Caesar with MakeCode

Problem:

- The computer only understands very simple orders.

- We have to rethink the encryption and decryption process.

What the computer doesn't understand

„All letters are on a disk, the plaintext letters on the outside and the ciphertext letters on the inside and to change the key you turn the inner disk."

- Numbers & text

- Simple operations
  - Numbers: add, subtract
  - Text: join

- Compare
  - Numbers: $=, <, >, \leq, \geq, \neq$
  - Text: $=, \neq$, contains
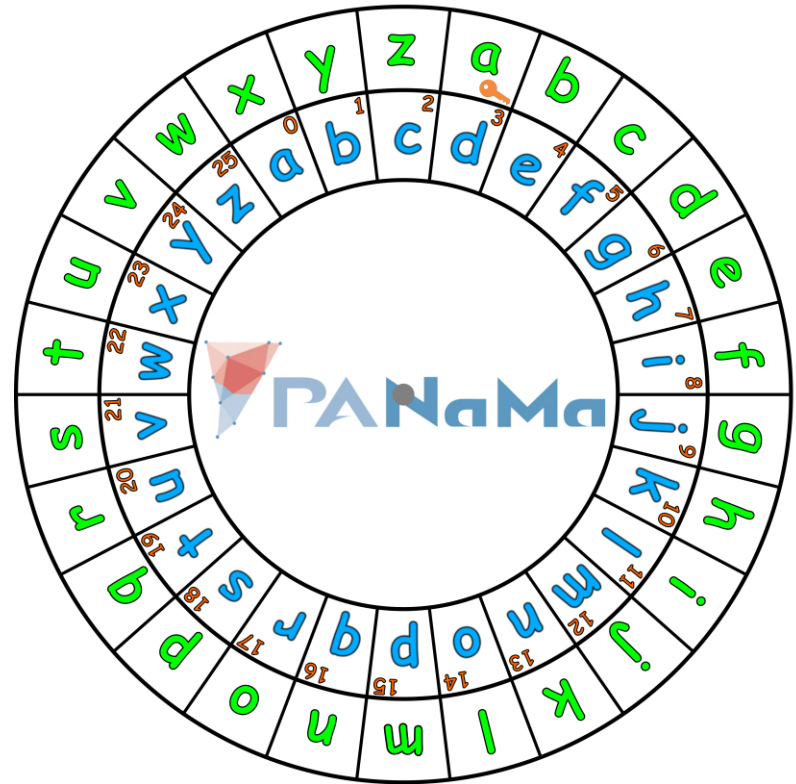
What is a computer able to do?

- The operations you can use on text won't help with shifting a letter.

- You can only shift numbers, by adding or subtracting.

- Translate letters to numbers.

The easiest way is to count of the letters.

Translate letters ↔ numbers

- a = 1
- b = 2
- c = 3
- d = 4
- e = 5
- f = 6
- g = 7

- h = 8
- i = 9
- j = 10
- k = 11
- l = 12
- m= 13
- n = 14

- o = 15
- p = 16
- q = 17
- r = 18
- s = 19
- t = 20
- u = 21

- v = 22
- w = 23
- x = 24
- y = 25
- z = 26

Translate letters ↔ numbers

a	b	c	...	x	y	z
↕	↕	↕	↕	↕	↕	↕
1	2	3	...	24	25	26

Encrypt with the computer
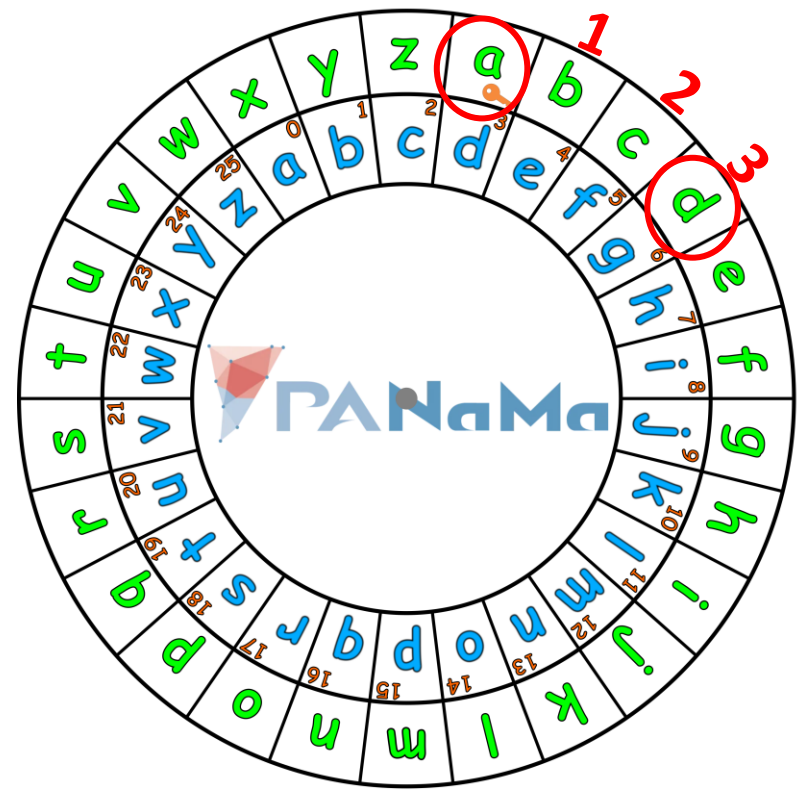
a	b	c	d	...	x	y	z
↕	↕	↕	↕	↕	↕	↕	↕
1	2	3	4	...	24	25	26

Encrypt with the computer
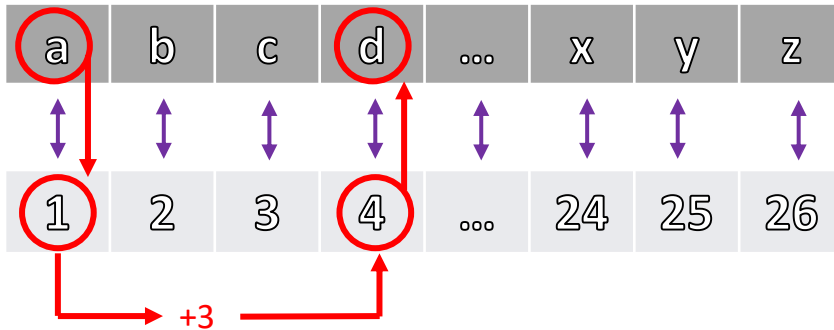
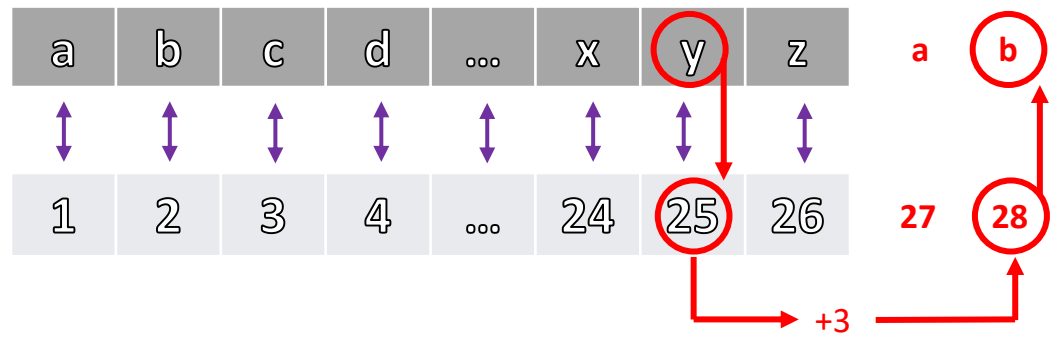| a	b	c	d	...	x	y	z
1	2	3	4	...	24	25	26

+3

Step 1: Translate a letter to a number

Step 2: Add the key to the number you got out

Step 3: Translate the new number back to a letter

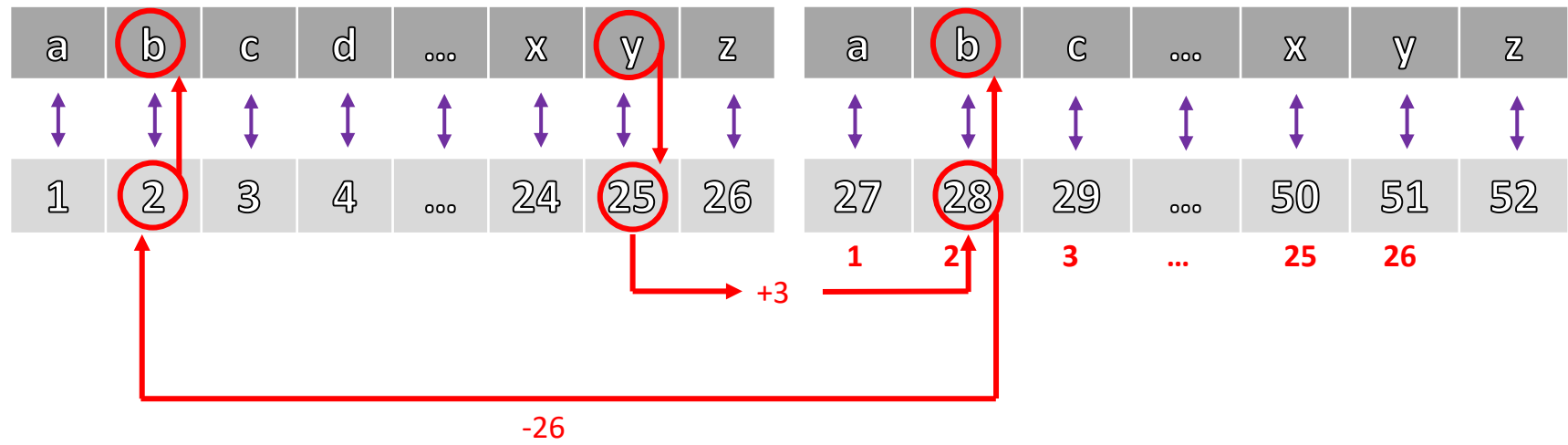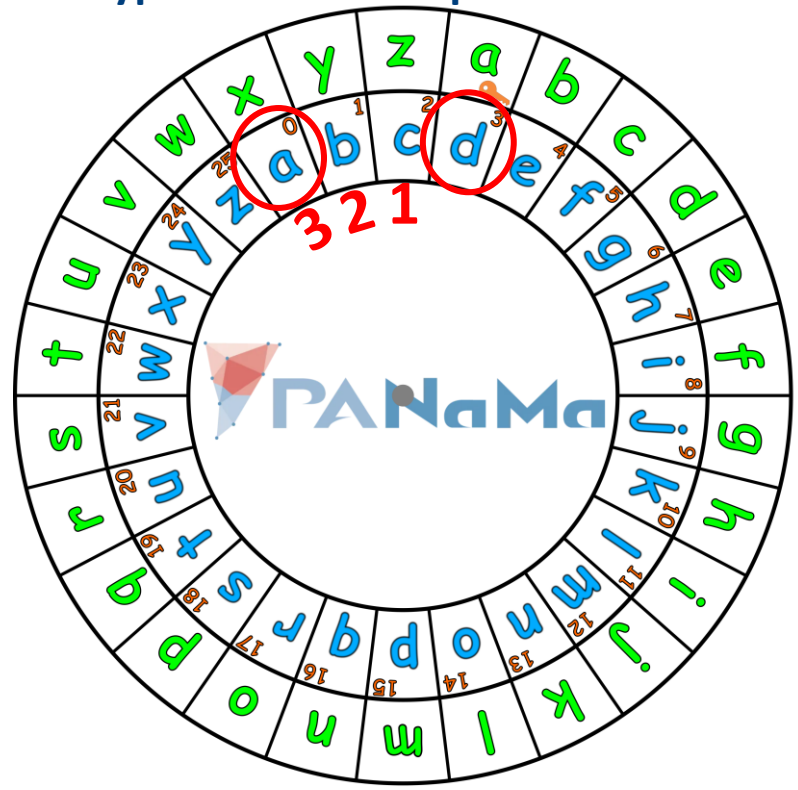# Encrypt with the computer

a	b	c	d	...	x	y	z
1	2	3	4	...	24	25	26

a   b

27   28

+3

25 + 3 = 28

Encrypt with the computer

If, after adding the key, you have a number bigger than 26, subtract 26.

a	b	c	d	...	x	y	z	a	b	c	...	x	y	z
1	2	3	4	...	24	25	26	27	28	29	...	50	51	52
								1	2	3	...	25	26	

+3

-26

Encrypt with the computer

- Step 1:
  Translate a letter to a number.

- Step 2:
  Add the key to the number you got out,
  if the sum is bigger than 26, subtract 26.

- Step 3:
  Translate the new number back to a letter.
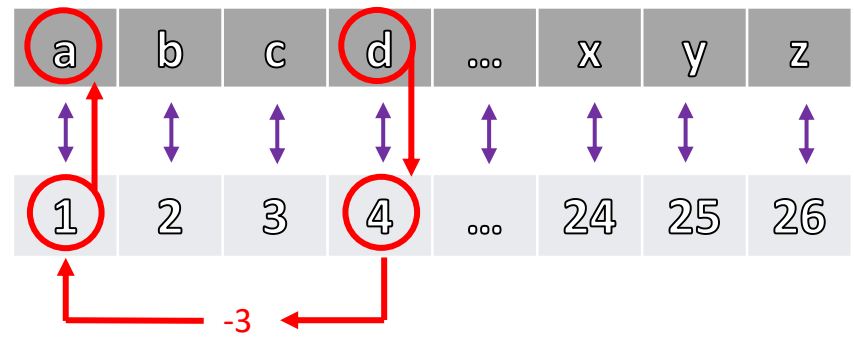
Decrypt with the computer

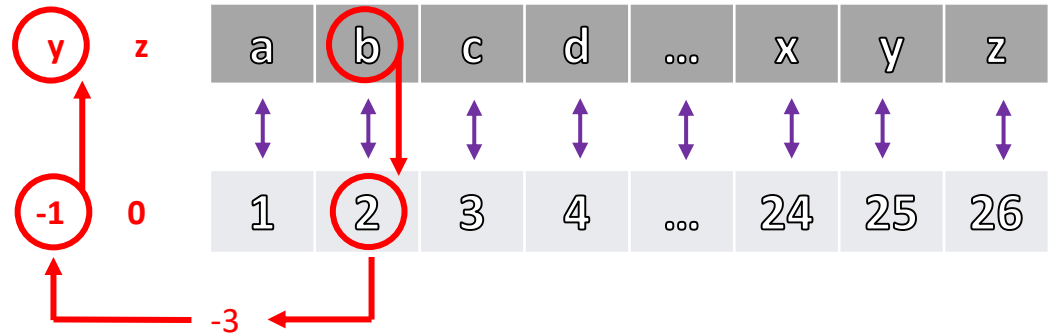| a	b	c	d	...	x	y	z
↕	↕	↕	↕	↕	↕	↕	↕
1	2	3	4	...	24	25	26

Decrypt with the computer

Step 1: Translate a letter to a number

Step 2: Subtract the key from the number you got out

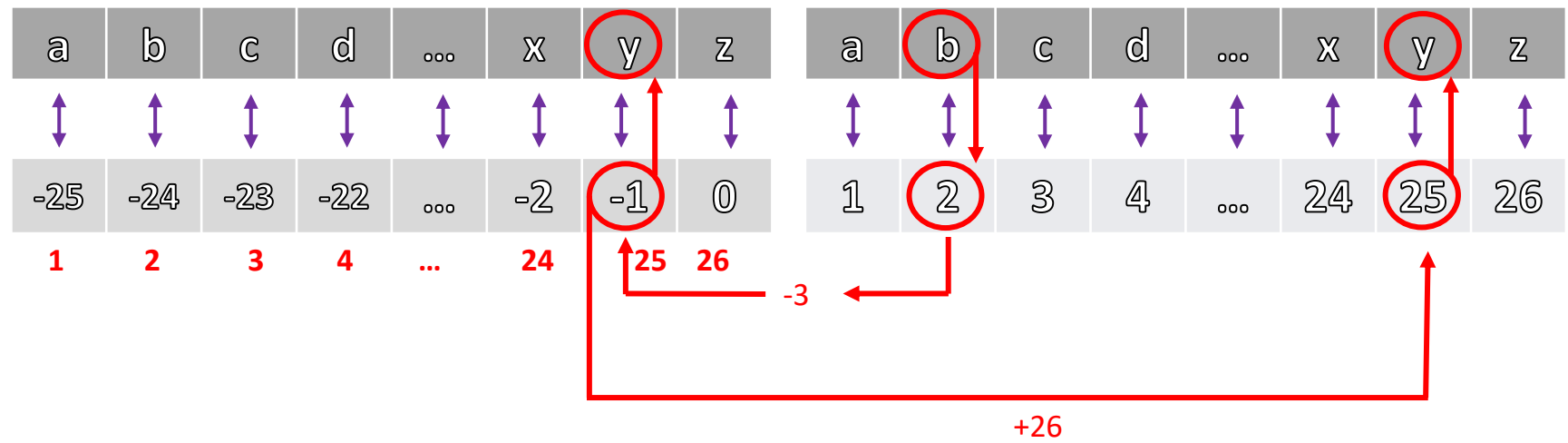Step 3: Translate the new number back to a letter

Decrypt with the computer
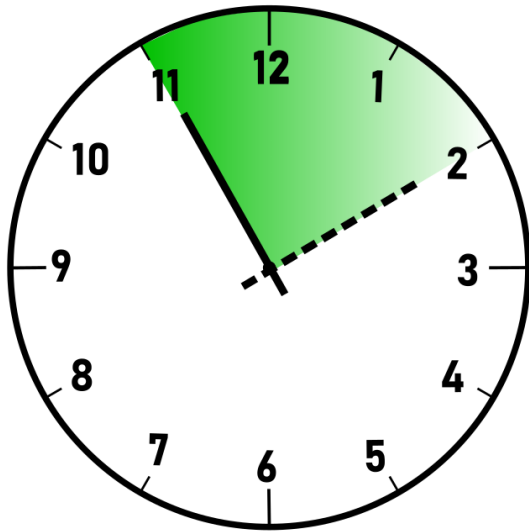
Decrypt with the computer

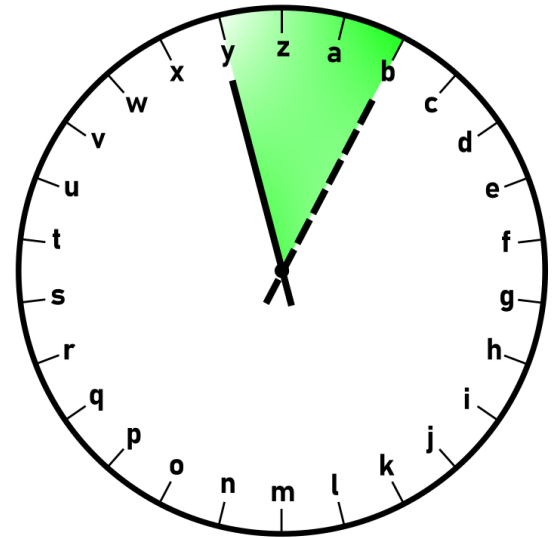If, after subtracting the key, you have a number smaller than 1, add 26.

Decrypt with the computer

- Step 1:
  Translate a letter to a number.

- Step 2:
  Subtract the key from the number you got out,
  if the difference is smaller than 26, add 26.

- Step 3:
  Translate the new number back to a letter.

You know the concept!

+3h

+3

You know the concept!

- The dial of a clock has got *12* hours, if we go beyond *12* we start over at *1*.

- The letter clock has got *26* letters, if we go beyond the *26th* we start over at the *1st*.

Summary

- In order to hand of the work to the computer, we have to express the encryption and decryption process in simple terms.

- Letters are translated to numbers and shifting a letter is done by adding or subtracting a key value.

- We have to make sure, that the numbers lie between 1 & 26 (only those numbers have a letter assigned to themself).