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STANDARD TEMPLATE LIBRARY WORKSHOP

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BASICS OF C++

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Introduction

C++ is a general purpose programming language which was built as an extension to the C language. So you can not only use the basic functions of C language but also use the benefits of C++ like OOP and STL. Widely used in Competitive Programming and Game Development.

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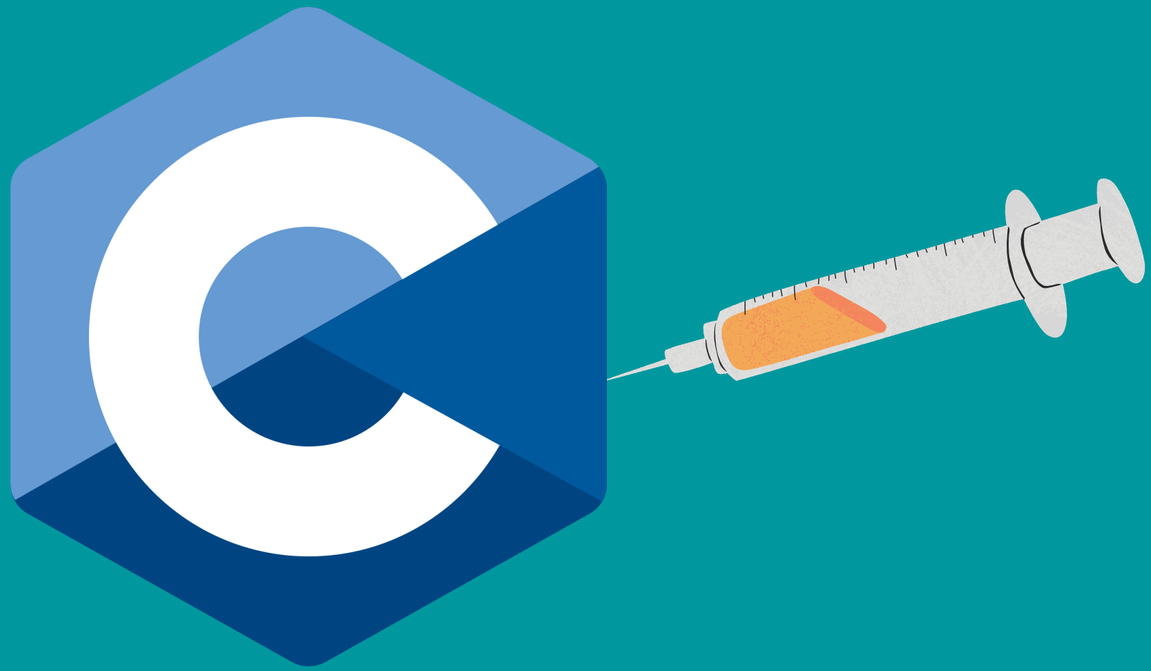

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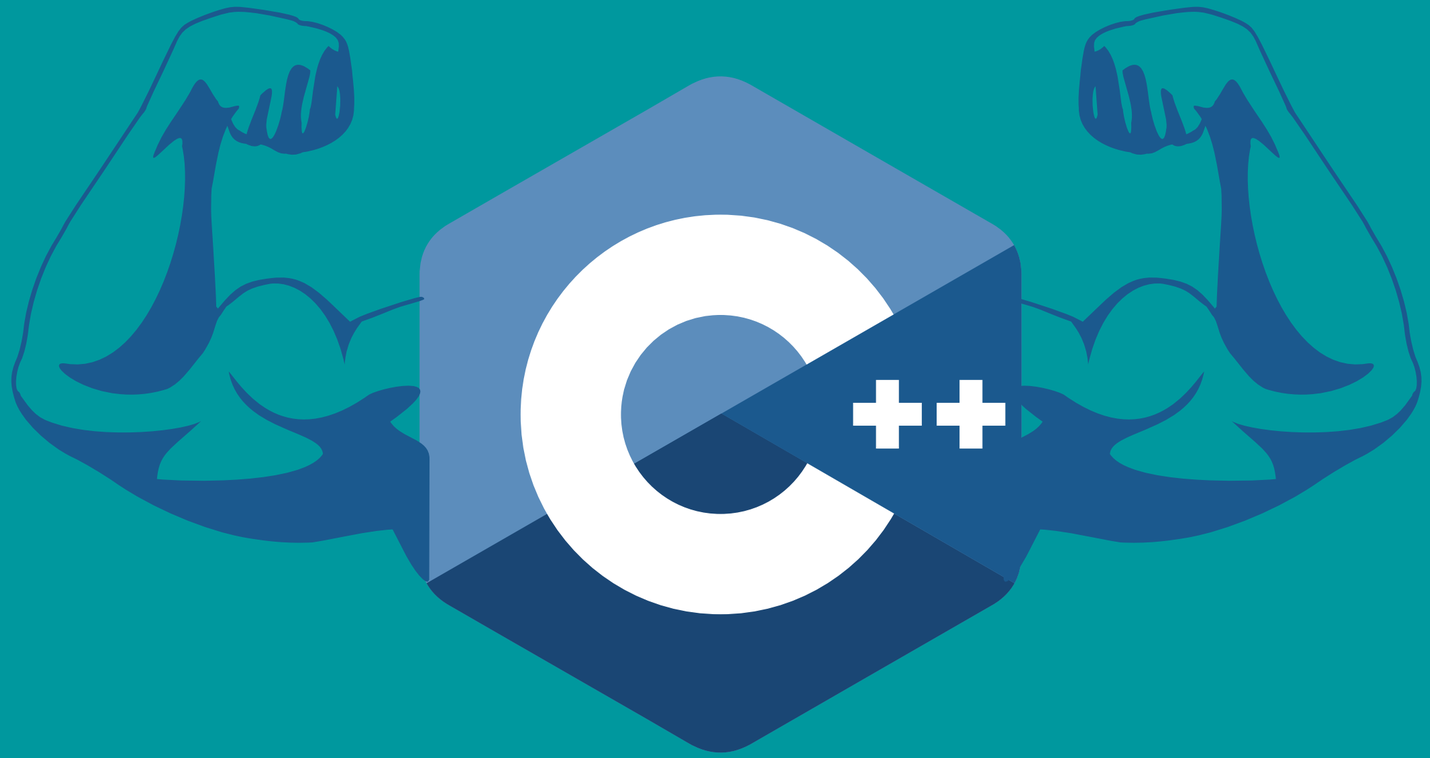

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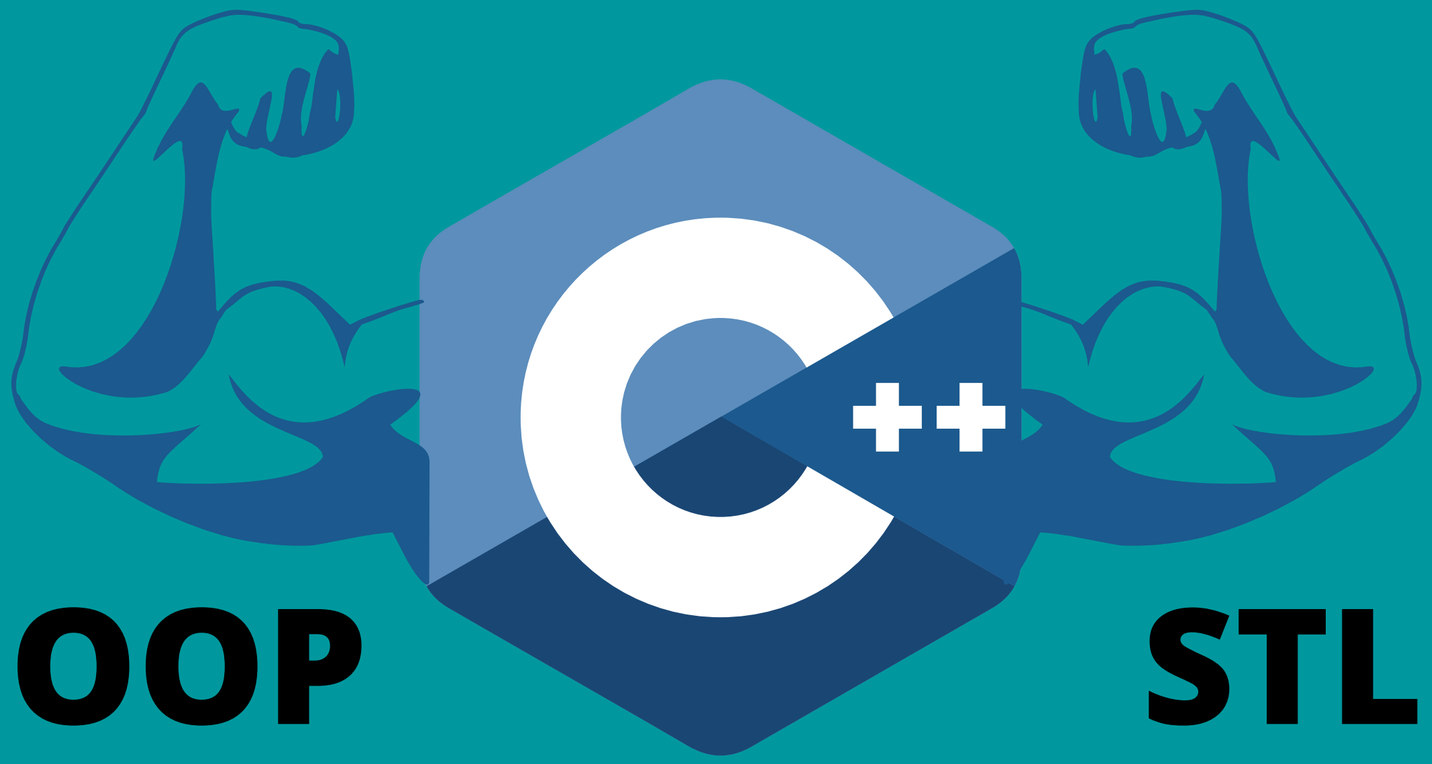

OOP

STL

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Time to Learn C++

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Let's Code

https://replit.com/

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Hello.cpp

```
#include <bits/stdc++.h>
using namespace std;
int main()
{
    cout << "Hello World" << endl;
    return 0;
}
```

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Basic Data Types

- Integers
- Boolean
- Double
- Characters
- String

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Conditional Statements

If-else are conditional statements, which are generally used when we want to run the code based on some condition.

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Loops

Loop is a sequence of instructions that is continually repeated until a certain condition is reached

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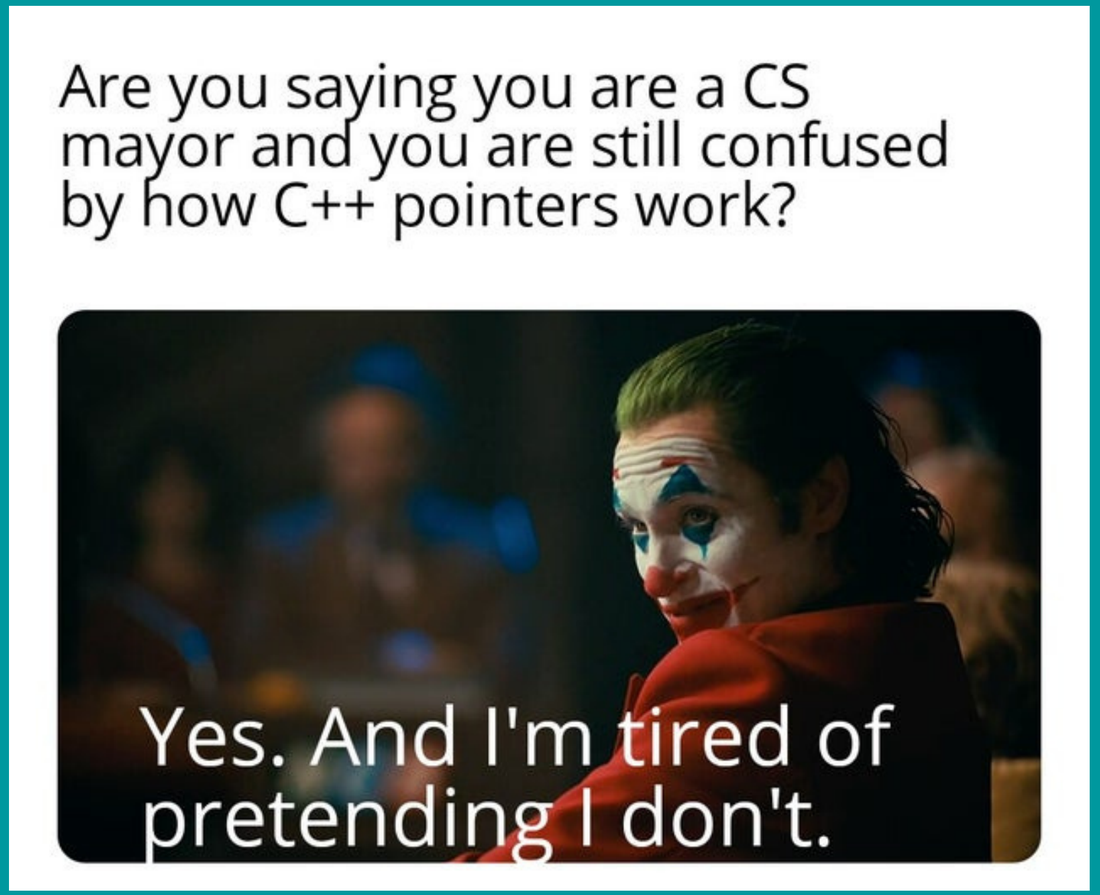
Pointers



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Pointers

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They store in the address of other variables and point towards it.

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Arrays

Arrays can be defined as group or collection of similar kind of elements under a particular name

They use block of contiguous memory location to store data of **fixed size**

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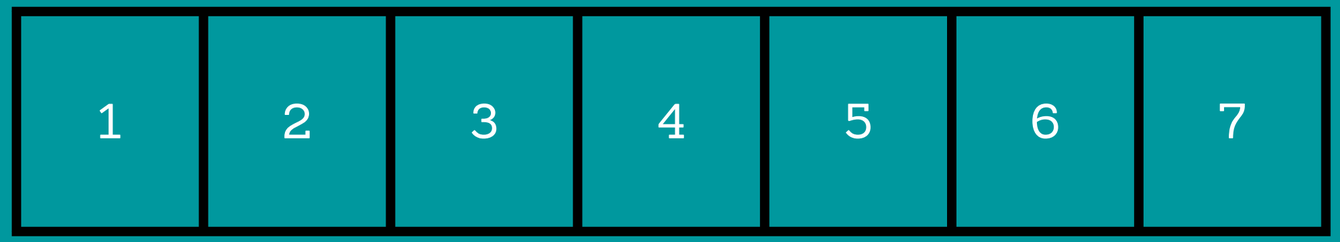
arr [7] =



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Functions

A function is a block of code which only runs when it is called. You can pass data, known as parameters, into a function.

Functions are used to perform certain actions, and they are important for reusing code.

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int main()

It serves as the entry point for the program. The computer will start running the code from the beginning of the main function.

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binary_search (startAddress , endAddress , valueToFind)

It is a widely used searching algorithm that requires the array to be sorted before search is applied. The main idea behind this algorithm is to keep dividing the array in half (divide and conquer) until the element is found, or all the elements are exhausted.

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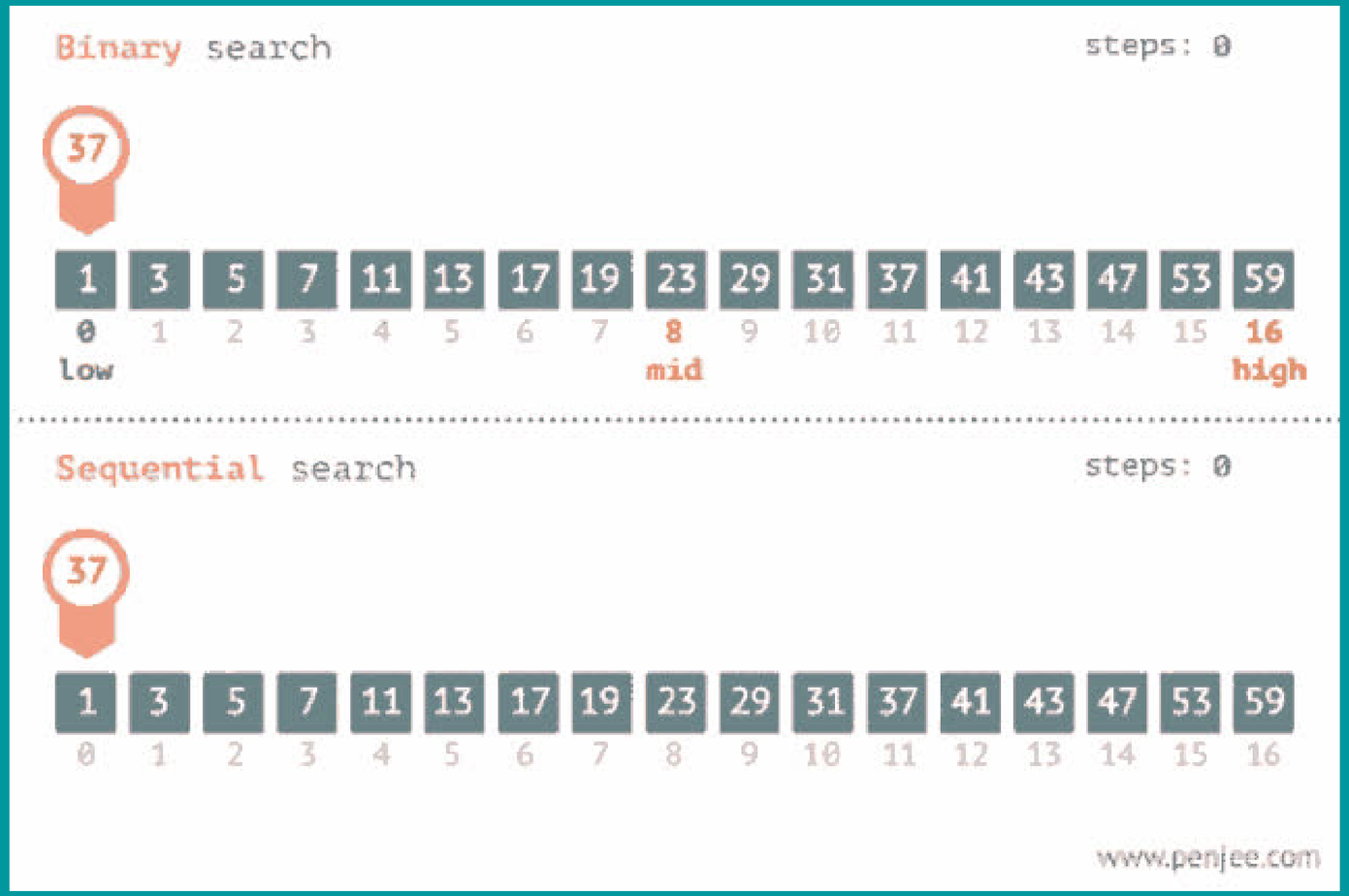
Binary Search Algorithm



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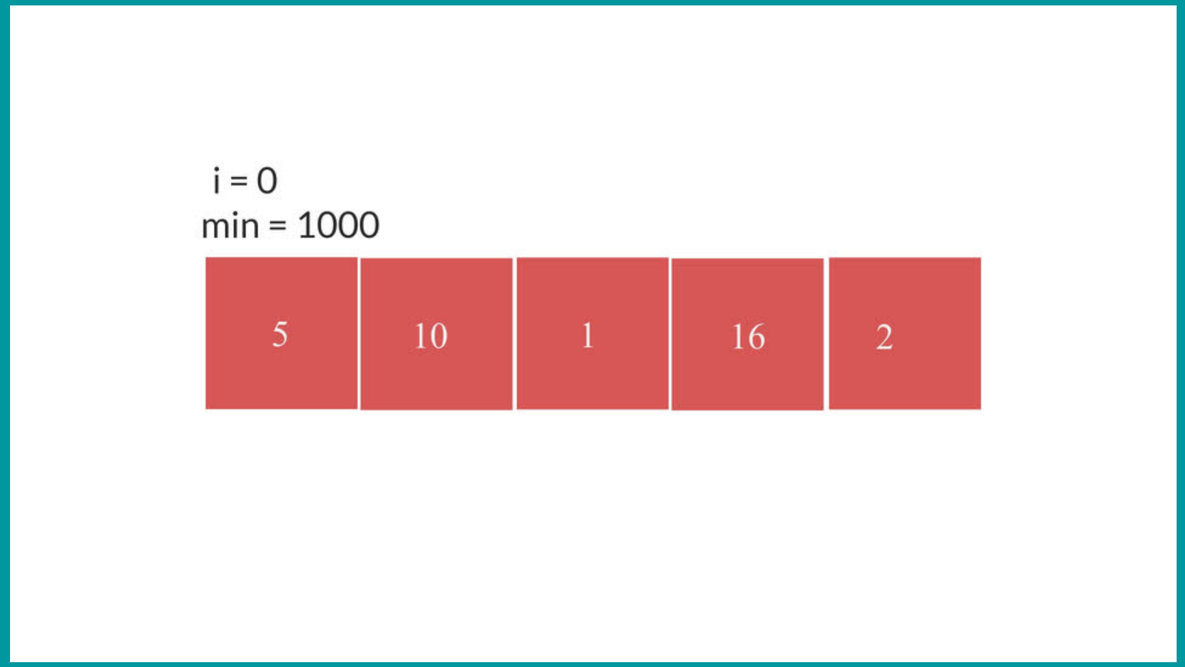
Min and Max Element

*min_element (first_index, last_index);

*max_element (first_index, last_index);



accumulate()

```
accumulate(first, last, sum);
```

```
accumulate(first, last, sum, myfun);
```

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What are vectors?

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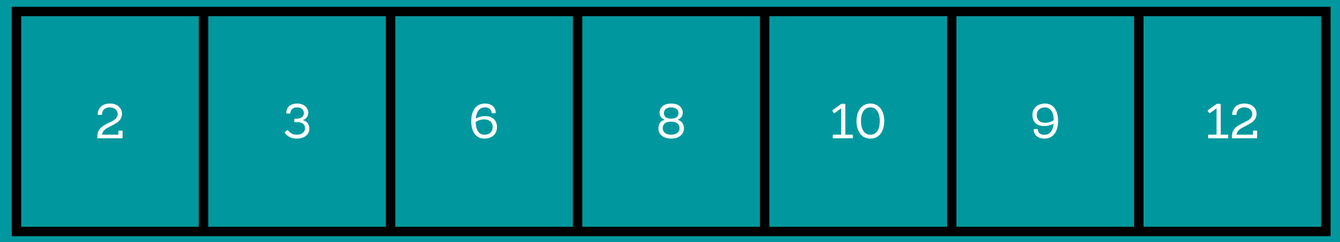
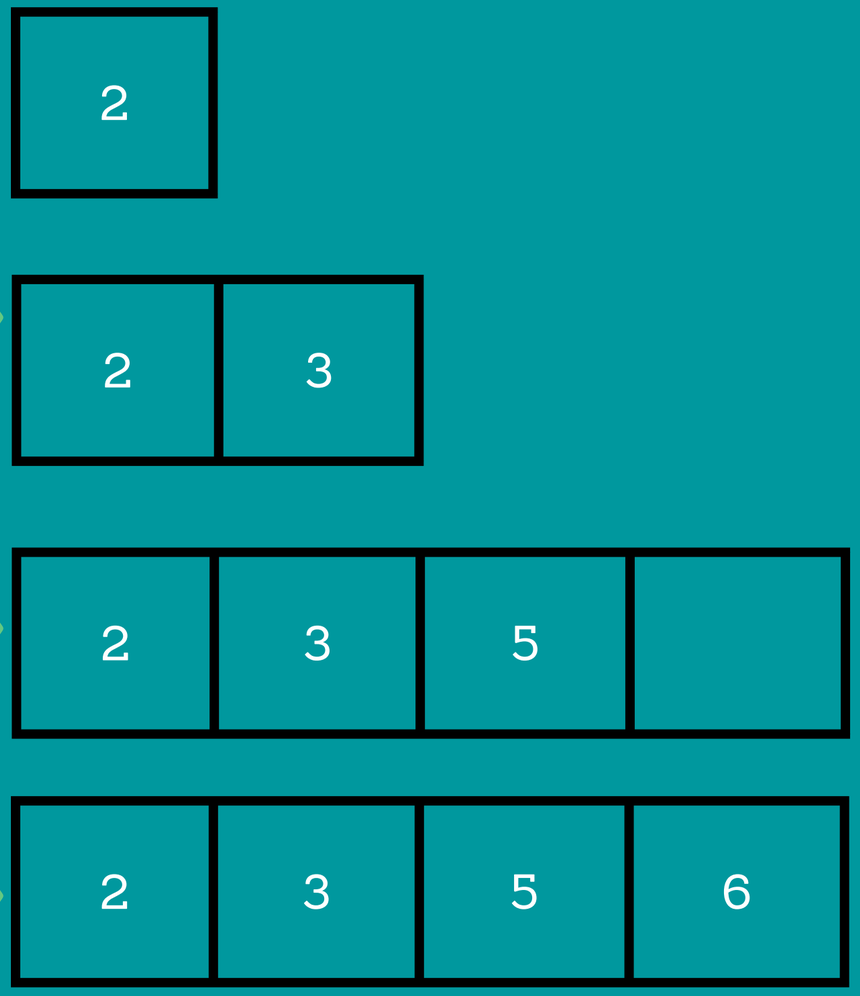
What is the problem with arrays?

arr[7] =





capacity = 1 , size = 1

capacity = 2 , size = 2

capacity = 4 , size = 3

capacity = 4 , size = 4

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Advantage of doubling capacity

1 -> 1,000

1 -> 2 -> 3 -> 4 -> 5 -> 6
-> 8 ->....1,000

1000 Operations

1 -> 2 -> 4 -> 8 -> 16 ->
32 -> 64 -> 128->
256 -> 512 -> 1024

10 Operations

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What are pairs?

- Pair is used to combine together two values that may be different in type.
- Pair provides a way to store two heterogeneous objects as a single unit.
- The first element is referenced as ‘first’ and the second element as ‘second’ and the order is fixed (first, second).

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Lists

List is a sequential container class template that allows non-contiguous memory allocation. Due to this, the traversal through the list is slower as compared to vectors. Just like vectors, lists also use iterators to traverse through.

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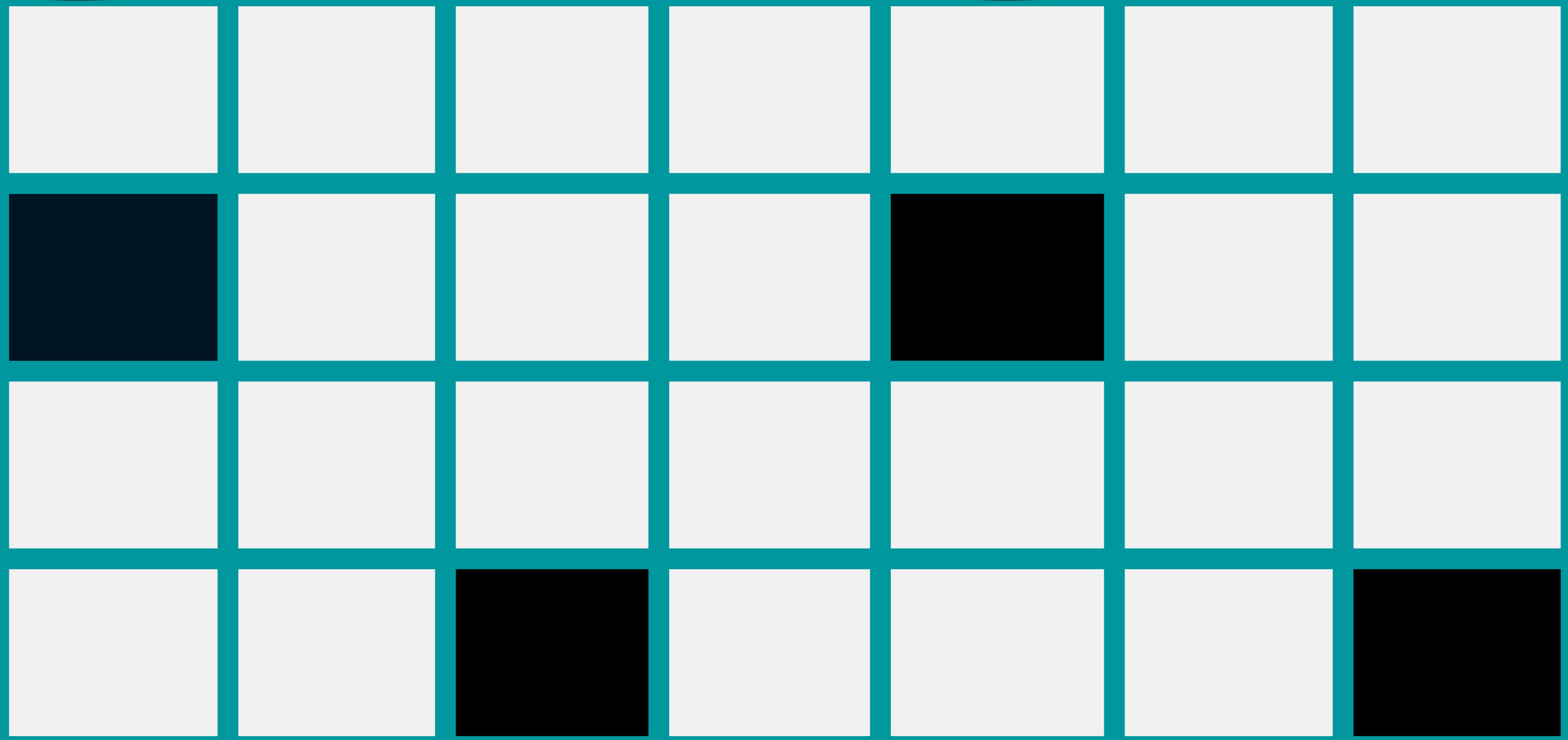

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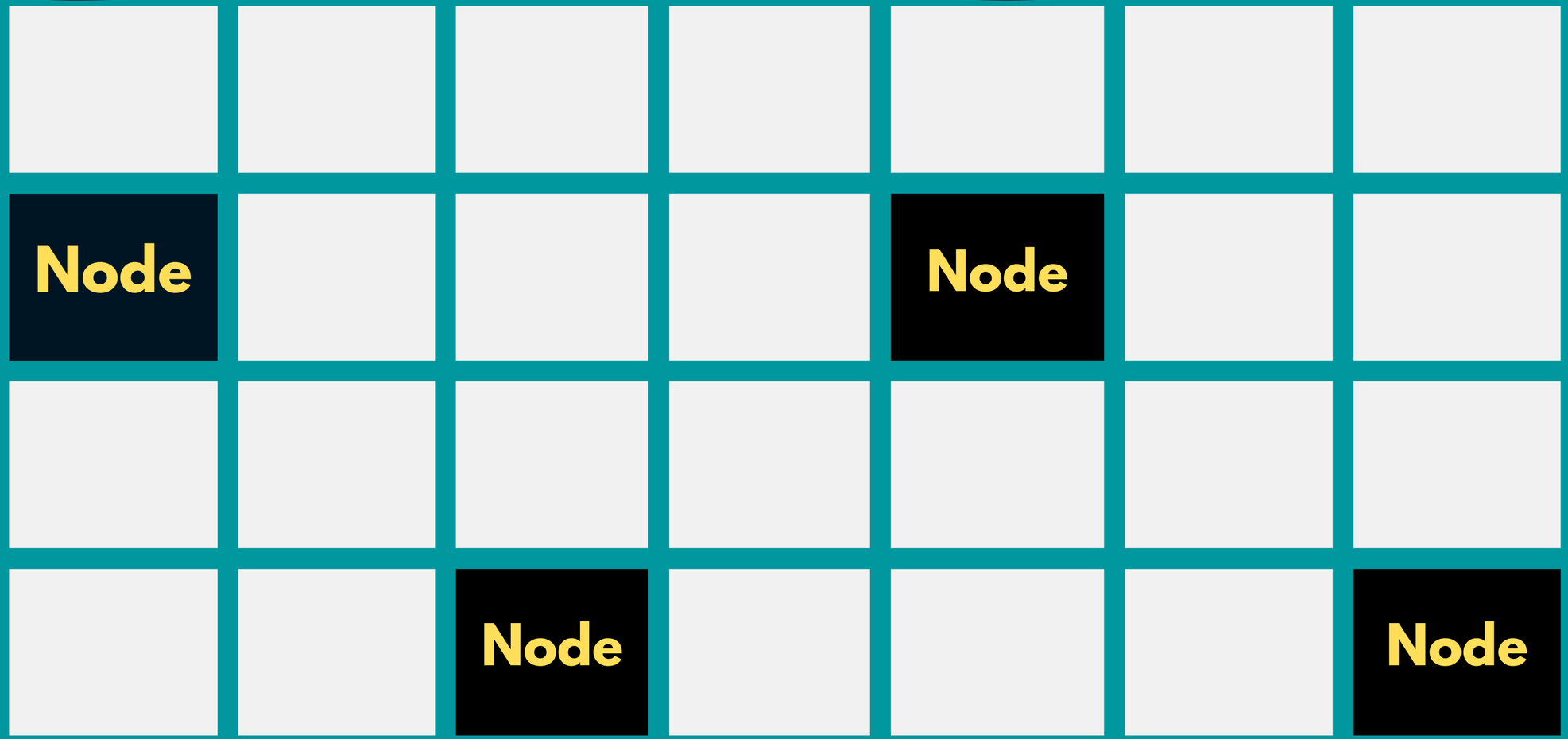

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1				3		
		2				4

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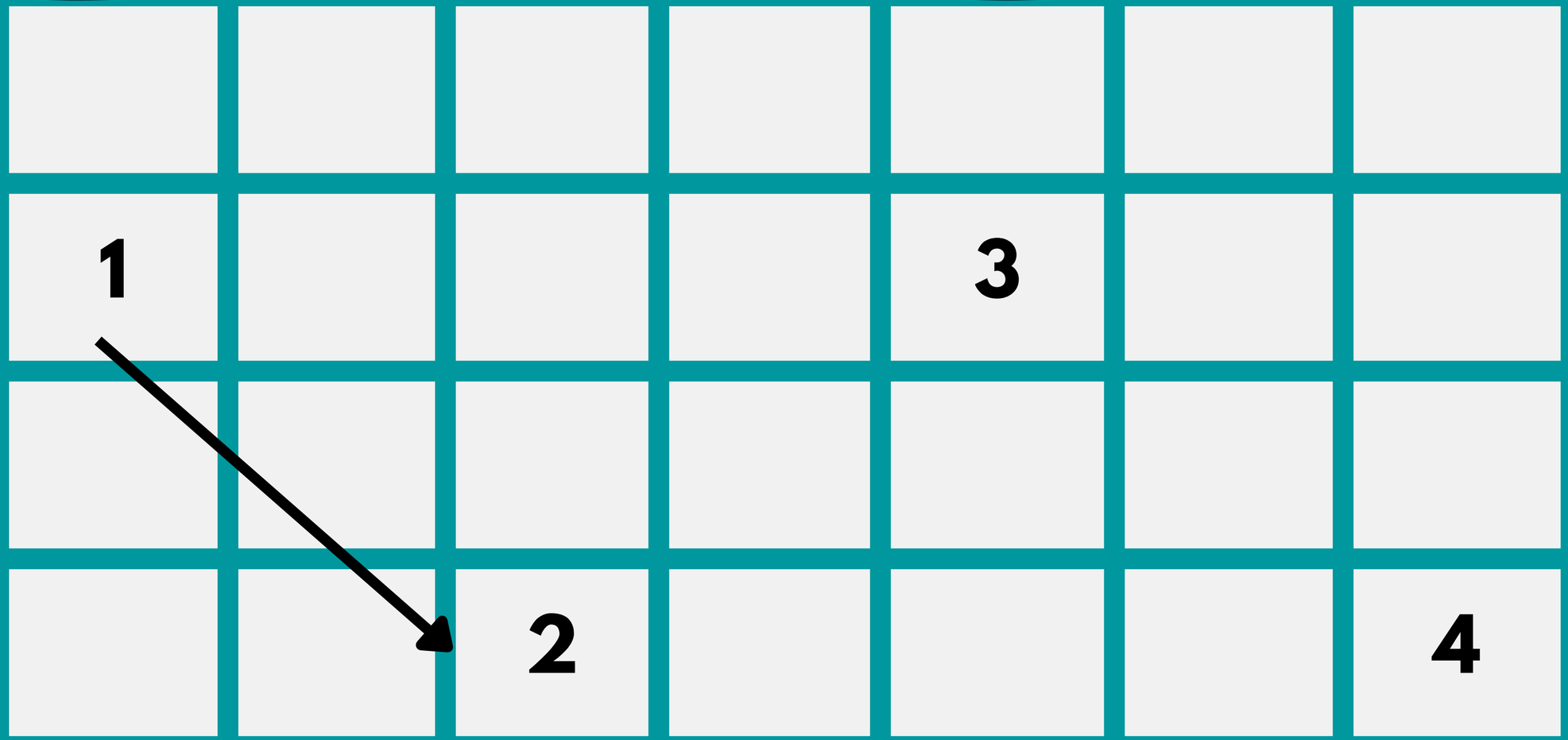

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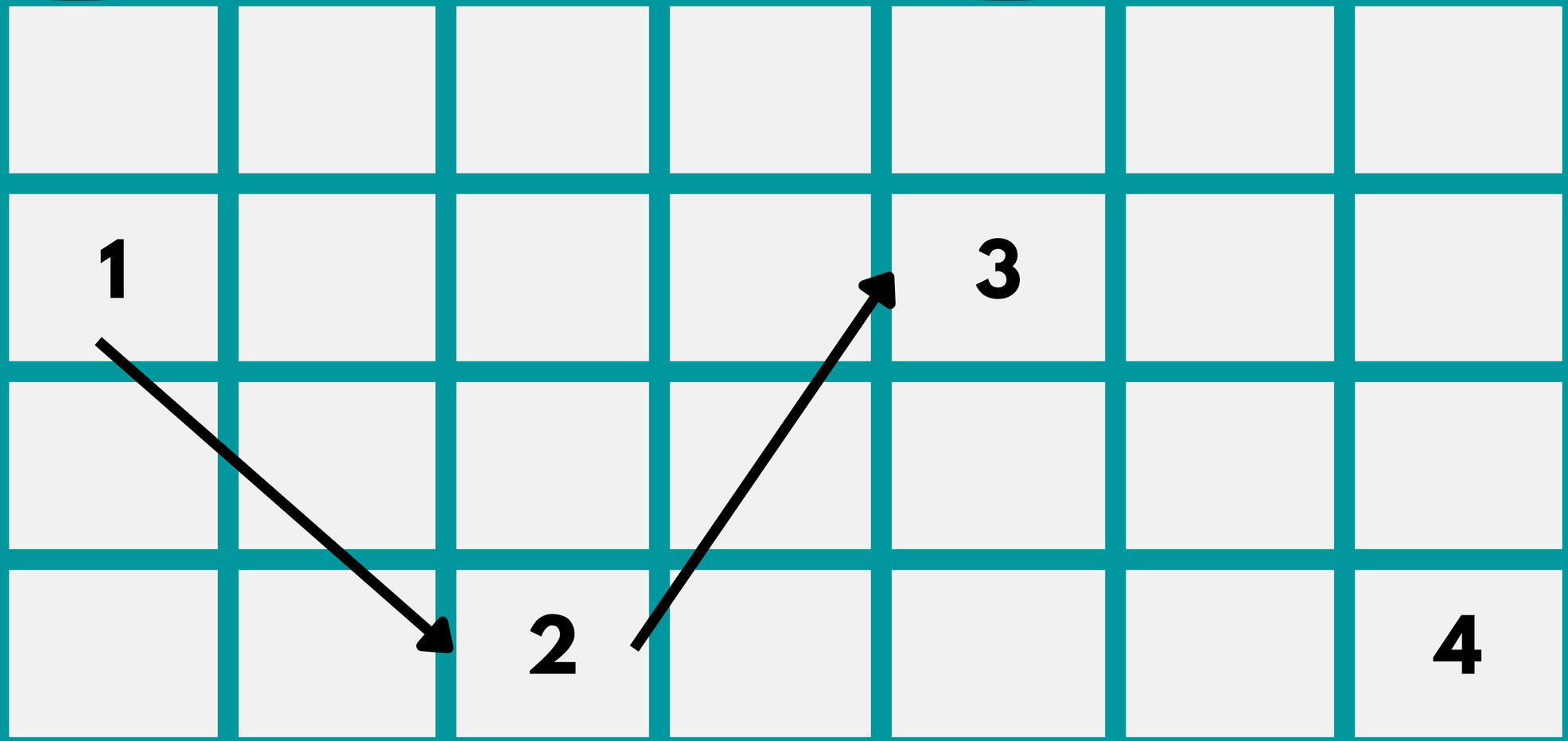
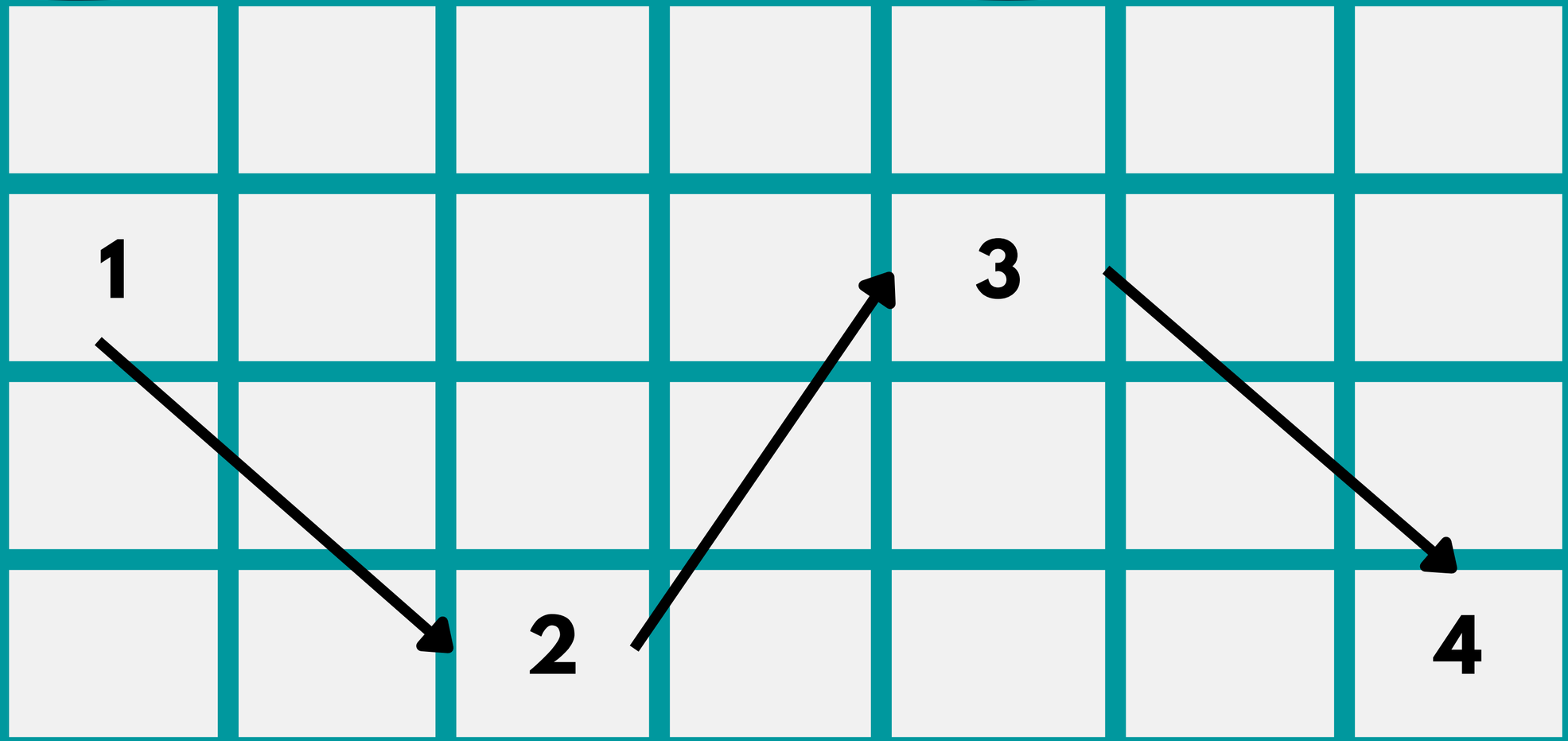
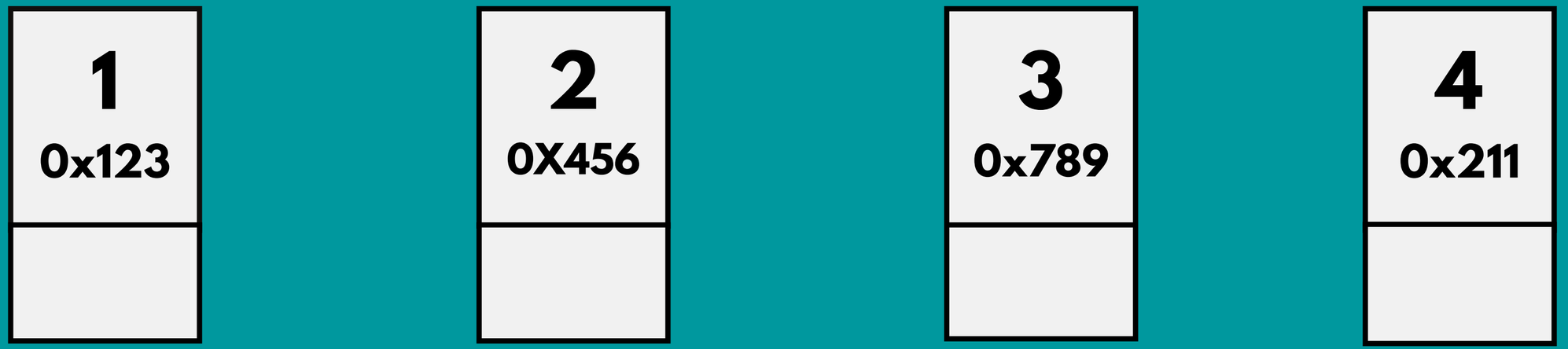
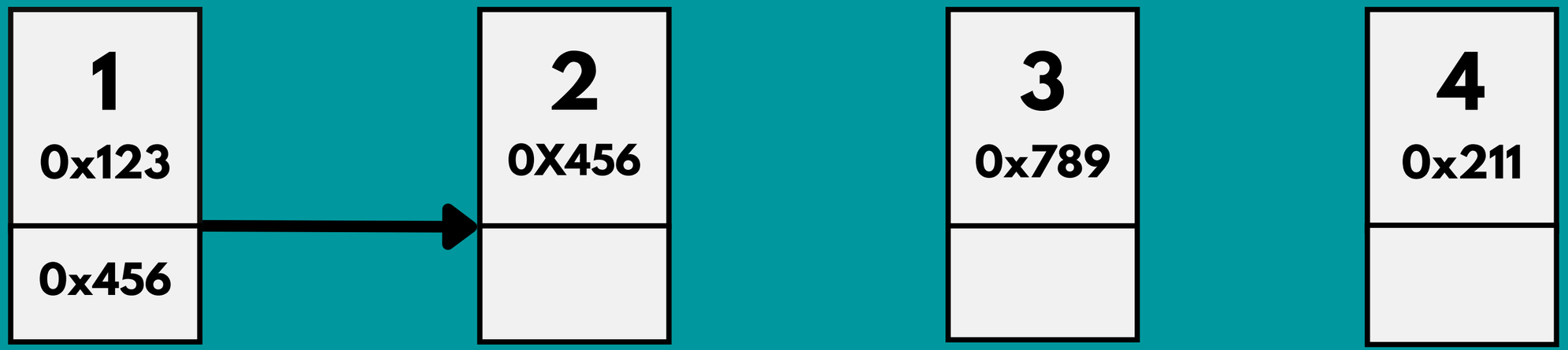



1
2
3
4


1
0x123
2
0X456
3
0x789
4
0x211


1
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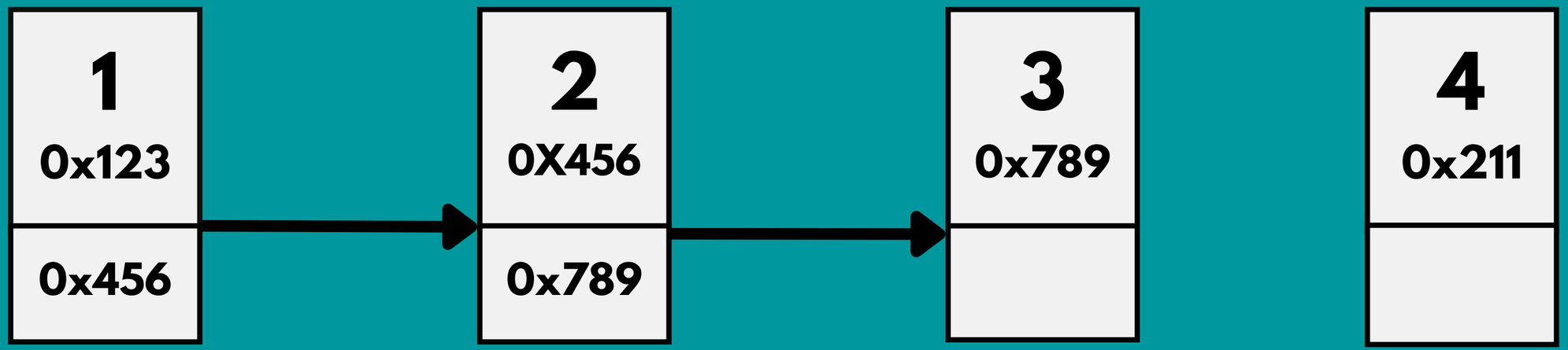
0x456
2
0X456
3
0x789
4
0x211


1
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3
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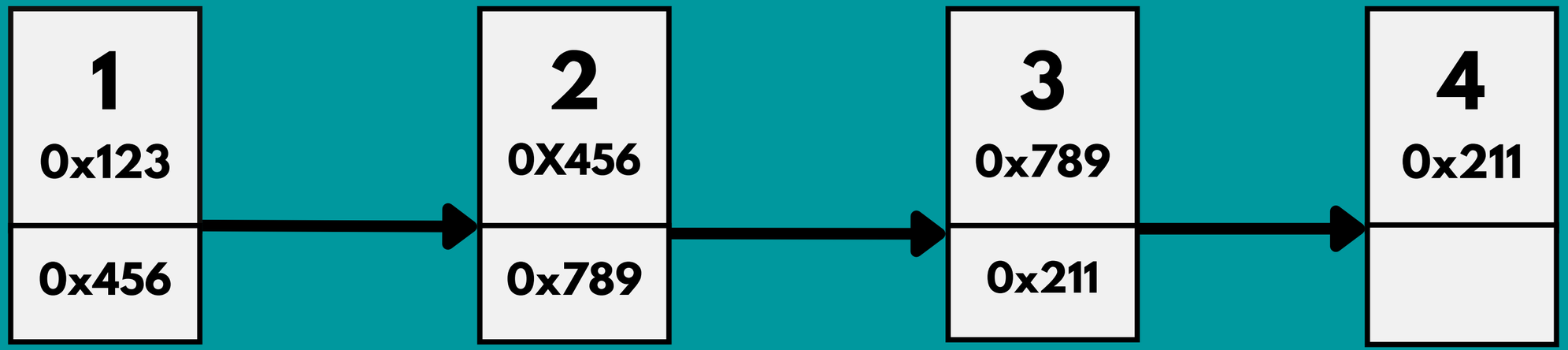
4
0x211


1
0x123
0x456
2
0X456
0x789
3
0x789
0x211
4
0x211

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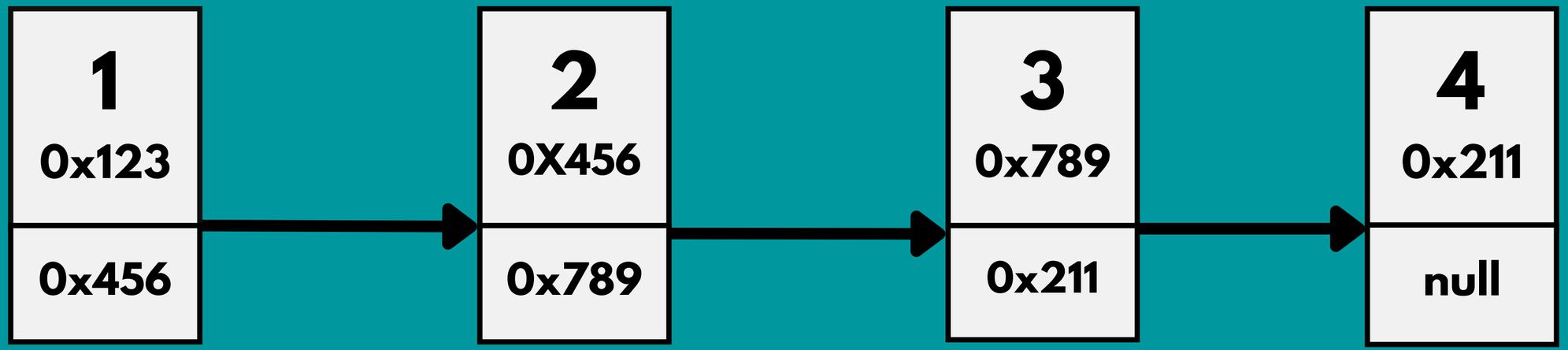
Singly Linked List



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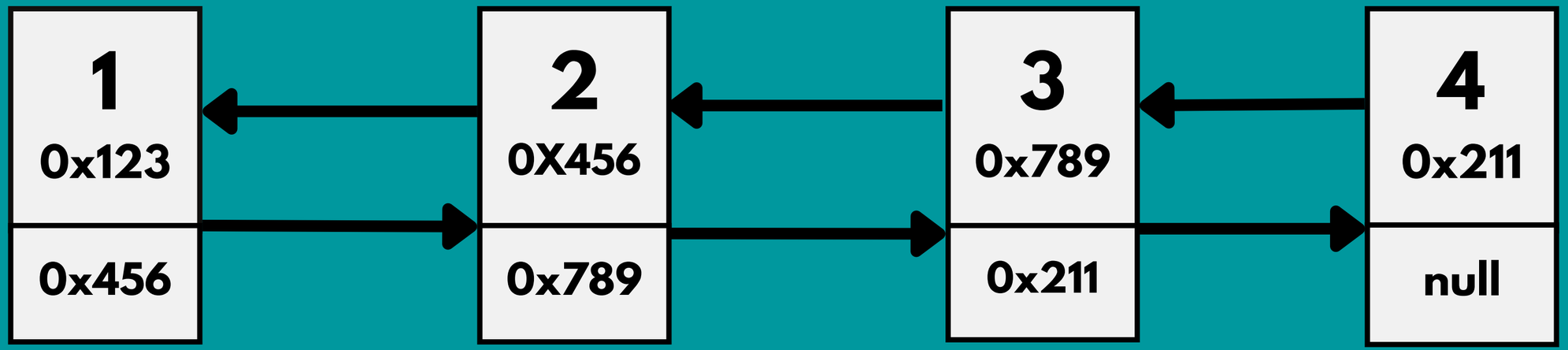
Doubly Linked List



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Lists

Arrays are better for random access

Linked Lists are better for quick insertion and deletion

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SETS

Properties:

- Each element is unique.
- Can contain any data type.
- Values are stored in sorted order.
- The values are immutable i.e the values of the set cannot be modified.
- The values in a set are unindexed.

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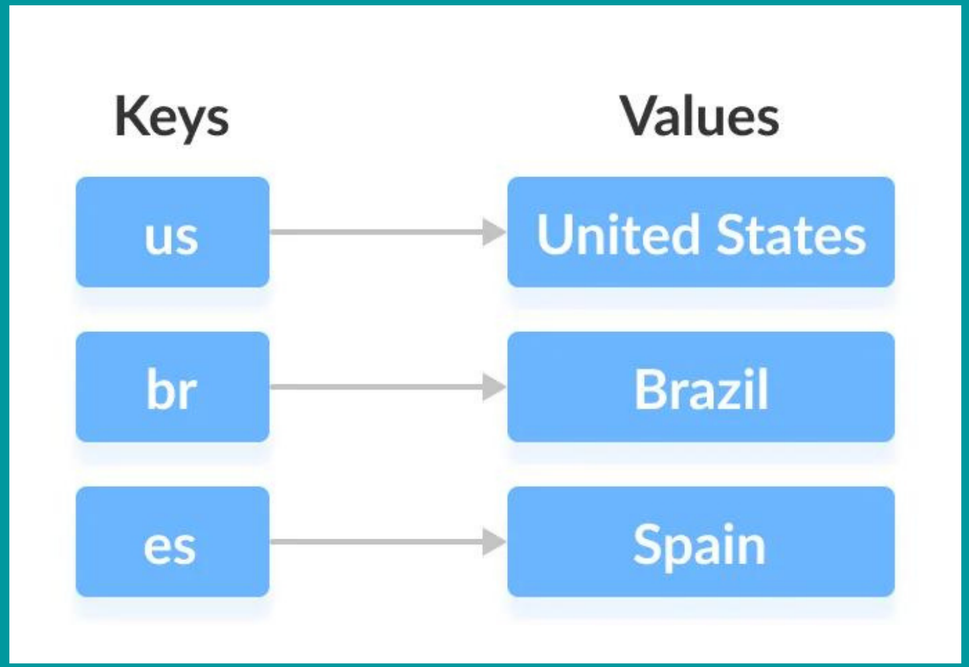
Maps

Maps are associative containers that store elements formed by a combination of a key value and a mapped value.



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Why Maps?

- They store unique key values and therefore, the keys are in a sorted order.
- Only one value for every key.
- Map can be used as an associative array.

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Stack

Stacks belong to a type of container adaptors which follow LIFO(Last In First Out) principle[in lifo, the element is added and removed from the same end]. Container adaptors are classes that rely on an object of one of the other container classes(such as list, vector) to handle the elements.

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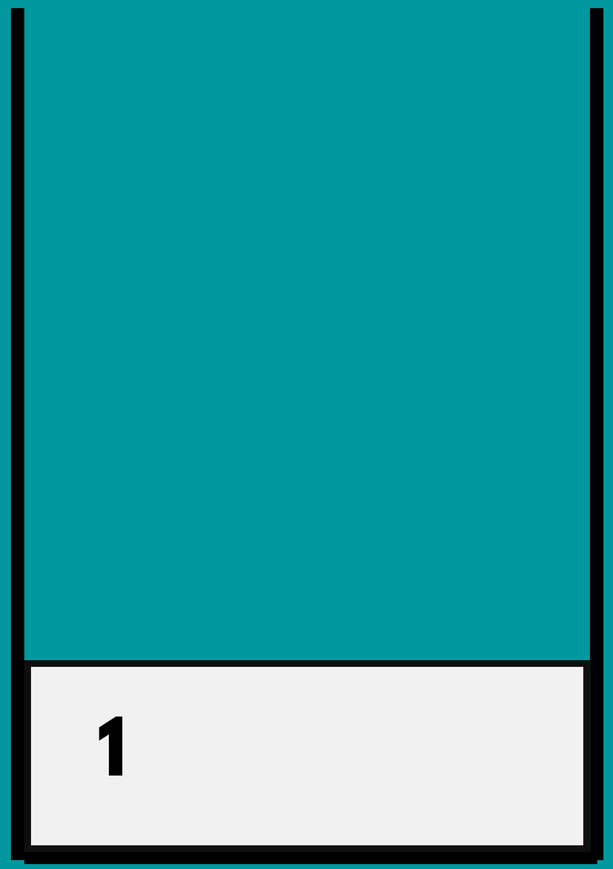

Stack.push(1)

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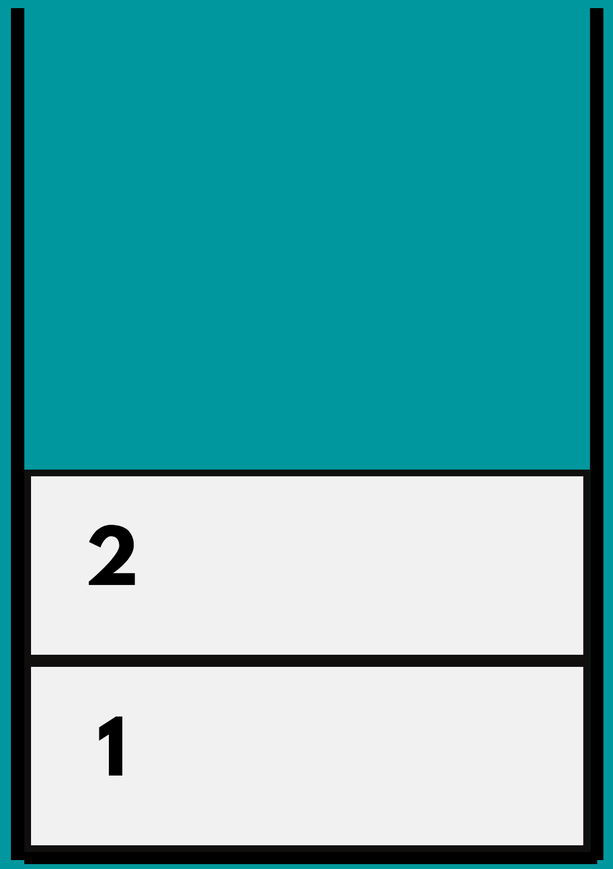

Stack.push(2)

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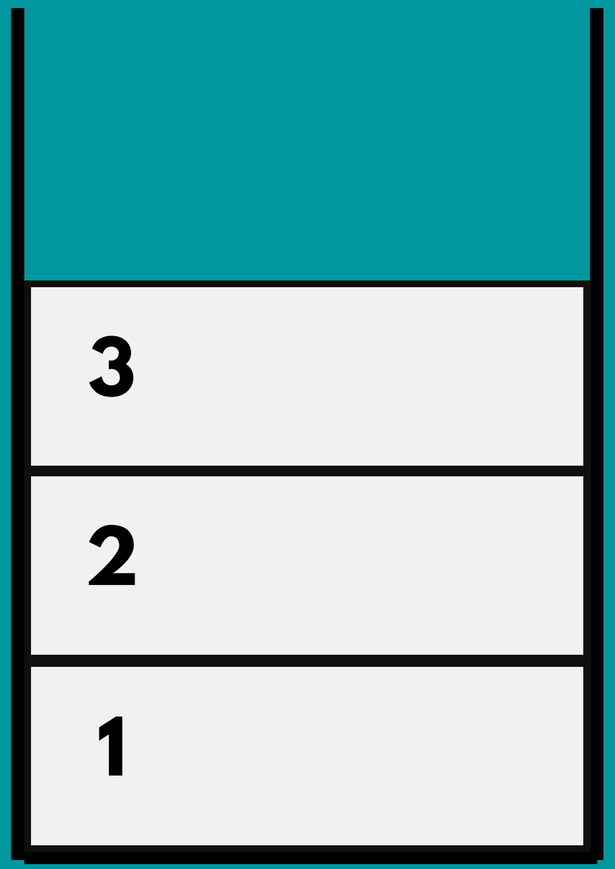

Stack.push(3)

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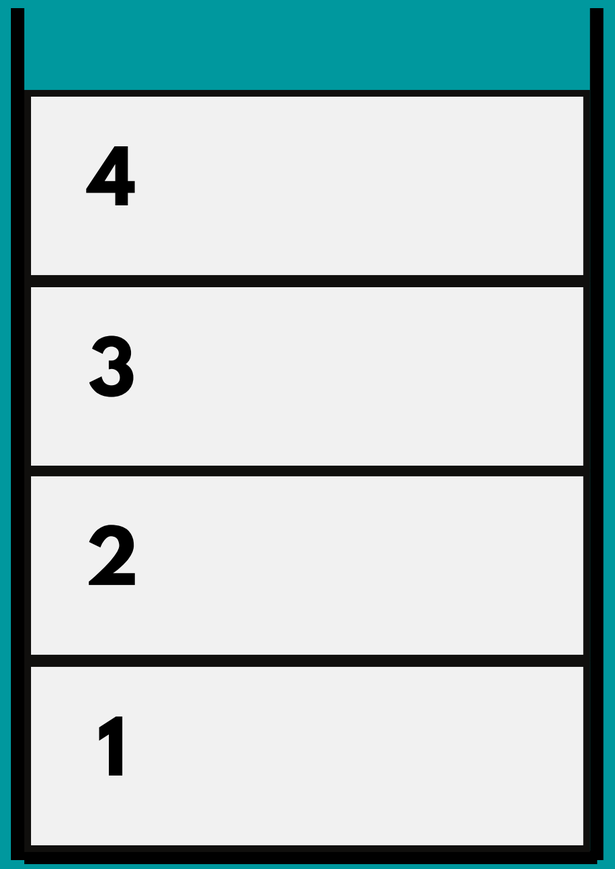
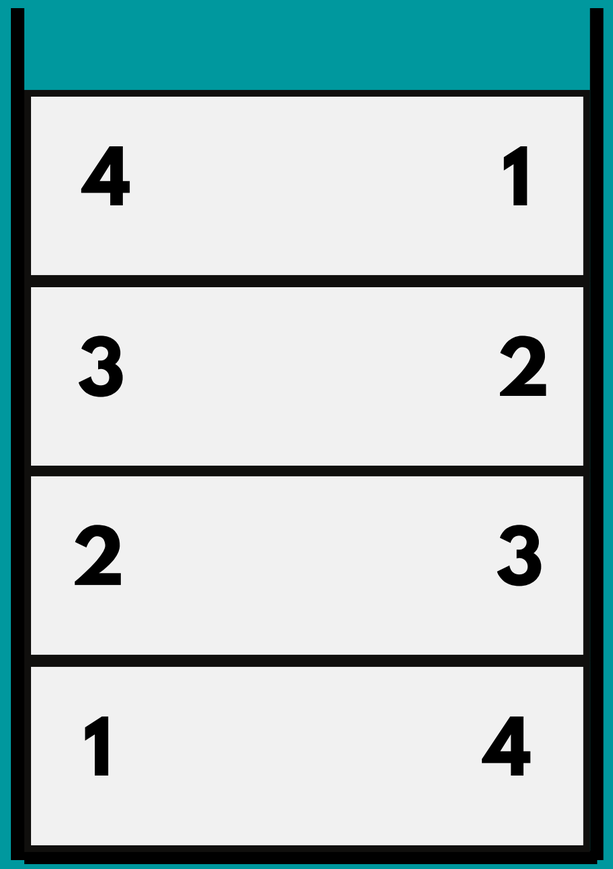
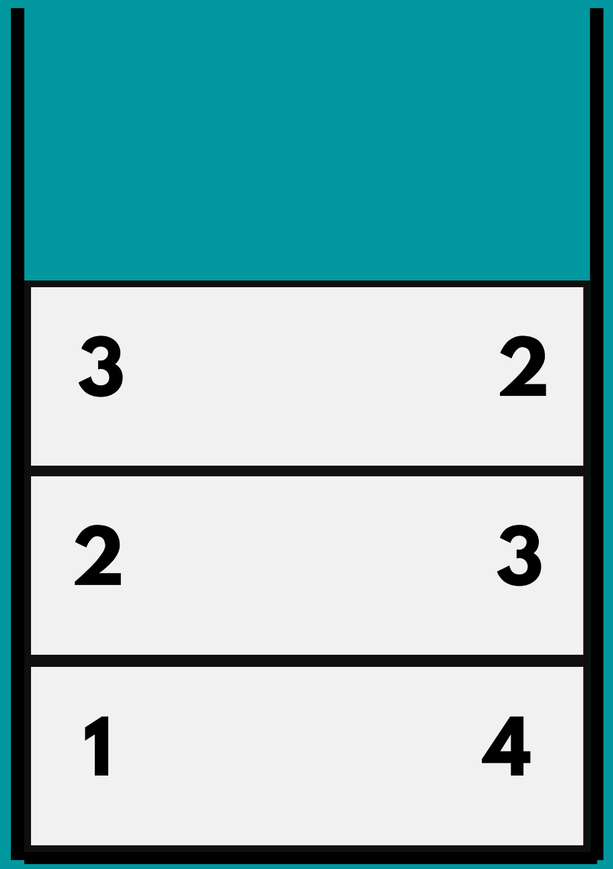


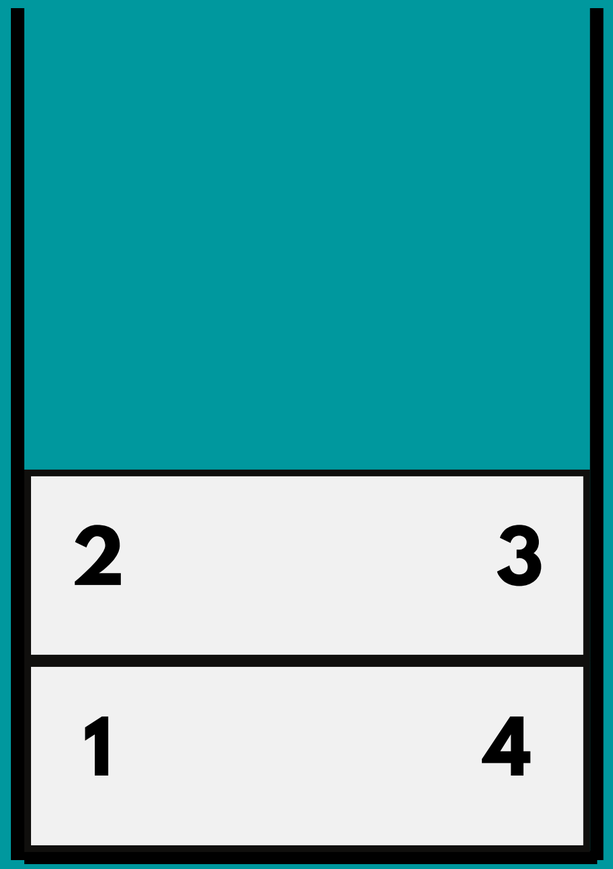
Stack.push(4)



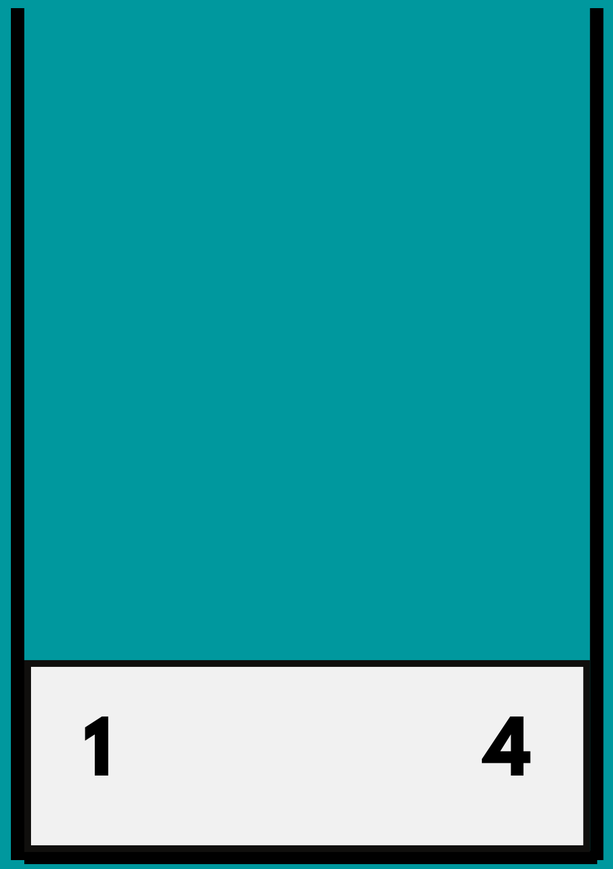
LIFO - Last in first out



LIFO - Last in first out



LIFO - Last in first out



LIFO - Last in first out

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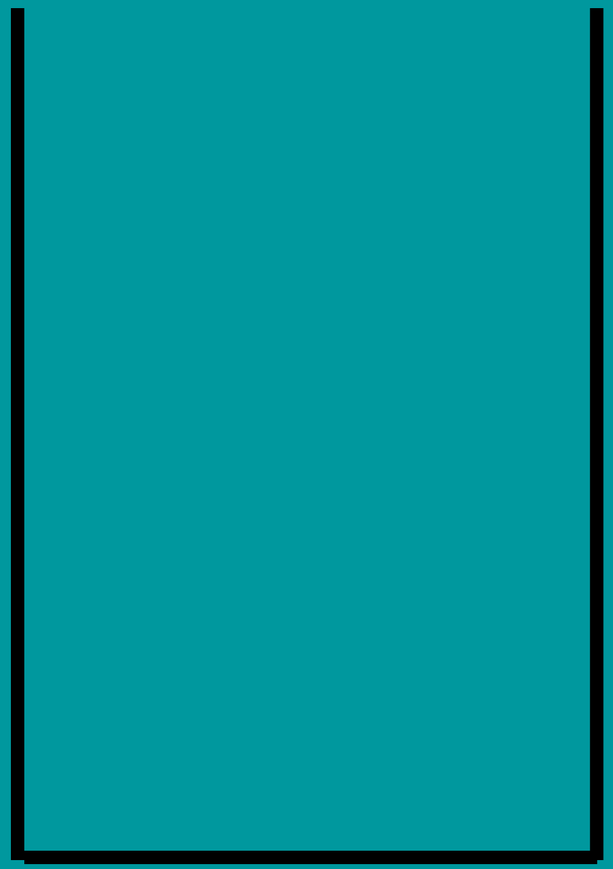

LIFO - Last in first out

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Queue

Queues are a type of container adapter, specifically designed to operate on FIFO context i.e. first in first out context , where elements are inserted into one end of the container and extracted from the other.

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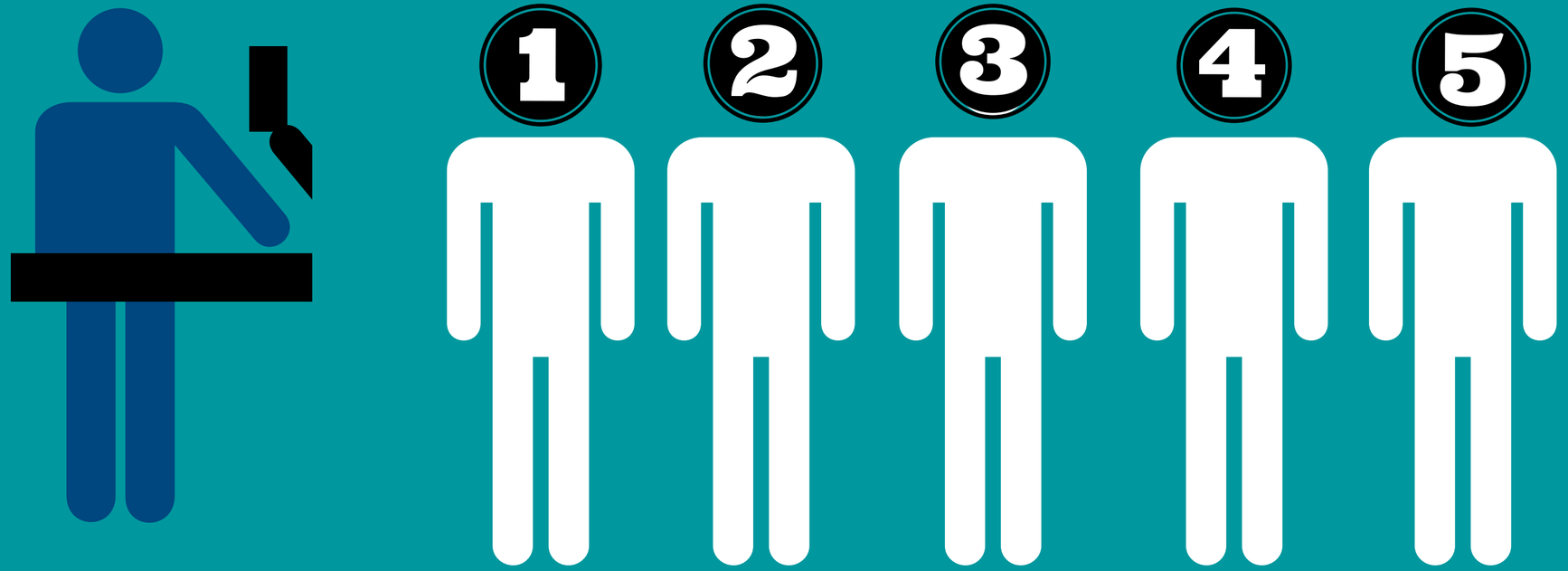
Queue



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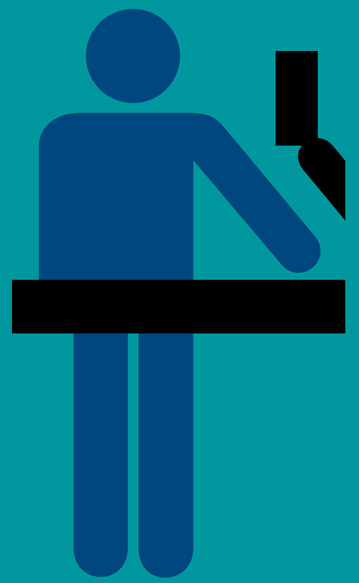
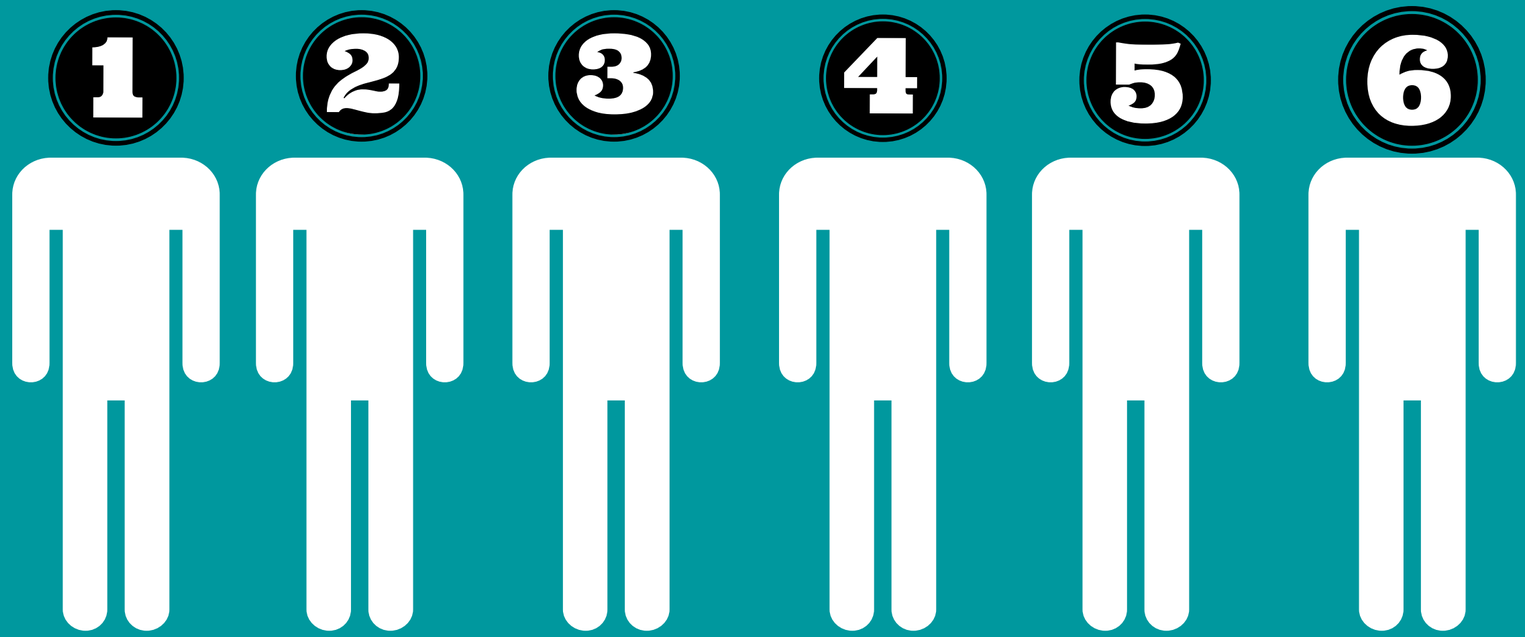
FIFO - First in first out





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FIFO - First in first out