ENGR 100 – Intro to Engineering Design

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Engineering & Computer Science

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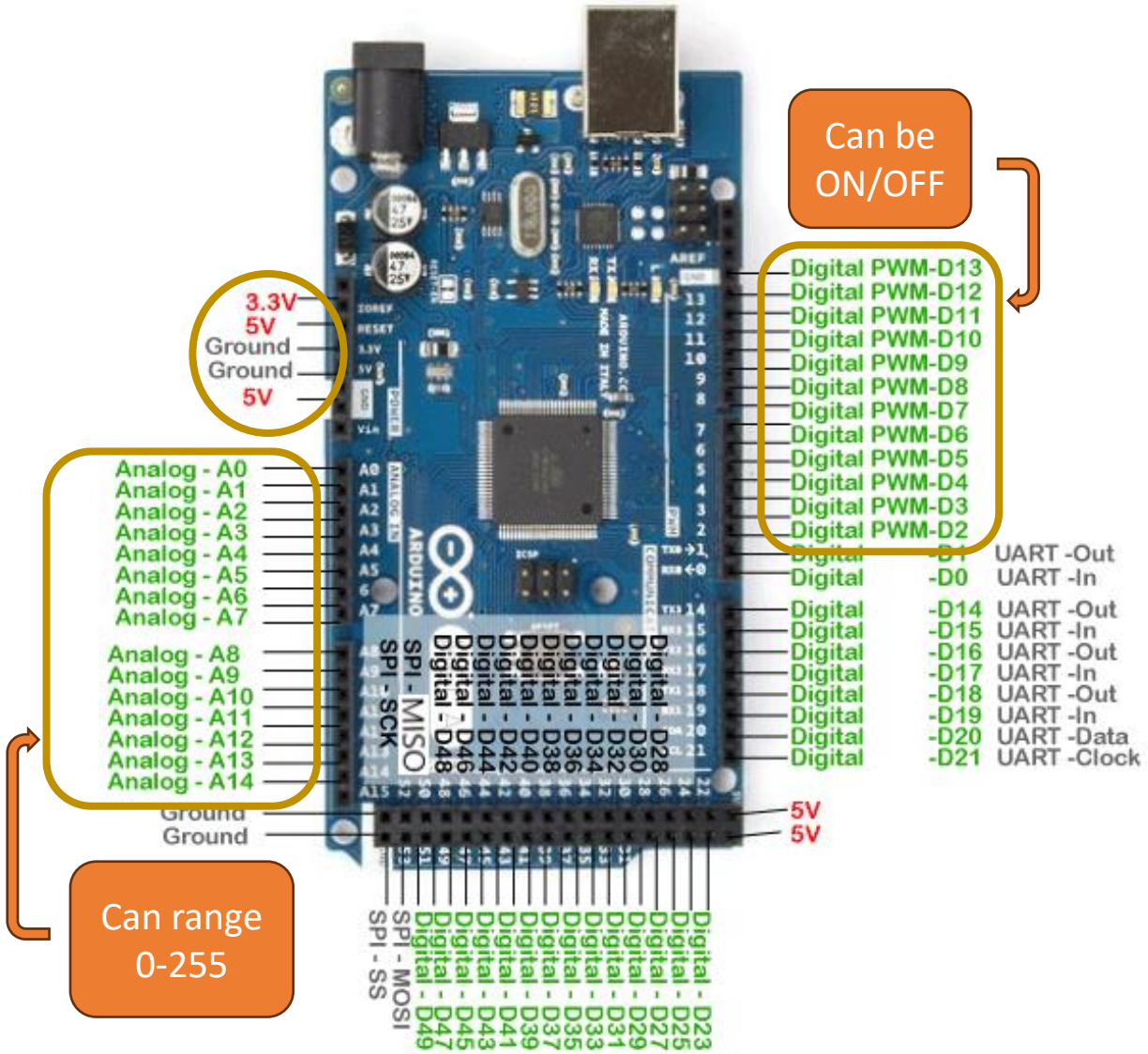
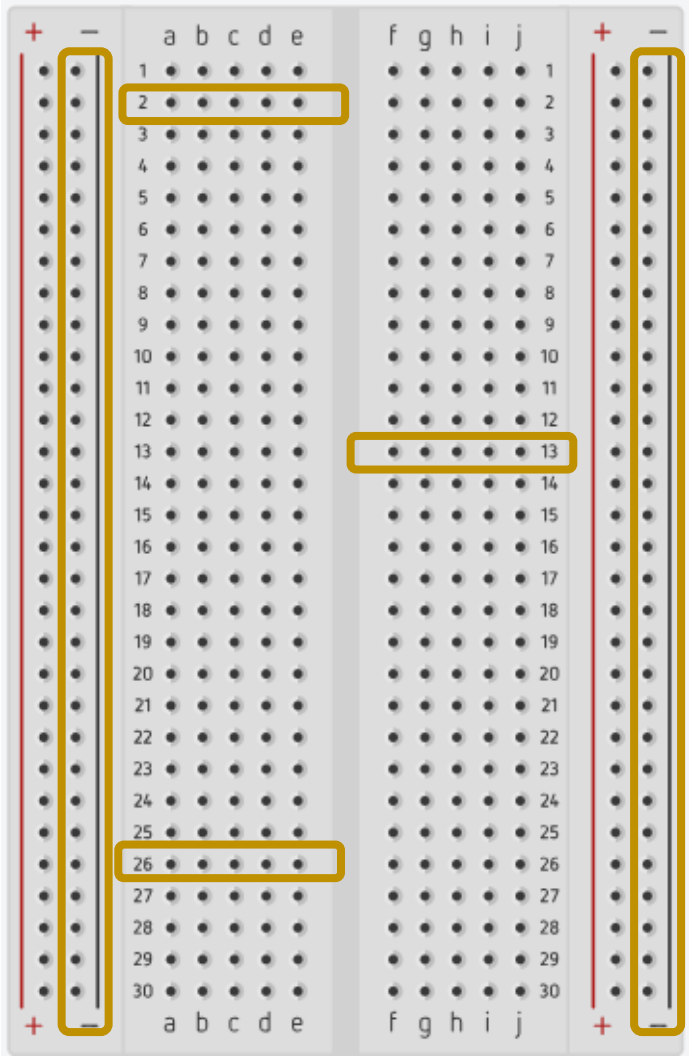
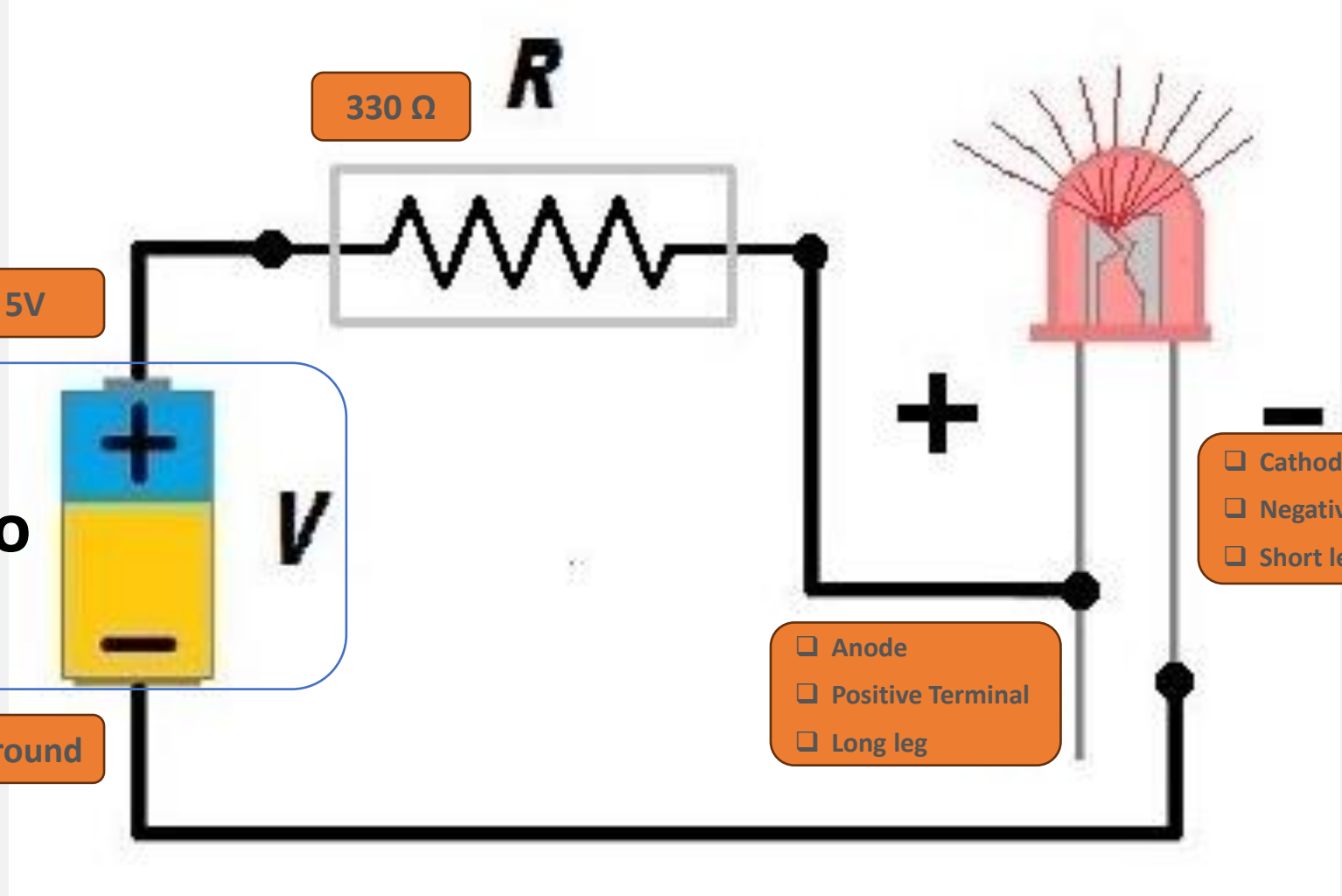
Arduino Mega 2560



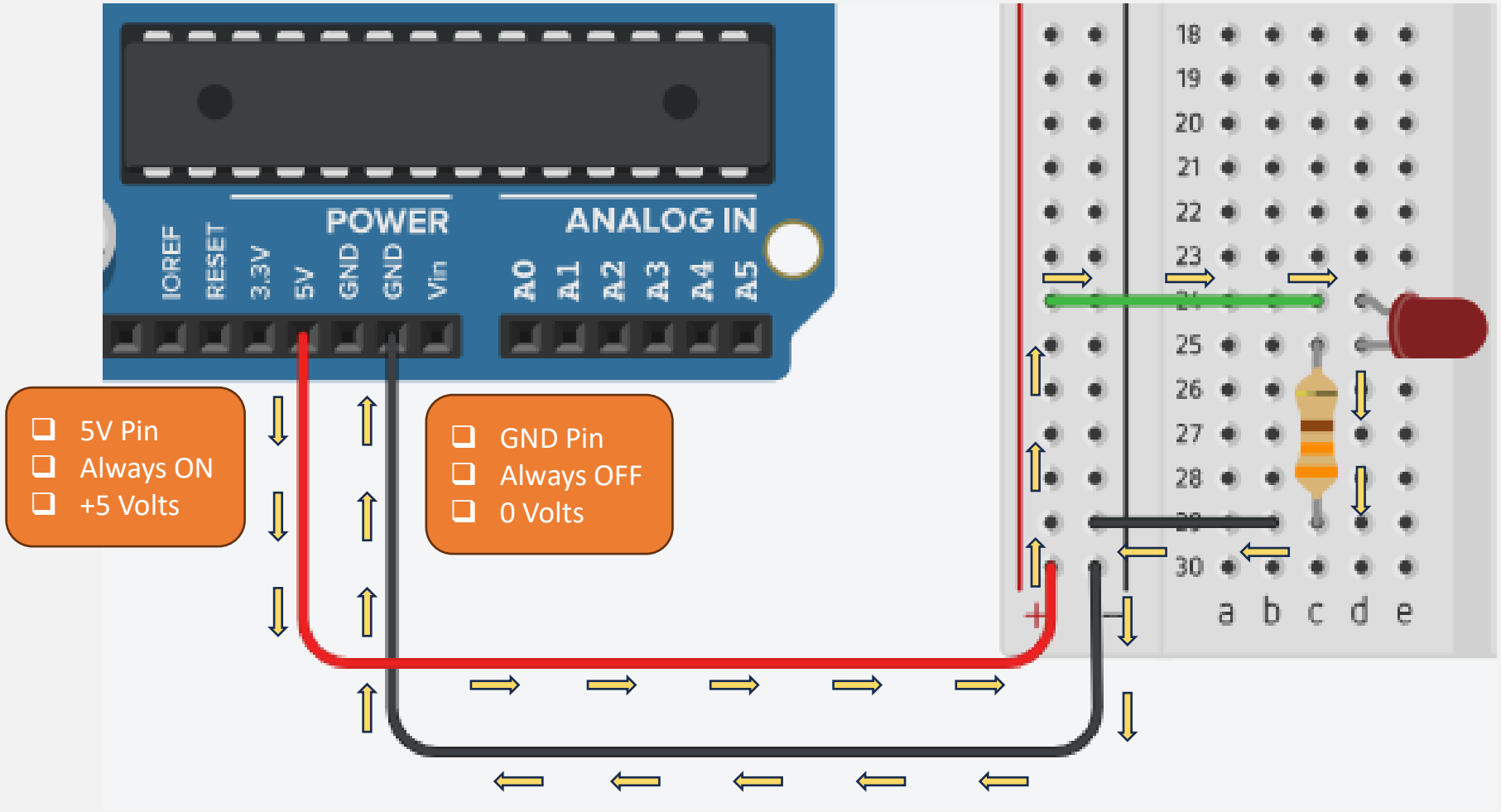
Breadboard



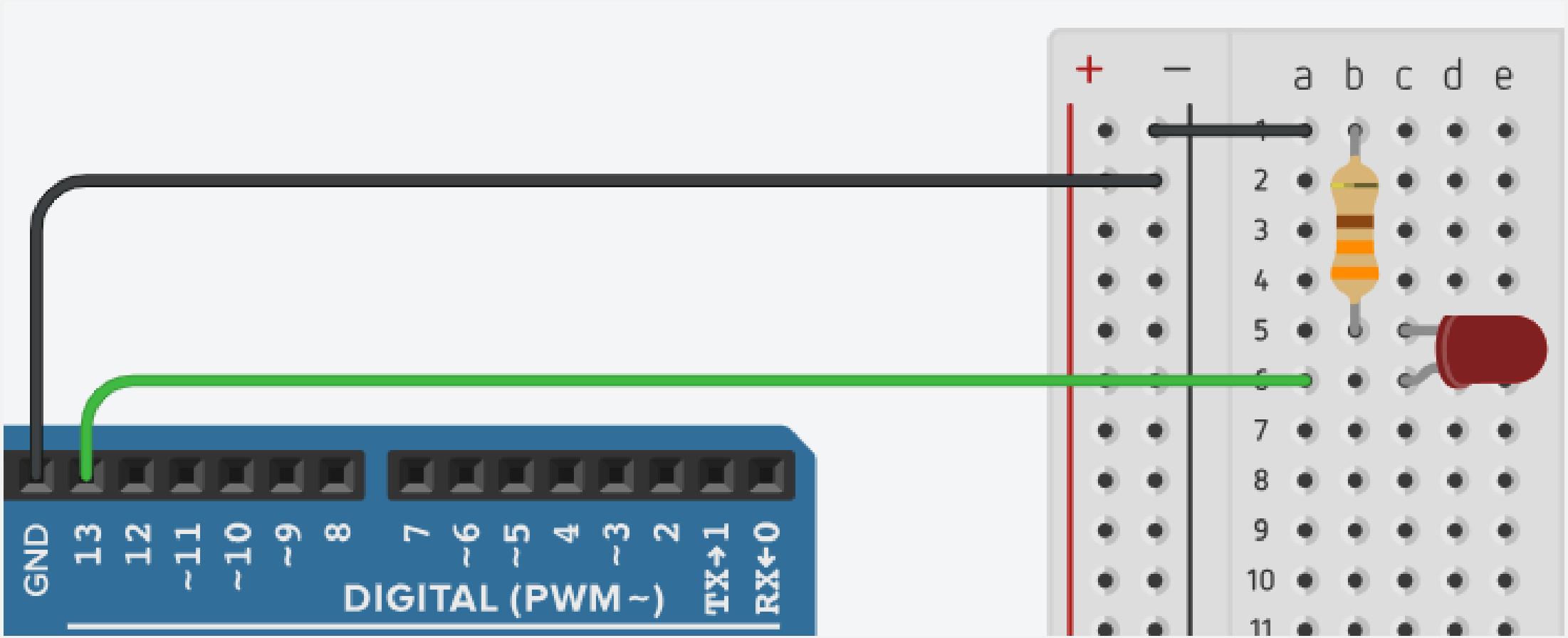
Electric Circuit



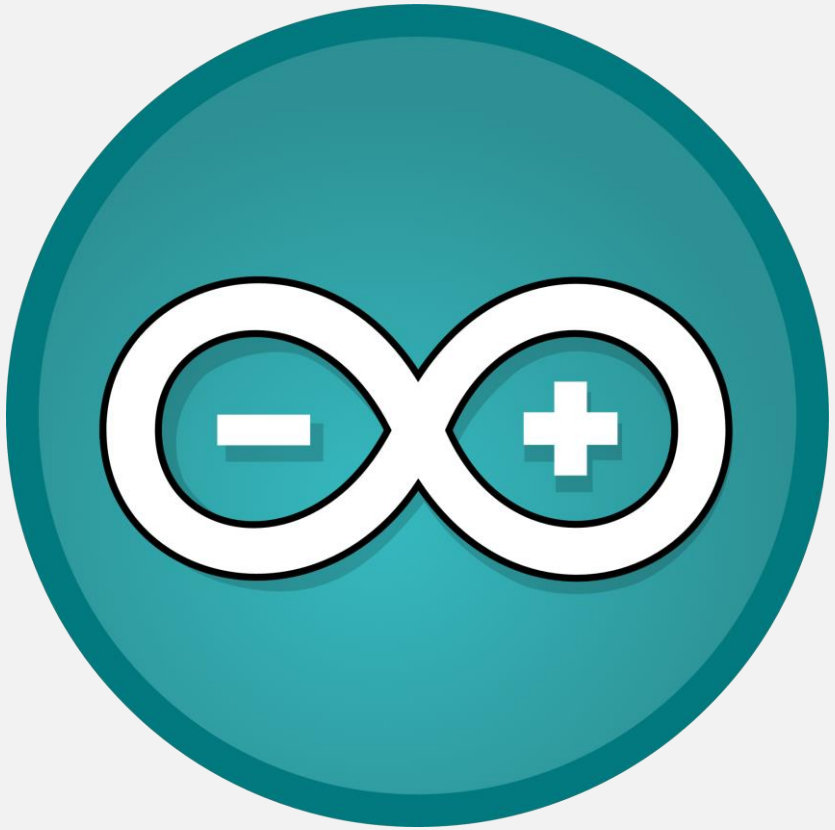
LED ON – Constant Power (no coding)

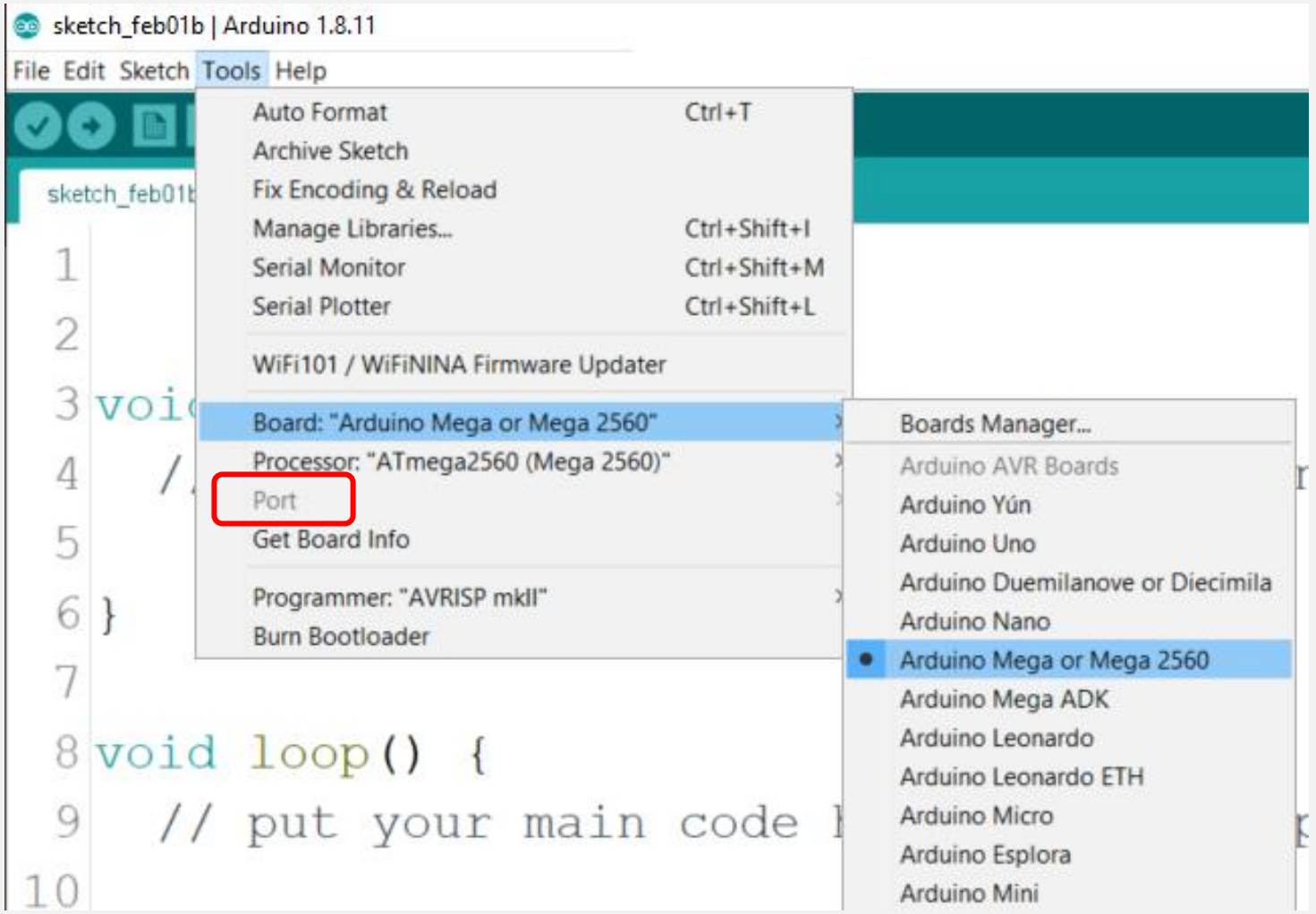


LED ON/OFF – Circuit



Arduino IDE




sketch_feb01b | Arduino 1.8.11
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Board: "Arduino Mega or Mega 2560"
Processor: "ATmega2560 (Mega 2560)"
Port
Get Board Info
Programmer: "AVRISP mkII"
Burn Bootloader
Boards Manager...
Arduino AVR Boards
Arduino Yún
Arduino Uno
Arduino Duemilanove or Diecimila
Arduino Nano
Arduino Mega or Mega 2560
Arduino Mega ADK
Arduino Leonardo
Arduino Leonardo ETH
Arduino Micro
Arduino Esplora
Arduino Mini
void loop() {
// put your main code

LED ON/OFF – Code

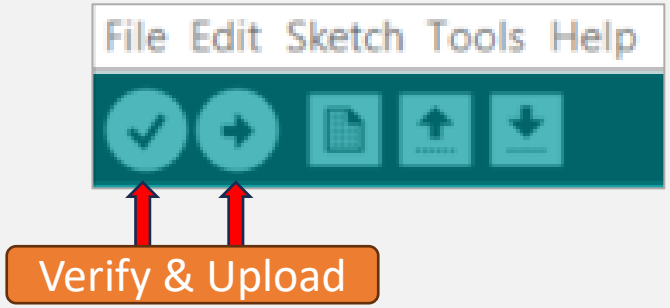
sketch_feb01b §

```
1
2
3  void setup() {
4    // put your setup code here, to run once:
5
6  }
7
8  void loop() {
9    // put your main code here, to run repeatedly:
10
11 }
```

```
int pin = 13;
```

```
pinMode(pin, OUTPUT);
```

```
digitalWrite(pin, HIGH);
delay(1000);
digitalWrite(pin, LOW);
delay(1000);
```

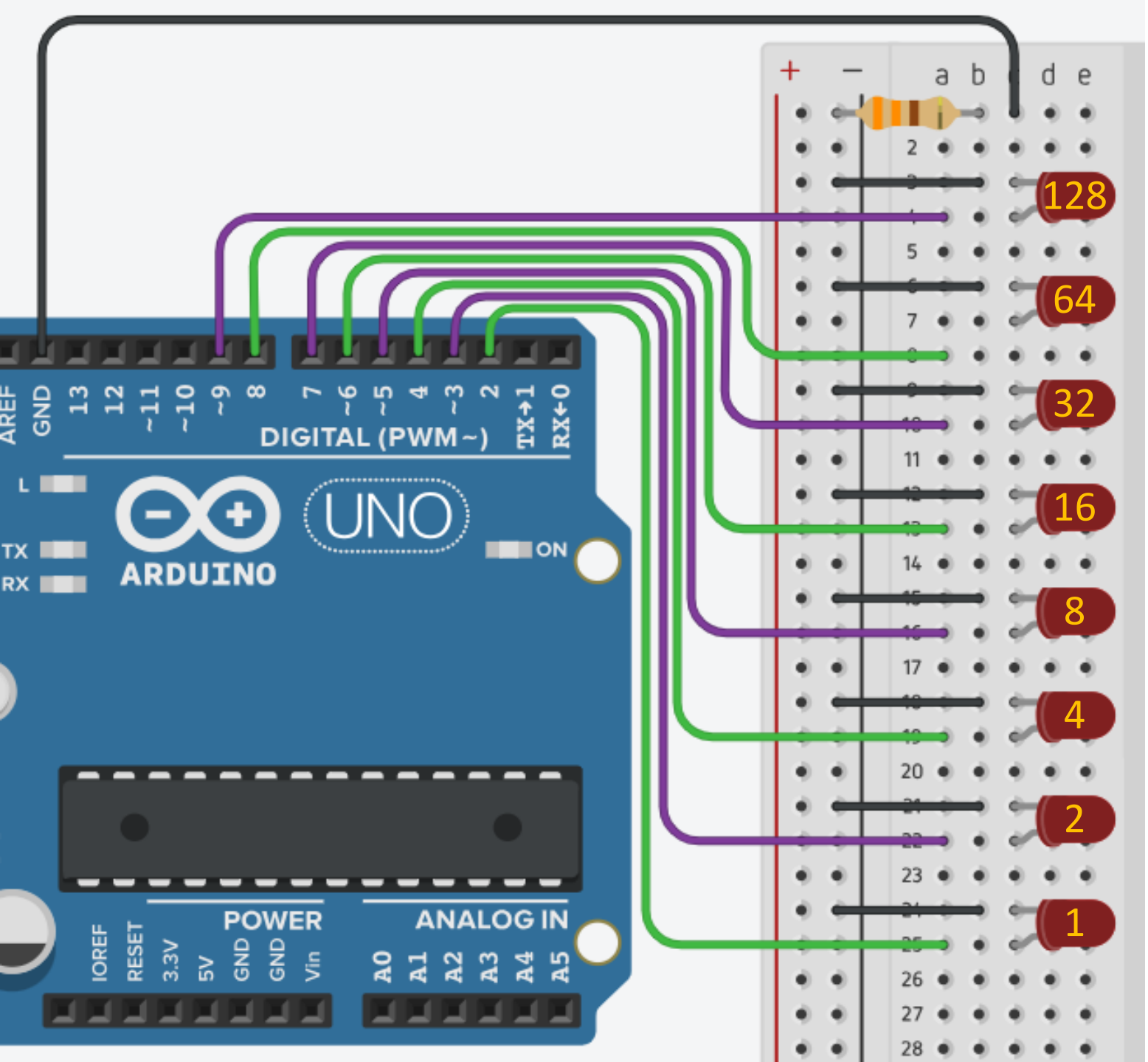


Data Storage and Binary

How is the number 43 stored by a computer/calculator?

43 => 00101011

- Every light bulb represents a bit
- A bit is either ON or OFF
- More bits means bigger numbers
- 1 byte = 8 bits



LED's as Bits

- The minus column is a connection to ground (0V)
- 330 Ohm resistor regulates current
- Every LED is connected to its own digital pin (2-9)
- Pins are turned ON (5V) with code
- Cathode (short leg) connects to Ground
- Cable colors don't matter

Binary Number – Code

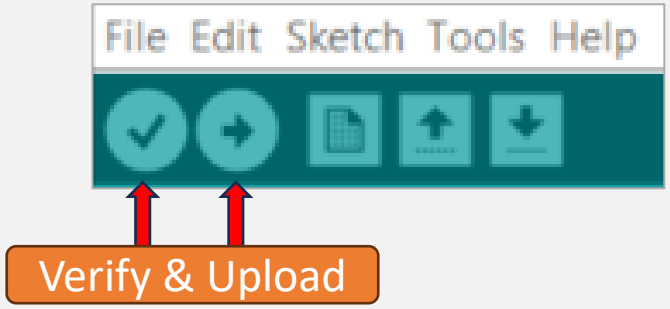
sketch_feb01b §

```
1
2
3 void setup() {
4   // put your setup code here, to run once:
5
6 }
7
8 void loop() {
9   // put your main code here, to run repeatedly:
10
11 }
```

```
1 int oneBit = 2;
2 int twoBit = 3;
3 int fourBit = 4;
```

```
7   pinMode(oneBit, OUTPUT);
8   pinMode(twoBit, OUTPUT);
9   pinMode(fourBit, OUTPUT);
```

```
14  digitalWrite(oneBit, HIGH);
15  digitalWrite(twoBit, HIGH);
16  digitalWrite(fourBit, LOW);
```



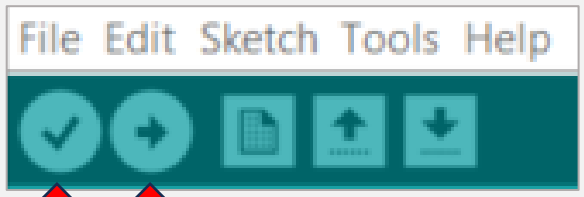
Add remaining bits and display the number 115 with LED's

Binary Number – Code with Functions (1/2)

sketch_feb01b §

```
1
2
3 void setup() {
4   // put your setup code here, to run once:
5
6 }
```

```
1 //Array of pins
2 int pins[] = {2, 3, 4, 5, 6, 7, 8, 9};
```




```
6   for( int i = 0; i < sizeof(pins); i++ )
7   {
8     pinMode( pins[i], OUTPUT );
9   }
10  displayNum( 115 );
11  delay(2000);
12  turnPinsOff();
```

Binary Number – Code with Functions (2/2)

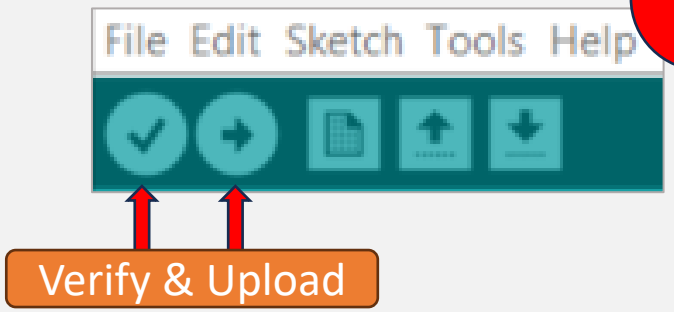
1

```
20 void displayNum( int num )
21 {
22   int i = 0;
23   while( num > 0 )
24   {
25     int rem = num % 2;
26     if( rem == 1 )
27     {
28       digitalWrite( pins[i], HIGH );
29     }
30     num /= 2;
31     i++;
32   }
33 }//end displayNum
```

2

```
35 void turnPinsOff()
36 {
37   for( int i = 0; i < sizeof(pins); i++ )
38   {
39     digitalWrite( pins[i], LOW );
40   }
41 }//end turnPinsOff
```

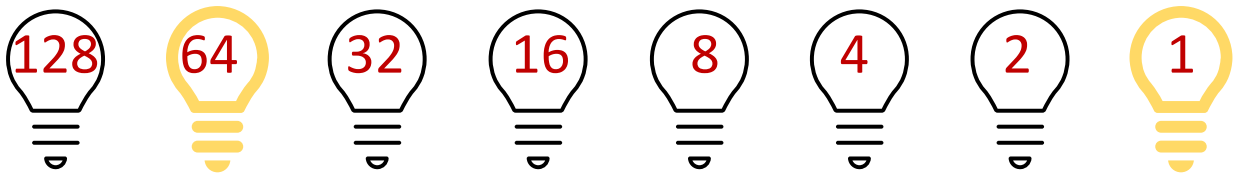
3



ASCII Table

Capital ‘A’ is encoded to the number 65.

‘A’ => 65 => 01000001



Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
65	41	101	A	A	97	61	141	a	a
66	42	102	B	B	98	62	142	b	b
67	43	103	C	C	99	63	143	c	c
68	44	104	D	D	100	64	144	d	d
69	45	105	E	E	101	65	145	e	e
70	46	106	F	F	102	66	146	f	f
71	47	107	G	G	103	67	147	g	g
72	48	110	H	H	104	68	150	h	h
73	49	111	I	I	105	69	151	i	i
74	4A	112	J	J	106	6A	152	j	j
75	4B	113	K	K	107	6B	153	k	k
76	4C	114	L	L	108	6C	154	l	l
77	4D	115	M	M	109	6D	155	m	m
78	4E	116	N	N	110	6E	156	n	n
79	4F	117	O	O	111	6F	157	o	o
80	50	120	P	P	112	70	160	p	p
81	51	121	Q	Q	113	71	161	q	q
82	52	122	R	R	114	72	162	r	r
83	53	123	S	S	115	73	163	s	s
84	54	124	T	T	116	74	164	t	t
85	55	125	U	U	117	75	165	u	u
86	56	126	V	V	118	76	166	v	v
87	57	127	W	W	119	77	167	w	w
88	58	130	X	X	120	78	170	x	x
89	59	131	Y	Y	121	79	171	y	y
90	5A	132	Z	Z	122	7A	172	z	z