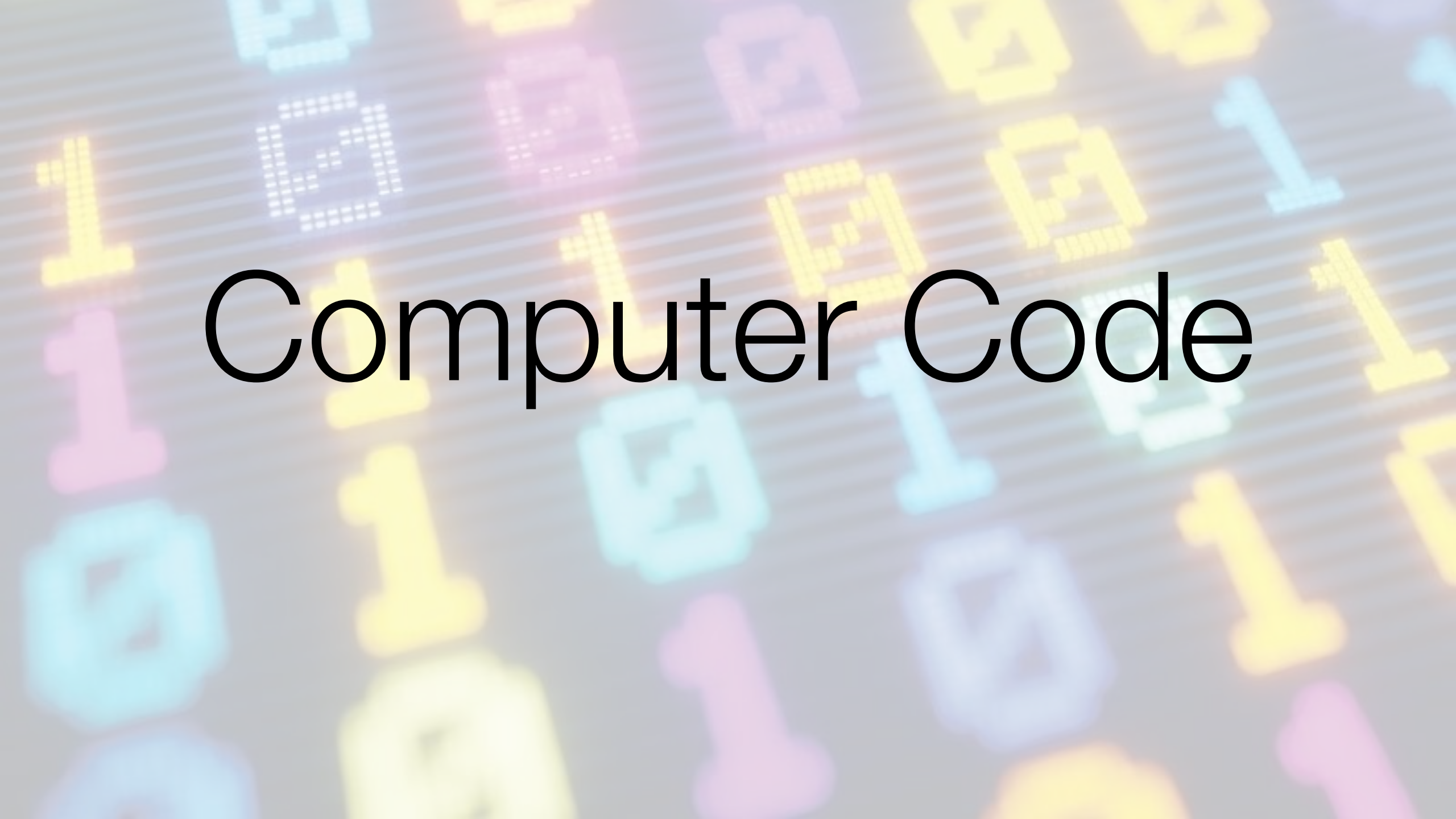
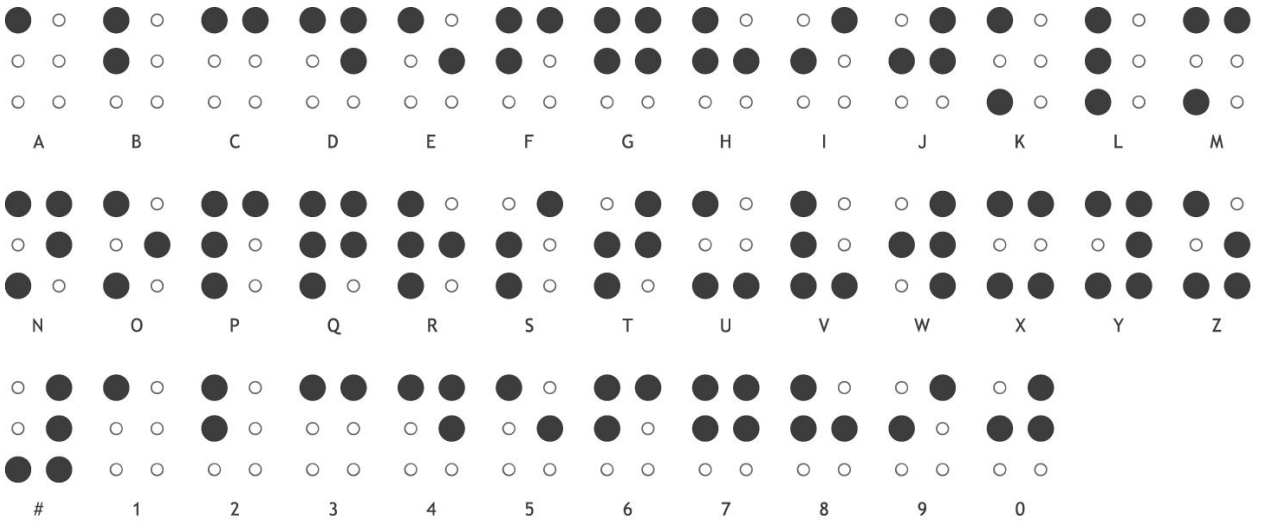

Computer Code

Use of Codes

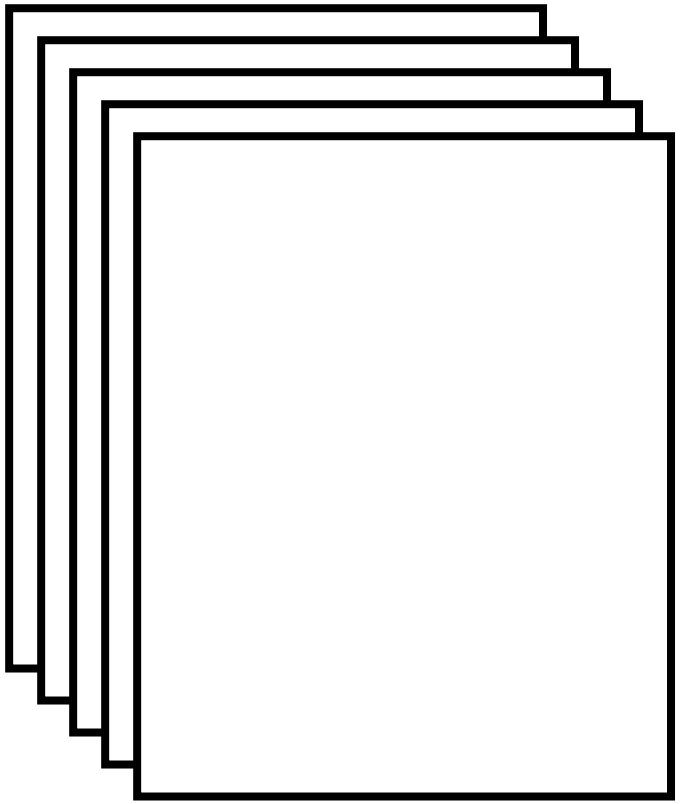
A ●−	J ●−−−	S ●●●
B −●●●	K −●−	T −
C −●−●	L ●−●●	U ●●−
D −●●	M −−	V ●●●−
E ●	N −●	W ●−−
F ●●−●	O −−−	X −●●−
G −−●	P ●−−●	Y −●−−
H ●●●●	Q −−●−	Z −−●●
I ●●	R ●−●	



What types of code do computers use?

https://commons.wikimedia.org/wiki/File:Evolution_of_computers.png

Source code is written using a human-readable programming language



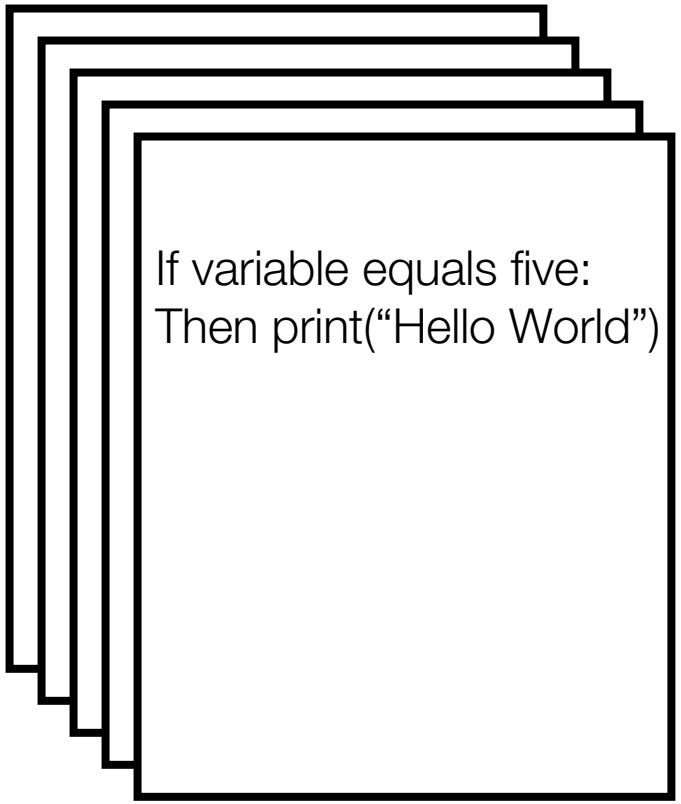
- Python
- C++
- R
- Java
- HTML
- Perl
- Ruby
- Scratch
- **Ozoblockly**

Just like English can be translated to Spanish…

Hi! How are you? ¡Hola! ¿Como estás?

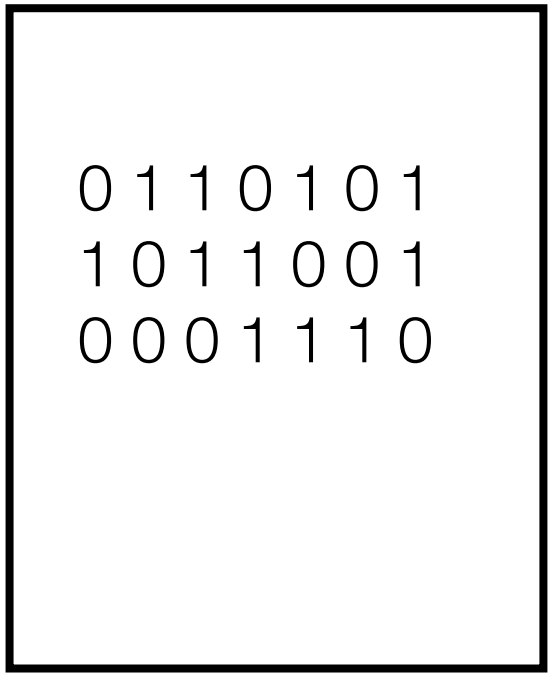
Translation

…Source code is translated to machine code



Source code

Translation

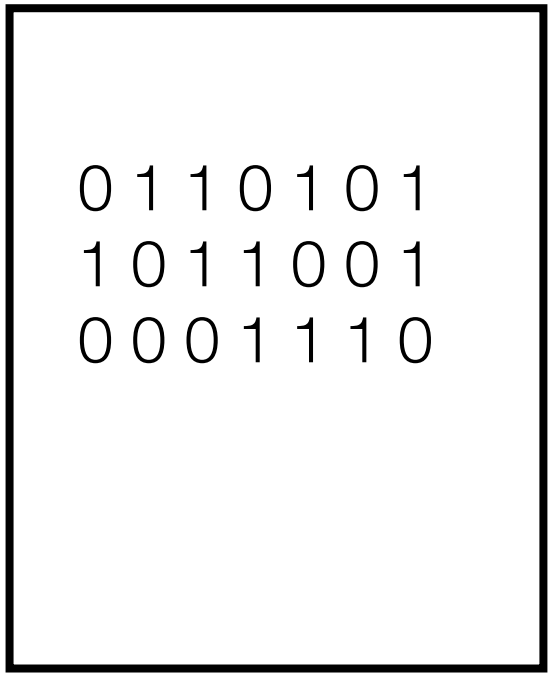


Machine code

https://medium.com/basecs/a-deeper-inspection-into-compilation-and-interpretation-d98952ebc842

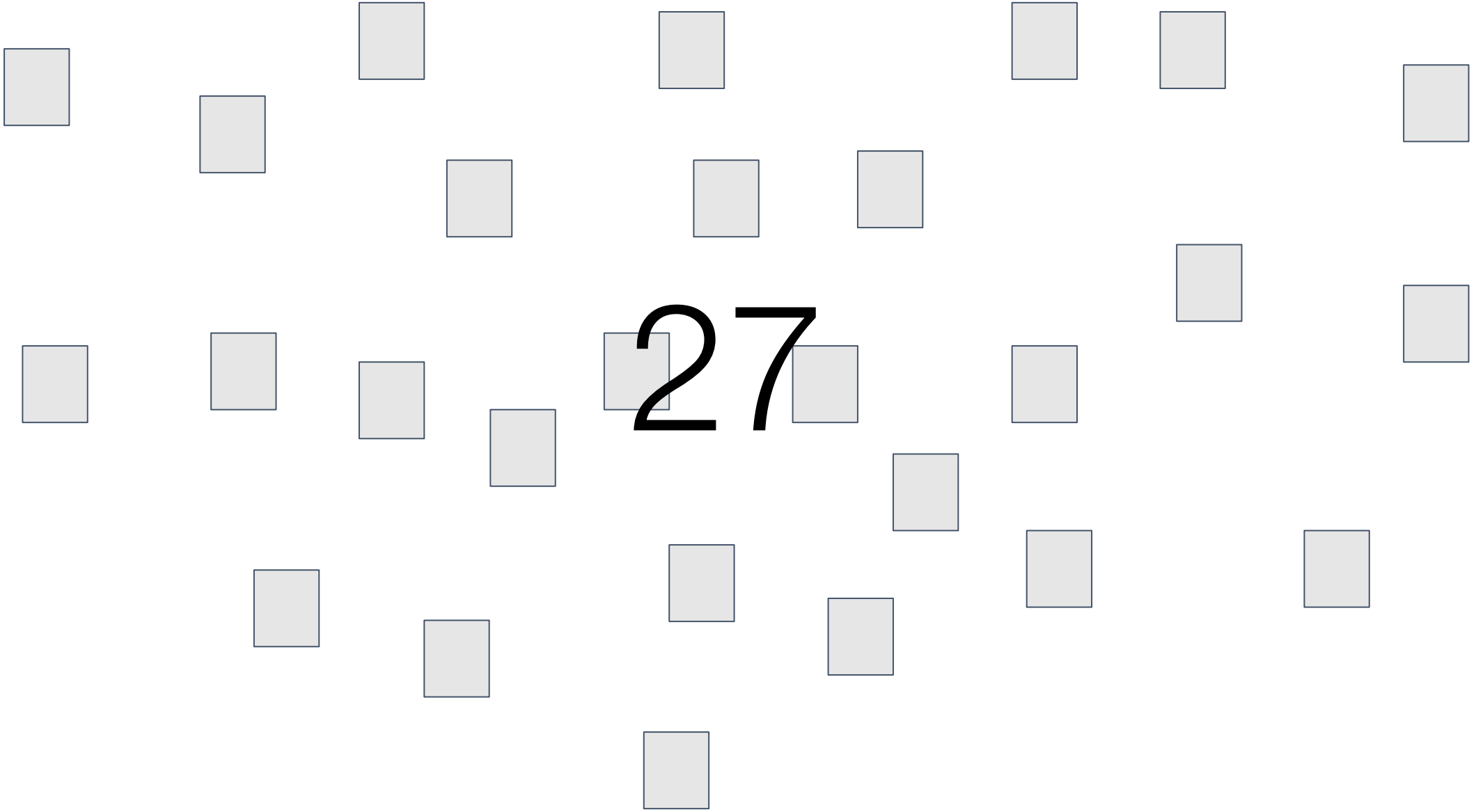
Machine code is also called **binary code**

- A language made entirely of 0 and 1
- Run by the central processing unit (CPU)
- Binary is a system of numerical notation using only 0 and 1
  - Binary arithmetic uses base 2, we usually use base 10



Machine code

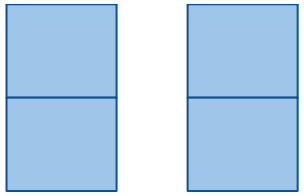
Counting in binary!


27

Base 10

2	7
10^1	10^0
10	1

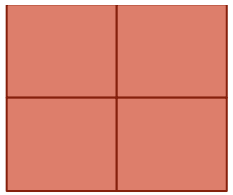
$$10x2 + 1x7 = \underline{27}$$



Base 5

1	0	2
5^2	5^1	5^0
25	5	1

$$25x1 + 5x0 + 1x2 = \underline{27}$$



Base 2

1	1	0	1	1
2^4	2^3	2^2	2^1	2^0
16	8	4	2	1

$$16x1 + 8x1 + 4x0 + 2x1 + 1x1 = \underline{27}$$

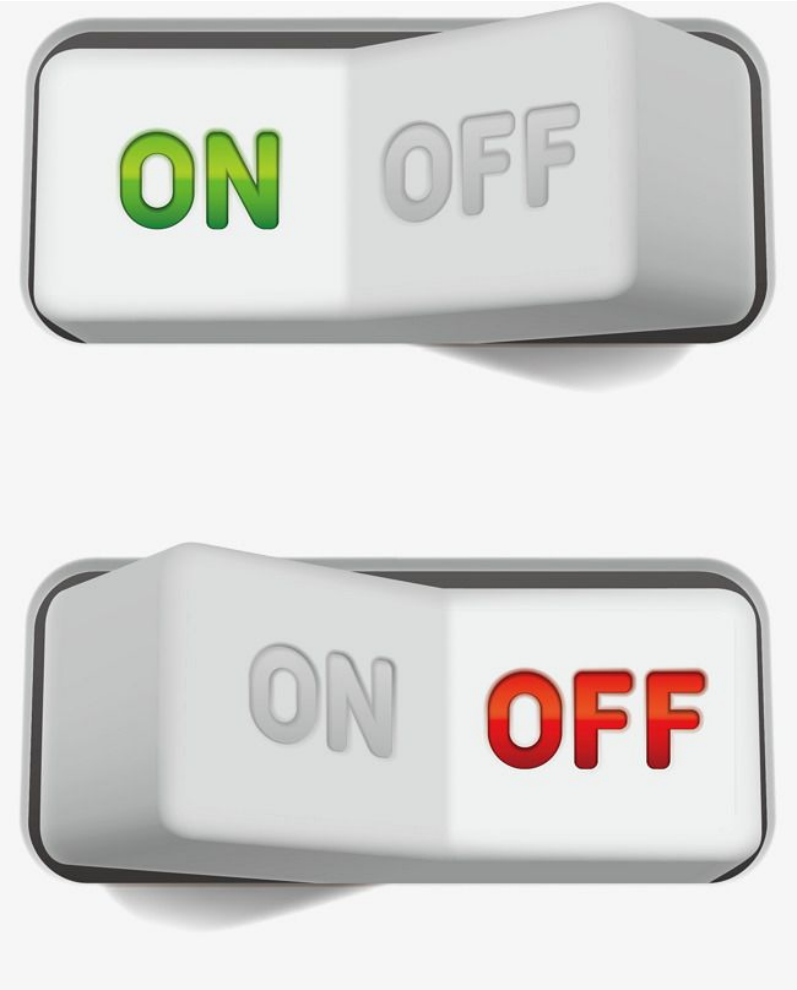
How to count in binary (base 2)

2^4	2^3	2^2	2^1	2^0	
16	8	4	2	1	
0	0	0	0	0	0 0

Boolean: binary variable with two possible values

1

0



TRUE

FALSE

Statement	Binary notation	Boolean notation
The sky is blue	1	TRUE
The Earth is flat	0	FALSE

```
If you like the color pink:
  Put your thumb up

 Else:
   Put your thumb down
```

```
If you like chocolate:
  Put your thumb up

 Else:
   Put your thumb down
```

```
If you were born in Michigan:
  Put your thumb up

 Else:
   Put your thumb down
```

```
If you like dogs:
  Raise your right hand

Else if you like cats:
  Raise your left hand

Else:
  Keep your hands down
```

```
If you like to read:
  Raise your right hand

Else if you like to watch tv:
  Raise your left hand

Else:
  Keep your hands down
```

Conditional statement

```
If something is TRUE:
   Then do something
Else if something is TRUE:
   Then do something
Else:
   Do something
```

Let’s get coding!

We write **algorithms** with **source code** to make the computer do what we want

- An algorithm is like a recipe
- A process or set of instructions for the CPU to follow

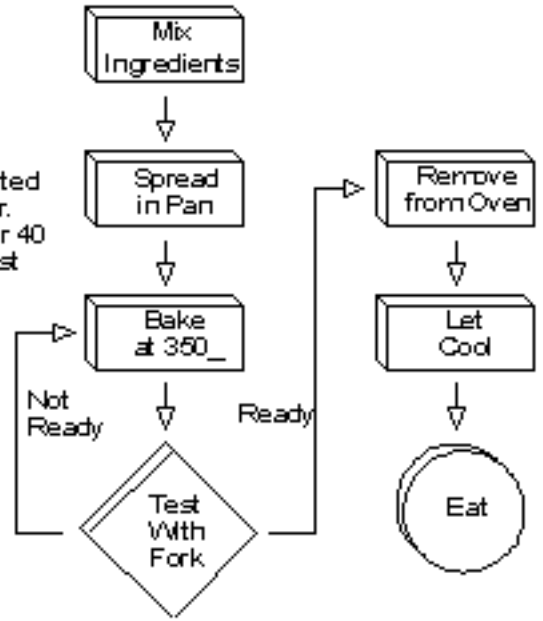
Recipe
CHOCOLATE CAKE

4 oz. chocolate
1 cup butter
2 cups sugar
3 eggs
1 tsp. vanilla
1 cup flour

Melt chocolate and butter. Stir sugar into melted chocolate. Stir in eggs and vanilla. Mix in flour. Spread mix in greased pan. Bake at 350_ for 40 minutes or until inserted fork comes out almost clean. Cool in pan before eating.

Program Code

```
Declare variables:
    chocolate   eggs        mix
    butter      vanilla
    sugar       flour
mix = melted ((4*chocolate) + butter)
mix = stir (mix + (2*sugar))
mix = stir (mix + (3*eggs) + vanilla)
mix = mix + flour
spread (mix)
While not clean (fork)
bake (mix, 350)
```



https://www.webopedia.com/TERM/A/algorithm.html

We are going to **write source code** that uses an **algorithm** to convert base10 to base2 numbers!

Goal: Turn your Ozobot into a decimal to binary number converter with booleans and conditional statements!

Use source code to:
1. Make the Ozobot follow the correct path
2. Check your answers to decimal-binary number conversions

at the University of Michigan Department of Computational Medicine and Bioinformatics

Visit https://girlswhocode.com/locations/

For high schoolers with transportation to University of Michigan:
Email gwc.bioinfo-requests@umich.edu for information about our Application for 2018-2019 Girls Who Code Club