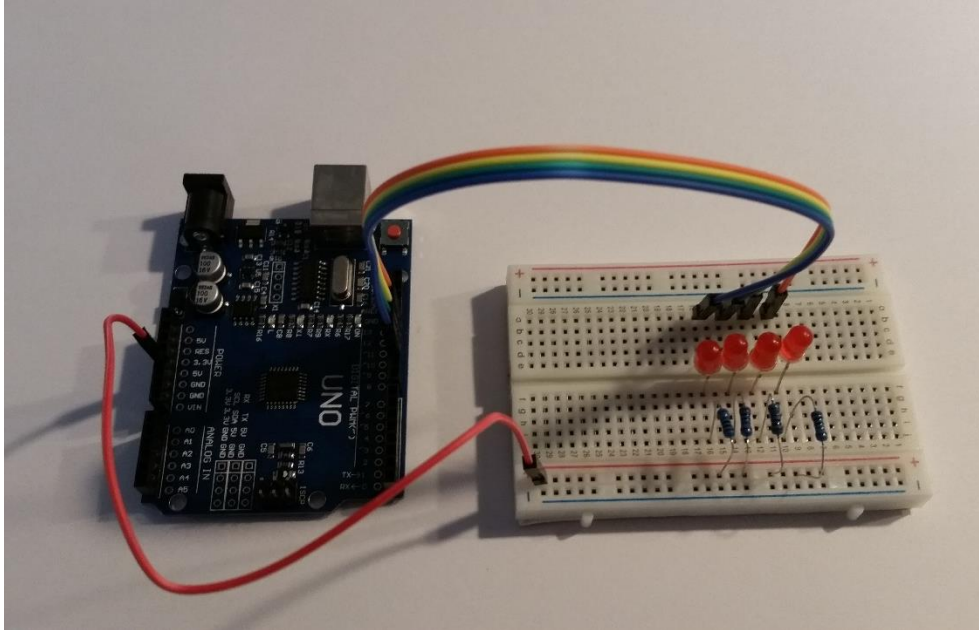


## GoldSTEM\_Lesson\_8\_Four\_LED\_Binary

This experiment uses the same setup as experiment 6.



Binary describes a numbering scheme in which there are only two possible values for each digit: 0 and 1. The term also refers to any digital encoding/decoding system in which there are exactly two possible states in digital data memory, storage, processing, and communications, the 0 and 1 values are sometimes called "low" and "high," respectively.

Binary numbers look strange when they are written out directly. This is because the digits' weight increases by powers of 2, rather than by powers of 10. In a digital numeral, the digit furthest to the right is the "ones" digit; the next digit to the left is the "twos" digit; next comes the "fours" digit, then the "eights" digit, then the "16s" digit, then the "32s" digit, and so on. The decimal equivalent of a binary number can be found by summing all the digits. For example, the binary 10101 is equivalent to the decimal  $1 + 4 + 16 = 21$ :

<b>DECIMAL = 21</b>	64	32	<b>16</b>	8	<b>4</b>	2	<b>1</b>
<b>BINARY = 10101</b>	0	0	<b>1</b>	0	<b>1</b>	0	<b>1</b>

LED 1	LED 2	LED 3	LED 4	<a href="#">Binary</a>	<a href="#">Octal</a>	<a href="#">Decimal</a>	<a href="#">Hexadecimal</a>
0	0	0	0	0000	0	0	0
0	0	0	1	0001	1	1	1
0	0	1	0	0010	2	2	2
0	0	1	1	0011	3	3	3
0	1	0	0	0100	4	4	4
0	0	1	1	0101	5	5	5
0	1	1	0	0110	6	6	6
0	1	1	1	0111	7	7	7
1	0	0	0	1000	10	8	8
1	0	0	1	1001	11	9	9
1	0	1		1010	12	10	A
1	0	1	1	1011	13	11	B
1	1	0	0	1100	14	12	C
1	1	0	1	1101	15	13	D
1	1	1	0	1110	16	14	E
1	1	1	1	1111	17	15	F

### Loading the code

#### GoldSTEM\_Lesson\_7\_Four\_LED\_Binary

```

/*
GoldSTEM_Lesson_7_Four_LED_Binary GoldSTEM tm 2-24-2016
Sequence four LED's
*/

```

```
int ledPin[] = {10,11,12,13};
```

```
void setup()
```

```
{
  for (int i =0;i<4;i++)
  {
    pinMode(ledPin[i], OUTPUT);
  }
}
```

```
void loop()
```

```
{
  for (byte counter =0;counter<=15; counter++)
```

```
{
  displayBinary(counter);
  delay(1000);
}

void displayBinary(byte numToShow)
{
  for (int i =0;i<4;i++)
  {
    if (bitRead(numToShow, i)==1)
    {
      digitalWrite(ledPin[i], LOW);
    }
    else
    {
      digitalWrite(ledPin[i], HIGH);
    }
  }
}
```

This program is a bit more sophisticated than the ones we ran before.  
Spend some time and analyses it.

