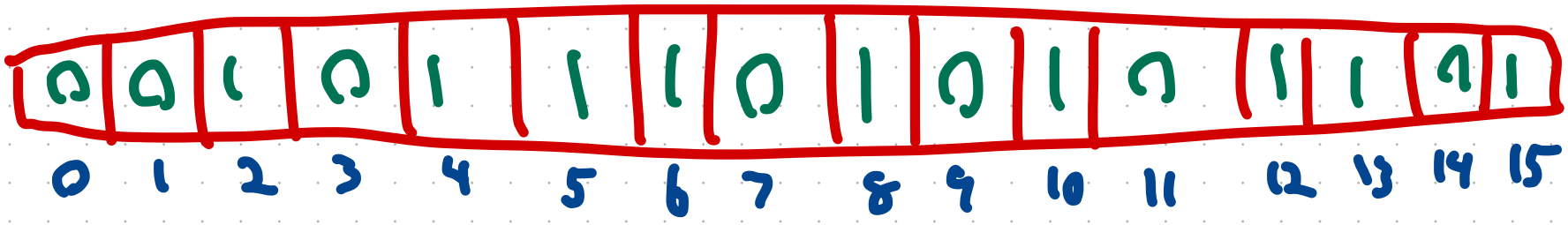
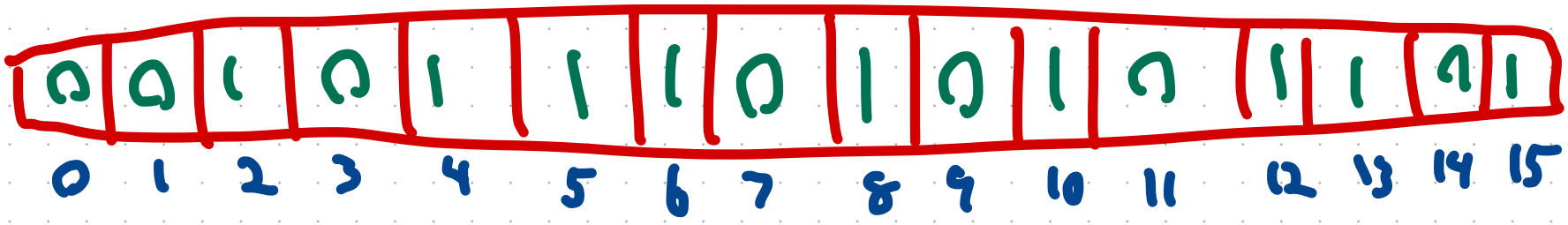
# Bit Arrays

Suppose You Want a Array/List of 0/1 values



# Suppose You Want a Array/List of 0/1 values




For example, you want to store a set of small positive integers

{2, 4, 5, 6, 8, 10, 12, 13, 15}

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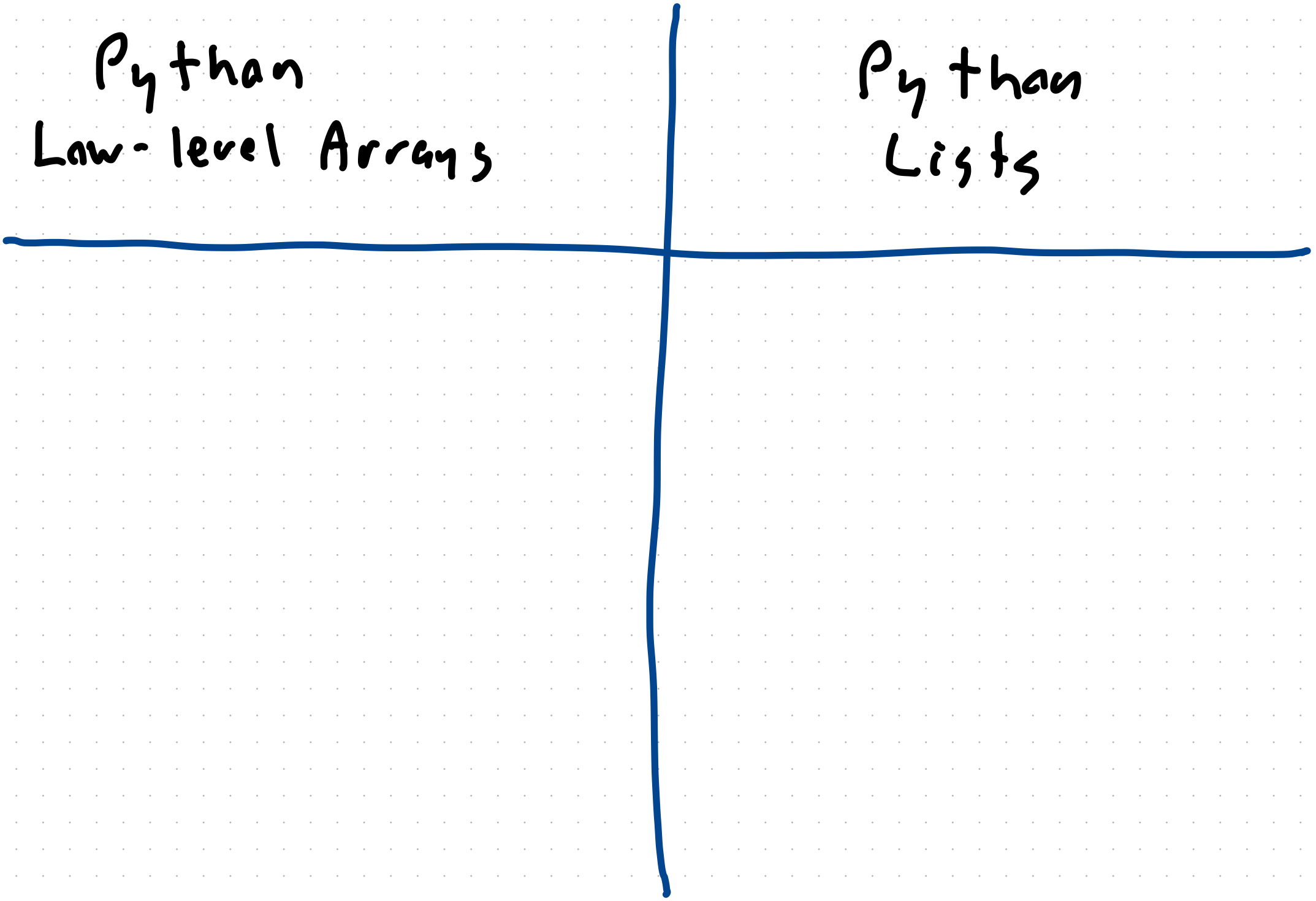
To store 1000 Bits!!

Can we do better?


Python
Low-level Arrays
Python
Lists

## Python Low-level Arrays

Can only hold one kind of data which must be specified in advance (e.g. byte, float)

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Fast

## Python Lists

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Slower

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Can only hold one kind of data which must be specified in advance (e.g. byte, float)

Compact

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Limited Features

## Python Lists

Can hold anything

Big

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Can do many things

# Creating a low-level Array of Bytes

```
A = array.array("B", initial values)
```

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↑ Code that means Byte - 8 bits

i.e. 0..255

# Bitarray

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```
B = BitArray(10)
```

size

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(10) ← size

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B[3] = 1
B[7] = 1
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# Bitarray

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```
B = BitArray(10)
B[3] = 1
B[7] = 1
print(B[7], B[8])
```

size

1 0

# Bitarray

It should work like this:

```
B = BitArray(10)
B[3]=1
B[7]=1
print(B[7], B[8])
    1   0
print(str(B))
    0001000100
```

size

# Bytes to Bits

The smallest array data type supported is a byte = 8 bits.

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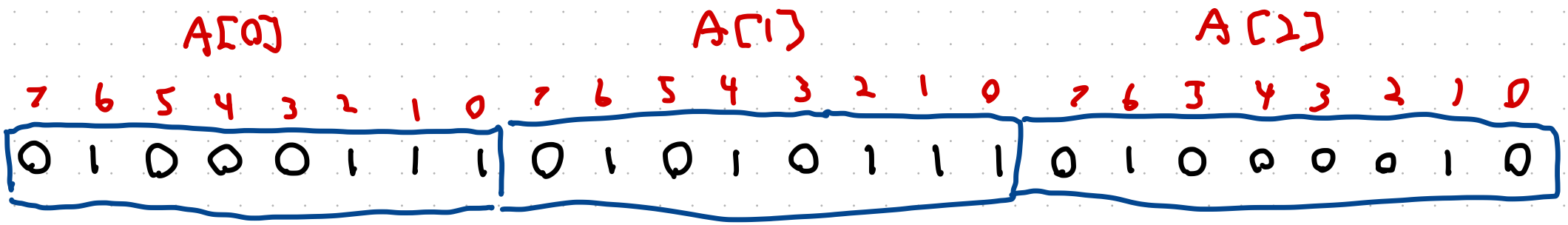
We need to do a little work to make a class where we can read/write individual bits.

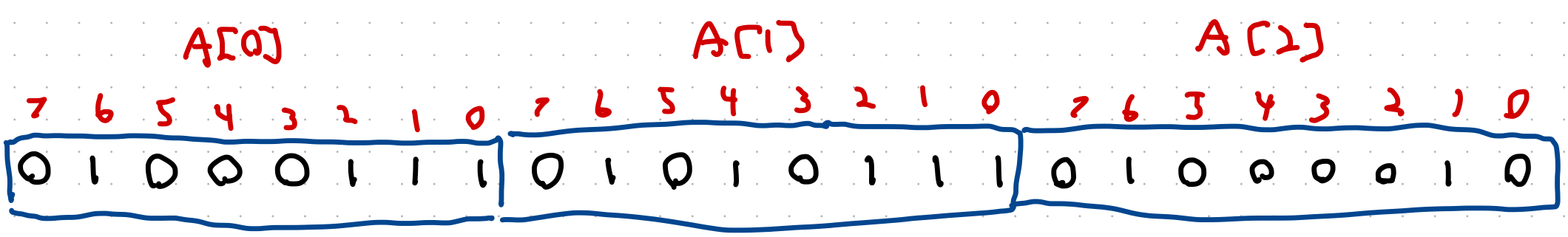



Where would we keep the 22^ND Bit?

In the 6^TH Bit of the 2^ND Byte

22 mod 8

$\lfloor \frac{22}{8} \rfloor$

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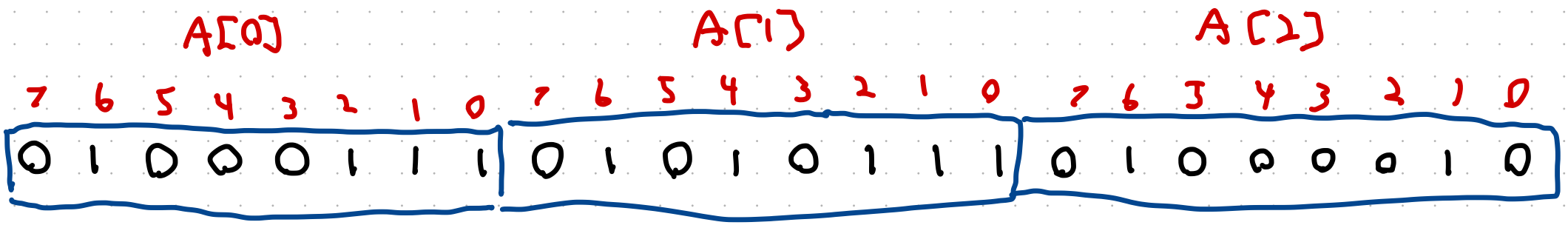
3rd Byte 0 1 0 0 0 0 1 0

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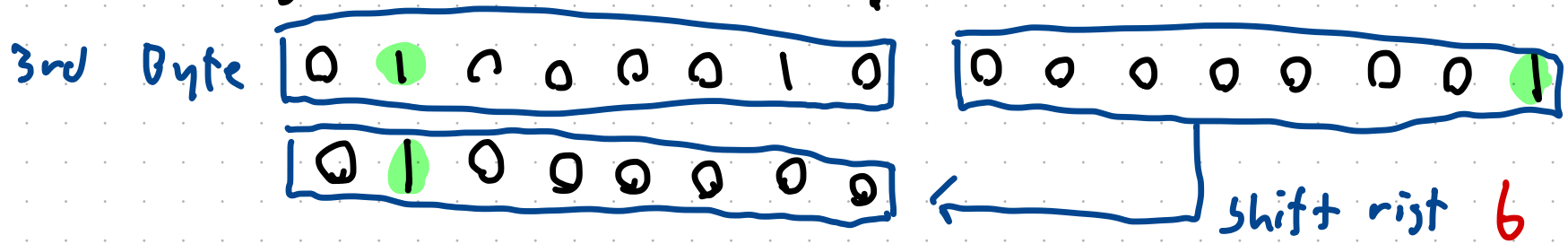

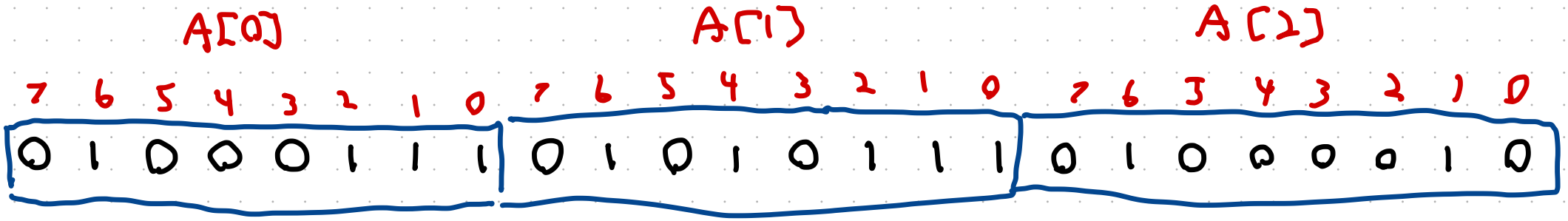


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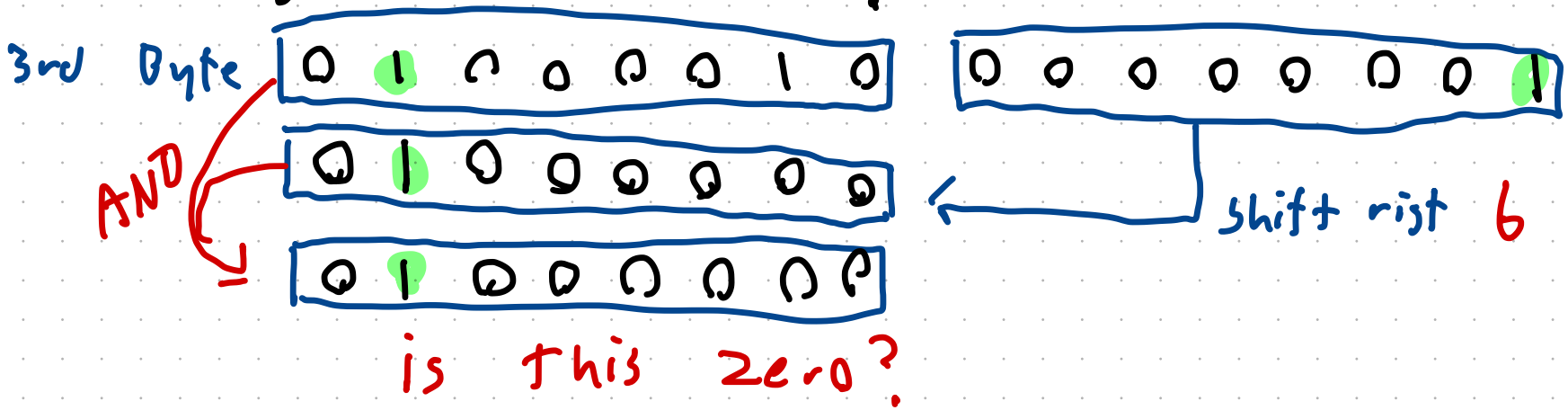

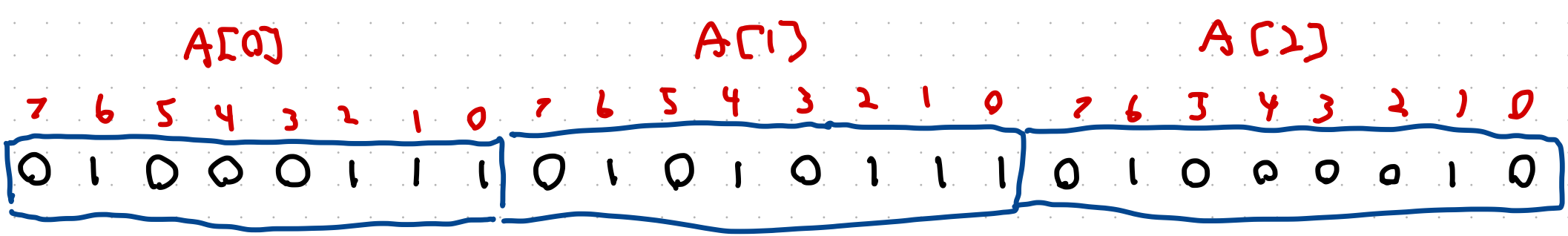


Python

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