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What is a hash table?

Hash Table | Data Structures

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A **hash table** is a type of data structure that stores key-value pairs. The key is sent to a hash function that performs arithmetic operations on it. The result (commonly called the *hash value* or *hash*) is the index of the key-value pair in the hash table.

Components of a hash table

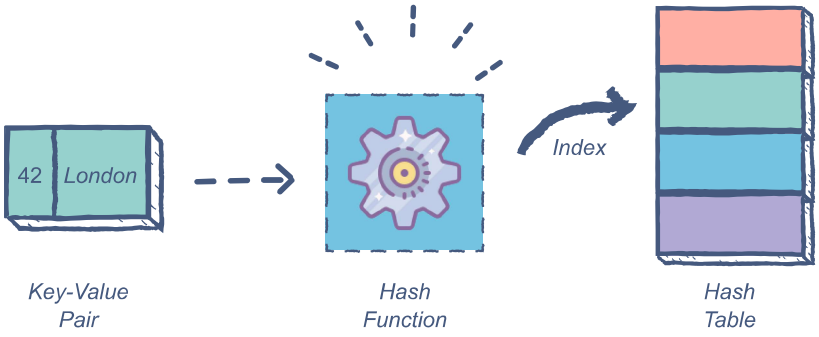
A basic hash table consists of two parts:

1. Hash function

As we've already seen, the hash function determines the index of our key-value pair. Choosing an efficient hash function is a crucial part of creating a good hash table. You should always ensure that it's a one-way function, i.e., the key cannot be retrieved from the hash. Another property of a good hash function is that it avoids producing the same hash for different keys.

2. Array

The array holds all the key-value entries in the table. The size of the array should be set according to the amount of data expected.



Collisions in hash tables & resolutions

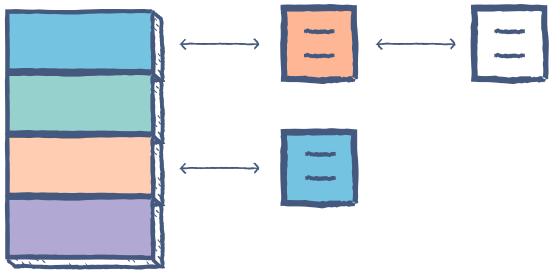
A **collision** occurs when two keys get mapped to the same index. There are several ways of handling collisions.

1. Linear probing

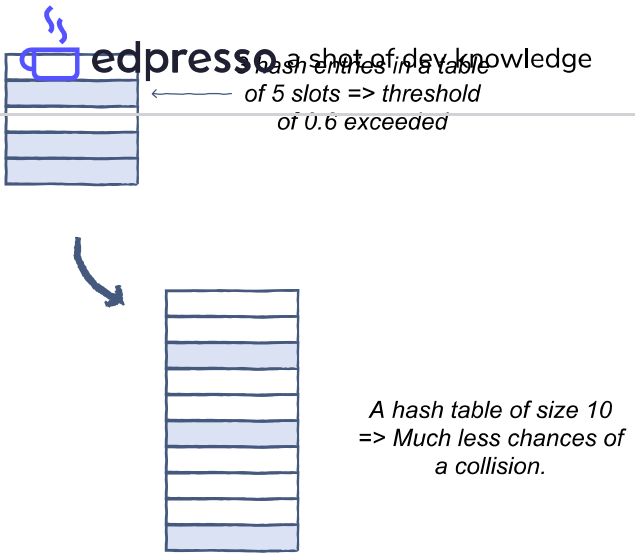
If a pair is hashed to a slot which is already occupied, it searches linearly for the next free slot in the table.

2. Chaining

The hash table will be an array of linked lists. All keys mapping to the same index will be stored as linked list nodes at that index.



3. Resizing the hash table



The size of the hash table can be increased in order to spread the hash entries further apart. A **threshold** value signifies the percentage of the hash table that needs to be occupied before resizing. A hash table with a threshold of 0.6 would resize when 60% of the space is occupied. As a convention, the size of the hashtable is doubled. This can be memory intensive.

Complexities

Operation	Average	Worst
Search	*O(1)*	*O(n)*
Insertion	*O(1)*	*O(n)*
Deletion	*O(1)*	*O(n)*
Space	*O(n)*	*O(n)*

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