

What the \$~#!*+ are electronics ?

Prepared by:

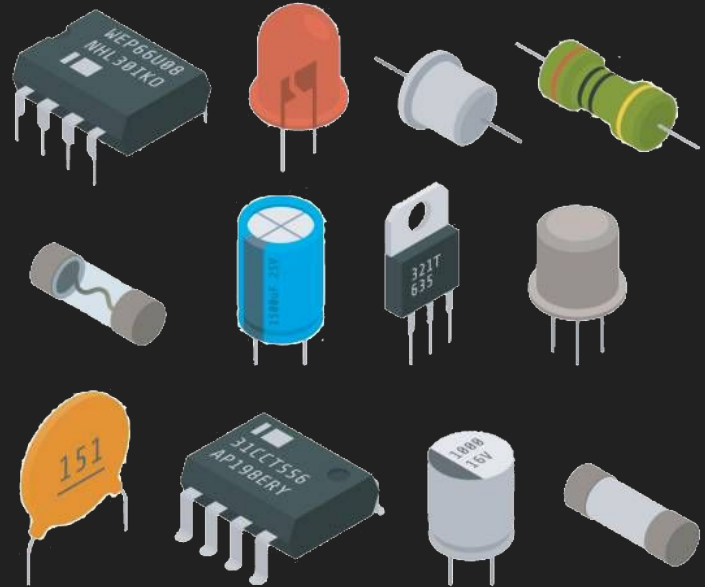
Radhi SGHAIER, github.com/Rad-hi

Hafedh BOUGHDIRI, github.com/B-hafedh



Context, and today's **four** questions !

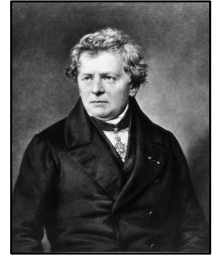
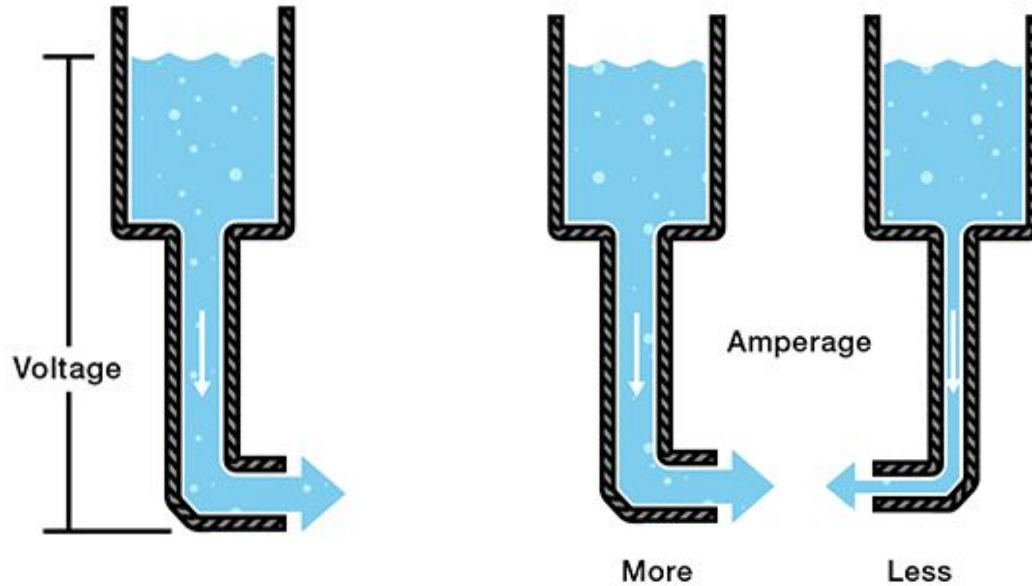
- What's the difference between I & V ?
- What are the 3 most important electronic components ?
- What the hell is digital logic ?
- How is digital logic shaping our life ?



1

What's the difference between Current & Voltage ?

1- I (Amp) vs V (Volt)



Additional resources (videos, reading)

Def of voltage & current: https://www.youtube.com/watch?v=iyG9_UFJVoI

Les sources du courant :

https://www.youtube.com/watch?v=d6BVTu_hMJs&list=PLjS13O8ZcTgZpoGv5QAMoHt4be6glcjJU&index=1&t=93s

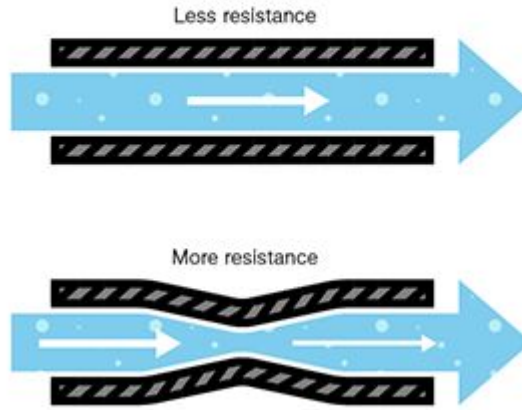
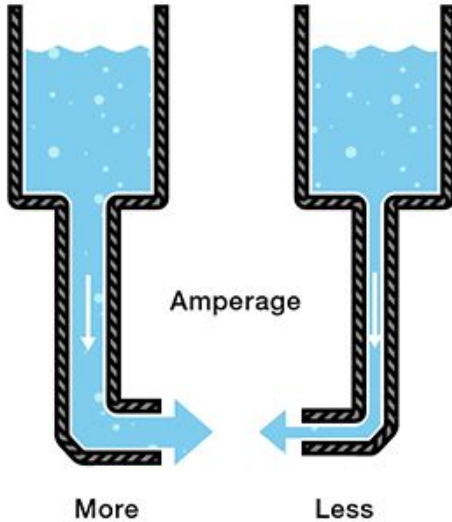
Voltage, Current, Resistance, and Ohm's Law:

<https://learn.sparkfun.com/tutorials/voltage-current-resistance-and-ohms-law>

2

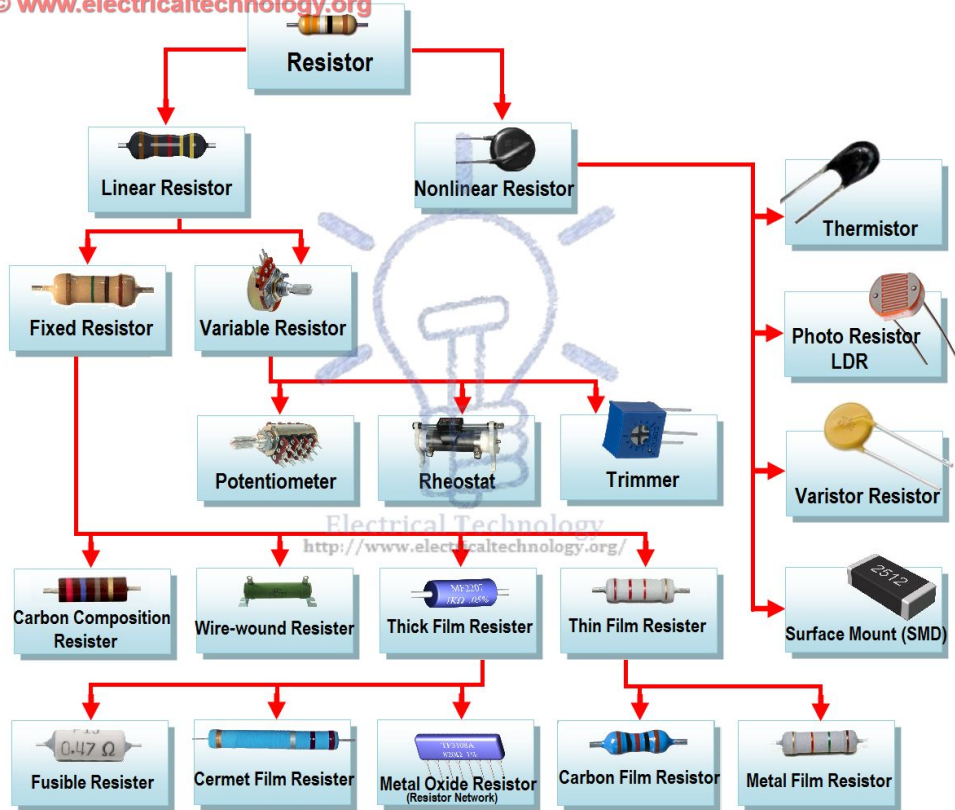
What are the 3 most important electronic components ?

2- The Big Three: **R**LC



2- The Big Three: RLC

© www.electricaltechnology.org



How to Read Resistor Color Codes

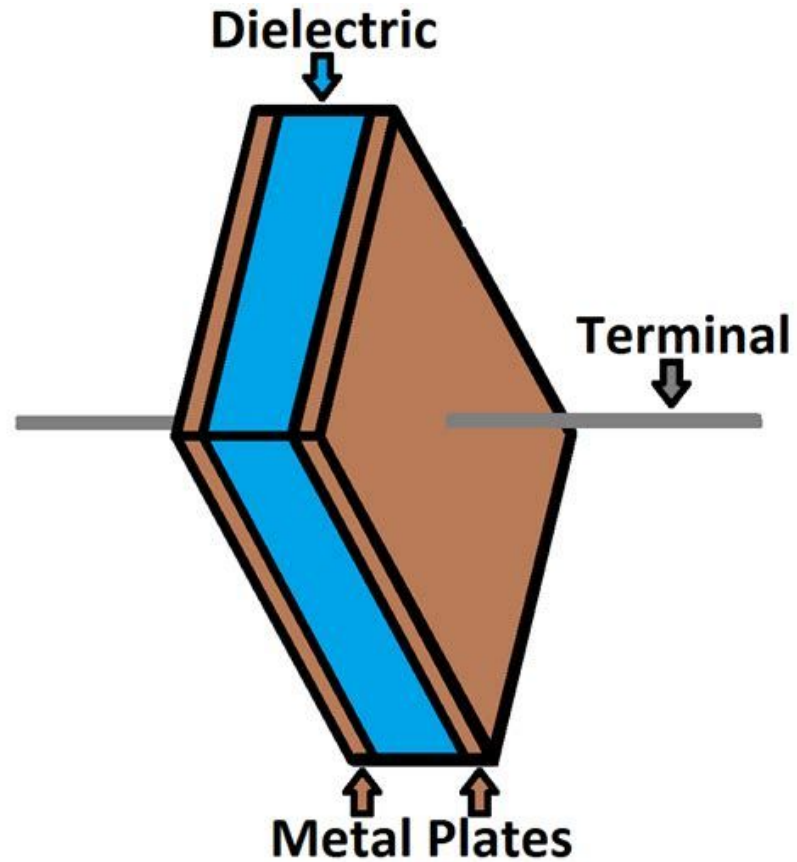
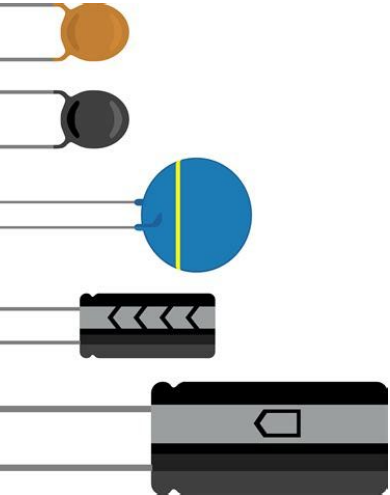
6-Band = $274 \Omega \pm 2\%$, 250 ppm/K

Color	1st Digit	2nd Digit	3rd Digit	Multiplier	Tolerance	Temperature Coefficient
Black	0	0	0	1 Ω		250 ppm/K
Brown	1	1	1	10 Ω	$\pm 1\%$	100 ppm/K
Red	2	2	2	100 Ω	$\pm 2\%$	50 ppm/K
Orange	3	3	3	1k Ω		15 ppm/K
Yellow	4	4	4	10k Ω		25 ppm/K
Green	5	5	5	100k Ω	$\pm 0.5\%$	20 ppm/K
Blue	6	6	6	1M Ω	$\pm 0.25\%$	10 ppm/K
Violet	7	7	7		$\pm 0.1\%$	5 ppm/K
Grey	8	8	8			1 ppm/K
White	9	9	9			
Gold				0.1 Ω	$\pm 5\%$	
Silver				0.01 Ω	$\pm 10\%$	

4-Band = $12 \times 10^5 \pm 5\%$ = 1,200 k $\Omega \pm 5\%$

5-Band = $100 \times 10^2 \pm 1\%$ = 10,000 $\Omega \pm 1\%$

2- The Big Three: RLC



2- The Big Three: RLC

1- <https://www.youtube.com/watch?v=WytU5uj78-4>

2- <https://www.youtube.com/watch?v=rbCXKhhzBN0&t=375s>

Examples of Capacitor Package, Lead, and Mounting Styles

Tantalum



Aluminum



Ceramic



Trimmer



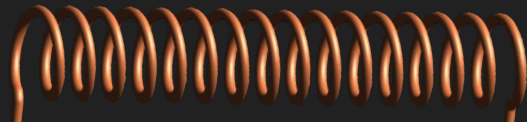
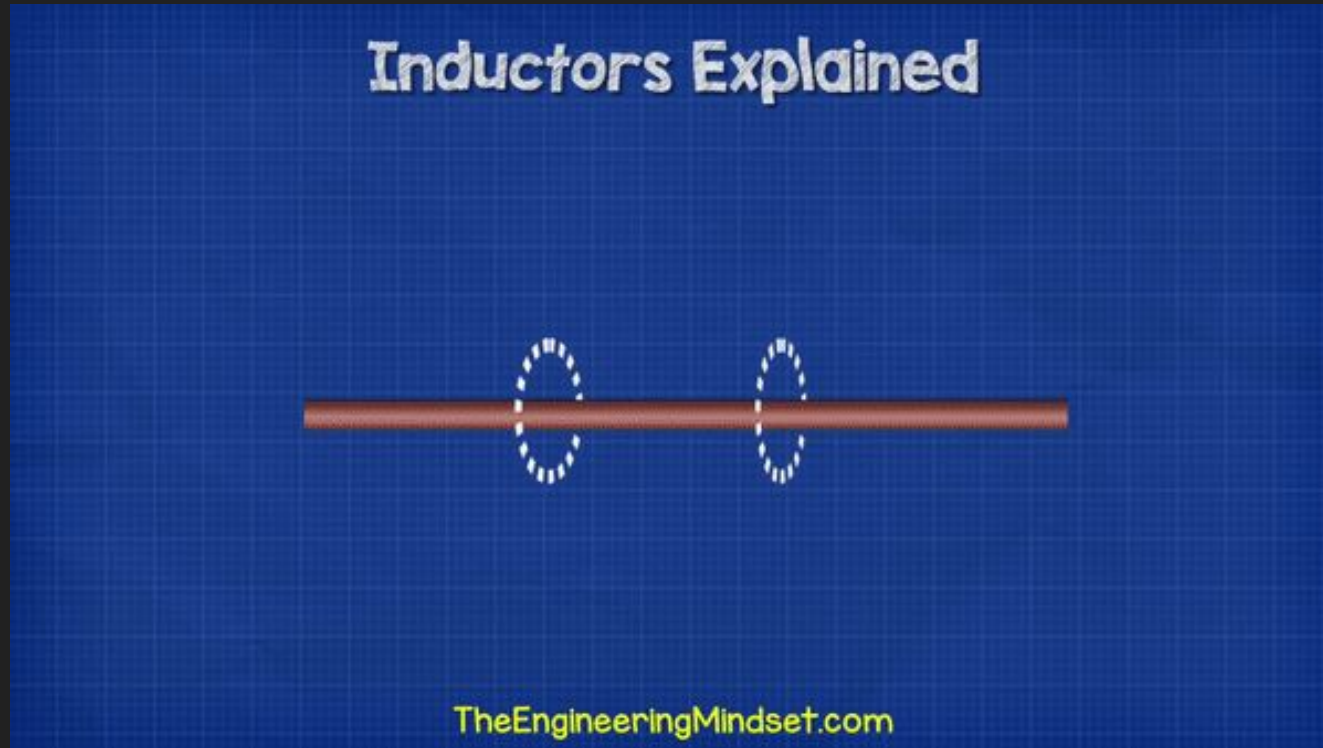
Thin Film



All examples provided by Vishay
website www.vishay.com

Compilation by
www.RFCafe.com

2- The Big Three: RLC



2- The Big Three: RLC

1-
<https://www.youtube.com/watch?v=hZxD1hwntqY&t=211s>

2-
<https://www.youtube.com/watch?v=KSylo01n5FY&t=342s>

3-
<https://www.youtube.com/watch?v=kdrP9WbJlb8&t=315s>



2- And their little brother: **The Diode**

AC/DC



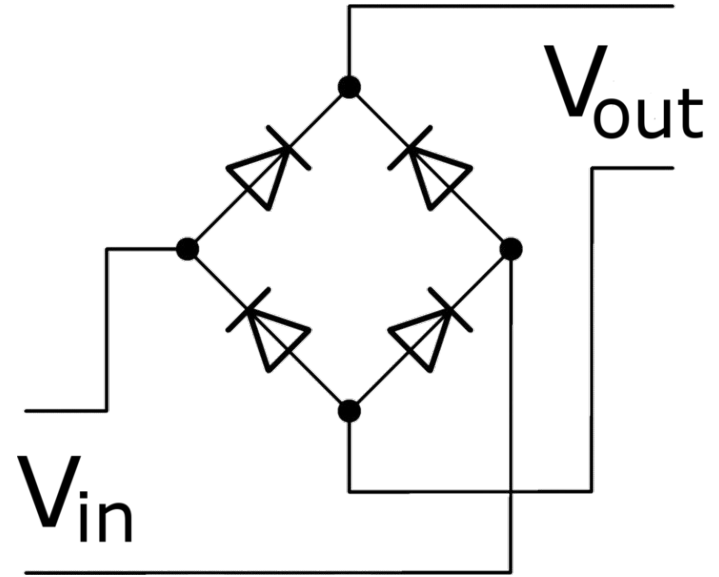
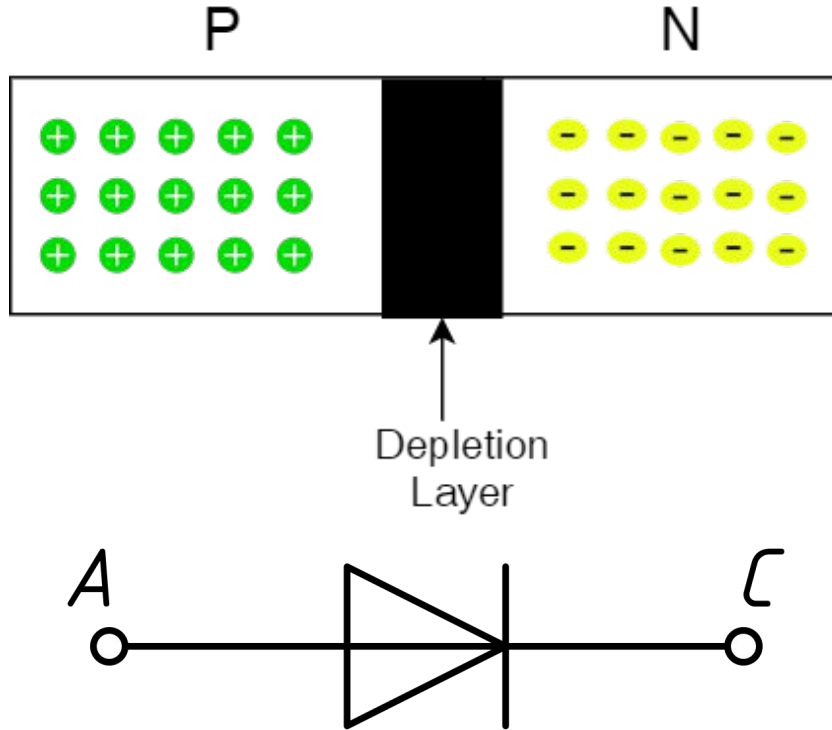
2- And their little brother: **The Diode**

Why use AC at homes: <https://www.youtube.com/watch?v=S7C5sSde9e4>

Des volts pour aller plus loin :

[https://www.youtube.com/watch?v=Vp_XUi22fTI&list=PLjS13O8ZcTgZpoGv5QAMoHt4be6qIcjJU
&index=7](https://www.youtube.com/watch?v=Vp_XUi22fTI&list=PLjS13O8ZcTgZpoGv5QAMoHt4be6qIcjJU&index=7)

2- And their little brother: **The Diode**



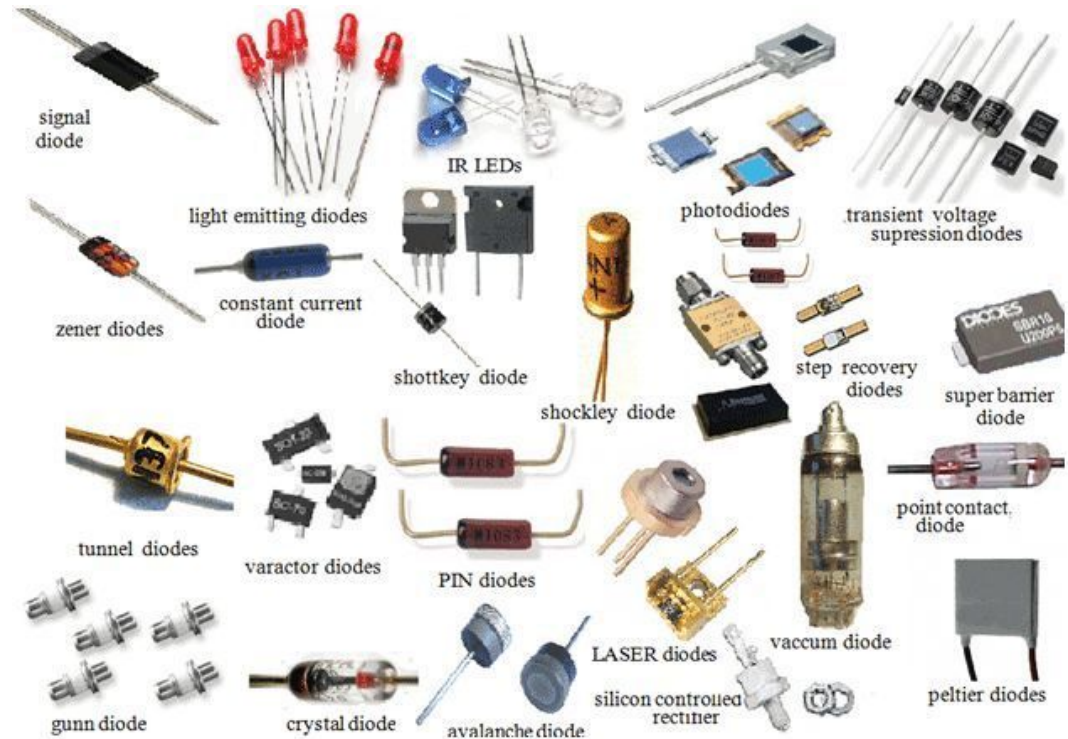
2- And their little brother: **The Diode**

Diodes:

<https://www.youtube.com/watch?v=JNi6WY7WKA>

Full bridge rectifiers:

<https://www.youtube.com/watch?v=sI5Ftm1-jik&t=29s>



Types of Diode

3

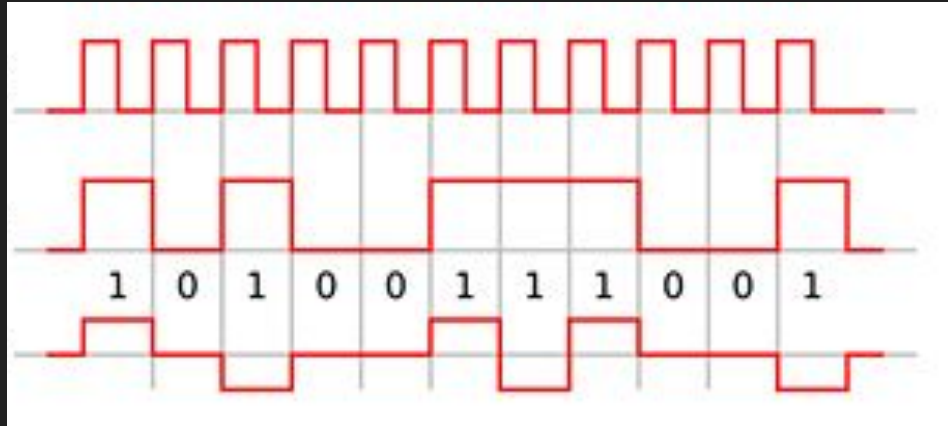
What the hell is digital logic ?

3- Signals: Digital vs Analog

Analog



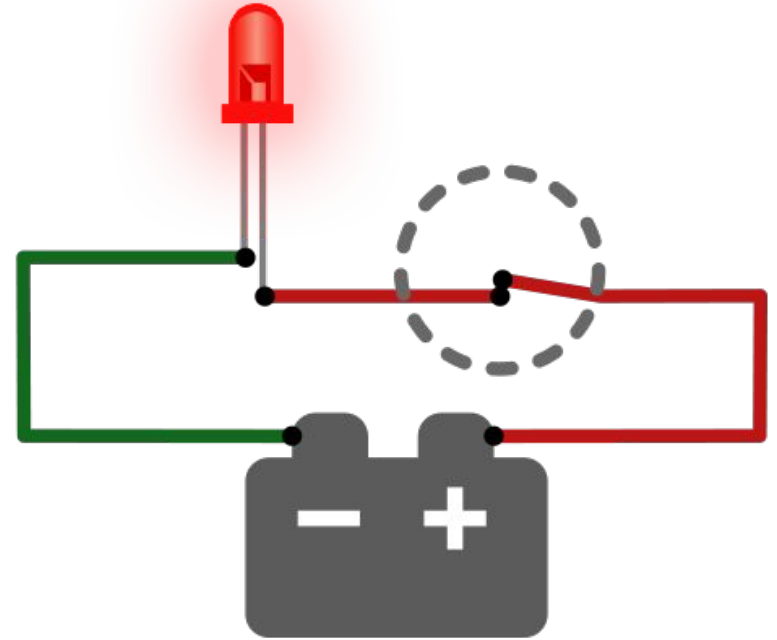
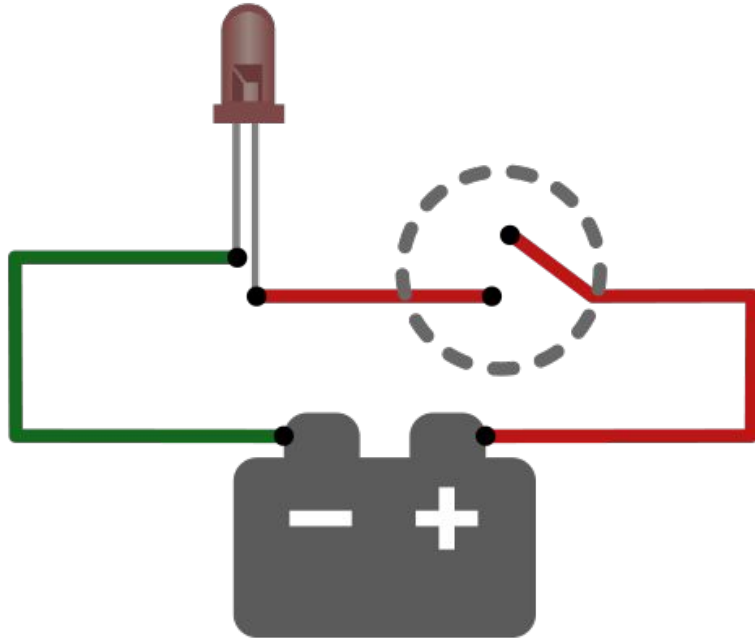
Digital



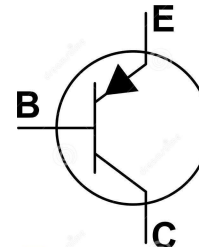
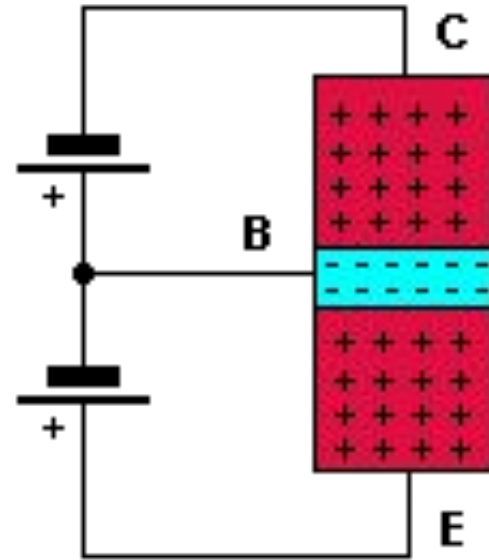
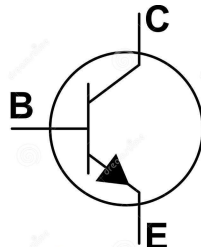
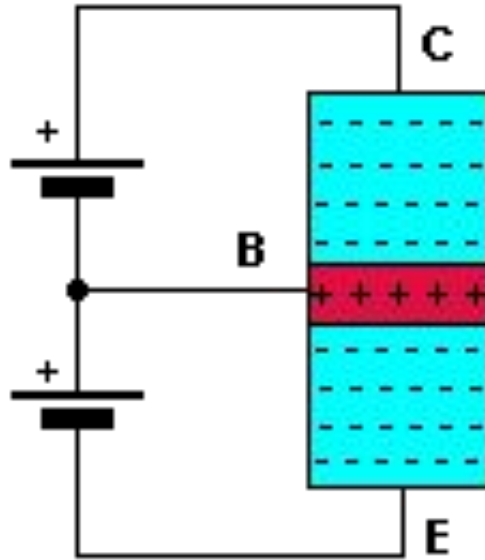
3- Machine language: High/Low, and Binary



3- Circuits: **From mechanical to electrical !**



3- Circuits: From mechanical to electrical !



3- Circuits: From mechanical to electrical !

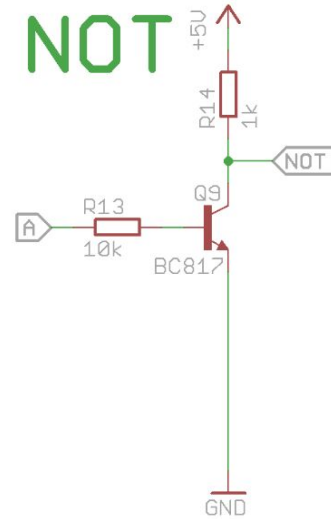
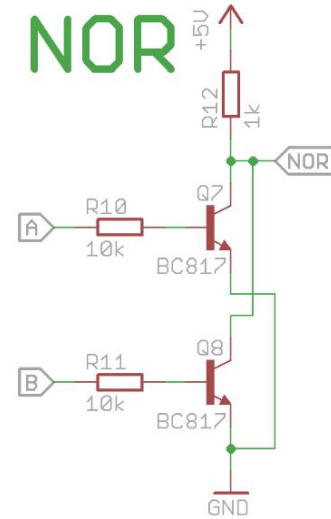
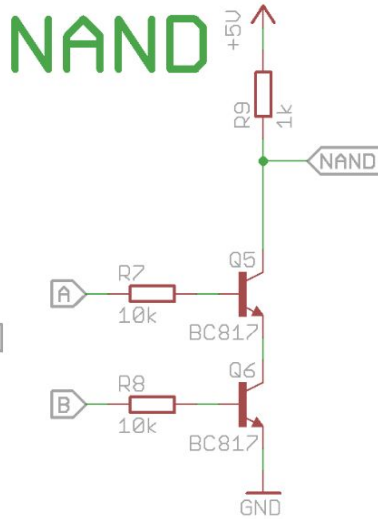
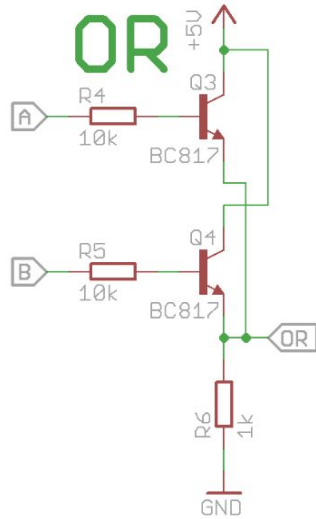
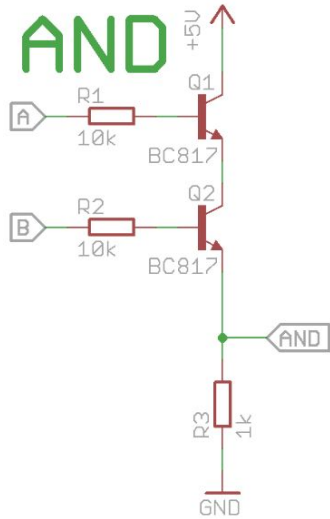


Transistors:

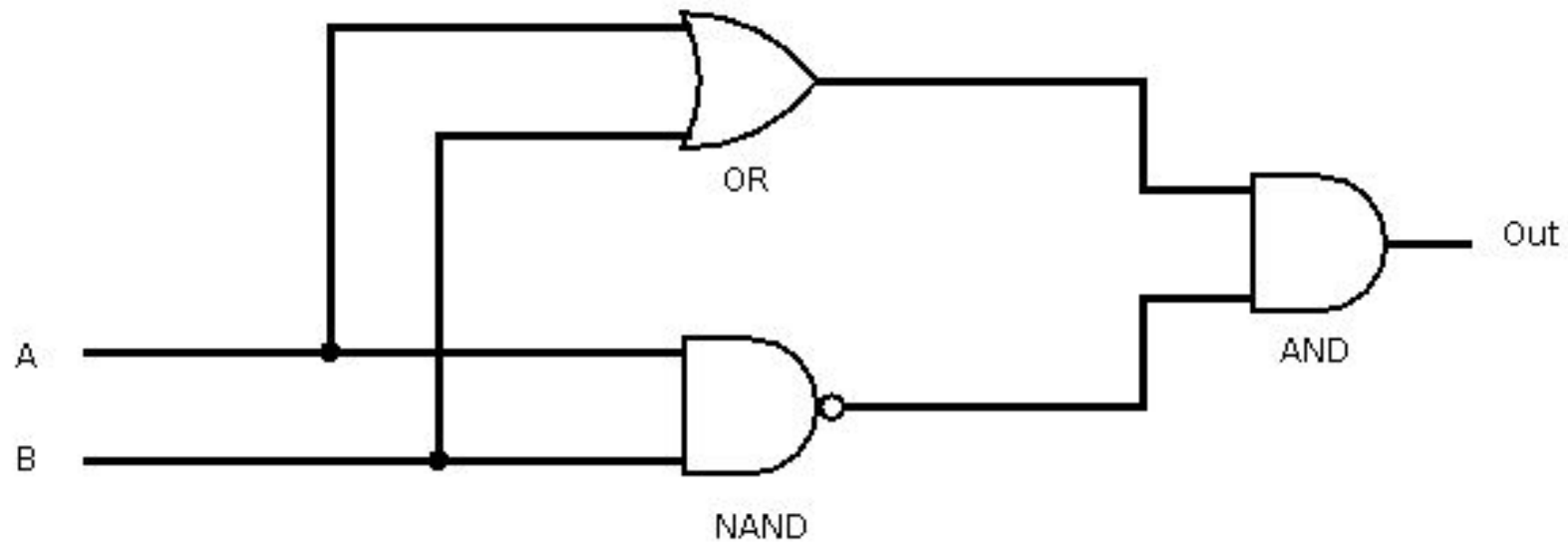
- <https://www.youtube.com/watch?v=7ukDKVHnac4&t=306s>
- <https://www.youtube.com/watch?v=IcrBqCFLHIY>

MOSFETS: <https://www.youtube.com/watch?v=stM8dqcY1CA>

3- Logic gates: **AND** - **OR** - **NAND** - **NOR** - **NOT**



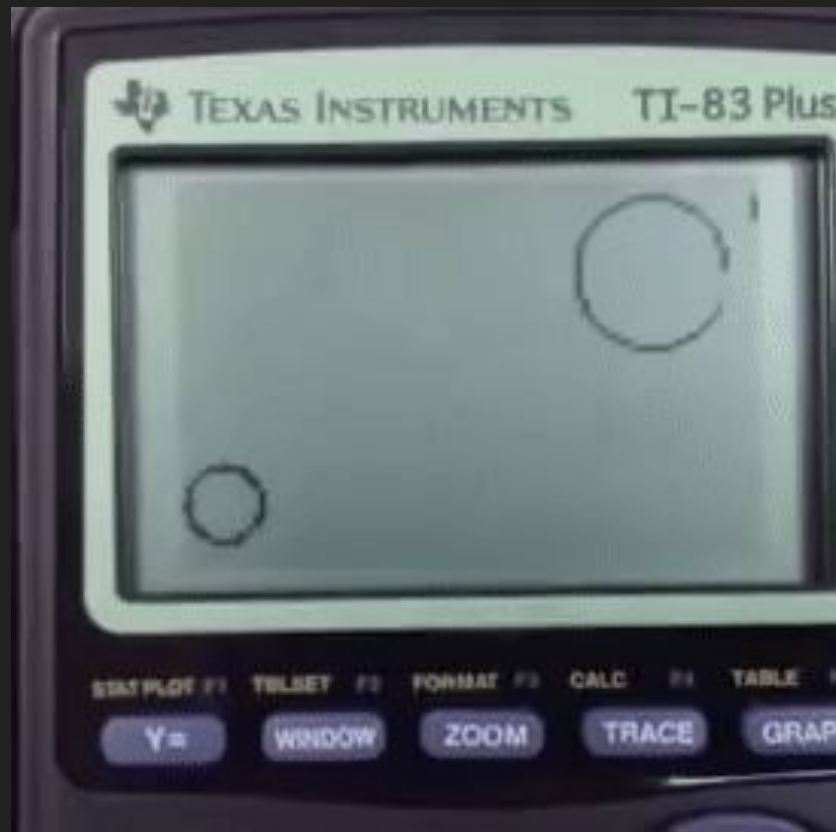
3- Logic gates: XOR



4

How is digital logic shaping our life ?

4- Computers: **They compute!**



4- Computers: The ALU

Three binary addition examples illustrating XOR logic:

$$\begin{array}{r} 0 \\ +0 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ +0 \\ \hline 1 \end{array} \quad \begin{array}{r} 0 \\ +1 \\ \hline 1 \end{array}$$

BOOLEAN LOGIC TABLE FOR XOR

A logic diagram showing an XOR gate with inputs A and B, and output SUM.

INPUTS		OUTPUTS
A	B	SUM
0	0	0
0	1	1
1	0	1

4- Computers: The ALU

Four binary addition examples are shown:

$$\begin{array}{r} 0 \\ +0 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ +0 \\ \hline 1 \end{array} \quad \begin{array}{r} 0 \\ +1 \\ \hline 1 \end{array} \quad \begin{array}{r} 1 \\ +1 \\ \hline 10 \end{array}$$

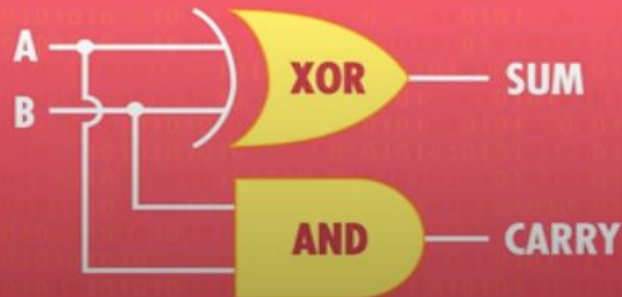
BOOLEAN LOGIC TABLE FOR XOR

A logic diagram shows two inputs, A and B, entering an XOR gate. The output of the gate is labeled SUM.

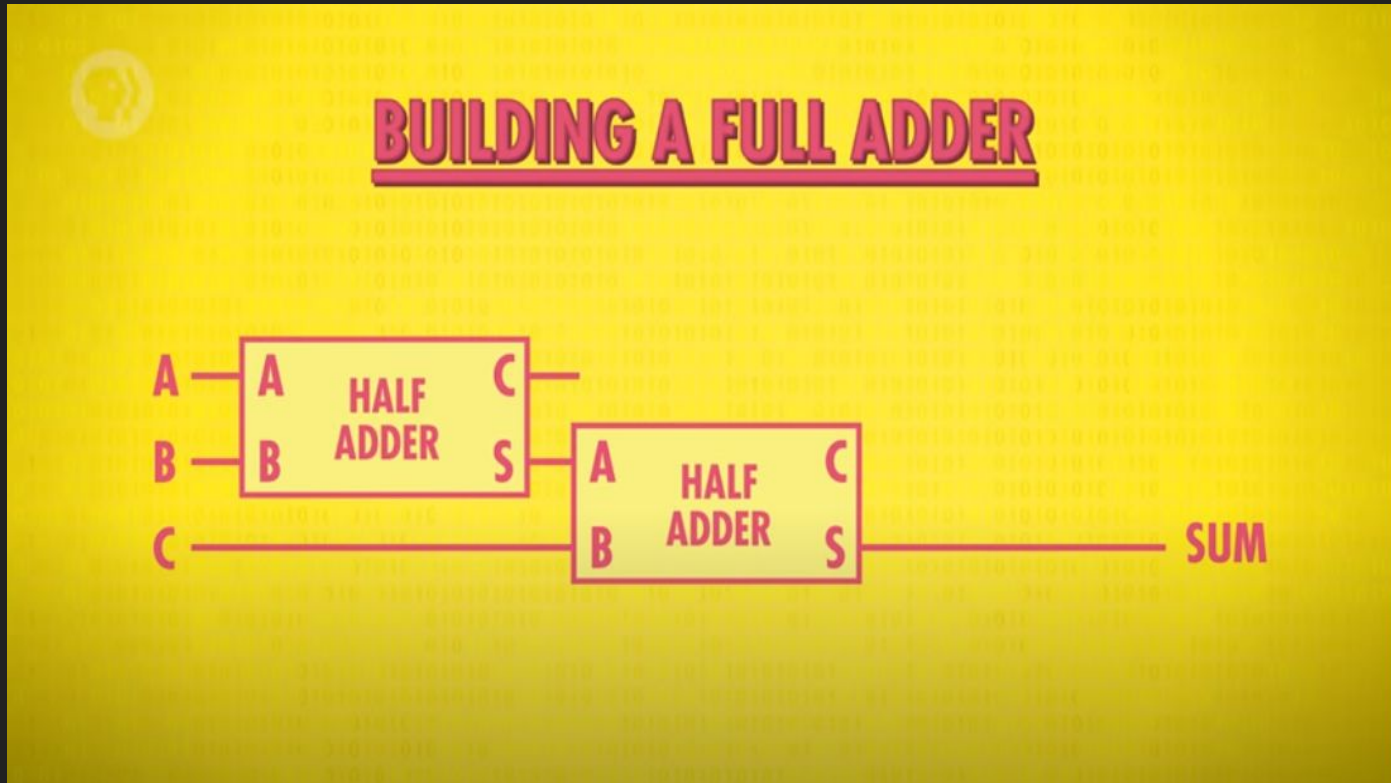
INPUTS		OUTPUTS
A	B	SUM
0	0	0
0	1	1
1	0	1
1	1	0

4- Computers: The ALU

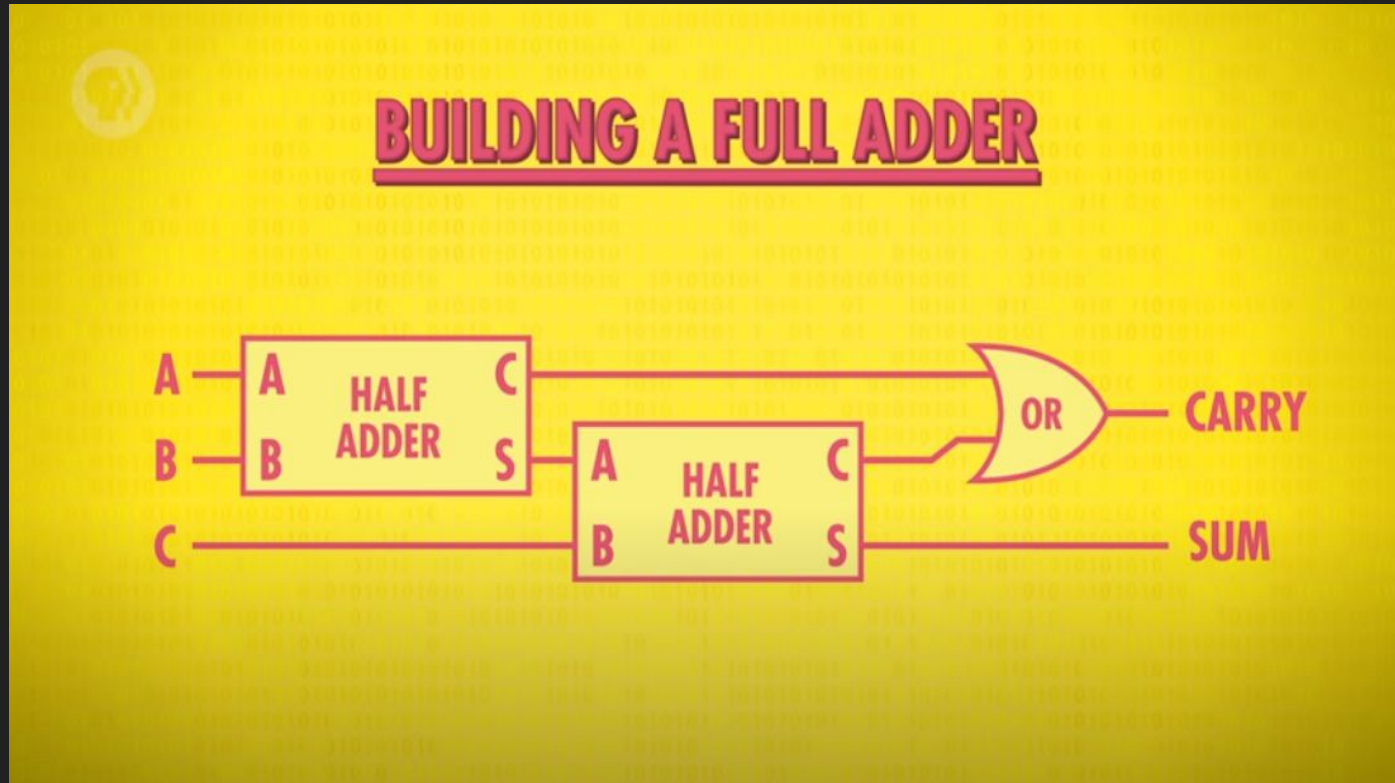
INPUTS		OUTPUTS	
A	B	CARRY	SUM
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0



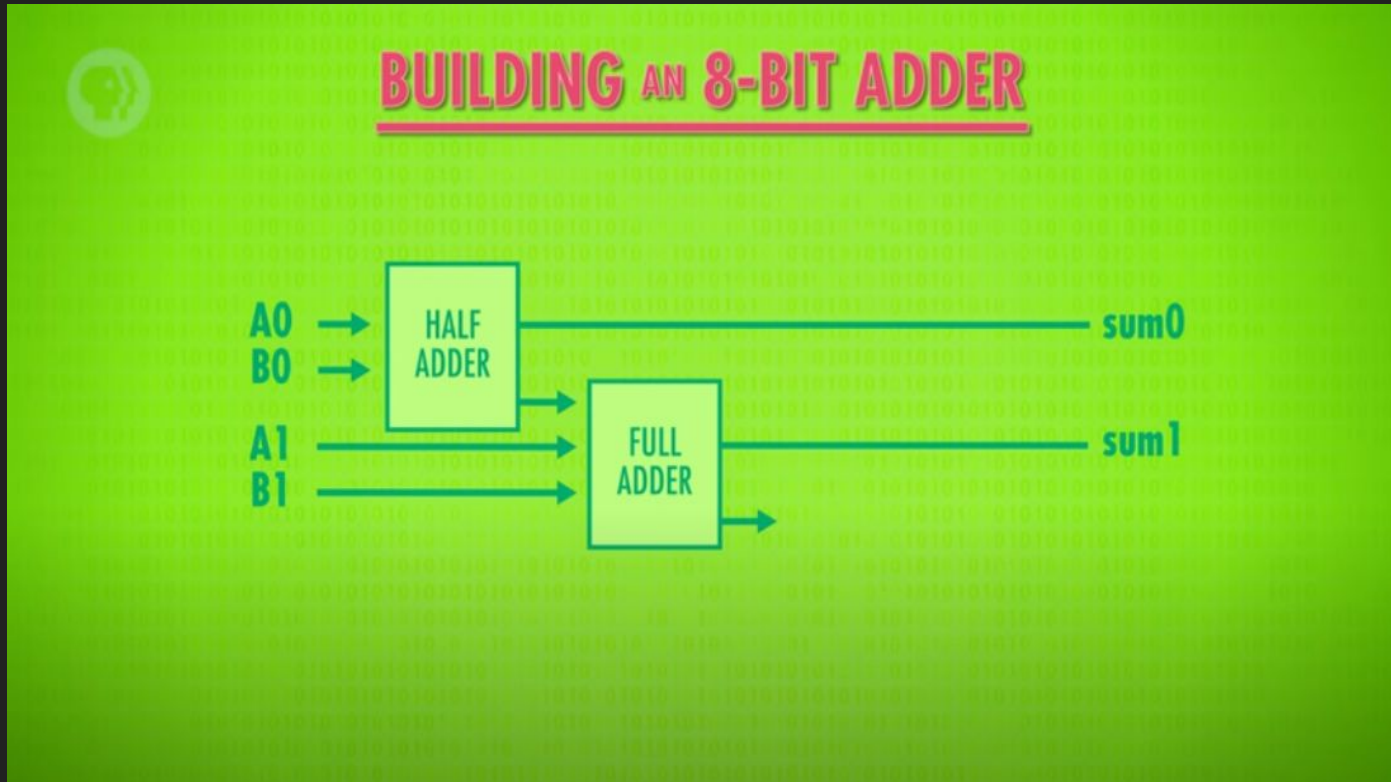
4- Computers: The ALU



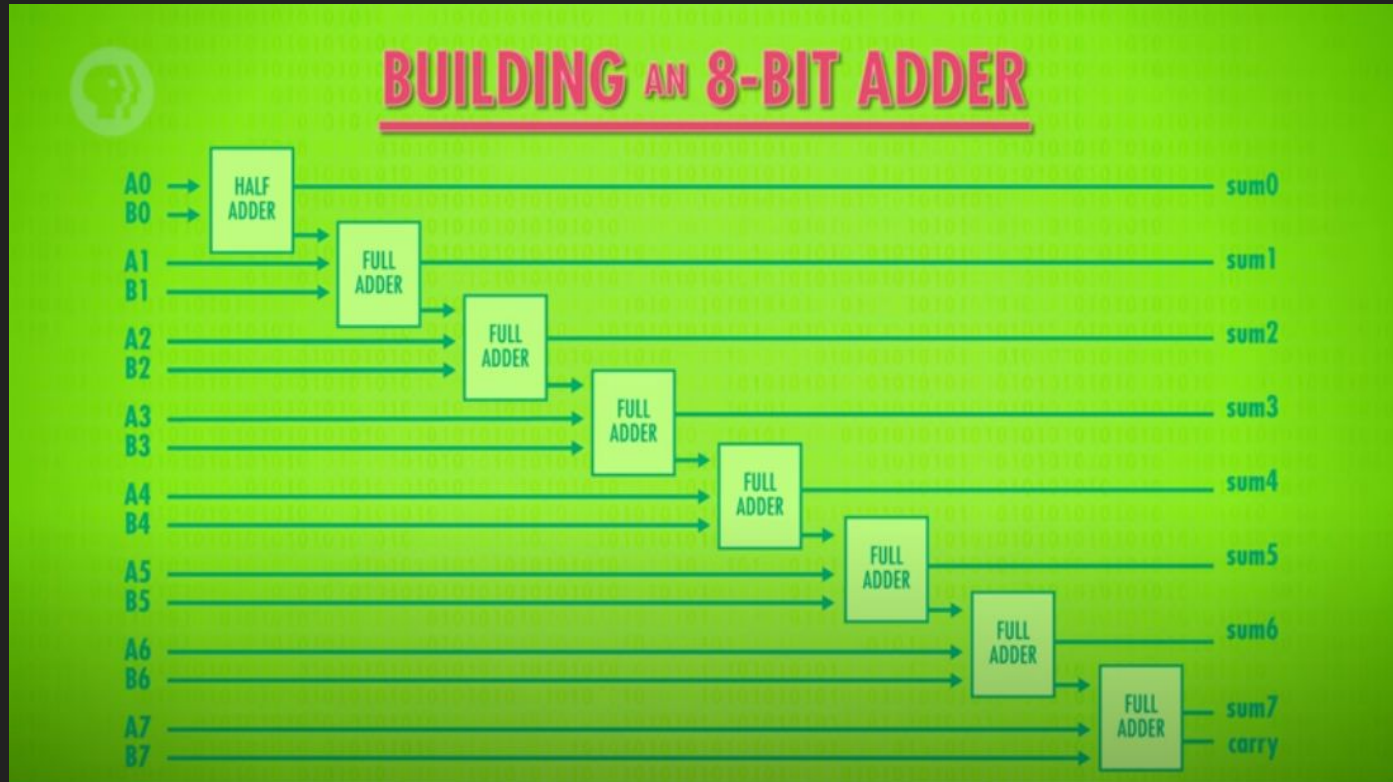
4- Computers: The ALU



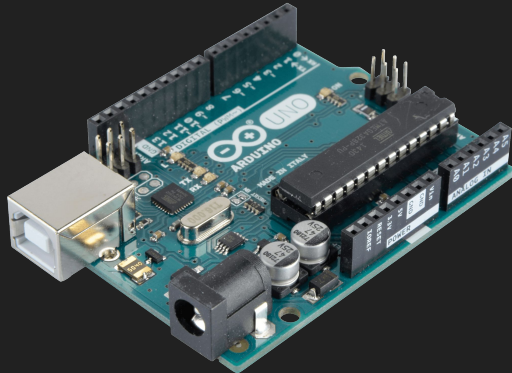
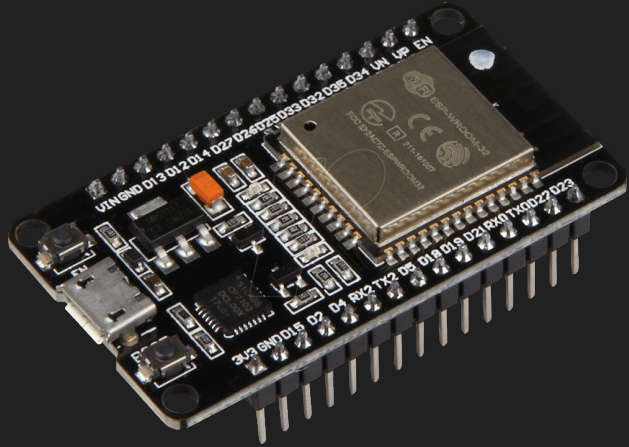
4- Computers: The ALU



4- Computers: The ALU



4- Computers: The full picture



Next up, **Playlists to watch!**

Electronics basics:

<https://www.youtube.com/watch?v=poWJTSV4Yio&list=PLowKtXNTBypETld5oX1ZMI-LYoA2LWi8D>

Voyage en électricité :

<https://www.youtube.com/playlist?list=PLjS13O8ZcTgZpoGv5QAMoHt4be6gIcJjU>

Digital logic, the full picture:

<https://www.youtube.com/watch?v=HyznrdDSSGM&list=PLowKtXNTBypGqImE405J2565dvjafqIHU>

Computer science fundamentals:

<https://www.youtube.com/watch?v=tplctyqH29Q&list=PLH2l6uzC4UEW0s7-KewFLBC1D0l6XRfye>

Thank you for your attention