Εκπαίδευση STEAM Arduino 3ο

Ιστοσελίδες για δημιουργία project

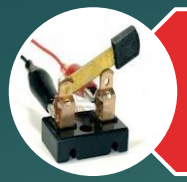
https://www.arduino.cc/

http://blog.ardublock.com/

http://www.tinkercad.com/

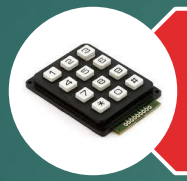
https://fritzing.org/

6 ΣΗΜΑΝΤΙΚΕΣ ΕΝΝΟΙΕΣ

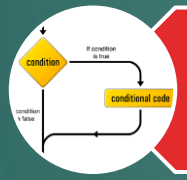


digitalWrite()

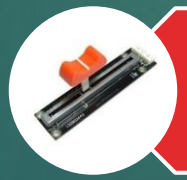
analogWrite()



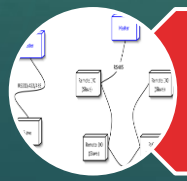
digitalRead()



if() statements / Boolean



analogRead()



Serial communication

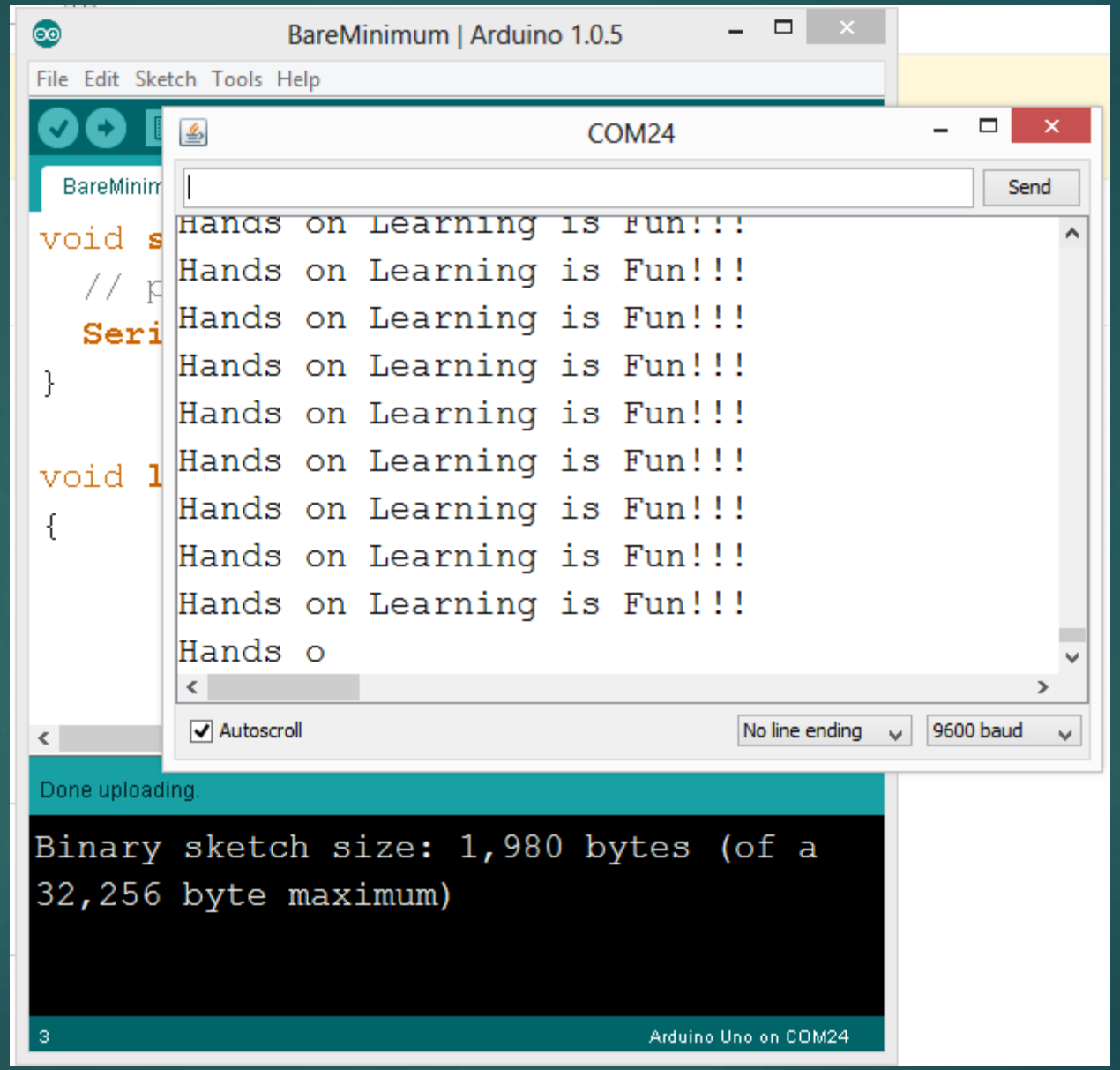
Analog Sensors

Παραδείγματα:

Sensors	Μετρούμενο μέγεθος
Mic	Ένταση ήχου
Photoresistor	Ένταση φωτός
Potentiometer	Θέση δρομέα
Temp Sensor	θερμοκρασία
Flex Sensor	κάμψη
Accelerometer	επιτάχυνση

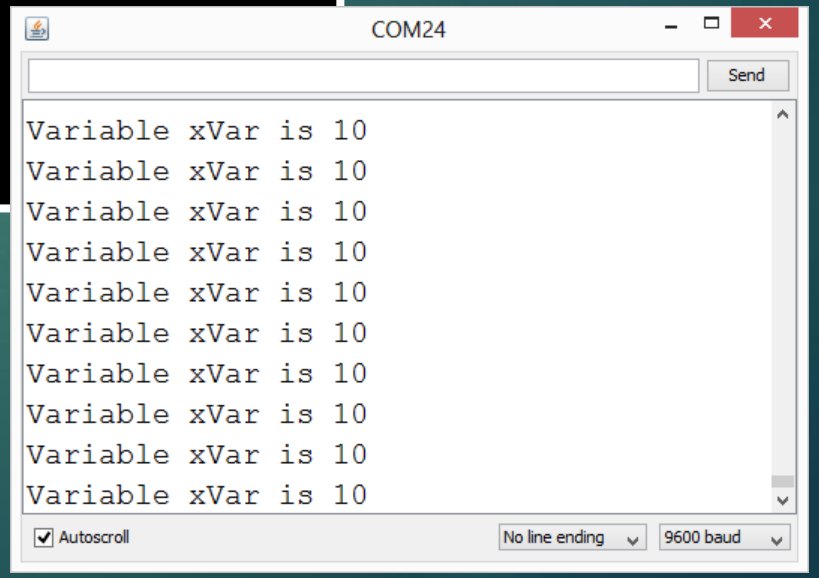
Σειριακή επικοινωνία, Serial Communication Απεικόνιση μηνυμάτων


```
void loop ( )
{
      Serial.print(“Hands on ”) ;
      Serial.print(“Learning ”) ;
      Serial.println(“is Fun!!!”) ;
}
```


BareMinimum | Arduino 1.0.5
File Edit Sketch Tools Help
BareMinim
void s
// p
Seri
}
void l
{
COM24
Send
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands o
Autoscroll
No line ending
9600 baud
Done uploading.
Binary sketch size: 1,980 bytes (of a 32,256 byte maximum)
3
Arduino Uno on COM24

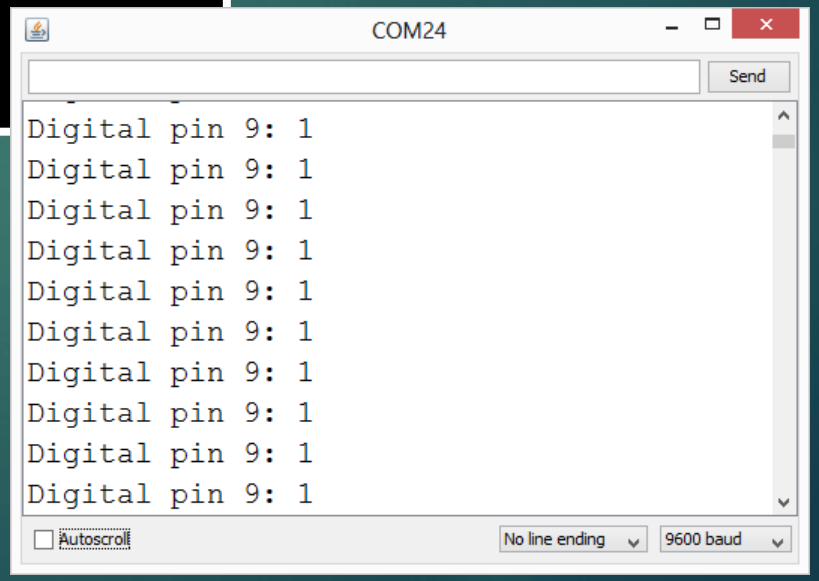
Serial Communication: Serial Debugging - Αποσφαλμάτωση

```
void loop()
{
   int xVar = 10;
   Serial.print ( “Variable xVar is ” ) ;
   Serial.println ( xVar ) ;
}
```

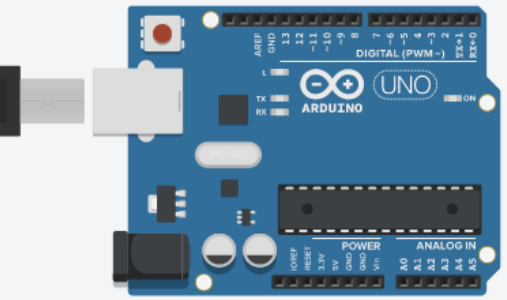


Serial Communication: Serial Troubleshooting - έλεγχος

```
void loop ( )
{
   Serial.print ("Digital pin 9: ");
   Serial.println (digitalRead(9));
}
```



Παράδειγμα 1: Serial Print



Blocks + Text

Output
Input
Notation
Control
Math
Variables

set built-in LED to HIGH

set pin 0 to HIGH

set pin 3 to 0

rotate servo on pin 0 to 0 degree

play speaker on pin 0 with tone 60

print to serial monitor Hands on without newline

print to serial monitor Learning without newline

print to serial monitor is Fun!!! with newline

wait 2 secs

1 (Arduino Uno R3)

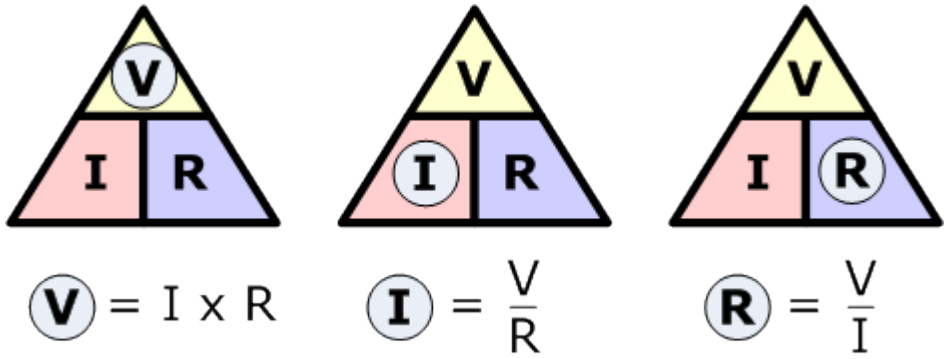
```
1  void setup()
2  {
3    Serial.begin(9600);
4
5  }
6
7  void loop()
8  {
9    Serial.print("Hands on ");
10   Serial.print("Learning ");
11   Serial.println("is Fun!!!");
12   delay(2000); // Wait for 2000 millisecond(s)
13 }
```

Serial Monitor

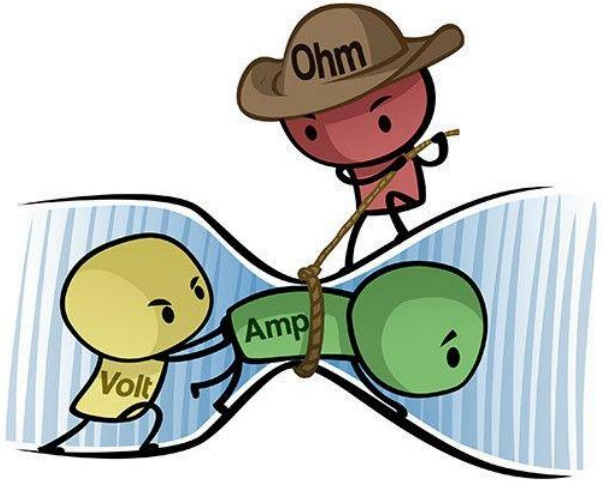
```
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
Hands on Learning is Fun!!!
```

Send Clear

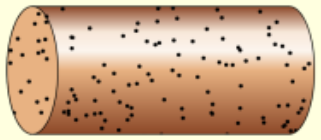
Νόμος του Ohm

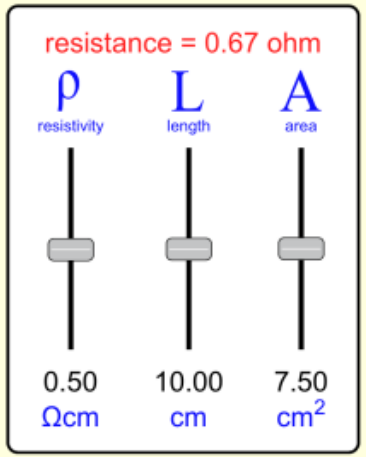


Νόμος του Ohm - Διαδραστικό περιβάλλον

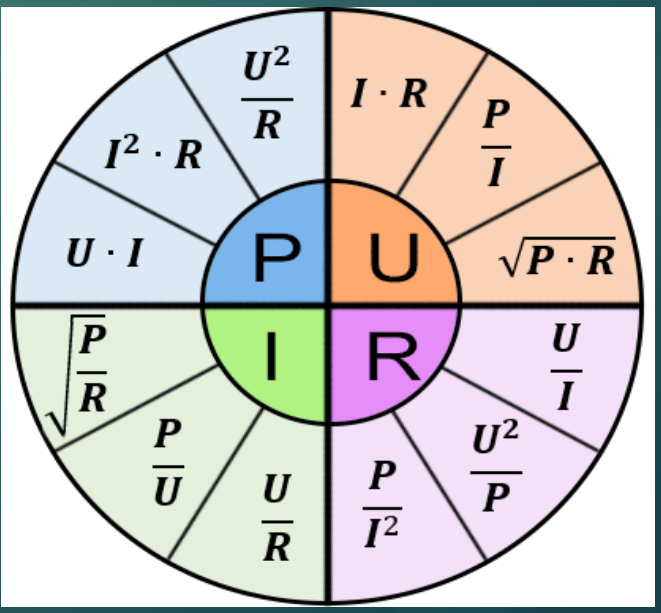


$$R = \frac{\rho L}{A}$$

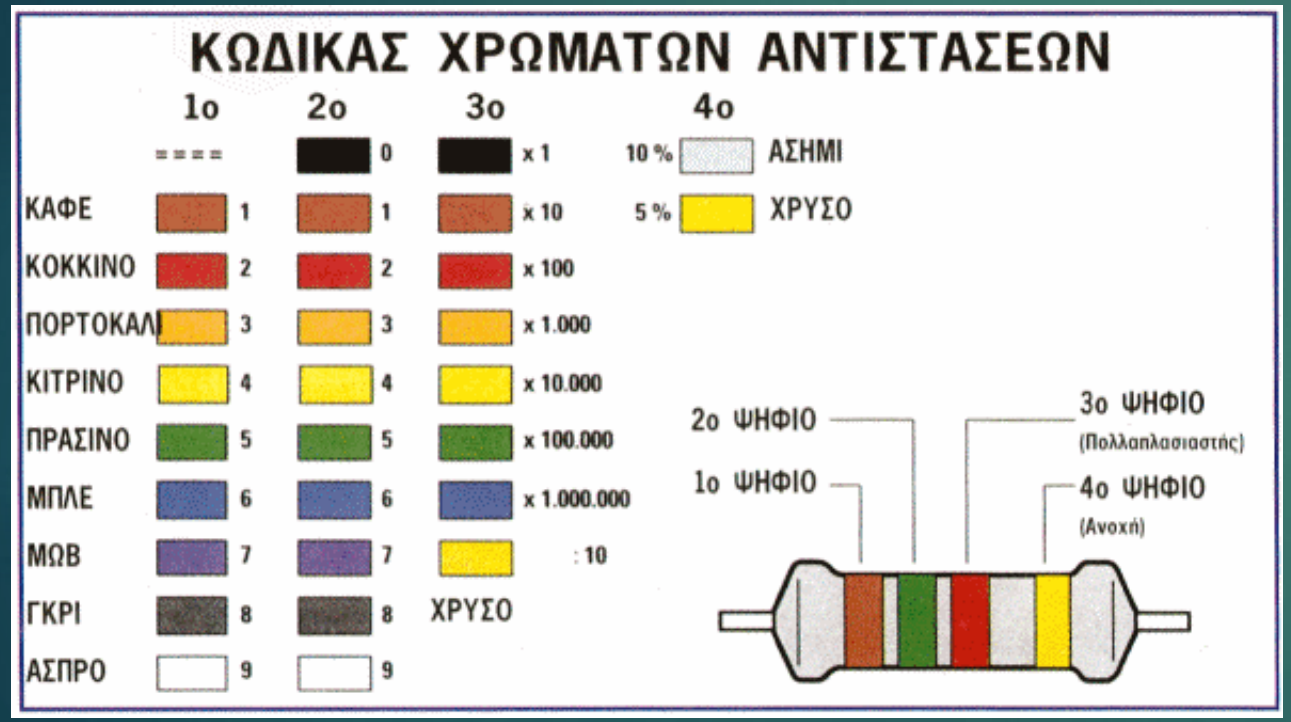


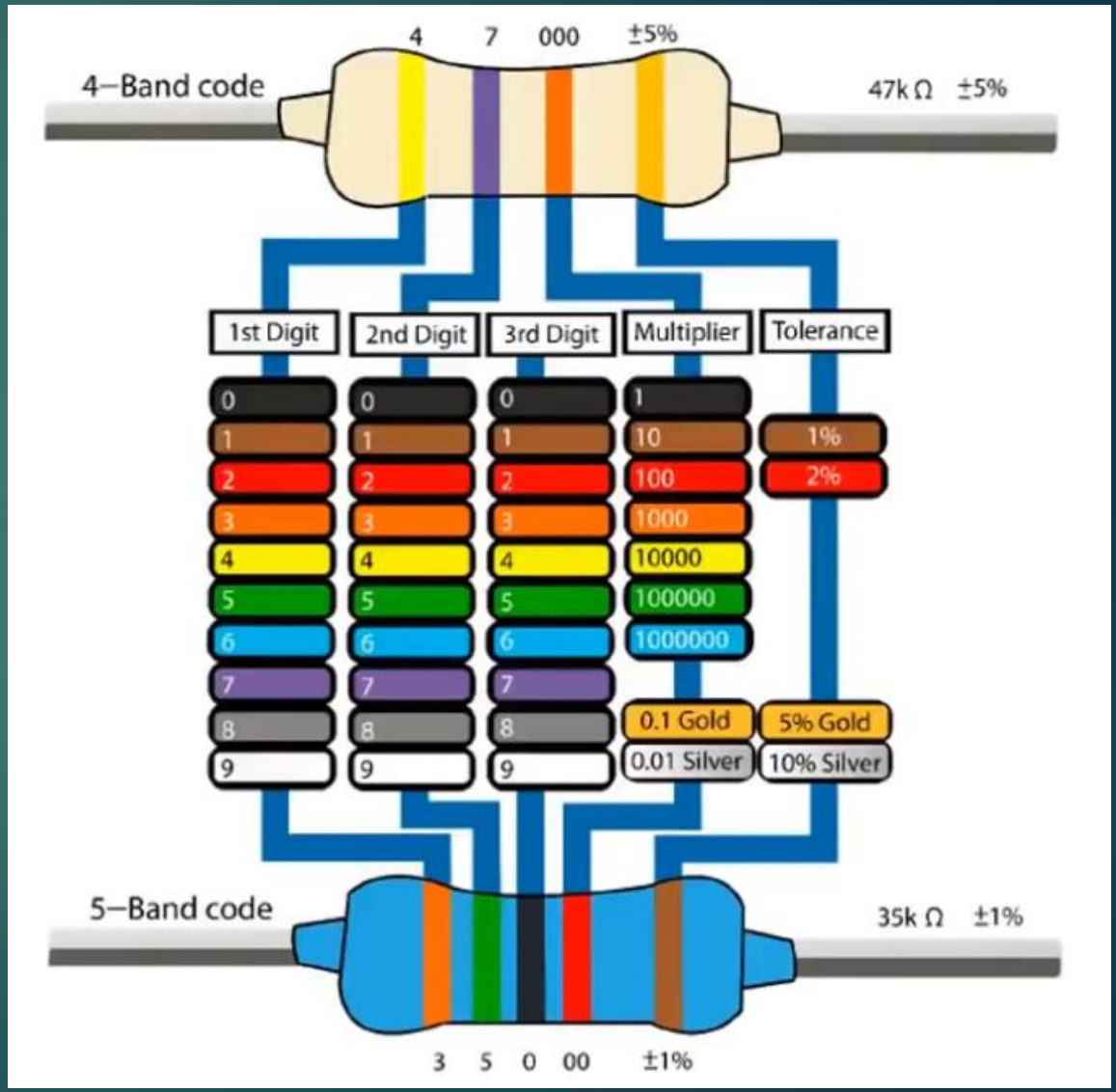


Αντίσταση σε καλώδιο - Διαδραστικό περιβάλλον



Χρωματικός κώδικας αντιστάσεων

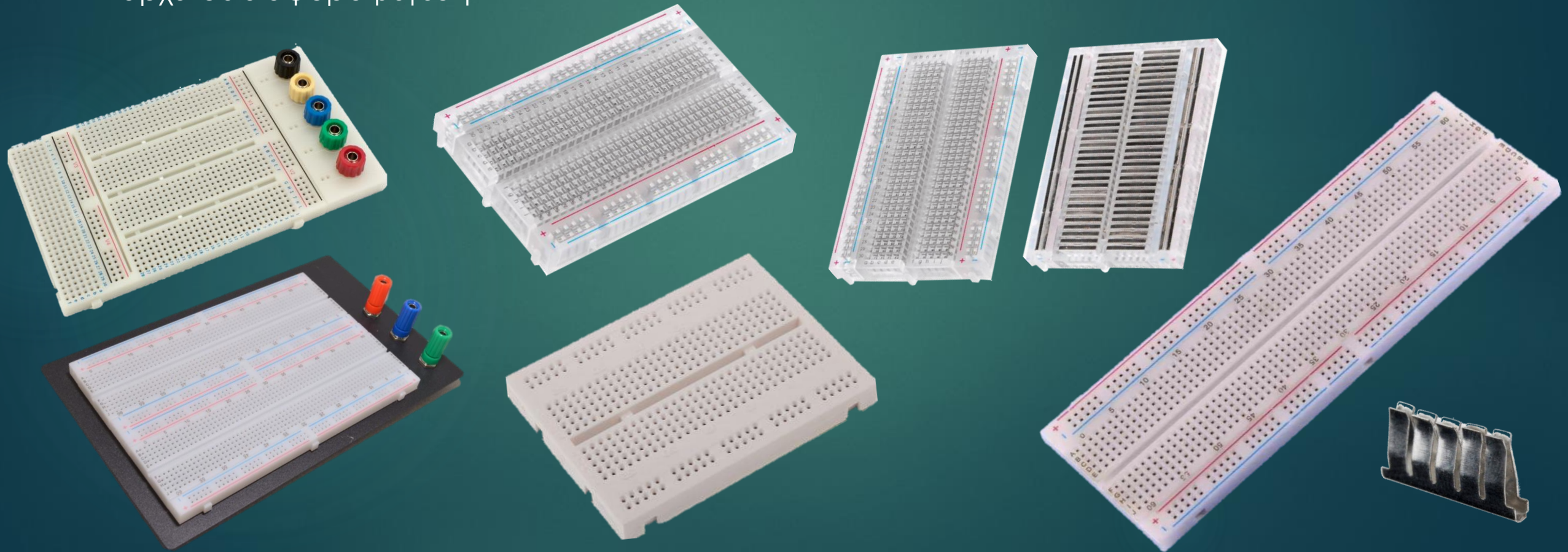




Πλακέτα δοκιμών (1)

Πλακέτα δοκιμών (raster) – Solderless Breadboard

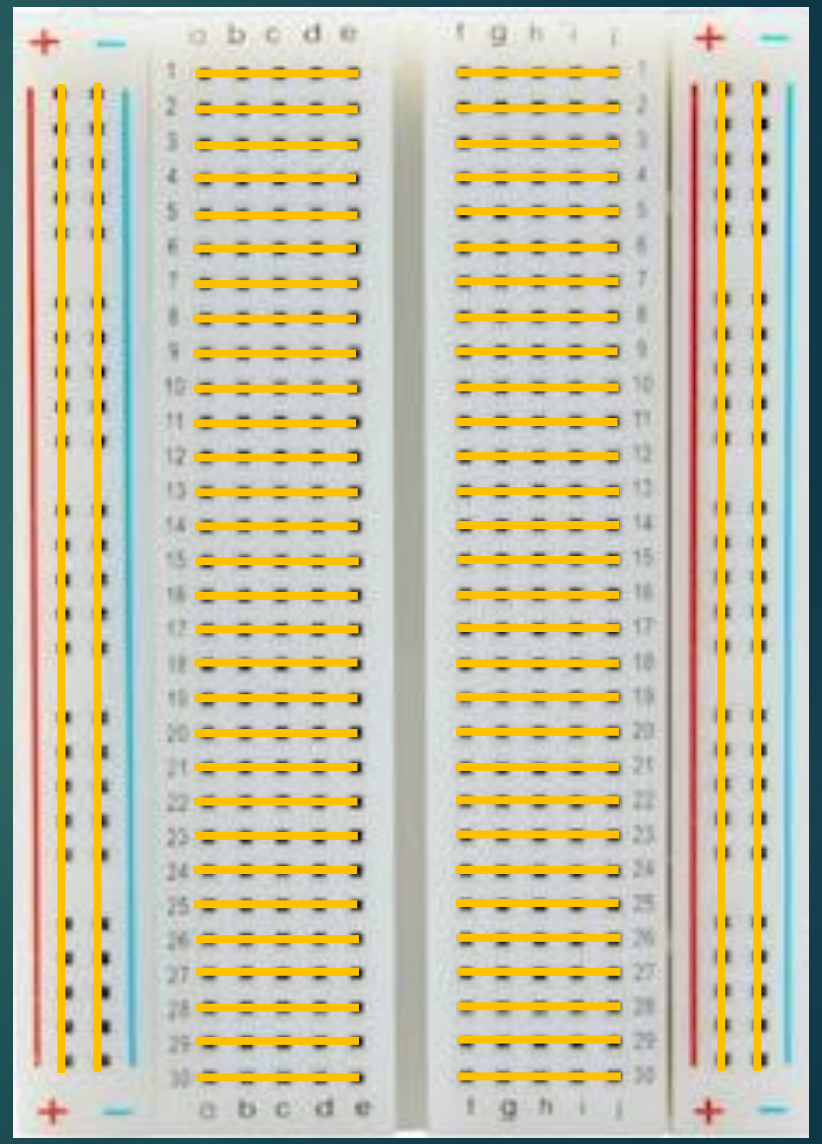
- Ένα από τα πιο χρήσιμα εργαλεία για κάποιον που ασχολείται με ηλεκτρονικά.
- Είναι πιο εύκολη η συνδεσμολόγηση του κυκλώματος σε σχέση με τις κολλήσεις.
- Πολλές από αυτές τις μικρές τρύπες είναι συνδεδεμένες (κάθετα ή οριζόντια)
- Υπάρχει σε διάφορα μεγέθη



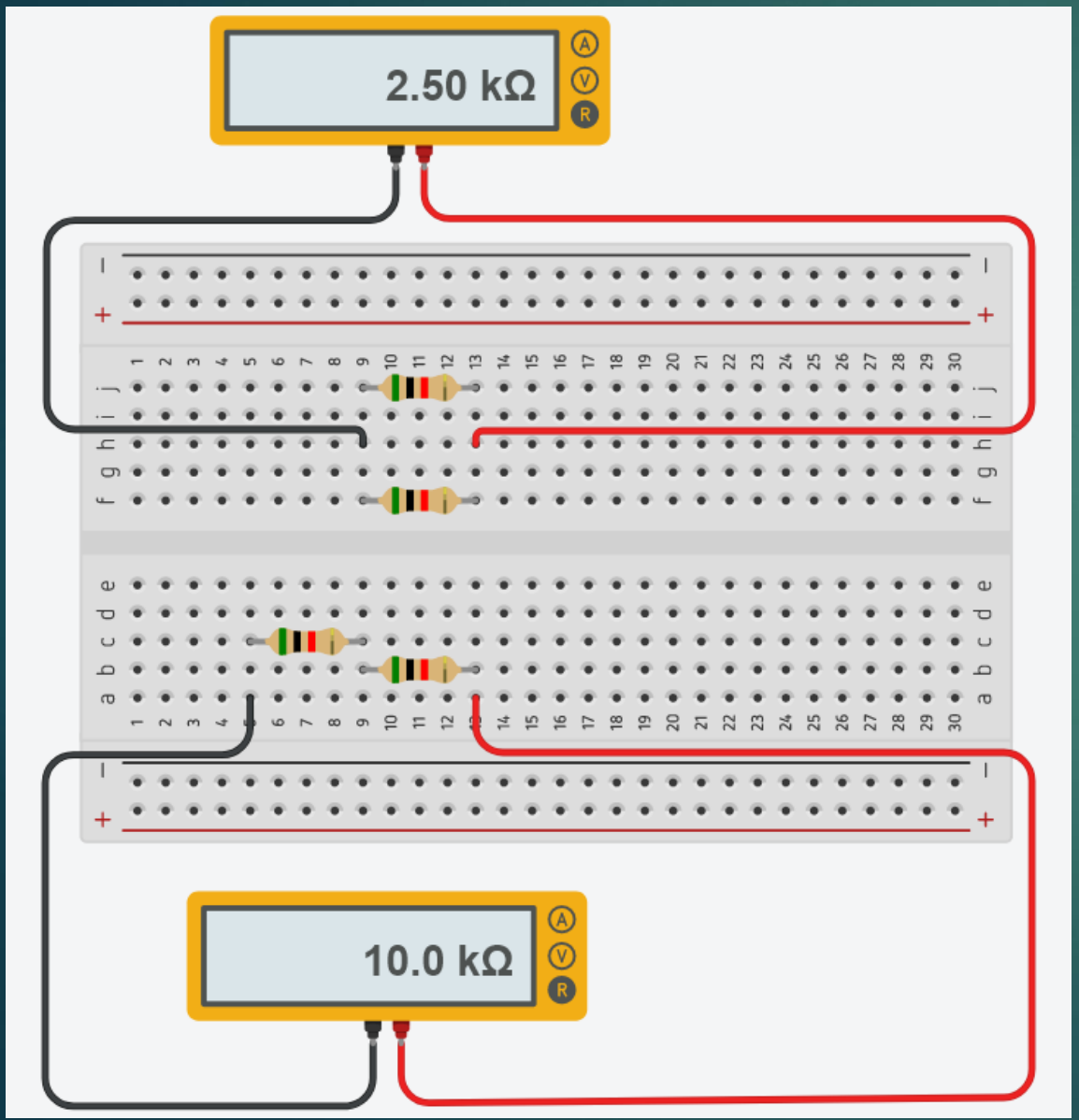
Πλακέτα δοκιμών (2)

Πλακέτα δοκιμών (raster) – Solderless Breadboard

- Κάθε οριζόντια γραμμή 5 οπών είναι συνδεδεμένη (βραχυκυκλωμένη).
- Οι κατακόρυφες στήλες τροφοδοσίας είναι συνδεδεμένες (βραχυκυκλωμένες).



Σύνδεση αντιστάσεων



Πρόγραμμα προσομοίωσης
www.tinkercad.com

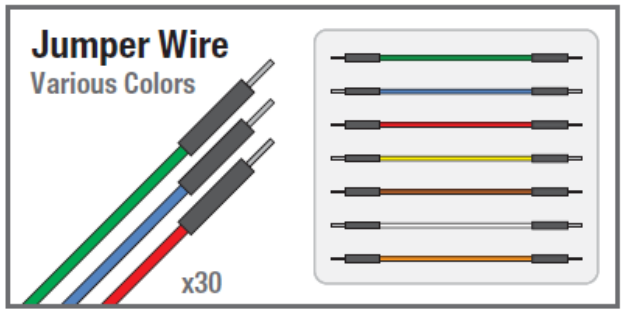
Σύνδεση αντιστάσεων παράλληλα

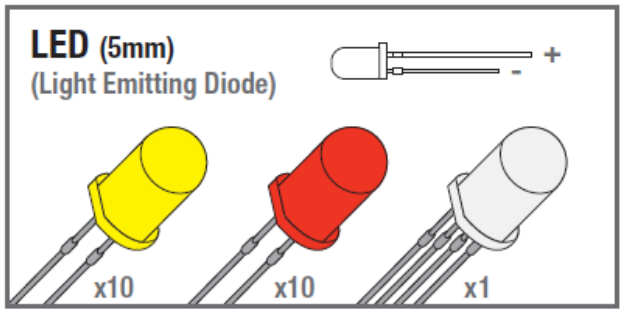
$$\frac{1}{R_{ΟΛ}} = \frac{1}{R_1} + \frac{1}{R_2} \Rightarrow R_{ΟΛ} = \frac{R_1 * R_2}{R_1 + R_2} = \frac{5 * 5}{5 + 5} = \frac{25}{10} = 2.5k\Omega$$

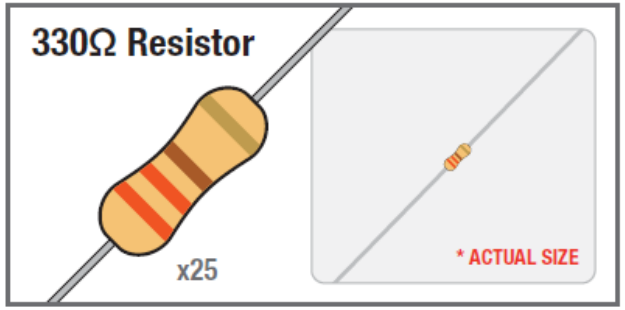
Σύνδεση αντιστάσεων σε σειρά

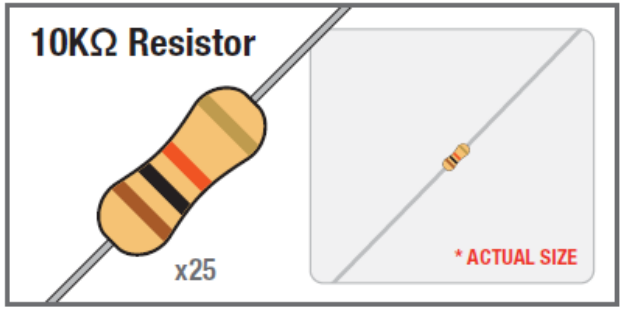
$$\mathrm{R}_{ΟΛ} = \mathrm{R}_1 + \mathrm{R}_2 = 5 + 5 = 10k\Omega$$

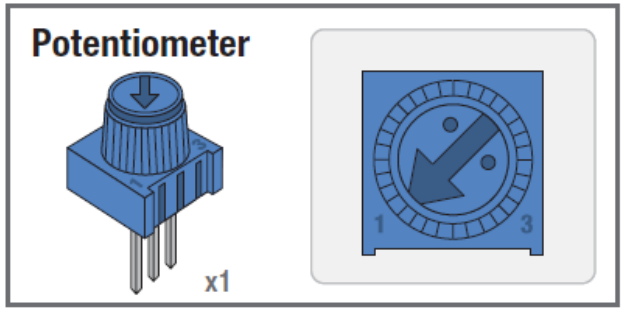
Υλικά

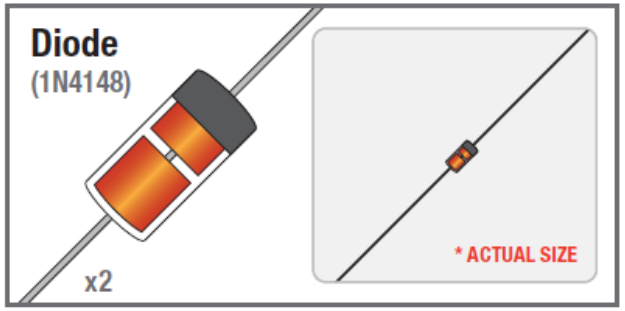

Jumper Wire
Various Colors
x30


LED (5mm)
(Light Emitting Diode)
+
-
x10
x10
x1


330Ω Resistor
x25
* ACTUAL SIZE


10KΩ Resistor
x25
* ACTUAL SIZE


Potentiometer
1
3
x1


Diode
(1N4148)
* ACTUAL SIZE
x2

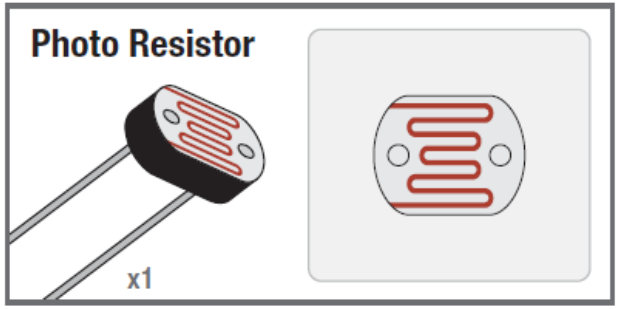
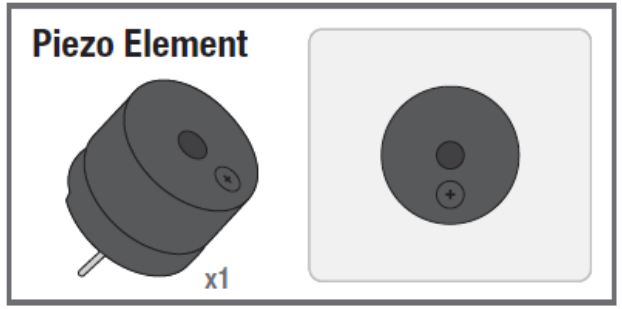
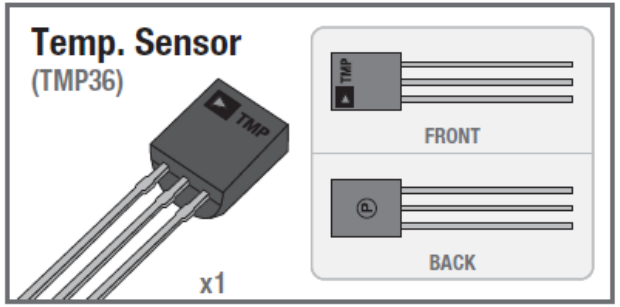
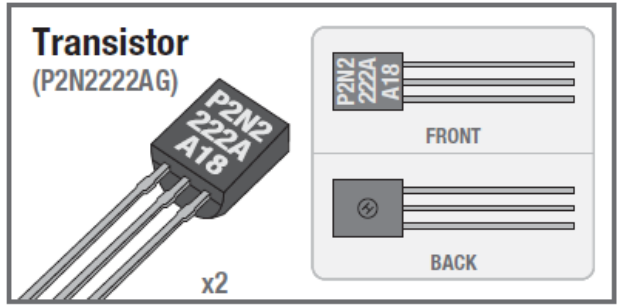
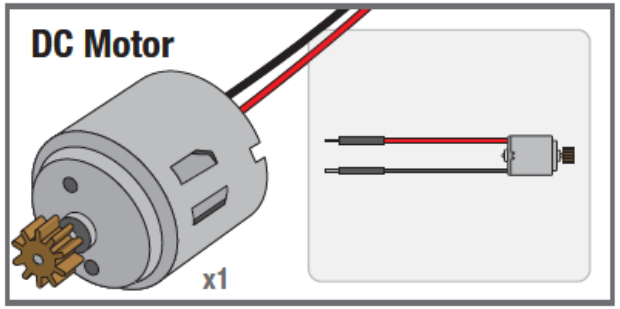


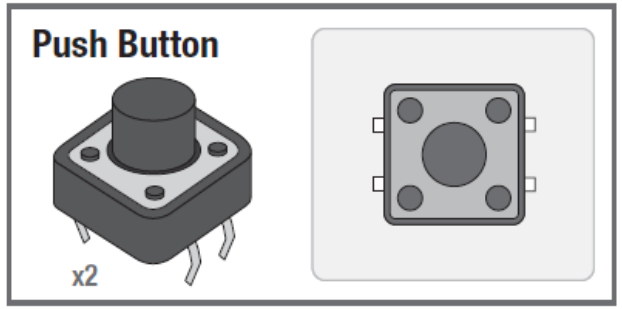
Photo Resistor
x1


Piezo Element
x1

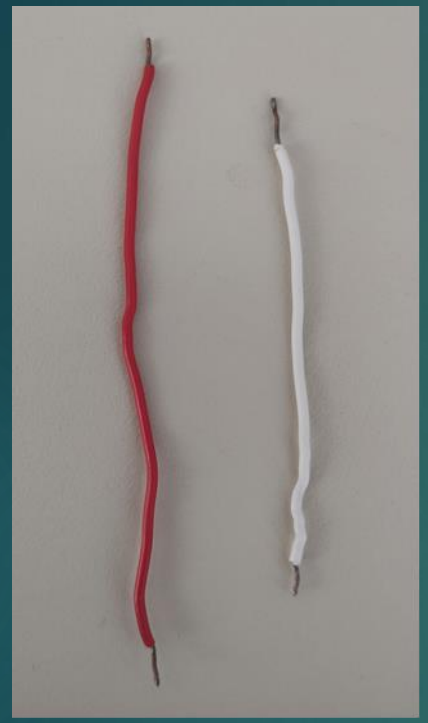

Temp. Sensor
(TMP36)
TMP
FRONT
BACK
x1

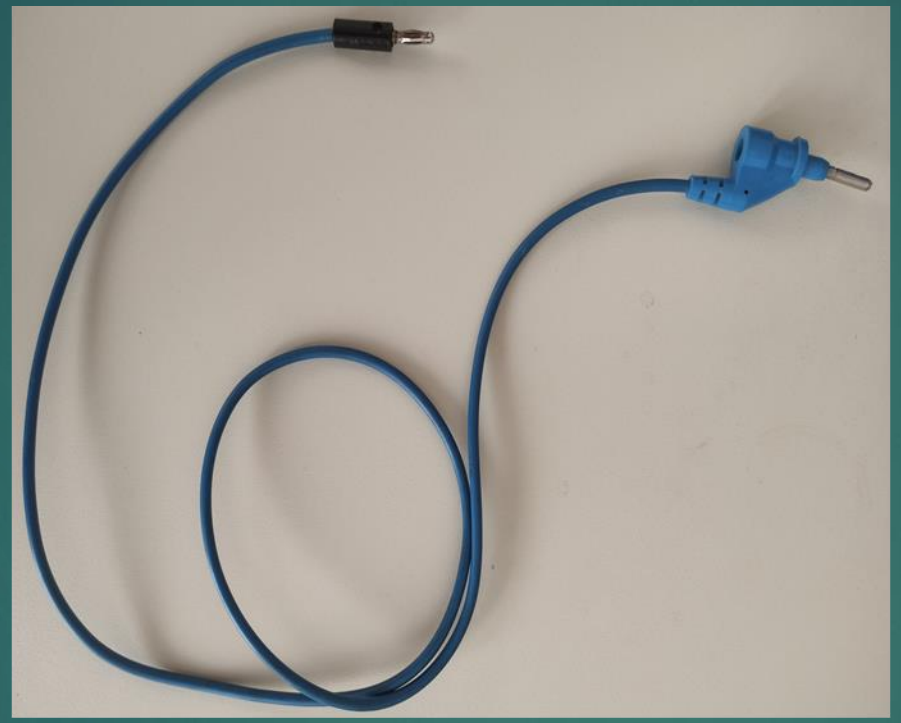

Transistor
(P2N2222AG)
P2N2
222A
A18
FRONT
BACK
x2

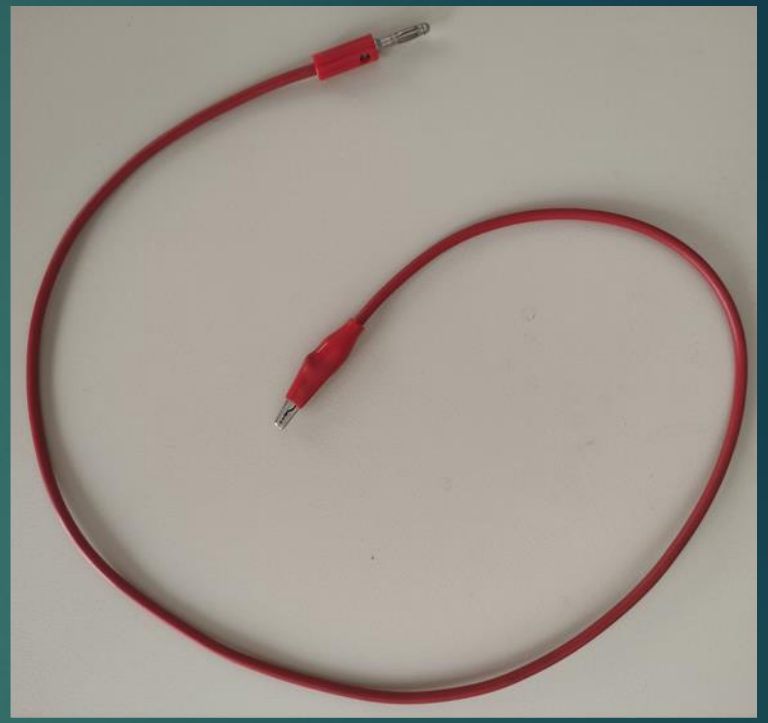

DC Motor
x1


Push Button
x2

Καλώδια



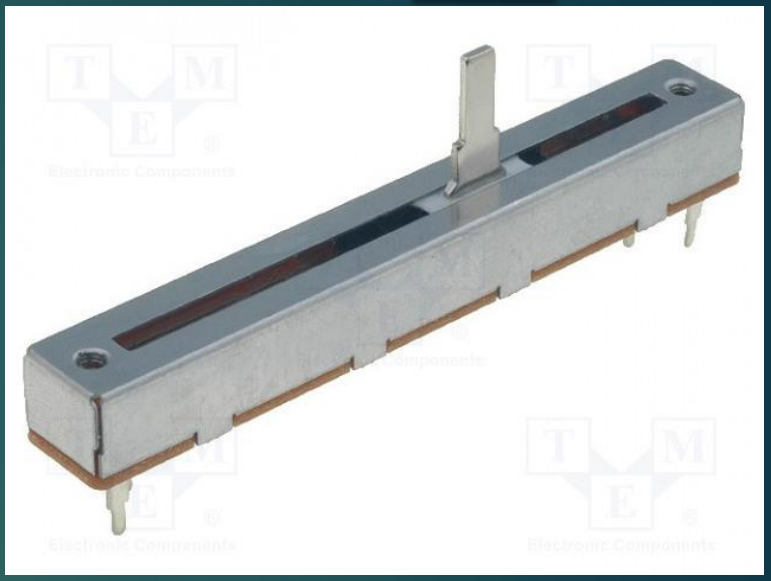


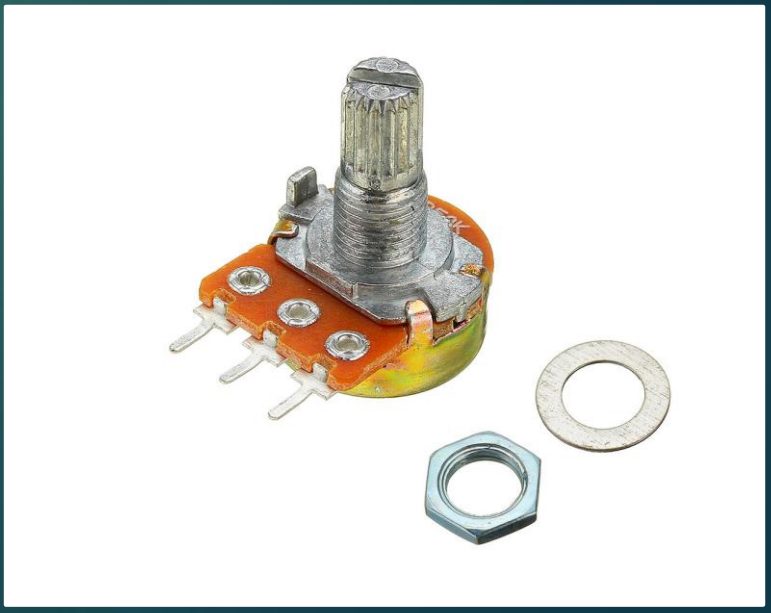


Μπανάνα

Κροκοδειλάκι

Ποτενσιόμετρο (1)





Ποτενσιόμετρο (2)

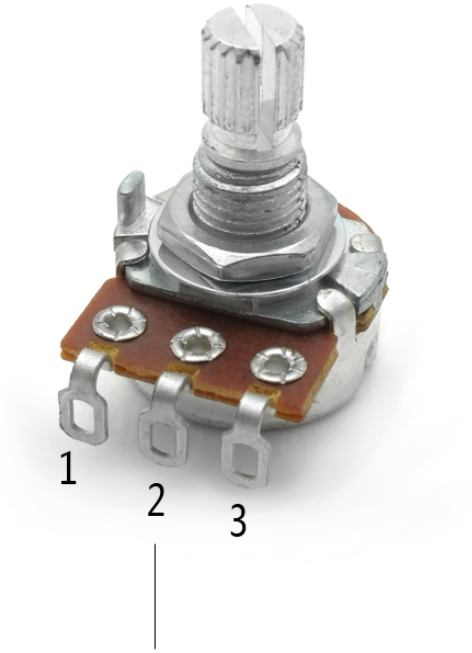
(α) Άνθρακα (Carbon) Σ‘ αυτά η πίστα αποτελείται από συμπαγή άνθρακα ή επίστρωση άνθρακα πάνω σε μονωτικό υλικό.

(β) Σύρματος (wire wound) Σ‘ αυτά η πίστα αποτελείται από σύρμα χρωμιονικελίνης τυλιγμένο πάνω σε μονωτικό υλικό.

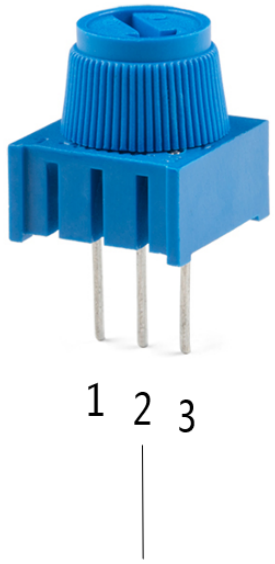
(γ) Φιλμ μετάλλου (Germet thin film) Σ‘ αυτά η πίστα είναι ένα παχύ στρώμα μεταλλικού φιλμ κολλημένο πάνω σε κεραμικό υλικό.

Ποτενσιόμετρο (3)

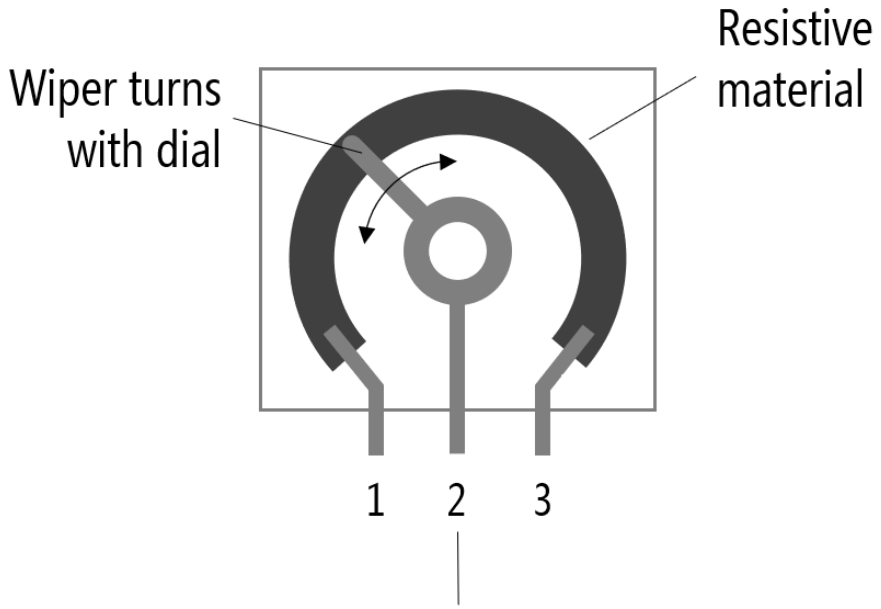
PANEL MOUNT POT 10KΩ



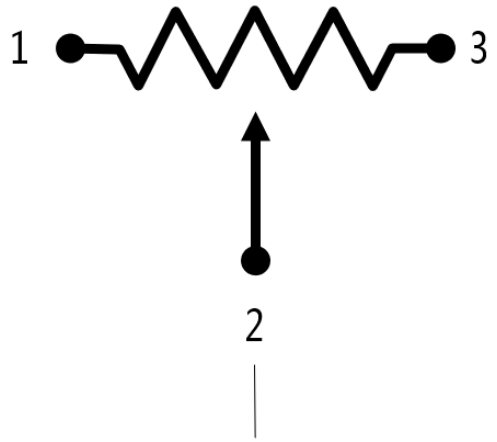
TRIM POT 10KΩ



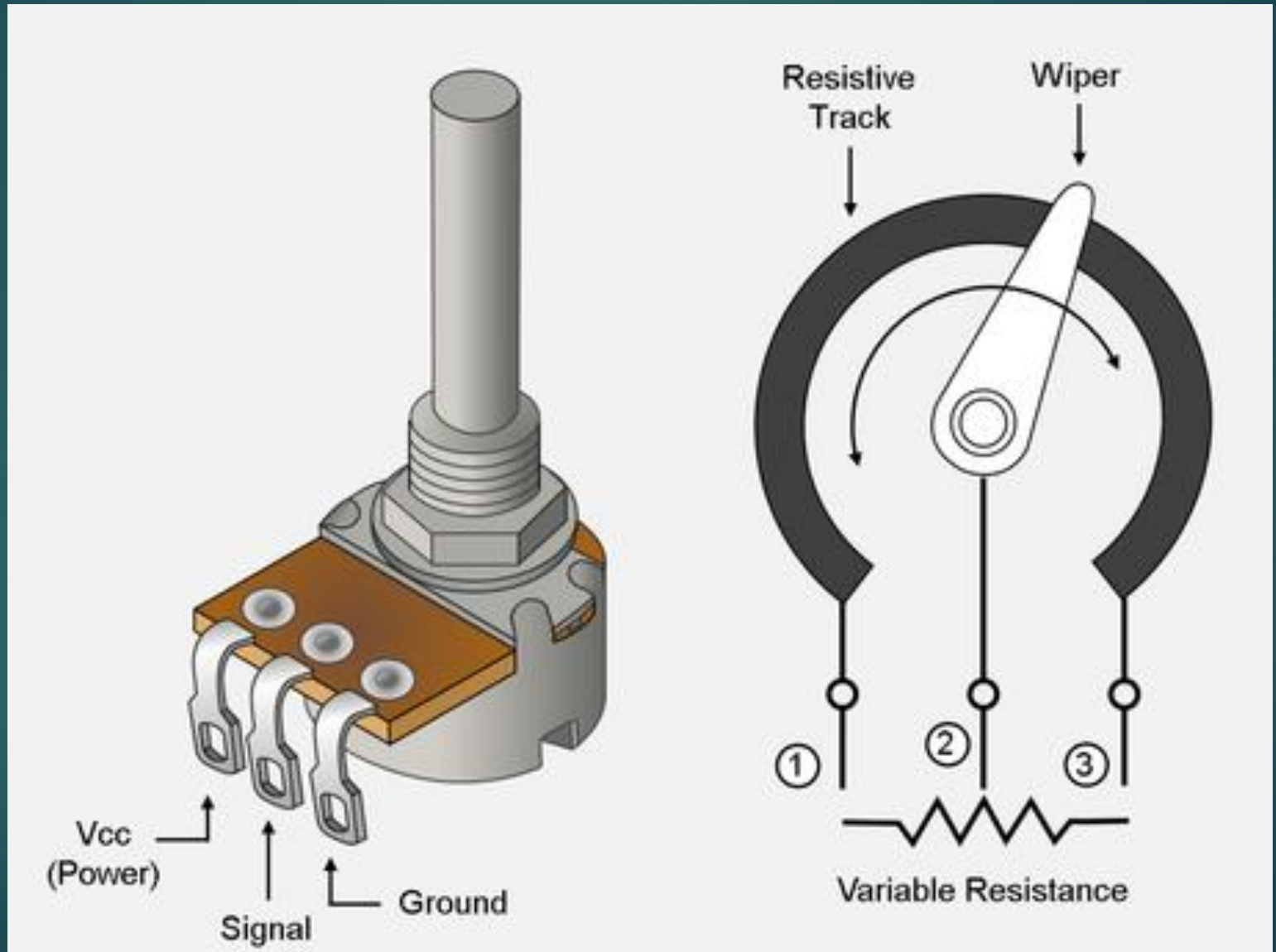
FUNCTIONAL DIAGRAM



SCHEMATIC SYMBOL



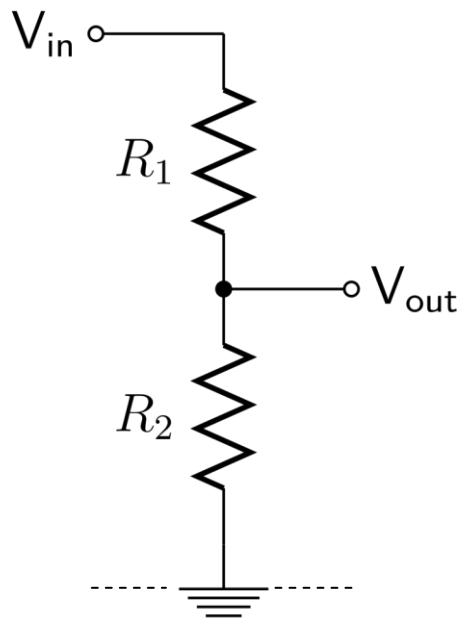
Ποτενσιόμετρο (4)



Ποτενσιόμετρο (5)

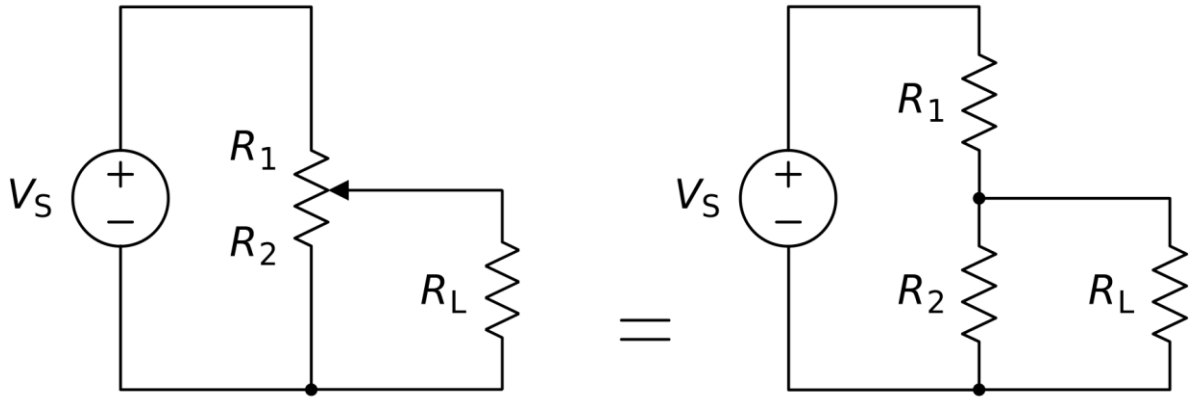
- Το ποτενσιόμετρο είναι ένας διαιρέτης τάσης.

Διαιρέτης τάσης
Υποβιβάζει την τάση



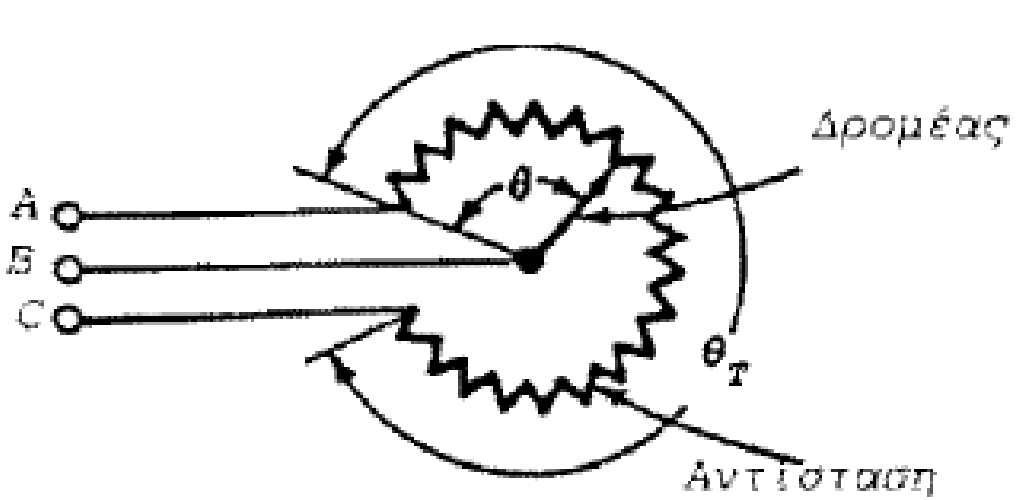
$$V_{\text{out}} = \frac{R_2}{R_1 + R_2} \cdot V_{\text{in}}$$

Ποτενσιόμετρο
Σχηματικό διάγραμμα

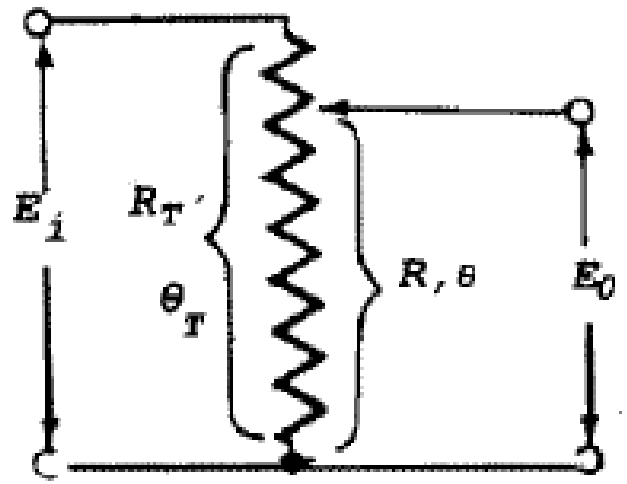


- $R_L >> R_2$ → $V_L = \frac{R_2}{R_1 + R_2} \cdot V_s$
- Γενικά → $V_L = \frac{R_2 R_L}{R_1 R_L + R_2 R_L + R_1 R_2} \cdot V_s$

Ποτενσιόμετρο (6)



α)



β)

Σχήμα 2-3: Ποτενσιόμετρο: α) φυσική σχεδίαση και β) σχηματική σχεδίαση

$$\frac{R}{R_T} = \frac{\theta}{\theta_T}$$

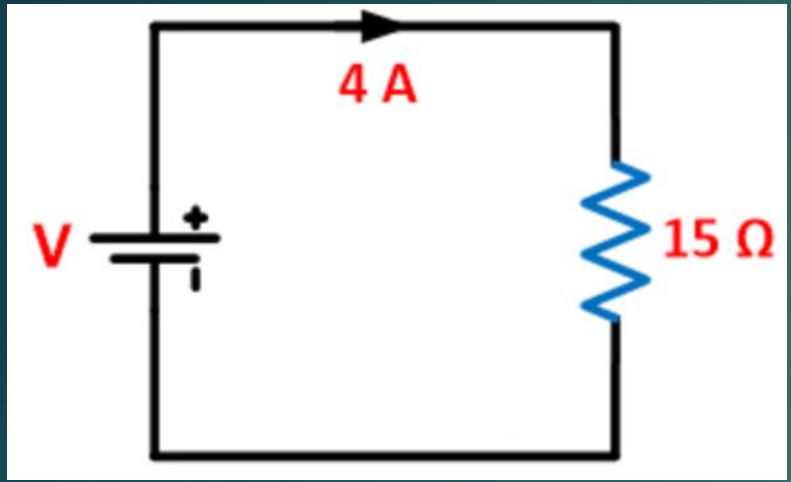
$$\frac{E_0}{E_i} = \frac{R}{R_T} = \frac{\theta}{\theta_T}$$

ή $$E_0 = \frac{\theta}{\theta_T} E_i$$

Πολύμετρο

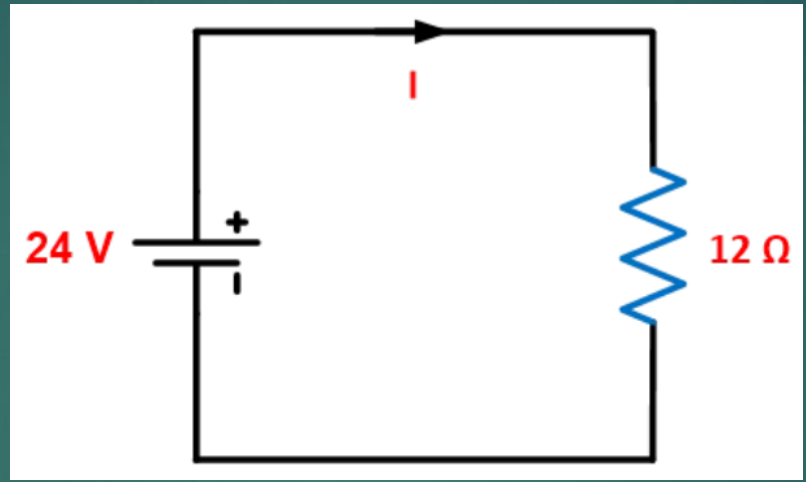
- Το πολύμετρο είναι ένα ηλεκτρολογικό/ηλεκτρονικό όργανο το οποίο μετράει την τάση, την ένταση και την αντίσταση σε ένα ηλεκτρικό κύκλωμα.
- Είναι μια φορητή συσκευή χρήσιμη για τη εύρεση ελαττωμάτων ή ένα όργανο που μπορεί να μετρήσει σε έναν πολύ υψηλό βαθμό ακριβείας.
- Μπορεί να χρησιμοποιηθεί για να χαρακτηρίσει τα πρότυπα αντίστασης και τάσης ή να ρυθμίσει και να ελέγξει την απόδοση των πολλών χρήσεων.
- Έχει όλες τις δυνατότητες των παραπάνω οργάνων (ωμόμετρο, βολτόμετρο, αμπερόμετρο) και ανάλογα την μέτρηση που κάνουμε αλλάζουμε τον μεταγωγέα στο κατάλληλο όργανο ενώ ταυτόχρονα απομονώνουμε τα υπόλοιπα.

Νόμος του Ohm – Παραδείγματα (1)



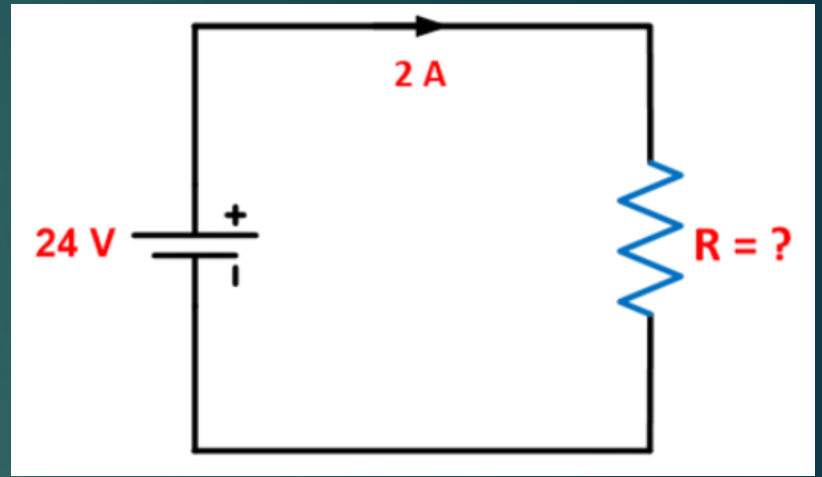
$I = 4\ A$ and $R = 15\ \Omega$

$$V = I * R$$
$$= 4 * 15$$
$$V = 60\ Volts$$



$V = 24\ V$ and $R = 12\ \Omega$

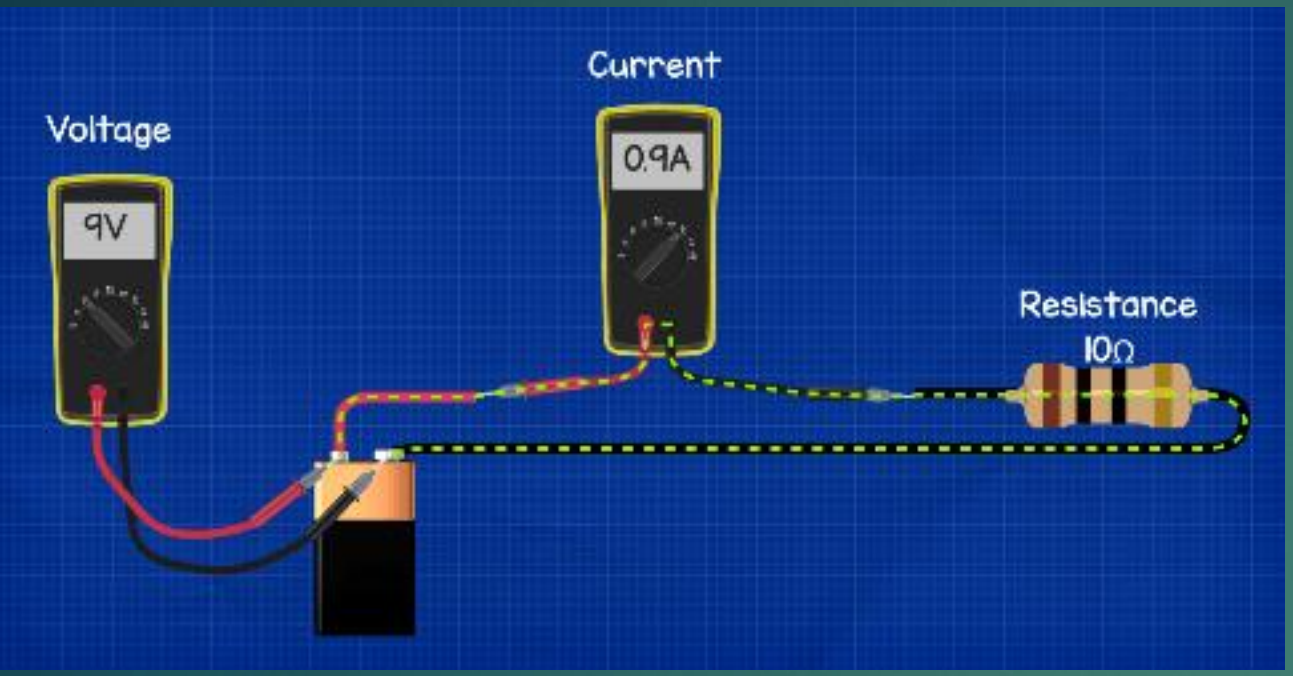
$$I = \frac{V}{R}$$
$$= \frac{24}{12}$$
$$I = 2\ A(Ampere)$$

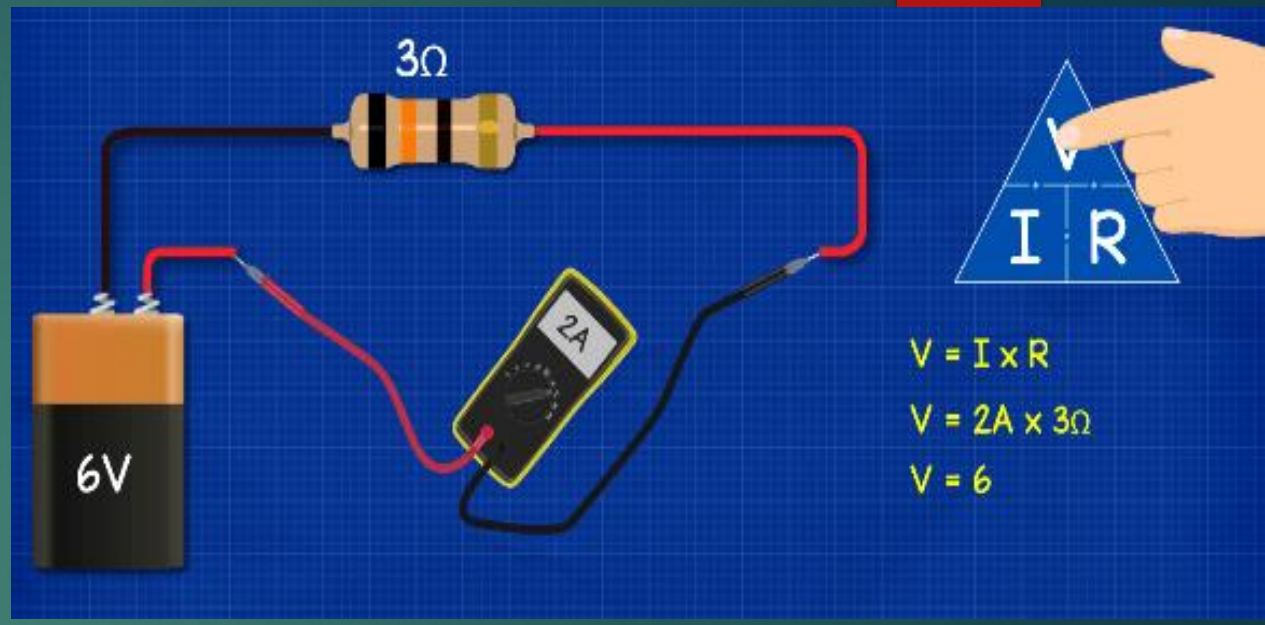


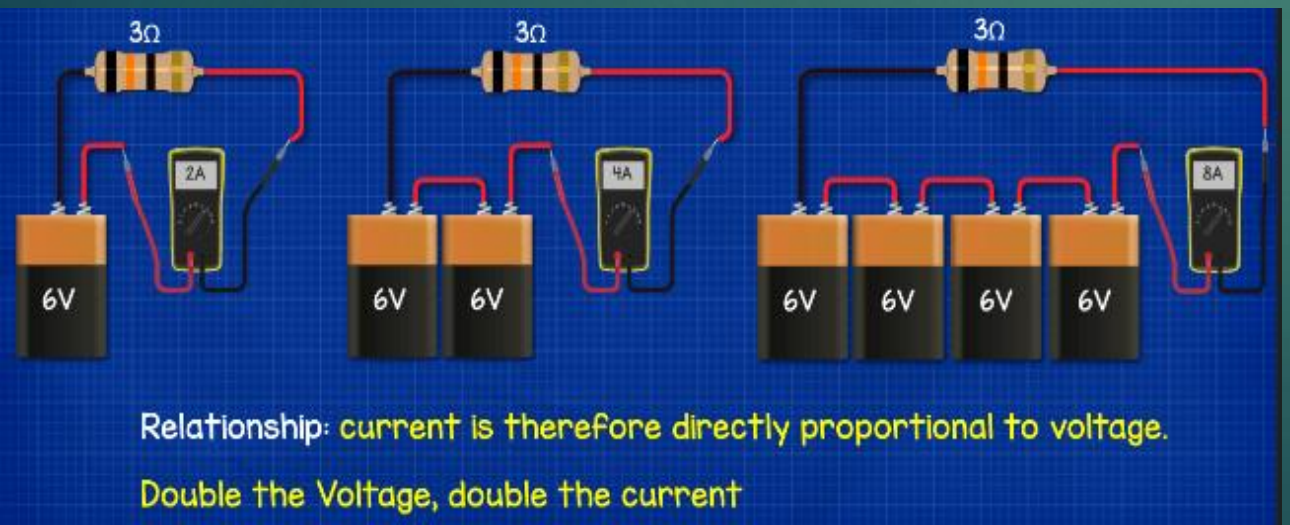
$V = 24\ V$ and $I = 2\ A$

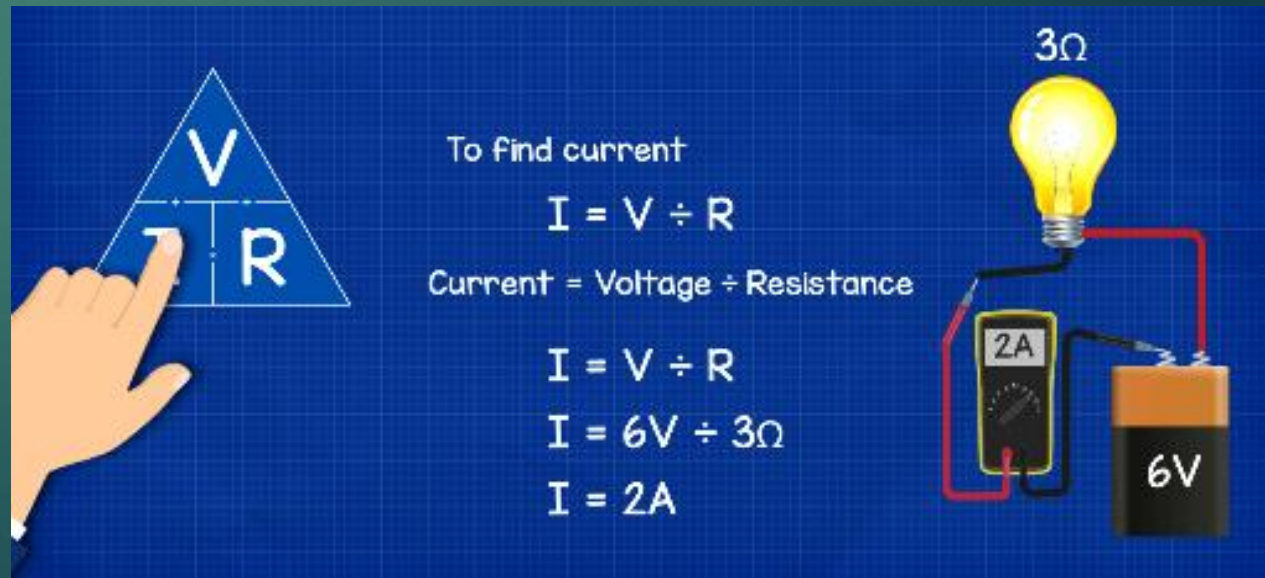
$$R = \frac{V}{I}$$
$$= \frac{24}{2}$$
$$R = 12\ \Omega$$

Νόμος του Ohm – Παραδείγματα (2)

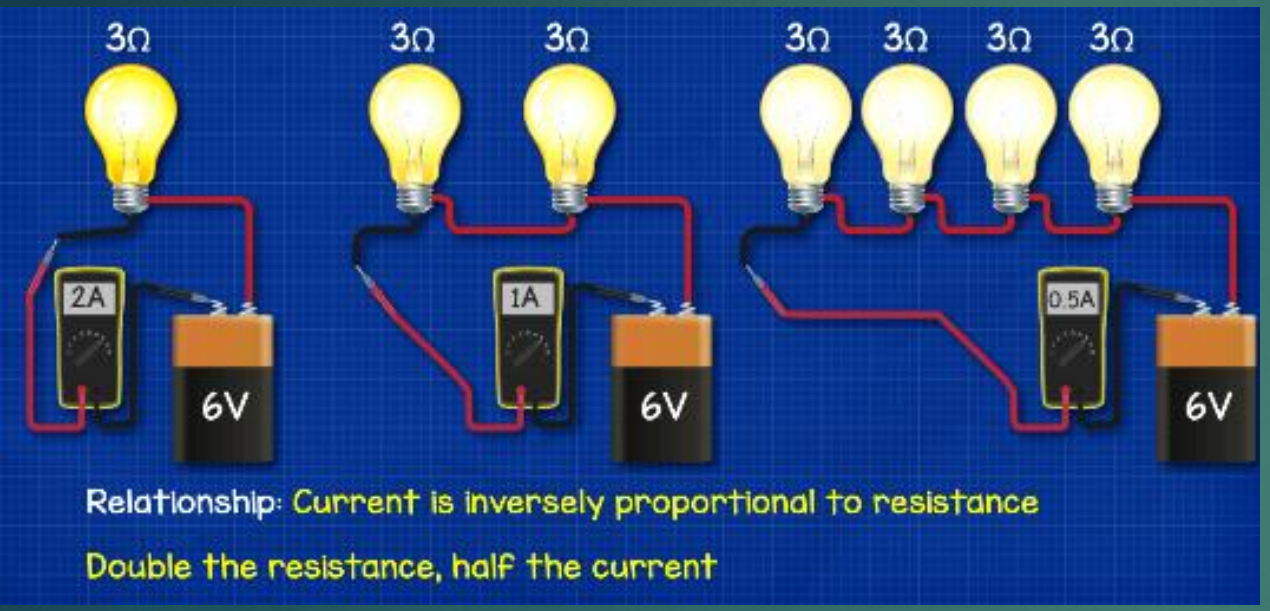


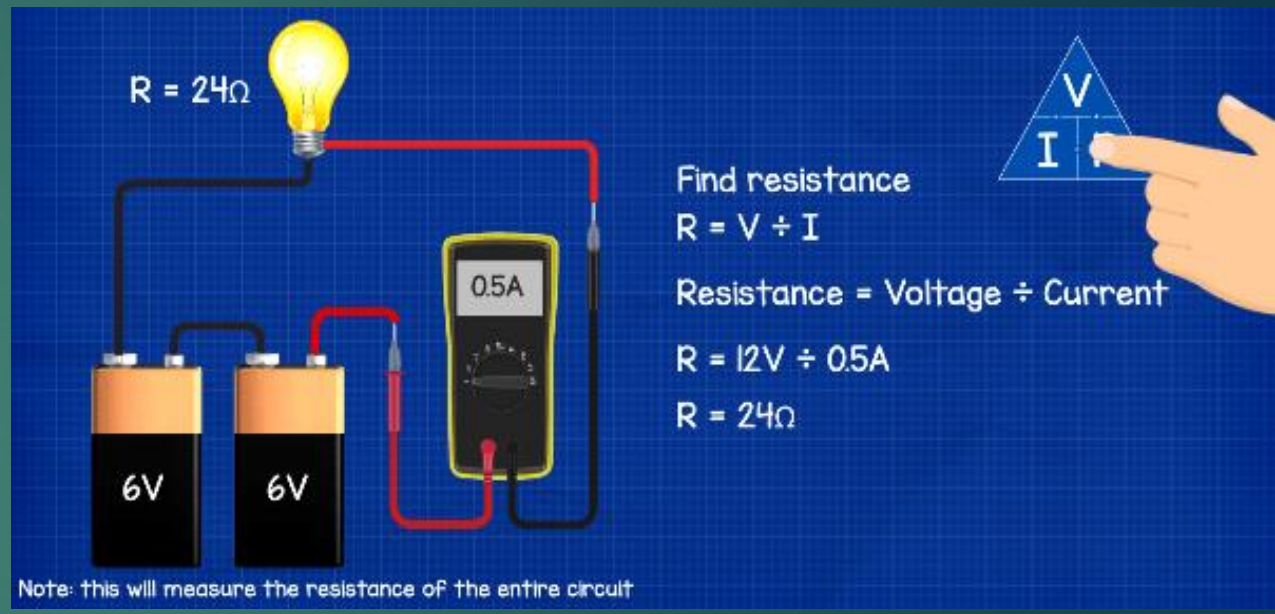


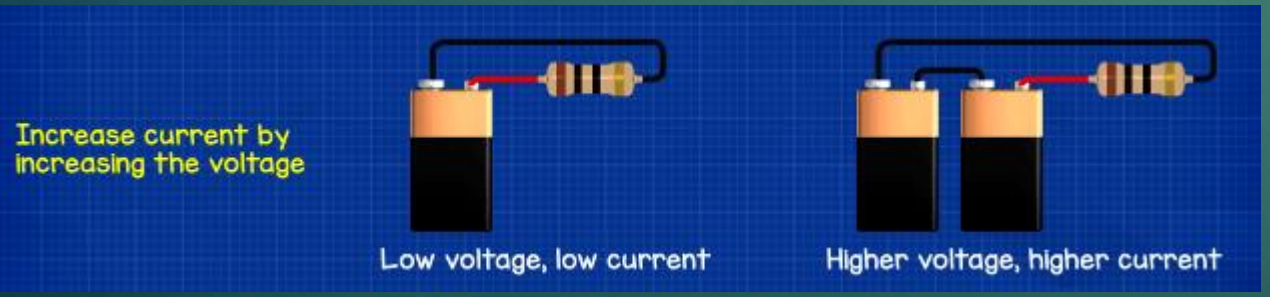


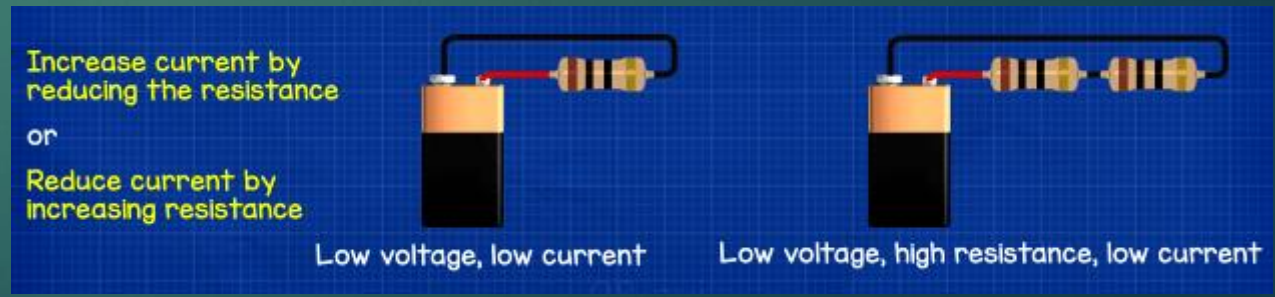


Νόμος του Ohm – Παραδείγματα (3)



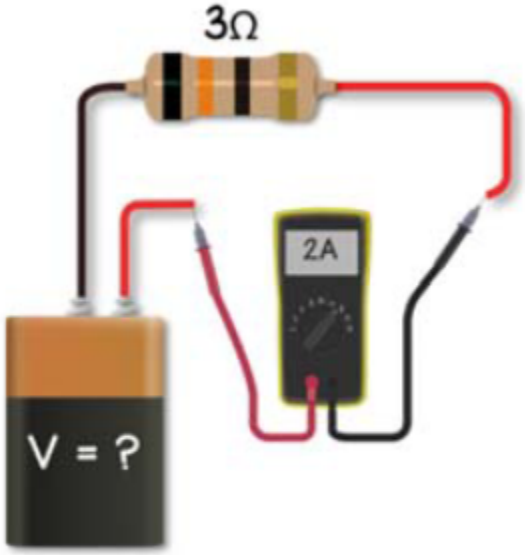






Πηγή: https://theengineeringmindset.com/

Νόμος του Ohm – Παραδείγματα (4)



In this circuit we have a 3Ω resistor connected to a battery with an unknown voltage. The current in the circuit is 2A. Find the voltage.

Using ohm's triangle, we find the formula:
Voltage (V) = Current (I) x Resistance (R)

Voltage = 2A x 3Ω
Voltage = 6V
Answer is 6V

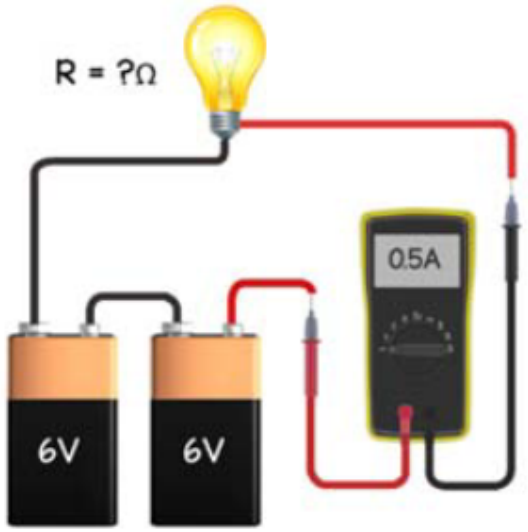
Νόμος του Ohm – Παραδείγματα (5)

In this circuit we have a 3Ω resistive lamp connected to a 6V battery. The current in the circuit is unknown. Find the current.

Using ohm's triangle, we find the formula:
Current (I) = Voltage (V) ÷ Resistance (R)

Current = 6V ÷ 3Ω
Current = 2A
Answer is 2A

Νόμος του Ohm – Παραδείγματα (6)

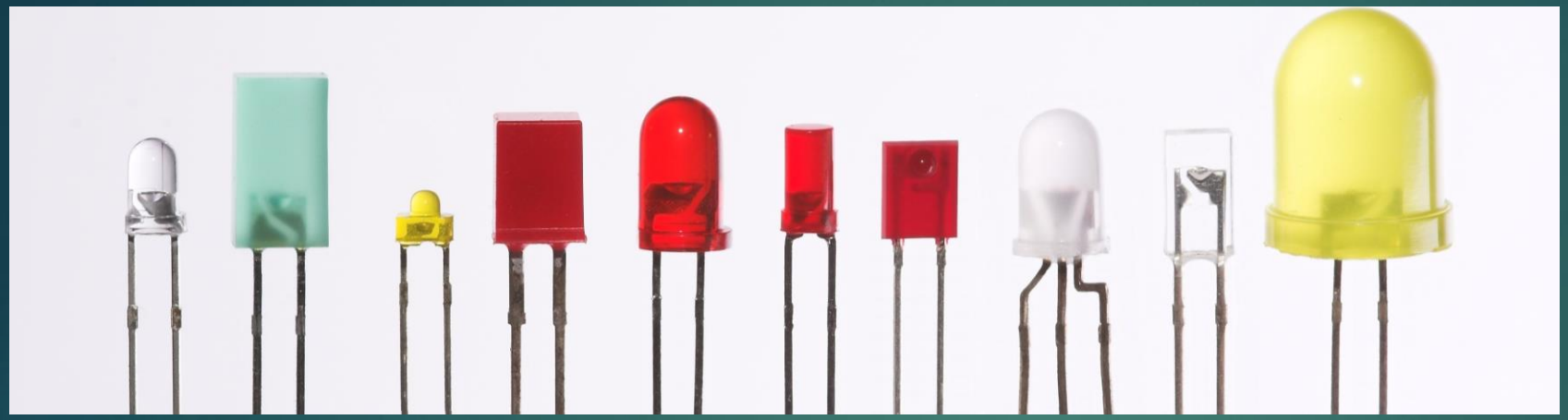


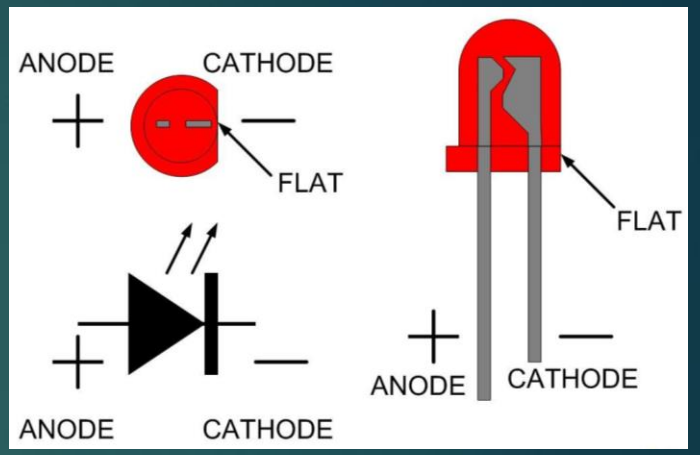
In this circuit we have a resistive lamp connected to two 6V batteries, which are wired in series, providing 12V to the circuit. The current in the circuit is 0.5A. Find the resistance.

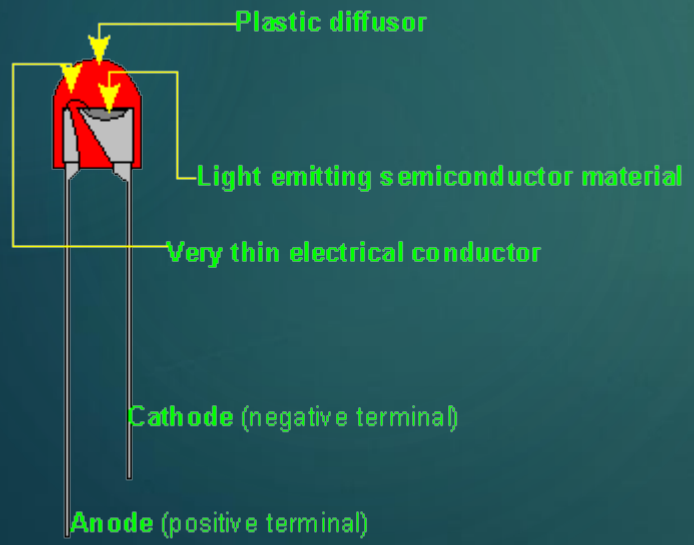
Using ohm's triangle, we find the formula:
Resistance (R) = Voltage (V) ÷ Current (I)

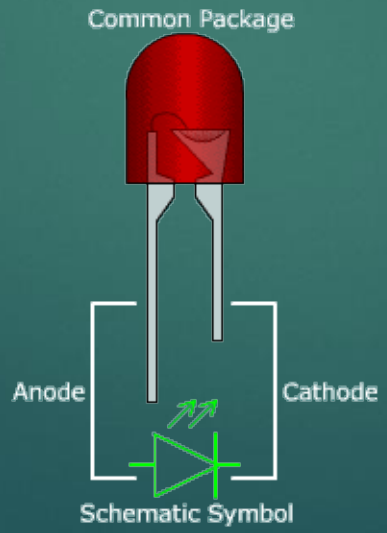
Resistance = 12V ÷ 0.5A
Resistance = 24Ω
Answer is 24Ω

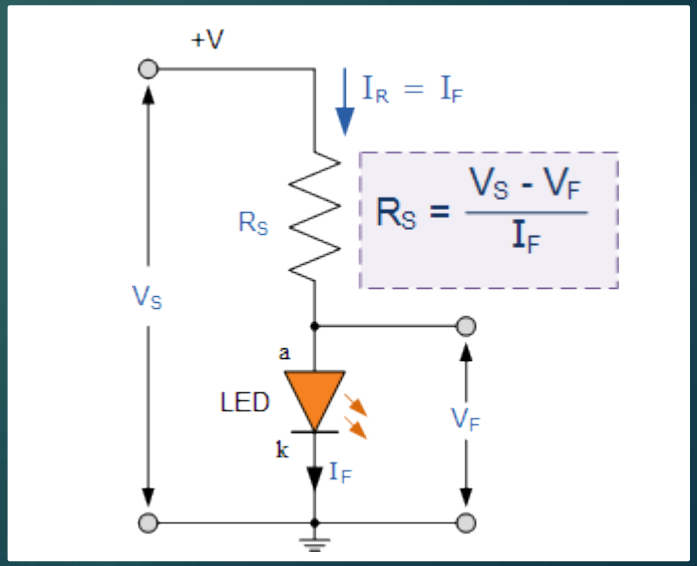
LED: Light Emitting Diode



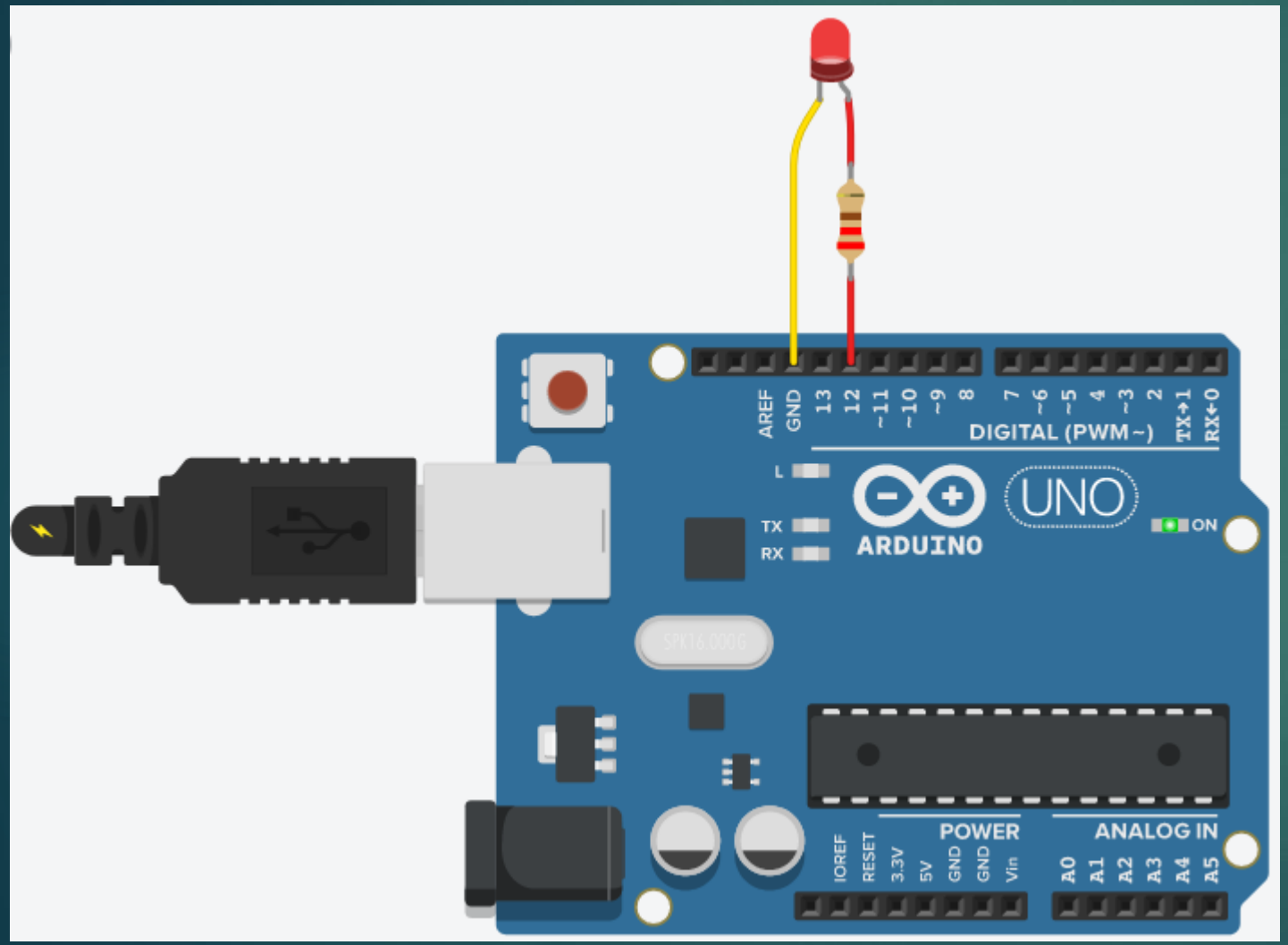






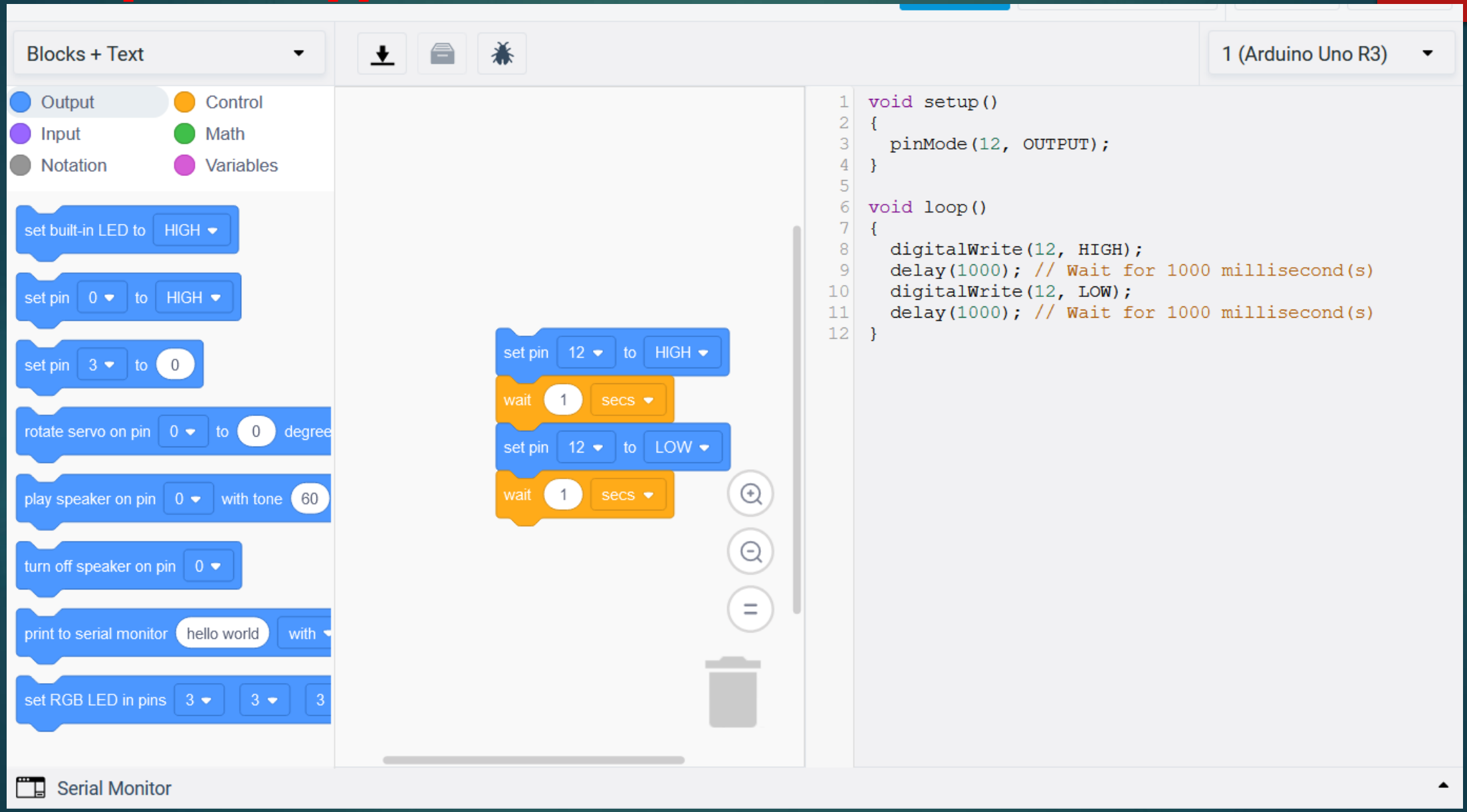


Παράδειγμα 2: Turn On-Off a LED

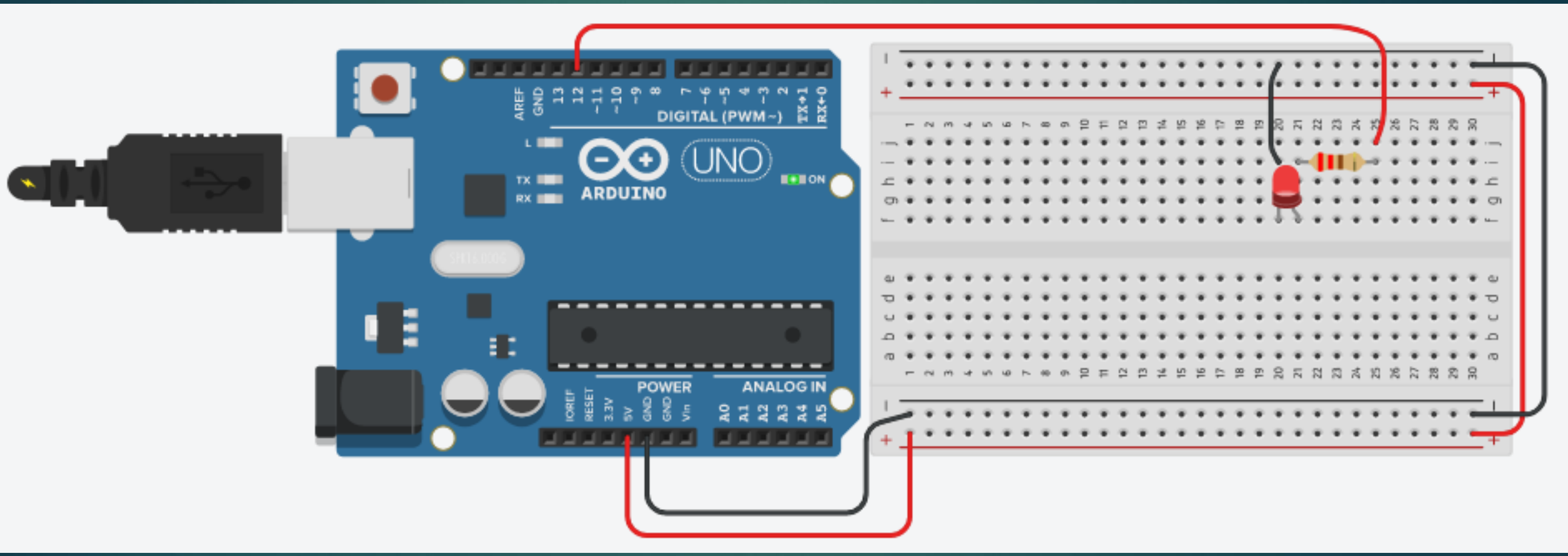



```
1  int LED = 12; // Το Pin που συνδέουμε το LED
2
3  void setup() // Κώδικας που τρέχει μία φορά
4  {
5    pinMode(LED, OUTPUT); // Δήλωση του LED ως έξοδο
6  }
7
8  void loop() // Κώδικας που επαναλαμβάνεται
9  {
10   digitalWrite (LED, HIGH); // Ανάβει το LED
11   delay(1000); // ON για 1sec
12
13   digitalWrite (LED, LOW); // Σβήνει το LED
14   delay(1000); // OFF για 1sec
15 }
```

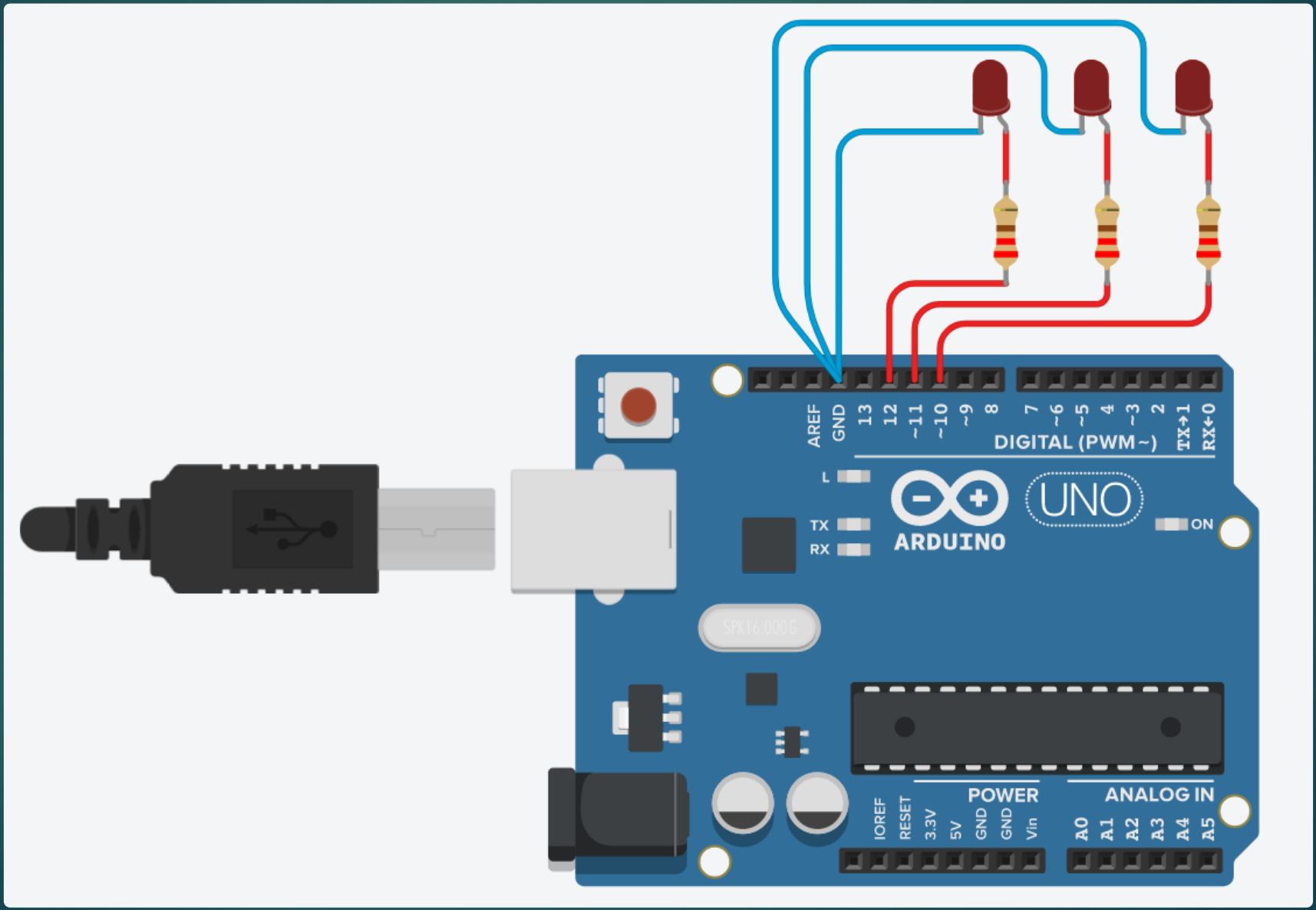
Παράδειγμα 2: Turn On-Off a LED



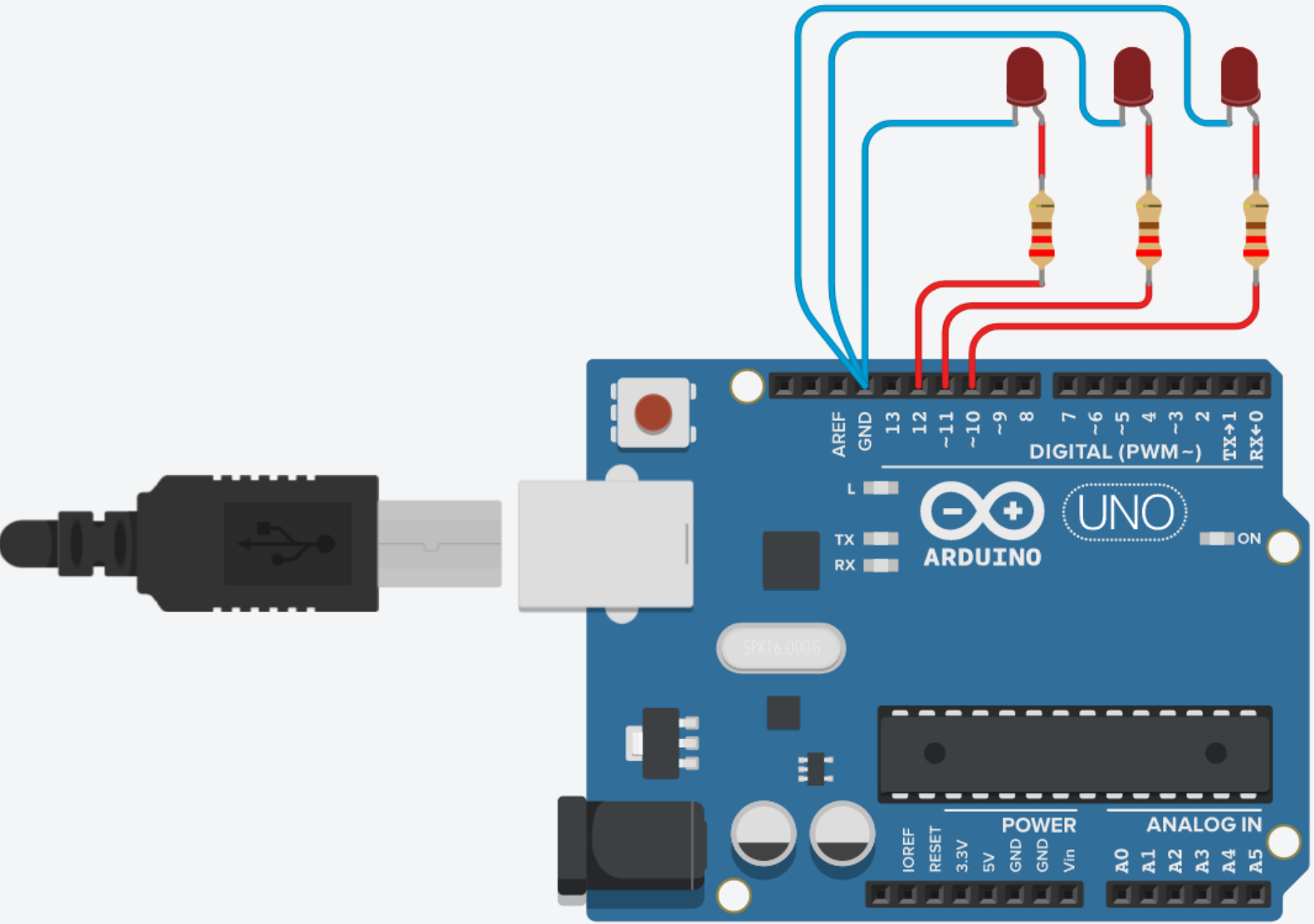
Παράδειγμα 2: Με χρήση Breadboard



Παράδειγμα 3: For loop with 3 LEDs



Παράδειγμα 3: For loop with 3 LEDs



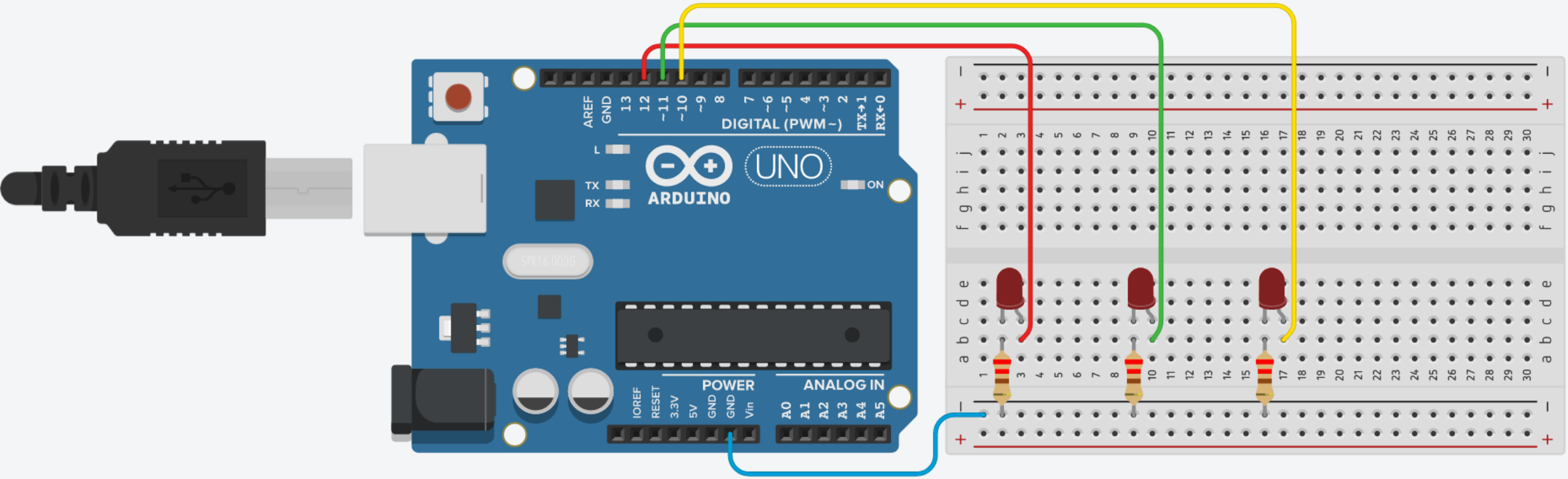
Text

1 (Arduino Uno R3)

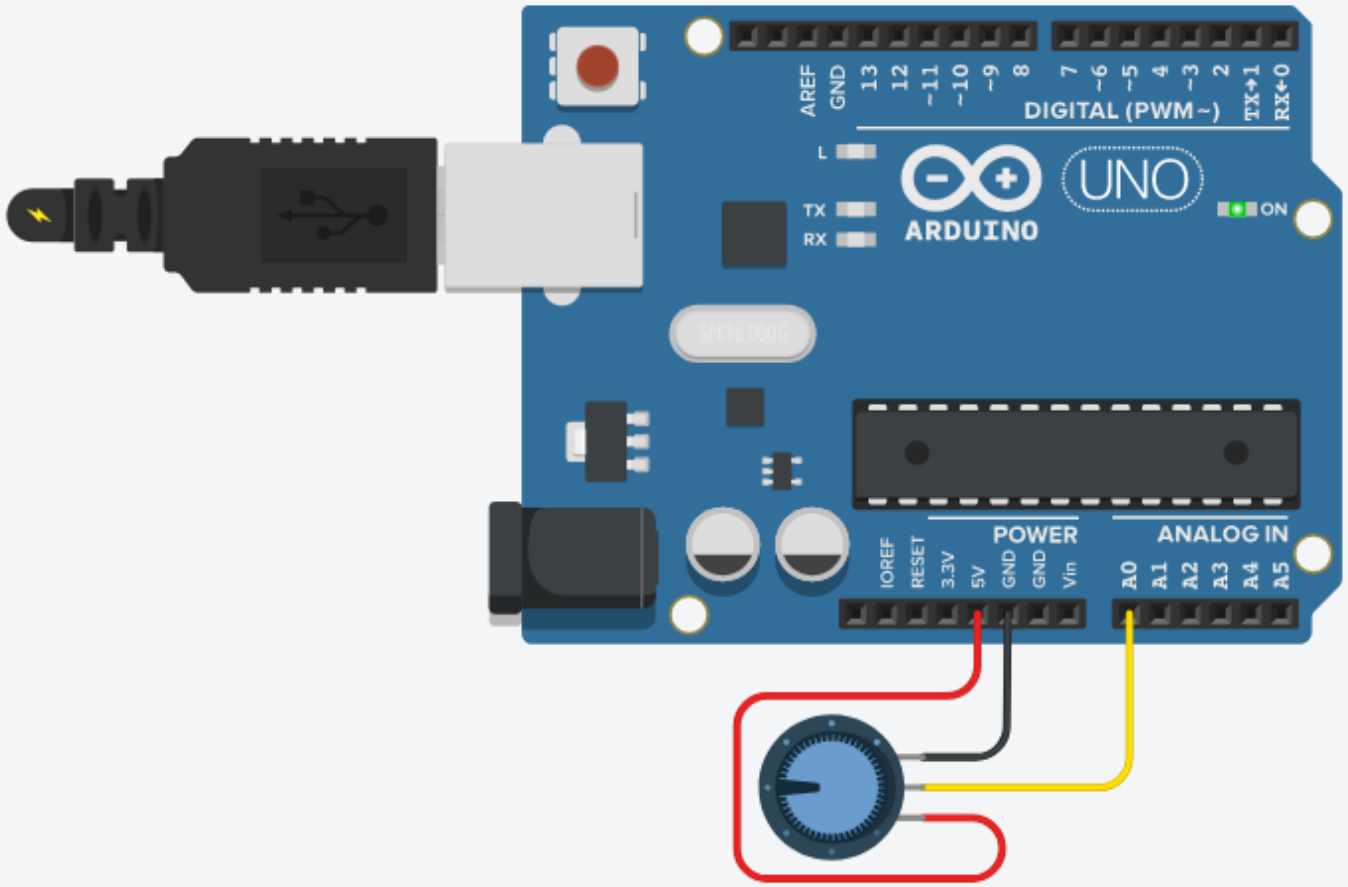
```
1  int i;
2  void setup()
3  {
4    for (i=10;i<13;i++)
5    {
6      Serial.begin(9600);
7      pinMode(i,OUTPUT);
8    }
9  }
10
11 void loop()
12 {
13   for (i=10;i<13;i++)
14   {
15     digitalWrite(i,HIGH);
16     Serial.print("ON LED ");
17     Serial.print(i);
18     Serial.println();
19     delay(2000);
20     digitalWrite(i,LOW);
21   }
22 }
```

Serial Monitor

Παράδειγμα 3: Breadboard



Παράδειγμα 4α: Potentiometer



1 (Arduino Uno R3)

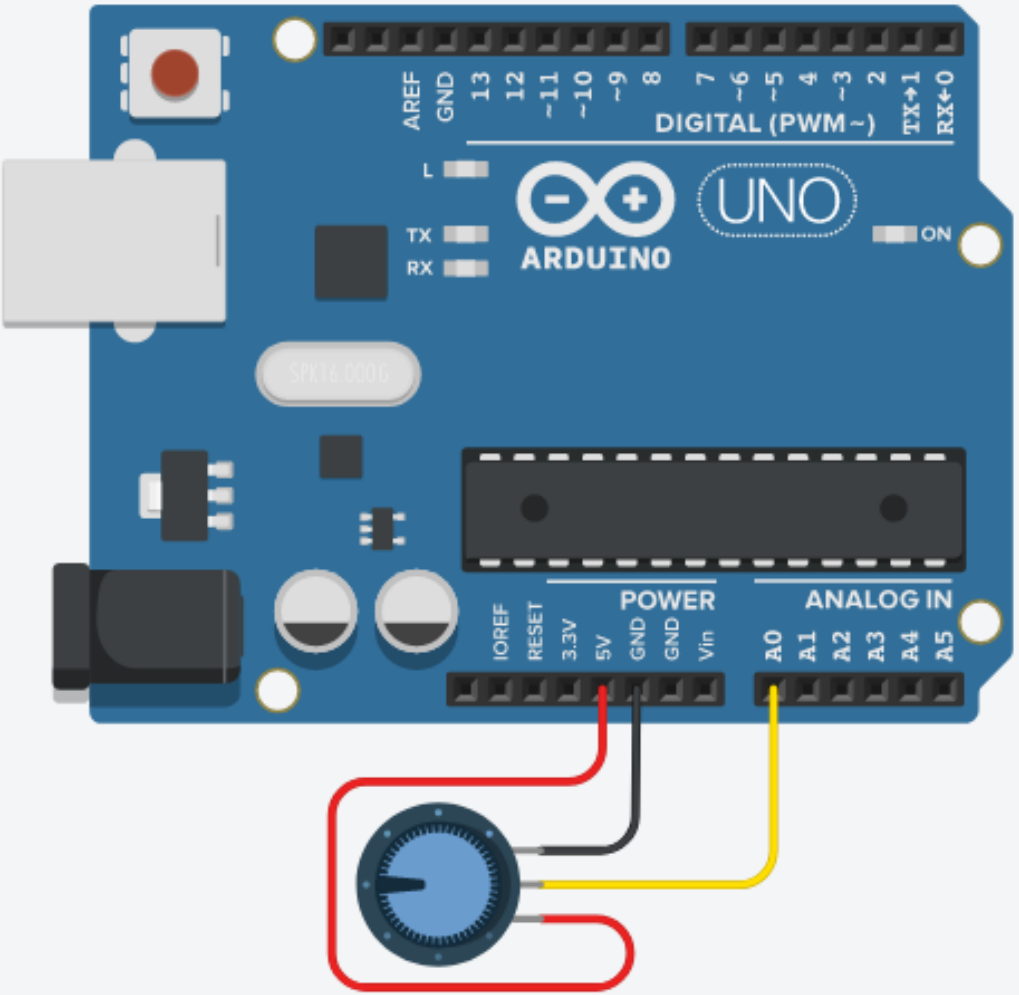
```
1  // the setup routine runs once when you press reset:
2  void setup() {
3    // initialize serial communication at 9600 bits per second:
4    Serial.begin(9600);
5  }
6
7  // the loop routine runs over and over again forever:
8  void loop() {
9    // read the input on analog pin 0:
10   int sensorValue = analogRead(A0);
11   // print out the value you read:
12   Serial.println(sensorValue);
13   delay(100); //delay in between reads for stability
14 }
```

Serial Monitor

```
511
511
511
511
511
511
511
511
511
```

Send Clear

Παράδειγμα 4b: Potentiometer



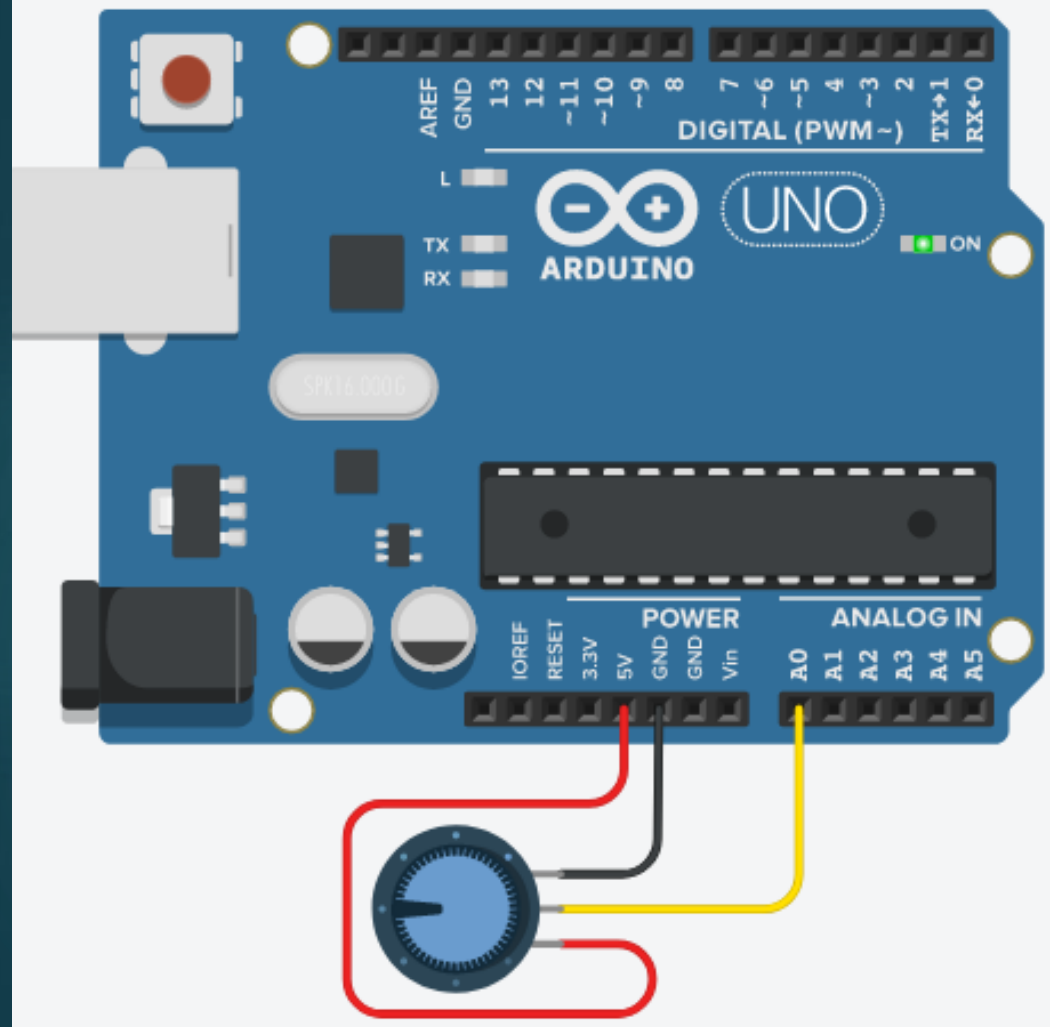
Text

1 (Arduino Uno R3)

```
/*
  ReadAnalogVoltage
  Reads an analog input on pin 0, converts it to voltage,
  and prints the result to the serial monitor.

  OPEN THE SERIAL MONITOR TO VIEW THE OUTPUT >>
  Attach the center pin of a potentiometer to pin A0,
  and the outside pins to +5V and ground.
  This example code is in the public domain.
*/

// the setup routine runs once when you press reset:
void setup() {
  // initialize serial communication at 9600 bits per second:
  Serial.begin(9600);
}

// the loop routine runs over and over again forever:
void loop() {
  // read the input on analog pin 0:
  int sensorValue = analogRead(A0);
  // Convert the analog reading (which goes from 0 - 1023) to a voltage (0 - 5V)
  float voltage = sensorValue * (5.0 / 1023.0);
  // print out the value you read:
  Serial.println(voltage);
}
```

Serial Monitor

Παράδειγμα 4b: Potentiometer

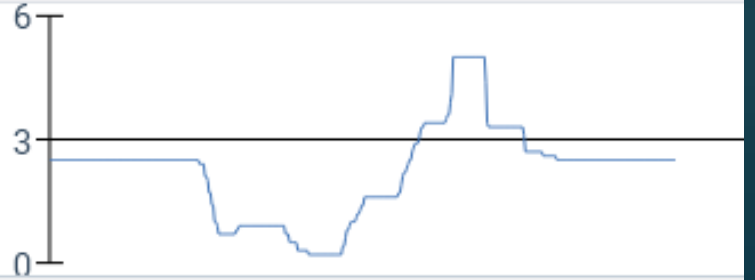


1 (Arduino Uno R3)

```
11
12  // the setup routine runs once when you press reset:
13  void setup() {
14    // initialize serial communication at 9600 bits per second:
15    Serial.begin(9600);
16  }
17
18  // the loop routine runs over and over again forever:
19  void loop() {
20    // read the input on analog pin 0:
21    int sensorValue = analogRead(A0);
22    // Convert the analog reading (which goes from 0 - 1023) to a volt
23    float voltage = sensorValue * (5.0 / 1023.0);
24    // print out the value you read:
25    Serial.println(voltage);
26  }
```

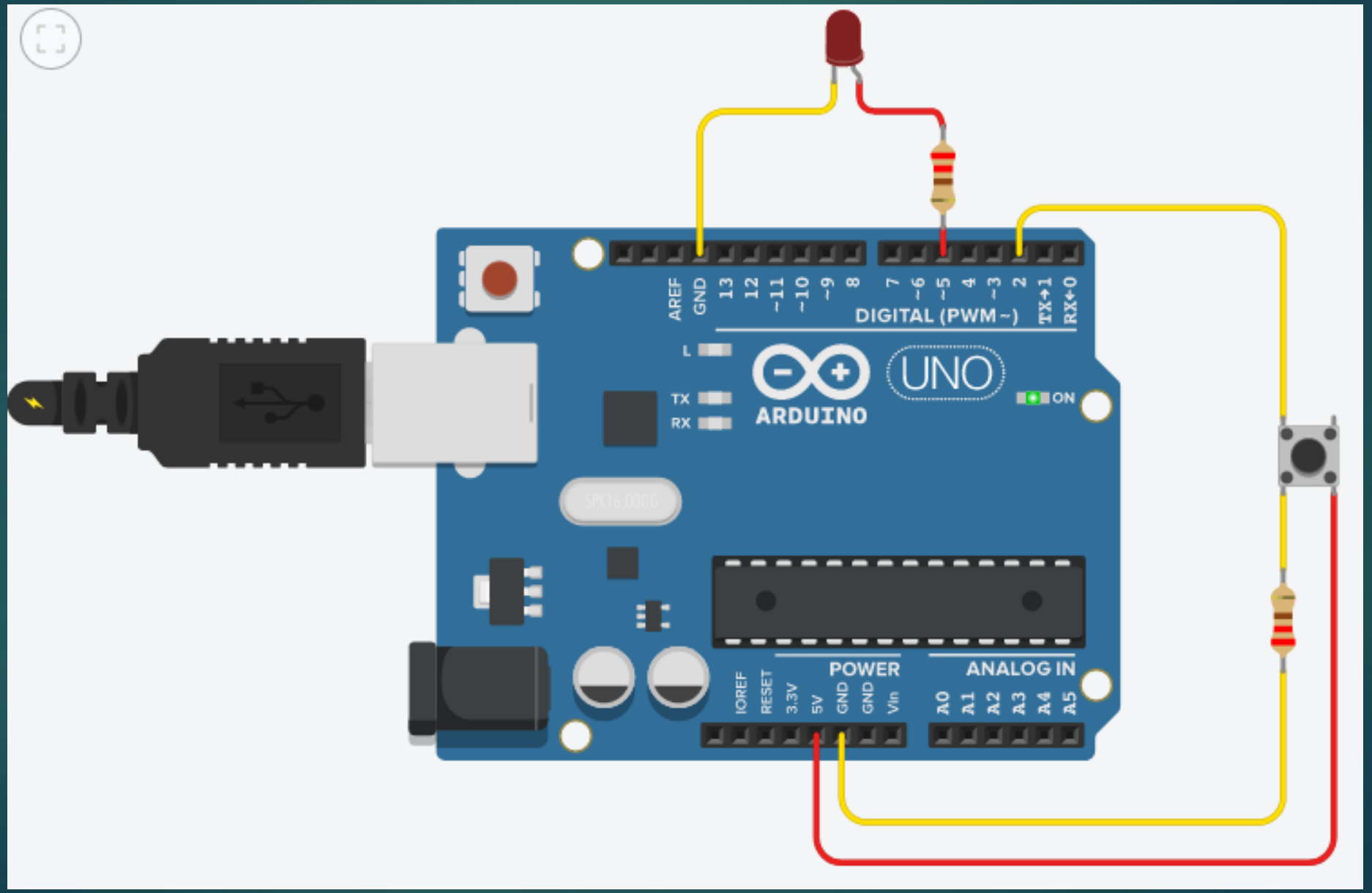
Serial Monitor

```
2.50
2.50
2.50
2.50
2.50
2.50
2.50
2.5
```



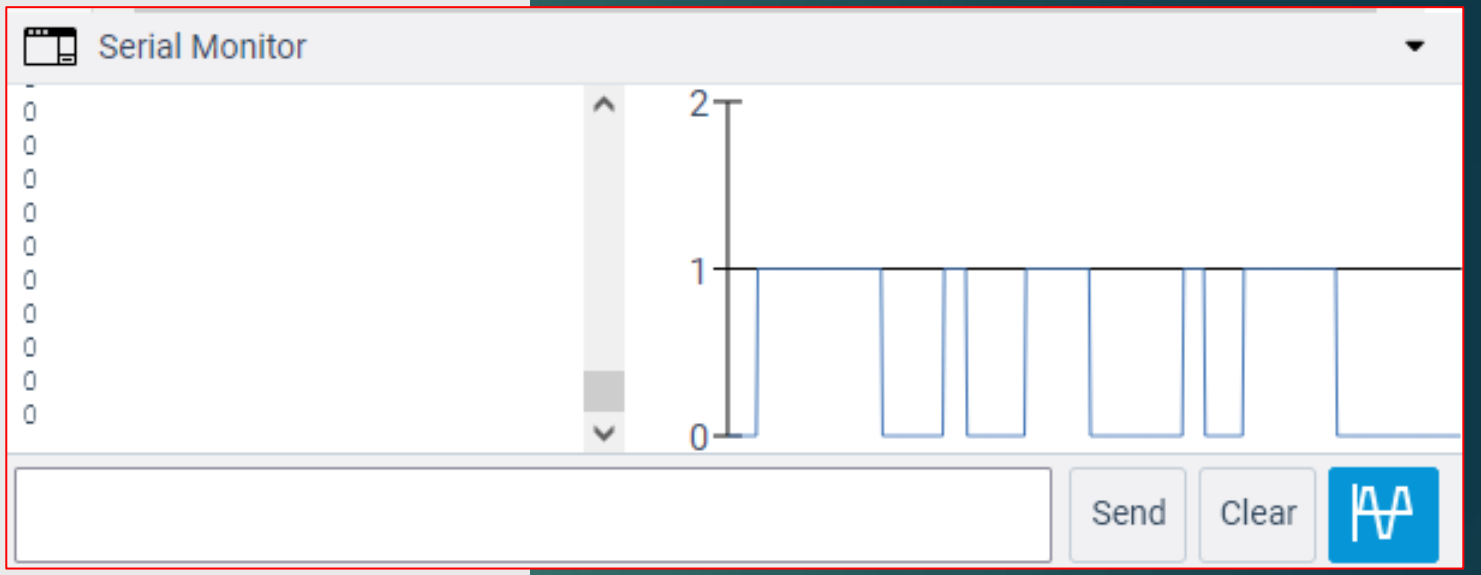
Send Clear

Παράδειγμα 5: Push-button

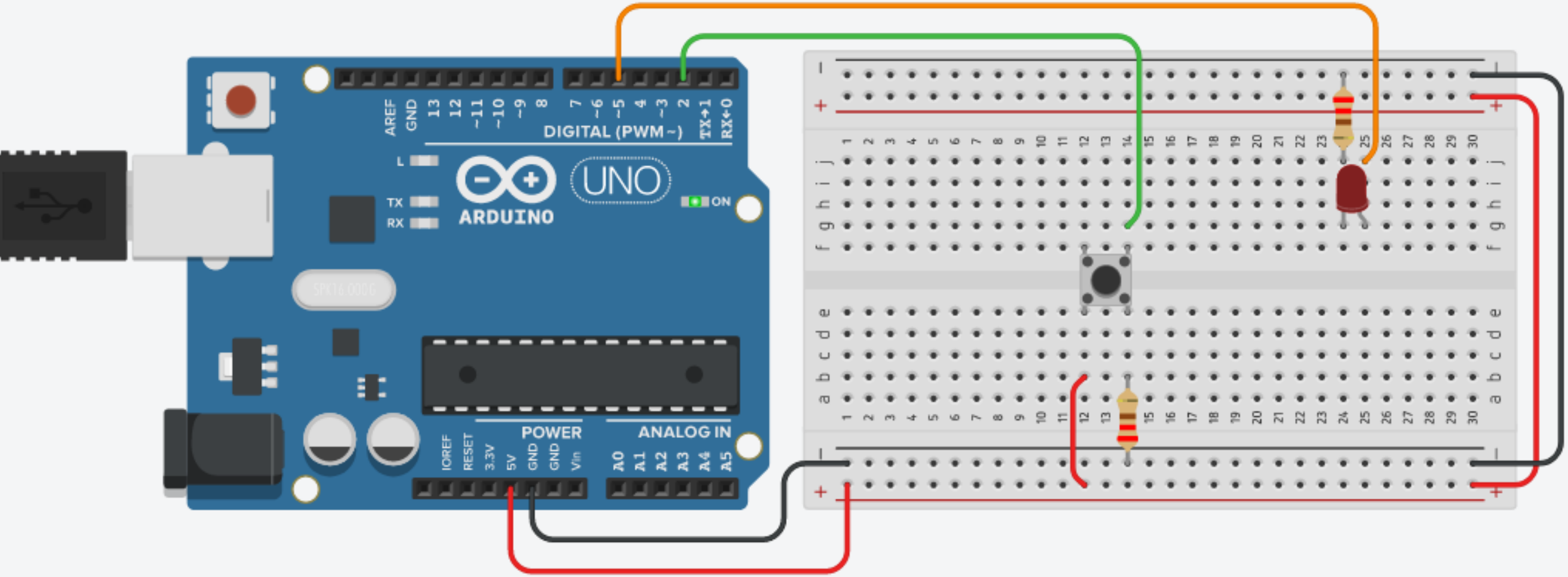


Παράδειγμα 5: Push-button

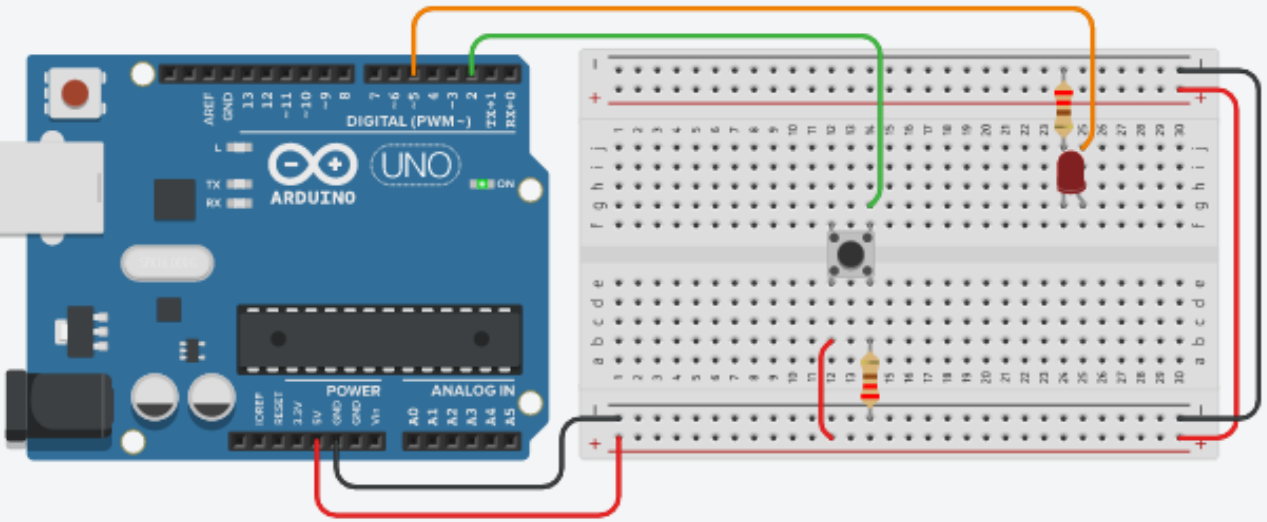

```
int buttonState = 0; // Initialize button state

void setup()
{
  Serial.begin(9600);
  pinMode(2, INPUT); // Set pin 2 as input
  pinMode(5, OUTPUT); // Set pin 5 as output
}

void loop()
{
  // read the state of the pushbutton value
  int sensorValue = digitalRead(2);

  // check if pushbutton is pressed.
  if (sensorValue == HIGH) // if it is, the buttonState is HIGH
  {
    Serial.println(sensorValue);
    digitalWrite(5, HIGH); // turn LED on
  }
  else // if it is not pressed, the buttonState is LOW
  {
    Serial.println(sensorValue);
    digitalWrite(5, LOW); // turn LED off
  }
  delay(10); // Delay a little bit to improve simulation performance
}
```



Παράδειγμα 5: Με Breadboard



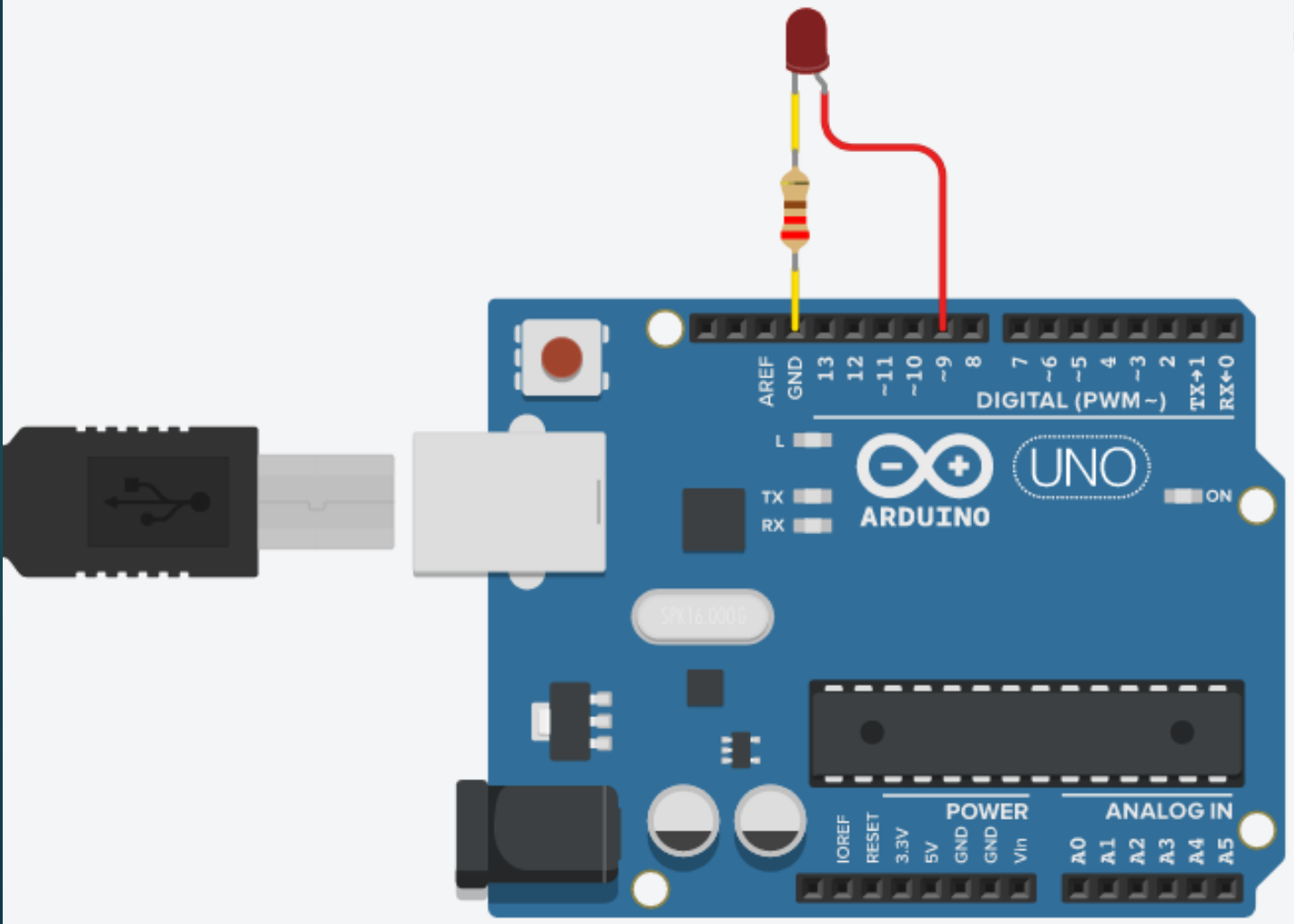
Παράδειγμα 5: Με Breadboard



1 (Arduino Uno R3)

```
1  int buttonState = 0; // Initialize button state
2
3  void setup()
4  {
5    pinMode(2, INPUT); // Set pin 2 as input
6    pinMode(5, OUTPUT); // Set pin 5 as output
7  }
8
9  void loop()
10 {
11   // read the state of the pushbutton value
12   buttonState = digitalRead(2);
13
14   // check if pushbutton is pressed.
15   if (buttonState == HIGH) // if it is, the buttonState is HIGH
16   {
17     digitalWrite(5, HIGH); // turn LED on
18   }
19   else // if it is not pressed, the buttonState is LOW
20   {
21     digitalWrite(5, LOW); // turn LED off
22   }
23   delay(10); // Delay a little bit to improve simulation performance
24 }
```

Παράδειγμα 6α: Fade Amount

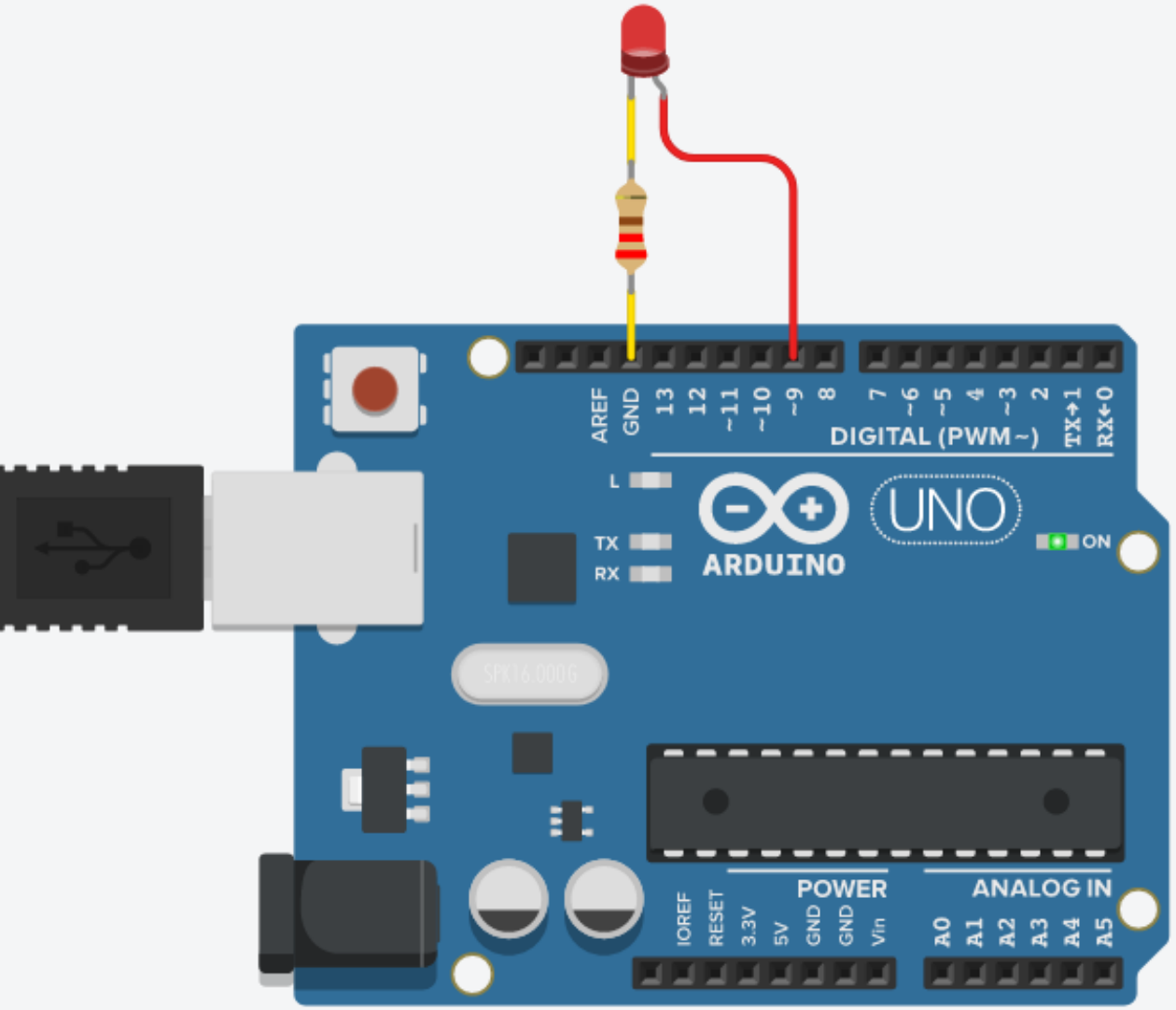


Text

1 (Arduino Uno R3)

```
1  int led = 9;           // the PWM pin the LED is attached to
2  int brightness = 0;    // how bright the LED is
3  int fadeAmount = 5;    // how many points to fade the LED by
4
5  // the setup routine runs once when you press reset:
6  void setup() {
7    // declare pin 9 to be an output:
8    pinMode(led, OUTPUT);
9  }
10
11 // the loop routine runs over and over again forever:
12 void loop() {
13   // set the brightness of pin 9:
14   analogWrite(led, brightness);
15
16   // change the brightness for next time through the loop:
17   brightness = brightness + fadeAmount;
18
19   // reverse the direction of the fading at the ends of the fade:
20   if (brightness <= 0 || brightness >= 255) {
21     fadeAmount = -fadeAmount;
22   }
23   // wait for 60 milliseconds to see the dimming effect
24   delay(60);
25 }
26
```

Παράδειγμα 6b: Fade Amount

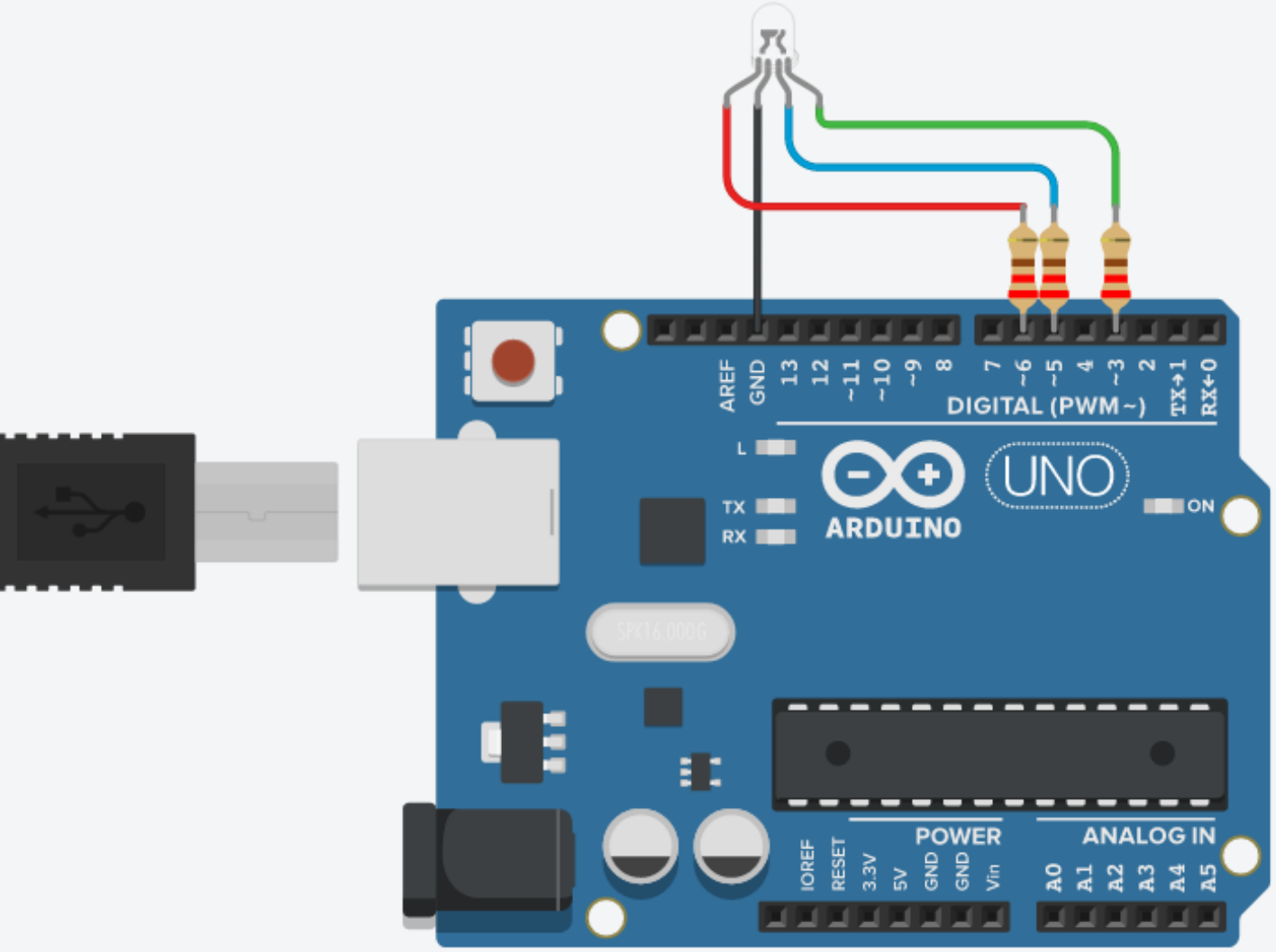


1 (Arduino Uno R3)

```
/*
  This example shows how to fade an LED on pin 9
  using the analogWrite() function.
  The analogWrite() function uses PWM, so if  you
  want to change the pin you're using, be  sure to
  use another PWM capable pin. On most  Arduino,
  the PWM pins are identified with   a "~" sign,
  like ~3, ~5, ~6, ~9, ~10 and ~11.
*/
int brightness = 0;
void setup()
{
  pinMode(9, OUTPUT);
}
void loop()
{
  for (brightness = 0; brightness <= 255; brightness += 5)
  {
    analogWrite(9, brightness);
    delay(30); // Wait for 30 millisecond(s)
  }
  for (brightness = 255; brightness >= 0; brightness -= 5)
  {
    analogWrite(9, brightness);
    delay(30); // Wait for 30 millisecond(s)
  }
}
```

Serial Monitor

Παράδειγμα 7α: RBG Led

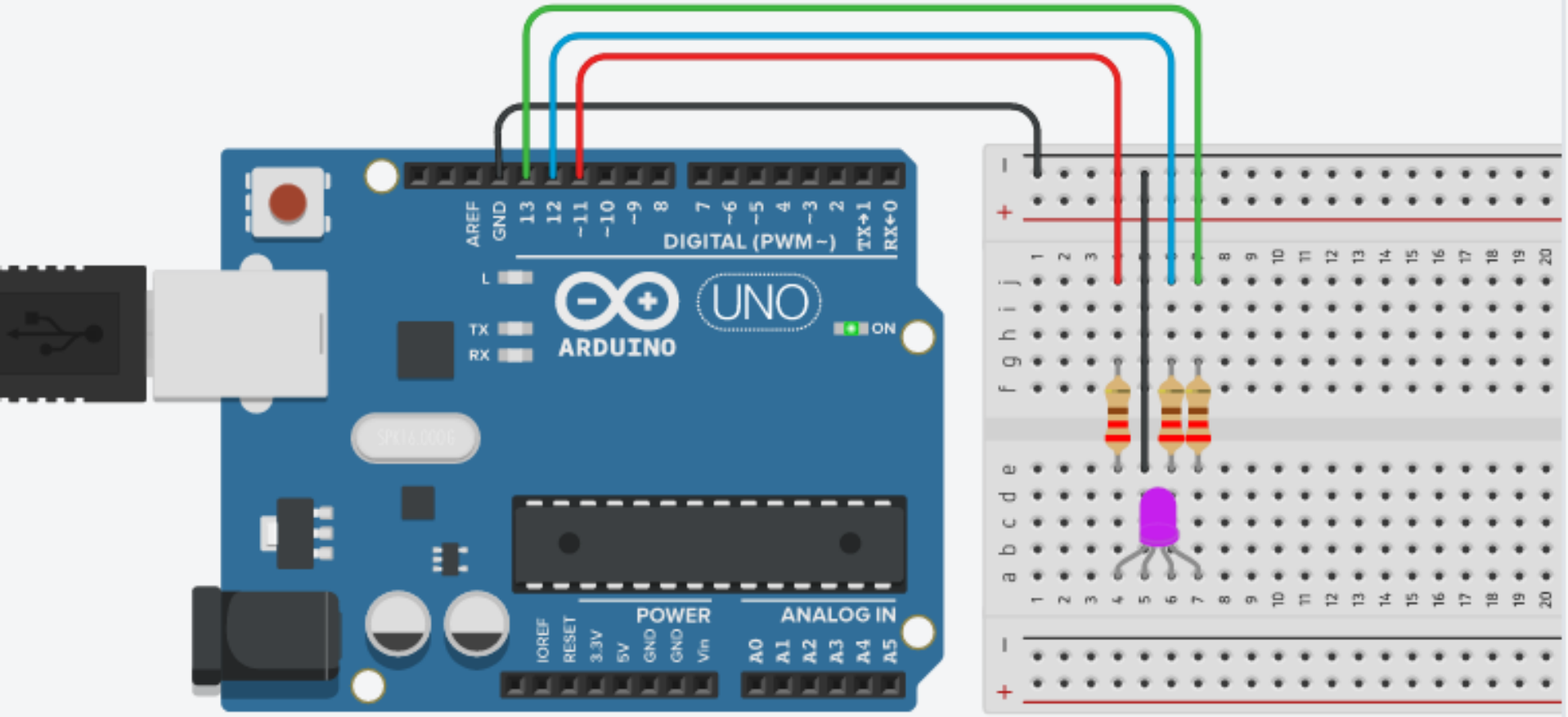


Text

1 (Arduino Uno R3)

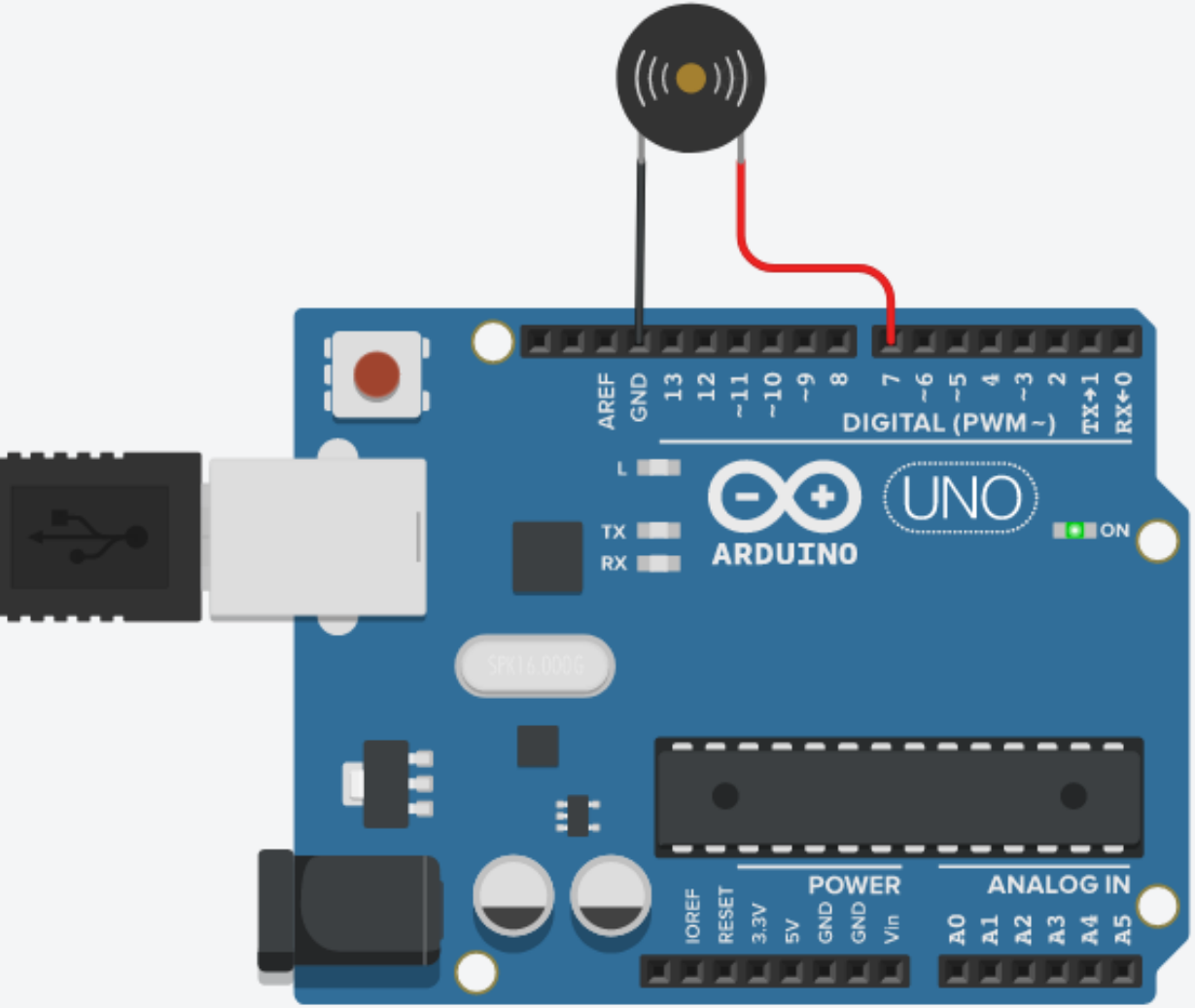
```
int led1 = 3;           // the pin that the LED1 is attached to
int led2 = 5;           // the pin that the LED2 is attached to
int led3 = 6;           // the pin that the LED3 is attached to
// the setup routine runs once when you press reset:
void setup()  {
  // declare pin 3,5,6 to be an output:
  pinMode(led1, OUTPUT);
  pinMode(led2, OUTPUT);
  pinMode(led3, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop()  {
int i,j,k=0;

//  analogWrite(led3,255);
//  delay(2000);

  for(i=0;i<10;i++)
 {
  analogWrite(led1, i*25);
    for(j=0;j<10;j++)
    {
     analogWrite(led2, j*25);
       for(k=0;k<10;k++)
       {
        analogWrite(led3, k*25);
        delay(10);
       }
    }
 }
}
```

Παράδειγμα 7b: Με breadboard




```
#define LEDR 11
#define LEDG 13
#define LEDB 12

void setup()
{
  pinMode(LEDR, OUTPUT);
  pinMode(LEDG, OUTPUT);
  pinMode(LEDB, OUTPUT);
}

int r = 0;
int g = 0;
int b = 0;

void loop()
{
  r = random(0, 255);
  g = random(0, 255);
  b = random(0, 255);
  analogWrite(LEDR, r);
  analogWrite(LEDG, g);
  analogWrite(LEDB, b);
  delay(1000);
}
```

Παράδειγμα 8α: Buzzer (Piezo)

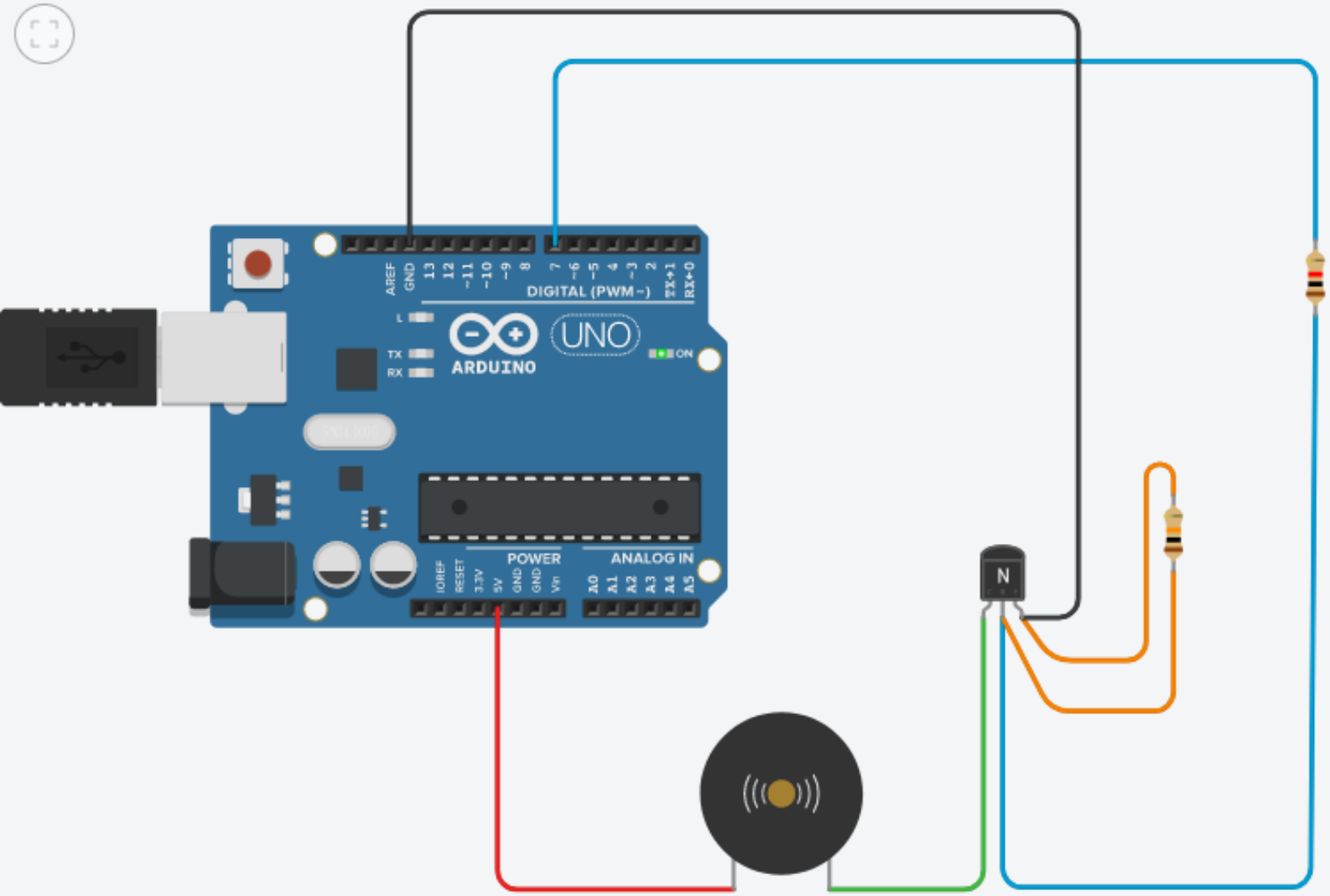


1 (Arduino Uno R3)

```
1  void setup()
2  {
3    pinMode(7, OUTPUT); // set pin 7 as output
4  }
5
6  void loop()
7  {
8    digitalWrite(7,HIGH); // make the buzzer sound
9    delay(1000); // wait for 1sec
10
11   digitalWrite(7,LOW); // set the buzzer off
12   delay(1000); //wait for 1sec
13 }
```

Serial Monitor

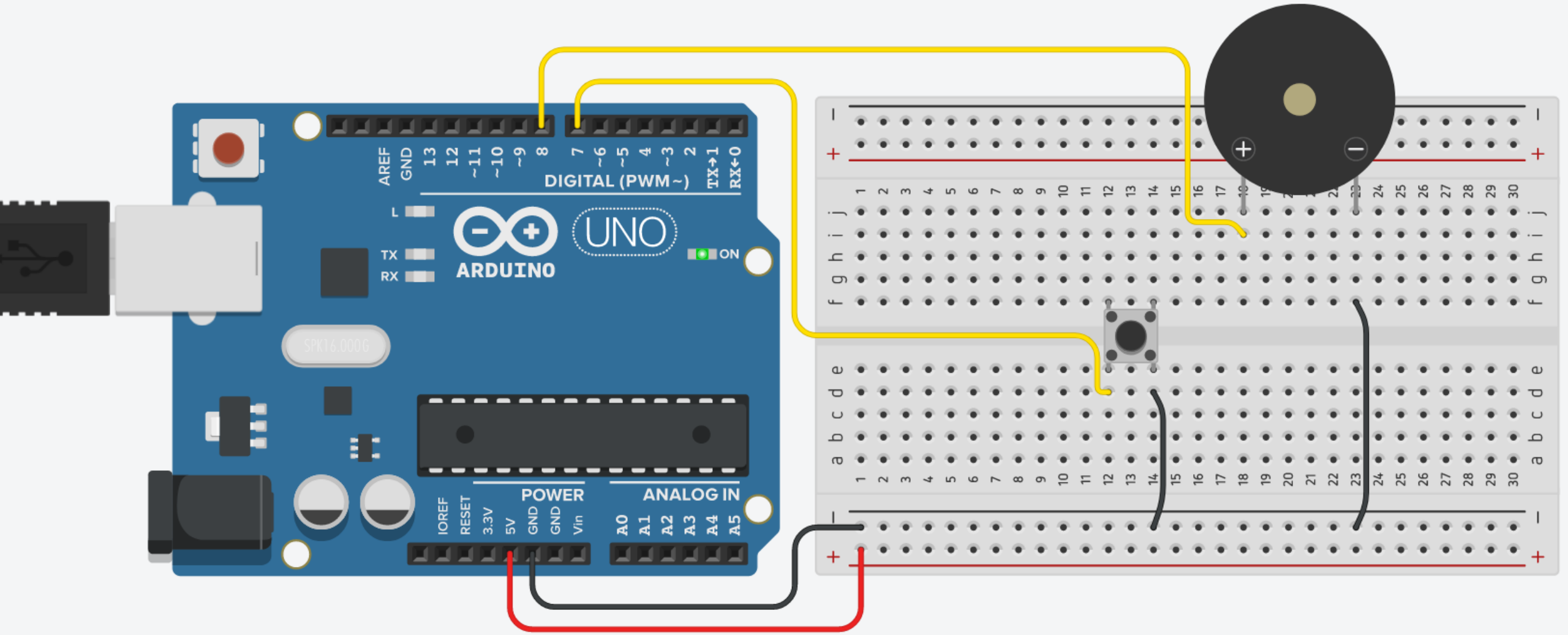
Παράδειγμα 8b: Buzzer (Piezo)




```
1  void setup()
2  {
3    pinMode(7, OUTPUT); // set pin 7 as output
4  }
5
6  void loop()
7  {
8    digitalWrite(7,HIGH); // make the buzzer sound
9    delay(1000); // wait for 1sec
10
11   digitalWrite(7,LOW); // set the buzzer off
12   delay(1000); //wait for 1sec
13 }
```

Serial Monitor

Παράδειγμα 8c: Buzzer with button



Παράδειγμα 8c: Buzzer with button

active_buzzer_with_button

```
int buzzerPin = 8;
int buttonPin = 7;

void setup() {
  pinMode(buzzerPin, OUTPUT);
  pinMode(buttonPin, INPUT_PULLUP);
}

void loop() {
  int buttonState = digitalRead(buttonPin);

  if (buttonState == LOW) {
    digitalWrite(buzzerPin, HIGH);
  }

  if (buttonState == HIGH) {
    digitalWrite(buzzerPin, LOW);
  }
}
```

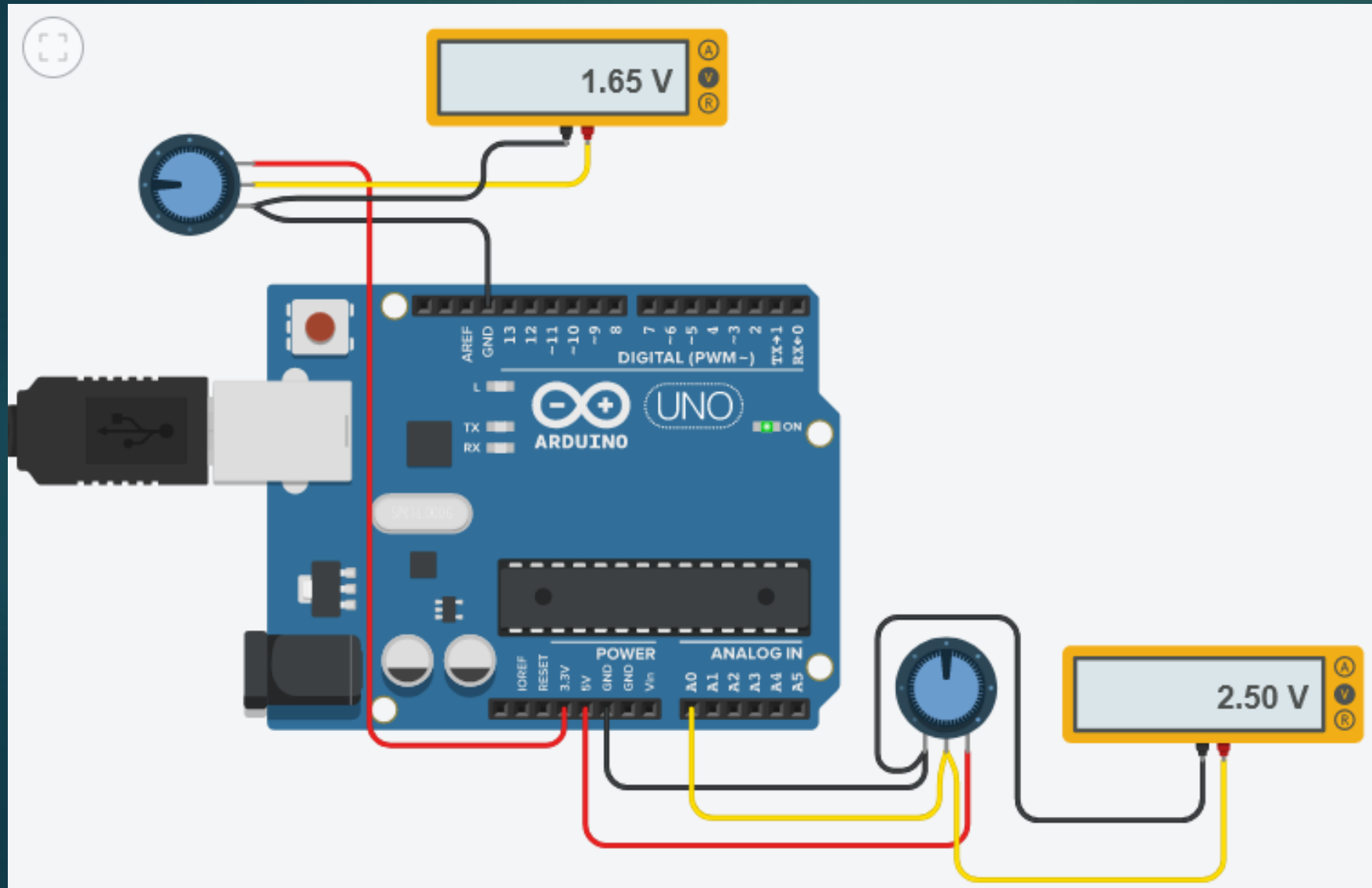
Χρησιμοποιήσαμε την ενσωματωμένη pull-up αντίσταση που διαθέτει η πλακέτα μέσω της εντολής INPUT_PULLUP.

Επομένως η αντίσταση συνδέεται στα 5V.

Δηλαδή όταν δεν είναι πατημένο το button βρίσκεται στην κατάσταση HIGH λόγω της pull-up αντίστασης. Άρα εμείς πρέπει να ορίσουμε σε αυτή την περίπτωση το buzzer να είναι στην κατάσταση LOW (χωρίς ήχο) αφού δεν είναι πατημένο το button.

Αντίθετα όταν το button είναι πατημένο βρίσκεται στην κατάσταση LOW και το buzzer θέλουμε να ηχήσει (HIGH) αφού θα είναι πατημένο το button.

Παράδειγμα 9:

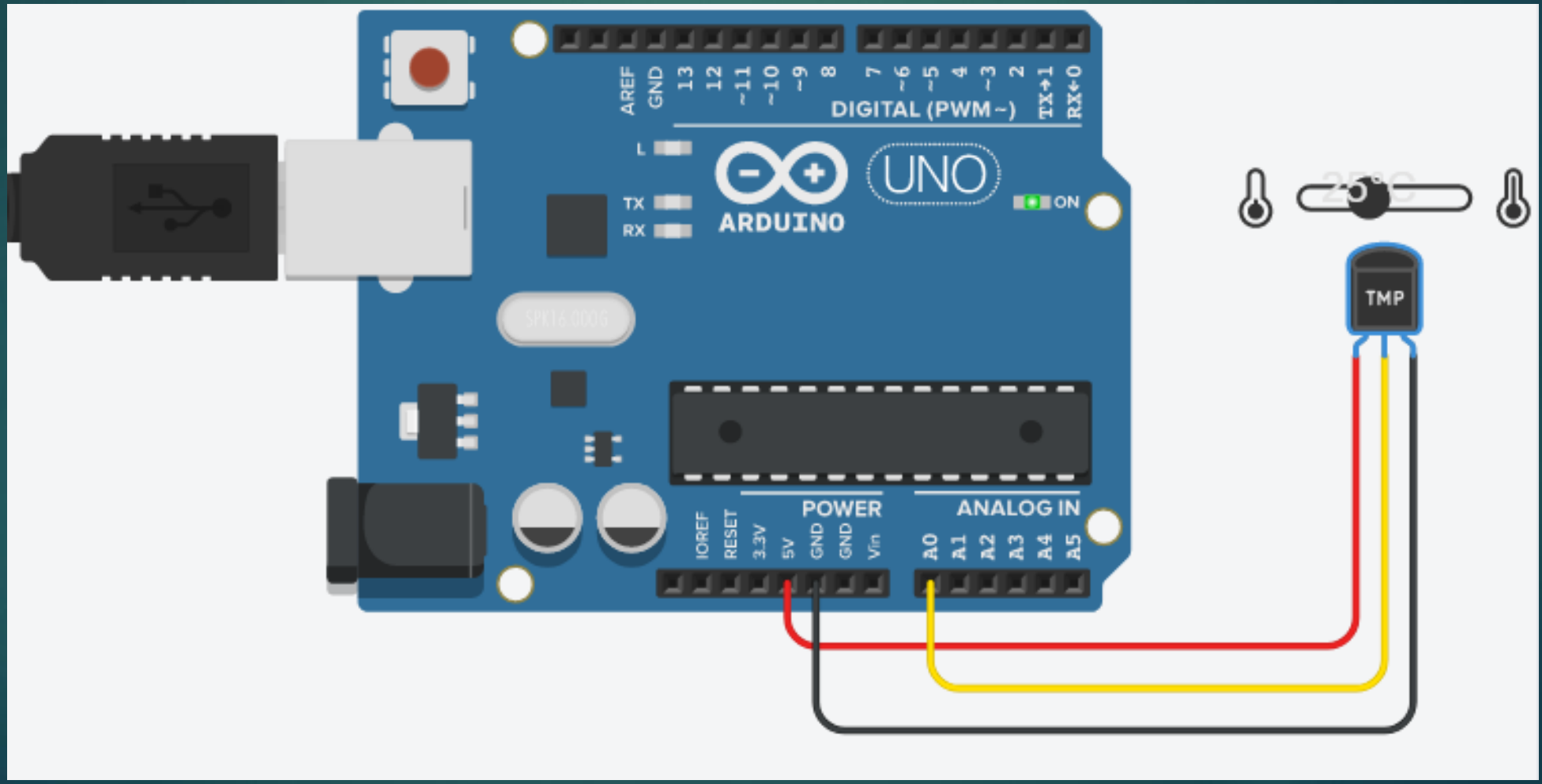



```
1  void setup()
2  {
3    Serial.begin(9600);
4  }
5
6  void loop()
7  {
8    int sensorValue = analogRead(A0);
9    Serial.println(sensorValue);
10 }
```

Serial Monitor

```
511
511
511
511
511
511
511
511
```

Παράδειγμα 10: Αισθητήριο Θερμοκρασίας



Παράδειγμα 10:


```
/*
  Temperature Measurement
  Reads an analog input on A0 (output of TMP36)
*/
float powervoltage = 5; //Define power supply voltage

void setup()
{
  //Initialize serial communicationat 9600 bits per second:
  Serial.begin(9600);
}

void loop()
{
  float temperature;
  //Read the inputon analog pin 0 (A0):
  float sensorValue = analogRead(A0);
  //Print out the value you read:
  Serial.println(sensorValue);
  delay(1000); //Wait for 1sec
  //Calculate the temperature (degC):
  //0.5 is an offset that should be subtracted
  //multiplied with 100 for conversion to degrees
  temperature=(((sensorValue/1023)*powervoltage)-0.5)*100;
  Serial.print("The room temperature degree is: ");
  Serial.println(temperature);
  delay(10); //delay in between reads for stability
}
```

Serial Monitor

```
The room temperature degree is: 44.82
123.00
The room temperature degree is: 10.12
127.00
The room temperature degree is: 12.07
145.00
The room temperature degree is: 20.87
153.00
The room temperature degree is: 24.78
153.00
The room temperature degree is: 24.78
```