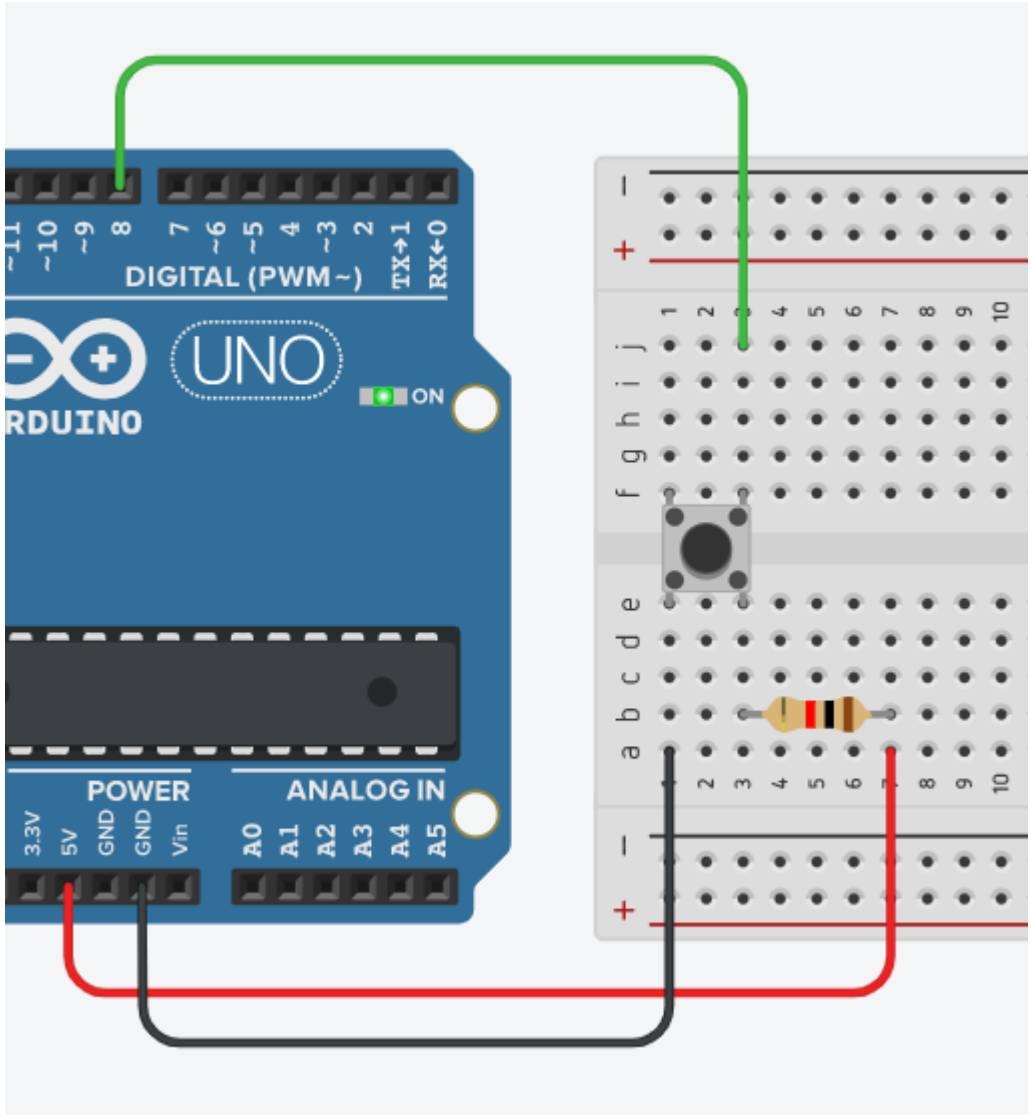
디지털 입력 실험(키 입력)

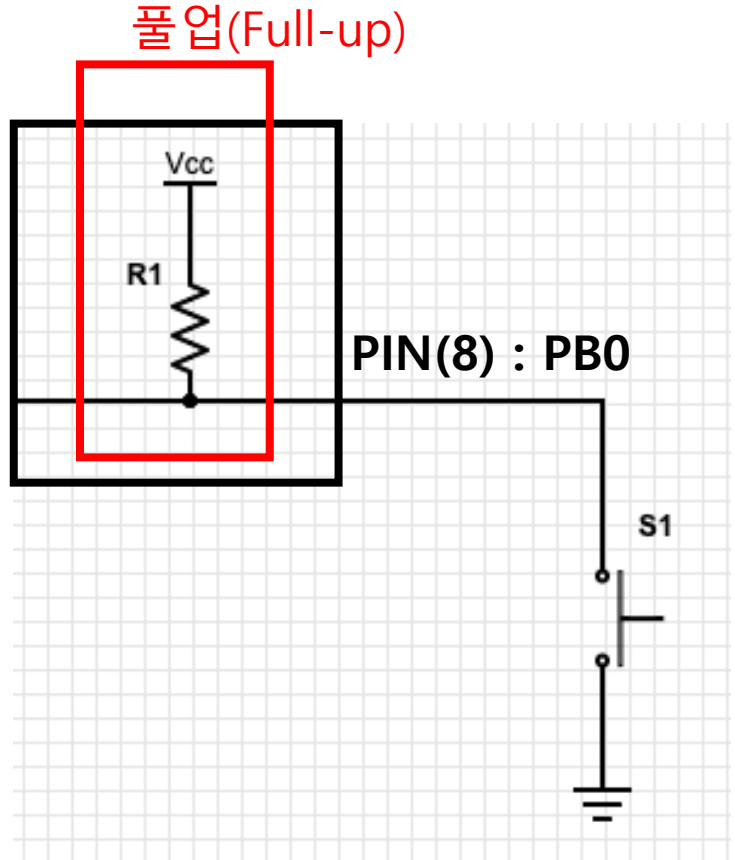




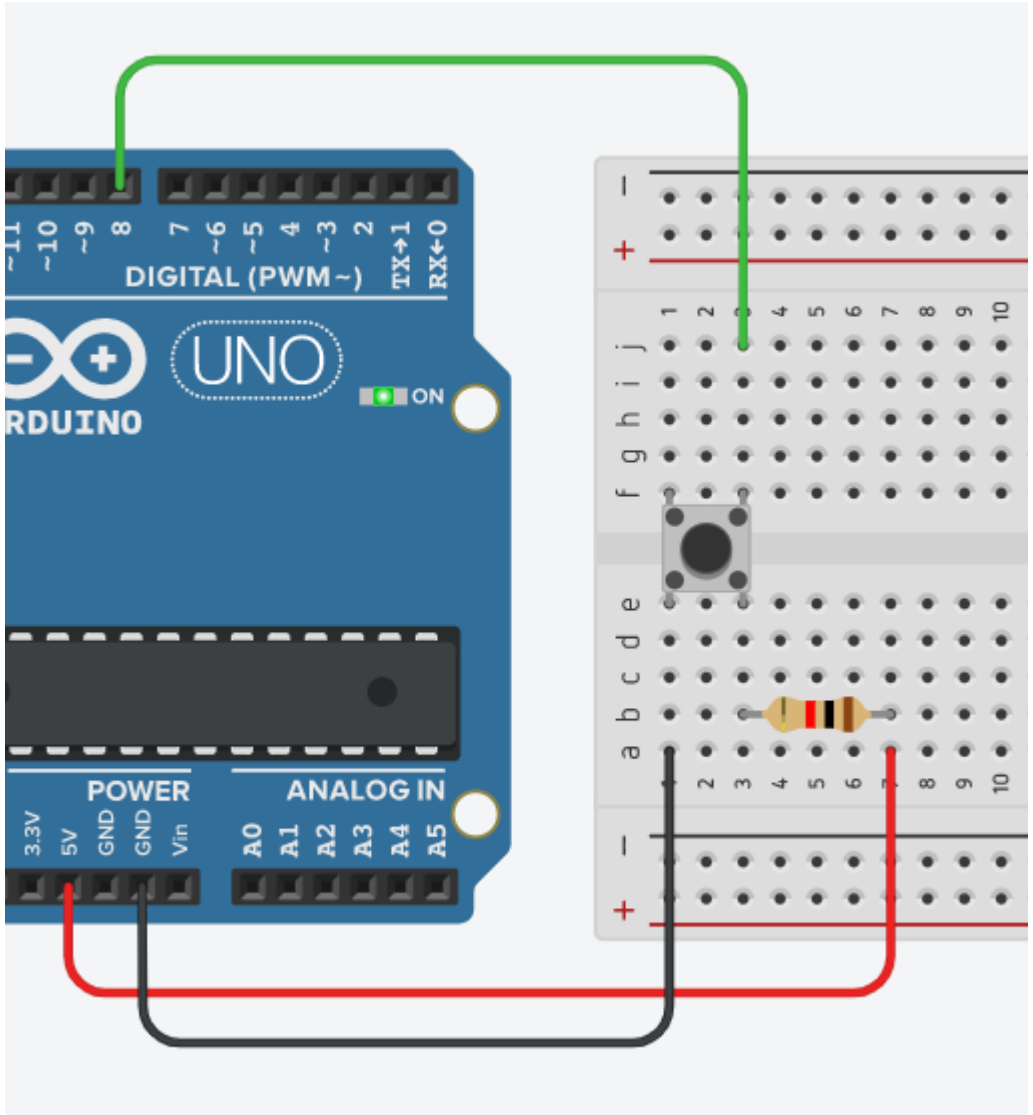


버튼을 이용한 Digital Input 실험





버튼을 이용한 Digital Input 실험




```
void setup()
{
  pinMode(8, INPUT) ;
  Serial.begin(9600) ;
}

void loop()
{
  int read = digitalRead(8) ;
  Serial.println(read) ;
}
```