Data Structures
Intro to Hash Tables

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Hash Table

a hash table is a data structure that implements a map ADT (associative array). a hash table has the properties of:

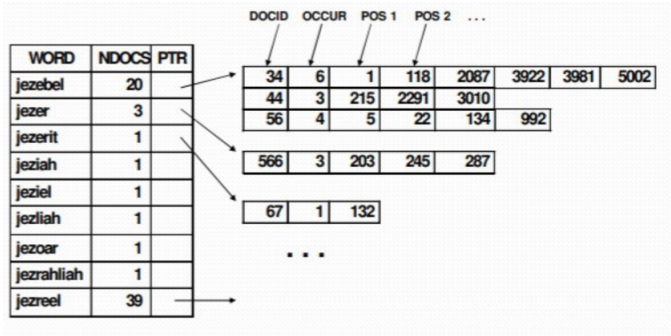
- a structure that can map keys to values
- a structure for fast lookup (and insertion)

and a map ADT consists of:

- a set of unique keys
- a set of values where each key is associated with one value or set of values. for example:

```
{('cain', 12), ('matthew', 11)}
```

Search engines use hashmaps to find webpages containing words in your query. An example of a hash table used in a search engine is a **doc-word** <key-value> pairs:



Map Operations

so to go over the hash table operations we must first go over the map operations:

- get(key k)
  returns null if key is not in map
- put(key k, val v)
  if the key is already associated with a value, replace that value with val
- remove(key k)
  if key is not in the map, do nothing
- size()
- isEmpty()

the main idea of a hash table is that we can use some mathematical function that takes a input (normally number) and converts it into a unique slot number between 0 and 99,999 in an array.

Hash Function the main way of keeping the output of the hash within the array bounds is by using the modulus function. once we have that implemented we can then create a operation for mutating the input such that each input gives a unique output for the given application