

Hashing

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Hashing

Hash tables are used for keeping values with a key.



Just imagine a locker. You can only open them if you have the keys.





Hashing

Assume you have a hash table named **Users** wherein username is used as key and the value is the name. It will be like this:

1st record in Hash Table

Key: jsmith

Value: John Smith

2nd record in Hash Table

Key: jdoe

Value: Jane Doe





Properties of Hash Function

Property 1: Deterministic

No matter how many times you parse through a particular input through a hash function you will always get the same result.

Property 2: Quick Computation

The hash function should be capable of returning the hash of an input quickly. If the process isn't fast enough then the system simply won't be efficient.





Properties of Hash Function

Property 3: Pre-Image Resistance

What pre-image resistance states is that given $H(A)$ it is infeasible to determine A , where A is the input and $H(A)$ is the output hash.

Property 4: Small Changes In Input Changes the Hash

Even if you make a small change in your input, the changes that will be reflected in the hash will be huge.





Properties of Hash Function

Property 5: Collision Resistant

Given two different inputs A and B where $H(A)$ and $H(B)$ are their respective hashes, it is infeasible for $H(A)$ to be equal to $H(B)$.

Property 6: Puzzle Friendly

It should be difficult to select an input that provides a pre-defined output. Thus, the input should be selected from a distribution that's as wide as possible.





Hashing

Consider inserting the keys

10, 22, 31, 4, 15, 28, 17, 88, and 59

into a hash table of length $m=11$ using open addressing with the primary hash function $h(k) = k \bmod m$. Illustrate the result of inserting these keys using collision avoidance through linear probing. What is the resultant hash table?





Hashing

0	22
1	88
2	
3	
4	4
5	15
6	28
7	17
8	59
9	31
10	10



Hashing



Consider inserting the keys

12, 18, 13, 2, 3, 23, 5 and 15

into a hash table of length $m=10$ using open addressing with the primary hash function $h(k) = k \bmod m$. Illustrate the result of inserting these keys using collision avoidance through linear probing.





Hashing

0	
1	
2	2
3	23
4	
5	15
6	
7	
8	18
9	

(A)

0	
1	
2	12
3	13
4	
5	5
6	
7	
8	18
9	

(B)

0	
1	
2	12
3	13
4	2
5	3
6	23
7	5
8	18
9	15

(C)

0	
1	
2	12, 2
3	13, 3, 23
4	
5	5, 15
6	
7	
8	18
9	

(D)

