Hashing

Hash Tables

What are they?	Structures that store information in a specific order but as key-value pairs
How do I implement it?	In Python, hash tables are basically just dictionaries
Why bother?	Unlike e.g. lists, hash tables save and retrieve data in constant time (O(1))

How Come Hash Tables are so Fast?

Hash tables use a **hash function** to convert keys directly into array indices, so they can jump straight to where the data is stored instead of searching through every element.

Can two keys hash to the same index?

Yes. This is called a **collision**. If two entries collide, we can resolve it (e.g. by **chaining** or **open addressing**).

Searching Algorithms

Searching Algorithm Examples

Linear Search (slow)

```
function linear_search(array, target):

    for each element in array:
        if element == target:
            return index of element

    return -1 (not found)
```

Binary Search (fast)

```
function binary_search(array, target):
    left = 0
    right = length of array - 1

    while left <= right:
        mid = (left + right) / 2

        if array[mid] == target:
            return mid
        else if array[mid] < target:
            left = mid + 1
        else:
            right = mid - 1

    return -1 (not found)
```