

# CSE12 - Lecture 15 - Notes

Friday, November 3, 2023 8:00 AM

PA5 due Wednesday @ 8am

PA3 Late/Resubmit due Wednesday @ 8am

Exam 1 grading - 23 points -> 18 points

Exam 2 - May 15th

- <https://ucsd-cse12-sp24.github.io/lectures/exam2.html>

Lecture 15

**Map and HashTable**

Hash Function

```
int getIndex(String k) {
    return k.length();
}
```

# of buckets - 6  
(i.e. the size of the array)

```
set("Smith", 1);
set("Johnson", 2);
set("Williams", 3);
set("Brown", 4);
set("Jones", 5);
set("Garcia", 6);
set("Miller", 7);
set("Davis", 8);
set("Rodriguez", 9);
set("Martinez", 10);
```

Draw the picture of the HashTable using Separate Chaining (no expandCapacity)

Mapping keys to values

```
class KeyValuePair<K, V> {
    K key;
    V value;
}
```

What is the run-time for this HashTable (do picture first):

replace duplicates

set()

Worst Case:  $\Theta(N)$

Best Case:  $\Theta(1)$

What conditions make up the best case for set()? empty bucket  $\rightarrow$  no collision even distribution

get()

Worst Case:  $\Theta(N)$

Best Case:  $\Theta(1)$

What conditions make up the best case for get()? empty bucket 1 element in a bucket 1st element in the bucket even distribution

	hash	index
set("Smith", 1);	5	5
set("Johnson", 2);	8	2
set("Williams", 3);	5	5
set("Brown", 4);	5	0
set("Jones", 5);	5	0
set("Garcia", 6);	6	0
set("Miller", 7);	5	5
set("Davis", 8);	9	3
set("Rodriguez", 9);	8	
set("Martinez", 10);	8	2

0  $\rightarrow$  {"Garcia", 6}, {"Miller", 7}

1  $\rightarrow$  {"Johnson", 2}

2  $\rightarrow$  {"Williams", 3}, {"Martinez", 10}

3  $\rightarrow$  {"Rodriguez", 9}

4  $\rightarrow$

5  $\rightarrow$  {"Smith", 1}, {"Brown", 4}, {"Jones", 5}, {"Davis", 8}

$N=10$   
Set  $\rightarrow$  add new 5 letter words  
~~LL  $\rightarrow$  add  $\Theta(N)$~~   
LL  $\rightarrow$  add  $\Theta(1) \rightarrow \Theta(N)$  expand capacity  
 $\rightarrow$  contains  $\rightarrow$  get  $\rightarrow \Theta(N)$   
LL  $\rightarrow$  preprend  $\Theta(1) \rightarrow$

get("Davis")  
4 comparisons  
get("Gregg")  
4 comparisons  
get("Grog")  
0 comparisons

9696

